

Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

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PREFACE.

UP to the end of 1921, the serial statistical publications of the Meteorological Office were grouped together as though they were parts of one comprehensive book. This book, which was entitled "The British Meteorological and Magnetic Year Book," consisted of:—

Part I	..	..	..	..	..	The Weekly Weather Report.
Part II	..	..	..	..	..	The Monthly Weather Report.
Part III, Section I			..	..	..	Daily Readings at Meteorological stations of the First and Second Orders.
		Section II	..	..	..	Geophysical Journal, Daily Values of Meteorological and Geophysical Elements.
Part IV, Section I			..	..	..	Hourly Values from Autographic Records. Meteorological Section.
		Section II	..	..	..	Hourly Values from Autographic Records. Geophysical Section.
Part V	..	..	..	..	..	Réseau Mondial.

The data for the year 1922 and subsequent years are found in the following publications:—

New Publication from 1922.					Corresponding parts of the British Meteorological and Magnetic Year Book until the end of 1921.
The Weekly Weather Report	..	..	..	..	Part I.
The Monthly Weather Report	..	..	..	..	Part II.
The Observatories' Year Book	..	..	..	..	{ Part III, Section II. Part IV, Section I.* Part IV, Section II.
The Réseau Mondial	..	..	..	..	Part V.

It will be noticed that Part III, Section I, of the old publication is not included in the new issues. This part contained "Daily Readings at Meteorological Stations of the First and Second Orders," and it has been decided that as the Observatories' Year Book contains daily values of the meteorological elements for the principal first order stations and the Daily Weather Report contains daily values for these and about 40 other stations, it is not necessary to revive the issue of this section, which ceased with the data for 1921.

The present volume is the seventh issue of the Observatories' Year Book. It contains geophysical data for Lerwick, Eskdalemuir, Cahirciveen and Richmond, meteorological data for Aberdeen, Eskdalemuir, Cahirciveen and Richmond, and in addition an aerological section giving the results of soundings of the upper atmosphere by means of registering balloons.

In accordance with the policy of printing site plans and photographs of the observatories every fifth year such plans and photographs, which were last published in the volume for 1923, are again included in this volume.

The table of mean annual values of magnetic data for observatories of the globe has been contributed by the Astronomer-Royal. It will be found in the Eskdalemuir section.

* Part IV., Section I., Hourly Values from Autographic Records, Meteorological Section, was discontinued after the data for 1913 had been published. The hourly values for the years 1914 to 1921 are, however, available in manuscript.

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ERRATA IN PREVIOUS VOLUMES

Year Book, 1926.

P. 49. Table 32.—Magnetic Character 1st August. *For 0 read 1.*
 Mean for Month. *For 0.23 read 0.26.*

P. 252. Table 336.—Vassouras, Brazil. Magnetic Declination 1924–26. *For E read W.*

Year Book, 1927.

P. 75. Table 56 Heading. *For Disturbed Days read "Quiet Days."*

P. 149. Line 21 from foot of page. *For maximum read minimum.*
For minimum read maximum.

P. 264. Table 340.—Apia, Samoa. Magnetic Declination for 1927. *For 10° 9.5 read 10° 29.5.*
 Vassouras, Brazil. Magnetic Declination 1925–26. *For E read W.*

P. 359. Table 460.—Mean Temperature 15th July. *For 97.7 read 87.7.*

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LIST OF OBSERVATORIES.

	Latitude.	Longitude	G.M.T. of Local Mean Noon.		Height above M.S.L. in metres.
			h	m	
Lerwick, Shetland Isles	60 8 N.	1 11 W.	12	5	81·7
Aberdeen	57 10 N.	2 6 W.	12	8	13·4
Eskdalemuir, Dumfries-shire	55 19 N.	3 12 W.	12	13	242·0
Valentia Observatory, Cahirciveen, Co. Kerry.	51 56 N.	10 15 W.	12	41	9·1
Kew Observatory, Richmond, Surrey ..	51 28 N.	0 19 W.	12	1	5·5

Note.—The height given is that of the site of the rain-gauge. The heights of other meteorological instruments are shown in the appropriate Tables.

NORMAL VALUES AND MONTHLY SUMMARIES.

Monthly and annual normals of pressure, dry bulb temperature, and rainfall for each hour of the day and for the period of 45 years, 1871–1915, are published for the observatories Aberdeen, Cahirciveen, Richmond and Falmouth in *Hourly Values from Autographic Records, 1917* (Part IV. of the British Meteorological and Magnetic Year Book, 1917), and in previous volumes of that series. Corresponding normals of wind-speed and sunshine are published there for the same observatories and for the period of 35 years, 1881–1915; while corresponding normals of relative humidity are also published there for the period of 30 years, 1886–1915.

For Eskdalemuir the same publication gives hourly averages for the months and for the year, referred to the period 1911–1915.

Summaries giving additional mean values and frequencies of occurrence of various meteorological phenomena will be found for all the observatories in *The Monthly Weather Report* and its Annual Summary. The latter also contains special summaries of the tabulations of the anemographs.

Monthly normal values of maximum, minimum and mean temperature, rainfall and sunshine for the period 1881–1915 are published in the *Book of Normals, Section I* for Aberdeen, Cahirciveen, Richmond and Falmouth. *Section IV* of the same publication gives information regarding the range of variation of temperature and rainfall at the same observatories, and monthly frequencies of the normal numbers of days of hail, thunder, snow, snow-lying and ground frost. *Section VI* of the *Book of Normals* gives isopleth diagrams showing the normal diurnal and seasonal variation of relative humidity at all the observatories for which data of relative humidity are included in this volume.

GENERAL INTRODUCTION TO THE METEOROLOGICAL TABLES.

The elements dealt with in the following meteorological tables for the Observatories at Aberdeen, Eskdalemuir, Cahirciveen and Richmond are :—barometric pressure, air temperature, humidity, rainfall, sunshine, wind speed and direction, minimum night temperature on the grass, cloud, visibility and weather, and in some cases temperature in the ground, solar radiation and level of underground water.

The positions of the Observatories and the heights of the sites are given on p. 10.

NOTES ON THE INSTRUMENTS AND TABULATION OF THE RECORDS.

A detailed description of the barograph, thermograph, and Beckley raingauge used for obtaining the records of pressure, temperature, humidity, and rainfall is given in the *Reports* of the Meteorological Office for the years 1867 and 1869 ; for a description of other instruments in use reference may be made to the *Meteorological Observer's Handbook* and to the article on Meteorological Instruments in the *Dictionary of Applied Physics*, Vol. III. The following notes are supplementary and are given partly for reference and partly as containing information necessary for the interpretation of the tables.

Barometer.—The record of barometric pressure is obtained photographically from a mercurial barometer.

A beam of light is passed through the space between the surface of the column of mercury and the top of the tube, and, after passing through a diaphragm which reduces the width of the beam of light to a very narrow sharp line, is focussed upon a sheet of sensitized paper (ordinary " bromide " paper is employed) carried upon a cylinder which is rotated by clockwork and makes one revolution about its vertical axis in rather more than 48 hours.

The barogram is therefore a continuous photograph of this narrow vertical line, and appears as a horizontal ribbon, the depth of which is constantly varying with the rise or fall of the mercury in the tube of the barometer.

The expansion of a zinc rod is utilised to compensate for the effect of temperature upon the height of the barometric column ; the arrangement produces mechanically a lengthening of the beam of light at its upper end as it becomes shortened at its lower extremity by the expansion of the mercury in the tube. A time-scale is recorded upon the barogram by means of a shutter actuated by the clock. This shutter cuts off the light for the space of four minutes every two hours, thus producing interruptions which appear as narrow white spaces on the record corresponding with known points of time. Until 1918 these time-breaks occurred at the even hours, 2h, 4h, 6h, etc., but it was found that when the edge of the record was not critically sharp owing to various causes, a systematic error was introduced when measuring the records, whereby the values at the even hours were slightly in excess of those at the odd hours where no time-break existed. From 1918 onwards the clock was so arranged that the time-breaks should occur half an hour before the even hours ; by this means both even and odd hour-values are measured at points on the trace which are unaffected by any systematic difference.

Control readings of a standard barometer are taken three times a day by different observers. The control readings are first corrected for index error, temperature and gravity, and then compared with the corresponding readings of the barogram. The differences between the control readings and the corresponding tabulated values

are then found and a correction derived therefrom is applied to all the tabulated values. This correction, known as the "residual correction," is so applied as to run smoothly throughout the whole length of each record—a period of 48 hours—and alterations in the amount of the correction occur, where necessary, in steps not exceeding 0.1 millibar.*

The scale value of the barograms is found from a comparison of a series of such standard and curve readings. The indications of a curve are converted into numerical values by measuring the ordinates with a tabulating instrument, graduated according to the ascertained scale value.

Thermometers.—The air temperature data at each Observatory are derived from records obtained photographically from two mercurial thermometers. One thermometer is used as a dry bulb and the other as a wet bulb thermometer.

Each thermometer has a large cylindrical bulb four inches long and a very long stem. The latter is bent twice at right angles to enable the bulb to be exposed outside the building in a louvred screen attached to the north wall of the Observatory.† The column of mercury in the vertical portion of the stem inside the building is broken at a convenient point by a small air space which moves up or down the stem with rise or fall of temperature. The record is obtained by passing a reflected beam of light through the air space and photographing its image upon a moving sheet of "bromide" paper in the same manner as described in the case of the barometer. A base line is traced on the paper by a pencil of light passing through a small aperture in the brass frame carrying the recording thermometer. The time-scale is automatically recorded upon the curves, a time-break occurring half an hour before each even hour.

Two large standard thermometers with very open scales graduated in degrees absolute and having bulbs similar to those of the thermograph are mounted in the screen side by side and close to the thermograph bulbs. One of the thermometers is arranged as a dry bulb, the other as a wet bulb. Control readings of these thermometers are made three times a day for comparison with the corresponding readings obtained from the thermograms.

The scale-value of the curves is found by a comparison of the readings of the standard thermometers, corrected for any errors they may have, with the corresponding measurements of the curves. The curves are measured by means of a plate of glass ruled with lines corresponding with the ascertained scale-value of the record, both for degrees and for time. The scale is graduated so as to read degrees vertically and hours horizontally.

Two alternative methods of reading the curves have been adopted.

- (a) At Richmond the scale is set by the base-line and after hourly readings have been obtained for the whole record comparisons are made with the control readings. The residual correction so determined (normally the same for the whole record of 48 hours) is applied to the tabulations.
- (b) At Aberdeen, Eskdalemuir and Cahirciveen, the practice is to adjust the glass scale so that the readings at the control hours on the trace are made to show general agreement with the corresponding eye-readings of the standard thermometers. The temperature equivalent of any part of the curve can then be read off. The base-line photographed on the record serves as a useful check.

* At Cahirciveen and Richmond the rule is to apply the same correction for the whole chart.

† At Eskdalemuir the screen stands in the open.

Rainfall.—This element is recorded by a Beckley self-registering raingauge, in which the rain as it falls is collected in a receiver supported on a float in a vessel of mercury. As the rain passes into the receiver, the float gradually sinks, carrying with it a pen which records its position upon a paper stretched upon a clock-driven cylinder. The displacement of the mercury by the float is arranged so as to give a uniform scale throughout. When five millimetres (two-tenths of an inch) of rain have entered the receiver a siphon comes into action, and, by discharging its contents, causes the float to rise till the pen is brought back to the zero line, from which the record begins again.

The collecting funnel of the Beckley raingauge has an area of approximately 100 square inches. Each gauge stands on level ground and its distance from every other object is greater than twice the height of the object. The height of the rim of the Beckley raingauge above the surface of the surrounding ground varies from 0.4 m. to 0.6 m. at the different observatories. Details are given at the head of the tables of hourly values. A check gauge with funnel 8 inches in diameter is installed near by.

The records obtained from the Beckley self-registering raingauge are, if necessary, subjected to a proportional correction whereby they are brought into agreement with the amount of rainfall as recorded by the check raingauge which is read twice daily at 7h. and 18h.

Sunshine.—The record of sunshine is obtained from a Campbell-Stokes recorder, in which instrument the sun's rays are focussed through a 4-inch spherical lens of crown glass upon a strip of blue card, which is scorched, or burned right through, according to the intensity of the sun's rays. Three different patterns of card are used at different seasons of the year. The cards are exposed in a metal bowl, and the focussed image of the sun leaves its mark behind it as it travels along the surface of the card with the apparent motion of the sun through the heavens. The intensity of the burn is not measured, but the record is regarded as that of "bright" sunshine whenever the card has been distinctly scorched. When measuring the duration of sunshine which is represented by intermittent burns, an allowance is made for the extension of the trace by the charring of the card.

Wind-Speed and Direction.—The hourly values of wind-speed and direction which appear in this volume are derived from the records of Dines tube anemographs. These instruments record the speed of the wind and its direction directly as functions of the time. For volumes previous to that of 1926 the hourly values of wind-speed and direction were derived from the records of Robinson Cup Anemographs, except at Eskdalemuir, where the records of tube-anemographs have always been used for the purpose of hourly values. Particulars of the exposure of the tube-anemographs at the several observatories will be found in the introductions to the data for each observatory. A description of the tube anemograph will be found in the *Meteorological Observer's Handbook*.

In consequence of these changes the values of wind-speed published for Aberdeen, Cahirciveen and Richmond for 1926 and later years are not directly comparable with those published for earlier years. The matter was briefly discussed in the General Introduction to the *Year Book* for 1926. The following table gives, for the various wind directions, the mean values of windspeed recorded by the tube anemographs, expressed as percentages of the corresponding values recorded by the cup anemographs :—

*Average values of the quantity $100 \times \frac{\text{Speed by tube anemograph}}{\text{Speed by cup anemograph}}$
at the three observatories, arranged according to the direction of the wind.*

North = 360°, East = 90°, South = 180°, West = 270°.

Wind Direction in degrees from North.	Aber- deen.	Cahir- civeen.	Rich- mond.	Wind Direction in degrees from North.	Aber- deen.	Cahir- civeen.	Rich- mond.
10	131	103	99	190	138	137	96
20	132	103	100	200	132	134	99
30	130	104	103	210	124	128	99
40	117	103	103	220	115	115	100
50	115	104	104	230	108	102	100
60	115	105	99	240	110	90	100
70	119	105	99	250	112	88	101
80	113	104	97	260	114	85	101
90	110	102	101	270	128	82	101
100	126	98	104	280	124	81	103
110	121	97	102	290	110	83	101
120	118	98	100	300	99	88	96
130	118	100	104	310	100	92	93
140	125	103	102	320	108	95	96
150	128	107	98	330	111	97	99
160	137	114	92	340	120	98	98
170	133	123	92	350	138	99	103
180	135	134	95	360	135	102	104

Minimum Night Temperature on the Grass.—This is the temperature determined by a minimum thermometer exposed freely over the surface of the grass. The stem of the thermometer is enclosed in an outer glass jacket, but the spirit bulb is freely exposed to the air. The thermometer is supported on two small Y-shaped pieces of wood so that it lies horizontally, with its bulb about one or two inches above the ground which is covered with short grass. When snow has fallen the thermometer is supported so as to lie just above the surface of the fallen snow, but not touching it.

The thermometer is laid out at 18h. each day, having been kept in an upright position, bulb downwards, inside the Stevenson Screen during the daytime, so that any spirit that may have condensed in the upper part of the stem may be able to run down and join the main spirit column.

NOTES ON THE TABLES.

General.—Interpolated values are printed within brackets, (). Maximum and minimum values are printed in heavy type.

Standard of Time.—The observations are referred to *Greenwich Mean Time* except as regards sunshine, for which element *local apparent time* is used.

Units.—In accordance with the practice introduced in 1911, as a consequence of certain resolutions of the Gassiot Committee of the Royal Society, the values in the tables are expressed throughout in units based upon the C.G.S. System: tables for conversion to other units are given in the *British Meteorological and Magnetic Year Book (Part IV)* for 1913 and are also to be found in the *Computer's Handbook*.

Daily Mean Values.—The daily means of pressure, temperature, relative humidity and wind speed are obtained by adding half the sum of the values for the initial and final midnights to the sum of the 23 intermediate hourly values and dividing by 24.

In the preparation of the tables of diurnal inequalities for individual months and for the year, it is assumed that the difference of value between the means for the initial and final midnights, which may be termed, so far as the hourly variations are concerned, the non-cyclic variation, is equally distributed over the whole 24-hour period. Thus, in a table of diurnal inequalities the entry d_n for the hour n is given by

$$d_n = x_n - \bar{x} - (n - 12) (x_{24} - x_0) / 24,$$

x_n being the value of the element at hour n and \bar{x} the mean for 24 hours.

Annual Values.—The mean values or totals for the whole year (given either in separate tables or at the end of the corresponding monthly tables), are computed as the means or sums of 365, in leap year 366, daily values.* The annual values of pressure at sea level are computed from the annual means at station level and the annual means of air temperature; the annual values of vapour pressure are derived from the annual means of air temperature and relative humidity.

Atmospheric Pressure.—All pressures recorded in this volume are expressed in *millibars*, one millibar being equal to 1000 dynes per square centimetre. The following are the values of physical constants used in evaluating the data :—

Density of Mercury = 13.5955 grams per cc. at 0°C.

Intensity of Gravity at Sea Level (Lat. 45°) = 980.617 centimetres per second per second.

1 inch = 25.4000 millimetres.

Hence 1000 millibars corresponds with a reading of 750.076 millimetres, on a mercury barometer at temperature 0°C. in Lat. 45°, or 29.5306 inches under standard conditions of temperature (mercury at freezing point, scale at 62° F.) in Lat. 45°.

As a millibar is a pressure, it can only be obtained from the reading of a barometer after the latter has been suitably corrected for

- (a) index error,
- (b) temperature,
- (c) gravity.

All these corrections have therefore been applied to the barometer readings in obtaining the pressure values published in this volume. The corrections for index error (including those for capillarity) are given in the certificates issued by the Kew Observatory or the National Physical Laboratory in respect of the standard barometers at each observatory. The corrections for temperature are equivalent to those published in the *International Meteorological Tables* (Gauthier-Villars, Paris, 1890). The correction for the variation of gravity from its standard value at sea level in latitude 45°, quoted above, is in accordance with the formula adopted in the *International Tables*, viz. :—

$$g_{z\lambda} / g_{0, 45^\circ} = (1 - 0.00259 \cos 2\lambda) (1 - 5z/4E)$$

where z = height of the station above M.S.L.

E = earth's radius, both expressed in the same units,

and λ = latitude of station.

Except at Eskdalemuir, the correction for the variation of gravity with height, contained in the second factor of the above equation, is insignificant.

* At Eskdalemuir the annual values for the years 1922 to 1926 were computed as the means or sums of 12 monthly values.

Unless otherwise stated, all pressure values refer to the level of the observatory, as given in the headings of the tables. The reduction to sea-level, wherever made, is effected by tables drawn up for each observatory in accordance with the following scheme:—

If p is pressure at station level, and P is pressure at sea-level, the correction required to reduce p to sea-level is $P-p$ where

$$\log_e (P/p) = \bar{g}z (1 - 3\bar{w}/8p)/K\bar{T}.$$

z = height of station in centimetres.

e = base of Napierian logarithms.

K = gas constant for dry air = $10^9/348.4$ C.G.S. units.*

\bar{T} = mean absolute temperature of the air column between station level and mean sea-level.

\bar{w} = mean value of water vapour pressure in the column.

\bar{g} = mean value of the acceleration of gravity in the air column. Even at Eskdalemuir, the highest station, the effect on the correction of the variation of gravity with height is, in this case, negligible, so that

$$\bar{g} = 980.617 (1 - 0.00259 \cos 2\lambda).$$

The factor $(1 - 3\bar{w}/8p)$ in the above formula is practically unity except at Eskdalemuir. Its value for that observatory is discussed in the Introduction to the Eskdalemuir section.

In the same way, the value of \bar{T} at each observatory differs inappreciably from the value of air temperature at the observatory, except in the case of Eskdalemuir (*see* Introduction to Eskdalemuir section for details).

Hence at all observatories except Eskdalemuir, no corrections are applied for the effects of water vapour, or of change of air temperature in the column of air between the station and sea level.

The scheme for correcting barometer readings outlined above was introduced for Eskdalemuir at the beginning of 1927. For the other observatories, it has come into effect as from 1st January, 1928. The effects of the introduction of the scheme on the tabulated values are briefly referred to in the several introductions to the individual sections. Only at Eskdalemuir are they at all appreciable.

The tables contain values of pressure at exact hours obtained from the photographic barograms in the manner described on p. 11; also daily, monthly and annual means of hourly values, together with the monthly and annual means of diurnal inequalities. Monthly and annual means of the hourly values after reduction to mean sea level are also given.

There is also a table showing the daily extremes of pressure, *i.e.*, the maximum and minimum values recorded during each day.

Temperature.—The scale on which temperatures are recorded is such that the freezing point of water under atmospheric pressure is 273°A precisely. Other temperatures differ by 273.0 from readings on the Centigrade scale.

The scale approximates to the absolute scale defined by Lord Kelvin, on which the temperature of the freezing point is 273.1 to the nearest tenth of a degree.† Accordingly, to convert temperatures published in this volume to the Kelvin scale, a correction $+0.1$ is to be added to each reading.

As an alternative to the application of this correction modified values may be used for the constants which enter certain formulæ. For example:—At temperature t on the scale adopted in the Year Book, the radiation according to Stefan's Law‡ is

$$5.709 \times 10^{-5} (t+0.1)^4 \text{ erg}/(\text{cm.}^2 \text{ sec.}); \text{ or } 5.717 \times 10^{-5} t^4 \text{ erg}/(\text{cm.}^2 \text{ sec.})$$

In using the modified formulæ we are virtually adopting a scale of temperature with the degrees greater than those of the Centigrade scale, in the ratio of 273.1 to 273 . This is the practice of the *Computer's Handbook* of the Meteorological Office.

* This value depends on a coefficient of expansion of dry air of $1/273$ and on the density of dry air at pressure 1013.23 mb. and temperature 273°A , *viz.*, $1293.052 \text{ g}/\text{m}^3$.

† A. L. Day and R. B. Sosman, *Dictionary of Applied Physics*. Macmillan, London, 1922. Vol. I., p. 840.

‡ The constant 5.709 is the value which has been adopted by the International Research Council for publication in the "*International Critical Tables*."

The tables give the values of temperature at exact hours obtained from the photographic thermograms ; also daily, monthly and annual means of hourly values, together with the monthly and annual means of diurnal inequalities. There is also a table showing the daily extremes of temperature.

Humidity.—When the temperature of the wet bulb is above 273a, values of relative humidity at exact hours are deduced from the corresponding values of dry and wet bulb temperatures obtained from tabulations of the photographic thermographs, complete saturation being taken as 100. Until the end of the year 1925 the reduction was effected from tables based on Glaisher's hygrometric factors* but from 1st January, 1926, tables have been employed which proceed from Regnault's formula

$$x = f - Ap (t - t')$$

where x = vapour pressure under the conditions of observation.

f = saturation vapour pressure at the temperature (t') of the wet bulb.

p = pressure of the air.

t = temperature of the dry bulb in absolute (Centigrade) degrees.

t' = temperature of the wet bulb in the same units.

A = a "constant."

The tables used in this volume for determining the hourly values of relative humidity when the wet bulb is above the freezing point are *Jelineks Psychrometer-Tafeln* (6th edition, Leipzig, 1911). They give values which are in almost exact agreement with those given by *Hygrometric Tables* published by the Meteorological Office in 1924 (M.O. 265) for general use at second and third order stations. The latter tables are not suited to the purposes of this Year Book, because in them temperature is expressed in Fahrenheit degrees, whereas the absolute centigrade scale of temperature is used at the observatories.

No allowance for variation of pressure p is made and the standard value used in Jelinek's tables, *i.e.*, 755 mm. of mercury (1006.57 mb.) is adhered to. Similarly no allowance is made in the adopted value of the constant "A" for the speed of the air flowing past the wet bulb, though it is well known that "A" is not independent of the ventilation. "A" is regarded as fixed and equal to .0008. In view of the well-marked diurnal variation of wind-speed, the diurnal variation of humidity, derived in this manner, is subject to slight modification.

When the wet bulb reading does not exceed 273a, the above method of reduction is not followed, but values of relative humidity are derived from the record of the hair hygograph. To these values are applied appropriate corrections based on a comparison between the readings of the record of that instrument and the corresponding values of humidity computed from dry and wet bulb readings during neighbouring periods when the wet bulb readings exceeded 273a.

The mean hourly values of vapour pressure are computed by slide rule from a table† of saturation vapour pressure over water, and the corresponding mean hourly values of relative humidity and air temperature.

* Glaisher's *Hygrometrical Tables*, 7th edition, London, 1885.

† The saturation vapour pressures used are those employed in the preparation of *Hygrometric Tables*. They are equivalent to those published by Scheel and Heuse in *Annalen der Physik*, 1910.

The normal hourly values of relative humidity for the period 1886–1915, published for certain Observatories in “Hourly Values from Autographic Records, 1917,” were derived from tables based on Glaisher’s factors. The application of the new tables to the normal hourly values of dry and wet-bulb temperature gives results for normal relative humidity which are only slightly different from those which have been published. At Kew Observatory in winter the difference is negligible; in July it does not exceed 1 per cent. at any hour, in October it does not exceed 2 per cent. at any hour. The effect is greatest in April when the published normal values of average relative humidity are reduced by 3 per cent. at noon and at 16h. and by smaller amounts at other hours.

Of greater importance is the effect on the values of absolute minimum humidity. Under the old system, values of relative humidity less than 30 per cent. seldom occurred; under the new system, values less than 20 per cent. may occur not infrequently.

Tables are printed giving the values of relative humidity at exact hours together with daily, monthly and annual means of hourly values. Monthly and annual means of vapour pressure computed from the corresponding mean values of temperature and relative humidity, together with monthly and annual means of diurnal inequalities of relative humidity, are also given.

Rainfall.—Tables are given showing for the 60 minute intervals between exact hours* the amount of precipitation, expressed in millimetres, derived from the record of the Beckley gauge (see p. 11). Totals of amount are given for each day, and for each month; the latter totals referring both to the complete days of the month, and to each of the hours of the day. When zero rainfall is assigned to a particular hour, the entry appears as “...”. Corresponding totals of duration of rainfall are also given, the duration being regarded as the number of hours during which rain falls at a rate of not less than 0·1 millimetre per hour. If slight precipitation, due to rain, snow, fog or dew, extends over some hours, and if the amounts collected in some or all of the hours are less than ·1 mm., the fact is indicated by a succession of entries, each of which is enclosed within brackets, covering the period over which precipitation is known or believed to have occurred. In such cases entries of (·1) are allocated evenly among the hours concerned in such a way that their sum is equal to the aggregate fall during the period, and the remaining entries are (...), (*), (≡) or (☉) according as the precipitation took the form of rain, snow, fog or dew. Slight precipitation which takes other forms such as hail, sleet, hoar frost, glazed frost and rime is dealt with similarly. When it is impossible to determine the hourly amounts of precipitation, *e.g.*, during snowfall or on occasions when the record has failed, the normal procedure is to consider each case on its merits, and to assign hourly values derived from estimates made by the observers as soon as possible after the event. Such values are also enclosed in brackets.

Annual totals of hourly amounts and duration and notes on special features of the rainfall of the year are also given.

Sunshine.—Tables are given showing for each of the 60-minute intervals between exact hours† according to *local apparent time*, from sunrise to sunset, the duration of bright sunshine recorded by the Campbell-Stokes instrument. The sums and means of hourly amounts are also given. For each day is shown the total duration of bright sunshine, and also the percentage this represents of the “possible” duration for the day. The “possible” for each day is computed as the period of time beginning and

* For the years 1904 to 1920 it was the practice to tabulate rainfall for the period of 60 minutes centred at the exact hours; the reversion to the method in use for 1903 *et ante* occurred on 1st January, 1921.

† Previous to 1st January, 1921, sunshine was tabulated for the period of 60 minutes centred at exact hours.

ending at the instants when the centre of the sun is apparently on the horizon, due allowance being made for atmospheric refraction. Even on a clear day the sun, when at an altitude less than $2\frac{1}{2}^{\circ}$ to 3° above the horizon, fails to make a scorch on the card of the Campbell-Stokes recorder.

A distinction is made in the tables between (a) sunshine not possible, and (b) sunshine possible but none recorded. If, in any hour, sunshine is not possible, the symbol “—” is used; if more than 3 minutes of “possible” sunshine falls in the 60-minute interval between exact hours according to local apparent time, and if no sunshine was recorded the symbol “...” is printed.

The values for the months and for the year of percentage of possible duration of sunshine are obtained by comparing the total recorded sunshine for the period with the total “possible” sunshine for the period.

Wind.—Tables are printed giving the hourly values of wind speed and direction, together with the mean speed for each day, each hour, and for the month and year. Values of speed are expressed in metres per second (1 metre per second = 2.2369 miles per hour): those of direction are given in degrees from true north. The values of direction* and speed are averages for periods of sixty minutes, centred at the exact hours of Greenwich Mean Time. They are obtained by estimation from the records with the aid of a glass scale, the transparent part of which has a width corresponding with one hour on the time scale of the record.

For speeds not exceeding 1.5 m/s the wind directions are regarded as indeterminate and are omitted.

The daily values of the speed and time of occurrence of the maximum gust and the monthly distribution of wind are shown in other tables.

Minimum Night Temperature on the Grass.—Values are given for each day of the year together with monthly and annual mean values. The interval to which the reading refers is from 18h the previous day to 7h on the day to which it is entered.

Diary of Cloud, Visibility and Weather.—In these tables are given particulars of the cloud forms observed daily at 7h, 13h, and 18h, the total cloud amount observed at 7h, 9h, 13h, 15h, 18h, and 21h, the range of visibility at each of these six hours and the kind of precipitation which may be falling at those hours. There is also a column devoted to remarks on the weather of the day.

Cloud Form.—The observations of cloud form are made in accordance with the International classification, and the following abbreviations are used in the tables:—

Cirrus	..	..	..	..	..	..	Ci.
Cirro-Stratus	..	..	..	..	..	..	Ci-St.
Cirro-Cumulus	..	..	..	..	..	..	Ci-Cu.
Alto-Cumulus	..	..	..	..	..	..	A-Cu.
Alto-Stratus	..	..	..	..	..	..	A-St.
Strato-Cumulus	..	..	..	..	..	..	St-Cu.
Nimbus	..	..	..	..	..	..	Nb.
Cumulus	..	..	..	..	..	..	Cu.
Cumulo-Nimbus	..	..	..	..	..	..	Cu-Nb.
Stratus	..	..	..	..	..	..	St.
Stratus-cumuliformis	..	..	..	..	..	..	St-Cuf.
Fracto-(prefix, as in fracto-stratus)	..	..	..	..	..	..	Fr.
-lenticularis (affix, as in stratus-lenticularis)	..	..	..	..	..	..	-lent.
Mammato-cumulus	..	..	..	..	..	..	M-Cu.

* Formerly it was the practice to take the direction at the exact hour. The present rule was adopted as from 1st May, 1915 (see also Introduction to *Hourly Values from Autographic Records*, 1913, p. xv.).

All the cloud forms noted by the observer at the time of observation are printed where space permits. When the number of forms is too great to allow of this, the predominating forms selected at the time of observation to give the best representation of the cloud canopy are printed. If high or medium cloud can be seen, one of the selected types is normally a high or medium cloud.

Cloud Amount.—The figure given for the amount of cloud denotes the proportion of the sky covered by cloud, the numerical scale running from 0, cloudless, to 10, completely overcast. The figure denotes the total cloudiness irrespective of form. In the case of fog through which it is impossible to discern the sun or stars the cloud amount is entered as 10, but if cloud can be seen through the fog, the form and amount of that cloud are entered in the usual way. If the sun or stars are visible through fog and if there is no evidence of cloud above the fog the amount is entered as 0.

Visibility.—Observations of the range of horizontal visibility made every day at 7h, 9h, 13h, 15h, 18h, and 21h are printed in the diaries of cloud and weather.

As described in detail in the *Meteorological Observer's Handbook* (Ed. 1926), a series of selected objects, A, B, C . . . , as nearly as possible at the standard distances given in the table which follows, are used for this observation. The objects are selected so as to be readily seen and identified from specified observing points in daylight,

SCHEME FOR OBSERVATIONS OF RANGE OF VISIBILITY AND OF FOG,
MIST AND HAZE.

Indication Letter of Object.	Standard Distance of Object.	Verbal Description.	BEAUFORT LETTERS.	
			Detailed Scale.	Contracted Scale.
(X)	Metres. —		8 f	
A	25	Dense fog	7 f	F
B	50	Thick fog	6 f	
C	100		5 f	
D	200	Fog	4 f	f
E	500	Moderate fog	3 f	
F	1,000	Mist, haze or very poor visibility	m or z	m or z.
G	2,000	Poor visibility	m ₀ or z ₀	m ₀ or z ₀
H	4,000	Moderate visibility		
I	7,000			
J	10,000	Good visibility		
K	20,000	Very good visibility		
L	30,000			
M	50,000	Excellent visibility		

NOTE.—The grouping of the letters by the horizontal lines indicates the limits of the several figures of the International Telegraphic Code for visibility, from 0 to 9, which grouping is also adopted in the tables of frequencies published in the *Monthly Weather Report*.

when the air is clear. A variation up to 10 per cent. from the standard distances is considered admissible. Particulars of the objects in use at each observatory, together with a statement of their actual distances and bearings from the point of observation and notes on local peculiarities which affect the observations will be found in the Introductions to the sections for the individual observatories.

The method of observing consists in determining which is the most distant of the selected objects that can be identified and entering the corresponding letter. In cases of uncertainty when the observer, though recognising the presence of an object, would be unable to identify its nature from the observations he is able to make *at the time*, the letter corresponding with the next nearer object is entered. If object A, the nearest of the selected objects cannot be identified, an entry X is made. At night the letters are used to denote as nearly as possible corresponding degrees of atmospheric obscurity.

Small letters are used to indicate interpolations or extrapolations made in cases where it has not been possible to find suitable objects within 10 per cent. of the standard distances. In such cases the observer may use objects at other than the standard distances to guide his judgment. Particulars of such auxiliary objects will be found in the sectional introductions.

At Cahirciveen, visibility is recorded in both landward and seaward directions. The observations of visibility landwards are printed in the main tables. Particulars of occasions when visibility seawards differed from visibility landwards are set out in the Introduction to the Cahirciveen Section.

Fog, Mist and Haze.—The table of standard distances of visibility objects also summarizes the descriptions used in connection with the phenomena of fog, mist and haze, and relates them to the scale of visibility. It also contains the Beaufort letters used for these phenomena in the Remarks column of the diary. In this Year Book as in other publications of the Meteorological Office, statistics of fog, mist and haze are based solely on visibility observations. The term *fog* is restricted to occasions when the visibility is less than 1 kilometre (*i.e.*, object F not visible); the terms *mist* and *haze* to occasions when the visibility is greater than 1 kilometre, but less than 2 kilometres (*i.e.*, object "F" visible, but "G" not visible). The distinction between mist (m) and haze (z) is determined by the depression of the wet bulb. When the visibility is between the limits specified for mist or haze, haze is recorded when the depression of the wet bulb is more than 1° F.; if the depression of the wet bulb does not exceed this limit, the term *mist* is used.

In volumes previous to 1926, occasions of haze, mist and fog were indicated by the International symbols for these phenomena, *viz.*, ∞, ≡° and ≡ respectively, but the relation of these terms to the visibility scale was less rigorous. In order to indicate that a change in procedure has occurred in this matter, the three International symbols for haze, mist and fog have not been used in the tables for 1926 and 1927.

Precipitation.—Whenever precipitation is falling at one of the six hours of observation there is printed in the Diary of Cloud and Weather under the heading "Precipitation" the International weather symbol which indicates the kind of precipitation, in accordance with the list below.

Remarks.—For the purposes of the column headed "Remarks on the Weather of the Day," it is usual to consider the day as divided into three portions, *viz.*, morning, afternoon and night, denoted by *a*, *p*, *n*, respectively, but it should be noted that no arrangements are made for regular eye observation of weather changes in the period 2h 30m to 6h 30m.

The entries in the remarks column consist very largely of international weather symbols and the letters of the Beaufort scale. These symbols and letters are as follows :—

Beaufort Notation and International Weather Symbols.

b	blue sky, whether with clear or hazy atmosphere.	r	● rain.
c	cloudy, <i>i.e.</i> , detached opening clouds.	←	ice crystals in the air.
o	overcast, <i>i.e.</i> , the whole sky covered with one impervious cloud.	s	* snow.
g	gloomy.	rs	✱ sleet.
u	ugly, threatening.	†	drift snow.
v	visibility, unusual clearness of atmosphere.	⊠	snow lying. (More than half the surrounding country covered with snow.)
z	haze.*	h	▲ hail.
m	mist, light fog.*	△	soft hail.
f	fog.*	t	⊥ thunder.
fe	wet fog, <i>i.e.</i> , fog which deposits water copiously on exposed surfaces.	l	⚡ lightning.
w	dew.	tlr	⚡ thunderstorm.
x	hoar frost.	☃	gale.
	rime.	q	squalls.
	glazed frost.	⊙	solar corona.
e	water deposited copiously on exposed surfaces, without rain falling.	⊕	solar halo.
y	dry air. (Relative humidity less than 60 per cent.)	☾	lunar corona.
p	passing showers.	☽	lunar halo.
d	drizzling rain.	☾	rainbow.
		☀	aurora.
		☾	zodiacal light.
		☾	mirage.

The letter *i* preceding a letter or symbol which denotes some form of precipitation indicates that the precipitation is of an "intermittent" or "occasional" character.

The letter *j* preceding a letter or symbol which denotes some form of precipitation indicates that the precipitation is within sight, though not actually falling at the station.

The figure 0 written after and above a symbol indicates slight, whilst the figure 2 indicates strong or heavy; thus ●⁰ slight rain, ●² heavy rain. The figures 0 and 2 written after and below the letters of the Beaufort notation are also used with a similar significance, thus d₀ stands for slight drizzle.

The letters b, c, o, g and u, are used to describe the general appearance of the sky. The use of the letters g and u is sufficiently clear from the definitions given above. o is used whenever the sky is completely overcast with a uniform layer of thick or heavy cloud; c is used to denote that there is some cloud present, but o is not appropriate; b denotes that there is some blue sky.†

In order to meet difficulties which occur when there are only small quantities of cloud or blue sky present, c is not used unless the sky is more than a quarter covered, and b unless there is more than a quarter of the sky free from cloud. If there is more than a quarter of the sky covered with cloud and more than a quarter of the sky free from cloud b and c are both recorded.

The gale symbol ☃ is normally used in this publication to indicate that the wind as recorded by the anemograph averaged at least 17·2 *m/s* for one or more "centred" hours. At Richmond (Kew Observatory) the symbol has been used with the word gust in brackets to indicate the occurrence of gusts reaching 17·2 *m/s*.

* To indicate varying intensities of haze, mist and fog the notation shown in the last two columns of the table on p. 18 is used.

† The present usage with regard to b, c and o dates from 1st Jan., 1926.

Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

LERWICK

Published by the authority of the
METEOROLOGICAL COMMITTEE



LONDON :
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

LERWICK OBSERVATORY.

Latitude	..	..	..	..	..	..	60° 8' N.
Longitude	..	..	..	..	..	..	1° 11' W.
G.M.T. of Local Mean Noon	..	..	..	..	..	..	12h. 5m.
Height of Site above Sea-level	..	..	..	..	..	..	From 80·5 metres. to 90·0 metres.

INTRODUCTION.

GENERAL REMARKS.

In 1919 the establishment of an observatory in the Shetlands was included in the programme of the Meteorological Office. A wireless station, built in 1913 by the Admiralty and transferred after the war to the Post Office, but used by that Department only in case of emergency, offered suitable accommodation in the way of offices and living quarters. It proved possible to make an arrangement under which the Air Ministry has the use of the station as an observatory and of the wireless plant for the reception of meteorological reports and time signals.

The Observatory was opened on the 7th June, 1921, when the first instalment of the instrumental equipment arrived. Later on in the same year the construction of a magnetograph house and of huts for absolute magnetic and auroral observations was commenced. The magnetograph house is a heavy concrete structure with walls 2 feet 6 inches (76 cm.) thick, of internal dimensions 16 feet by 10 feet (4·9 m. × 3 m.), and after construction several months had to elapse before the thick concrete walls and roof could be thoroughly dried and the recording instruments placed in position. These instruments, which are described below, consist of magnetographs recording magnetic declination and horizontal and vertical force. During 1928 subsidiary magnetographs recording declination and horizontal force were installed in one of the adjacent non-magnetic huts; the records obtained therefrom are used to cover lacunæ in the standard traces or for special investigations. In addition, in order to obtain a record of the more minute changes in the vertical component of terrestrial magnetic force, a line of twin cable was laid in an approximately horizontal plane round Loch Trebister, the terminals of the cable being connected to a suitable galvanometer on which could be measured the current induced in the cable by changes in the vertical component of terrestrial magnetic force. The arrangement is similar to one in use at Eskdalemuir Observatory, but no records from either have yet been included in official publications.

Other instruments installed at the Observatory included barometers, barograph, hygrograph, psychrometers, nephoscope, raingauges (ordinary and self-recording), sunshine recorder and Dines tube anemograph and, later, an electrograph; and in 1928 a Krogness auroral camera. But meteorological observations have been restricted, and the time of the somewhat limited staff available has been devoted chiefly to magnetic work and to some work in atmospheric electricity.

The site and the work in Atmospheric Electricity and Terrestrial Magnetism will now be described.

LERWICK OBSERVATORY.

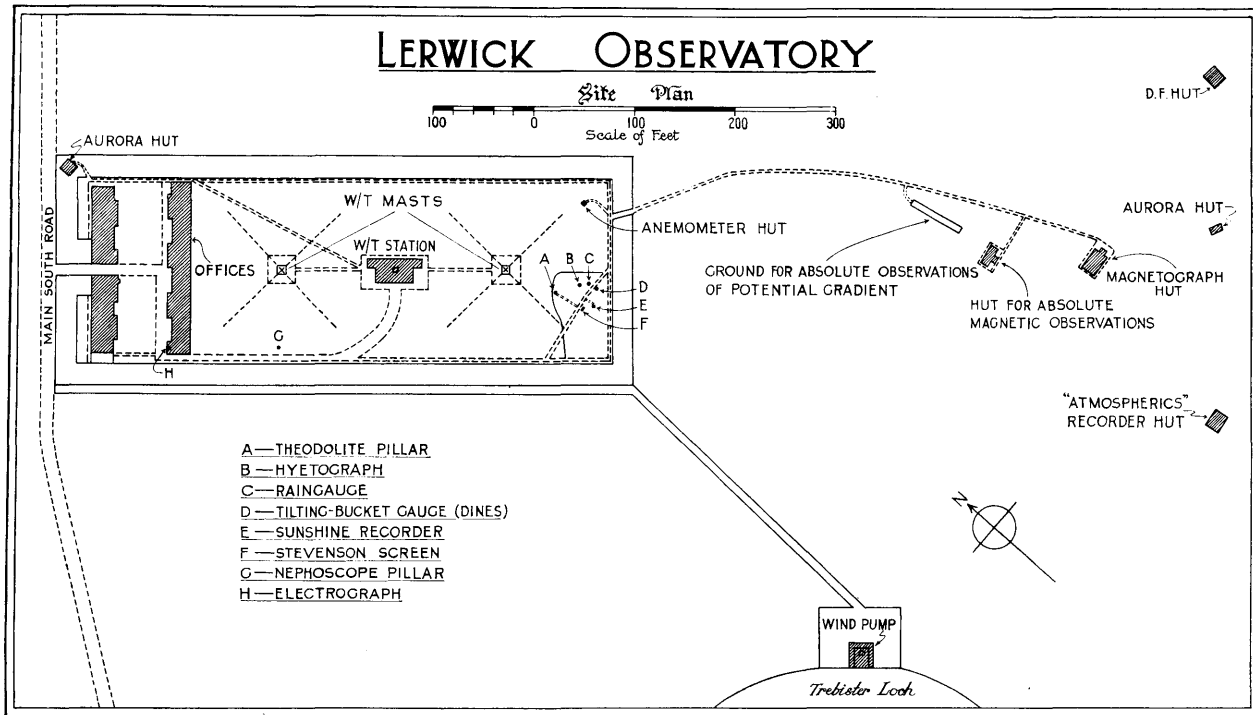


FIG. 1. SITE PLAN.

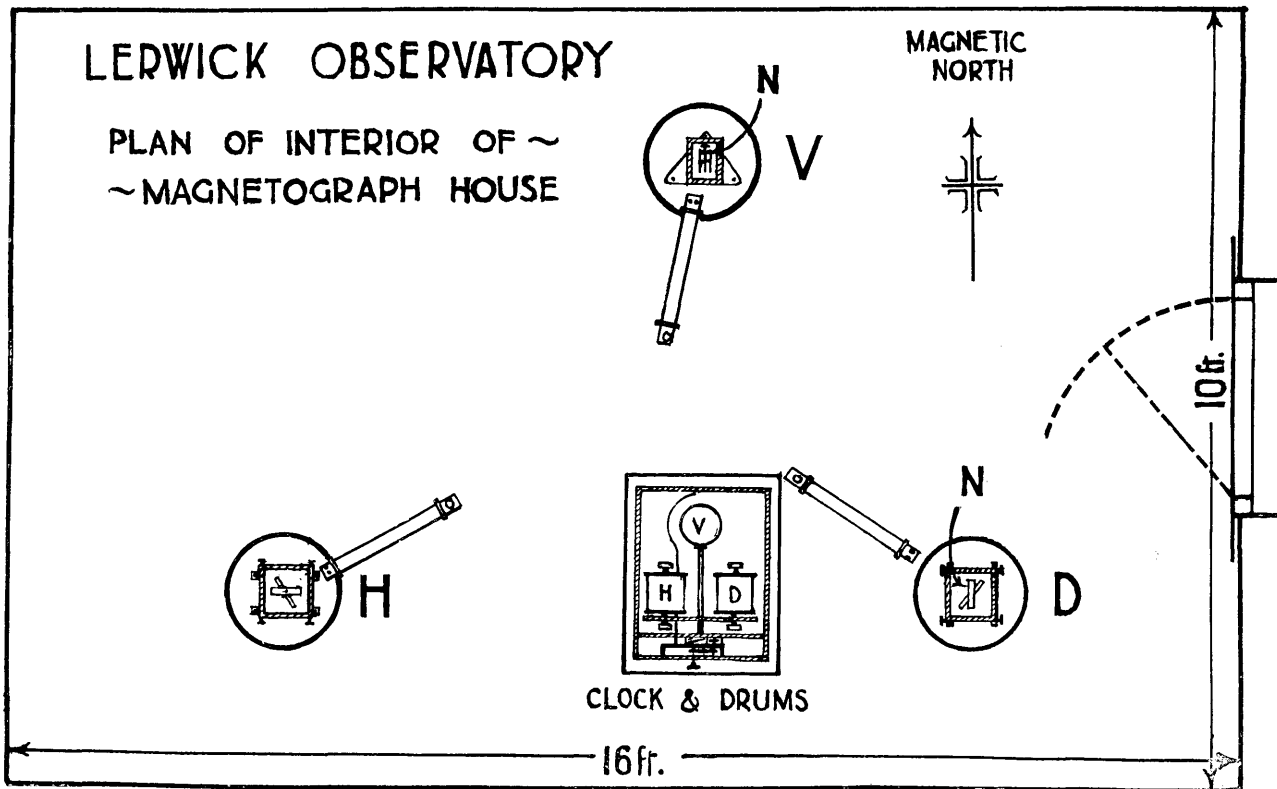


FIG. 2. ARRANGEMENT OF MAGNETOGRAPHS.

LERWICK OBSERVATORY.



FIG. 3. GENERAL VIEW FROM SOUTH.



FIG. 4. MAIN ENTRANCE AND FRONT VIEW
(from N.W.)

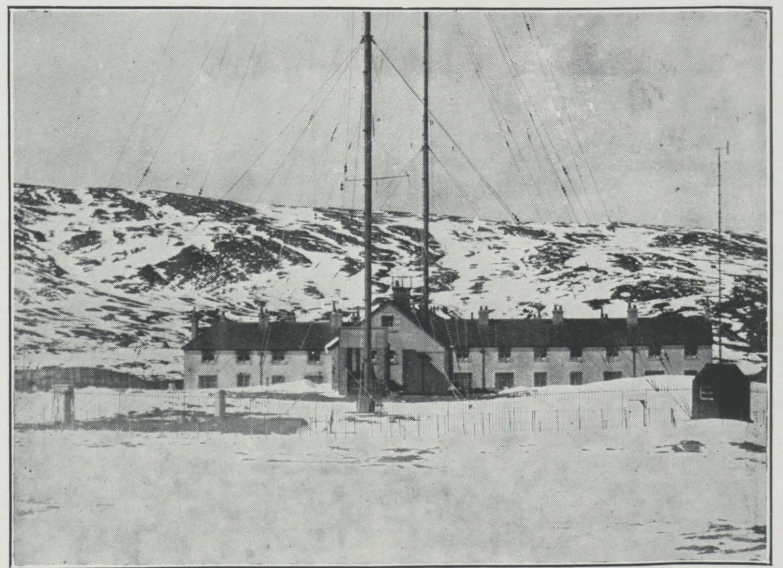


FIG. 5. NEAR VIEW OF BUILDINGS AND METEOROLOGICAL
INSTRUMENTS (from S.E.)

SITE.

The Observatory is situated on a ridge of high ground about a mile and a half (2.4 km.) to the south-west of Lerwick and adjoins the main road between Lerwick and Scalloway. The site slopes upward from west-north-west to east-south-east, the average height above M.S.L. being about 280 feet (85 metres). The ground to the east and south-east rises slightly for about $\frac{1}{4}$ mile (.4 km.) then slopes sharply down to the sea. In other directions there is a downward slope for about $\frac{1}{4}$ mile extending to the Loch of Trebister on the south-west, Sandy Loch to north-west, and to the Burn of Sound to north-north-west; beyond these and distant about $\frac{3}{4}$ mile (1.2 km.) from the Observatory are small hills—Munger Hill to the south is about 320 feet (97 metres) above M.S.L., Shurton Hill to west-north-west rises to 576 feet (176 metres), and Stony Hill to the north to about 400 feet (122 metres). In clear weather it is possible to see the Outer Skerries, 25 $\frac{1}{2}$ miles (41 km.) north-east by north, and Sumburgh Head, 20 miles (32 km.) south by west; the horizon in other directions is limited to a few miles.

The average depth of soil in the vicinity is about a foot, and outcrops of sandstone occur in many places. The surrounding country is barren and desolate, the only vegetation being coarse grass, stunted heather, and moss, with occasional patches of bare black peat. The Observatory ground is of a very uneven nature, and, owing to lack of proper drainage, is frequently water-logged; in winter it may be almost submerged for considerable periods. Views of the station are shown in Figs. 3, 4 and 5, and the arrangement of buildings and situation of instruments are set out on the site plan in Fig. 1.

ATMOSPHERIC ELECTRICITY.

Notes on the Instruments.—The records of potential gradient are obtained from a Benndorf electrograph (No. 108, by L. Castagna, Wien) which since 1926 has been installed in the north-west corner of the Office Block. The site is divergent from the ideal for two reasons:—

(1) There is distortion of the equipotential surfaces by adjacent houses, wireless plant, etc.,

(2) It is a comparatively large distance (236 metres) away from the ground where absolute determinations are made.

Consideration of the variations of mean monthly values of the reduction factor shows that these disadvantages are less serious than might be anticipated.

The collector rod passes through a window in the north wall, and is situated 190 cm. from the corner of the building. The collector, which is 476 cm. above the ground and projects 123 cm. from the window, consists of a copper spiral about 5 cm. long, painted over, by means of a special adhesive varnish, with a salt of radium; according to the maker, Mr. Harrison Glew, this particular salt has no sensible rate of decay, the loss being only 1 per cent. per century. The collector is soldered into the smaller end of a tapered German silver tube, 76 cm. long, and of triangular cross section, which, in turn, is attached to a "Duralumin" tube, 89 cm. long and 1.3 cm. in diameter. The latter tube passes through a hole, 3.8 cm. diameter, in one end of a wooden box (dimensions 38 × 25 × 10 cm.), where it is supported horizontally between the ends of two metal rods embedded in sulphur. A number of small 2-volt electric bulbs are kept burning inside the box in order to improve the insulation of the supports for the collector rod during wet weather, and a similar bulb is placed inside the case of the electrometer. The rod is connected to the base of the acid pot of the Benndorf electrometer by a fine wire. A detailed description of this instrument is to be found in *Phys. Zeit.* 7 (1906), p. 98, whilst the general principle is described in Mathias' *Traité d'Electricité Atmosphérique et Tellurique*, p. 54, and in Chauveau's *Electricité Atmosphérique*, pp. 61-64.

The record consists of a series of dots made once a minute on a long roll of paper as it is unwound from a drum by clockwork, exact hours being indicated by dots near the edge of the sheet. Timing is taken from electric clock No. 1,031, governed by the Observatory standard, Shelton No. 35. The needle of the electrometer is earthed at least twice daily, and a zero line is obtained by connecting up these earth marks; owing to the constancy of the perpendicular distance between the zero line and the line through the hour marks, further intermediate positions of the zero are easily obtained. The scale value has been about 21 volts per millimetre, which permits a range from +1700 to -1100 volts per metre in the open to be recorded.

Combined tests of the insulation of the system and scale value of the record are made daily, the procedure being to remove the collector and to charge the needle, which is connected to a Wulf electrometer. The rate of leak is obtained for a period of 5 minutes with a positive charge and for the same interval with a negative charge. Considering the climatic difficulties the behaviour of the instrument in the matter of insulation has been very satisfactory. The rate of leak has been in general small, the average during 1928 being such that the instrument would lose half its potential in $38\frac{1}{2}$ minutes. It has been found that the scale value remains reasonably steady and may, for all practical purposes, be taken as constant across the full width of the sheet. The factor by which the recorded potential must be multiplied for conversion into potential gradient in the open is obtained from absolute measurements above a levelled piece of ground near the old site of the electrograph (see site plan in Fig. 1). An insulated wire, stretched horizontally between two stout wooden posts 125 cm. in height and 9.48 m. apart, carries at its centre a burning fuse exactly 1 metre above the ground. Wulf electrometer, No. 5225 (Günther & Tegetmeyer, Braunschweig), is connected to one end of the wire and ten to twenty readings are obtained from the electrometer at minute intervals. The reduction factor is deduced from the mean of these values and the corresponding mean potential at the collector as recorded by the Benndorf. Smoothed monthly means of factors so obtained are employed in reduction of the records.

The position of the collector was not changed during 1928, but two renewals were made to this part of the apparatus:—

- (1) On 26th June, when a new collector rod was substituted for that which was formerly used but had been damaged by gales.
- (2) On 7th December, when a more rapid radio-active collector was brought into use. The mean of 13 tests with the new collector gives 48 seconds as the time required for the electrograph to acquire half the true potential.

Monthly scale values and exposure factors, together with data relating to rate of leak, are shown in the following table:—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean Value of $-\frac{d}{dt} \log_e V. \dots$	014	016	013	014	011	011	019	025	037	033	015	012	018
No. of days used in mean	27	28	31	28	29	28	29	24	27	26	27	31	335
Highest $-\frac{d}{dt} \log_e V. \dots$	029	029	020	065	025	022	035	049	081	065	060	019	—
Lowest $-\frac{d}{dt} \log_e V. \dots$	008	007	006	005	006	005	007	010	019	006	007	005	—
Scale Value (v/mm) ...	22.2* 19.7	20.2	20.1	20.4	20.2	20.3* 20.8 21.5 20.8 20.1	20.4	20.6	21.0	20.9	21.3	21.6	—
Mean Exposure Factor Applied Exposure Fac- tor ...	1.29	1.21	1.36	1.32	1.37	1.45	1.37	1.28	1.37	1.28	1.28	1.13	1.31
No. of Determinations of Exposure Factor...	8	8	7	6	6	7	11	8	4	7	5	9	86

* Changes of scale value occurred on 21st January, 7th, 15th, 18th, and 26th June.

In its response to changes of potential gradient the Benndorf instrument is very sluggish, compared, for instance, with the Kelvin water dropper in use at Eskdalemuir Observatory. In general, the rise to a steady potential takes an approximately exponential character, and it was found that the mean of 140 tests during 1927 gave 69 seconds as the time to rise to half the final value; the mean of 34 tests in 1925-26 gave a corresponding period of 63 seconds; this is about 10 times as slow as the water dropper at Eskdalemuir Observatory. Sometimes when there is no wind the rate of rise of potential is very much slower and apparently nearly linear. If the instrument rises through a potential V and has a capacity C a quantity of electricity CV has to be given to the air in the neighbourhood of the collector, and in the absence of wind and the presence of fog this may hang about in the form of a heavily charged cloud for a considerable time before being dispersed. It is difficult to accept the readings from a radio-active collector during such times. Fortunately these conditions are rare at Lerwick except in early summer, but on the other hand they are then very interesting.

If we assume the leaking and the charging to be exponential, i.e.—

$$\text{If } \frac{dV}{dt} = -K_L V$$

$$\text{and } \frac{d(V_0 - V)}{dt} = K_C (V_0 - V)$$

where K_L measures the rate of leak,
and K_C „ „ „ charging,

then the potential finally acquired by the instrument is equal to the real potential multiplied by $K_C/(K_L + K_C)$.

K_L/K_C varies from $\frac{1}{50}$ to $\frac{1}{20}$, the higher values usually occurring in winter; that is, the instrument records 2 per cent. to 5 per cent. below the true potential. This variation is included in the exposure factor and would—other things being equal—cause the factor to be about 3 per cent. lower in summer than in winter; in practice, the factor has been found to be about 12 per cent. higher in summer. As the capacity of the instrument cannot be reduced nothing can be done to remedy this except to keep K_L as small as possible.

The average rate of leak during the year, .018, is the same as that for 1927, being such that the instrument would lose half its potential in $38\frac{1}{2}$ minutes. Insulation was worst from August to October, when insects were a frequent source of trouble; if these months are excluded the average leak corresponds with a fall to half potential in 50 minutes.

The mean exposure factor for 1928 is 1.31, which is 3 per cent. lower than the mean of the 1927 observations. The changes in factor from month to month agree closely with those for 1927, the values being higher in summer, lower in winter. The variation cannot be explained by leakage in the instruments, and there is no obvious relationship between the factor and potential during the absolute determinations. The vegetation around the absolute ground only undergoes a very slight change throughout the year, and the grass in the immediate vicinity is always short.

The following table shows mean values of the exposure factor for 1927 and 1928 summarised according to wind direction:—

	Calm.	N	NE	E	SE	S	SW	W	NW	1927 -28
Mean Factor	1.35	1.33	1.37	1.27	1.24	1.37	1.36	1.35	1.29	1.33
No. of Observations	24	19	16	12	21	44	28	21	26	211

Relatively high values of the factor are associated with winds from north-east, south, south-west, and west, for which directions the electrograph collector has a good exposure. The exposure in other directions is obstructed by adjacent buildings (see Fig. 1), and the depression of the factor depends upon the proximity of these obstructions to the collector. The lower factors, resulting from the higher potential of the collector when shielded from the wind, also follow from R. A. Watson's conclusion that potential gradient is inversely dependent upon wind speed. (Geophysical Memoir No. 38). Wind direction, however, appears to have no appreciable bearing upon the annual variation of factor discussed in the preceding paragraph.

On 28th June, 4th July, and 12th September, measurements were made of potential gradient above fairly smooth ground near sea level. The determinations on the two earlier dates were taken at the Point of Trebister, $2\frac{1}{4}$ km. south-south-east of the Observatory, those on the third near the Sands of Sound, 1 km. to the east. In all, ten series of observations were obtained. The mean electrograph exposure factor computed therefrom works out at 1.36, a value in close agreement with the standard determinations.

IDENTIFICATION NUMBERS OF INSTRUMENTS USED IN 1928.

Benndorf electrograph (L. Castagna, Wien)	108
Wulf bifilar electrometer (Günther & Tegetmeyer, Braunschweig)	5225
Electrostatic voltmeter (Cambridge Instrument Company)	11889

Review of Results.—Days when there was a complete trace have been classified as follows by means of an electric character figure :—

- 0, denotes a day during which, from midnight to midnight, no negative potential was recorded.
- 1, denotes a day with excursions to the negative not amounting in the aggregate to more than three hours.
- 2, denotes a day with negative potential amounting in the aggregate to more than three hours.
- a*, denotes that the range of potential gradient in the open did not exceed 1,000 volts in any of 25 hourly periods of the day.
- b*, denotes that this range was exceeded in at least one, but in fewer than six, of these periods.
- c*, denotes that this range was exceeded in six or more of the hourly periods.

The character figures so assigned are given in Table 4.

The annual mean character figure, 0.92, approximates closely to the corresponding figure for 1927. Compared with 1927 the average character of individual months was lower from March to June and in September, identical in February, and higher in the remaining months.

Curves are read by means of a glass scale graduated in millimetres (by R. Fuess, of Berlin), the tabulated values being 60 minute means centring at exact hours G.M.T. The ordinates are converted into volts per metre in the open by multiplying by the product of the appropriate scale value and reduction factor. Values are assigned for 3h, 9h, 15h, and 21h, on all days, and for each hour on "a" days.

An indication of the characteristics of indeterminate potentials may be obtained from the tabulations in which :—

- (1) z is marked against hours when there occurred large oscillations of small period which are not accurately reproduced in the record. The signs +, —, following the z indicate on which side of zero the mean value lay; for values marked \pm the sign of the mean value was uncertain.
- (2) values prefixed by the symbols $>$, $<$, indicate that for one or more periods during the hour potential passed beyond the range recorded by the electrograph.

The hourly values for 3h, 9h, 15h, and 21h are given in Table 1; estimated values, enclosed within brackets, are given in cases where the record was in some manner defective. Two sets of mean values are given :—

(a) The means of all positive values; hours when the trace passed off the top of the sheet are included in obtaining these means, the upper limit of registration being taken as the value for the period not recorded.

(b) The means for all days on which all four hours were completely recorded or could be estimated.

The monthly mean value for *oa* days (see Table 2) is greater than the (a) mean in five months of the twelve, and less than the (b) mean in three months; the (a) mean exceeds the (b) mean in each month. The annual mean values of the means for *oa* days and the (a) and (b) means are 166 v/m, 156 v/m, and 134 v/m respectively; the corresponding values for 1927 were considerably higher, being 213 v/m, 179 v/m, and 160 v/m.

The extreme hourly values recorded were :— >1118 v/m, December 7d 7h, during heavy snow, and <-1108 v/m, December 16d 24h, during continuous heavy rain. As the trace frequently passed off the sheet, particularly for negative potentials, these limits may have been exceeded. The absolute daily range was greater than 2500 v/m on the following dates :—January 3, 4, 5, 8, 9, 10, 11, 24, 25, 26, 29, February 2, 5, 7, 9, April 3, 16, 19, 20, June 11, 15, September 1, October 9, November 9, 13, 20, 21, 27, December 3, 5, 6, 7, 8, 24, 25, 26, 27 and 31.

Notable spells of high potential gradient were :—

- (1) June, 21d 8h—22d 21h. (Mean gradient, 592 v/m).
- (2) September, 8d 19h—9d 6h. (520 v/m) and 9d 15h—23h, (495 v/m).
- (3) September, 13d 17h—14d 2h. (749 v/m).

Winds were light on each occasion and fog occurred at times during the two earlier spells.

Details of occasions when potential gradient was negative for periods approximating to or exceeding six hours, together with the mean potentials during the periods, are :—

- (1) February, 18d 6h 30m—12h 35m. <-496 v/m. (Continuous heavy rain.)
- (2) March, 30d 6h 45m—12h 30m. -318 v/m. (Continuous rain to 9h 30m; intermittent rain later.)
- (3) October, 30d 4h 40m—12h 40m. -288 v/m. (Continuous heavy rain.)
- (4) November, 17d 10h 25m—17h 0m. <-557 v/m. (Continuous moderate rain.)

Considerable periods of negative potential gradient, interrupted only by short intervals of positive gradient, occurred on the following dates:—

- (1) February, 15d 8h 5m—15h 15m. <-455 v/m. (Continuous heavy rain.)
- (2) March, 2d 0h 55m—10h 20m. <-663 v/m. (Continuous moderate rain.)
- (3) October, 18d 16h 40m.—19d 1h 30m. <-321 v/m. (Continuous heavy rain.)
- (4) December, 16d 18h 40m—17d 1h 20m. <-784 v/m. (Continuous heavy rain.)

The diurnal inequalities for *oa* days for the months, seasons, and year, are given in Table 2, together with mean values of the potential gradient and particulars of the non-cyclic change and the number of days used; the inequalities for the seasons and year are means of the monthly inequalities. Similar data for the *1a* and *2a* days are given in Table 3.

The winter diurnal variation is of the usual type but there is much less difference between the winter and summer curves than at other existing observatories. In particular, the principal minimum of the day continues, in the majority of equinoctial and summer months, to occur in the early morning hours (2h to 4h) rather than near the middle of the day as in other summer months and as, for example, at Eskdalemuir. There is however, at Lerwick, a secondary minimum near mid-day. The range covered by the inequalities is considerably less than in 1927.

In the three previous years the potential gradient was noticeably higher in summer than in winter. In 1928 the means derived from *oa* days in summer and winter are practically identical. The same is true of the "a" means of Table 1. The mean potentials derived from *1a* and *2a* days are however 25 v/m higher in summer than in winter; and the "b" means of Table 1 are likewise 22 v/m higher in summer than in winter.

TERRESTRIAL MAGNETISM.

Notes on the Instruments.

The standard records of declination and horizontal and vertical force are obtained from the Munro magnetographs which were in use at Falmouth until 1912. The instruments had been stored for several years, but were reconditioned by the makers, and the declination and horizontal force instruments were tested at Kew before being installed at Lerwick in November, 1922.

The declination magnet has a unifilar suspension, and the torsion correction is negligible. The scale value is constant for all positions of the light dot on the sheet; throughout the year it was 1 mm. of ordinate to 1.93 minutes of arc. In the horizontal force instrument the magnet is maintained in a position approximately perpendicular to the magnetic meridian by torsion of the bifilar suspension. The vertical force balance consists of a single heavy magnet similar to those used for recording declination and horizontal force, and may be compensated for variations of temperature. Copper damping plates are fitted to each instrument and the recording mechanism is similar to that used at Eskdalemuir. The arrangement of the instruments in the magnetograph house is shown in Fig. 2.

The chief instrumental defects encountered during the year were :—

- (a) A slight drift of the trace in the case of the H force instrument ; corrosion of the tungsten wire used for the suspension of the magnet caused a breakage to occur on 16th November.
- (b) Unsteadiness of the vertical force system. This instrument was adjusted on the following dates : 21st February, 8th March, 4th May, 22nd June, 24th July and 13th November.

Although these troubles have not been entirely overcome the records for 1927 and 1928 are better and more continuous than those of former years.

Monthly scale values have been assigned to the records by taking overlapping means except when discontinuities occurred and special measures were required. The determinations are made by Broun's method, the deflecting magnet being placed in the " broadside on " position and at a distance of 55.9 cm. from the recording magnets. A larger deflection distance would render the error due to inequality of the distribution co-efficients for the H, D and V magnets less appreciable, but cannot be used owing to the restricted size of the magnetograph house. The scale value of H was maintained at approximately 6 γ /mm. ; that of V showed a progressive change throughout the year from about 10 γ /mm. to 12 γ /mm.

The records of declination, horizontal force and vertical force have been tabulated hour by hour. The values are read off by means of graduated glass scales, a value being the mean reading for 60 minutes centring at the hour.

Base values for the records are obtained from the results of absolute observations, the determinations of declination and horizontal force being taken at least twice weekly, those of dip five or six times in each week. Horizontal force and declination are determined with Unifilar No. L 3951 (Cambridge Instrument Co.) using magnets 3951A and 3951C. The magnetometer is used on the centre pillar (No. 2) of the absolute hut, the azimuth of the fixed mark being taken as 8° 43' 2" east of south. Inclination is measured with Dover Circle No. 238 placed on the East pillar (No. 3), using 3½ inch needles. In the deflection experiment three distances 25, 30 and 35 cm. are used for obtaining the distribution coefficients, the horizontal force being computed from the deflection at 25 cm. only.

Mean annual values of the P and Q correction have been derived from observations during the period March 1923 to 1927. An accident caused some change to the magnet in March 1923, and values for earlier months have been discarded.

The values during these years are as follows :—

Year.	P.	Q.	$\log_{10}(1 + P/25^2 + Q/25^4)$.
1923 (March-December)	.. -2.398	-14.36	$\bar{1}.99831$
1924 .. ..	.. -1.236	-464.6	$\bar{1}.99862$
1925 .. ..	.. -1.165	-875.9	$\bar{1}.99821$
1926 .. ..	.. +1.225	-1711.2	$\bar{1}.99895$
1927 .. ..	.. +2.229	-2183.8	$\bar{1}.99912$
1928 .. ..	.. +0.223	-1395.6	$\bar{1}.99860$

The mean value of $\log_{10}(1 + P/25^2 + Q/25^4)$ employed in the reduction of all observations for 1928 was the mean of the values derived up to the end of 1927, namely, $\bar{1}.99864$. If the 1928 values are added, the mean for the total available period is identical with that provisionally taken.

As stated in the general remarks the walls of the magnetograph chamber are of concrete, 2 feet 6 inches in thickness. The diurnal variation of temperature within the chamber is comparatively small, the ranges of the mean diurnal variation in the various months of 1928 having been as follow :—

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>
0.06	0.07	0.07	0.11	0.11	0.12	0.13	0.12	0.08	0.08	0.06	0.07

No correction for this diurnal variation of temperature has been applied to the diurnal inequalities or other data published in this volume. It will be noted, however, from the Tables, that the day to day change of temperature is sometimes considerable. On the average for 1928 it is $0.31a$; and there are 10 cases where it reaches or exceeds $1.0a$. These rapid fluctuations of temperature obviously add considerably to the problem of satisfactorily determining base line values in the cases of the horizontal and vertical force magnetographs. The temperature coefficient of the former is known with fair accuracy, being taken to be 6.1γ per $1a$; consideration of the trend of base values indicates that the error introduced by omitting to apply a correction for temperature of the magnetograph is usually less than the error of observation and that it would be desirable to have absolute observations made more frequently than twice weekly. For another reason, namely that magnetic disturbance at Lerwick is so much more frequent and so much more considerable than at more southerly observatories, it would similarly be desirable to have very frequent absolute observations, with a view to the retention only of those made at times when the autographic records indicate a reasonably constant magnetic field. With the existing staff and instruments it has not, however, been possible to contemplate any increase in the observations of horizontal force.

In the case of the vertical force, the magnetograph appears to be subject to a thermal hysteresis sufficiently large to render ineffectual any method so far tried of making allowance for the fluctuations of temperature in the chamber. It has not therefore been possible to bring into close accord with one another the base line values deduced from individual absolute observations. So long as these conditions exist the hourly values of vertical force must be regarded as of a somewhat lower order of accuracy than might be desirable. The diurnal inequalities are not of course subject to any appreciable uncertainty on this account; the uncertainty only arises where for instance the mean value for a given day or series of days comes to be compared with that for another day or series of days.

Again, owing to the smallness of the chamber, the presence of an observer for a short time, as, for instance, during a scale test, causes an appreciable rise in temperature and this seems to be reflected in the record of vertical force in the form of a fairly rapid rise and afterwards a slow recovery to normal. The effect on the record is so characteristic that an approximation to the undisturbed curve can in general be drawn in with considerable confidence, and this has been done where the duration of the visit of an observer was sufficient to make the magnitude of the effect noticeable. It appears that the presence of an observer even for two or three minutes at the time of changing the charts can at times produce a measurable effect, but it is pretty certain that it is complicated by the existence of a mechanical effect, not definitely determinable. The quiet day inequality of vertical force for March 1927 showed a small irregularity arising from this cause.

Aurora.

From about September to April a watch for aurora is maintained normally until about 23h G.M.T. each evening, and observations—as a rule at intervals of 15 to 20 minutes—are made of the northern horizon and of general meteorological conditions. The records form what is called the auroral log, a brief summary of which is given in Table 67. When any auroral display is observed, a second observer is

called and detailed observations are maintained until the display subsides. These detailed observations have continued to be mainly non-instrumental and have consisted in noting and making descriptions of the phenomena seen during the display, but from October auroral photography was attempted with the Krogness camera whenever the manifestation was sufficiently bright. The descriptive notes are entered in a second log reserved for records of actual auroral displays. Extracts from this latter log may be obtained by anyone requiring the detailed information.

A general auroral table for Scotland (Table 68) is also included. This table has been compiled from the records of all stations at which climatological observations or weather logs are maintained. The observers at these stations, whilst noting occasions of aurora which they may happen to observe, do not in general maintain a special watch.

Notes on the Tables.

The hourly values of H, D and V, obtained as described above, appear in three of the four monthly tables. The variations in D, being expressed in minutes, may be readily converted to units of force (γ) of the component perpendicular to the magnetic meridian by multiplying by a factor which for 1928 is approximately 4.25. A rough comparison of the H, D, and V registrations with component registrations (geographical N and W, and V) as for instance at Eskdalemuir, can then be easily made. The mean value for the day is computed according to the expression:—

$$x = \left\{ \frac{1}{2} (x_0 + x_{24}) + x_1 + x_2 + \dots + x_{23} \right\} / 24.$$

The letters "Q" and "D," prefixed to dates, denote the five quiet and the five disturbed days as selected at De Bilt.

In the fourth table for each month are given:—

- (a) The values and times of the daily maximum and minimum and the values of the absolute daily range for each of the elements H, D and V.
- (b) The value of ΣR^2 for each day. ΣR^2 is written for $R_H^2 + R_D^2 + R_V^2$ where R_H , R_D and R_V denote the absolute ranges in force for a calendar day of the components along and perpendicular to the magnetic meridian and of the vertical component, the ranges in declination having been for this purpose converted into units of force of the component perpendicular to the magnetic meridian.
- (c) The daily magnetic character figures, assigned according to the international scheme wherein "0," "1," "2," respectively, denote quiet, moderately disturbed, and highly disturbed conditions.
- (d) The daily values of temperature in the magnetic chamber.

Mean diurnal inequalities of H, D and V on "all" days and on international quiet and disturbed days are given, for the months, seasons and year, in Tables 53 to 61.

In calculating diurnal inequalities the non-cyclic change has been eliminated on the assumption that its time rate is linear. The values of the range of the mean diurnal inequalities of the several elements on the three different types of day are brought together in Table 62, and the values of the non-cyclic change are given in Table 64. The "Average Departures," or mean values of the inequality taken irrespectively of sign, throughout the 24 hours, are given in Table 63.

The mean values of the squares of the absolute daily ranges are summarized in Table 65.

In Table 66 appear for the months and year the mean values of N, W, V, D, I, H and Total Force T. The means of N, W, I and T are derived from the corresponding mean values of H, D and V, which are the means of hourly values on "all" days in the month or year.

Finally, in Tables 67 and 68 are given summaries of auroral observations obtained as already described.

Review of Results.

Mean and Extreme Values of the Magnetic Elements, 1928.—The mean values of the magnetic elements for the years 1927 and 1928 are given in Table I. The values of H, D and V have been computed from the hourly values derived from the autographic records of "all" days, standardized by means of the absolute observations; those of N, W, I and T have been deduced from the values of H, D and V.

TABLE I.

Year.	H.	D. (West)	I.	N.	W.	V.	T.
1927.. ..	γ 14607	$^{\circ}$ ' γ 14 49.9	$^{\circ}$ ' γ 72 38.1	γ 14120	γ 3739	γ 46713	γ 48944
1928.. ..	14585	14 37.1	72 39.4	14113	3681	46702	48926

The decrease in westerly declination from 1927 to 1928 ($12'.8$) was less than the rates for the four previous years, these having been $13'.8$ for 1923-24, $13'.0$ for 1924-25, $14'.9$ for 1925-26 and $12'.9$ for 1926-27.

Mean values derived from (a) international quiet days and (b) international disturbed days, are as follow:—(a) H, 14589γ ; D, $14^{\circ} 37'.2$; V, 46703γ ; (b) H, 14577γ ; D, $14^{\circ} 37'.0$; V, 46698γ .

The extreme values of H, D and V recorded during 1928 are given in Table II., but these values may have been exceeded at times when the light passed beyond the edges of the photographic paper.

TABLE II.

Element.	Maximum.		Minimum.		Absolute Annual Range.
	Value.	Date, 1928.	Value.	Date, 1928.	
Horizontal Force...	15016γ	d. h. m. Oct. 18 ... 17 46	$<14046\gamma$	d. h. m. Aug. 27 ... 02 10 and 02 39	} $> 970\gamma$
Declination ...	$16^{\circ} 37'.9$	July 8 ... 01 12	$<13^{\circ} 9'.8$	July 8 ... 05 49		} $> 3^{\circ} 28'.1$
Vertical Force ...	$>47428\gamma$	Between July 8 ... 04 05 and 08 54	46254γ	July 8 ... 01 10	$> 1174\gamma$

The range of $3^{\circ} 28'.1$ in declination is equivalent to a range of 884γ in the component of force perpendicular to the magnetic meridian. In the year 1927 smaller ranges were recorded in D and V, but a larger range in H. In the year 1926, much greater ranges were recorded, the extremes in H, D and V, respectively, having been $> 1561\gamma$, $> 4^{\circ} 44'.9$ and $> 2086\gamma$.

Magnetic Character of the Year.—The mean sunspot number has increased in recent years from 5.8 in 1923 to 16.7 in 1924, 44.3 in 1925, 63.9 in 1926, 69.0 in 1927 and 76.8 in 1928. Coincident roughly with this increase there was, up to 1926, an increase of magnetic activity, but the years 1927 and 1928 indicate some falling away. Thus the mean absolute daily range of declination rose from $14'.9$ in 1923 to $15'.4$ in 1924, $18'.1$ in 1925 and $25'.0$ in 1926, but fell to $20'.0$ in 1927 and was $21'.4$ in 1928. For individual months of 1928 the table below indicates no obvious relationship between the provisional sunspot numbers and the magnetic conditions.

At the same time it has to be remarked that if consideration be given to the data of a number of years, it would appear that certain magnetic quantities, in the summer months, are fairly closely correlated with the sunspot numbers. For example, taking the 24 summer months in the period 1923-28, the correlation between the mean daily range of the inequality of H on "all" days of a month and the mean sunspot number for the month is .75 with a standard error of .09. In the case of July, whether H or D be considered, the relationship seems to be still closer. In the equinoctial months the correlation is small; and in the winter months no definite relationship appears.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Provisional sunspot number	79.2	74.6	80.5	76.0	75.4	88.5	101.9	82.4	89.8	59.6	51.2	62.1
Mean absolute daily range of D	12.1	16.4	16.2	19.1	28.3	20.4	26.3	22.3	25.3	26.5	25.2	18.1
Mean ΣR^2 (100y ²)	61	92	416	230	1287	400	1197	878	834	821	593	168

The values of mean absolute daily range for the months and seasons of the year 1928 are given in Table IV., the ranges of declination in angle having for convenience of comparison been converted to units of force of the component perpendicular to the magnetic meridian. It will be seen that the ranges of H and V are greater than the corresponding Eskdalemuir values, the ratios of the annual mean ranges of Lerwick H to Eskdalemuir N, Lerwick D to Eskdalemuir W, and Lerwick V to Eskdalemuir V being respectively 1.3, 1.0 and 1.1; the 1927 ratios were the same in the first two cases, but the ratio of the V's was 1.8; the corresponding 1926 ratios were 1.4, 1.1 and 2.1.

The significant change in the three years 1926-28 is thus a diminution in the ratios of the V ranges at the two observatories.

Another important change is in the seasonal behaviour of the ranges; both at Lerwick and at Eskdalemuir during 1928 Summer and not equinox is the season of largest mean absolute daily range.

TABLE III.

Month.	Magnetic Character Figures.			Mean Character Figures.		Mean Value of $\Sigma R^2/100y^2$.					
	Number of "0" days.	"1" days.	"2" days.	Lerwick.	International.	"All" days.	Q days.	"0" days.	"1" days.	"2" days.	D days.
1928.											
January	11	20	0	0.65	0.44	61	12	15	82	—	195
February	7	22	0	0.76	0.62	92	27	25	113	—	175
March	11	16	4	0.77	0.48	416	34	39	109	2,526	2,063
April	13	17	0	0.57	0.52	230	71	82	342	—	501
May	10	16	5	0.84	0.75	1,287	99	102	379	6,562	6,259
June	4	24	2	0.93	0.72	400	108	87	297	2,266	1,164
July	3	25	3	1.00	0.72	1,197	129	121	284	9,884	1,091
August	16	13	2	0.55	0.56	878	94	103	662	8,477	4,202
September	9	14	7	0.93	0.75	834	69	93	249	2,957	3,556
October	8	20	3	0.84	0.83	821	67	80	272	0,458	2,462
November	15	13	2	0.57	0.65	593	19	61	590	4,604	2,532
December	19	11	1	0.42	0.54	168	20	49	279	1,226	621
Year, 1928	126	211	29	0.74	0.63	581	62	71	305	4,996	2,068
Year, 1927	137	206	22	0.68	0.63	586	58	66	409	5,491	2,427
Year, 1926	208	134	23	0.50	0.65	1,436	58	93	1,014	15,614	7,226
Year, 1925	207	130	28	0.51	0.56						
Year, 1924	229	114	23	0.44	0.55						

TABLE IV.—ABSOLUTE DAILY RANGE. MEAN MONTHLY VALUES.

Month.	Mean absolute daily Range. 1928.			Mean daily Range expressed as percentage of Yearly Mean. 1928.		
	H.	D.	V.	H.	D.	V.
	γ	γ	γ	%	%	%
January ...	37	51	19	31	56	35
February ...	50	70	21	42	77	38
March ...	87	69	67	74	76	123
April ...	101	81	41	86	89	75
May ...	212	120	59	180	132	108
June ...	144	87	40	122	96	73
July ...	130	112	84	127	123	154
August ...	158	95	74	134	105	136
September ...	164	108	74	139	119	136
October ...	143	113	65	121	124	119
November ...	111	107	71	94	118	130
December ...	58	77	40	49	85	73
Winter ...	64	76	38	54	84	70
Equinox ...	124	93	62	105	102	114
Summer ...	166	103	64	141	113	117
Year ...	118	91	55	—	—	—

The frequency distribution of absolute daily ranges recorded in 1928 is shown in Table V. A comparison with the corresponding figures for Eskdalemuir (Table V. on page 179) indicates that ranges in excess of 200γ are much more frequent at Lerwick than at Eskdalemuir, except in the case of D or W ranges of which the frequency distributions at the two places show less divergence. Apart from this it is notable that the ranges of maximum frequency at Lerwick fell in the intervals 70-79γ for H, 50-59γ for D, and 10-19γ for V, that is, at lower points in the case of D and V than at Eskdalemuir.

TABLE V.—FREQUENCY DISTRIBUTION OF ABSOLUTE DAILY RANGE.

Range.	Number of Cases, 1928.			Percentage Distribution.		
	H.	D.	V.	H.	D.	V.
γ						
0-9 ...	0	0	40	0.0	0.0	10.9
10-19 ...	5	1	98	1.4	0.3	26.8
20-29 ...	26	14	51	7.1	3.8	13.9
30-39 ...	30	20	40	8.2	5.5	10.9
40-49 ...	26	29	21	7.1	7.9	5.7
50-59 ...	27	55	27	7.4	15.0	7.4
60-69 ...	26	42	13	7.1	11.5	3.5
70-79 ...	49	40	10	13.4	10.9	2.7
80-89 ...	30	38	8	8.2	10.4	2.2
90-99 ...	28	25	4	7.7	6.8	1.1
100-109 ...	22	19	7	6.0	5.2	1.9
110-119 ...	9	14	4	2.5	3.8	1.1
120-129 ...	7	12	9	1.9	3.3	2.5
130-139 ...	6	10	3	1.6	2.7	0.8
140-149 ...	8	11	4	2.2	3.0	1.1
150-159 ...	4	5	3	1.1	1.4	0.8
160-169 ...	4	3	1	1.1	0.8	0.3
170-179 ...	7	5	0	1.9	1.4	0.0
180-189 ...	2	4	0	0.5	1.1	0.0
190-199 ...	1	0	1	0.3	0.0	0.3
200+ ...	45	16	20	12.3	4.4	5.5
Days omitted	4	3	2	—	—	—

TABLE VI.—PRINCIPAL MAGNETIC DISTURBANCES RECORDED AT LERWICK, 1928.

Where the beginning of a disturbance has been marked by a "sudden commencement," the serial number is followed by an asterisk (*), and the time entered in the second column is that of the sudden commencement, estimated to the nearest minute. In other cases, the exact hour nearest the time at which disturbance may be regarded as having begun is entered in the second column. To the tabulated values of maximum and minimum, the following have to be added:—H, 14000 γ; D, 14°, V, 46000 γ.

No.	From	To	Horizontal Force.					Declination.					Vertical Force.				
			Max.	Time.	Min.	Time.	Range.	Max.	Time.	Min.	Time.	Range.	Max.	Time.	Min.	Time.	Range.
1	Jan. 26 19	Jan. 27 23	665	27 18 8	560	27 11 51	105	55.8	27 13 12	27.6	27 5 16	28.2	812	27 18 17	673	27 5 12	139
2*	Feb. 12 7 15	Feb. 15 3	647	14 20 51	567	14 3 51	80	50.6	14 14 22	28.9	13 21 51	21.7	783	13 21 49	706	14 4 26	77
3*	Mar. 10 22 16	Mar. 13 6	939	11 15 31	256	12 2 48	683	65.5	11 15 0	18.4	12 1 57	47.1	1048	11 15 42	483	12 2 47	565
4	Mar. 13 10	Mar. 15 6	660	13 16 24	467	14 1 14	193	53.7	13 16 11 and 14 14 56	18.6	14 0 59	35.1	832	13 17 36	540	14 0 3	292
5	Apr. 6 17	Apr. 8 6	656	7 17 9	401	7 21 38	255	54.1	7 21 31	12.2	7 21 43	41.9	709	6 19 42	593	8 1 36	116
6	Apr. 19 2	Apr. 21 20	657	21 16 6	407	20 2 50	250	53.4	21 14 4	15.0	20 1 27	38.4	735	21 17 9	593	20 1 20	142
7†	May 5	May 6 7	676	5 19 52	509	5 12 49	167	50.3	5 20 0	32.2	6 6 32	18.1	727	5 20 7	669	5 8 20	58
8	May 10 12	May 11 9	824	10 17 4	99	10 23 31	725	52.9	10 17 1	10.3	10 23 42	42.6	780	10 17 2	516	10 23 36	264
9	May 11 13	May 15 6	853	11 16 43	394	12 0 58	459	59.5	11 16 47	13.3	12 1 51	46.2	769	11 17 12	611	13 0 32	158
10	May 16 10	May 17 22	703	16 19 42	418	17 1 26	285	58.1	17 1 3	16.6	10 20 22	41.5	707	16 19 20	606	17 1 28	101
11	May 18 3	May 19 22	698	18 19 2	537	19 8 48	161	53.1	18 5 5	21.1	18 18 59	32.0	744	18 15 30	672	18 5 30	72
12	May 27 9	May 30 8	>954	28 12 37 and 16 39	<64	28 23 25 and 23 59	>890	107.8	27 20 57	-27.8	28 23 41	135.6	776	28 21 28	647	29 2 3	129
13	May 31 10	June 2 4	707	1 19 15	508	2 1 48	199	50.5	1 17 46	26.0	1 23 9	24.5	722	31 10 0	684	2 1 22	38
14	June 3 3	June 6 2	712	3 17 9	463	5 21 51	249	51.9	5 3 7	23.7	5 22 18	28.2	757	3 18 20	691	6 1 10	66
15	June 7 4	June 9 6	799	7 16 49	496	8 1 38	303	50.4	7 16 42	25.3	9 0 52	25.1	713	7 17 7	692	8 2 10	21
16	June 12 0	June 15 4	653	14 15 56	442	14 2 11	211	54.4	14 1 48	25.0	13 5 22	29.4	739	13 12 32	632	14 2 11	107
17	June 22 0	June 25 24	700	22 15 8	251	23 0 18	449	58.0	22 9 21	18.9	22 21 12	39.1	797	22 13 59	531	23 0 16	266
18*	July 2 8 33	July 3 24	695	3 18 59	526	2 10 38	169	50.6	2 14 50	22.5	3 21 21	28.1	686	2 16 20	621	3 22 23	65
19	July 7 18	July 12 24	884	7 23 40	<116	8 0 57 and 9 52	>768	157.9	8 1 12	<-50.2	8 5 49	>208.1	>1428	8 4 5 and 8 54	254	8 1 10	>1174
20	July 21 12	July 23 7	691	22 18 21	419	22 3 27	272	54.1	22 0 22	12.8	22 2 25	41.3	721	22 18 9	645	22 3 47	76
21	July 28 0	July 29 9	670	28 17 30	541	28 6 21	129	45.3	28 13 38	29.6	29 8 30	15.7	759	28 15 14	612	29 4 40	147
22	July 30 15	Aug. 1 8	727	31 17 59	483	1 0 18	244	48.7	31 19 1	21.5	31 19 52	27.2	766	31 18 23	579	1 0 46	187
23*	Aug. 4 17 7	Aug. 6 3	999	5 17 45	<80	5 1 27 and 1 53	>919	59.3	5 17 59	-1.3	5 1 47	60.6	848	5 17 43	320	5 1 27	528
24	Aug. 6 18	Aug. 7 24	660	7 15 15	271	6 23 24	389	50.6	6 23 40	18.3	7 0 49	32.3	751	7 16 0	481	7 0 50	270
25	Aug. 12 4	Aug. 13 24	743	12 17 19	527	12 11 22	216	47.8	13 2 10	20.0	12 20 25	27.8	750	12 18 52	636	13 4 10	114
26*	Aug. 25 22 35	Aug. 29 6	682	28 18 30	<46	27 2 10 and 2 39	>636	56.2	26 5 18	-29.1	27 3 15	85.3	731	26 13 50	461	27 5 7	270
27	Sept. 1 23	Sept. 4 1	>959	3 17 1 to 17 20	511	2 4 9	>448	56.0	3 13 31	9.1	2 3 22	46.9	886	3 17 1	524	2 3 16	362
28*	Sept. 7 13 44	Sept. 10 4	>953	7 17 4 to 17 13	187	8 2 10	>766	54.7	7 17 21	-0.9	8 23 22	55.6	837	7 17 52	592	8 23 26	245
29*	Sept. 18 15 42	Sept. 19 24	693	18 20 12	<133	18 22 52 to 22 55	>560	51.1	18 20 18	-13.3	18 23 32	64.4	800	19 16 59	650	18 23 51	150
30*	Sept. 24 16 22	Sept. 26 21	668	25 14 8	404	25 21 49	264	49.9	25 21 45	7.2	25 22 9	42.7	802	25 16 10	647	26 0 40	155
31*	Oct. 1 19 17	Oct. 3 4	701	2 17 4	526	2 9 49	175	50.3	2 15 10	16.3	2 19 23	34.0	832	2 17 47	692	1 22 20	140
32*	Oct. 18 7 23	Oct. 20 12	1016	18 17 46	168	18 20 49	848	75.2	18 17 54	-4.5	18 8 39	79.7	773	18 15 39	616	18 21 14	157
33	Oct. 20 20	Oct. 23 1	699	22 18 29	459	22 1 15	240	45.8	22 18 34	18.2	22 2 29	27.6	711	22 18 27	661	22 2 12	50
34	Oct. 24 2	Oct. 26 6	724	25 20 8	<97	25 1 0 and 2 23	>627	61.5	25 2 35	-16.9	25 1 12	78.4	890	25 2 4	415	25 0 49	475
35	Nov. 1 20	Nov. 4 24	939	3 17 51	396	3 0 4	543	49.5	3 17 50	-11.9	3 19 28	61.4	776	2 17 58	604	3 0 40	172
36*	Nov. 10 6 55	Nov. 11 3	642	10 15 26	543	10 22 59	99	59.0	10 15 0	23.7	10 23 59	35.3	823	10 15 44	703	10 8 4	120
37*	Nov. 11 16 58	Nov. 14 6	>979	13 18 12 and 18 18	399	11 23 10	>580	94.6	13 18 19	6.2	13 18 33	88.4	939	13 17 8	579	13 19 17	360
38	Nov. 15 13	Nov. 19 4	637	17 19 55	384	15 21 16	253	52.5	15 21 15	5.1	15 22 15	47.4	781	17 15 55	534	15 21 26	247
39	Dec. 5 16	Dec. 7 7	618	6 14 42	396	6 3 1	222	43.2	6 2 55	-20.2	5 23 37	63.4	760	6 17 38	538	5 23 28	222
40	Dec. 11 17	Dec. 14 6	634	11 18 56	513	13 22 35	121	42.2	12 16 47	12.8	12 2 26	29.4	692	11 21 59	599	12 5 44	93

† Record incomplete; lighting failed between 5d 0^h and 5d 8^h.

Diurnal Inequalities.—The ranges of the mean diurnal inequalities of H and D on "all" days in 1928 are rather higher in summer months than those of 1926 and 1927, and have not changed greatly in winter and equinoctial months from the conditions of 1927. In the case of vertical force there is either little change or general reduction in the "all" day inequality ranges, the month of November providing the only conspicuous exception.

The quiet day inequality ranges have behaved in similar fashion, except that the range of the V inequality in December, as well as in November, has risen appreciably.

Considering now the disturbed days the most conspicuous feature has been the continued drop in the range of the mean diurnal inequality of vertical force, the mean values for the years 1926, 1927 and 1928 being respectively 132, 99, and 67. The range in the inequality of horizontal force is increased in May, August and November above any of the values for these months in recent years; in other months it is lower than one or both of the years 1926 and 1927.

A comparison of the records of Eskdalemuir and Lerwick shows that the declination inequalities at the two places for all, quiet and disturbed days are very similar in general appearance, although minor irregularities on the one set of values are not always reproduced on the other, or if so, only with diminished amplitude. Differences are more obvious on the horizontal force curves even on quiet days; and the disturbed day inequalities in H in some months bear little resemblance to one another. In the case of vertical force the present year is the third year of observations to be published. In some months the quiet day inequalities are very different from those at Eskdalemuir, and it will be seen from the table below that the range of the inequality varies from about one-fifth of the Eskdalemuir range in some summer months to 1.6 times the Eskdalemuir range in December. The seasonal variation of this ratio is thus higher even than in 1926 and much higher than in 1927. There is another point connected with the quiet day inequality of V in which 1928 resembles 1926 more nearly than 1927. At Lerwick the V oscillation on quiet days is more definitely semi-diurnal than at Eskdalemuir, having fairly well marked maxima at about 7h and 18h. In all seasons of 1928, as in 1926, the afternoon hump is definitely the larger, though in 1927 the morning hump was rather the larger in the mean for the year and very definitely the larger in the summer season.

Ratio of the Range of the Inequality at Lerwick to that at Eskdalemuir. (1928).

Type of Day.	Element.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
q	D	... .78	.86	.88	.94	.95	1.03	1.09	1.04	.95	.92	.99	1.07
d	D	... 1.09	1.08	1.00	1.03	1.30	.92	.94	1.26	1.16	1.03	1.12	1.14
q	H	... .73	.84	.95	1.06	1.06	1.04	1.17	1.04	.96	.92	.74	.92
d	H	... .74	.75	1.56	.95	1.93	1.53	1.60	2.46	2.41	2.41	3.14	1.19
q	V	... .68	.76	.38	.22	.20	.32	.20	.41	.35	.85	1.63	1.40
d	V	... 1.18	.59	2.39	1.26	.65	1.20	.91	1.30	1.04	.91	1.33	1.71

On Plates I. and II. the diurnal behaviour of magnetic force is illustrated graphically, the representation in the latter plate being in the form of vector diagrams.

Magnetic Disturbances.—Particulars of the principal magnetic disturbances recorded at Lerwick during the year are given in Table VI. In the Eskdalemuir Section will be found a similar list which deals with the same disturbances as recorded at that Observatory.

In so far as "sudden commencements" are concerned it has to be remarked that within the limits of accuracy of measurement and registration, these events appear to occur simultaneously at the two Observatories.

DIURNAL VARIATION OF THE MAGNETIC ELEMENTS

LERWICK 1928

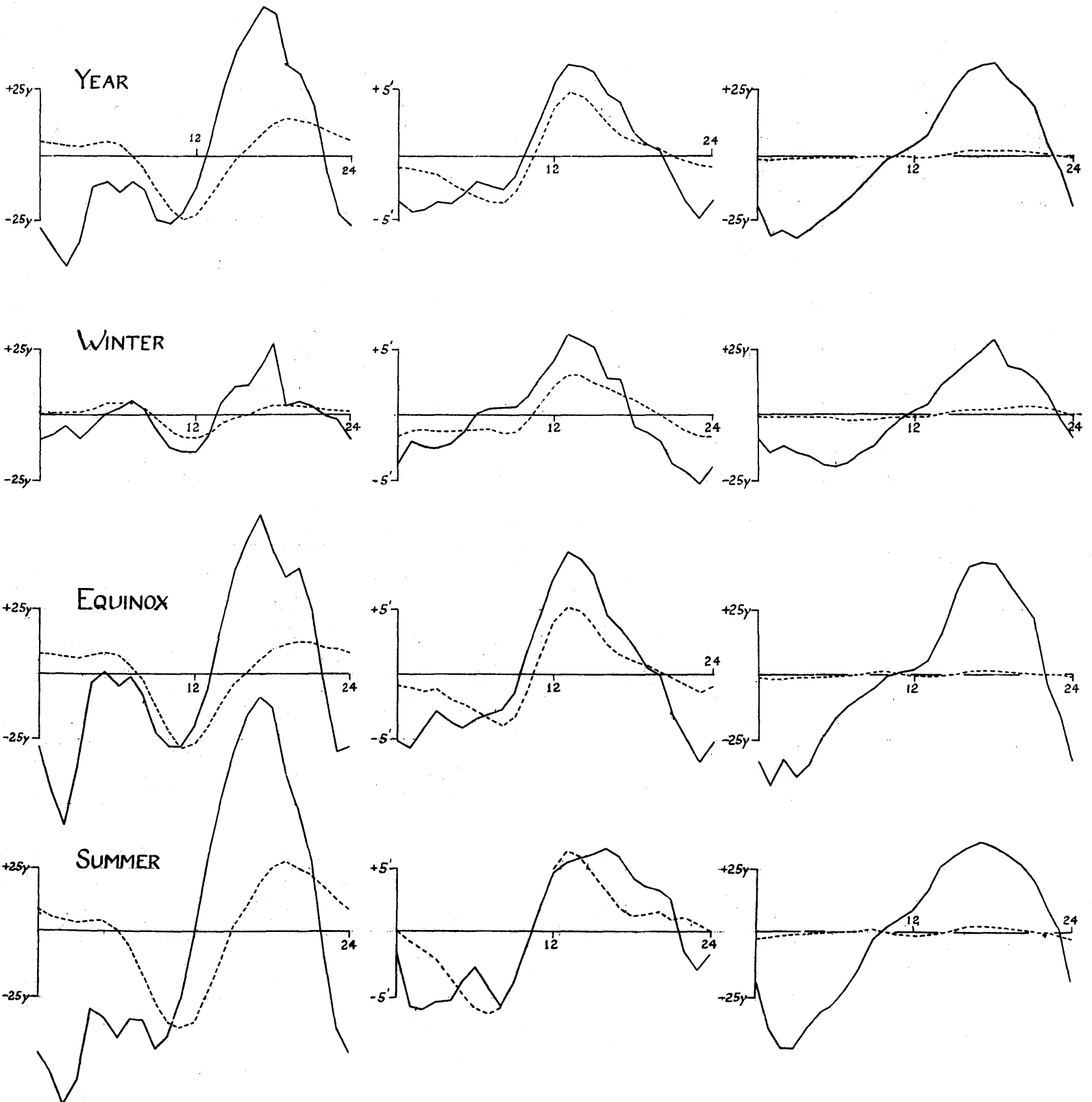
Quiet days -----

Disturbed days —

Horizontal Force

Declination

Vertical Force



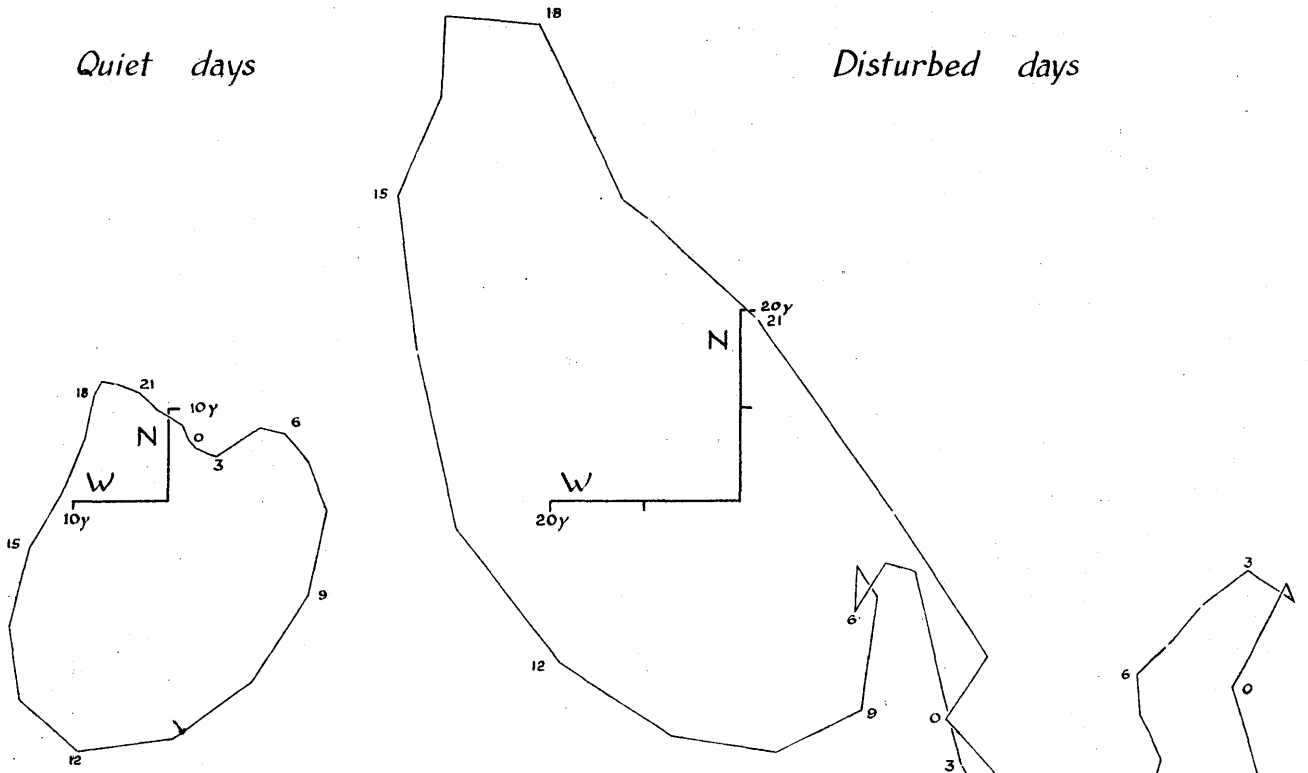
VECTOR DIAGRAMS ILLUSTRATING DIURNAL VARIATION OF MAGNETIC FORCE

LERWICK 1928

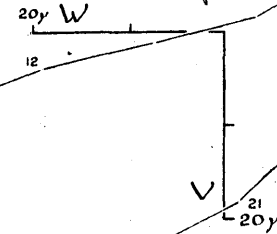
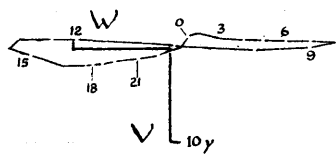
Quiet days

Disturbed days

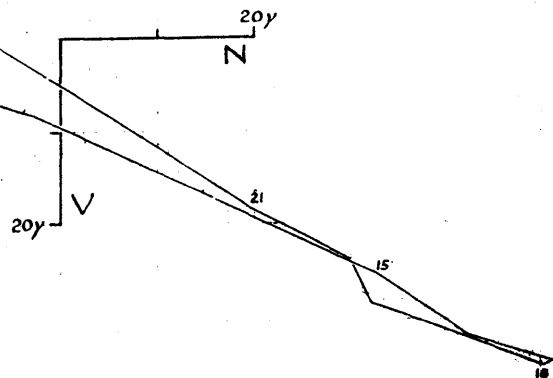
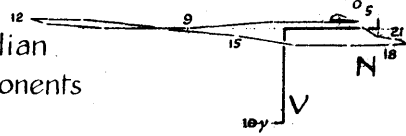
Horizontal
Components



Prime
Vertical
Components



Meridian
Components



Remarks on the Autographic Records, 1928.

January.—(Average Character Figure 0.65.)—Apart from a slight disturbance from 20h to 24h on the 1st, the month was quiet until the 26th. Some disturbance occurred from 26d 19h to 27d 22h, but the ranges were small, 101 γ in H, 27'.6 in D, 135 γ in V. Thereafter till the end of the month conditions were rather less quiet. Character figure 2 was not assigned to any day of the month.

Aurora was observed at one or more places in Scotland on January 8, 13, 15, 22, 26 and 27, but only on the two last mentioned dates was the display more than a glow.

February.—(Average Character Figure 0.76.)—A slight disturbance from about 20h to 21h on the 1st consisted of a dip of 14' in D and a wave of amplitude 10 γ in H; this was repeated in a movement of very similar shape, beginning at 2d 18h 40m, which was followed by slight disturbance for the next 24 hours. Conditions were then quiet until the middle of the month. A "sudden commencement" at 12d 7h 15m consisted of an abrupt drop of 0'.8 in D, followed by a rise of 2'.4 in 4 minutes, and a fall of 3'.6 in the next 9 minutes; the corresponding changes in H being +5.5 γ , -18 γ , +27 γ . This was followed by slight disturbance which reached its greatest intensity in the night of the 13th-14th; the chief auroral activity of the month seems to have occurred on this night.

Mention may be made of a sudden rise of 103 γ in H, beginning at 15d 21h 58m, with a recurrence at 16d 19h 57m in the form of a rise of 98 γ ; in each case the curve returned to its previous position in about the next 25 minutes. Simultaneously with these there were dips of 7'.7 and 4'.6 in D, and slight but perceptible movements in V. Other rather similar cases occurred, notably at 26d 22h 30m and 27d 21h 31m, there being a drop of 18' in D in about 20 minutes on the latter occasion.

There was slight disturbance on several days in the second half of the month.

Character figure 2 was not assigned to any day in this month.

Aurora was observed at one or more places in Scotland on February 3, 5, 12-16 inclusive, 18-22 inclusive.

March.—(Average Character Figure 0.77.)—Until the 10th conditions were very quiet. A "sudden commencement" at 10d 22h 16m was followed by a rise of 29 γ in H in 13 minutes, and a fall of 35 γ in V in about an hour, superposed on oscillations of very small period and amplitude. This was succeeded by quiet conditions for several hours, during which all three components gradually returned to about their undisturbed values; but shortly before 11d 8h began a considerable disturbance, which lasted until about 15d 2h, with a quiet interval in the early hours of 13th. (The four days 11th-14th were awarded character figure 2). The storm had its greatest intensity from 11d 12h-12d 6h, during which time the H curve assumed the general shape of a complete sine-wave of amplitude about 110 γ , with maximum at 11d 18h; the form and phase of the V curve were roughly the same, the amplitude being about 220 γ , but in D changes of long period were not much in evidence. Superposed on these were large fluctuations of smaller period, the maximum value of H for the storm (14939 γ) occurring in a very pronounced peak at 11d 15h 31m, the minimum (14256 γ) in a sharp dip at 12d 2h 48m; the maxima and minima of D and V occurred at about the same times, the ranges being 47'.1 and 565 γ .

It is noticeable that many of the features of the Lerwick curves, particularly the smallest ones, are faithfully reproduced at Eskdalemuir in the corresponding component; this is especially true of V on this occasion, the curves for the two places being very similar both in general outline and in detail.

A "sudden commencement" at 20d 22h 33m (+27 γ in H) was not followed by any disturbance worthy of mention, and conditions were quiet till the end of the month.

Aurora was observed at one or more places in Scotland on March 11, 12 and 13, all within the magnetically disturbed period referred to above.

April.—(Average Character Figure 0.57.)—The first few days of the month were not entirely quiet, but the first disturbance to be mentioned was the very moderate one which lasted from 6d 17h to 8d 6h. Between 21h 24m and 21h 50m on the 7th, there was a sharp fall and rise of about 200 γ in H, accompanied by a wave of amplitude 20' in D and a fall of about 95 γ in V. At about 8d 0h H fell rapidly by about 110 γ , remaining near the same value from 0h 40m to 1h 30m, and after a further brief fall rising again rapidly to its undisturbed value; this was accompanied by oscillations in D and a rounded dip of about 65 γ in V.

Some disturbance occurred between 16d 14h and 17d 6h, the ranges recorded being 125 γ in H, 29' in D and 133 γ in V.

In the night of 19th-20th there were well-marked fluctuations in all three components. After short-period oscillations lasting about 7 hours, H fell to a sharp minimum of some 210 γ below its undisturbed value, at 20d 2h 51m; there was also a dip of about 10 hours duration in V, with a minimum at 20d 1h 20m of 120 γ below the undisturbed value. Thenceforward to the end of the month there is nothing to be mentioned, although no day was free from slight disturbance. The last 8 days were awarded character figure 0. Character figure 2 was not given to any day in the month.

Aurora was observed at one or more places in Scotland on the 15th-21st inclusive.

May.—(Average Character Figure 0.84.)—During the first four days of the month conditions were quiet and the normal diurnal variation was well marked. After several days of slight disturbance, a considerable storm occurred between 10d 12h and 11d 10h, which was repeated on the 11th-12th, with curves of very similar characteristics but smaller amplitude. After small and rapid oscillations lasting 3 hours from about 9h on the 10th, H rose fairly steadily for 5 hours, the maximum of 14824 γ occurring in a sharp peak at 17h 4m; the curve then falls, most rapidly after 20h, and reaches a minimum, after well marked oscillations, of 14099 γ at 23h 31m, instantly rising very rapidly and increasing by 440 γ in the next hour. The curve of V is of the same general shape, with a range during the storm of 264 γ , the maximum and minimum occurring within 5 minutes of those of H. The long-period oscillation is less noticeable in the D curve, but is approximately in phase with those of H and V, and there is considerable disturbance of a shorter period, the range of D being 42'.6. On the following night disturbance recurred, but the range was considerably smaller in H and V, though slightly larger in D.

The general features of the disturbance are very similar at Eskdalemuir.

Disturbed conditions persisted for several days, the 17th being noticeable for a very sharp V-shaped dip of about 280γ in H, with a minimum at 1h 26m, which was accompanied by a peak of 18' in D and a drop of 70γ in V.

Conditions were fairly quiet from the 20th to 26th, but on the morning of the 27th began a disturbance of great intensity which lasted till the 30th. The main characteristic of this storm was the great activity in H and D, and the relative quietness of V. During the first day and night (27th-28th) the ranges were 629γ in H, $98' \cdot 4$ in D (the greatest up to this date in 1928) but only 94γ in V; during the succeeding 24 hours the H trace passed off the sheet on both sides for long periods, while ranges of $122' \cdot 9$ in D and 129γ in V were recorded. In its larger features the H curve follows the usual course of a more or less regular and gradual rise during the afternoon hours, then a sharp peak about 17h, followed by a gradual fall, which becomes very rapid about an hour before the minimum; after the minimum the curve rises rapidly, and irregular oscillations follow during the small hours of the morning. The fluctuations in D were large and irregular during the 27th-28th, larger but less irregular during the 28th-29th, when rather regular oscillations of about 20 minutes period are noticeable.

Comparing the traces with those obtained at Eskdalemuir, we find the usual similarity in the horizontal components, but a much greater activity in V at Eskdalemuir. No aurora was observed from stations in Scotland at this time, but it is reported to have been seen from S.S. "Wangaratta"¹ in Latitude $38^{\circ} 17'$ S, Long. $93^{\circ} 3'$ E. shortly after 21h G.M.T. on 27th, i.e., near to the time of minimum force on that date in H and V at Lerwick.

The 29th also was considerably disturbed, the 30th and 31st less so, though with continual movement of a small order.

Aurora was observed at one or more places in Scotland on May 10 and 19.

June.—(Average Character Figure 0.93.)—June was marked by continual activity, but little disturbance of large amplitude. On the 7th H rose by about 210γ between 13h 30m and 14h 40m, remained at a high value for 2 hours, afterwards falling again gradually, with a dip of about 90γ between 1h and 2h on the 8th. Simultaneously there were irregular fluctuations in D and a small prolonged hump in V.

The 10th and 11th were quiet, though during the daylight hours of the 10th there were very small and rapid oscillations, with periods of the order of 2 minutes and amplitude $\frac{1}{2}\gamma$ or less in H; then followed another period of moderate activity, ending in a disturbance of somewhat unusual character on the 22nd. The movement appeared first as a rapid fall in H, beginning at 22d 6h; the curve reaches a sharp minimum about 240γ below the undisturbed value at 8h 48m, then rises rapidly for $\frac{1}{2}$ hour, and from then till midnight it has a gently rounded shape with small and rapid oscillations superposed; between 22d 23h 40m and 23d 1h 0m there is a sharp V-shaped dip of about 270γ , followed by irregular and rapid oscillations during the morning of the 23rd. The D trace presents no very marked features for description, the most noteworthy being a minimum at 22d 8h 37m, followed by a small rounded maximum at 9h 11m. In the case of V the movement is first noticeable about 9h, when a small drop occurs, which is followed by a gradual rise to a maximum at 13h 59m; the curve then falls slowly till about 23h, when irregular fluctuations begin, a minimum is reached at 23d 0h 16m, and there is a gradual rise till the afternoon of the same day; the range in V was 266γ .

¹ Marine Observer, Vol. VI., p. 101.

At Eskdalemuir the dip in H about midnight of the 22nd-23rd is scarcely noticeable ; apart from this the records are very similar to those of Lerwick in all three components.

During the rest of the month, though it was not quiet, there was no noteworthy disturbance.

Aurora was not reported from any place in Scotland during June.

July.—(Average Character Figure 1.00.)—A “sudden commencement” at 2d 8h 33m was followed by very moderate activity during the rest of the day. The succeeding days were also moderately active, until an abrupt movement at 7d 22h 12m, somewhat similar to a “sudden commencement,” marked the beginning of the greatest magnetic storm of the year. Violent oscillations occurred in all three components, H and V exceeding the limits of registration for long periods ; H rose to a sharp maximum at 7d 23h 40m, afterwards decreasing very rapidly, passing off the sheet at 8d 1h, and remaining off for most of the time until 10h ; there was a temporary rise about 8d 2h. D, after a very sharp maximum at 8d 1h 12m, decreased gradually, with large oscillations, till about 8d 9h, when it rose again. V fell to a sharp minimum at 8d 1h 10m, afterwards rising and passing off the top of the sheet at intervals till 9h, when it fell rapidly, the disturbance of this component appearing to die out about 10h. The ranges during the period 7d 22h-8d 10h cannot be given, but exceeded 770 γ , 208' and 1174 γ in H, D, and V respectively.

Whereas at Lerwick the main feature of the V curve is a great rise during the morning hours after 8d 1h, at Eskdalemuir there is a no less conspicuous fall.

There was disturbance of considerable intensity until the early hours of the 10th, after which followed a period of comparative calm, the 13th, 14th, and 15th being the quietest days of the month. This continued till near the end of the month, with the exception of about 48 hours beginning at noon on the 21st, when there was disturbance of moderate intensity, the ranges being 272 γ in H, 41'·3 in D and 79 γ in V during the period.

The last 6 days of the month were notable for the fact that the ranges of diurnal variation in V were unusually large compared with those of H and D.

The 31st saw some disturbance of a usual type, continued on August 1st. The ranges recorded were 244 γ in H, 27'·2 in D, and 187 γ in V. The maxima of both H and V occurred about 31d 18h, the minima about August 1d 1h ; at Eskdalemuir the disturbance was of similar shape, but there was no pronounced minimum in N corresponding to that in H at Lerwick.

Aurora was not reported from any place in Scotland during July, but a bright display was seen from stations in England and in America on the evening of the 7th¹, also from many ships in both hemispheres².

August.—(Average Character Figure 0.55.)—Great disturbance set in after a “sudden commencement” at 4d 17h 7m. Irregular fluctuations occurred till midnight, when H and V began to decrease rapidly ; both components remained at a low value between 1h and 3h on the 5th, afterwards rising irregularly. H passed off the bottom of the sheet between 1h 25m and 1h 55m, during which time the absolute minimum occurred ; as frequently happens, there was a temporary rise in H at about 2h. During this time D underwent large oscillations, and afterwards rose to a maximum at 5d 5h 47m.

¹ Nature, CXXII., pp. 108 and 167.

² Marine Observer, Vol. VI., pp. 146-147.

The D curve during the second day of the storm is gently rounded in general outline, with maximum about 15h, and having no very pronounced fluctuations. H rose to a maximum in a very sharp peak at 5d 17h 45m, afterwards falling irregularly till midnight, when the disturbance seems to have died away temporarily. V rose during the morning and afternoon of the 5th, reached a sharp maximum at 17h 43m, followed by a rapid fall, fluctuated irregularly for the next 6 hours and fell to a rounded minimum at about 6d 0h 35m. The ranges in the period discussed were $>919\gamma$ in H, $60\cdot6$ in D, 528γ in V. The disturbance at Eskdalemuir was of similar shape, but of markedly small amplitude in N as compared with H at Lerwick.

There was a recurrence of disturbance during the night of the 6th-7th, when a large dip of roughly 300γ occurred in H, with a temporary rise about midnight. There was a dip of 220γ in V, with minimum about 1h, and large irregular fluctuations in D.

Moderate disturbance occurred on the 12th-13th; conditions were then comparatively quiet until, after a "sudden commencement" at 25d 22h 35m, fluctuations set in in all three elements. Small and rapid oscillations continued throughout the 26th, and at about 22h disturbance of large amplitude began. The H curve shows a large dip between 26d 22h and 27d 8h, with a subsidiary maximum about 1h, the depth, measured from a mean line through the oscillations, being about 450γ . There are dips also in the D and V curves, though in the case of D, as is usual, the oscillation of long period is small compared with those of short period. The notable features of this storm are the absence of any pronounced maximum during the afternoon of the 26th, and the presence of continuous small oscillations with a period of the order of 4 or 5 minutes.

Moderate activity continued during the 27th and 28th, the last three days of the month being quiet.

Aurora was observed at one or more places in Scotland on August 24, 26 and 27.

September.—(Average Character Figure 0.93.)—Character figure 2 was awarded to seven days in this month, more than in any other month of the year. After moderate agitation throughout the 2nd, there was a somewhat unusual disturbance on the afternoon of the 3rd. H rose irregularly till 17h 55m, when a sudden and very large rise took place, carrying the trace beyond the limit of registration; it returned again about 20 minutes later, falling rapidly to approximately the normal position at 17h 30m, and the disturbance died away in small oscillations during the next 7 hours, with a temporary increase of activity from about 19h 20m to 20h 40m. In D there was not much disturbance, beyond oscillation of roughly 10' amplitude around 17h and 20h. In V there was a gradual rise in the afternoon to a sharp maximum at 17h 1m, followed by an irregular fall till about 21h. The Eskdalemuir V curve is similar to the Lerwick H.

One of the most disturbed days of the month was the 7th, when great agitation began immediately after a "sudden commencement" at 13h 44m. Very large and jagged peaks and dips are superposed on the usual diurnal oscillation of H during the succeeding 18 hours, and these have a well marked period of about $3\frac{1}{4}$ hours; including the "sudden commencement" itself there are six pronounced minima. The maximum occurred at about 7d 17h 10m, when the trace passes off the sheet,

the minimum at 8d 2h 10m, the range being somewhat greater than 770γ . The usual temporary rise in H during the period of minimum around midnight is here well marked, but increased in duration to some three hours. There was much agitation of short period in D, with a dip at 22h-23h, and an irregular hump about 8d 2h, the range during the storm being $53'\cdot 1$. The V curve is of normal character with a range of 223γ . The main features of the disturbance as recorded at Eskdalemuir show no very striking differences from those at Lerwick.

The disturbance continued with lessened intensity during the 8th, 9th and 10th, and was followed by a week of quiet conditions. The 12th, 16th and 17th were among the quietest days of the month, but on the 18th a "sudden commencement" at 15h 42m marked the beginning of a rather unusual disturbance. H rose abruptly by 45γ , and after a period of small and rapid oscillations rose to a rounded maximum shortly after 20h, broken by a sharp temporary drop of about 110γ (which was accompanied by a fall of $40'$ in D); there followed an increasingly rapid fall to a minimum at 23h, after which H rose rapidly but irregularly, nearing its normal value soon after midnight. There were no further large fluctuations, but minor activity continued until near midnight of the 19th. After its drop shortly after 18d 20h, D rose gradually till 22h 40m, when there was a further drop of $40'$, followed by a rise again at 23h 30m. V underwent a gradual rise from 19h to 21h, followed by a gradual fall, with a sharp temporary rise at 23h. The ranges during the night of the 18th-19th were $>560\gamma$ in H, $64'\cdot 4$ in D and 128γ in V.

As recorded at Eskdalemuir the disturbance is of remarkably similar shape in the horizontal components; but in V, although there is the same gradual rise with maximum about 21h, the sharp rise at 23h is inverted and appears as a no less sharp temporary drop. It is perhaps worthy of remark that here, as in many other cases, the preliminary agitation in N at Eskdalemuir is of about the same amplitude as that in H at Lerwick; but the very large movements of H in which the storm seems to culminate are not reproduced at Eskdalemuir on anything like the same scale.

The rest of the month was relatively quiet for the time of year, except for the two days following a "sudden commencement" at 24d 16h 22m. The disturbance, though not of large proportions, was of interesting character. Small and rapid oscillations occurred in H during the rest of the night, with a sharp V-shaped drop of about 120γ between 25d 1h 30m and 2h 5m. This was accompanied by a double peak in D and a small dip in V. From 7h till 11h on the 25th there were continued oscillations of about 5 minutes period and the relatively large amplitude of 12γ , more or less, in H, and $3'$ in D. Moderate activity occurred during the afternoon, with marked oscillations in all three elements about 22h, after which the disturbance died gradually away.

At Eskdalemuir the disturbance was of similar shape and amplitude, but the initial movements in the horizontal components at the "sudden commencement" were somewhat greater than at Lerwick.

Aurora was observed at one or more places in Scotland on September 7-11 inclusive, 13, 14, 18 (bright and widely seen), 19, 20, 21, 23.

October.—(Average Character Figure 0·84.)—The first half of the month was quiet, particularly the period 9d 0h to 13d 10h. A small “sudden commencement” at 14d 19h 17m was followed by moderate activity till about 3d 1h. On the 18th a large disturbance occurred, which was unusual in that it began abruptly after a “sudden commencement” at 7h 26m, and had almost died away by midnight. H fell with irregular oscillations to a sharp minimum at 8h 40m, and then mounted in three jagged waves to a maximum at 17h 46m, the preceding two hours being marked by very large oscillations. These changes were accompanied by small but increasing oscillations in D and V. Beginning shortly after the maximum, H fell by three abrupt stages of about 250 γ , separated by intervals of oscillation, to a sharp minimum at 20h 49m, and rose again rapidly, reaching an approximately normal value at 22h, and continuing without much change, but with small and rapid oscillations, for the next 36 hours. The largest oscillations of D and V also took place between 17h and 22h, after which they died away very quickly. The ranges during the storm were 848 γ in H, 79'·7 in D and 157 γ in V.

At Eskdalemuir the disturbance appeared with much greater intensity in V, of which the curve is very similar to that of H at Lerwick, rising in three large waves, with maxima at about 12, 15 and 18h, and afterwards falling rapidly to a minimum about 21h.

It may be a coincidence that a small peak of about 90 γ in H at 18d 21h 35m is repeated three times at intervals of about 48 hours, with small corresponding movements in D and V.

After a very quiet day on the 23rd, disturbance began at 24d 2h. Minor oscillations continued throughout the day, increasing about 20h. At 22h a fall began in H, which was very rapid about 23h; after irregular oscillations the curve passes off the sheet at 25d 1h, returning in a rapid rise at 2h 40m, after which small and rapid oscillations continued for about 48 hours, with a renewal of activity from 25d 17-22h. In the curve of D there is an irregular dip from 24d 20h to 25d 8h, with large oscillations some 20' in amplitude, the range during this period being 78'·4; but perhaps the most unusual feature of the disturbance is the sharp peak in V, about 420 γ high, which occurred around 25d 2h, during a pronounced dip of 230 γ lasting from 24d 22h to 25d 6h. This dip in V occurred also at Eskdalemuir, but the peak is inverted into a sharp minimum.

The rest of the month was fairly quiet, especially 28d 10h to 29d 10h.

Aurora was observed at one or more places in Scotland on October 2, 6-13 inclusive, 15, 17-21 inclusive, 22 (very bright in Shetland), 24, 25 (widely), 30, 31. The aurora of 18th was seen from ships in the N. Atlantic (Lat. 50° N., Long. 61° 30' W.) and off the New South Wales Coast of Australia.¹

November.—(Average Character Figure 0·57.)—Moderate disturbance occurred on the 2nd, 3rd and 4th. The activity was of a low order, broken during the night of the 2nd-3rd by a peak of 120 γ in H at 17h 40m, and a dip of 150 γ about midnight; the peak is repeated in a larger one of about 350 γ at 3d 17h 51m (of which there

¹ Marine Observer, Vol. VI., p. 219.

is no trace at Eskdalemuir), and again on the 4th by a small one at 18h 55m. The oscillations in D have a marked period of slightly over 2 hours, and amplitude of the order of 10' during the night of the 2nd-3rd, and these are discernible continuously until 4d 8h. V rose gradually to a maximum shortly before 18h on the 2nd, afterwards falling to a rounded minimum soon after midnight, the range being 172 γ ; during the 3rd-4th the movements of V were rather irregular and of small extent.

It seems worthy of remark that the marked peaks which occurred in H during the period 2d 14h to 3d 20h either gave no counterpart in N at Eskdalemuir, or are inverted; but during the preliminary stages of the disturbance from 1d 20h to 2d 14h the two curves are very much alike, as are the D and W curves throughout. Another notable point of difference is in the V curves of the 3rd-4th, where a pointed peak 110 γ high occurring at Eskdalemuir at 3d 17h 56m has its counterpart at Lerwick, not in the V curve, but in H. (Compare October 18th.)

After five days of moderately calm conditions, the 8th and 9th being among the quietest days of the month, a small "sudden commencement" occurred at 10d 6h 55m and was followed by very slight disturbance during the rest of the day; there was further slight disturbance from 11d 22-24h after a "sudden commencement" at 16h 58m. During the afternoon and evening of the 13th there was some disturbance, culminating in large movements in all three elements shortly after 18h. H rose by 300 γ to a peak at 18h 12m, falling immediately by more than 400 γ , after which the disturbance died away during the night; D had a sharp maximum at 18h 19m, followed by large oscillations for about an hour, the range of variation being 88'·4; in V there was a peak at 14h 20m, another irregular rise about 17h, followed by an oscillating fall to a minimum during the next two hours, with a very abrupt fall and rise of 230 γ at 18h 21m; the curve rises to a rounded maximum about 21h, and there is a rounded minimum about 14d 2h.

At Eskdalemuir the V curve is more similar than N to the Lerwick H.

A little disturbance occurred on the night of the 15th-16th; the rest of the month was without noteworthy disturbance, the 21st, 22nd and 29th being among the quietest days of the month.

Aurora was observed at one or more places in Scotland on November 2-20 inclusive; bright and fairly widely seen on 13th.

December.—(Average Character Figure 0·42.)—There was no very large disturbance in this month, which, judged by the average character figure, was the quietest of the year, although as judged by the mean value of ΣR^2 it was more disturbed than January or February.

The largest disturbance of the month took place between 5d 16h and 7d 7h. After small fluctuations lasting 6 hours, H fell to an irregular minimum about 5d 23h, separated by a rounded hump from a slightly deeper minimum about 6d 3h; the daylight hours of the 6th were marked by small and rapid oscillations, and the disturbance died away in irregular fluctuations during the night. In D the greatest disturbance was from 5d 23-24h, when a dip of 45' occurred, followed by a rise to

a maximum shortly before 6d 3h. In V there were two dips with minima about 5d 23h 20m and 6d 3h 15m; the curve rises during the 6th to a maximum at 17h 38m. The disturbance was very similar at Eskdalemuir except that the first of the two minima in H is represented by two peaks in N.

From the afternoon of the 11th to the end of the 13th there was some activity, though no well-marked disturbance. The rest of the month was quiet, with occasional periods of slight activity.

Aurora was observed at one or more places in Scotland on December 3, 5, 6, 7, 11-14 inclusive, 17, 20.

1. **Lerwick.**

1928.

Day.	January. Factor 1·27.				February. Factor 1·27.				March. Factor 1·31.			
	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1	51	183	147	65	69	103	(80)	(130)	142	139	160	- 221
2	73	138	152	226	- 31	139	<-357	23	<-1002	<-818	237	442
3	276	350	113	- 178	82	118	164	136	237	323	118	224
4	68	107	z±	158	100	159	(160)	- 15	255	<-447	184	387
5	141	226	(180)	110	90	105	62	z+	153	- 13	100	<-129
6	71	87	279	118	203	239	113	26	82	92	84	124
7	73	90	178	141	131	< 242	247	72	50	> 339	155	158
8	175	> 420	(280)	<-338	72	- 257	8	193	89	95	118	124
9	149	166	<-285	> 403	108	z±	108	180	60	252	131	126
10	> 355	144	- 584	<- 23	90	113	26	- 8	303	89	150	113
11	< 130	152	- 23	113	8	72	85	111	103	110	131	116
12	73	104	90	141	69	149	224	190	<-736	158	105	145
13	- 82	99	183	161	118	152	224	> 923	160	158	131	129
14	90	121	147	- 90	93	131	121	z-	95	168	131	181
15	152	130	643	307	90	- 347	- 254	41	97	103	168	210
16	31	(80)	(100)	118	64	75	26	134	139	189	268	137
17	76	223	68	116	23	- 293	- 126	- 18	150	242	289	- 16
18	87	113	85	79	54	<-902	131	157	<-423	258	184	(200)
19	- 28	- 3	- 790	223	80	118	126	159	(-500)	103	684	168
20	254	116	- 39	152	152	100	234	306	0	- 18	- 34	187
21	166	85	80	150	303	357	455	766	139	139	137	134
22	77	95	153	220	77	103	134	162	110	147	181	213
23	127	133	(-600)	- 775	95	104	141	177	53	158	221	208
24	100	(110)	- 7	825	72	62	108	134	- 16	205	347	426
25	z+	z-	177	230	90	131	116	164	- 97	- 42	- 168	- 505
26	160	105	157	145	226	157	254	545	71	24	339	216
27	60	113	143	170	244	332	308	465	87	216	368	55
28	125	105	127	127	360	305	411	360	158	171	395	313
29	77	147	220	195	164	152	177	182	155	268	195	187
30	- 75	195	137	143	-	-	-	-	97	- 573	50	137
31	85	- 5	105	90	-	-	-	-	108	168	113	179
(a)	122	148	171	189	119	160	163	239	126	173	203	194
(b)	90	126	82	119	124	99	135	197	83	117	188	127
Mean ...	(a) 157. (b) 104.				(a) 170. (b) 139.				(a) 174. (b) 129.			
Day.	April. Factor 1·34.				May. Factor 1·38.				June. Factor 1·41.			
	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1	- 289	115	- 5	142	103	179	148	173	103	134	206	266
2	66	126	145	117	117	73	145	167	157	120	169	229
3	<-1026	137	306	- 131	86	112	139	187	103	83	117	94
4	117	128	76	139	89	142	220	59	86	80	31	112
5	101	134	137	311	153	145	220	156	89	43	17	83
6	197	164	55	139	33	22	89	64	60	92	97	120
7	235	420	382	311	103	(130)	(150)	(120)	155	91	237	147
8	270	319	306	131	(90)	112	117	179	111	85	82	185
9	257	491	355	456	106	112	126	204	138	123	144	111
10	265	325	415	404	114	109	114	81	100	50	111	- 243
11	216	123	33	38	81	70	(100)	67	- 120	z+	- 32	149
12	126	46	98	194	45	86	109	120	70	91	208	123
13	191	213	197	153	81	81	86	81	- 56	111	(130)	(150)
14	115	128	199	177	78	- 33	92	123	(90)	(120)	(140)	(150)
15	167	134	- 55	224	53	112	134	22	(90)	(80)	67	118
16	90	117	- 87	164	73	114	156	148	88	112	73	133
17	85	115	109	131	109	142	170	220	106	- 94	- 82	- 45
18	63	52	27	153	86	89	- 11	45	15	64	(150)	(200)
19	49	22	106	120	- 536	- 396	98	148	(150)	(180)	(200)	234
20	33	- 134	106	120	28	78	109	126	170	(170)	167	293
21	104	35	79	153	89	92	- 416	184	188	563	598	439
22	104	106	- 175	167	95	170	148	201	325	1043	703	501
23	115	8	145	117	112	117	131	195	132	141	155	79
24	57	265	491	407	109	92	(130)	198	- 29	108	67	88
25	352	317	330	265	64	106	92	198	111	76	117	50
26	358	377	404	339	89	114	139	220	64	202	(100)	85
27	134	150	131	44	139	148	165	142	59	122	110	99
28	46	85	134	246	114	61	- 89	413	91	195	201	597
29	412	169	183	63	326	53	218	254	365	158	150	283
30	347	224	197	216	109	148	145	167	156	59	(z±)	(z±)
31	-	-	-	-	92	134	165	193	-	-	-	-
(a)	167	174	198	195	97	111	138	157	125	161	168	189
(b)	151	165	156	195	77	90	108	157	112	155	159	167
Mean ...	(a) 183. (b) 167.				(a) 126. (b) 108.				(a) 161. (b) 148.			

NOTE.—The Potential Gradient is reckoned as positive if the potential increases upwards. For indeterminate potential gradient the following notation is used : z +, Indeterminate, positive value; z -, Indeterminate, negative value; z ±, Indeterminate in magnitude and sign.
 (a) Mean of all positive readings. (b) Mean from all complete days using both positive and negative readings.

1. Lerwick.

Day.	July. Factor 1·37.				August. Factor 1·33.				September. Factor 1·33.				
	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	
1	v/m. (o)	v/m. 92	v/m. 81	v/m. 167	v/m. 101	v/m. 126	v/m. 104	v/m. 145	v/m. <-993	v/m. 226	v/m. 206	v/m. 304	
2	212	232	499	363	66	167	132	134	234	416	483	684	
3	36	98	112	126	140	137	110	214	-290	296	117	195	
4	106	145	128	243	348	255	112	214	114	123	131	195	
5	106	312	193	259	414	353	301	553	145	170	170	335	
6	340	190	139	165	216	367	348	266	209	-73	114	139	
7	109	86	109	165	301	356	274	323	112	145	296	128	
8	176	310	156	156	85	96	58	-88	315	167	195	463	
9	75	139	92	151	55	82	96	132	644	368	572	480	
10	92	106	181	552	60	27	88	142	215	151	(100)	84	
11	67	198	120	165	82	170	178	85	81	100	109	128	
12	89	126	416	312	77	110	66	79	84	165	340	257	
13	84	145	123	117	425	241	575	189	142	446	223	480	
14	151	81	170	(110)	326	255	277	367	357	234	(160)	(170)	
15	47	84	139	209	112	(400)	458	282	(110)	(140)	(160)	(170)	
16	134	148	112	56	96	252	164	307	(110)	(140)	(160)	(100)	
17	142	70	61	139	60	110	101	129	(50)	(140)	193	-64	
18	70	89	64	84	82	115	77	142	28	100	117	-131	
19	84	95	67	17	90	88	142	173	145	78	89	112	
20	39	56	56	131	82	162	90	233	114	109	109	187	
21	109	114	117	195	88	140	164	153	89	98	114	195	
22	148	173	106	195	90	145	164	255	89	137	156	89	
23	73	106	53	112	107	167	110	118	-56	131	109	142	
24	78	112	(z±)	(z±)	63	(60)	(60)	69	89	81	84	137	
25	(z±)	156	45	8	66	77	110	186	81	137	137	198	
26	128	179	95	134	79	104	164	249	109	142	114	131	
27	134	95	181	> 259	107	110	142	238	78	-70	128	112	
28	81	139	218	> 368	88	156	142	167	61	114	78	114	
29	89	103	70	31	126	121	159	230	33	81	6	190	
30	89	92	103	120	107	121	112	197	86	114	131	193	
31	47	73	81	131	85	137	142	222	-	-	-	-	
(a)	105	134	136	168	136	168	168	206	145	170	170	218	
(b)	106	133	137	148	136	168	168	197	123	151	169	194	
Mean ...	(a) 136. (b) 131.				(a) 169. (b) 167.				(a) 176. (b) 159.				
Day.	October. Factor 1·30.				November. Factor 1·24.				December. Factor 1·19.				
	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	
1	v/m. 76	v/m. 71	v/m. 139	v/m. 109	v/m. 69	v/m. 135	v/m. 111	v/m. 108	v/m. 59	v/m. 108	v/m. 126	v/m. 129	
2	60	95	155	136	77	140	108	164	> 59	64	123	-319	
3	82	112	114	171	71	135	135	164	445	98	126	80	
4	73	141	245	212	132	87	55	121	59	-23	129	69	
5	158	174	171	359	74	135	90	169	69	z+	123	116	
6	79	-231	120	133	87	153	164	185	67	121	252	478	
7	82	185	112	364	55	82	114	180	514	159	301	301	
8	362	38	120	84	61	111	140	132	z+	z+	z+	170	
9	33	-24	109	z±	79	z+	61	-77	85	44	-13	136	
10	-44	-33	160	152	69	-61	-124	137	301	188	193	152	
11	84	114	133	256	58	32	95	50	136	116	195	159	
12	87	128	128	103	82	116	185	214	352	136	141	80	
13	71	112	117	139	> 412	583	z+	214	111	206	188	105	
14	125	141	133	150	164	116	187	282	95	118	(150)	129	
15	109	112	218	386	148	-290	341	8	93	103	111	134	
16	269	250	316	528	143	100	98	106	51	8	-21	<-830	
17	65	98	136	324	-153	79	-554	103	100	231	129	134	
18	112	144	150	-348	53	103	69	87	80	103	175	352	
19	84	-44	106	174	61	309	261	21	-87	90	172	-95	
20	-73	52	101	79	74	95	z+	267	72	111	113	146	
21	84	98	139	305	79	71	(50)	48	80	98	113	213	
22	82	166	136	133	(80)	(120)	-190	158	85	118	-213	136	
23	122	120	160	38	16	z-	(o)	(50)	98	129	164	-280	
24	(o)	(140)	(160)	(180)	z-	77	137	195	93	141	283	170	
25	(100)	(100)	(160)	(180)	77	79	108	108	z+	z+	113	206	
26	(o)	(140)	307	313	79	74	428	137	-105	108	123	z+	
27	272	408	-38	141	66	71	114	137	31	z+	111	116	
28	82	-76	92	79	61	129	114	58	98	121	177	198	
29	-22	128	160	207	106	129	103	74	100	131	111	113	
30	52	-242	136	264	79	135	285	185	247	154	146	116	
31	8	98	112	112	-	-	-	-	108	103	108	z+	
(a)	100	135	151	200	93	131	142	133	137	119	152	166	
(b)	88	91	147	182	75	92	99	125	126	120	138	120	
Mean ...	(a) 147. (b) 127.				(a) 125. (b) 98.				(a) 143. (b) 126.				
Annual Means ...									(a)	123	149	163	188
									(b)	108	126	141	161
									(a) 156.		(b) 134.		

The Potential Gradient is reckoned as positive if the potential increases upwards. For indeterminate potential gradient the following notation is used :
 z + Indeterminate, positive value ; z - Indeterminate, negative value ; z ± Indeterminate in magnitude and sign.
 (b) Mean from all complete days using both positive and negative readings.

POTENTIAL GRADIENT (reduced to level surface): DIURNAL INEQUALITIES (in volts per metre).

The departures from the mean of the day are adjusted for non-cyclic change.

2. Lerwick.

* 0a DAYS ONLY.

1928.

Month and Season.	Hour G.M.T.		3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Non-cyclic change 24-0.	No. of Days used.	Mean Values.
	1.	2.																									
Jan. ...	v/m. -8	v/m. -3	v/m. -29	v/m. -29	v/m. -16	v/m. +4	v/m. +6	v/m. +28	v/m. +11	v/m. +24	v/m. +13	v/m. +8	v/m. +3	v/m. 0	v/m. -3	v/m. -17	v/m. -15	v/m. -10	v/m. +15	v/m. +6	v/m. +5	v/m. +16	v/m. +2	v/m. -10	v/m. -57	1	v/m. 95
Feb. ...	-55	-48	-52	-43	-33	-27	-29	-46	-29	+2	+5	0	-3	+6	+13	+8	+44	+46	+70	+91	+111	+13	-9	-35	+15	7	264
Mar. ...	-24	-35	-47	-50	-53	-49	-31	-4	-3	-14	-14	-8	+9	+16	+33	+43	+48	+41	+42	+55	+47	+19	-3	-19	-40	7	163
April ...	-26	-19	-8	-27	-12	-7	-13	-17	+5	+12	-1	0	+14	+20	+25	+23	-1	+25	+30	+25	-3	-14	-5	-24	+67	9	247
May ...	-23	-21	-29	-30	-23	-3	-5	-9	-15	-13	-19	-14	+5	+8	+15	+12	+15	+18	+23	+28	+38	+25	+15	+2	-11	16	139
June ...	-47	-57	-57	-51	-57	-46	-51	-16	+8	+2	-9	-5	+7	+36	+22	+29	+24	+35	+57	+60	+50	+64	+29	-26	+72	6	203
July ...	+12	+4	+3	+5	+9	-3	+11	+19	+1	-14	-14	-11	-15	-18	-24	-25	-22	-3	0	0	+20	+22	+27	+17	+12	10	127
Aug. ...	-7	-28	-44	-29	-27	-13	-5	-7	+6	+2	-1	+11	-2	-8	-3	+8	-1	+14	+29	+48	+45	+25	-8	-6	+16	15	148
Sept. ...	+19	0	-21	-29	-30	-36	-17	-14	-4	-17	-20	-32	-46	-52	-35	-14	+46	+78	+102	+81	+19	-14	+17	+22	+121	9	196
Oct. ...	-36	-33	-40	-41	-44	-40	-34	-30	-29	-29	-29	-15	+17	+16	+24	+46	+56	+51	+97	+46	+37	+32	-7	-16	+61	5	143
Nov. ...	-35	-49	-43	-47	-29	-29	-10	+13	-4	-16	-19	-23	-1	-26	+23	+69	+26	+48	+71	+36	+45	+13	+1	-13	-21	4	128
Dec. ...	-62	-50	-55	-52	-51	-20	-22	-2	+21	+29	+23	+9	+25	+14	+23	+37	+76	+76	+51	+9	-13	-17	-7	-41	-11	2	135
Year ...	-24	-28	-35	-35	-31	-22	-17	-7	-3	-3	-7	-7	+1	+1	+9	+18	+25	+35	+49	+40	+33	+15	+4	-12	-	-	166
Winter	-40	-37	-45	-43	-32	-18	-14	-2	0	+10	+5	-1	+6	-1	+14	+24	+33	+40	+52	+35	+37	+6	-3	-25	-	-	155
Equinox	-17	-22	-29	-37	-35	-33	-24	-16	-8	-12	-16	-14	-1	0	+12	+25	+37	+49	+68	+52	+25	+6	+1	-9	-	-	187
Summer	-16	-25	-32	-26	-25	-16	-13	-3	0	-6	-11	-5	-1	+5	+3	+6	+4	+16	+27	+34	+38	+34	+16	-3	-	-	154

3. Lerwick.

* 1a AND 2a DAYS ONLY.

1928.

Month and Season.	Hour G.M.T.		3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Non-cyclic change 24-0.	No. of Days used.	Mean Values.
	1.	2.																									
Jan. ...	v/m. -19	v/m. -153	v/m. -15	v/m. +26	v/m. +27	v/m. +10	v/m. +22	v/m. +28	v/m. +62	v/m. +52	v/m. +40	v/m. +32	v/m. +26	v/m. +17	v/m. +35	v/m. +15	v/m. -3	v/m. -4	v/m. -7	v/m. -14	v/m. -28	v/m. -40	v/m. -26	v/m. -82	v/m. +202	5	v/m. 104
Feb. ...	-25	-45	-9	+15	-6	+13	+53	+30	-42	-19	+40	+47	+40	+41	+1	-24	-25	-32	-96	0	+72	0	-35	+5	-33	5	59
Mar. ...	-61	-56	-84	-97	-77	-58	-103	-69	-81	-43	-22	+10	+51	+79	+77	+101	+87	+107	+116	+125	+16	0	+38	-55	-93	8	158
April ...	+1	-5	-11	+13	-12	-12	-24	-25	-2	-28	-11	-31	-2	-21	-39	+37	+32	+31	+53	+25	+23	-29	+21	+16	-89	6	185
May ...	+21	-13	-4	-2	+18	+28	-16	-26	-5	-4	+2	-28	-44	-6	-49	-35	-51	-31	+45	+35	+56	+58	+30	+21	+25	9	83
June ...	-9	-12	-26	-11	-7	-7	-1	-12	+1	-8	-11	+1	-21	+14	+16	+2	-8	+14	+24	-13	+31	+19	+9	+14	-46	9	90
July ...	-22	-18	-33	-36	-97	-56	-19	-15	+7	+10	+26	+39	+25	+13	-10	-8	+11	+32	+55	+45	+34	+30	+9	-23	+15	8	129
Aug. ...	+4	-8	-6	+1	-4	+20	-8	+7	+7	+10	-4	+10	+30	+31	-20	-42	-66	-15	+14	+25	+25	+4	-5	+5	+1	8	153
Sept. ...	-32	-7	-92	-110	-53	-22	-52	-20	+5	-14	+10	+12	+21	+27	+26	+32	+31	+45	+50	+35	+35	+51	+25	-4	+14	7	115
Oct. ...	+10	-21	-26	-31	-71	-62	-71	-69	-47	-33	-52	-44	-4	+13	+35	+56	+49	+52	+64	+80	+80	+38	+23	+32	-61	11	106
Nov. ...	-3	-26	-6	-38	-54	-87	-24	+17	+27	+13	+15	-1	+12	0	+8	+40	+33	+21	+8	-16	+2	+5	+47	+7	+13	9	91
Dec. ...	-44	-16	+6	-17	+33	+1	-5	+13	+11	+1	-1	-7	-7	-5	-33	+15	+31	+51	+51	+23	+11	-18	-39	-55	+81	4	110
Year	-15	-32	-25	-24	-25	-19	-21	-13	-5	-5	+3	+3	+11	+17	+4	+16	+10	+23	+31	+29	+30	+10	+8	-10	-	-	115
Winter	-23	-60	-6	-3	0	-16	+11	+22	+15	+12	+28	+18	+18	+13	+3	+11	+9	+9	-11	-2	+14	-13	-13	-31	-	-	91
Equinox	-21	-22	-53	-56	-53	-39	-63	-46	-31	-29	-19	-13	+17	+25	+25	+57	+50	+59	+71	+66	+39	+15	+27	-3	-	-	141
Summer	-1	-13	-17	-12	-23	-4	-11	-15	+3	+2	+3	+5	-3	+13	-16	-21	-29	0	+35	+23	+37	+28	+11	+4	-	-	116

* NOTE.—For explanation of 0a, 1a and 2a Days, see page 51.

ELECTRICAL CHARACTER OF EACH DAY, AND APPROXIMATE DURATION OF NEGATIVE POTENTIAL GRADIENT.

4. **Lerwick.**

1928.

Day.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.	Char- acter. Duration of nega- tive pot. grad. hrs.
1	1b 2.0	1b —	1a 1.0	1b 3.2	0a 0.0	0a 0.0	1a —	1a 0.5	1b 1.1	0a 0.0	1a 0.9	0a 0.0
2	1b 0.9	2c 3.3	2c 9.2	0a 0.0	1a 0.2	0a 0.0	2b 3.8	0a 0.0	0a 0.0	0a 0.0	1a 0.1	1b 1.1
3	1c 1.5	1b 0.3	1a 0.2	2b 5.5	0a 0.0	1a 0.4	1a 0.9	0a 0.0	2a 3.2	0a 0.0	1a 0.1	1b 1.2
4	2c (3.4)	2b 4.1	1b 1.4	1b 1.5	0a 0.0	1a 1.2	0a 0.0	1a 0.2	0a 0.0	0a 0.0	0a 0.0	2a 6.2
5	1c 1.9	1c 2.4	1b 2.2	1a 0.2	0a 0.0	2a (3.4)	1a 1.4	1a 0.1	0a 0.0	1a 0.7	0a 0.0	2c 3.2
6	1a 0.3	1b 2.7	1b 0.7	1a 2.1	1a 0.7	1a 1.3	0a 0.0	0a 0.0	2b 5.5	2a 5.4	0a 0.0	2b 3.1
7	2b 3.9	2c 3.1	1b 0.8	0a 0.0	— —	2b 3.8	1a 1.6	1a 1.2	1a 1.1	1a 0.4	1a 1.7	1c 0.9
8	1c 2.2	2a 7.9	1a 1.5	0a 0.1	1a 0.5	2b 4.0	1b 1.7	2b 4.4	0a 0.0	1a 1.1	0a 0.0	1c 2.8
9	1c 2.1	2c 4.1	0b 0.0	0a 0.0	0a 0.0	1a 1.7	1a 0.9	1a 0.3	1a 1.5	1b 1.5	2c 10.8	2a 3.9
10	2c (5.3)	2a 3.6	1b 0.1	0a 0.0	0a 0.0	2a 5.2	1b 0.7	1a 0.7	1b (2.7)	1b 1.9	2a 6.8	0a 0.0
11	1c 2.7	2a 2.7	1b 0.2	2b 5.2	0a 0.0	2c 10.0	1b 1.2	0a 0.0	1a 0.3	1a 0.4	1a 2.5	1b 0.1
12	2b (3.4)	0a 0.0	2b 4.4	1a 1.2	0a 0.0	1a 1.3	0a 0.0	2b 4.9	0a 0.0	2a 3.1	1a 2.0	1b 1.1
13	2a 4.7	1b 0.6	0a 0.0	1a 0.1	2a (3.6)	1 1.8	0a 0.0	1a 0.3	0a 0.0	1a 1.2	1c 1.5	0a 0.0
14	2b 4.1	2b 3.3	0a 0.0	0a 0.0	1a 0.8	— —	0a 0.0	1b 1.1	1 0.1	1a 0.1	1b 1.2	2b —
15	1b 0.7	2b 6.5	0a 0.0	1a 0.8	1a 1.5	2b —	0a 0.0	1b 1.1	0 0.0	0a 0.0	2b 7.3	1a 0.5
16	1a (1.0)	1a 1.7	1a 0.5	2b 5.4	1a 0.3	1a 0.3	0a 0.0	0a 0.0	— —	1b 1.1	2a 3.7	2b 12.8
17	1a 0.2	2b 6.6	1a 1.4	1b 0.5	0a 0.0	2b 4.6	0a 0.0	0a 0.0	1 (1.9)	1b 2.2	2b 10.1	1b 1.9
18	0a —	2 6.2	2b 3.7	1b 0.6	2b 3.8	1a —	0a 0.0	0a 0.0	2b 3.4	2b 7.0	1a 0.8	1b —
19	2a —	0a 0.0	— —	1b 2.0	2b 5.0	0 0.0	1b 2.6	0a 0.0	1b 1.4	2b 3.4	1a 2.6	2b 6.2
20	2b 3.4	1a —	2b 6.2	2b 3.1	1a 1.4	1a 0.3	1a 0.3	0a 0.0	1a 0.3	2b 6.3	1c 1.2	1a 2.0
21	1a —	0a 0.0	0a 0.0	1b 2.7	1a 2.1	0a 0.0	0a 0.0	1a 0.1	0a 0.0	1b 1.2	2b —	1a 1.1
22	1a 0.2	1a 0.7	0a 0.0	1a 1.6	0a 0.0	0a 0.0	0a 0.0	0a 0.0	0a 0.0	1b 1.4	2b —	1b 2.7
23	2b —	0a 0.0	1a 1.8	1b (2.5)	0a 0.0	1a 0.3	0a 0.0	1a 0.3	2a 4.5	1a 2.4	2b —	2b 5.0
24	1c —	0a 0.0	1a 2.7	0a 0.0	0a 0.0	1a 0.4	0a —	2b —	1a —	1a —	2b 3.7	1c (2.9)
25	2c 3.7	1a 0.3	2a 14.7	1a 0.1	0a 0.0	0a 0.0	1a —	0a 0.0	0a 0.0	1a —	1b 0.8	1c 2.1
26	1b 2.0	0a 0.0	1a 1.4	0a 0.0	0a 0.0	0a 0.0	0a 0.0	0a 0.0	0a 0.0	1a —	1b 2.4	2c 3.3
27	1b 1.0	0a 0.0	1b 2.2	0a 0.0	0a 0.0	0a 0.0	1a 0.7	0a 0.0	2a 4.3	1b 2.1	1b 1.8	1c 0.9
28	1b (2.0)	0a 0.0	0a 0.0	0a 0.0	2a 9.2	0a 0.0	1b 1.0	0a 0.0	1b 1.2	1a 1.5	1a 0.3	1b 0.7
29	1b 1.9	0a 0.0	0a 0.0	0a 0.0	0a 0.0	1b 1.1	2b 5.3	0a 0.0	1a (2.0)	1a 0.5	1a 0.5	1a 0.1
30	1a 2.8	— —	2a 8.5	0a 0.0	0a 0.0	2a —	1a 0.3	1a (1.3)	1a 0.1	2a 8.2	0a 0.0	1b 0.3
31	2c 3.1	— —	1b 1.3	— —	0a 0.0	— —	1a 1.0	0a 0.0	— —	1a 1.3	— —	1b 0.7
Total No. of days used.	— 60.4	— 60.1	— 66.1	— 38.4	— 29.1	— 41.1	— 23.4	— 16.5	— 34.5	— 54.4	— 62.8	— 66.8
Mean	— 2.3	— 2.2	— 2.2	— 1.3	— 1.0	— 1.6	— 0.8	— 0.5	— 1.2	— 1.9	— 2.3	— 2.3

Annual Values :—Character Frequency $\begin{matrix} 0 & 1 & 2 \\ 110 & 174 & 78 \end{matrix}$
 Mean character figure 0.91 (362 days)
 Duration of negative pot. grad.: Total 553.6 hrs.
 No. of days 339
 Mean 1.63 hrs.

Explanatory Note.—The electric character of the day is indicated by the figures 0, 1, or 2, according to the character of the trace of the electrograph as regards negative potential gradient. The explanation of these symbols is as follows:—

0, denotes a day during which from midnight to midnight no negative potential was recorded.

1, denotes one or more excursions of limited duration to the negative side of the scale.

2, denotes negative potential extending in the aggregate over 3 hours or more.

a, denotes that within the 25 periods of 60 minutes for which an estimate of the mean potential gradient has to be made in the process of tabulation there was in no case a range of potential gradient in the open exceeding 1000 volts.

b, denotes that a range of potential gradient in the open exceeding 1000 volts was reached in at least one but in fewer than six of the 25 hourly periods referred to above.

c, denotes that a range of 1000 volts or more occurred in at least six of the 25 hourly periods.

TERRESTRIAL MAGNETIC FORCE : HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

5. Lerwick. (H.)

14,000 γ (-14 C.G.S. unit) +

January, 1928.

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day 1-31). Values range from 580 to 615. Includes a 'Mean' row at the bottom.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

6. Lerwick. (D.)

14° +

January, 1928.

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day 1-31). Values range from 37.4 to 45.5. Includes a 'Mean' row at the bottom.

* Light failed.

† Mean of 29 days; 15th and 16th omitted.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

7. Lerwick. (V.)

46,000 γ (46 C.G.S. unit) +

January, 1928.

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.
Day.	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ
1 D	699	698	697	694	692	690	689	688	687	687	688	689	690	687	687	688	688	688	688	688	689	694	697	687	685	690
2	686	686	686	686	685	684	684	685	686	686	687	687	687	687	687	687	687	687	687	687	687	687	687	686	686	686
3	687	687	684	679	680	681	681	682	683	684	687	687	687	687	687	687	687	687	687	687	687	687	687	687	687	685
4	688	688	688	688	688	688	687	687	687	688	689	690	691	691	691	692	692	692	692	692	693	693	693	692	689	690
5	691	691	693	694	694	694	694	695	696	697	696	697	698	699	700	702	701	701	702	702	702	702	703	703	703	698
6	704	703	704	704	705	705	705	704	705	705	708	708	709	709	710	710	711	711	711	711	711	711	708	709	710	708
7	712	711	712	706	707	709	710	711	711	712	713	713	713	713	714	715	715	716	716	716	716	715	716	715	715	713
8	716	715	715	715	715	715	714	714	714	714	715	714	714	714	715	716	716	716	716	716	716	715	715	714	715	715
9	717	715	715	715	716	716	716	716	716	716	716	716	717	717	719	721	722	723	723	723	723	723	723	723	722	719
10	723	719	719	720	720	720	720	720	720	720	721	721	722	722	723	723	724	725	726	726	726	726	725	724	722	722
11 Q	722	720	720	720	719	719	720	720	720	720	722	722	722	723	726	727	727	726	725	725	724	724	723	721	719	722
12 Q	718	717	716	717	717	717	717	716	717	717	716	716	717	717	716	716	716	716	716	716	716	716	716	716	716	716
13 Q	715	714	714	714	714	714	714	714	714	714	713	714	714	713	713	713	713	713	713	714	714	714	715	715	715	714
14 Q	714	714	714	714	713	713	713	713	714	714	715	716	717	718	719	719	720	721	723	723	724	726	726	726	726	718
15	724	724	724	724	724	723	724	724	724	725	727	728	728	726	725	724	724	725	*	—	—	—	—	—	—	—
16	—	—	—	—	—	—	—	—	—	—	—	*	731	730	730	730	730	730	731	731	731	731	731	731	730	—
17	730	730	730	730	731	731	730	730	731	732	731	732	732	732	732	732	732	732	731	731	731	731	731	731	732	731
18	732	732	732	731	731	729	729	727	727	728	731	731	731	731	731	731	731	731	731	731	731	731	731	731	729	730
19	729	729	729	729	731	731	731	729	729	729	731	733	733	733	733	733	731	731	731	731	731	729	727	727	727	730
20	727	725	725	725	725	723	723	723	723	723	725	725	725	725	725	725	725	725	725	725	721	721	721	721	719	724
21	719	718	717	715	713	712	711	711	711	713	716	716	715	717	728	728	728	726	725	725	725	723	723	723	723	719
22	723	724	724	725	725	724	724	724	723	723	723	724	728	728	729	730	731	732	733	733	734	731	726	723	722	727
23 D	722	720	718	719	720	720	720	720	719	718	722	724	724	724	725	727	730	732	733	733	735	734	733	733	732	725
24	732	732	731	731	731	731	731	731	731	731	732	732	733	741	749	753	753	757	756	756	754	750	750	750	750	741
25	750	745	746	747	747	747	747	747	747	748	749	749	750	751	753	753	754	755	755	756	756	757	757	757	755	751
26	755	756	757	757	757	757	756	756	755	754	754	755	755	755	755	755	755	755	755	754	755	763	767	766	765	757
27 D	765	753	750	751	748	697	683	693	701	706	713	720	730	742	759	759	757	759	787	803	788	786	783	774	771	746
28 D	771	769	768	768	768	768	768	768	768	768	770	770	775	775	774	772	771	772	772	773	771	764	764	759	756	769
29 D	756	755	757	756	753	751	755	756	757	759	762	763	765	781	783	792	794	798	804	801	800	794	784	773	771	773
30	771	771	769	768	767	765	765	765	766	767	767	767	768	770	771	772	770	770	772	771	771	772	769	770	769	773
31 Q	770	766	766	766	765	765	765	765	765	765	763	763	764	765	766	764	764	764	764	765	765	765	766	766	765	765
Mean†	726	724	724	724	723	721	721	721	721	722	723	724	725	726	728	729	729	730	731	731	731	730	730	728	728	726

8. Lerwick.

**DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS ;
MAGNETIC CHARACTER FIGURES ; TEMPERATURE IN MAGNET HOUSE.**

January, 1928.

Day.	Terrestrial Magnetic Elements.												Character Figure $\frac{\Sigma R^4}{100\gamma^2}$ §	Magnetic Character of Day (0-2).	Temperature in Magnet House 200 +				
	Horizontal Force.						Declination.			Vertical Force.									
	Maximum 14,000 γ +		Minimum 14,000 γ +		Range.	Maximum 14° +		Minimum 14° +	Range.	Maximum 46,000 γ +		Minimum 46,000 γ +				Range.			
	h. m.	γ	γ	h. m.	γ	h. m.	γ	h. m.	h. m.	γ	h. m.	γ							
1D	19 16	619	546	11 25	73	11 51	57.2	23.0	21 21	34.2	21 40	704	684	13 22	20	270	I	74.3	
2	21 32	603	575	10 4	28	13 2	48.2	40.1	21 49	8.1	21 15	689	681	5 50	8	21	O	74.8	
3	22 19	608	582	10 48	26	1 56	47.2	41.6	9 1	5.6	10 44	689	677	2 40	12	14	O	75.5	
4	23 50	621	575	12 8	46	14 8	51.2	35.9	23 46	15.3	20 30	695	683	7 58	12	65	I	75.9	
5	0 3	617	580	11 5	37	14 48	48.6	37.9	0 19	10.7	20 8	705	687	0 15	18	38	I	76.0	
6	22 11	610	581	11 30	29	12 18	48.6	37.8	21 59	10.8	20 20	713	702	0 0	11	31	I	75.9	
7	23 33	616	580	2 15	36	2 19	50.6	37.6	23 40	13.0	18 24	718	703	3 0	15	45	I	75.6	
8	7 12	613	586	11 30	27	12 38	46.9	37.6	0 28	9.3	18 30	718	712	9 29	6	40	O	75.7	
9	6 51	612	578	14 39	34	13 12	47.8	35.6	21 35	12.2	18 4	725	714	3 20	11	40	I	76.1	
10	5 15	611	584	18 57	27	16 55	46.2	37.7	21 11	8.5	19 5	728	717	0 30	11	21	I	76.1	
11Q	22 34	614	592	10 35	22	13 0	46.5	40.9	7 40	5.6	14 10	729	716	12 2	13	12	O	76.0	
12Q	20 6	612	592	12 43	20	13 8	46.9	42.1	22 27	4.8	12 40	719	714	10 3	5	8	O	75.9	
13Q	19 9	616	597	10 4	19	12 50	46.8	41.2	22 28	5.6	23 0	717	711	15 52	6	10	O	76.0	
14Q	14 29	612	592	12 31	20	13 12	48.2	41.0	21 55	7.2	22 11	729	711	4 19	18	17	O	76.1	
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	O	76.0
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	O	76.0
17	19 28	618	597	9 58	21	11 51	45.7	39.0	23 50	6.7	24 0	733	728	2 4	5	13	O	76.0	
18	7 25	621	586	12 20	35	13 39	51.3	39.4	0 3	11.9	22 4	735	726	5 41	9	39	I	75.8	
19	20 26	623	591	10 51	32	12 58	47.8	36.4	20 58	11.4	12 0	733	727	23 0	6	35	I	75.9	
20	0 27	628	591	13 17	37	15 38	51.6	37.3	1 9	14.3	15 25	726	718	24 0	8	52	I	76.1	
21	22 21	627	590	12 29	37	1 59	48.9	35.4	20 4	13.5	16 0	729	709	6 18	20	51	I	76.9	
22	6 11	619	588	11 47	31	13 47	47.4	35.0	2										

TERRESTRIAL MAGNETIC FORCE : HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

9. Lerwick. (H.)

February, 1928.

14,000 γ (.14 C.G.S. unit) +

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.
Day.	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ
1	609	611	609	609	604	605	615	616	615	610	603	599	594	593	599	603	605	610	614	614	610	606	609	613	611	607
2	611	609	609	612	611	611	611	611	610	606	603	601	601	602	606	610	617	607	607	610	599	597	604	616	588	607
3	588	583	595	598	593	595	619	619	613	604	589	593	591	590	597	609	612	600	604	609	604	607	609	607	613	602
4	613	606	604	605	605	608	613	620	607	603	601	595	588	590	597	608	614	620	608	612	614	615	614	611	611	607
5	611	611	613	613	614	614	620	618	610	602	591	586	590	590	599	605	608	611	613	614	615	612	607	609	610	607
6	610	612	609	611	613	613	614	612	609	604	600	593	594	598	605	608	610	615	620	604	608	612	612	613	611	608
7	611	607	608	613	615	620	620	625	621	613	606	598	600	606	609	612	613	613	615	617	611	606	612	613	613	612
8Q	613	611	611	607	607	613	613	612	615	617	608	601	601	603	608	612	615	617	610	610	614	616	611	612	612	611
9Q	612	612	611	611	612	611	614	616	613	611	605	600	598	600	606	609	612	613	615	615	615	615	615	611	616	611
10Q	616	612	614	616	616	616	616	615	615	615	608	603	601	603	603	610	613	614	615	615	616	616	621	617	619	613
11Q	619	612	611	611	610	612	613	613	610	605	606	604	604	604	607	613	616	615	615	613	616	615	615	615	620	611
12	620	615	613	614	613	613	616	615	629	623	621	615	615	609	610	620	626	630	631	627	622	620	631	621	611	619
13D	611	612	610	611	611	615	614	613	614	613	608	609	609	608	610	620	614	625	614	609	614	619	614	614	607	613
14	607	598	605	611	593	608	609	614	609	603	605	603	611	613	611	613	617	614	614	614	618	623	607	609	608	610
15	608	608	609	610	609	613	611	607	606	611	610	601	599	605	609	614	620	623	618	623	617	609	624	605	607	611
16	607	612	614	607	611	612	611	614	611	603	595	583	590	600	606	611	612	616	621	622	621	607	608	609	601	608
17	601	610	606	605	611	611	611	611	611	607	598	594	593	599	604	610	608	610	611	617	616	611	611	616	615	608
18D	615	615	617	615	612	615	622	625	620	615	593	586	585	576	586	598	609	615	613	608	608	598	593	604	607	606
19D	607	615	609	603	580	607	621	617	613	602	603	597	591	589	594	607	614	612	616	613	612	613	614	614	614	607
20	614	613	613	613	613	614	615	616	615	603	586	581	588	591	595	597	606	611	618	609	598	589	577	579	590	602
21D	590	602	605	601	605	607	612	614	615	611	609	606	592	590	600	610	609	608	616	601	607	615	605	605	600	606
22	600	593	597	610	606	610	611	610	605	594	583	583	585	588	593	596	605	606	609	613	611	624	607	588	598	601
23	598	603	604	604	607	612	615	613	610	609	597	576	579	581	595	597	603	605	608	607	607	607	607	608	607	602
24Q	607	610	607	607	609	611	611	610	607	598	588	584	583	587	591	593	595	597	601	606	607	612	613	615	615	602
25	615	613	612	612	616	613	601	615	617	601	594	583	568	579	591	590	595	595	607	607	599	604	604	601	612	601
26D	612	604	606	602	603	605	607	607	606	593	585	583	559	577	588	594	599	599	606	605	602	606	605	610	605	598
27	605	606	601	594	599	604	604	608	597	577	581	576	575	578	584	588	593	603	602	607	609	609	618	597	600	596
28	600	597	598	598	600	604	608	603	598	592	582	576	577	583	586	597	602	608	609	607	608	606	608	607	607	598
29	607	606	607	602	603	604	605	605	602	596	586	580	580	585	591	596	599	602	603	607	607	607	607	607	606	600
Mean	608	608	608	608	607	611	613	614	611	605	598	593	591	594	599	605	609	611	612	612	611	610	610	608	608	606

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

10. Lerwick. (D.)

February, 1928.

14° +

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.
Day.																										
1	40.9	41.7	40.9	41.9	39.4	39.7	40.9	40.9	40.9	40.9	41.5	43.8	45.3	45.7	46.7	45.7	44.8	43.6	43.4	43.6	38.4	36.7	41.9	41.9	41.3	42.1
2	41.3	42.3	42.4	41.7	41.5	41.3	41.3	41.1	41.1	42.1	42.6	44.0	45.5	46.5	45.3	43.8	42.8	43.6	35.3	35.7	40.5	40.9	34.9	34.7	41.7	
3	34.7	37.2	38.8	39.4	42.4	42.8	40.5	40.9	40.9	42.1	42.6	44.6	47.8	51.1	47.3	48.6	48.2	45.9	44.8	43.0	40.5	40.7	41.7	41.5	40.1	42.9
4	40.0	40.8	42.0	42.9	42.7	42.9	41.8	41.8	43.1	43.3	43.5	45.2	47.0	50.3	48.5	45.0	44.5	43.1	44.1	42.7	42.0	41.4	41.6	41.4	41.4	43.4
5	41.4	42.3	42.9	42.5	43.1	43.7	40.2	40.8	40.6	40.0	41.4	43.3	46.2	47.2	47.2	44.5	43.9	42.9	42.7	42.5	42.3	41.0	40.2	40.8	42.0	48.7
6	42.0	42.7	43.1	42.7	42.5	42.3	41.8	41.2	40.6	40.4	41.6	42.5	44.1	45.4	46.2	45.0	44.5	44.3	43.5	43.3	41.0	42.0	41.4	42.3	42.9	42.8
7	42.9	44.7	44.7	42.7	41.2	40.4	40.2	40.6	40.8	41.2	42.7	42.9	44.3	44.9	44.7	43.9	43.9	44.7	44.7	43.9	38.9	39.8	40.8	41.6	42.0	42.5
8Q	42.0	42.3	41.0	40.2	39.3	39.4	40.0	40.6	40.6	41.2	42.3	43.9	45.6	46.8	46.4	45.0	44.7	44.1	45.8	45.2	43.3	42.2	39.4	39.1	39.4	42.5
9Q	39.4	40.8	41.2	41.6	41.0	42.3	41.4	41.0	40.4	40.6	41.4	42.7	44.1	45.2	45.4	44.7	44.3	43.1	43.1	42.5	42.0	41.0	41.0	40.8	40.6	42.1
10Q	40.5	41.5	41.3	41.1	40.9	40.9	40.7	40.7	40.1	39.3	39.9	42.2	43.8	46.9	48.6	48.4	46.7	44.6	46.3	44.6	42.8	42.1	41.3	40.9	38.6	42.7
11Q	38.6	38.0	39.0	39.2	39.3	39.2	39.5	39.3	39.0	39.0	41.1	43.0	45.7	46.3	46.1	45.3	46.3	46.7	43.6	42.6	41.3	40.7	40.3	40.3	39.0	41.7
12	39.0	39.9	40.9	40.9	40.7	40.7	40.5	39.9	39.3	39.7	41.1	43.4	45.1	46.9	47.6	46.3	45.9	45.3	44.6	44.8	39.5	37.6	33.0	36.6	40.1	41.7
13D	40.1	41.5	41.1	40.5	40.3	40.1	40.3	40.3	40.1	40.5	40.9	43.0	44.6	45												

TERRESTRIAL MAGNETIC FORCE: VERTICAL COMPONENT.
Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

February, 1928.

11. Lerwick. (V.)

46,000 γ (·46 C.G.S. unit) +

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.
Day.	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ
1	766	763	763	762	763	763	762	762	762	762	767	767	767	767	767	766	766	766	766	766	765	766	765	764	762	765
2	762	761	761	760	760	760	759	759	758	758	759	759	758	758	757	757	758	759	760	761	760	759	758	753	750	759
3	750	747	739	740	743	743	745	749	750	751	754	757	759	763	766	765	768	776	777	774	770	774	779	768	767	763
4	763	763	763	763	762	762	762	761	762	761	761	761	763	764	764	768	768	767	768	768	766	765	763	762	762	764
5	762	762	762	762	760	757	754	754	754	754	757	757	757	757	756	757	757	757	756	756	756	755	754	753	753	757
6	753	753	753	752	752	752	752	752	751	751	753	752	752	752	753	754	754	754	754	756	756	754	752	750	749	753
7	749	748	746	747	749	747	746	745	745	745	745	746	747	747	747	747	747	747	747	747	747	748	747	746	744	747
8 Q	744	744	743	743	743	743	741	741	739	738	738	737	738	737	737	738	738	739	740	740	738	739	737	736	740	
9 Q	736	735	734	734	734	732	729	727	727	727	726	726	726	726	727	727	728	727	727	727	727	726	725	724	724	
10 Q	724	723	723	722	722	723	723	723	722	722	724	724	724	731	743	746	747	748	746	747	749	750	750	747	746	734
11 Q	746	746	744	744	743	743	743	743	743	742	741	741	741	741	741	742	744	745	749	751	751	749	749	747	744	745
12	744	743	742	742	742	742	743	742	741	740	740	738	739	741	743	742	743	744	745	750	768	768	760	759	747	747
13 D	759	755	754	754	754	753	752	752	752	751	753	753	753	753	753	754	755	756	760	761	762	762	759	759	759	759
14	774	768	759	745	732	715	728	736	741	745	746	748	748	749	751	753	755	760	761	762	762	759	759	759	759	750
15	759	756	756	755	753	753	753	752	752	750	750	751	751	751	752	752	752	752	752	752	753	757	755	744	747	752
16	747	745	744	743	738	739	740	740	741	741	740	742	741	741	741	741	741	741	740	739	738	740	741	739	738	741
17	738	732	731	731	731	731	731	731	732	732	734	733	733	733	734	736	736	736	737	737	735	735	735	735	733	733
18 D	733	734	732	730	730	729	729	728	727	731	731	731	731	731	731	732	732	734	736	740	740	740	739	734	733	733
19 D	733	724	723	723	721	707	708	713	715	717	721	722	723	725	725	726	725	728	728	729	729	728	728	727	728	723
20	728	729	729	728	728	727	727	725	724	724	725	725	726	725	726	726	726	725	725	726	725	722	713	716	714	725
21 D	714	717	721	723	722	721	721	720	721	720	721	721	722	723	724	727	730	731	731	735	736	737	735	732	731	726
22	731	729	726	718	723	726	727	729	729	731	731	731	731	731	733	733	734	735	736	736	736	734	727	729	729	730
23	729	727	727	730	733	733	732	732	732	732	732	732	733	733	734	736	736	736	736	736	736	734	733	733	732	733
24 Q	732	731	731	731	732	732	732	731	731	731	730	729	727	727	728	729	730	731	731	732	732	730	728	727	727	730
25	727	727	727	727	726	727	727	726	723	724	721	722	724	723	724	724	725	728	728	729	731	727	726	724	721	726
26 D	721	720	719	720	721	721	721	722	722	722	723	725	726	726	726	727	729	731	733	731	731	729	729	727	727	725
27	727	725	725	724	723	724	726	727	727	727	727	727	728	727	727	729	728	728	728	727	727	727	727	726	723	726
28	723	720	720	721	721	723	723	723	723	724	725	725	726	738	750	759	767	757	745	742	739	737	734	733	732	733
29	732	729	717	717	719	720	721	721	722	721	723	724	723	723	722	721	721	721	721	721	721	721	721	721	721	721
Mean.	742	740	738	738	737	736	736	737	737	737	738	738	739	739	741	742	743	743	744	744	745	744	743	741	740	740

12. Lerwick.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS; MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

February, 1928.

Day.	Terrestrial Magnetic Elements.												Character Figure ΣR^2 γ^2	Magnetic Character of Day (0-2).	Temperature in Magnet House. $200+$					
	Horizontal Force.						Declination.			Vertical Force.										
	Maximum $14,000 \gamma +$		Minimum $14,000 \gamma +$		Range.		Maximum $14^\circ +$		Minimum $14^\circ +$	Range.		Maximum $46,000 \gamma +$				Minimum $46,000 \gamma +$		Range.		
1	h. m.	γ	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	91	I	70·1
2	6 31	622	588	12 49	34	13 49	48·4	27·6	20 25	20·8	768	760	3 10	γ 8	100	I	76·3			
3	22 38	637	585	20 14	52	13 18	46·9	27·2	19 9	19·7	763	748	23 33	15	112	I	76·3			
4	7 21	624	577	1 11	47	13 4	53·3	33·8	0 2	19·5	779	733	2 13	46	52	I	76·0			
5	17 15	628	581	12 23	47	13 10	51·6	39·1	0 8	12·5	771	758	7 1	13	34	I	76·0			
6	6 40	623	584	10 52	39	13 46	48·5	38·7	21 46	9·8	764	752	6 40	12	21	O	76·1			
7	17 38	623	591	11 36	32	13 58	46·6	39·1	9 32	7·5	759	749	24 0	10	21	O	76·1			
8 Q	7 20	631	596	10 50	35	0 29	47·0	34·2	20 18	12·8	750	744	2 0	6	43	O	76·1			
9 Q	20 32	622	597	11 32	25	12 50	47·2	38·5	4 9	8·7	744	736	24 0	8	21	O	76·6			
10 Q	23 33	618	595	11 40	23	13 40	46·0	38·9	0 3	7·1	737	724	24 0	13	16	O	77·8			
11 Q	23 53	626	597	11 25	29	13 56	49·2	36·8	23 48	12·4	753	721	0 40	32	47	I	77·8			
12	23 59	626	601	13 2	25	16 56	47·1	37·0	1 11	10·1	753	738	12 0	15	27	O	77·1			
13 D	21 48	639	600	7 23	39	13 47	48·4	30·3	22 13	18·1	773	736	10 50	37	88	O	76·8			
14	20 57	633	592	13 23	41	19 26	49·0	28·9	21 51	20·1	783	749	9 22	34	102	I	76·1			
15	20 51	647	567	3 51	80	14 22	50·6	29·6	3 23	21·0	775	706	4 26	69	191	I	75·3			
16	22 9	661	588	22 52	73	13 59	47·4	32·7	23 0	14·7	759	740	22 50	19	96	I	75·3			
17	20 8	654	572	11 8	82	11 1	47·0	33·1	23 50	13·9	746	734	20 15	12	103	O	75·8			
18 D	19 35	620	590	11 40	30	13 19	47·0	35·2	0 3	11·8	738	729	1 40	9	35	O	76·6			
19 D	7 10	626	571	12 46	55	13 2	52·0	34·4	21 48	17·6	741	726	9 10	15	89	I	76·8			
20	5 30	639	569	4 19	70	4 35	53·6	32·2	5 22	21·4	732	701	5 10	31	141	I	77·0			
21 D	18 25	623	557	21 24	66	14 35	47·3	23·5	22 10	23·8	729	711	21 41	18	149	I	77·5			
22	17 56	637	573	12 17	64	12 44</														

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

March, 1928.

13. Lerwick. (H.)

14,000 γ (*14 C.G.S. unit) +

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day, 1-31). Values range from 485 to 615.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

March, 1928.

14. Lerwick. (D.)

14° +

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day, 1-31). Values range from 37.2 to 47.4.

* Light failed.

† Mean of 29 days; 17th and 18th omitted.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

15. Lerwick. (V.)

46,000 γ (-46 C.G.S. unit) +

March, 1928.

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.	
Day.	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	
1	721	719	720	719	719	719	719	718	719	720	725	725	723	723	724	725	726	726	725	725	725	725	726	725	725	725	723
2 Q	725	726	727	727	726	726	726	726	726	727	728	728	729	730	731	732	733	734	734	734	734	734	733	733	733	733	730
3	733	734	733	733	733	733	733	734	734	733	737	737	738	737	737	737	737	737	736	736	735	734	735	736	735	735	735
4 Q	735	735	735	734	733	733	733	733	733	734	736	736	736	737	736	736	736	736	734	732	731	731	730	731	731	731	734
5 Q	731	732	733	733	732	731	731	731	732	732	732	731	731	731	732	731	731	731	731	729	729	729	729	728	728	728	731
6	728	728	728	728	728	728	729	729	729	728	727	726	726	726	726	726	725	725	725	725	725	725	724	723	722	721	726
7	721	720	720	720	720	719	718	717	718	718	718	717	716	716	717	717	725	738	746	745	740	739	736	727	726	725	725
8	726	723	721	719	718	719	719	719	721	721	719	718	722	727	732	736	742	738	735	733	734	728	724	721	718	718	725
9 Q	718	710	712	716	718	720	720	720	721	721	718	715	711	709	710	716	722	727	726	724	721	718	718	718	718	718	718
10	718	718	719	718	719	720	719	719	719	720	718	717	712	708	710	715	717	727	733	733	723	715	712	686	684	717	717
11 D	684	692	699	703	705	707	708	707	706	704	704	709	714	734	788	899	973	899	947	895	848	857	800	732	652	771	771
12 D	652	593	527	526	577	623	663	697	712	716	729	728	723	722	724	744	773	770	763	733	731	712	669	671	701	688	688
13 D	701	712	717	715	701	690	704	712	718	720	723	723	720	718	728	743	758	821	797	800	763	737	690	644	563	724	724
14 D	563	561	608	629	662	697	708	711	716	717	745	761	759	763	769	781	780	783	785	782	743	714	721	718	720	719	719
15	720	691	672	689	705	720	724	729	734	735	736	735	734	732	734	735	737	742	745	739	733	729	726	721	712	725	725
16	712	710	710	711	712	712	712	711	711	712	710	710	707	705	705	708	712	713	710	709	718	709	709	706	707	710	710
17	707	708	707	707	707	705	704	706	708	709	714	708	706	709	712	714	720	725	727	725	724	722	721	713	716	713	713
18	716	714	714	711	701	693	695	697	699	700	700	*	—	—	—	*	711	728	729	726	723	719	715	713	708	—	—
19	708	700	700	704	705	702	701	704	703	703	701	703	705	706	707	711	718	720	715	714	715	714	714	712	711	708	708
20	711	712	712	712	704	700	700	701	702	704	711	711	710	707	706	710	714	721	721	719	719	717	716	704	704	710	710
21	704	703	698	683	691	694	694	696	697	700	704	702	701	701	702	705	711	715	722	724	723	722	719	715	711	705	705
22	711	707	706	709	710	710	709	707	704	701	702	700	696	696	698	703	711	720	728	737	743	744	740	728	721	714	714
23 D	721	711	703	694	685	676	678	685	689	689	688	686	690	696	707	723	733	734	733	729	727	723	719	720	717	706	706
24	717	720	721	725	726	724	724	721	720	718	718	717	725	732	735	736	736	736	735	735	735	735	733	731	727	727	727
25	727	713	702	705	709	712	718	721	723	724	727	729	728	727	729	743	757	748	745	743	741	736	731	729	727	728	728
26	727	724	723	724	724	725	725	726	727	726	727	729	726	724	724	725	732	738	739	737	738	734	731	728	725	728	728
27	725	718	714	717	717	719	720	723	724	722	721	718	717	717	718	719	718	719	720	720	720	719	718	718	715	719	719
28	715	709	709	708	709	709	710	711	712	712	714	711	708	706	707	707	707	708	715	715	715	715	714	709	710	710	710
29	709	710	710	709	709	709	709	711	713	714	713	713	711	708	706	706	708	709	710	710	711	710	710	710	710	710	710
30	710	710	710	710	709	709	709	709	710	711	715	714	713	712	712	711	711	710	708	708	711	708	705	704	704	710	710
31 Q	704	703	703	703	703	702	702	702	702	702	699	698	694	693	694	694	694	694	694	696	696	697	698	699	698	698	698
Mean. †	710	705	703	704	707	710	713	715	716	717	719	719	718	719	722	730	737	739	740	737	732	728	722	715	709	720	720

**DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS ;
 MAGNETIC CHARACTER FIGURES ; TEMPERATURE IN MAGNET HOUSE.**

March, 1928.

Day.	Terrestrial Magnetic Elements,												Character Figure ΣR^2 100γ²	Magnetic Character of Day (0-2)	Temperature in Magnet House 200+			
	Horizontal Force.			Declination.			Vertical Force.			Character Figure ΣR^2 100γ²	Magnetic Character of Day (0-2)	Temperature in Magnet House 200+						
	Maximum 14,000 γ +	Minimum 14,000 γ +	Range.	Maximum 14° +	Minimum 14° +	Range.	Maximum 46,000 γ +	Minimum 46,000 γ +	Range.									
1	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	h. m.	γ	19	0	78.0	
2 Q	22 58	611	585	11 24	26	13 11	45.9	38.0	8 52	7.9	16 50	728	718	7 0	10	8	78.0	
3	21 55	618	589	11 5	29	13 50	43.7	37.3	8 54	6.4	14 0 } about }	738	733	6 0 } about }	5	16	77.9	
4 Q	3 40	618	584	10 59	34	13 45	45.6	37.7	8 23	7.9	15 40 } about }	738	730	22 0 }	8	24	77.8	
5 Q	23 1	622	587	10 51	35	12 51	46.0	36.1	9 28	9.9	3 0 }	733	728	24 0	5	30	78.0	
6	18 19	621	577	11 2	44	12 26	46.6	35.2	8 39	11.4	8 6	731	719	24 0	12	45	78.1	
7	17 50	624	576	11 35	48	13 35	48.1	36.1	20 31	12.0	18 29	748	714	13 0	34	61	77.6	
8	19 19	620	579	10 55	41	13 28	49.3	36.1	8 21	13.2	16 0	743	718	11 0	25	54	77.2	
9 Q	0 41	621	577	11 50	44	13 40	47.9	34.2	1 9	13.7	17 20	729	707	13 0	22	58	77.1	
10	22 30	645	581	11 50	64	14 20	48.5	33.8	23 33	14.7	18 53	738	680	23 26	58	114	77.1	
11 D	15 31	989	474	23 59	465	15 0	65.5	26.7	22 30	38.8	15 42	1048	540	24 0	508	5015	2	77.0
12 D	19 3	641	256	2 48	385	2 39	53.3	18.4	1 57	34.9	15 49	780	463	2 47	297	2586	2	76.7
13 D	16 24	660	485	23 19	175	16 11	53.7	25.1	22 48	28.6	17 36	832	543	23 32	289	1290	2	76.8
14 D	17 20	653	467	1 14	186	14 56	53.7	18.6	0 59	35.1	15 25	793	540	0 3	253	1211	2	76.4
15	17 58	625	550	11 16	75	13 32	53.3	33.8	17 43	19.5	17 45	749	665	1 52	84	196	1	76.8
16	20 31	616	563	12 8	53	13 26	52.7	35.0	21 27	17.7	16 40	716	703	13 30	13	86	1	76.9
17	—	—	—	—														

TERRESTRIAL MAGNETIC FORCE: HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

April, 1928.

17. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

Table with 25 columns (0-24) and 25 rows (Day 1-25). Columns represent hours of Greenwich Mean Time. Rows represent days. Values are magnetic force in γ. Includes a 'Mean.' row at the bottom.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

April, 1928.

18. Lerwick. (D.)

14° +

Table with 25 columns (0-24) and 25 rows (Day 1-25). Columns represent hours of Greenwich Mean Time. Rows represent days. Values are magnetic declination in degrees. Includes a 'Mean.' row at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

19. Lerwick. (V.)

46,000 γ (·46 C.G.S. unit) +

April, 1928.

Hour. G.M.T.	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.
Day.	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ	γ
1D	699	700	700	700	699	701	702	703	701	702	705	703	703	702	705	707	715	717	718	719	722	719	714	712	710	707
2	710	710	710	711	711	709	705	705	706	708	710	712	710	709	712	714	714	713	712	710	710	710	709	711	704	710
3	704	700	702	704	708	709	709	710	712	712	714	713	713	713	719	728	739	742	743	740	736	730	727	711	707	718
4	707	697	700	705	697	701	707	708	709	711	715	715	713	713	711	711	715	721	725	727	725	724	721	715	711	712
5	711	704	704	701	705	709	709	711	709	709	709	709	707	709	709	709	713	715	714	712	711	711	710	708	703	709
6	703	701	701	701	703	703	701	701	701	701	703	703	701	701	703	703	704	703	705	707	706	702	701	688	659	701
7D	659	658	667	670	665	666	673	678	682	687	690	691	691	691	691	693	695	695	704	704	703	699	629	643	657	680
8	657	613	612	643	661	669	673	678	680	680	685	687	689	689	689	694	699	706	710	709	707	709	709	707	706	682
9	706	708	709	709	710	711	711	712	713	713	718	718	716	718	720	725	730	736	735	730	729	728	728	726	716	719
10D	716	681	687	702	706	710	707	705	707	712	714	714	714	714	721	723	722	723	729	731	731	729	722	719	711	714
11	711	714	718	721	724	726	727	729	729	731	736	734	734	735	737	737	738	739	741	742	741	743	745	743	741	733
12Q	741	741	741	741	741	740	737	739	739	738	737	734	731	729	729	727	727	727	728	728	728	728	726	726	726	726
13Q	726	727	727	727	727	727	727	727	727	727	727	727	726	724	723	723	722	722	721	721	722	724	723	723	722	725
14	722	722	721	721	721	721	721	721	720	719	721	719	716	713	709	711	714	714	714	713	714	715	716	714	713	717
15	713	713	713	713	713	712	710	711	711	710	711	710	709	709	709	708	708	709	709	708	713	729	725	722	689	712
16	689	669	672	671	677	679	681	687	690	695	701	700	698	697	697	697	699	703	723	743	733	731	723	693	653	697
17	653	653	629	633	658	666	672	678	682	685	697	698	699	698	698	699	702	707	707	706	705	706	703	698	691	685
18	691	689	690	695	696	697	696	695	697	697	703	703	702	702	701	700	702	702	701	701	699	701	699	700	700	698
19	700	699	699	697	698	699	699	698	698	698	697	696	696	696	696	697	698	701	703	703	707	714	714	699	643	699
20D	643	605	621	623	621	638	655	666	672	673	690	690	688	689	690	690	690	690	688	687	686	690	691	688	686	670
21D	686	686	686	686	686	686	686	685	685	684	683	683	682	681	681	686	691	723	725	723	719	711	703	697	693	694
22	693	692	693	693	693	693	693	693	691	693	691	689	687	687	687	687	687	687	687	689	687	687	685	685	683	681
23	681	676	674	676	677	679	681	681	681	683	683	681	677	675	675	681	689	695	700	698	691	681	681	681	681	682
24	657	665	666	667	668	671	673	673	673	675	675	675	675	673	673	673	673	673	673	673	673	673	671	673	672	672
25Q	672	671	672	672	673	673	675	674	674	676	676	675	674	673	671	670	670	670	671	672	672	673	673	673	674	673
26	673	674	674	675	676	676	676	676	675	675	675	675	673	673	672	672	672	672	672	672	672	674	674	674	674	674
27	674	673	674	677	679	680	680	681	683	681	681	681	680	679	679	680	681	683	686	686	686	686	686	685	685	681
28Q	685	689	688	690	690	690	693	692	692	693	692	692	692	692	691	691	691	690	690	689	689	689	689	688	688	690
29Q	688	689	690	690	691	692	692	692	691	693	693	692	692	692	691	691	691	689	690	690	689	689	689	688	688	691
30	688	690	690	691	694	696	697	698	698	698	698	698	696	694	695	695	695	694	693	694	695	694	694	694	693	695
Mean	692	687	688	690	692	694	696	697	698	699	701	701	699	699	699	701	703	705	707	708	707	707	703	699	692	699

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS;
 MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

20. Lerwick.

April, 1928.

Day.	Terrestrial Magnetic Elements.											Character Figure $\frac{\Delta R^2}{100\gamma^2}$	Magnetic Character of Day (0-2).	Temperature in Magnet House. 200+.				
	Horizontal Force.				Declination.				Vertical Force.									
	Maximum 14,000 γ +	Minimum 14,000 γ +	Range.	h. m.	γ	h. m.	γ	Range.	Maximum 46,000 γ +	Minimum 46,000 γ +	Range.							
1 D	18 49	657	563	11 48	94	12 46	53·3	31·0	22 9	22·3	20 26	724	698	0 0	26	185	I	78·8
2	0 3	627	549	10 33	78	12 42	49·5	33·3	22 55	16·2	15 58	716	702	6 20	14	110	I	79·0
3	22 46	641	541	10 14	100	12 31	50·3	29·4	0 29	20·9	17 50	746	696	1 9	50	204	I	79·3
4	19 11	641	548	10 52	93	13 40	49·8	31·2	6 30	18·6	18 40	730	692	0 42	38	163	I	79·4
5	16 35	623	544	11 25	79	12 54	50·7	31·4	7 0	19·3	17 0	717	697	3 0	20	134	I	79·3
6	18 17	644	507	23 26	137	23 16	49·0	23·7	23 59	25·3	19 42	709	654	24 0	55	335	I	79·3
7D	17 9	656	401	21 38	255	21 31	54·1	12·2	21 43	41·9	18 4	706	605	21 55	101	1069	I	79·6
8	16 26	629	420	1 36	209	13 53	51·2	19·6	1 51	31·6	18 0	711	593	1 36	118	758	I	79·8
9	16 15	621	531	10 42	90	13 31	52·0	31·9	8 10	20·1	17 20	738	705	0 0	33	166	I	80·1
10D	18 18	627	516	9 4	111	13 4	52·3	29·1	21 15	23·2	19 40	733	673	1 10	60	257	I	80·4
11	16 29	614	535	10 54	79	13 59	49·0	33·2	7 59	15·8	22 0	745	709	0 5	36	120	O	80·8
12Q	22 38	602	534	11 10	68	13 20	46·4	32·5	8 10	13·9	0 10	744	726	15 3	18	84	O	80·6
13Q	20 11	614	542	11 10	72	13 6	46·8	32·3	7 48	14·5	9 50	730	721	15 40	9	91	O	80·0
14	19 8	620	544	11 19	76	13 20	47·3	32·6	8 10	14·7	9 39	724	708	13 45	16	100	O	79·7
15	19 6	640	545	12 20	95	13 39	46·7	25·5	23 59	21·2	20 50	731	687	24 0	44	191	I	78·9
16	17 35	640	514	23 49	126	12 47	47·6	16·3	23 15	31·3	18 52	749	648	24 0	101	435	I	78·6
17	18 7	617	518	1 45	99	14 24	46·2	22·1	0 6	24·1	21 5	709	611	2 10	98	300	I	78·2
18	22 25	609	558	10 26	51	13 40	47·5	34·9	0 49	12·6	10 0	703	687	0 36	16	58	O	77·8
19	19 35	633	491	23 33	142	12 38	46·3	19·9	23 55	26·4	21 20	717	632	24 0				

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

21. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

May, 1928.

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (1-31). Values represent magnetic force in γ. Includes 'Q' for quiet days and 'D' for disturbed days.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

22. Lerwick. (D.)

14° +

May, 1928.

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (1-31). Values represent magnetic declination in degrees. Includes 'Q' for quiet days and 'D' for disturbed days.

* Light failed.

† Mean of 29 days; 4th and 5th omitted.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE: VERTICAL COMPONENT.
Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

May, 1928.

23. Lerwick. (V.)

46,000 γ (·46 C.G.S. unit) +

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and multiple rows of daily magnetic force observations for Lerwick. Includes 'Day' column and 'Mean' column.

24. Lerwick.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS;
MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

May, 1928.

Table with columns: Day, Terrestrial Magnetic Elements (Horizontal Force, Declination, Vertical Force), Character Figure, Magnetic Character of Day, Temperature in Magnet House. Includes sub-columns for Maximum, Minimum, and Range for each magnetic element.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

25. Lerwick. (H.)

June, 1928.

14,000 γ (·14 C.G.S. unit) +

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day 1-30). Values range from 575 to 630. Includes a 'Mean' row at the bottom.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

26. Lerwick. (D.)

June, 1928.

14° +

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day 1-30). Values range from 37.3 to 44.8. Includes a 'Mean' row at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

June, 1928.

27. Lerwick. (V.)

46,000 γ (.46 C.G.S. unit) +

Table with 25 columns (0-24) and rows for each hour of the day (Day, 7D, 8, 9, 10Q, 11Q, 12D, 13D, 14, 15, 16Q, 17Q, 18, 19, 20, 21, 22D, 23D, 24, 25, 26, 27Q, 28, 29, 30, Mean). Each cell contains a numerical value representing magnetic force.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS; MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

June, 1928.

28. Lerwick.

Table with 15 columns: Day, Horizontal Force (Maximum, Minimum, Range), Declination (Maximum, Minimum, Range), Vertical Force (Maximum, Minimum, Range), Character Figure, Magnetic Character of Day, and Temperature in Magnet House. Includes rows for each hour of the day and a Mean row.

§ For explanation see p. 33.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

29. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

July, 1928.

Table with 24 columns (Hours 0-24) and 25 rows (Days 1-31). Columns include Hour G.M.T., Day, and values for each hour. Includes a 'Mean.' row at the bottom.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

30. Lerwick. (D.)

14° +

July, 1928.

Table with 24 columns (Hours 0-24) and 25 rows (Days 1-31). Columns include Hour G.M.T., Day, and values for each hour. Includes a 'Mean.' row at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

31. Lerwick. (V.)

46,000 γ (.46 C.G.S. unit) +

July, 1928.

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (Day 1-31). It lists magnetic force values for each hour of the day in Lerwick.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS ; MAGNETIC CHARACTER FIGURES ; TEMPERATURE IN MAGNET HOUSE.

32. Lerwick.

July, 1928.

Table with 15 columns (Day, Horizontal Force, Declination, Vertical Force, Character Figure, Magnetic Character, Temperature) and 31 rows (Day 1-31). It provides daily extremes for magnetic elements and temperature in Lerwick.

§ For explanation see p. 33. Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE : HORIZONTAL COMPONENT.
Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

33. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

August, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Contains magnetic force data for Lerwick (H.).

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

34. Lerwick. (D.)

14° +

August, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Contains magnetic declination data for Lerwick (D.).

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

37. Lerwick. (H.)

14,000 γ (*14 C.G.S. unit) +

September, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-30, Mean). Values range from 547 to 616.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

38. Lerwick. (D.)

14° +

September, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-30, Mean). Values range from 27.7 to 35.5.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

39. Lerwick. (V.)

46,000 γ (.46 C.G.S. unit) +

September, 1928.

Table with 25 columns (0-24) and 30 rows (1-30) showing magnetic force components (o, i, 2-24) and Mean values.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS;

MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

September, 1928.

40. Lerwick.

Table with multiple columns for Terrestrial Magnetic Elements (Horizontal Force, Declination, Vertical Force), Character Figure, Magnetic Character, and Temperature in Magnet House, with 30 rows (1-30).

§ For explanation see p. 33.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE : HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

41. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

October, 1928.

Table with 25 columns (o. to Mean) and 31 rows (Day 1 to Mean). Contains magnetic force data for Lerwick (H.) in October 1928.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

42. Lerwick. (D.)

14° +

October, 1928.

Table with 25 columns (o. to Mean) and 31 rows (Day 1 to Mean). Contains magnetic declination data for Lerwick (D.) in October 1928.

* Light failed.

† Mean of 30 days; 2nd omitted.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE: HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

45. Lerwick. (H.)

November, 1928.

14,000 γ (·14 C.G.S. unit) +

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day, 1-30). Contains magnetic force data for Lerwick (H.) in November 1928.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

46. Lerwick. (D.)

November, 1928.

14° +

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day, 1-30). Contains magnetic declination data for Lerwick (D.) in November 1928.

* Suspension broken. † Mean of 29 days; 16th omitted.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE : HORIZONTAL COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

49. Lerwick. (H.)

14,000 γ (·14 C.G.S. unit) +

December, 1928.

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day ID 1-31). Each cell contains a numerical value representing magnetic force. A 'Mean.' row is at the bottom.

MAGNETIC DECLINATION (WEST).

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

50. Lerwick. (D.)

14° +

December, 1928.

Table with 25 columns (Hour G.M.T. 0-24) and 25 rows (Day ID 1-31). Each cell contains a numerical value representing magnetic declination. A 'Mean.' row is at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

TERRESTRIAL MAGNETIC FORCE: VERTICAL COMPONENT. Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

December, 1928.

51. Lerwick. (V.)

46,000 γ (*46 C.G.S. unit) +.

Table with 25 columns (0-24 hours) and 1 column (Mean). Rows represent days (1D to 31). Each day's row contains 25 values representing vertical magnetic force at hourly intervals.

DAILY EXTREMES OF TERRESTRIAL MAGNETIC ELEMENTS; MAGNETIC CHARACTER FIGURES; TEMPERATURE IN MAGNET HOUSE.

December, 1928.

52. Lerwick.

Terrestrial Magnetic Elements.

Character Figure 2R/100γ²

Magnetic Character of Day (0-2).

Temperature in Magnet House. 200+.

Table with multiple columns: Day (1D-31), Horizontal Force (Maximum, Minimum, Range), Declination (Maximum, Minimum, Range), Vertical Force (Maximum, Minimum, Range), Character Figure, Magnetic Character of Day, and Temperature in Magnet House.

§ For explanation see p. 33.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 56-61.

DIURNAL INEQUALITIES OF THE TERRESTRIAL MAGNETIC ELEMENTS.—“ALL” DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table for 53. Lerwick. HORIZONTAL FORCE (all days except Jan. 15, 16; March 17, 18; May 4, 5; Oct. 2; Nov. 16). 1928. Columns: Hour, G.M.T. (1-24), and values for each month (Jan-Dec), Year, Winter, Equinox, Summer.

DECLINATION (all days except Jan. 15, 16; March 17, 18; May 4, 5; Oct. 2; Nov. 16).

Table for 54. Lerwick. DECLINATION (all days except Jan. 15, 16; March 17, 18; May 4, 5; Oct. 2; Nov. 16). 1928. Columns: Hour, G.M.T. (1-24), and values for each month (Jan-Dec), Year, Winter, Equinox, Summer.

VERTICAL FORCE (all days except Jan. 15, 16; March 17, 18; May 4, 5; Oct. 2; Nov. 16).

Table for 55. Lerwick. VERTICAL FORCE (all days except Jan. 15, 16; March 17, 18; May 4, 5; Oct. 2; Nov. 16). 1928. Columns: Hour, G.M.T. (1-24), and values for each month (Jan-Dec), Year, Winter, Equinox, Summer.

DIURNAL INEQUALITIES OF THE TERRESTRIAL MAGNETIC ELEMENTS.—INTERNATIONAL QUIET DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table for 56. Lerwick. HORIZONTAL FORCE (QUIET DAYS). 1928. Columns: Hour (1-24), G.M.T. (1-24), and monthly/seasonal data for 1928.

Table for 57. Lerwick. DECLINATION (QUIET DAYS). 1928. Columns: Hour (1-24), G.M.T. (1-24), and monthly/seasonal data for 1928.

Table for 58. Lerwick. VERTICAL FORCE (QUIET DAYS). 1928. Columns: Hour (1-24), G.M.T. (1-24), and monthly/seasonal data for 1928.

DIURNAL INEQUALITIES OF THE TERRESTRIAL MAGNETIC ELEMENTS.—SELECTED DISTURBED DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table for 59. Lerwick. 1928. Columns: Hour (1-24), G.M.T. (1-24). Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer). Values: Horizontal Force (Disturbed Days).

Table for 60. Lerwick. 1928. Columns: Hour (1-24), G.M.T. (1-24). Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer). Values: Declination (Disturbed Days).

Table for 61. Lerwick. 1928. Columns: Hour (1-24), G.M.T. (1-24). Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer). Values: Vertical Force (Disturbed Days).

RANGE OF MEAN DIURNAL INEQUALITIES FOR THE MONTHS, YEAR AND SEASONS OF 1928.

NOTE.—The ranges are those shown in Tables 53 to 61 in the preparation of which the non-cyclic change has been eliminated.

62. Lerwick.

1928.

Month and Season.	" All " Days.			Quiet Days.			Disturbed Days.		
	H.	D.	V.	H.	D.	V.	H.	D.	V.
January ...	19.7	6.15	9.7	13.2	4.00	3.2	33.7	10.93	36.6
February ...	22.5	8.24	9.8	17.4	6.92	9.0	27.9	11.61	12.3
March ...	42.6	10.17	37.0	28.4	8.32	4.6	82.7	16.81	149.9
April ...	64.1	12.72	20.9	58.3	10.01	4.7	65.9	16.69	39.2
May ...	99.9	10.35	30.5	73.8	11.14	5.1	350.9	22.08	75.6
June ...	73.8	12.21	18.3	64.5	12.13	6.7	123.9	11.39	57.5
July ...	86.3	13.80	31.5	66.2	13.90	4.9	107.1	13.87	66.4
August ...	66.3	12.77	35.4	53.0	13.22	8.9	216.1	20.32	137.4
September ...	69.2	12.53	38.8	46.9	10.33	6.1	242.0	23.76	113.7
October ...	43.3	9.42	25.7	35.3	8.19	8.5	180.2	13.45	63.4
November ...	30.4	7.91	33.8	14.1	4.10	6.5	115.3	13.96	114.3
December ...	15.1	6.14	16.1	12.4	5.35	7.7	37.2	12.55	51.6
Year ...	49.1	9.26	23.3	38.6	7.55	3.3	100.4	11.95	67.3
Winter ...	19.6	6.92	15.3	12.6	4.70	4.6	41.7	11.38	48.2
Equinox ...	51.3	10.75	28.6	40.9	9.14	3.1	120.2	16.11	85.9
Summer ...	80.4	12.06	27.6	64.1	12.60	4.7	158.4	12.54	79.6

AVERAGE DEPARTURE OF THE INDIVIDUAL VALUES FROM MEAN OF THE DAY.

63. Lerwick.

1928.

Month and Season.	" All " Days.			Quiet Days.			Disturbed Days.		
	H.	D.	V.	H.	D.	V.	H.	D.	V.
January ...	3.6	1.52	2.8	2.6	1.08	1.0	5.9	2.40	9.1
February ...	5.0	2.18	2.9	4.1	2.07	2.4	5.6	2.95	3.1
March ...	9.7	2.51	9.1	7.6	1.79	0.7	22.5	4.09	37.6
April ...	14.1	3.05	4.7	14.0	2.13	1.2	14.5	3.72	8.8
May ...	24.1	2.96	8.5	18.6	2.57	1.2	85.8	5.41	24.3
June ...	18.6	3.24	5.1	14.1	2.94	1.5	30.5	3.48	15.8
July ...	23.7	3.68	7.0	15.8	3.36	1.1	31.1	3.41	18.0
August ...	17.3	3.24	9.2	14.3	2.91	2.3	45.5	4.64	37.5
September ...	14.6	3.43	9.8	11.7	2.45	1.4	54.0	5.83	32.1
October ...	10.5	2.67	7.1	9.1	2.09	2.4	28.7	3.54	13.9
November ...	5.4	2.05	8.7	3.3	1.03	1.2	19.5	3.77	26.7
December ...	3.6	1.54	5.5	2.7	1.40	2.0	9.0	3.01	17.3
Year ...	10.9	2.55	6.3	9.5	2.07	0.9	26.1	3.43	19.3
Winter ...	4.1	1.78	4.9	3.1	1.38	1.4	7.6	2.66	13.3
Equinox ...	11.6	2.87	7.5	10.6	2.10	0.8	26.8	4.24	22.2
Summer ...	20.4	3.24	6.8	15.6	2.91	1.0	45.9	4.12	23.0

NON-CYCLIC CHANGE (24h.—0h.).

64. Lerwick.

1928.

Month.	" All " Days.			Quiet Days.			Disturbed Days.		
	H.	D.	V.	H.	D.	V.	H.	D.	V.
January ...	+0.5	-0.08	+1.8	+1.6	+0.04	+0.6	+0.6	-0.20	+0.4
February ...	-0.1	0.00	-1.6	+3.0	-0.50	-1.0	-0.4	+0.26	+6.6
March ...	0.0	0.00	-0.8	+1.4	-0.50	-1.0	+1.6	+2.88	+6.4
April ...	-0.2	-0.06	-0.2	+1.6	-0.20	-3.6	+12.2	+4.02	+10.8
May ...	-0.5	-0.04	0.0	+4.0	+0.24	-2.8	-35.6	-2.60	-37.6
June ...	+0.3	0.00	-1.0	+3.2	-0.58	-1.2	-14.8	+1.22	-0.6
July ...	-3.3	+0.06	-2.0	+4.2	-0.08	-0.8	+0.4	+0.78	-46.6
August ...	+2.5	-0.34	+1.3	0.0	-0.90	-4.4	+12.0	-0.08	+37.2
September ...	+0.4	+0.19	-2.0	+7.0	-0.42	-2.4	-75.6	-3.54	-20.6
October ...	-0.8	-0.09	-2.5	+6.6	+0.58	-0.2	+1.5	+0.96	-3.0
November ...	-0.4	+0.31	-0.4	+4.2	+1.62	+7.6	-18.4	+2.48	-1.2
December ...	+0.1	-0.01	+0.1	+1.8	-0.72	-1.2	-10.2	+2.52	-9.0
Year 1928 ...	—	—	—	—	—	—	—	—	—

MEAN VALUES OF THE SQUARES OF THE ABSOLUTE DAILY RANGES.**
(Unit, 100γ².)

65. Lerwick.

1928.

R ₁₁ ²	R ₂ ²	R ₃ ²	R ₁ ² + R ₂ ²	R ₁ ² + R ₃ ²	Mean Character Figure.
*16.9	*34.2	*9.8	*51.1	*61.0	0.65
28.1	57.0	6.6	85.1	91.7	0.76
†174.7	†61.1	†180.3	†235.8	†416.0	0.77
123.8	77.4	28.3	201.3	229.6	0.57
940.2	274.7	71.8	1214.9	1286.7	0.84
272.9	82.5	44.6	355.4	400.1	0.93
382.6	332.8	481.8	715.4	1197.2	1.00
585.8	123.6	168.1	709.4	877.5	0.55
582.1	151.5	100.5	733.7	834.2	0.93
525.0	173.9	122.2	698.9	821.1	0.84
299.2	186.9	106.8	486.1	592.9	0.57
53.3	79.7	35.3	132.9	168.2	0.42
332.1	136.3	113.0	468.3	581.3	0.74

* Mean of 29 days; 15th and 16th omitted.

† Mean of 29 days; 17th and 18th omitted.

** R₂ in this Table is used to signify the range in declination converted into units of force of the component perpendicular to the magnetic meridian. See also p. 33.

MEAN MONTHLY AND ANNUAL VALUES OF TERRESTRIAL MAGNETIC ELEMENTS.

(All days except those noted in monthly tables.)

66. Lerwick.

1928.

Month.	North Component.	West Component.	Vertical Component.	Total Force.	Declination (West).	Inclination (North).	Horizontal Force.
January ...	14124	3710	46726	48955	14	43.0	14603
February ...	14128	3706	46740	48969	14	41.8	14606
March ...	14123	3700	46720	48948	14	40.8	14600
April ...	14115	3693	46699	48925	14	39.8	14590
May ...	14114	3690	46708	48933	14	39.0	14588
June ...	14122	3687	46701	48929	14	37.9	14595
July ...	14108	3673	46688	48911	14	35.5	14578
August ...	14107	3671	46668	48892	14	35.2	14577
September ...	14111	3665	46715	48937	14	33.5	14579
October ...	14102	3662	46686	48907	14	33.5	14570
November ...	14101	3660	46700	48919	14	33.0	14568
December ...	14105	3655	46671	48893	14	31.7	14571
Year 1928 ...	14113	3681	46702	48926	14	37.1	14585

67. Lerwick.

Date.	Month.	Date.	Month.	Date.	Month.	Date.	Month.
	January.		March.		September (contd.).		November.
2 ...	Moonlight.	2 ...	Cloudy to overcast. Fog, 20·20-01·00.	10 ☽	Glow visible through breaks in clouds, 20·40-02·45.	1 ...	Moonlight; rain.
3 ...	Moonlight.	5 ...	Moonlight.	11 ☽	Glow and faint arch, 20·50-23·00.	2 ☽	Moderate aurora, 09·24-00·40
4 ...	Moonlight.	6 ...	Cloudy, moonlight.	12 ...	Cloudy to overcast; rain.	3 ☽	Much bright aurora, 18·10-00·40.
5 ...	Moonlight.	7 ...	Cloudy.	13 ☽	Glow and faint arch, 20·24-23·00.	4 ...	Cloudy.
6 ...	Moonlight.	8 ...	Cloudy, 19·40-23·00.	14 ☽	Moderate aurora, 20·45-23·00.	5 ☽	Faint glow, 22·15-23·20.
7 ...	Moonlight.	9 ...	Cloudy.	15 ...	Cloudy to overcast, 19·00-21·40; rain.	6 ☽	Bright aurora 20·28-23·45.
8 ☽	Glow visible through breaks in clouds, 18·15-18·35; intermittent rain later.	10 ...	Cloudy.	16 ...	Cloudy to overcast; rain.	7 ☽	Glow visible through breaks in clouds, 19·24-23·05.
9 ...	Moonlight.	12 ☽	Aurora visible through breaks in clouds, 21·00-24·00.	17 ...	Cloudy to overcast; rain.	8 ...	Northern sky clouded.
10 ...	Moonlight.	13 ...	Cloudy to overcast.	18 ☽	Extensive bright aurora, 20·01-00·45.	9 ...	Cloudy to overcast; rain.
11 ...	Rain and sleet showers.	14 ...	Cloudy to overcast.	19 ☽	Moderate aurora, 20·20-01·10	10 ☽	Glow visible through breaks in clouds, 22·30-23·40.
12 ...		19 ...	Cloudy 10·10, to overcast.	20 ...	Glow visible through breaks in clouds, 20·55-21·43.	11 ☽	Glow visible through breaks in clouds, 22·17-23·45.
13 ...		20 ...	Cloudy 19·00-21·40.	21 ☽	Cloudy.	12 ☽	Glow visible through breaks in clouds, 20·42-03·06.
15 ...		21 ...	Cloudy.	22 ...	Bright aurora, 20·05-23·55.	13 ☽	Bright aurora, 17·10-17·25. glow, 19·00-23·00.
16 ...		22 ...	Overcast to cloudy.	23 ...	Cloudy to overcast.	14 ☽	Weak aurora, 22·00-01·00.
17 ...		25 ...	Cloudy to overcast.	24 ...	Northern sky obscured by cloud drizzle.	16 ☽	Glow visible through breaks in clouds, 21·40-23·40.
19 ...	Overcast, 20·00-23·00.	27 ...	Rain.	25 ☽	Bright aurora, 20·05-23·55.	17 ☽	Faint glow, 20·50-23·20.
20 ...		28 ...	Cloudy; moonlight.	26 ☽	Glow visible through breaks in clouds, 20·55-21·43.	18 ☽	Faint glow visible through breaks in clouds, 20·23-00·45.
21 ...	Overcast, 19·00-20·20.	31 ...	Overcast to cloudy.	27 ...	Moonlight.	20 ...	Moonlight; rain.
22 ☽	Glow, 19·40-00·30.			28 ...	Moonlight.	21 ...	Cloudy to overcast; rain.
24 ...	Cloudy to overcast, 19·20-24·00.		April.	29 ...	Moonlight.	22 ...	Moonlight.
25 ...	Overcast, 20·20-23·00.	1 ...	Cloudy.	30 ...	Moonlight.	23 ...	Cloudy; rain.
26 ☽	Mainly overcast 19·00-21·40; bright glow visible through breaks in clouds, 22·00-00·30.	2 ...	Moonlight.			24 ...	Moonlight.
27 ☽	Aurora observed, 20·25-24·00 very bright around 21·10.	3 ...	Cloudy; rain.		October.	25 ...	Moonlight; sleet showers.
28 ...	Moonlight.	4 ...	Moonlight.	2 ...	Aurora visible through breaks in clouds, 19·03-22·50.	26 ...	Moonlight; rain.
29 ...	Moonlight; overcast with rain, 22·00-23·00.	5 ...	Moonlight.	3 ...	Cloudy; drizzle.	27 ...	Moonlight; rain.
30 ...	Moonlight.	6 ...	Moonlight; showers.	4 ...	Moonlight.	28 ...	Moonlight; rain.
31 ...	Overcast to cloudy.	10 ...	Cloudy.	5 ...	Overcast to cloudy.		December.
		11 ...	Cloudy to overcast; rain.	6 ...	Overcast to cloudy.	1 ...	Cloudy.
		12 ...	Overcast to cloudy.	7 ☽	Glow visible through breaks in clouds, 21·50-22·57.	2 ...	Cloudy to overcast; rain.
		13 ...	Cloudy.	8 ☽	Overcast to cloudy. Glow visible through breaks in clouds, 21·10-21·27.	3 ...	Showers.
		14 ...	Cloudy.	9 ...	Cloudy; hail showers.	5 ☽	Moderate aurora, 20·25-00·13
		15 ...	Cloudy.	10 ...	Moderate aurora, 21·30-23·47	6 ...	Showers of snow and hail.
		16 ☽	Bright aurora, 21·20-01·00.	11 ☽	Moderate aurora, 22·10-00·10	7 ☽	Faint glow visible through breaks in clouds, 19·44-22·00.
		17 ...	Cloudy, 19·00-21·40.	12 ☽	Glow visible through breaks in clouds, 18·08-22·00.	10 ...	Cloudy to overcast.
		18 ...	Cloudy to overcast; sleet.	13 ...	Moderate aurora, 19·10-23·55	11 ☽	Moderate aurora, 21·04-00·10
		19 ...	Cloudy to overcast; rain.	14 ...	Cloudy to overcast.	12 ☽	Glow visible through breaks in clouds, 22·30-23·15.
		20 ...		15 ...	Cloudy to overcast; rain.	13 ☽	Bright aurora, 20·26-23·00.
		21 ...		16 ...	Strong glow visible through breaks in clouds, 19·40-21·40; eclipsed by clouds.	14 ...	Cloudy to overcast.
1 ...	Cloudy.	22 ...		17 ☽	Auroral glow, 20·25-23·30.	15 ...	Cloudy; rain.
2 ...	Moonlight; cloudy, 19·40-24·00.	23 ...	Cloudy.	19 ☽	Faint glow through breaks in clouds, 21·35-00·27.	16 ...	Cloudy; rain.
3 ...	Moonlight.	24 ...	Cloudy.	21 ☽	Bright aurora, 18·15-20·20; eclipsed by cloud.	17 ...	Rain.
5 ☽	Glow visible through breaks in clouds, 19·18-19·35; cloudy.	25 ...	Cloudy.	22 ☽	Cloudy; rain.	18 ...	Northern sky clouded; rain.
6 ...	Cloudy.	26 ...	Cloudy to overcast.	23 ...	Moonlight.	19 ...	Cloudy to overcast; rain.
7 ...	Rain.	27 ...	Cloudy.	24 ...	Faint aurora, 19·40-23·05.	20 ...	Moonlight.
8 ...	Mainly overcast.	28 ...	Cloudy to overcast; fog.	25 ...	Moonlight.	21 ...	Drizzle.
9 ...		29 ...	Cloudy to overcast, 20·20-24·00; fog.	26 ...	Cloudy; rain.	22 ...	Moonlight.
12 ...	Glow, 19·00-23·00.	30 ...		27 ...	Moonlight; cloudy with rain, 19·44-23·00.	23 ...	Cloudy; rain.
13 ☽	Glow, 19·00-20·20. Eclipsed by cloud; overcast 21·00-23·00.		September.	28 ...	Moonlight.	24 ...	Showers of rain, hail, and sleet.
14 ☽	Faint glow, 18·20-18·53.	1 ...	Moonlight.	29 ...	Cloudy; rain.	25 ...	Cloudy; rain.
16 ☽	Overcast, 19·00-24·00; bright glow, 21·45-01·50.	2 ...	Overcast to cloudy.	30 ☽	Faint glow visible through breaks in clouds, 22·30-23·50.	26 ...	Cloudy; showers of hail and sleet.
17 ...		3 ...	Cloudy.	31 ☽	Moderate aurora, 19·21-20·45	27 ...	Moonlight.
18 ...	Cloudy, 20·00-01·00.	4 ...	Cloudy.			28 ...	Moonlight; showers.
19 ...	Cloudy, 19·40-23·00.	5 ...	Cloudy.			29 ...	Moonlight.
21 ☽	Faint aurora, 19·35-20·40, eclipsed by cloud.	6 ...	Cloudy.			30 ...	Moonlight.
22 ☽	Moderate aurora, 20·20-23·20	7 ...	Moonlight.			31 ...	Cloudy; rain and sleet.
26 ...		8* ...	Cloudy, 10·10, to overcast; rain.				
28 ...	Cloudy, 19·00-21·40.	9 ☽	Glow visible through breaks in clouds, 22·40-23·22.				

* Very bright aurora reported from Lerwick around midnight, but not seen at Observatory.

In the interests of brevity there have been omitted from the table above all dates on which the sky throughout the evening remained completely overcast and on which, therefore, no opportunity arose of determining whether or not aurora occurred. The nights on which aurora was actually seen are indicated by the symbol ☽. The nights on which aurora was not seen, despite at least an occasional interval of more or less clear sky, are indicated by the symbol ...; in the latter case also, remarks on the weather are added to assist the reader in judging how far the fact of no observation of aurora may be taken as indicating that there was not actual aurora. A full description is available of the auroral phenomena observed.

68. Other Scottish Stations.

Date.	Month.	Date.	Month.	Date.	Month.	Date.	Month.
	January.		August.		October (contd.).		November (contd.).
13	H. glow over northern quadrant of sky, 19.45 to 22.00.	24	Glas Island, 01.00 to 02.00.	11	H. faint glow along horizon, W. to N.E., 20.00 to 22.00; Kirkwall, low N.W., about midnight; Cantick Head, 23.00; Hellyar Holm, N., 23.00 to 24.00.	7	H. faint glow, N.W. to N.E., 18.30 to 23.00; B.; G.C.; A.; Helensburgh, 22.00 to 23.00.
15	H. glow, W. to N.E., extending from horizon midway up to Polaris, 21.15 to 23.00; B.	26	B. 21.00; Glas Island, 01.00 to 01.45.			8	H. glow to N., 19.00; glow visible through breaks in clouds, 20.00 to 22.00; A.
22	H. glow low down along horizon, 19.00 to 22.30.	27	Copinsay, 00.40; Killantringan, 01.10; Tiumpnan Head, 00.25 to 01.30.			9	H. glow visible through small opening in clouds above horizon, 23.30.
26	H. glow visible through breaks in clouds, N.W. to N., 21.30 to 22.30; A.			12	H. fairly bright glow, W. to E., 20.00 to 22.30; D., 21.00.	10	H. faint glow W. to N.E., extending up to Ursa Majoris, 19.00 to 23.00; B.
27	H. glow, N.W. to N.E., extending up to Polaris, 22.30 to 24.00; A.			13	H. bright aurora visible above bank of cloud, N.W. to N.E., 19.00 to 20.00; Kirkwall, N.W., midnight; Craibstone, Kirkwall, low N.W., midnight.	11	D.; A.; Nairn; G.C. Kirkwall, 20.00; Leuchars ill defined arch and porches, 22.20 to 22.30; Tiumpnan Head, N., 22.30 to 24.00.
	February.	7	September.	15	A. auroral glow, moderately bright, whitish-green colour, 23.00. elevation about 15°; G.C.; Eskdalemuir, northern sky cloudy in early evening, and cloud interfered with observation later; 18.30 and later, brightness above cloud to north; around 19.30, glow, sometimes bright, and rays, 19.55. rays, N., reaching up to 55°-60°; 20.45 to 21.00, brightness, slight, N. and N.E.; a fairly considerable disturbance was in progress on October 18th, but the largest changes occurred before aurora was seen; Oban, N.	12	D.; A.; G.C.
		8	A. rather faint glow seen between clouds at 21.00.	17	H. faint glow along northern horizon, 20.45 to 22.00.	13	H. aurora visible above bank of cloud along northern horizon, 18.00; bright broad band from E. through S. to W., passing over Jupiter, γ and α Pegasi and Altair to W., 18.15; band fainter, streamers leaping to zenith from all points W. through N. to E., 18.40 to 20.00; glow, 21.00 to 23.00; A.; G.C.; Arbroath, clear vivid aurora, N.N.W., 18.00 to 20.00; Edinburgh, 18.00 to 19.30; B.; Nairn; Banff; bright at 18.30; Eskdalemuir; Tiumpnan Head, brilliant display, 18.50 to 19.50; Killantringan, 17.30; Pentland Skerries, 21.00; Cantick Head, 03.45.
3	Arbroath, 21.00, N.W.	10	A. faint greenish yellow auroral glow seen at 24.00; D.; Cantick Head, 23.30; Copinsay, 02.00 to 04.00; Fair Isle North, 02.45 to 03.30; Bressay, 22.00 to 24.00.	19	Boghall, 20.45; Eskdalemuir, 20.50, rays to N.; 20.55, brightness to N.	14	H. faint glow, W. to E.N.E., 20.30 to 22.00; rather faint arch, 23.00; B.; Crieff.
12	H. bright glow, W. to N.E., 19.00 to 23.30; B. 18.00; A.; G.C.	11	B.; Fair Isle North, 23.30 to 24.00.	20	H. glow visible through breaks in clouds, 20.30 to 21.00, bright glow, W. to N.E., 21.30 to 22.30; G.C.; B. 21.00; Cantick Head, 24.00.	15	Cantick Head, 21.00; Copinsay, 20.00 to 21.00; Auskerry, 21.00; A.; Eskdalemuir.
13	H. bright arch, W.N.W. to N.E., 18.45 to 19.15; streamers shooting upwards from arch, 19.30 to 20.00; aurora visible through breaks in clouds, 20.15 to 22.00; B. 19.30; Wick.	13	H. glow, W. to E., 20.30 to 23.00; D. low.	21	H. very bright arch, W.N. to N.E., with coloured streamers shooting up to Polaris, 18.25; temporarily eclipsed by cloud; glow, 18.45 to 19.00; streamers to N., 19.30; bright glow, 20.00 to 24.00; Wick; Cantick Head.	16	A.; G.C.
14	H. bright glow, W. to N.E., 19.00 to 23.00.	18	H. fairly bright glow, W. to E.N.E., 21.00 to 22.30.	22	Kirkwall, high N.E.	17	H. glow visible through breaks in clouds, 19.00 to 23.00; A; G.C.
15	G.C.	18	H. aurora observed, W. to N.E., streamers shooting up from N.W. to N.E. as high as Polaris, 20.00 to 20.40; very bright glow visible through breaks in clouds, W. to N.E., 20.00 to 22.30; A. moderate bright glow first seen 19.15, occasional streamers; D.; G.C. very bright aurora; Braemar; Arbroath, 21.00, in N.; Stornoway, between 22.00 to 23.00, streamers; Wick, 20.15 to 00.30; Craibstone, 22.00 onwards; Inchkeith; Boghall, 21.00; Marchmont, between 21.00 to 22.00; Glasgow; Eskdalemuir, 21.00 to 22.00, brightness at low elevation, between N.N.E. and N.W.; Start Point, N.W. to N.E., 20.00 to 24.00; Fair Isle North, 22.40 to 00.15; Bressay, 21.00 to 24.00; Pentland Skerries, 20.00 to 23.00; Killantringan, 22.40.	24	H. arch, W. to N.E., with streamers shooting upwards, 21.00 to 22.30, brightest N.N.E.; B.; Boghall, brilliant at 21.00; Leuchars; Edinburgh; Pentland Skerries, N., 03.00; Cantick Head, 02.30; Hellyar Holm, 00.15 to 03.30; Auskerry, 01.00 to 04.00; Fair Isle North, 00.30 to 03.00; Turnberry, 02.30 till morning; Killantringan, 01.30.	18	H. glow visible through breaks in clouds, 19.00 to 22.30; D.; Bressay, 19.30 to 21.00.
16	H. glow visible through breaks in clouds, 21.00 to 23.00.	19	H. glow visible through breaks in clouds, W. to N.E., 20.00 to 22.30; D. low.	25		19	A.
18	H. faint glow, W. to E.N.E., 19.00 to 23.30.	20	H. faint glow along horizon, W. to N.E., 20.30 to 22.00; A. faint low arch seen at 22.00.			20	B.
19	H. glow, W. to N.E., 19.00 to 22.00.	21	H. glow visible through breaks in clouds, 20.00 to 22.30; A. very faint glow seen at 22.00.				December.
20	H. glow, W. to N.E., 19.00 to 23.00; G.C.; Kirkwall.	23	H. glow visible along northern horizon, 21.15 to 21.30; aurora visible through breaks in clouds, 21.45 to 22.30; A. moderately bright auroral glow at 21.00.			3	H. bright glow along N.W. to N.E., 19.00 to 19.20; glow visible through breaks in clouds, 20.00.
21	H. glow, W. to E.N.E., 19.00 to 21.00.			2	November.	5	D.; G.C.; B.; Kirkwall, 22.00; Stornoway;
22	H. glow, N.W. to N.N.E., 21.45 to 23.00; B.			3	H. bright glow, W. to N.E., 19.00 to 21.00; glow and streamers; Stornoway.	6	A.; B.; Kirkwall.
	March.			4	H. bright glow, W. to E.N.E., 18.20 to 19.00; B.	7	H. glow visible through openings in clouds, N. quadrant of sky, 19.00 to 22.30.
11	Stornoway, N.; Tiumpnan Head, vivid display in N., from 21.30 to 23.00; Sound of Mull, 22.00 to 23.00; A. moderate bright glow seen between clouds, 23.00.			11	H. glow, W. to N.E., 18.15; streamers, 18.30; band, E. to W., through N. passing near zenith, 18.40 to 19.00; bright streamers leaping upwards from horizon to band near zenith, 19.00; bright glow, 19.30 to 22.15.	11	H. bright glow visible through breaks in clouds, 19.00 to 22.30.
12	Fair Isle North, 21.00 to 22.15.			5	H. glow visible through break in clouds.	12	H. glow visible through breaks in clouds in northern part of sky, 19.00 to 20.30; B.
13	H. fairly bright aurora, 20.00 to 21.00; aurora visible through breaks in clouds, 21.30 to 22.45; B.; Fair Isle North, 20.00 to 03.00; Start Point, 19.30 to 24.00.			6	H. very bright glow, W. to N.E., extending up to a Ursa Majoris, 18.30 to 23.00; B.; D.; Bressay, N.W., 21.00 to 24.00.	13	H. glow along horizon, W. to N.E., with faint luminous waves moving up to an elevation of about 40°, 20.30 to 23.00; B.
	April.					14	H. faint glow W. to E. and up to Ursa Majoris, 19.00 to 24.00; B.
15	H. bright glow, W. to N.N.E., 21.00 to 22.30; A.; B. 21.30.					17	H. glow visible through breaks in clouds, 20.30 to 23.00.
16	H. bright glow, W. to N.E., 20.30 to 23.00; A.; Duncansby Head, bright display in N., 23.00 to 03.00; Mull of Kintyre, N., 22.15.					20	H. faint glow N.W. to N.N.E., 20.30 to 23.00.
17	H. glow visible through breaks in clouds, 21.30 to 23.15; A.						
18	H. glow visible through breaks in clouds, 21.30 to 23.00.						
19	H. glow visible through breaks in clouds, 21.00 to 22.30.						
20	H. glow visible through breaks in clouds, 22.00 to 23.00.						
21	H. glow visible through breaks in clouds, 21.00 to 23.00.						
	May.						
10	A. moderate faint glow, 22.15 to 23.00, centred about N.; Barnsness, 22.45.						
19	G.C.						

NOTE—For brevity, stations which figure frequently in the above Table are represented by their initials, viz., D—Deerness, B—Baltasound, A—Aberdeen, G.C.—Gordon Castle, H—Haroldswick, Shetland, where a continuous watch was kept.



M.O. 320
(Aberdeen)

Air Ministry
METEOROLOGICAL OFFICE

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OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

ABERDEEN

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METEOROLOGICAL COMMITTEE



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—
1930

ABERDEEN OBSERVATORY.

Latitude	57° 10' N.
Longitude	2° 6' W.
G.M.T. of Local Mean Noon	12h. 8m.

Heights in metres above Sea-Level.

Barometer	26·0*
Rain-gauge	13·4* and 11·4†
Robinson Cup Anemograph	36*
Dines Tube Anemograph	21

Heights in metres above ground.

Thermometer Bulbs, North Wall Screen	12·5
Sunshine Recorder	20·7
Robinson Cup Anemograph	23
Dines Tube Anemograph	13
Beckley Rain-gauge Rim	0·6

INTRODUCTION.

SITE.

The Observatory, which was established in 1868, is housed in the top floor of the Cromwell Tower of King's College in Old Aberdeen. The College lies on a plain gradually rising from the sea from which it is distant about 1 mile (1·6 km.). There are no serious irregularities of surface in the vicinity excepting the two river valleys of the Don and the Dee. To the north, at a distance of about 1 km. the Don flows eastwards to the sea; the Dee flows into the sea at a distance of about 3 km. to the south-east of the College. Between the College and the sea is a golf course covered for the most part with grass. Westwards is the High Street of the Old Town and beyond this there is another street. Further west grass pasture extends for about one kilometre. Southward are some open spaces beyond which the modern town is reached. The enclosure in which the Stevenson screen, the Beckley and check rain-gauges and the grass minimum thermometer are exposed, has had its position changed during the year on account of the extension of the College buildings. From January to May inclusive its position was, as in previous years, about 50 metres to the north-east of the Observatory, but from the 1st June and onwards the site has been a new one, also to the north-east of the Observatory, but at a distance of approximately 180 metres. The height of this "station" above M.S.L. is 11·4 metres. The "North-wall" screen in which the recording thermometers are exposed is erected on the wall outside the north window of the uppermost storey of the Observatory. The nature of the soil and sub-soil is loam and sand.

Plans showing the position of the Observatory relative to the City of Aberdeen, and the general arrangement of the College Buildings, and also photographs, are given in the present volume. The enclosure shown is that on the new site. A view of the old site will be found in the Introduction to the Observatories' Year Book, 1923.

Change of value adopted for height of Station above Mean Sea Level.—Consequent upon a careful redetermination of the height of the Station above Mean Sea Level a new value has been adopted for this height for all purposes, as from the 1st January, 1925. The value for the station level is now 13·4 m., and that for the height of the barometer-cistern is 26·0 m., in place of the former values of 14·0 m. and 26·8 m. respectively.

* These values differ slightly from those given in former years. See note above.

† See remarks in Introduction.

ABERDEEN OBSERVATORY.

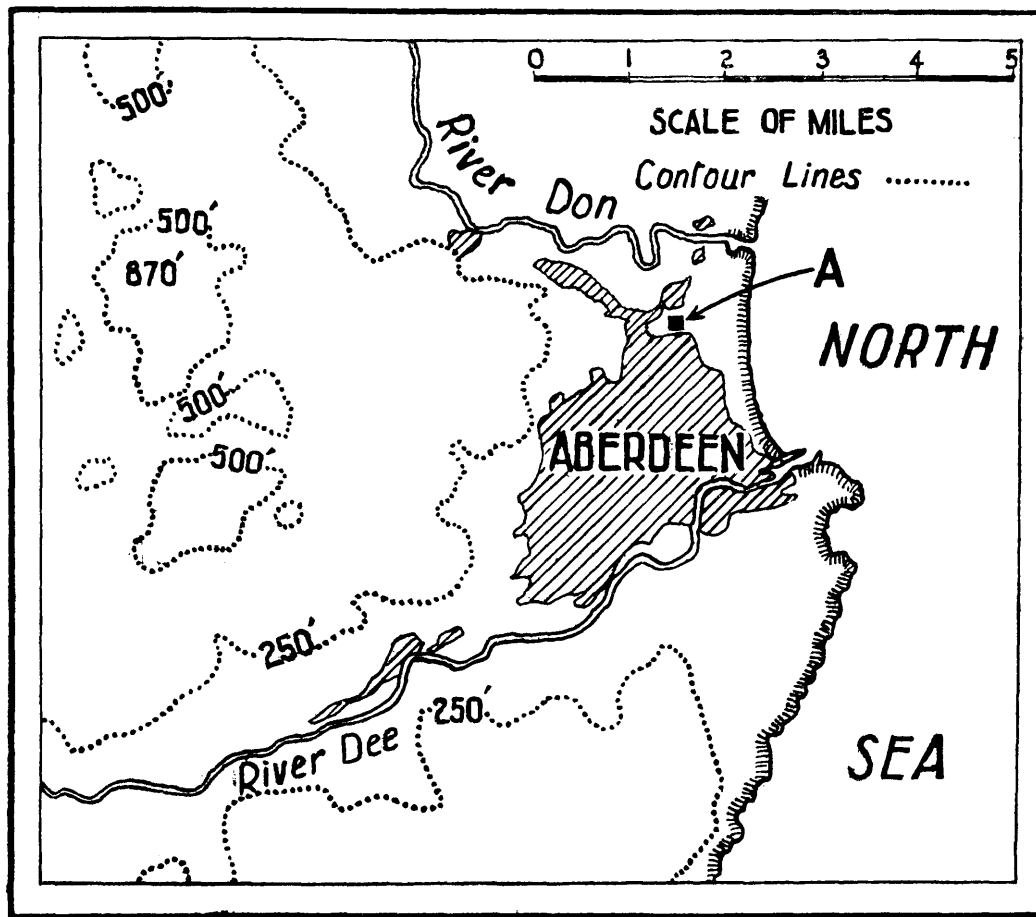


FIG. 6. A SHOWS POSITION OF OBSERVATORY. Shaded areas represent the City of Aberdeen. Figures indicate heights in feet above M.S.L.

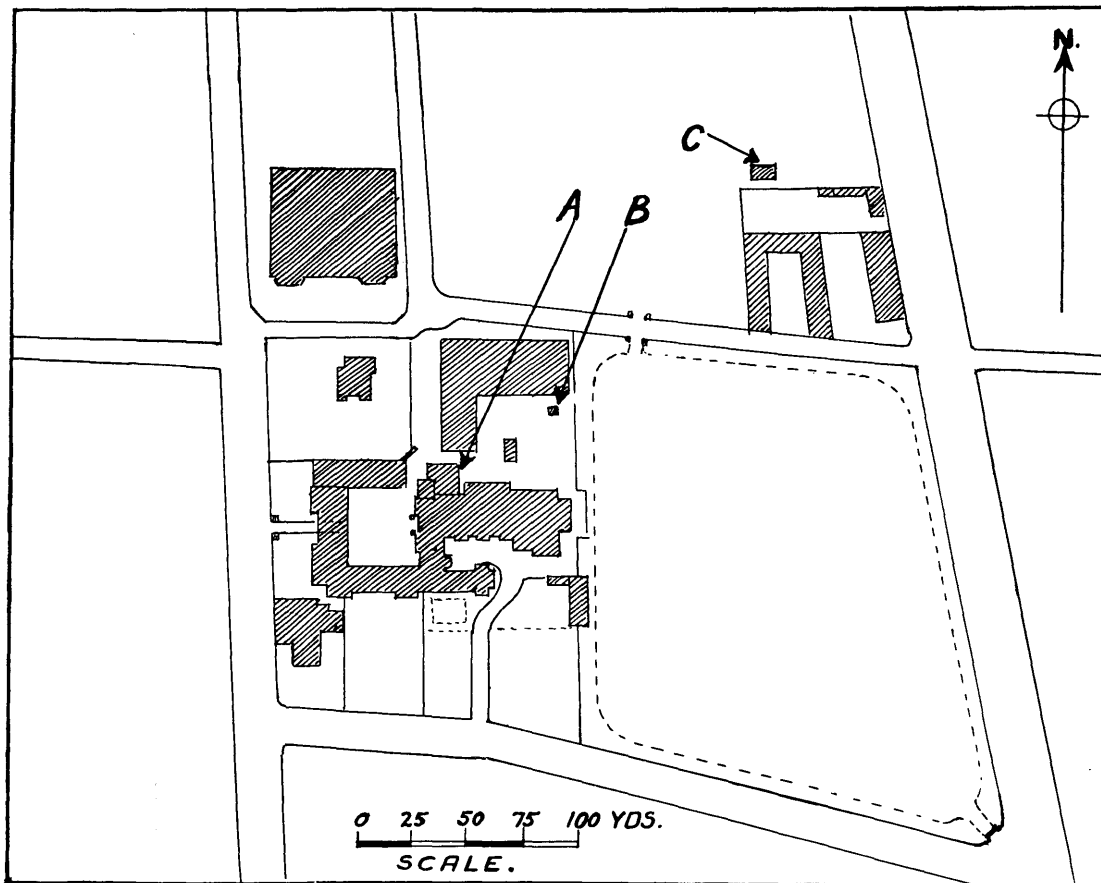


FIG. 7. PLAN OF COLLEGE BUILDINGS. A is Observatory Tower. B is old site of Stevenson Screen Enclosure. C is new site for Stevenson Screen Enclosure.

ABERDEEN OBSERVATORY.

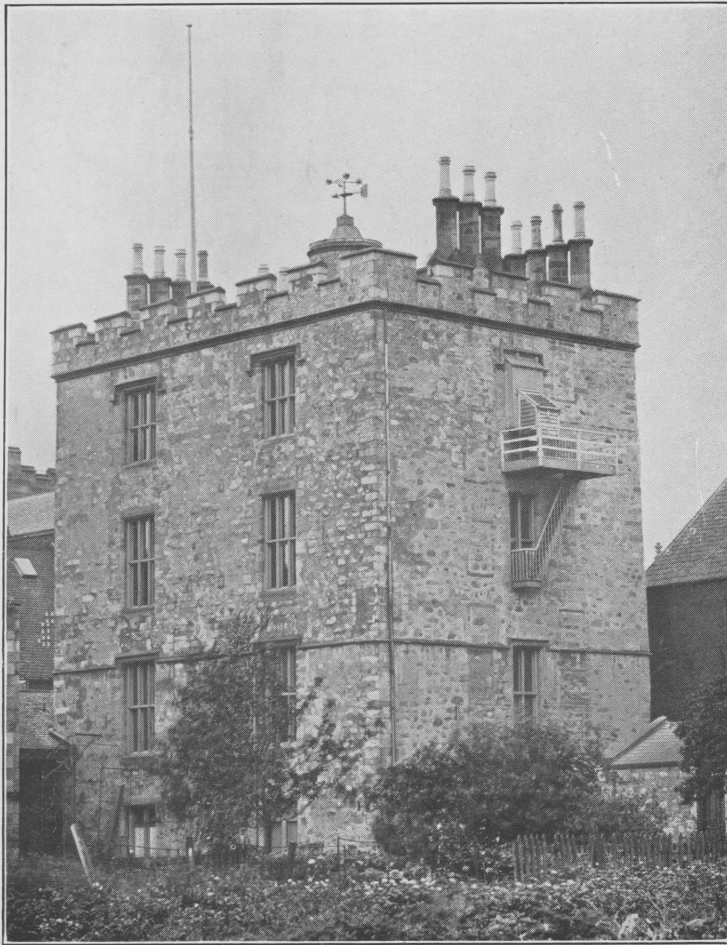


FIG. 8. OBSERVATORY TOWER (seen from N.E.)



FIG. 9. NEW ENCLOSURE FOR STEVENSON SCREEN AND RAINGAUGE (seen from W.S.W.)

[To face p. 85.]

METEOROLOGY.

The elements dealt with in the following tables are :—Atmospheric pressure, air temperature, humidity, rainfall, sunshine, wind speed and direction, earth temperature and minimum temperature on the grass, together with a diary of cloud and weather.

The instruments from which values of the above elements have been obtained and the methods of tabulating the records are described in the General Introduction to this volume. The following additional information refers especially to Aberdeen.

Pressure and Temperature.—The barograph, standard Kew barometer and thermograph are housed in the uppermost storey of the Observatory. The pressure scale value of the barogram is 1 mm. on the paper = 0.85 mb., when the paper is at normal atmospheric humidity. In similar circumstances the time scale is 9.3 mm. = 1 hour. The records of the photobarograph are standardized by means of control readings taken from Fortin Standard Barometer M.O. 273. The N.P.L. certificate of this barometer shows a correction varying from -0.1 mb. to -0.2 mb. throughout the scale, at a temperature of 273 a. ; and this correction has been applied to the control readings.

The recording thermometers are placed in the North-wall screen already referred to. The scale value of the wet bulb thermograph record is 1° absolute = 3.20 millimetres on the paper ; for the dry bulb thermograph the scale value varies slightly with the temperature, but is approximately 1° absolute = 3.4 millimetres. The time scale is 1 hour = 9.23 millimetres. Reading of the photothermograms is done by means of glass measuring scales, the records being standardized by control readings from Standard Thermometers M.O. 1698 (dry bulb) and M.O. 1697 (wet bulb). These thermometers have corrections, varying at different parts of the scale, of between -0.1 a. and +0.2 a. ; these corrections have been applied to the control readings. The heights of the barometer cisterns and of the bulbs of the thermometers are given at the top of the appropriate tables.

It may here be emphasized that the bulbs of the thermometers in the North-wall screen are at the considerable height of 12.5 metres above the ground, and that readings from these thermometers are exclusively used for this publication (except as noted below under *Humidity*) and for the corresponding summaries printed in the *Monthly Weather Report*.*

Rainfall.—The recording instrument in use is Beckley rain-gauge No. 2 with an area of 101.1 square inches (653 cm²). The procedure adopted in tabulating the records is similar to that described in the General Introduction and calls for no comment. Control was by check gauge M.O. 167 up till 31st May, and by M.O. 266 from 1st June onwards.

Humidity.—On those occasions when the temperature of the wet bulb has been 273a or under, the relative humidity has been obtained from the records of a hair hygograph. This instrument was accommodated up till the end of May in a small louvered screen which rests on top of the Stevenson screen and is securely fixed to it ; since 1st June it has been placed inside the new large screen at the new site. The hygograph is now 13.2 metres below the level of the thermograph bulbs in the North-wall screen, and in using its records an appropriate adjustment is made.

* The temperatures for Aberdeen published in the *Daily Weather Report*, and summaries from them given in the *Weekly Weather Report* are from different thermometers, viz., those in the Stevenson Screen with their bulbs only 1.3 metres above the ground.

Sunshine.—The sunshine recorder (Campbell-Stokes type) is exposed on the small circular tower on the Observatory roof on which the Robinson Cup Anemograph is erected. It is rigidly held by lead flaps soldered to the lead roof. The exposure is excellent; the only obstruction is a flagpole to the east, of angular diameter about 1° , which may obstruct 0.1 hr. record about 7h between April and September. This loss has been allowed for, whenever practicable, in tabulating the records. In computing the percentage duration of sunshine the actual possible values for each day of the year 1928 have been employed, a procedure similar to that adopted from 1926 onwards.

Wind-Speed and Direction.—As stated in the General Introduction, the values for 1928 are tabulated from the records obtained by the Dines Pressure-tube Anemograph. This instrument is one of the "standard mounting" type, and is situated in a field about $\frac{1}{2}$ km. east of the Observatory. The exposure is a more open one than is that of the Cup Anemograph, the records of which were tabulated previous to 1926. The effect of this exposure upon the recorded values is given in the Table in the General Introduction.

In a few instances where the records of the Pressure-tube instrument have been defective, the required values have been obtained from the records of the Cup instrument, a suitable adjustment of such values having been made in accordance with the data given in the above-mentioned table. Values thus obtained are entered in italics.

Temperature in the Ground.—This is recorded by a thermometer (unnumbered), which is kept at a depth of 124 cm. (four feet). At Aberdeen the thermometer is carried in a slot near the end of a long bar of wood, about three inches (7.5 cm.) square in section. This bar fits closely into a wooden sleeve, sunk vertically into the earth, so that the bulb of the thermometer is at the required depth. The thermometer itself is enclosed in a glass tube, and its bulb is embedded in paraffin wax so as to render the thermometer insensible to sudden changes of temperature. This allows of its being drawn to the surface and read before the temperature of the bulb has time to change appreciably. As underground temperature changes very slowly, the loss of sensitiveness, resulting from the coating of wax, does not lead to inaccuracies in the determination of the temperature of the earth. The thermometer is read at 9h each morning. The thermometer has a correction of -0.2 a.; this correction is applied to all readings.

Minimum Temperature on the Grass.—The grass minimum thermometer is exposed in the enclosure on two wooden pegs about 4 cm. above grass. It is set at 18h and read at 7h, the reading being entered to the day of observation. There is no correction to M.O. 17866, whereas for M.O. 17007, the correction varied between 0.0 a and 0.05 a., and this correction has been applied to the appropriate readings.

Cloud.—In connection with the observations of cloud-forms it might be well to indicate the practice adopted at Aberdeen in dealing with the types Nimbus and Strato-cumulus, in view of the fact that there exists among meteorologists some divergence of opinion upon these types, and also because suggestions have been made for a prospective modification in the definitions of the International Classification.

In the case of Nimbus it is the custom at Aberdeen to enter "Nb" on all occasions when the cloud layer from which rain is falling is obviously dense and has developed from A-St, even when no Fr-Nb is visible below it. This is done because it is not always certain to the observer whether the cloud layer is actually uniform low A-St developed as far as rain, or whether a slight mist-film exists below the ragged Fr-Nb, obscuring the latter from view, and thus giving it the appearance of a uniform

featureless sheet. (It is probable that in future a suggestion will be made to extend the definition of A-St in the International Classification to include the dense rain-giving layer which develops from the normal A-St.)

On occasions when the low anticyclonic stratus degrades into drizzle or light rain, it is customary at Aberdeen to enter Nb-St (Nimbo-stratus). The entry "St" is reserved for the type of cloud found generally in dry anticyclonic weather.

The entry St-Cu includes only the cloud-forms as defined under that heading in the International Classification, though some of the entries might equally well have been termed A-Cu. It does not, however, include the bases of closed-up cumulus clouds, nor groups of cumulus arranged in lines.

Visibility.—In the subjoined table there is given a list of the objects used for the determination of the degree of visibility, together with their distances and bearings from the observation-point, which may be taken as the roof of the Observatory tower, the N.E. corner thereof being used for the nearer objects.

The range of visibility from the Observatory is somewhat limited by the high ground surrounding the city. From S.E. through S. to N. the distance of the visible horizon is between 2 and 4 miles (4 to 7 km.), but in the N.W. a higher hill, at a distance of 5 miles (8.5 km.), rises above the nearer ridges. To the N.N.E. however there is a clear view of the coast-line as far as Cruden Scaurs, where the coast consists of cliffs over 100 feet high, and is nearly 19 miles (30 km.) distant. From N.N.E. to S.E. there is only the sea-line as horizon, which from the height of the Observatory tower is about 10 miles (16 km.) distant.

Definite objects exist at standard distances from A to H, but from I to M there are no definite objects, though there are adequate identification marks for K and L. Owing, however, to these marks being on the sea-coast, and to the generally clearer visibility to the seaward side of the Observatory, it has been deemed advisable to employ small letter entries for all visibility distances that are not definitely landward estimates. The distances I and J are based upon estimates between other available distances. During darkness the estimates depend upon personal judgment, and upon the degree of obscuration, and alteration in the colour, of the surrounding lights of the town.

VISIBILITY OBJECTS AT ABERDEEN.

OBJECT.	DESCRIPTION.	DISTANCE.	BEARING.
A	Bushes in the garden	26 yards.	N.E.
B	Top of finial at East end of University Library roof	55 "	E.S.E.
C	Gate in North wall of Athletics ground	110 "	E.N.E.
D	East wall of Athletics ground, and trees along it ..	218 "	E.
E	{ (i.) Ventilator tops on Sunnybank School	550 "	S.W.
	{ (ii.) Pressure-tube Anemograph pole	ca. 550 "	E.
F	Top of Kiln, Seaton Brickworks	1,100 "	N.E.
G	{ (i.) Turret of Salvation Army Citadel	1 $\frac{1}{2}$ miles.	S.S.E.
	{ (ii.) Coastguard watch-tower	1 $\frac{3}{4}$ "	N.E.
H	{ (i.) Girdleness lighthouse-top	2 $\frac{3}{8}$ "	S.E.
	{ (ii.) Springhill House	2 $\frac{1}{2}$ "	W.
I (i)	No object. Estimate between Strabathie Hill (3 $\frac{1}{2}$ miles) and Brimmond Hill (5 $\frac{1}{4}$ miles).	{ (3 $\frac{1}{2}$ ") { (5 $\frac{1}{4}$ ")	N.N.E. N.W.
J (j)	No object. Estimate between Brimmond Hill (5 $\frac{1}{4}$ miles) and Sea horizon (10 miles).	{ (5 $\frac{1}{4}$ ") { (10 ")	N.W. E.
K (k)	Sand-patch, mouth of Ythan River	12 $\frac{1}{2}$ "	N.N.E.
L (l)	Cruden Scaurs	18 $\frac{3}{8}$ "	N.N.E.
M (m)	Cannot see so far. Used when "L" object shows clear detail and colour-differences.		

IDENTIFICATION NUMBERS OF INSTRUMENTS USED IN 1928.

The following were the instruments actually in use during the year 1928:—

Standard Fortin Barometer	M.O. 273
„ Dry Bulb Thermometer	M.O. 1698
„ Wet „ „	M.O. 1697
Recording Beckley Raingauge	2
Control Raingauge	M.O. 167* and M.O. 266
Glass for „	M.O. 400† and M.O. 1507
Hair Hygrograph	M.O. 35
Campbell-Stokes Sunshine Recorder	M.O. 32
Robinson Cup Anemograph	M.O. 50
Dines Tube „ „	M.O. 1011
Earth Thermometer	—
Grass Minimum Thermometer	M.O. 17007‡ and M.O. 17866

* Replaced by M.O. 266 on 1st June, 1928. † Broken on 18th May. ‡ Broken on 17th July.

Review of Meteorological Results.

Pressure.—Pressure over the whole year was about 2 mb below its normal value. The largest deficits occurred in January (11 mb), November (8 mb), June (6 mb), and October (6 mb). Excesses were recorded in December (6 mb), and September (3 mb). The months showing greatest pressure disturbance were January, with a daily range of about 15 mb, and February, November and December with daily ranges of between 11 mb and 12 mb.

As in the past two years the mean diurnal inequalities for the months, seasons, and year have been analysed harmonically, and the results are shown in the accompanying Table. The unit employed in calculating the values for the individual months is .01 mb., that for the seasons and the year is .001 mb. The phase-angles are reduced to Local Mean Time. This year it is also possible to include in the Table the average values of the various coefficients for the period of 56 years from 1871 to 1926,—these having been calculated by Dr. A. Crichton Mitchell,*—and the Table is therefore arranged similarly to the Table for Eskdalemuir.

The inequality is supposed to be given by the expression—

$$c_1 \sin(15t^\circ + \alpha_1) + c_2 \sin(30t^\circ + \alpha_2) + \dots$$

t being the time in hours since midnight.

HARMONIC COMPONENTS OF THE DIURNAL INEQUALITY OF ATMOSPHERIC PRESSURE—
ABERDEEN, LONGITUDE 2° 6' W.

Values of c_n, α_n , in the series $\sum c_n \sin(15nt^\circ + \alpha_n)$, t being Local Mean Time reckoned in hours from midnight.

Month and Season.	c_1		α_1		c_2		α_2		c_3		α_3		c_4		α_4	
	1928	1871-1926	1928	1871-1926	1928	1871-1926	1928	1871-1926	1928	1871-1926	1928	1871-1926	1928	1871-1926	1928	1871-1926
January ..	mb. .40	mb. .094	° 67	° 171	mb. .11	mb. .227	° 247	° 151	mb. .16	mb. .130	° 41	° 355	mb. .10	mb. .054	° 239	° 221
February ..	.17	.156	102	176	.15	.270	139	149	.13	.104	342	355	.03	.026	199	96
March ..	.12	.164	275	158	.30	.295	141	151	.04	.052	330	336	.04	.031	30	35
April ..	.18	.153	129	155	.34	.284	136	151	.01	.019	186	188	.04	.044	338	359
May ..	.21	.098	161	135	.26	.237	134	143	.05	.059	200	163	.01	.022	342	329
June ..	.17	.057	124	104	.27	.219	131	141	.06	.065	129	155	.02	.008	330	331
July ..	.09	.089	262	137	.21	.208	137	144	.06	.068	115	159	.01	.013	318	345
August ..	.19	.112	137	162	.24	.232	150	145	.01	.041	209	167	.03	.029	327	336
September ..	.23	.119	235	146	.25	.287	159	148	.01	.027	10	342	.05	.053	1	339
October ..	.09	.155	187	183	.30	.274	151	149	.07	.075	5	349	.04	.027	52	20
November ..	.70	.132	33	197	.39	.229	155	152	.14	.103	350	354	.02	.014	338	172
December ..	.26	.164	300	169	.19	.211	169	146	.10	.122	355	356	.08	.051	203	204
Arithmetic Mean	.23	—	—	—	.25	—	—	—	.07	—	—	—	.04	—	—	—
Year ..	.064	.116	85	163	.236	.247	147	149	.040	.030	13	0	.009	.009	297	340
Winter ..	.271	—	40	—	.180	—	164	—	.120	—	4	—	.048	—	227	—
Equinox ..	.092	—	208	—	.296	—	146	—	.028	—	353	—	.037	—	15	—
Summer ..	.126	—	151	—	.244	—	137	—	.038	—	144	—	.018	—	327	—

Note.—*Winter* comprises the four months January, February, November, December; *Equinox* the months March, April, September, October; and *Summer* May to August.

* Diurnal Variation of Pressure and Temperature at Aberdeen, 1871-1926, by A. Crichton Mitchell, D.Sc., Q.J.R.Met.Soc., 1929, p. 197.

As frequently happens, there is great variation in the individual monthly values of the amplitude of the 24-hour term. In November c_1 is as high as .70 mb., while in the preceding month of October it is only .09 mb. In January also c_1 is high. The corresponding phase-angles α_1 vary irregularly from month to month as usual.

The values of c_2 show the usual maxima in spring and autumn; the winter minimum is unusually low. The phase-angles α_2 are lower than the usual values from February to July inclusive, and higher from August to December. In January α_2 shows a remarkable departure of over 90° from its normal value, while the corresponding amplitude c_2 is as low as .11 mb., less than half its usual value, and almost the least important of the four term-amplitudes for that month, all the other amplitudes, c_1 , c_3 , and c_4 being much above their average values. January, as already remarked, was a month of very low and very unsteady pressure.

The coefficients of the 8-hour term c_3 and α_3 show the usual seasonal variations, the equinoctial minimum and winter maximum of c_3 are well developed, as is likewise the reversal of phase from winter to summer. The values of c_4 follow the normal values very closely except in January and December, in which months the amplitudes are almost twice the usual values. The phase-angles α_4 are in fair agreement with the average except in February and November.

Speaking generally, the year 1928 shows greater variation in the amplitudes of all four terms than do either of the two preceding years; in the cases of c_1 and c_2 the variation is twice as great as that shown in 1926.

Temperature.—In 1928 the temperature showed only a very slight departure from the average over the year as a whole, but the winter half of the year was distinctly warmer throughout, while the summer half, with the exception of July, was definitely cooler than the normal. The monthly departures from the average values were in no cases considerable, the greatest being an excess of 1.1 a. in February, and a deficit of the same amount in June. In this respect the present year bears some resemblance to the previous one, when March was considerably warmer, and June considerably cooler than normal, but the departures this year are not so marked.

Rainfall.—The present year again showed an excess of rainfall. During the period of seven years from 1922 to 1928, only one year—1925—was deficient in rainfall. The excess during the present year amounted to 67 mm. The incidence of precipitation showed notable departures from the averages for the individual months. There were large excesses in January (41 mm.) June (40 mm.) March (30 mm.) and November (25 mm.), and deficits in February (36 mm.) May (18 mm.) and July (18 mm.). Over the seven years from 1922 to 1928 the total excess of precipitation amounts to 485 mm.

Relative Humidity.—The fluctuations in the values of relative humidity showed, as might reasonably be expected, good agreement on the whole with the recorded monthly percentage of sunshine, whereas the incidence of rainfall had apparently little relation. For example, the very small rainfall of February was accompanied by a normal value of relative humidity, while June, with nearly twice its usual rainfall, had an average relative humidity about three per cent. below the usual.

Sunshine.—The year was duller than the average by about 4 per cent. of the possible sunshine. The most of this deficiency arose in the spring months, March, April and May, over which period the loss was fully 13 per cent. March was the dullest month of the year, its value of 13 per cent of the possible being only two-fifths of the average for that month. The month showing the largest excess was September, which had 6 per cent. above the normal, notwithstanding an excess of rainfall; while the four winter months were all brighter than usual.

Wind.—The average wind velocity for the year, 4·7 m.p.s., exceeded that of 1927 by about 10 per cent. The variation between the individual monthly means was, however, less than in 1927. The windiest months were March (5·8 m.p.s.), and December (5·7 m.p.s.), while on the other hand, May, August and September all had mean values of 3·9 m.p.s. Only one gale was recorded, that of March 29th, but the highest velocity in a gust was attained on October 28th when a velocity of 27 m.p.s. (61 m.p.h.) was recorded at 9h 25m. The prevailing winds were from the S.E. and S.W. sectors, but in March, April and May, a considerable excess over the normal of winds from the N.E. quadrant had its concomitant in the marked deficiency of sunshine during that period.

Aurora.—The aurora was observed on 25 occasions during the year; twice as frequently in the latter half as in the earlier. The month of greatest frequency was November with 9 observations. The dates of observations will be found in the General Auroral Table.

General.—The Seasons of the year 1928 showed, at Aberdeen, the following characteristics. Spring was nearly normal in temperature but was wet and very dull; Summer was slightly cooler than usual, somewhat wet and rather dull; Autumn was slightly warmer than usual, decidedly wet, but a little brighter than normal; and the Winter months were decidedly warmer and brighter than normal, and had average, though erratic, rainfall.

Readings in millibars at exact hours, Greenwich Mean Time.

69. Aberdeen : H_b (height of barometer cistern above M.S.L.) = 26.0 metres.

January, 1928.

Table for Aberdeen in January 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours. Values in millibars.

70. Aberdeen : H_b = 26.0 metres.

February, 1928.

Table for Aberdeen in February 1928. Columns: Hour G.M.T., Station Level (1-29), Mean (Station level), Mean (Sea level). Rows: 1-29 hours. Values in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

71. Aberdeen : H_b (height of barometer cistern above M.S.L.) = 26.0 metres.

March, 1928.

Table with 25 columns (1-24) and 31 rows (1-31). Columns 1-24 represent hourly readings in millibars (mb.) at various station levels. Column 25 is the Mean. Rows 1-10 are at the top station level, and rows 11-31 are at the bottom station level. The table shows a general downward trend in pressure from top to bottom, with a mean value of 1007 mb. at the top and 1010 mb. at the bottom.

72. Aberdeen : H_b = 26.0 metres.

April, 1928.

Table with 25 columns (1-24) and 31 rows (1-31). Columns 1-24 represent hourly readings in millibars (mb.) at various station levels. Column 25 is the Mean. Rows 1-10 are at the top station level, and rows 11-31 are at the bottom station level. The table shows a general downward trend in pressure from top to bottom, with a mean value of 1009 mb. at the top and 1010 mb. at the bottom.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

73. Aberdeen : H_b (height of barometer cistern above M.S.L.) = 26.0 metres.

May, 1928.

Table for Aberdeen pressure readings in May 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours. Values in millibars.

74. Aberdeen : H_b = 26.0 metres.

June, 1928.

Table for Aberdeen pressure readings in June 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours. Values in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

75. Aberdeen : H_b (height of barometer cistern above M.S.L.) = 26.0 metres.

July, 1928.

Table for Aberdeen July 1928. Columns: Hour, G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours. Data: Millibar readings for each hour and station level.

76. Aberdeen : H_b = 26.0 metres.

August, 1928.

Table for Aberdeen August 1928. Columns: Hour, G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours. Data: Millibar readings for each hour and station level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

77. Aberdeen : H_b (Height of barometer cistern above M.S.L.) = 26.0 metres.

September, 1928.

Table for Aberdeen pressure readings in September 1928. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station Level/Sea level). Values are in millibars.

78. Aberdeen : H_b = 26.0 metres.

October, 1928.

Table for Aberdeen pressure readings in October 1928. Columns include Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Values are in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure i is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

79. Aberdeen : H_b (height of barometer cistern above M.S.L.) = 26.0 metres.

November, 1928.

Table for Aberdeen pressure readings in November 1928. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station level/Sea level). Rows show hourly pressure readings in millibars.

80. Aberdeen : H_b = 26.0 metres.

December, 1928.

Table for Aberdeen pressure readings in December 1928. Columns include Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Rows show hourly pressure readings in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

ANNUAL MEANS FROM HOURLY VALUES.

From readings in millibars at exact hours, Greenwich Mean Time.

1928.

81. Aberdeen : H_b = 26.0 metres.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 2 rows (Station Level, Sea Level). Station Level values range from 1006.18 to 1006.53. Sea Level values range from 1009.86 to 1009.72.

PRESSURE AT STATION LEVEL ; MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

1928.

82. Aberdeen : H_b = 26.0 metres.

Table with 25 columns (Month, Hour G.M.T. 1-24) and 13 rows (Jan. to Dec., Year). Monthly means range from 1006.53 to 1007.12. Diurnal inequalities are shown in bold text, e.g., -0.80, -0.34, -0.80.

ABSOLUTE EXTREMES OF PRESSURE AT STATION LEVEL FOR EACH DAY.

Maximum and Minimum for the interval 0h. to 24h., Greenwich Mean Time.

1928.

83. Aberdeen : H_b = 26.0 metres.

Large table with 23 columns (Month, Day, Max., Min.) and 31 rows (Days 1-31). Values range from 984.1 to 999.8. Extremes are highlighted in bold text, such as 991.4 and 986.2.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1012.3 mb. is written 012.3. This rule does not, however, apply to monthly means.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

84. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulb above the ground) = 12.5 metres.

January, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings in degrees absolute, and column 25 represents the mean. The data shows temperature fluctuations throughout the month, with a mean of 76.5 degrees absolute.

85. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

February, 1928.

Table with 25 columns (1-24) and 29 rows (Day 1-29). Columns 1-24 represent hourly readings in degrees absolute, and column 25 represents the mean. The data shows temperature fluctuations throughout the month, with a mean of 76.8 degrees absolute.

Note.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

86. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulb above ground) = 12.5 metres.

March, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is the Mean. Rows 1-31 represent days from 1 to 31. Each cell contains a numerical value representing temperature in degrees absolute.

87. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

April, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is the Mean. Rows 1-31 represent days from 1 to 31. Each cell contains a numerical value representing temperature in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

88. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulb above ground) = 12.5 metres.

May, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is the Mean. Rows 1-5 are for days 1-5, 6-10 for days 6-10, 11-15 for days 11-15, 16-20 for days 16-20, 21-25 for days 21-25, 26-30 for days 26-30, and 31 for day 31. The Mean row is at the bottom of the table.

89. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

June, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is the Mean. Rows 1-5 are for days 1-5, 6-10 for days 6-10, 11-15 for days 11-15, 16-20 for days 16-20, 21-25 for days 21-25, 26-30 for days 26-30, and 31 for day 31. The Mean row is at the bottom of the table.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

July, 1928.

90. Aberdeen : North Wall Screen on Tower : ht (height of thermometer bulb above ground) = 12.5 metres.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is labeled 'Mean'. The table shows daily temperature fluctuations throughout July 1928.

August, 1928.

91. Aberdeen : North Wall Screen on Tower : ht = 12.5 metres.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is labeled 'Mean'. The table shows daily temperature fluctuations throughout August 1928.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

92. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulb above ground) = 12.5 metres.

September, 1928.

Table with 25 columns (1-24) and 30 rows (Day 1-30). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is labeled 'Mean'. The table shows a diurnal temperature cycle with a minimum of 81.8 and a maximum of 88.8.

93. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

October, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 contain temperature readings in degrees absolute. Column 25 is labeled 'Mean'. The table shows a diurnal temperature cycle with a minimum of 80.3 and a maximum of 88.8.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

TEMPERATURE : ANNUAL MEANS OF HOURLY VALUES.
From readings in degrees absolute at exact hours, Greenwich Mean Time.

96. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

1928.

Table with 25 columns (Hour 1-24, Mean) and 1 row of data for Aberdeen in 1928. Values range from 79.88 to 82.40.

TEMPERATURE : MONTHLY MEANS AND DIURNAL INEQUALITIES.
The departures from the mean of the day are adjusted for non-cyclic change.

97. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

1928.

Table with 25 columns (Month, Mean, Hour 1-24) and 12 rows of monthly data for Aberdeen in 1928. Values range from 277.03 to 283.33.

ABSOLUTE EXTREMES OF TEMPERATURE FOR EACH DAY.
Maximum and Minimum for the interval 0h. to 24h., Greenwich Mean Time.

98. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

1928.

Large table with 25 columns (Month, Jan-Dec) and 31 rows (Day 1-31) of absolute temperature extremes for Aberdeen in 1928. Values range from 72.4 to 85.1.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Percentages at exact hours Greenwich Mean Time.

99. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulbs above the ground) = 12.5 metres. January, 1928.

Table with 27 columns (1-24 hours, Mean, Vapour Pressure*) and 31 rows (Day 1-31). Columns 1-24 contain percentage values for each hour. Mean and Vapour Pressure* columns are on the right.

100. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

February, 1928.

Table with 27 columns (1-24 hours, Mean, Vapour Pressure*) and 29 rows (Day 1-29). Columns 1-24 contain percentage values for each hour. Mean and Vapour Pressure* columns are on the right.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

101. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulbs above the ground) = 12.5 metres.

March, 1928.

Table with 27 columns (Hour G.M.T. 1-24, Mean, Vapour Pressure*) and 31 rows (Day 1-31). Data represents relative humidity percentages.

102. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

April, 1928.

Table with 27 columns (Hour G.M.T. 1-24, Mean, Vapour Pressure*) and 31 rows (Day 1-31). Data represents relative humidity percentages.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

Percentages at exact hours, Greenwich Mean Time.

105. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulbs above the ground) = 12.5 metres.

July, 1928.

Table with 26 columns (1-24 for hours, 25 for Mean, 26 for Vapour Pressure) and 31 rows (Day 1-31). Data includes relative humidity percentages and vapour pressure in millibars.

106. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

August, 1928.

Table with 26 columns (1-24 for hours, 25 for Mean, 26 for Vapour Pressure) and 31 rows (Day 1-31). Data includes relative humidity percentages and vapour pressure in millibars.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

Percentages at exact hours, Greenwich Mean Time.

107. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulbs above the ground) = 12.5 metres. September, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure) and 31 rows (Day 1-30, Mean, Vapour Pressure). Columns 1-24 show percentage values for each hour. Mean and Vapour Pressure are shown in the final two columns.

108. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres. October, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure) and 31 rows (Day 1-30, Mean, Vapour Pressure). Columns 1-24 show percentage values for each hour. Mean and Vapour Pressure are shown in the final two columns.

* Computed from the mean temperature and mean relative humidity. † Mean of the column, ‡ Mean of the row.

HUMIDITY : ANNUAL MEANS FROM HOURLY VALUES.

For exact hours, Greenwich Mean Time.

111. Aberdeen : North Wall Screen on Tower : h_t (height of thermometer bulbs above the ground) = 12.5 metres.

1928.

Hour. G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean
Relative Humidity ...	% 83.2	% 83.5	% 83.8	% 84.0	% 84.0	% 83.6	% 82.7	% 81.4	% 79.8	% 78.3	% 77.1	% 76.1	% 75.6	% 75.6	% 75.6	% 76.6	% 77.2	% 78.3	% 79.5	% 81.3	% 82.0	% 82.5	% 82.9	% 83.1	% 80.3
Vapour Pressure, in millibars* ...	mb. 8.3	mb. 8.2	mb. 8.2	mb. 8.2	mb. 8.2	mb. 8.3	mb. 8.4	mb. 8.5	mb. 8.6	mb. 8.7	mb. 8.8	mb. 8.9	mb. 8.9	mb. 8.9	mb. 8.9	mb. 8.9	mb. 8.8	mb. 8.8	mb. 8.7	mb. 8.7	mb. 8.6	mb. 8.5	mb. 8.4	mb. 8.4	mb. 8.6

* Computed from the mean temperature and mean relative humidity.

RELATIVE HUMIDITY : MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

112. Aberdeen : North Wall Screen on Tower : h_t = 12.5 metres.

1928.

Month.	Mean.	Hour. G.M.T. 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
Jan.	% 81.7	% -1.4	% -0.1	% +0.4	% +0.1	% +2.0	% +2.1	% +2.1	% +2.5	% +2.3	% +1.8	% -0.3	% -0.7	% -0.7	% -2.7	% -2.2	% -0.9	% -1.6	% -1.5	% -0.9	% +0.3	% -0.3	% +0.2	% +0.1	% -0.7
Feb.	% 78.8	% +1.5	% +1.1	% +2.1	% +1.3	% +1.7	% +2.7	% +2.6	% +3.6	% +2.7	% +1.6	% -0.9	% -3.9	% -5.2	% -5.1	% -5.3	% -3.5	% -2.6	% -1.1	% -0.3	% +1.0	% +2.1	% +0.7	% +1.6	% +1.4
Mar.	% 83.0	% +0.5	% +1.1	% +1.2	% +1.3	% +2.0	% +2.9	% +3.7	% +1.6	% +1.2	% -0.1	% -1.5	% -3.4	% -3.7	% -3.2	% -3.9	% -2.6	% -2.0	% -0.7	% +1.0	% +1.7	% +1.3	% +0.9	% +0.2	% +0.5
April	% 79.2	% +5.4	% +5.9	% +5.2	% +5.5	% +5.6	% +4.9	% +3.9	% +1.8	% +0.5	% -1.6	% -3.0	% -4.0	% -7.2	% -7.8	% -7.6	% -7.4	% -7.8	% -5.3	% -1.7	% +1.7	% +3.1	% +2.4	% +3.1	% +4.4
May	% 81.7	% +4.5	% +4.7	% +4.6	% +5.7	% +5.4	% +4.1	% +1.8	% -1.0	% -2.8	% -4.2	% -4.6	% -5.4	% -4.5	% -5.4	% -5.4	% -5.3	% -5.1	% -3.9	% -1.3	% +1.7	% +3.4	% +4.3	% +4.5	% +4.1
June	% 74.7	% +6.8	% +6.5	% +7.0	% +7.4	% +6.1	% +3.5	% +0.1	% -2.7	% -3.5	% -5.6	% -6.2	% -3.8	% -4.5	% -3.3	% -4.9	% -5.8	% -5.1	% -5.0	% -5.0	% -0.5	% +2.2	% +4.5	% +5.6	% +6.6
July	% 74.7	% +5.0	% +5.0	% +5.7	% +6.1	% +5.7	% +3.2	% +1.9	% -1.3	% -3.8	% -5.4	% -5.7	% -7.7	% -7.6	% -5.5	% -5.2	% -2.8	% -1.8	% -2.0	% -0.8	% +1.3	% +2.6	% +3.4	% +5.0	% +4.6
Aug.	% 84.2	% +5.0	% +4.8	% +5.5	% +5.5	% +5.5	% +4.5	% +2.1	% +0.3	% -2.9	% -4.4	% -4.6	% -5.1	% -4.8	% -4.7	% -6.2	% -4.0	% -4.5	% -4.1	% -1.6	% +0.5	% +1.7	% +3.2	% +3.9	% +4.3
Sept.	% 81.2	% +5.2	% +6.0	% +6.2	% +6.5	% +6.3	% +6.3	% +4.6	% +2.7	% -1.5	% -5.6	% -6.6	% -9.0	% -8.8	% -9.5	% -8.8	% -7.5	% -4.3	% -1.8	% +0.3	% +2.2	% +3.1	% +3.9	% +5.1	% +4.9
Oct.	% 83.5	% +3.2	% +3.3	% +3.2	% +3.1	% +2.4	% +2.5	% +2.4	% +1.7	% +0.5	% -0.7	% -3.5	% -4.7	% -5.7	% -6.9	% -6.1	% -4.9	% -2.5	% -0.1	% +0.8	% +1.1	% +1.8	% +3.0	% +3.1	% +3.1
Nov.	% 83.2	% +0.1	% -0.1	% +0.7	% +0.6	% +0.7	% +1.8	% +1.6	% +2.2	% +1.2	% +0.6	% -1.5	% -2.5	% -2.9	% -2.7	% -0.1	% +0.3	% +0.8	% +1.5	% +0.6	% +0.5	% -0.3	% -0.8	% -1.7	% -0.7
Dec.	% 77.7	% -0.6	% -0.3	% +0.1	% +0.8	% +0.7	% +0.8	% +2.3	% +1.3	% +0.6	% -0.2	% 0.0	% -0.5	% -1.8	% +0.3	% -1.1	% -1.0	% -0.8	% -0.7	% -1.1	% +0.1	% -0.7	% +0.7	% +0.5	% +0.4
Year	% 80.3	% +2.9	% +3.2	% +3.5	% +3.7	% +3.7	% +3.3	% +2.4	% +1.1	% -0.5	% -2.0	% -3.2	% -4.2	% -4.8	% -4.7	% -4.7	% -3.8	% -3.1	% -2.0	% -0.8	% +1.0	% +1.7	% +2.2	% +2.6	% +2.7

RAINFALL : ANNUAL TOTALS OF HOURLY VALUES.

Amounts, in millimetres ; durations, in hours, for periods of sixty minutes between the exact hours, Greenwich Mean Time.

113. Aberdeen : H_T = 13.4 metres + 0.6 metres. (After June 1st H_T = 11.4 metres + 0.6 metres.)

1928.

Hour. G.M.T.	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to Noon	Noon to 13	13 to 14	14 to 15	15 to 16	16 to 17	17 to 18	18 to 19	19 to 20	20 to 21	21 to 22	22 to 23	23 to 24	0 to 24
Amount ...	mm. 36.0	mm. 35.3	mm. 23.0	mm. 24.2	mm. 30.0	mm. 41.2	mm. 26.4	mm. 28.2	mm. 32.2	mm. 28.9	mm. 32.4	mm. 43.0	mm. 46.9	mm. 37.8	mm. 36.1	mm. 26.2	mm. 29.7	mm. 36.8	mm. 36.7	mm. 34.1	mm. 36.9	mm. 36.2	mm. 40.3	mm. 36.3	mm. 814.8
Duration ...	hr. 27.3	hr. 33.6	hr. 24.3	hr. 26.6	hr. 27.3	hr. 33.2	hr. 30.8	hr. 27.0	hr. 29.9	hr. 23.2	hr. 30.6	hr. 32.9	hr. 37.6	hr. 29.6	hr. 25.0	hr. 25.2	hr. 21.6	hr. 29.3	hr. 25.4	hr. 32.4	hr. 33.7	hr. 34.6	hr. 34.1	hr. 32.2	hr. 707.4

114. Aberdeen.

NOTES ON RAINFALL.

1928.

Notable Falls of the Year.—During 1928 there was no fall worthy of special remark. The greatest rate occurred during a fall of 13 mm. on July 28th, when 5 mm. fell in 6 minutes, and 10 mm. in 48 minutes.

Dry Periods.—(Periods of 7 days or over with no rainfall or with trifling falls.)

Feb. 18—29. In 12 days only 0.1 mm.—due to wet fog—was recorded. February had less than half its normal rainfall.
 May 29—June 5. Only 0.1 mm. fell in 8 days.
 July 16—26. On 11 days only 0.4 mm. fell. During the 16 days from 11th to 26th the total fall was 2 mm.

Wet Periods.—(With notes of the heavier rates of fall.)

April 19th.—In a little over 10 hours, 22 mm. fell. During the three days, 18th to 20th, 35 mm. were recorded.
 June 26th.—29 mm. fell in 21 hours from 20h. on 25th to 17h. on 26th.
 July 28th.—In a fall of 13 mm. the heaviest rate of fall during the year was recorded, as mentioned above under "Notable Falls."
 Nov. 23rd.—27 mm. fell in 13 hours.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

119. Aberdeen : H_r (height of receiving surface above M.S.L.)=H (height of station above M.S.L.)+h_r (height of receiving surface above ground) =13.4 metres + 0.6 metres. May, 1928.

Table with 25 columns for hourly rainfall (0-1 to 23-24) and 2 columns for duration (0-24 and hr.). Rows include hourly data from Day 1 to 31, and summary rows for 'Sum.' and 'Total Duration.'.

120. Aberdeen : H_r=11.4 metres + 0.6 metres.

June, 1928.

Table with 25 columns for hourly rainfall (0-1 to 23-24) and 2 columns for duration (hr.). Rows include hourly data from Day 1 to 30, and summary rows for 'Sum.', 'Total Duration.', and 'Hour G.M.T.'.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

129. Aberdeen : h_s (height of recorder above ground) = 20.7 metres.

March, 1928.

Table with 21 columns for hourly intervals and 2 columns for Total and Per cent. Rows include Day (1-31), Sum., and Mean.

130. Aberdeen : h_s = 20.7 metres.

April, 1928.

Table with 21 columns for hourly intervals and 2 columns for Total and Per cent. Rows include Day (1-30), Sum., Mean., and a final header row for Hour. L.A.T.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

133. Aberdeen : h_s (height of recorder above ground) = 20.7 metres.

July, 1928.

Table for July 1928 showing duration of bright sunshine in hours for each hour of the day (3 to 4 to 21), total for the day, and percentage of possible sunshine.

134. Aberdeen : h_s = 20.7 metres.

August, 1928.

Table for August 1928 showing duration of bright sunshine in hours for each hour of the day (3 to 4 to 21), total for the day, and percentage of possible sunshine.

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + ha (height of anemograph above ground) = 8 metres + 13 metres.

January, 1928.

Table with columns for days 13-24, Mean, and Day. Each day column contains wind speed data in m/s for various heights (e.g., 200, 170, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0).

February, 1928.

Table with columns for days 13-24, Mean, and Day. Each day column contains wind speed data in m/s for various heights (e.g., 250, 220, 200, 170, 150, 140, 130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0).

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°) : Speed in metres per second.

141. Aberdeen : Dines anemograph from Jan. 1926.

Ha (height of anemograph above M.S.L.) = Height of ground above

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind direction and speed data.

142. Aberdeen : Ha = 8 metres + 13 metres.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind direction and speed data.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°) : Speed in metres per second.

143. Aberdeen : Dines anemograph from Jan. 1926.

H_a (height of anemograph above M.S.L.) = Height of ground above

Table with 23 columns (Hour, G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s and degrees.

144. Aberdeen : H_a = 8 metres + 13 metres.

Table with 23 columns (Hour, G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s and degrees.

Direction expressed in degrees from North (E=90°, S=180°, W=270°, N=360°) : Speed in metres per second.

145. Aberdeen : Dines anemograph from Jan. 1926.

H_a (Height of anemograph above M.S.L.) = Height of ground above

Table with 13 columns (Hour, 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s for two different heights.

146. Aberdeen : H_a = 8 metres + 13 metres.

Table with 13 columns (Hour, 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s for two different heights (8m and 13m).

Direction expressed in degrees from North. (E = 90°, S = 180°, W = 270°, N = 360°) : Speed in metres per second.

147. Aberdeen : Dines anemograph from Jan. 1926.

H_a (height of anemograph above M.S.L.) = Height of ground above

Table with 13 columns (Hour, 1-11, Noon) and 2 rows per hour (Day, m/s). Contains wind direction and speed data for Aberdeen from Jan 1926.

148. Aberdeen : H_a = 8 metres + 13 metres.

Table with 13 columns (Hour, 1-11, Noon) and 2 rows per hour (Day, m/s). Contains wind direction and speed data for Aberdeen at two heights.

Summary table with 13 columns (Hour, 1-11, Noon) and 2 rows (Hour, G.M.T., 1., 2., 3., 4., 5., 6., 7., 8., 9., 10., 11., Noon).

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + ha (height of anemograph above ground) = 8 metres + 13 metres.

September, 1928.

Table with columns for days 13-24, Mean, and Day. Each cell contains wind speed in m/s. Includes a summary row at the bottom.

October, 1928.

Table with columns for days 27-31, Mean, and Day. Each cell contains wind speed in m/s.

153. Aberdeen.

Readings, in degrees absolute, at 9h, Greenwich Mean Time.

1928.

Month.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Day.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.
1	77.5	77.2	77.4	78.3	79.8	81.6	82.9	84.8	85.1	84.0	82.2	80.5
2	77.4	77.1	77.4	78.3	80.0	81.7	83.0	84.8	85.1	83.9	82.2	80.5
3	77.4	77.0	77.5	78.4	80.1	81.7	83.0	84.8	85.0	83.8	82.2	80.4
4	77.3	76.9	77.5	78.4	80.3	81.8	83.1	84.7	85.0	83.7	82.1	80.4
5	77.2	76.9	77.6	78.6	80.4	81.8	83.1	84.6	85.0	83.5	82.0	80.4
6	77.2	76.9	77.6	78.6	80.6	81.9	83.2	84.6	85.0	83.4	81.9	80.3
7	77.2	76.8	77.7	78.7	80.7	82.0	83.2	84.6	85.0	83.3	81.8	80.2
8	77.2	76.8	77.8	78.8	80.8	82.1	83.3	84.7	85.0	83.3	81.8	80.2
9	77.2	76.8	77.8	78.8	81.0	82.2	83.3	84.8	85.0	83.3	81.7	80.1
10	77.2	76.9	77.8	78.8	81.1	82.2	83.4	84.8	85.0	83.4	81.7	80.0
11	77.2	77.1	77.8	78.9	81.1	82.2	83.4	84.8	85.0	83.4	81.6	79.9
12	77.1	77.2	77.7	79.0	81.0	82.2	83.5	84.8	85.0	83.4	81.4	79.8
13	77.1	77.1	77.6	79.1	80.9	82.2	83.6	84.8	85.1	83.4	81.3	79.7
14	77.0	77.1	77.5	79.2	81.0	82.2	83.7	84.8	85.0	83.3	81.3	79.6
15	77.0	77.1	77.4	79.2	81.1	82.2	83.8	84.8	85.0	83.2	81.3	79.6
16	77.0	77.0	77.4	79.2	81.1	82.2	83.9	84.9	84.9	83.1	81.2	79.5
17	77.1	77.0	77.4	79.2	81.2	82.3	84.0	84.9	84.9	83.0	81.2	79.5
18	77.1	77.0	77.4	79.1	81.2	82.3	84.1	84.9	84.9	82.9	81.2	79.5
19	77.2	77.0	77.4	79.1	81.2	82.3	84.2	84.9	84.9	82.9	81.1	79.4
20	77.2	77.0	77.5	79.1	81.2	82.3	84.2	84.9	84.9	82.9	81.1	79.3
21	77.2	77.1	77.6	78.9	81.2	82.3	84.3	85.0	84.9	82.8	81.1	79.2
22	77.3	77.2	77.8	78.9	81.2	82.4	84.4	85.0	84.8	82.8	81.1	79.1
23	77.4	77.2	77.8	78.9	81.2	82.4	84.4	85.0	84.7	82.8	81.1	79.1
24	77.4	77.3	77.8	79.0	81.2	82.5	84.6	85.0	84.6	82.7	81.0	79.0
25	77.4	77.3	77.9	79.1	81.2	82.6	84.7	85.0	84.4	82.6	80.9	78.9
26	77.4	77.4	77.9	79.2	81.3	82.6	84.8	85.0	84.4	82.5	80.9	78.9
27	77.4	77.4	78.0	79.2	81.3	82.7	84.8	85.0	84.3	82.4	80.8	78.9
28	77.3	77.4	78.1	79.3	81.4	82.8	84.8	85.0	84.2	82.4	80.7	78.9
29	77.3	77.4	78.2	79.5	81.5	82.8	84.9	85.0	84.2	82.4	80.6	78.8
30	77.2	—	78.2	79.7	81.6	82.9	84.9	85.1	84.1	82.3	80.6	78.8
31	77.2	—	78.3	—	81.6	—	84.9	85.1	—	82.3	—	78.7
Mean	77.2	77.1	77.7	78.9	81.0	82.2	83.9	84.9	84.8	83.1	81.4	79.6

Annual Mean at 124 cm. 281.0

MINIMUM TEMPERATURE "ON THE GRASS" DURING THE INTERVAL 18h. to 7h. G.M.T.

154. Aberdeen.

Readings, in degrees absolute.

1928.

Month.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Day.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.
1	68.1	74.2	76.1	76.9	77.4	81.6	74.1	75.8	75.9	69.8	75.8	77.1
2	73.4	71.8	73.2	75.6	79.6	78.7	82.7	72.6	75.2	76.5	74.1	68.6
3	71.2	73.5	72.1	77.6	76.8	74.4	82.1	80.8	83.1	70.9	75.1	73.3
4	71.5	70.7	73.1	72.3	78.9	79.6	81.4	83.6	83.5	73.1	77.6	70.7
5	72.9	75.8	74.8	70.6	73.7	73.4	83.1	77.6	83.8	82.0	72.4	77.0
6	72.8	72.3	73.7	70.4	78.1	77.1	83.0	80.8	82.8	82.1	77.4	69.2
7	71.7	73.6	75.0	73.4	78.0	81.8	78.2	85.2	79.9	76.6	75.2	71.8
8	73.6	77.5	73.6	75.7	74.7	79.5	78.9	80.0	83.2	83.7	70.8	71.0
9	70.2	75.2	72.3	75.8	74.2	76.7	80.3	80.2	80.1	75.4	66.3	67.5
10	72.1	71.8	72.3	77.6	74.8	80.6	82.4	77.6	80.2	72.0	74.2	75.8
11	73.0	72.0	70.2	79.1	71.5	76.8	87.4	84.1	77.0	72.1	72.0	76.9
12	70.2	71.7	71.9	74.3	79.9	73.6	84.1	84.7	73.4	72.2	77.4	76.0
13	74.8	68.9	72.8	75.8	78.0	79.2	85.8	82.4	76.5	73.1	76.8	74.2
14	74.3	71.9	74.9	75.2	75.2	78.5	85.9	83.9	80.3	71.5	72.6	71.9
15	72.7	70.9	74.1	74.4	76.0	72.3	81.7	77.6	81.6	80.6	73.8	69.0
16	74.9	74.7	75.4	69.8	75.2	75.4	80.4	81.3	76.9	78.9	72.8	74.6
17	75.8	73.6	77.8	71.3	73.4	79.7	78.8	80.8	83.1	74.9	69.5	72.9
18	74.7	71.6	75.4	69.6	74.9	77.9	82.6	80.7	76.5	75.9	69.9	68.1
19	73.2	77.1	73.4	72.9	76.4	75.3	78.8	83.8	70.9	77.8	77.4	71.4
20	73.9	75.4	79.1	73.6	75.2	79.3	76.8	84.6	72.3	80.2	77.5	72.2
21	74.2	74.8	76.3	75.0	73.7	73.9	80.9	84.2	74.9	73.6	72.6	67.4
22	73.1	72.7	73.3	74.0	75.8	80.7	79.3	84.3	75.4	69.0	73.1	69.3
23	68.9	69.4	74.9	75.0	78.2	79.1	84.1	81.3	74.7	67.1	71.8	68.8
24	74.6	76.5	78.0	79.1	76.3	76.5	84.7	85.7	79.7	80.6	73.7	77.1
25	72.0	71.9	77.5	77.4	72.6	74.8	80.2	80.3	77.3	80.1	75.2	67.0
26	72.9	71.9	75.6	78.1	76.9	82.6	84.7	81.6	78.0	73.2	74.1	73.5
27	72.0	74.7	74.3	75.2	80.9	78.6	83.1	84.6	76.9	81.4	71.2	72.6
28	70.8	70.2	72.1	79.5	81.1	78.3	80.3	81.2	78.0	74.1	72.5	69.0
29	70.4	75.2	72.7	78.9	77.6	83.2	78.8	82.4	72.1	71.6	72.7	75.3
30	72.3	—	73.7	78.1	80.2	81.0	80.6	80.6	74.5	79.1	81.5	70.1
31	69.3	—	76.1	—	78.6	—	75.7	74.3	—	78.7	—	73.9
Mean	72.4	73.2	74.4	75.1	76.6	78.0	81.4	81.2	77.9	75.7	74.1	72.0

Annual Mean 276.0

NOTES:—(1) The initial 2 and 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.
 (2) The minimum "on the grass" refers to the interval from 18h on the previous day to 7h on the day to which it is entered.

155. Aberdeen.

Table for January 1928 in Aberdeen, showing daily weather observations from 1st to 31st. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

156. Aberdeen.

Table for February 1928 in Aberdeen, showing daily weather observations from 1st to 29th. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

157. Aberdeen.

Table for March 1928, Aberdeen. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes a Mean Cloud Am't. row at the bottom.

158. Aberdeen.

April 1928.

Table for April 1928, Aberdeen. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes a Mean Cloud Am't. row at the bottom.

161. Aberdeen.

Table for July 1928, Aberdeen. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes a Mean Cloud Am't row at the bottom.

162. Aberdeen.

Table for August 1928, Aberdeen. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes a Mean Cloud Am't row at the bottom.

163. Aberdeen.

September, 1928.

Table for Aberdeen, September 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Rows 1-30 show daily observations.

164. Aberdeen.

October, 1928.

Table for Aberdeen, October 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Rows 1-31 show daily observations.

Table for Aberdeen, November 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Rows 1-30 show daily weather data.

Table for Aberdeen, December 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Rows 1-31 show daily weather data.



M.O. 320
(Eskdalemuir)

Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

ESKDALEMUIR

Published by the authority of the
METEOROLOGICAL COMMITTEE



LONDON
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

—
1930

ESKDALEMUIR OBSERVATORY.

Latitude	...	...	...	...	55° 19' N.
Longitude	...	...	...	...	3° 12' W.
G.M.T. of Local Mean Noon	...	...	...	...	12h. 13m.

Heights in metres above Sea-Level.

Barometer	...	...	...	...	237·3
Rain-gauge	...	...	...	...	242·0
Dines Tube Anemograph	...	...	...	...	250

Heights in metres above ground.

Thermometer Bulbs	...	...	...	0·9
Sunshine Recorder	...	...	...	1·5
Dines Tube Anemograph	...	...	...	15
Beckley Rain-gauge Rim	...	...	...	0·4

INTRODUCTION.

HISTORICAL.

Early in the twentieth century the increasing artificial magnetic disturbance at Kew Observatory, Richmond, due to the westward extension of the electric tramway system from London made desirable the establishment of a magnetic observatory in a locality unlikely to be affected, at least for a large number of years, by electric power or traction system. A committee of the Royal Society of London selected a site in the parish of Eskdalemuir, Dumfries-shire, for the new observatory. The nearest towns or industrial centres are Langholm and Lockerbie, distant approximately 16 and 18 miles (26 and 29 km.) by road, and there is no point of railroad within 9 miles (14 km.) of the Observatory. Installation of the instrumental apparatus commenced in the summer of 1908, the Observatory at that time forming a part of the then recently established National Physical Laboratory.

It seems to have been the initial intention that the new observatory should serve mainly as a magnetic annexe or substation to Kew Observatory, but as soon as it was possible to compare records of simultaneous magnetic changes at Eskdalemuir and Kew it was apparent that natural magnetic disturbance is considerably larger at the former station. Thus, in no sense can the magnetic results obtained at Eskdalemuir be regarded as a direct continuation of the Kew series. As it happened, magnetic observations (and the work of verification of magnetic instruments) were continued at Kew until the end of 1924.

Although the Observatory was established primarily in the interests of the study of terrestrial magnetism the field of geophysical work undertaken has been considerably wider and has included, almost from the beginning, meteorology, atmospheric electricity (mainly atmospheric potential gradient), and seismology. In the earlier years Milne, Wiechert, Omori, and Galitzin seismographs were in operation at Eskdalemuir, but seismological observations ceased in October, 1925, when the three-component installation of Galitzin seismographs was transferred to Kew Observatory. In 1910, when the majority of the various initial difficulties had been overcome, Eskdalemuir passed from the control of the National Physical Laboratory to that of the Meteorological Office. In consequence of this change the meteorological work assumed increased importance, and from the beginning of 1914 the Observatory has served as a telegraphic reporting station of the Meteorological Office.

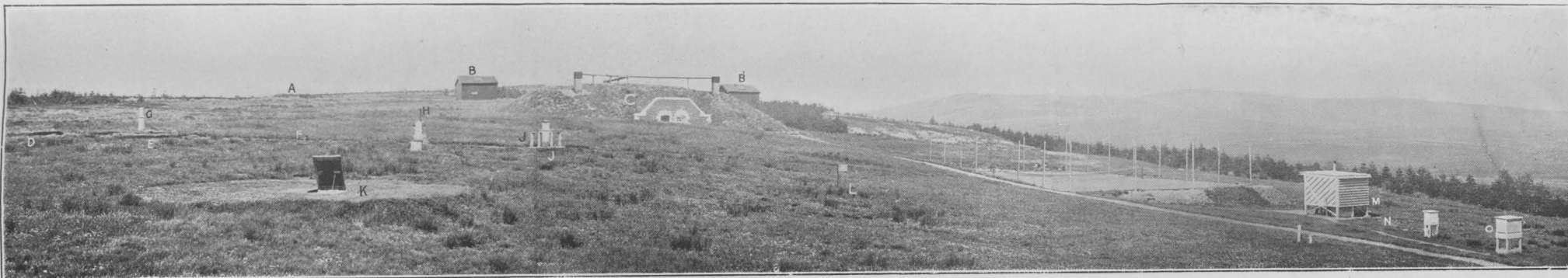


FIG. 10. GENERAL VIEW (NORTH-WEST TO NORTH-EAST) FROM MAIN OBSERVATORY BUILDING.

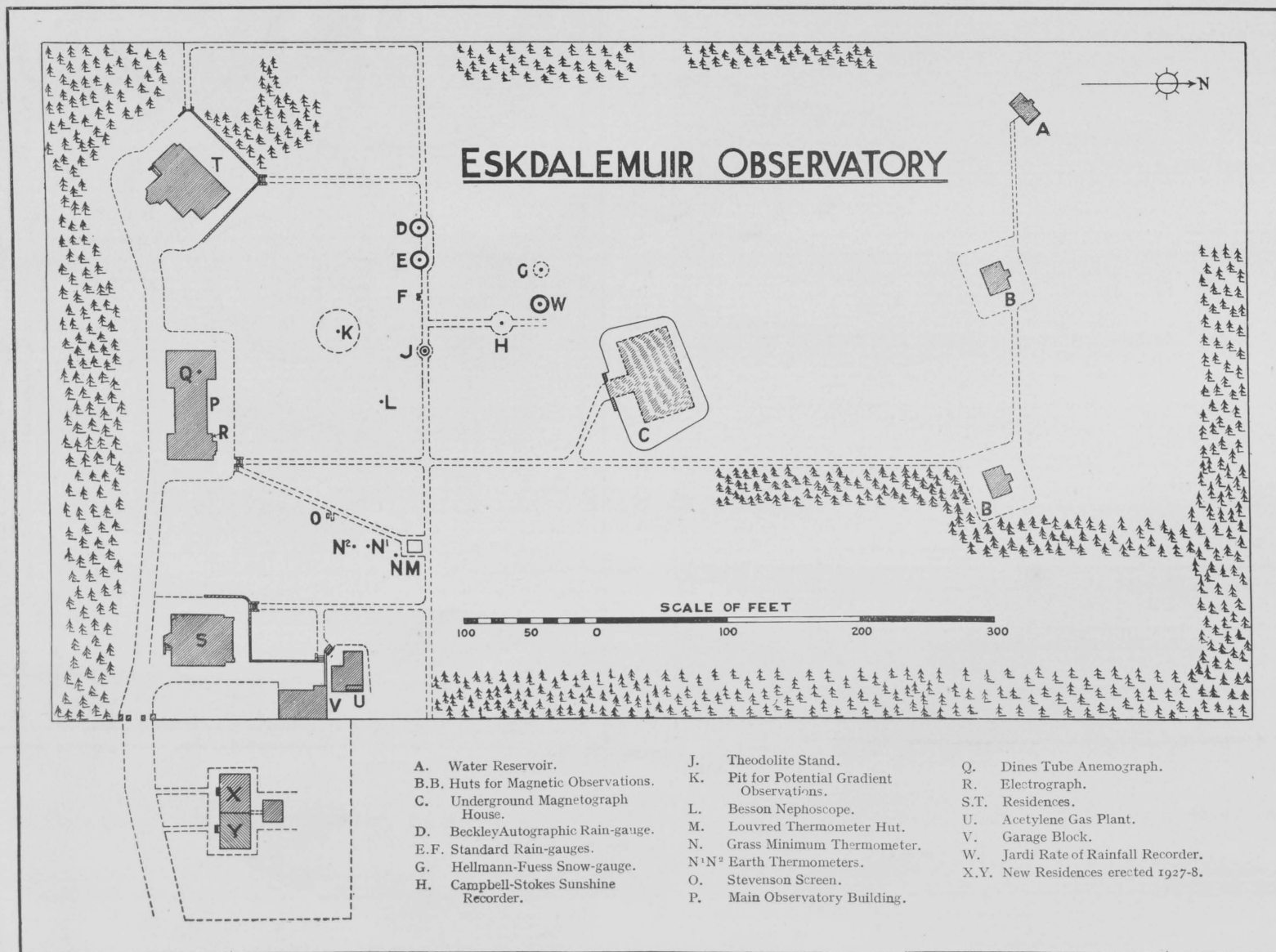


FIG. 11. SITE PLAN (for explanation see page 147).

ESKDALEMUIR OBSERVATORY.

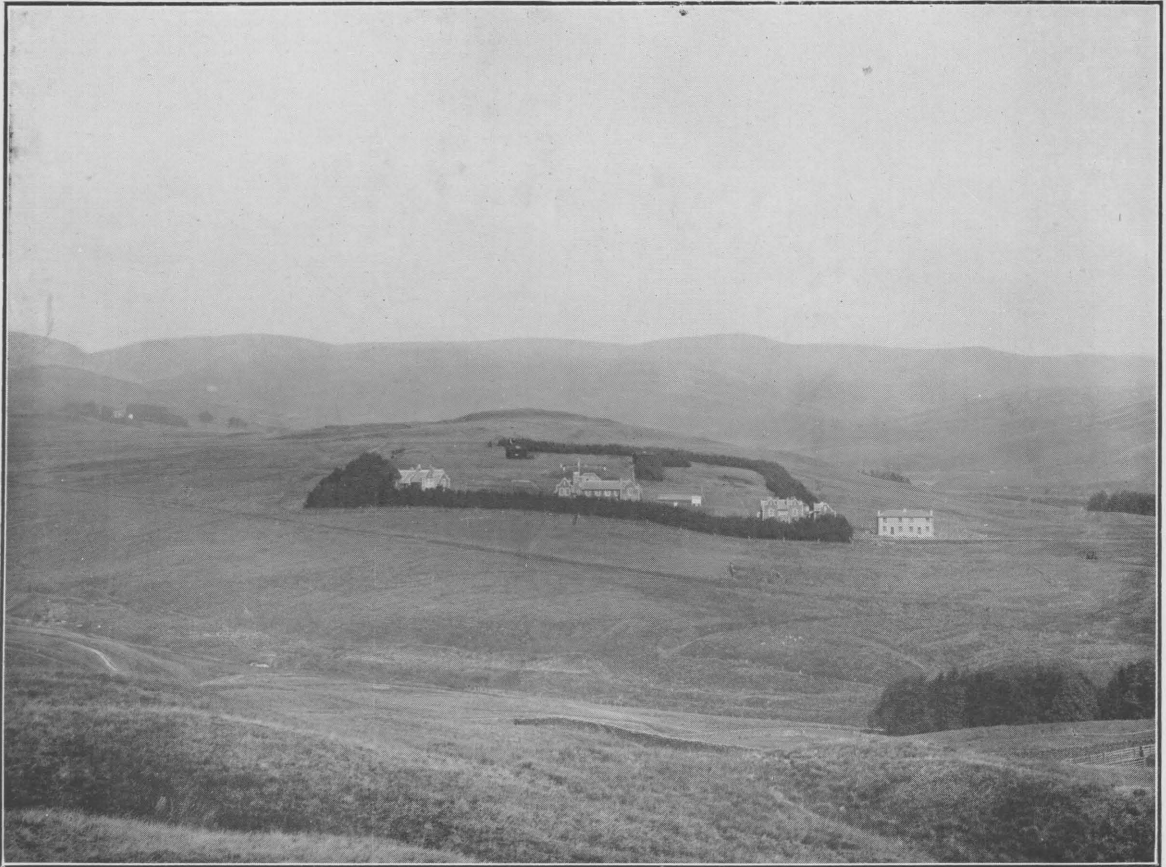


FIG. 12. GENERAL VIEW FROM SOUTH-SOUTH-WEST.

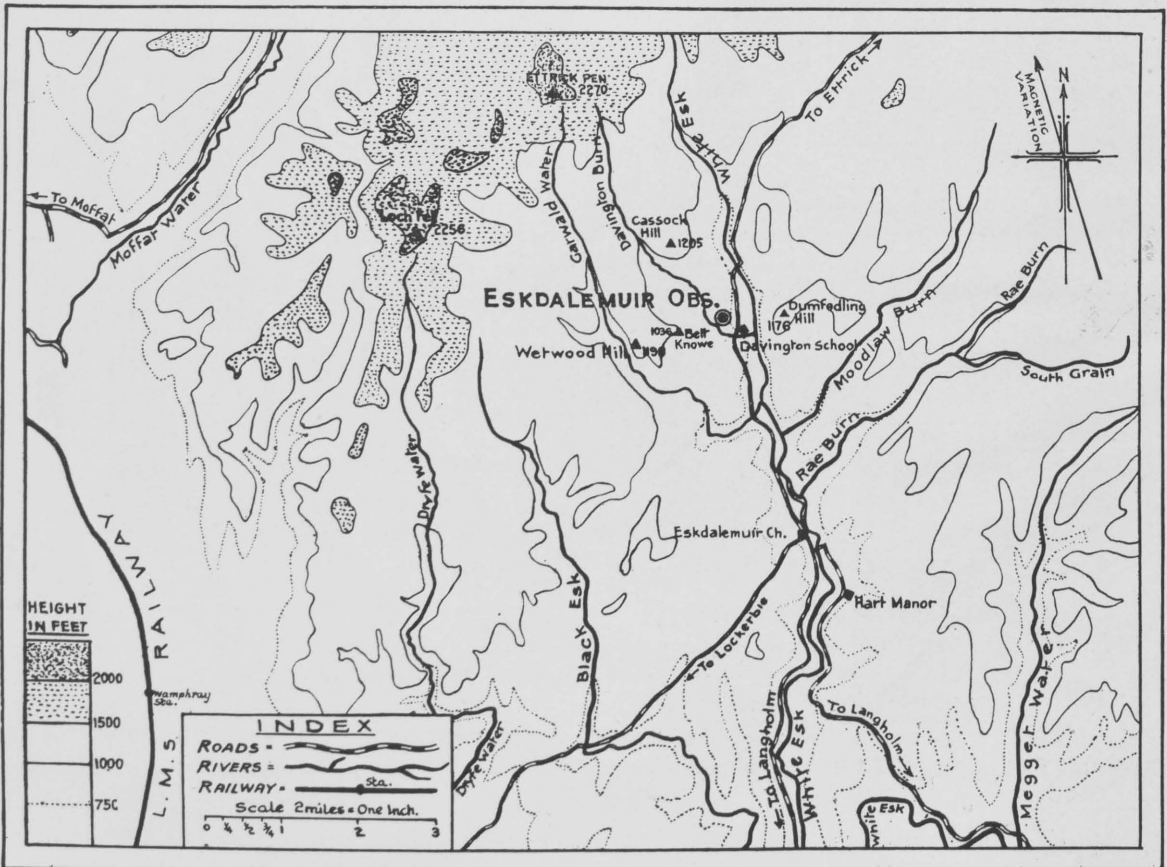


FIG. 13. CONTOURED MAP SHOWING POSITION OF OBSERVATORY.

Summaries of the results of observations made in 1909-10 were published in the Report of the Observatory Department of the National Physical Laboratory, 1909-10. The results for subsequent years are included in the publications mentioned in the Preface to the present volume.

SITE.

Eskdalemuir Observatory, some $3\frac{1}{2}$ miles ($5\frac{1}{2}$ kilometres) north-north-west of Eskdalemuir Parish Church in the county of Dumfries-shire, is situated on a rising shoulder of moorland which is bounded on the east by the road which leads north to Ettrick and Selkirk, on the west by the small Davington Burn, and at the southern extremity by the small hamlet of Davington.

The hillside in the immediate vicinity of the Observatory slopes generally from the north-west to south-east. The mean height above sea level of the Observatory site is about 800 feet (244 metres). Cassock Hill, slightly more than a mile distant to the north-west, is 1,205 feet (367 metres), while the bench mark at Davington School, $\frac{1}{4}$ mile (0.4 km.) to south-east, is 699 feet (213 metres) above M.S.L. To the east the ground slopes fairly rapidly to the valley bottom, the level of the Ettrick road at a point about $\frac{1}{4}$ mile (0.4 km.) east of the underground magnet house being 682 feet (208 metres). The River White Esk is rather less than $\frac{1}{2}$ mile (0.8 km.) to the east. Immediately beyond the river, and almost due east of the Observatory, Dumfedling Hill rises to a height of nearly 1,200 feet (366 metres) above M.S.L. Some 4 or 5 miles (8 km.) to the north is a high ridge, following approximately the boundary between Dumfries-shire and Selkirkshire, the highest point of which is Ettrick Pen (north-north-west) 2,200 feet (670 metres) above M.S.L. Rather more than half a mile (0.8 km.) to the west, and beyond Davington Burn, the ground rises to 1,040 feet (317 m.), and reaches nearly 1,200 feet (366 m.) half a mile (0.8 km.) further on. To the south and south-south-east the Observatory commands a view of the White Esk Valley as far as Hartmanor, 4 miles ($6\frac{1}{2}$ km.) distant, and beyond that the upper slope of Cauldkine Hill, about 10 miles (16 km.) distant, is visible. The surrounding country is bare and wild and there are but few trees to relieve the monotony of the grass-covered hills and moorland.

Within the Observatory grounds the soil is peaty and in many places is more or less boggy at all seasons. Some two feet, or less, below the surface a clay-like substance containing soft rock is encountered. The local geological formation is described as "rock of the Tarannon Llandovery series traversed by igneous dykes."

The general features of the immediate surroundings and the lay-out of the buildings may be seen from the accompanying photographs, plan and map.

The following brief descriptive notes serve as an index to the accompanying site plan (Fig. 11).

There is a narrow belt of trees—chiefly conifers, with a few birch and rowans—around the greater part of the Observatory enclosure. These trees were planted shortly after the building of the Observatory and subsequently. They are largest to the south, but few of them exceed 20 feet (6 metres) in height.

A is a water reservoir, from which water is distributed to the various buildings. The reservoir is fed from a spring on Cassock Hill by means of a pipe line.

B, B are two similar double-walled wooden huts in which absolute observations of the magnetic elements are made. The space between the inner and outer wooden shells is packed with non-conducting material. Lighting is provided by windows in the north sides and by skylights.

C is the underground magnetograph house, constructed throughout of non-magnetic material. Within the outer shell of stone and concrete, and separated therefrom and from each other by corridors and vaultings, are two similar rooms of which the approximate internal dimensions are:—Length, 25 feet (7·6 m.); width, 20 feet (6·1 m.); height, 10 feet (3·0 m.). The ceilings of the rooms are just below the undisturbed level of the surrounding ground. The roof portion of the outer containing shell is covered with a thick layer of earth, thus forming the mound shown in Fig. 10. The super-structure which is visible in the photograph is part of the ventilation system. The east room contains the standard magnetographs and the photographic barometer. Other magnetographs have been set up from time to time in the west room. Acetylene gas is used as illuminant.

D is the Beckley self-recording rain-gauge, and E the standard 8 inch rain-gauge; each is surrounded by a low wall or dyke of turf. F is an auxiliary 8 inch rain-gauge but is not artificially screened. G is a snow-gauge of the Hellmann pattern, made by Fuess.

H is the Campbell-Stokes sunshine recorder.

J is a concrete pillar, 4 feet high, on which a pilot-balloon theodolite may be mounted. The pillar is surrounded by a wooden seat of convenient dimensions.

K is the pit from which observations of the electric potential at 1 metre above the surface of the ground are made. The dimensions of the brick-lined pit are 4 feet (1·2 m.) by 3 feet (0·9 m.) by 3 feet. The lid which consists of a fixed and a hinged portion is covered with zinc, is provided with a small glass window, and is flush with the level of the approximately circular lawn indicated on the plan by the dotted circle.

L is a stone pillar formerly used as a support for an Ebert ion-aspiration apparatus but latterly used to support a Besson Comb nephoscope.

M is a large louvred hut which contains the standard dry and wet bulb thermometers, the photographic and pen thermographs, and maximum and minimum thermometers. The hut, of which the general features may be seen on reference to Fig. 10, is painted white inside and out. Until 1925, when electric light was introduced, acetylene gas was the illuminant for the photographic thermograph.

N marks the position in which the grass minimum thermometer is exposed between 18h and 9h G.M.T.

N¹, N² are earth thermometers, 1 foot (0·3 m.) and 4 feet (1·2 m.) below ground level respectively.

O is an auxiliary screen in which a hair hygograph was exposed until June 15, 1928.

P is the main building, two-storied, and containing offices, workshop, laboratory, seismograph and photographic rooms. Q indicates the position of the mast of the Dines tube anemograph and R the position of the jet of the Kelvin water-dropper electrograph.

S, T are residences (Rayleigh House and Schuster House, respectively).

U is the acetylene gas generating house.

V is a block containing the garage, the electric lighting generating set and the accumulator batteries. The electric lighting equipment, which was installed in 1924, provides for continuous illumination for photographic recording instruments in M and P and for occasional general lighting in P, U and V. The voltage on the lighting

circuits is restricted to 8 volts. Connection between the battery room in V and buildings M and P is by underground cable which is insulated, lead covered, and armoured. All precautions have been taken to guard against leakage of current to earth.

W is a Jardi rate of rainfall recorder. It is installed in a pit six feet (1·8 m.) deep and screened by a low dyke of turf.

X, Y are residences (Glazebrook House and Shaw House, respectively) which were erected in 1927-8.

METEOROLOGY.

The elements dealt with in the following tables are:—Atmospheric pressure, air temperature, humidity, rainfall, sunshine, solar radiation, wind speed and direction, and minimum temperature on the grass. There is also a diary of cloud and weather.

Notes on Instruments.

Brief descriptions of the recording instruments and of the methods of tabulating the records, with notes on the information contained in the Tables, are given in the General Introduction to the Tables. The following particulars, which refer specially to Eskdalemuir, are to be regarded as amplifying the information contained therein. References to full accounts of other instruments used at Eskdalemuir appear below.

Pressure.—The standard mercury barometer, Kew pattern, is situated in a north window embrasure on the ground floor of the main building.

The photographic mercurial barograph is situated in the east room of the underground magnet house. The daily range of temperature to which the instrument is subject is normally less than 0·05°C., the annual range being about 4°C. The scale value of the records is 1 millimetre on the paper = 0·85 millibar, and the time scale is 9·1 millimetres on the paper = 1 hour.

As in former years, records of pressure were also obtained from (a) a Dines float barograph¹, and (b) a Richard barograph, pen recording, the records of which are changed weekly.

Temperature.—The photographic thermograph and the standard mercurial thermometers, dry bulb and wet bulb, are situated in a wooden hut, provided with louvred sides and double roof, which is some 200 feet (60 m.) north-north-east of the main building. The installation is similar to that described on p. 10, except that a special enclosure is provided inside the hut to accommodate the optical and photographic arrangements.

The scale values of the thermograph records are 1a. = 3·064 mm. and 2·438 mm. on the paper for the dry and wet bulb records respectively, while the time scale is 1 hour = 9·250 mm.

Auxiliary records of temperature are obtained from one or more instruments of the bimetallic type described in the *Meteorological Observers' Handbook*. These instruments are situated in the hut which contains the photographic thermograph.

Humidity.—In addition to the dry and wet bulb thermograph described above there is a Richard hair hygograph which was situated in a Stevenson screen about midway between the louvred hut and the main building until June 15, 1928, and in the louvred hut after that date.

¹ Q.J.R. Meteor. Soc., Vol. LV, pp. 37-53, 1929.

As is stated in the General Introduction, the records from this instrument are utilised when the wet bulb reading does not exceed 273a. On the records obtained in 1928 a change of 10 per cent. in relative humidity is represented by about 0.8 centimetre, the time scale being 1 hour = 3 millimetres.

Rainfall.—The recording instrument is a Beckley self-registering rain-gauge, which is described on p. 13. The time scale of the record is 1 hour = 9.24 millimetres on the paper and the rain scale has a magnification of 3.35. The instrument has been in use at Eskdalemuir since 1908 and was originally installed at Fort William in July, 1890.

The conical part of the gauge funnel is surrounded by a cylindrical copper casing lined with asbestos on the inner side and of diameter equal to that of the funnel, viz. 11.27 inches (28.6 cm.). Within the enclosure so formed is a gas jet, and a flame of suitable dimensions is maintained, as circumstances dictate, to melt snow which may be collected.

The gauge is surrounded by a circular turf wall or dyke, the top of which is on a level with the rim of the gauge; the external and internal diameters of the dyke being 11.5 feet (3.5 m.) and 7 feet (2 m.) respectively.

A standard 8 inch (20.3 cm.) rain-gauge is situated some 24.5 feet (7.5 m.) to the east of the Beckley gauge and is surrounded by a turf dyke of similar dimensions. Readings of amounts of rain received in the 8 inch gauge are made at 7h and 18h G.M.T. It is customary to adjust the indications of the recording gauge to agree with the readings of the standard check gauge.

Until May 14 and again after November 8 auxiliary autographic records of precipitation were obtained by means of a Hellmann-Fuess snow-gauge. In the former period the exposure of the instrument was as described on p. 142 of *The Observatories' Year Book, 1927*. In the latter period the gauge was situated in a somewhat deeper pit 8 feet (2.4 m.) almost due north of the 8 inch standard gauge, the pit being surrounded by a low wall of earth and turf—the top of the wall being approximately level with the rim of the gauge. The records so obtained are used only in the event of failure or uncertainty of the Beckley autographic record.

Sunshine.—The record of sunshine is obtained from a Campbell-Stokes recorder described on p. 13.

The recorder is fixed on a stone pillar and has a reasonably free exposure, the chief obstacles being hills to east and west. The elevation of hills between 70° and 110° east of south varies from 2.5° to 5°, while between 50° and 135° west of south the high ground varies in elevation from 3° to 4.4°, being generally about 3.5°. As sunshine can be recorded when the sun is 3° above the horizon only in the most favourable circumstances, it appears that the loss of record occasioned by the neighbouring high ground is of relatively small extent and is confined mainly to a possible defect of record at the beginning of the day during a few weeks centred about the equinoxes.

Solar Radiation.—Measurements of the intensity of radiation received from the sun by a surface which is normal to the line drawn from the instrument to the sun are effected by means of an Ångström compensating pyrliometer.¹ The intensity of radiation is expressed in milliwatts per square centimetre (1mw. per sq. cm. = 0.01435 gramme calorie per sq. cm. per minute). In addition, the value is given of

¹ For description see *The Observer's Handbook, 1921*, Ed., Meteorological Office, London; *Astro-physical Journal*, Vol. IX, 1899; *Actes de la société royale des Sciences d'Upsal*, 1893; also *Geophysical Memoirs*, No. 21 (1923), Meteorological Office, London. The pyrliometer was under repair as from September 20, 1928.

the function $(p/p_0) \sec Z$, in which p is the barometric pressure at the observatory in millibars at the time of the observation, p_0 is 1000 millibars, and Z is the zenith distance of the sun. This affords a measure of the mass of atmosphere which the solar radiation has had to penetrate before reaching the earth. Entries in the column headed "Sky" are intended to show the presence or absence of haze, mist or cloud in the direct path of the solar radiation recorded.

Wind.—A Dines tube anemograph, furnished with direction recorder, is situated in the main building. The vane-head is 15 metres above a tangent plane to the slope of the hillside and approximately 7 metres above the general level of the roof of the building.

The anemograph vane in use throughout 1928 is that which was introduced in August, 1925. It differs from that formerly in use in that the greatest dimension of the fin is vertical instead of horizontal, and that the cross-section of the fin is of aerofoil shape. A twin-lever direction recorder has been in use since June, 1925. In this instrument a pen is carried by each of two pivoted arms, upper and lower. A projection from each arm engages with a flange of a dual helical device cut in a short cylinder (of vertical axis) which rotates with the vane, being connected thereto by a vertical "rod" consisting of steel tubing 1.5 cm. external diameter.

No modifications to the anemograph were made in 1928. On February 2 and March 12 choking of the head with snow rendered the record unreliable.

Apart from the surrounding hills, the exposure of the vane-head is tolerably free in all directions save to the west where at a distance of some 130 feet (40 m.) is a rather large building, of which the height is somewhat greater than that of the main building. With winds from nearly due west the direction records show markedly greater turbulence than with other winds.

Earth Temperature.—Commencing on July 28, 1928, readings have been made at 9h. G.M.T. of the earth temperature at nominal depths of one foot and four feet below the surface of the grass lawn a few yards south of the thermometer hut. The thermometers and the method of exposure are of the standard type described in the *Meteorological Observers' Handbook*. The depths of the thermometer bulbs below the grass-covered surface of the ground are 30 and 123 cm.

Minimum Temperature on the Grass.—The thermometer used for readings of grass minimum temperature is of the spirit type with index; and when exposed, between 18h and 7h G.M.T., is supported at a height of one or two inches (4 cm.) above close-cropped grass a few metres from the louvred thermometer hut.

Visibility.—The descriptions of the selected visibility objects, together with the distances and bearings from the point of observation, are given in the subjoined table. Auxiliary objects and guide criteria are given in brackets. Certain of the nearer objects may be identified by reference to the photographs and site plan. Unless otherwise stated, the distances and bearings are with reference to certain of the windows on the upper floor of the main building.

The situation of the Observatory and the nature of the immediate surroundings allow of only a very limited choice of objects. The objects A to D are situated mainly to the north, while the more distant objects are toward south to south-east, *i.e.*, down valley. Four miles or so to the north of the Observatory the hills rise in places to rather more than 2,000 feet above sea level and at times visibility in this direction is distinctly less than towards south. On other occasions the hills to the north are visible, but nearer objects down the valley are invisible owing to valley mist. With the exception of the cottage at Finglandshiel, and Cauldkine Hill, the objects more distant than D are below the level of the Observatory. There are no objects

at distances which approximate sufficiently closely to the standard distances for objects H, J, and K. When it is estimated that the range of visibility is such that objects at these standard distances would be visible the corresponding small letter entries are made in the Diary of Cloud and Weather. The estimates of visibility in the dark depend largely on the judgment of the observer. There are no lights other than those in the Observatory buildings and in two cottages within a radius of one mile.

VISIBILITY OBJECTS AT ESKDALEMUIR.

Object.	Description.	Distance.	Bearing.
A	(i) White wooden post	25 yards	NE.
	(ii) Twigs on trees nearest the boundary wall in front of the main building	25 "	S.
	(iii) Small thermometer screen—viewed from steps facing the back entrance to the main building	26 "	NNE.
B	(i) Theodolite pillar	55 "	N.
	(ii) Chimney (or cowl) on the large thermometer screen	60 "	NE.
C	Posts and shafts on underground magnetograph house ...	107 "	N.
D	Standards on Observatory water reservoir	217 "	NNW.
E	(i) Church and Manse, Davington	550 "	SE.
	(ii) (Davington Farm House)	470 "	SSE.
F	(i) Chimneys at Burncleuch	1180 "	SSE.
	(ii) (Cottage at Finglandshiel)	1550 "	NE.
G	Trees at Garwaldwaterfoot	2160 "	SSE.
H (h)	(Lower slope of Raeburn Hill)	2½ miles	SSE.
I	Hart Manor	4 "	SSE.
J (j)	(Cauldkine Hill, 1,478 feet, near Westerkirk; not clearly visible)	10½ "	SSE.
K (k)	(Cauldkine Hill, 1,478 feet, near Westerkirk; plainly visible)		
L (l)	No objects available		
M (m)			

Note.—The descriptions of auxiliary objects and guide criteria are given in brackets.

IDENTIFICATION NUMBERS OF INSTRUMENTS IN USE IN 1928.

Standard Kew pattern Barometer	.. .. .	M.O. 1320
Standard Dry Bulb Thermometer	.. .. .	M.O. 19123
Standard Wet Bulb Thermometer	.. .. .	M.O. 1695
Hair Hygrograph	.. .. .	M.O. 59
Recording Beckley Rain-gauge	.. .. .	4
Control Rain-gauge	.. .. .	M.O. 391
" " glass for	.. .. .	M.O. 1354
Campbell-Stokes Sunshine Recorder	.. .. .	M.O. 99
Ångström compensating Pyrheliometer	.. .. .	116
Dines Tube Anemograph	.. .. .	M.O. 1032
Grass Minimum Thermometer	.. .. .	M.O. 23008

CORRECTIONS TO INSTRUMENTS IN USE IN 1928.

The corrections to the instruments in use during 1928 are given below. In all cases the corrections are those given in the certificate of examination issued by the National Physical Laboratory. The corrections here given have been applied in 1928 and, with the exception of the grass minimum thermometer, in previous years. The date on which each of the instruments mentioned was brought into use is given for purposes of reference.

Kew pattern barometer, M.O. 1,320. December 16, 1913.
 at 920 940 960 980 1,000 1,020 1,040 1,060 mb.*

-0.4 -0.3 -0.2 -0.1 -0.1 0.0 +0.1 +0.1
 attached thermometer: +0.1 at 290a.

Dry Bulb Thermometer, M.O. 19,123. January 27, 1919.
 at 263 268 273 278 283 288 293 298 303a.

+0.2 +0.1 0.0 0.0 0.0 -0.1 -0.1 -0.1 -0.1

Wet Bulb Thermometer, M.O. 1,695. November 1, 1915.
 at 260 265 270 275 280 285 290 295 300 305a.

+0.20 +0.15 +0.15 0.00 -0.10 -0.15 -0.15 -0.10 -0.10 -0.10

Grass Minimum Thermometer, at 253 263 273 283 293 303a.

M.O. 23008 -0.1 -0.2 0.0 0.0 -0.1 -0.2

NOTE ON THE REDUCTION OF BAROMETER READINGS.

The Kew pattern mercury barometer, M.O. 1320, by J. Hicks, London, has been used as the standard instrument since December 16, 1913. Before this date a Fortin barometer, 657, was the standard instrument.

1. *Reduction to Pressure at Station Level.*—For this purpose it has been the custom to apply to a reading of the Kew pattern barometer a total correction embodying the separate corrections in respect of index error, temperature, and gravity. The corrections for index error (including those for capacity and capillarity) as given in the N.P.L. certificate dated November 26, 1913, are reproduced above. The corrections for temperature are those given in the *International Meteorological Tables* as appropriate to a Fortin barometer. At the time the index corrections of the barometer were determined, the comparisons were made at ordinary room temperatures in the neighbourhood of 60° F. (288a), and as the observing barometer was regularly read at room temperatures, which did not differ materially from 60° F., the practice of using corrections appropriate to a Fortin barometer, although technically incorrect, would not lead to appreciable systematic error in practice.

In the following table are set out the corrections to the barometer readings on this account, for various readings of the attached thermometer.

If the temperature is { above } 288a { subtract } the correction :
 { below } { add }

Attached thermometer.	Corrections.	Attached thermometer.
<i>a</i>	<i>mb.</i>	<i>a.</i>
288	·00	288
287	·01	289
286	·01	290
285	·02	291
284	·03	292
283	·04	293
282	·05	294
281	·06	295
280	·07	296

* These corrections, if applied to readings of the barometer, would bring the readings into agreement with the atmospheric pressure, provided the instrument were at a temperature of 273a. (0°C) and in Latitude 45°.

The corrections for the variation of gravity as obtained from the expression
 $g = 980.617 (1 - 0.00259 \cos 2\lambda) (1 - 5z/4E)$
 where λ = latitude
 z = height of the station
 E = earth's radius

are as follow :—

at reading of 900 920 940 960 980 1000 1020 1040 mb.

Correction +.78 +.80 +.81 +.83 +.85 +.87 +.88 +.90 mb.

2. *Reduction to Mean Sea Level.*—The correction to reduce pressure at station level (p) to pressure at sea level (P) is $P - p$

where $\log_e (P/p) = \frac{\bar{g}z}{K\bar{T}} (1 - \frac{3\bar{w}}{8p}) \dots\dots\dots (A)$

z = height of station in centimetres.

e = base of Napierian logarithms.

K = gas constant for dry air = $10^9/348.4$ C.G.S. units.*

\bar{T} = mean absolute temperature of air column between Station level and Mean Sea level.

\bar{w} = mean value of water vapour pressure in air column.

\bar{g} = mean value of the acceleration due to gravity in the air column. This mean value coincides with the value of gravity at some definite height h above mean sea level, and is given by

$$980.617 (1 - 0.00259 \cos 2\lambda) (1 - 2h/E).$$

For the relatively small height of Eskdalemuir we can write $z/2$ for h (Actually the term $2h/E$ exercises no appreciable effect on the final result in this case).

It will be noted that the above expression for g differs from that in a preceding paragraph as regards the correction for altitude ; the one referring to determination of gravity at the earth's surface, the other at a point above the earth's surface. This difference is in accordance with the usage of the *International Meteorological Tables*, and it has been decided to make no change, although recent work on isostasy indicates that in many cases the correction $2h/E$ is more nearly in accordance with observation than the correction $5z/4E$.

The term $(1 - \frac{3\bar{w}}{8p})$ in the above formula represents approximately the ratio of the density of moist air to that of dry air at the same temperature. Since the value of \bar{w} is not known, an approximate correction on account of the effect of water vapour in the air column is made, so that in practice the correction for the reduction of station-level pressure (p) to sea-level pressure (P) is taken to be

$$P - p = p_0 - p - \frac{w^\dagger}{100}$$

where $\log_e \frac{p_0}{p} = \frac{\bar{g}z}{K\bar{T}} = \frac{\bar{g}z}{K(\bar{T} + 1)} \dots\dots\dots (B)$

w is water vapour pressure at station level. T is the absolute temperature of the air at station level, and e, \bar{g}, z, \bar{T} and K have the same values as before.

In computing the value of $p_0 - p$ the value of \bar{T} has been taken to be the air temperature at station level increased by 1a, i.e., a uniform lapse rate of 1° C in 119 metres has been assumed to apply at all times of day and all seasons of the year. The values of $p_0 - p$ for different values of p and of air temperature at station level, in accordance with equation (B), are given in the subjoined table. As indicated in the formula above the allowance for the water vapour in the air column is made by subtracting $w/100$ (w being the water vapour pressure at station level) from the value of $p_0 - p$ extracted from the table.

* This value depends on a co-efficient of expansion of dry air of 1/273.

† The correction $-\frac{w}{100}$ is the approximate value at Eskdalemuir of the difference $P - p_0$, as computed from equations (A) and (B).

CORRECTIONS USED AT ESKDALEMUIR FOR REDUCING PRESSURE AT STATION LEVEL TO PRESSURE AT MEAN SEA LEVEL.

Air Temperature at Station Level.	Pressure at Station Level in Millibars.											
	920	930	940	950	960	970	980	990	1000	1010	1020	1030
a.	Millibars.											
260	29.05	29.37	29.68	30.00	30.31	30.63	30.95	31.26	31.58	31.89	32.21	32.53
261	28.94	29.25	29.57	29.88	30.20	30.51	30.83	31.14	31.45	31.77	32.08	32.40
262	28.83	29.14	29.45	29.77	30.08	30.39	30.71	31.02	31.33	31.65	31.96	32.27
263	28.72	29.03	29.34	29.65	29.97	30.28	30.59	30.90	31.21	31.53	31.84	32.15
264	28.61	28.92	29.23	29.54	29.85	30.16	30.47	30.78	31.09	31.41	31.72	32.03
265	28.50	28.81	29.12	29.43	29.74	30.05	30.36	30.67	30.98	31.28	31.59	31.90
266	28.39	28.70	29.01	29.31	29.62	29.93	30.24	30.55	30.86	31.17	31.47	31.78
267	28.28	28.59	28.90	29.20	29.51	29.82	30.13	30.43	30.74	31.05	31.36	31.66
268	28.17	28.48	28.79	29.09	29.40	29.71	30.01	30.32	30.62	30.93	31.24	31.54
269	28.07	28.37	28.68	28.98	29.29	29.59	29.90	30.20	30.51	30.81	31.12	31.42
270	27.96	28.27	28.57	28.88	29.18	29.48	29.79	30.09	30.40	30.70	31.00	31.31
271	27.86	28.16	28.47	28.77	29.07	29.37	29.68	29.98	30.28	30.59	30.89	31.19
272	27.76	28.06	28.36	28.66	28.96	29.26	29.57	29.87	30.17	30.47	30.77	31.07
273	27.65	27.95	28.25	28.55	28.85	29.15	29.46	29.76	30.06	30.36	30.66	30.96
274	27.55	27.85	28.15	28.45	28.75	29.05	29.35	29.65	29.95	30.25	30.54	30.84
275	27.45	27.75	28.05	28.34	28.64	28.94	29.24	29.54	29.84	30.13	30.43	30.73
276	27.35	27.65	27.94	28.24	28.54	28.84	29.13	29.43	29.73	30.02	30.32	30.62
277	27.25	27.55	27.84	28.14	28.43	28.73	29.03	29.32	29.62	29.91	30.21	30.51
278	27.15	27.45	27.74	28.03	28.33	28.63	28.92	29.22	29.51	29.81	30.10	30.40
279	27.05	27.35	27.64	27.93	28.23	28.52	28.82	29.11	29.40	29.70	29.99	30.29
280	26.95	27.25	27.54	27.83	28.13	28.42	28.71	29.01	29.30	29.59	29.88	30.18
281	26.86	27.15	27.44	27.73	28.02	28.32	28.61	28.90	29.19	29.48	29.78	30.07
282	26.76	27.05	27.34	27.63	27.92	28.21	28.51	28.80	29.09	29.38	29.67	29.96
283	26.67	26.95	27.25	27.53	27.83	28.11	28.40	28.69	28.98	29.27	29.56	29.85
284	26.57	26.86	27.15	27.44	27.73	28.01	28.30	28.59	28.88	29.17	29.46	29.75
285	26.48	26.76	27.05	27.34	27.63	27.91	28.20	28.49	28.78	29.07	29.35	29.64
286	26.38	26.67	26.96	27.24	27.53	27.82	28.10	28.39	28.68	28.96	29.25	29.54
287	26.29	26.58	26.86	27.15	27.43	27.72	28.00	28.29	28.58	28.86	29.15	29.43
288	26.20	26.48	26.77	27.05	27.34	27.62	27.91	28.19	28.48	28.76	29.05	29.33
289	26.11	26.39	26.67	26.96	27.24	27.53	27.81	28.09	28.38	28.66	28.94	29.23
290	26.01	26.30	26.58	26.86	27.15	27.43	27.71	27.99	28.28	28.56	28.84	29.13
291	25.93	26.21	26.49	26.77	27.05	27.33	27.61	27.90	28.18	28.46	28.74	29.02
292	25.83	26.11	26.40	26.68	26.96	27.24	27.52	27.80	28.08	28.36	28.64	28.92
293	25.75	26.03	26.31	26.59	26.87	27.15	27.43	27.71	27.98	28.26	28.54	28.82
294	25.66	25.94	26.21	26.49	26.77	27.05	27.33	27.61	27.89	28.17	28.45	28.73
295	25.57	25.85	26.13	26.40	26.68	26.96	27.24	27.51	27.79	28.07	28.35	28.63
296	25.48	25.76	26.04	26.31	26.59	26.87	27.14	27.42	27.70	27.97	28.25	28.53
297	25.40	25.67	25.95	26.22	26.50	26.78	27.05	27.33	27.60	27.88	28.16	28.43
298	25.31	25.58	25.86	26.13	26.41	26.69	26.96	27.23	27.51	27.79	28.06	28.33
299	25.22	25.50	25.77	26.05	26.32	26.59	26.87	27.14	27.42	27.69	27.97	28.24
300	25.14	25.41	25.69	25.96	26.23	26.51	26.78	27.05	27.32	27.60	27.87	28.15
301	25.05	25.33	25.60	25.87	26.14	26.42	26.69	26.96	27.23	27.51	27.78	28.05
302	24.97	25.24	25.51	25.79	26.06	26.33	26.60	26.87	27.14	27.41	27.68	27.96
303	24.89	25.16	25.43	25.70	25.97	26.24	26.51	26.78	27.05	27.32	27.59	27.86
304	24.81	25.07	25.34	25.61	25.88	26.15	26.42	26.69	26.96	27.23	27.50	27.77

NOTES ON THE METEOROLOGICAL SUMMARIES.

The number of years for which meteorological results are available is insufficient as yet to yield a completely representative set of normal values. Although certain meteorological data are available for 1909 and 1910 it is only since 1911 that the reductions have been made in accordance with an approximately uniform plan. In the following notes the normal or average values referred to are for the period 1911 to 1926, unless otherwise stated.

Pressure.—As was the case generally in the British Isles the mean pressure for the year was below normal, the defect at Eskdalemuir being 1.3 mb. Only in February, May, July, September and December were the monthly means above normal, whilst in January, April, June, October and November they were conspicuously below normal. The extreme instantaneous values recorded were 1008.5 mb. on February 22 and 928.0 mb. on November 23. The greatest and least mean daily values are 1004.1 and 948.4 mb. on these two dates respectively. The largest values of the range during a calendar day are 39.7 mb. on February 10 and November 23. The mean value of the absolute daily range of pressure varies between 14.0 mb. in January and 4.7 mb. in May and July. The annual mean value of the daily range is a little above normal.

Pressure (Diurnal Variation).—In the mean diurnal inequality for each month there are two maxima, in the late forenoon and usually an hour or two before midnight, and two minima, in the early forenoon and at 16h or 17h. In all months, excepting September, October and December, of 1928, the night maximum is the larger, and except for January, February and November this is true of the representative inequalities for the years 1911–20. The principal minimum in the latter inequalities is in the afternoon except in February, March, August and November, but in 1928 the principal minimum falls in the early forenoon in July, August, September, October and December. Compared with the mean diurnal inequality for 1911–20 the values of the mean inequality for the year 1928 are algebraically less from 9h to 17h and greater from 19h to 7h. In other words, relatively speaking the afternoon trough in 1928 is enhanced, the night crest enhanced and somewhat prolonged in time, the early forenoon trough and the forenoon crest diminished.

The results of the harmonic analysis of the monthly and seasonal mean diurnal inequalities for 1928 are given in the accompanying table. For purposes of comparison the corresponding data ⁽¹⁾ derived from the mean inequalities for the period 1911–20 are also given. In computing the Fourier co-efficients for the individual months of 1928 the unit employed was .01 mb.; but for the seasons and the year the inequalities were taken to .001 mb., and in these cases the values of c_1 etc. are given to three decimal places. Although for 1928, as for recent years, the phase angles are given to the nearest 1° , this course is scarcely justified, at least for the third and fourth components, by the character of the data from which the harmonic coefficients for the months and seasons of a single year are computed. The phase angles α_1 etc. given in the table below refer to Local Mean Time, whereas in the corresponding tables for 1922 and 1923 the phase angles refer to Greenwich Mean Time.

As is usually the case the amplitude and phase of the 24-hour term fluctuate irregularly from month to month. The ratio of the mean of the twelve monthly values of c_1 to the value of c_1 for the year as a whole considerably exceeds unity and is greater than in any of the years 1922–7. c_1 is noticeably high for January and for November, low for October. The values of c_2 for the year, winter and summer, are less than the corresponding normals. The variation in the 8-hour term from month to month is fairly normal, the amplitude being largest in winter months and least at the time of equinoctial phase transition. The values of c_3 for the year, winter, and equinox are slightly above normal; that for summer is very slightly below normal. For the 6-hour term, also, the amplitude for the year, winter and summer, is above normal.

⁽¹⁾ "On the Diurnal Variation of Atmospheric Pressure at Eskdalemuir and Castle O'er, Dumfriesshire," by A. Crichton Mitchell, D.Sc., *Quarterly Journal of the Royal Meteorological Society*, Vol. L., No. 210, April, 1924.

HARMONIC COEFFICIENTS OF THE DIURNAL INEQUALITY OF ATMOSPHERIC PRESSURE—ESKDALEMUIR, LONGITUDE 3° 12' W.

Values of c_n, α_n in the series $\Sigma c_n \sin (15nt^\circ + \alpha_n)$, t being Local Mean Time reckoned in hours from midnight.

Month and Season.	c_1		α_1		c_2		α_2		c_3		α_3		c_4		α_4	
	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.	1928.	1911-20.
Jan. ...	mb. .67	mb. .094	° 75	° 346.4	mb. .12	mb. .235	° 190	° 151.6	mb. .06	mb. .125	° 30	° 345.3	mb. .06	mb. .046	° 266	° 213.9
Feb. ...	.27	.118	82	215.1	.24	.273	168	138.1	.14	.083	344	341.2	.05	.042	357	67.7
Mar. ...	.11	.128	61	185.3	.36	.304	151	145.3	.14	.053	301	335.0	.04	.051	24	24.5
Apr. ...	.37	.205	116	92.3	.37	.299	156	154.8	.05	.022	201	156.3	.06	.045	344	355.7
May ...	.32	.225	63	52.7	.28	.270	139	147.4	.06	.075	174	160.1	.03	.035	341	330.1
June ...	.27	.152	101	53.9	.22	.234	151	146.1	.08	.084	165	160.6	.02	.018	354	325.7
July ...	.12	.171	224	69.4	.18	.211	148	141.2	.08	.077	164	155.8	.03	.023	5	300.0
Aug. ...	.16	.114	173	114.6	.21	.239	147	147.7	.07	.057	156	157.2	.04	.047	341	330.8
Sept. ...	.18	.121	253	87.7	.28	.313	158	151.6	.02	.012	73	110.7	.04	.050	6	344.7
Oct. ...	.04	.110	157	76.0	.33	.315	173	159.5	.10	.060	21	8.2	.04	.041	45	32.9
Nov. ...	.100	.125	68	183.5	.34	.242	194	168.1	.14	.101	356	9.2	.03	.015	135	146.2
Dec. ...	.17	.137	260	97.1	.22	.213	170	146.9	.14	.124	355	4.2	.08	.067	234	212.8
Arithmetic mean	.31	.142	...	...	.26	.262	...	...	.09	.073	...	...	.04	.040	...	...
Year ...	.213	.085	86	90.8	.253	.260	162	150.1	.026	.020	16	41.7	.024	.016	339	341.9
Winter ...	.438	.038	72	165.4	.226	.236	181	150.9	.118	.106	357	355.5	.029	.023	256	189.1
Equinox ...	.117	.108	116	103.9	.333	.306	159	152.8	.028	.021	18	4.4	.042	.044	11	8.9
Summer ...	.124	.153	107	67.2	.222	.238	146	145.8	.070	.074	164	158.5	.033	.030	350	324.3

NOTE.—*Winter* comprises the four months January, February, November, December.
Equinox the months March, April, September, October.
Summer the months May to August.

Temperature.—The mean temperature, 279.87 a. (44°.4 F.) for the year 1928 is equal to the normal value. Monthly mean values depart from the corresponding normals by amounts varying between +1.7a. (3° .0 F.) in November to -2.0a. (3° .5 F.) in June. June is the coldest month of the name since records commenced at Eskdalemuir, having been slightly colder even than June of the previous year. The extreme temperatures recorded during the year were 294.2a. (70° .2 F.) on August 5 and 261.1a. (10° .6 F.) on January 1. The latter day, with mean daily temperature of 267.5a. (22° .1 F.) was the coldest of the year. According to mean daily temperature, May 28 and September 8, with 287.7a. (58° .5 F.), were the hottest days of the year. The values of the absolute range of temperature within a calendar month vary between 24.5a. (44° .1 F.) in May, and 16.1a. (29° .0 F.), in February. Values not in excess of 273.0a. (32° .0 F.) are :—mean daily temperature on 15 days (9 in December), minimum temperature on 95 days (23 in December), and maximum temperature on only one day.

The mean absolute daily range of temperature varied from 9.9a. (18° .0 F.) in May to 5.3a. (9° .5 F.) in November, the mean value for the year being 7.4a. (13° .3 F.). In six months, and for the year as a whole, the mean value is less than the corresponding normal. The greatest daily ranges were 18.1a. (32° .6 F.) on June 3 and 17.6a. (31° .7 F.) on June 2, while the least range was 1.4a. (2° .5 F.) on December 13.

In March, April, June, July, October and November the range of the mean diurnal inequality is more than 5 per cent. below, and in February, May, September, November and December more than 5 per cent. above the range of the mean diurnal inequality for the years 1911-26, the greatest positive departure from the normal being 38 per cent. in December and the greatest negative departure 32 per cent. in March.

Humidity.—As is mentioned in the General Introduction, owing to a change in the hygrometric tables used the results for 1926–7 are not strictly comparable with those of earlier years. Compared with the mean values for 1911–25 the chief departures of the values of mean relative humidity in 1928 are +5 in March, —7 in May and —3 in April. The mean relative humidity, 83.5 per cent., for the year is the same as for 1925 and 1927, but is less than that for the other years since 1922 ; whilst the mean vapour pressure, 8.3 mb., is again smaller than in any of the years 1923–6. The extreme daily mean values of relative humidity and vapour pressure were 99.1 per cent. on July 11, 53.2 per cent. on May 6, 16.0 mb. on September 4, 3.6 mb. on January 1. The lowest hourly readings of relative humidity, one of 19 and others below 30 per cent. occurred on May 6.

Precipitation.—1928 was much the wettest year experienced since records commenced at Eskdalemuir, the total amount of rainfall, 2222.6 mm. (87.50 in.), being 47 per cent. over the mean for the period 1911–27. The most outstanding month was January with 390.3 mm. (15.37 in.) or 231 per cent. of normal. The driest month was May with 39.2 mm. (1.54 in.) or 38 per cent. of normal. Precipitation fell, at the rate of not less than 0.1 mm. per hour, for a total period of 1503.4 hours, *i.e.*, in the aggregate for rather more than one-sixth of the whole year. The monthly duration was greatest, 202.0 hr., in January, the duration for October being only 11 hours less, and least, 44.0 hr., in April. For the year as a whole the average rate of fall per hour is 1.48 mm. ; the rate of fall during individual months ranges between 1.99 in August and 0.81 in May. The greatest amount recorded during a calendar day was 46.4 mm. (1.83 in.) on January 12. There were 115 days (21 in May) on which either no precipitation was recorded or in amounts too small to be measured. Precipitation amounting to 0.2 mm. or more was recorded on 238 days ; to 1.0 mm. or more on 199 days ; to 20.0 mm. or more on 34 days.

Snow or sleet fell on 45 days, but on no day from May 17 to November 15 inclusive. Observations of “ snow lying ” at 7h. number 27, 9 of which were in March. There were no large falls of snow.

Sunshine.—The year's total duration of bright sunshine, 1145.2 hr., represents 26 per cent. of the theoretically “ possible ” duration ; whereas the average percentage of “ possible ” for the years 1911–26 is 27.1. As regards the percentage of “ possible ” May was the sunniest, and January the least sunny (as also the wettest) month of 1928. In all, there were 90 days without sunshine, 15 of these being in December, 14 in January and 14 in November, and 65 days with 50 per cent. or more of the “ possible ” sunshine. The days with most sunshine were June 2 with 15.1 hr. (88.9 per cent.) and June 1 and 3 with 14.4 hr. (85.0 and 84.6 per cent.). The first mentioned also represents the highest value of the percentage of “ possible ” sunshine.

Wind.—The mean speed for the year, 5.7 m/s (12.8 mi/hr) has been exceeded only by that of the year 1911. In comparison with the normal values for individual months the mean speeds for January, February, June, July, October and November exhibit the most considerable excess, and that for March the greatest relative deficiency. There were 30 hours of gale force (mean speed greater than 17.1 m/s), a greater number than in any other year since 1922 with the exception of 1927. The highest gust of the year, 39 m/s (87 mi/hr) and the highest hourly speed, 22.7 m/s (50.8 mi/hr) occurred on November 23, and the highest mean daily speed, 13.1 m/s (29.2 mi/hr) occurred on July 2. The quietest days were September 27 and October 3, with mean speeds of 0.4 and 0.6 m/s.

There was a remarkable dearth of westerly winds (between south-south-west and north-north-west) in March and May and marked scarcity of easterly winds (between north-north-east and south-south-east) in January and July. The predominance of winds from between south and west was greatest in January, February and July and the predominance of north-easterly winds was very marked in May.

Grass Minimum Temperature.—There were 104 occasions of ground frost (*i.e.*, grass minimum temperature not greater than 272·1a. or 30°·4 F.), but none of these occurred between June 22 and September 18. The occurrence as in 1927 of as many as seven ground frosts in June is unusual. The lowest grass minimum temperature was 259·3a. (7°·3 F.) on January 1; readings less than 263·0a. (14°·0F.) did not occur in any other month. The mean grass minimum temperature for each of the months January, February, March and December is less than 273·0a. (32°·0F.). The mean value for April is high in comparison with the values in the previous years.

Cloud and Weather.—(A) The mean amount of cloud observed at the six hours of observation is 7·6 which is the same as in 1927. March has the largest mean amount, 8·2, and September has the smallest, 6·7. The largest mean amount for an observational hour is 8·7 at 13h in March (as in 1927); the least is 5·6 at 21h in September. For the year as a whole there was most cloud at 13h and least at 21h. In eleven months the mean cloud amount was least at 21h and in most months it was greatest at 13h or 7h. February 28 is the only day of the year on which no cloud was seen at the normal hours of observation. On 40 days the amount 10 was recorded at every hour of observation.

(B) Thunder was heard on only six days, a smaller number than in any of the years since 1922. There were observations of solar halo on 21 days (five of which were in September), of lunar halo on five days, and of aurora or auroral glow on four days.

(C) The numbers of occasions on which the range of visibility was estimated to be (1) not greater than 500 metres (550 yards), corresponding with the entries X to E, and (2) at least 20 kilometres (12½ miles), corresponding with the entries k, l, m, are summarized below. The limitations to which the estimates of visibility are subject are mentioned on p. 143. It is to be noted that the group (1) above consists of the occasions which are held to merit the description as “fog, moderate, thick, or dense,” while the entries k, l, m, denote “very good or excellent visibility.”

There were fewer occasions of fog and more of estimates k, l, and m together than in 1927. Fog was most frequent in January and December, but entirely absent (at the standard hours of observation) in May. Occasions of very good and excellent visibility were most frequent in May, June, July, September and December. There were 24 estimates of m, visibility 50 km. (31 mi.) or more, distributed among 18 days. 19 of the 24 occasions were at 15h or 18h, 18 were associated with increasing barometric pressure, and 15 with winds from west-south-west through north to north-east.

1928.		NUMBER OF OCCASIONS OF—													
		VISIBILITY X TO E.						VISIBILITY k, l, m.							
		7h	9h	13h	15h	18h	21h	Total.	7h	9h	13h	15h	18h	21h	Total.
Jan.	..	3	1	1	—	2	1	8	1	6	9	14	8	4	42
Feb.	..	—	—	1	2	1	1	5	1	2	5	5	3	1	17
Mar.	..	—	—	—	—	—	2	2	5	4	9	8	7	3	36
Apr.	..	1	—	—	—	—	—	1	5	5	15	14	13	10	62
May	..	—	—	—	—	—	—	—	14	14	14	19	19	10	90
June	..	—	—	—	—	1	—	1	12	13	13	16	16	12	82
July	..	1	1	1	1	1	1	6	10	12	13	18	17	14	84
Aug.	..	1	—	—	—	—	—	1	5	10	16	16	16	11	74
Sept.	..	2	—	—	—	1	1	4	14	16	19	23	18	13	103
Oct.	..	1	1	—	—	—	—	2	9	11	9	12	7	7	55
Nov.	..	—	2	1	—	—	—	3	12	13	15	15	9	10	74
Dec.	..	2	2	2	1	1	1	9	11	16	15	14	14	15	85
Year	..	11	7	6	4	7	7	42	99	122	152	174	147	110	804

ATMOSPHERIC ELECTRICITY.

Notes on the Instruments.

Continuous autographic records of atmospheric electrical potential gradient are obtained by means of an electrograph of which the essential components are a collector of the Kelvin water-dropper type and a Dolezalek quadrant electrometer. The water-jet pipe (see Fig. 11) projects from the north wall of the main building and the water-jet itself is double, *i.e.*, it consists of two portions issuing from holes one on either side of the nozzle in such a way that the plane containing the jet is parallel to the wall and at a distance of about 30 cm. therefrom. The jet holes are 3·8 m. above the roadway beneath. Although the position of the jet is probably the best available in regard to general convenience it is not ideal owing to the proximity of the wall corners and of a door which is opened frequently. A shallow insulated tank on the upper storey of the building contains the water supply for the jet. The possible range in the head of water at the jet holes is from 1·59 to 1·72 m., but as the water supply in the tank is replenished at 7, 13 and 21h. daily the actual range is normally less than that stated. The insulated tank-and-jet system is connected to the needle of a Dolezalek quadrant electrometer, across the quadrants of which is connected a battery of either two or four Weston cells. The mid-point of the battery and the electrometer case are earthed. A photographic record (time scale, two cm. to one hour) is obtained of the indications of the electrometer needle and therefore of the potential at the spraying-points of the water-jet. Satisfactory zero potential marks are produced on the record as a result of the replenishment (thrice daily) of the water in the insulated tank.

Tests of the insulation of the electrograph system are made on almost all days. For this purpose a Wulf quartz-thread electrometer is connected to a convenient point of the system and, the water-jet having been turned off, a charge is given by means of a Zamboni pile or a Simpson charging rod. The fall in potential in a four-minute interval is noted and the quantity $-d/dt$ ($\log_e V$) is computed, where V is the potential measured in volts and the unit of time is one minute. If the rate of leak so determined is less than 0·025, which value corresponds with a reduction of charge by one-half in about 28 minutes, the insulation is considered to be satisfactory. Apart from failures of insulation due to spider webs the average value of the logarithmic rate of leak, defined as above, is usually from 0·010 to 0·015. It is usual to earth the system immediately after taking the reading of the Wulf electrometer at the end of the four-minute interval, and to utilize the corresponding photographically recorded deflection of the Dolezalek electrometer for the purpose of deriving the scale value of the record. Thus, one set of operations, consisting of giving both positive and negative charges to the system, serves as an insulation and a scale test. The scale value is reasonably steady and, unless some definite change has been made, in reducing the curve readings of a given month, the scale value employed is a mean of the several determinations made during the month. During 1928 the mean scale values ranged from 3·03 to 3·11 volts per millimetre.

In order to convert values of potential at the jet into values of potential gradient in the open the former are multiplied by a factor, the value of which is obtained in the following manner. The Wulf electrometer is supported within a small pit situated at the centre of a levelled and grass-covered expanse some fifty yards from the main building. From the electrometer a thin metal rod, 0·4 cm. in diameter, projects vertically upwards through a small hole in the metal-covered lid of the pit and is of such a length that a fuse (made of blotting paper impregnated with lead nitrate) fixed horizontally to the upper end is 1 metre above the surface of the lid, which is level with the surrounding ground. The fuse having been ignited, the observer shuts himself completely within the pit and takes readings of the electrometer every half-minute, the instrument being earthed momentarily after every two or three

readings. The voltages corresponding with these readings are taken to represent the atmospheric electric potential at 1 metre above the surface of the ground in the open. Within the Observatory grounds, which slope down towards south and south-east, there is no entirely satisfactory site where absolute determinations of potential gradient may be made. The pit appears to be in about the most satisfactory position nearest to the electrograph jet. At the level of the pit the angular elevation of the higher parts of the main building and of Rayleigh House varies from 7° to 12°, while the elevation of trees to the west approaches 7°. The grass on the small lawn surrounding the pit is kept short but there are seasonal changes in the height of the grass beyond this area. Observations of potential in the open are made during suitable weather conditions and usually at least six such observations per month are obtained. From the mean of the readings taken throughout an interval of from ten to twenty minutes and from the corresponding mean value of the potential at the jet, as derived from the photographic record, the electrograph reduction factor is deduced. Unless any change in the jet exposure is known to have been introduced a constant factor is employed for a given month. In some earlier years the monthly values of the factor were obtained by an apparently rough smoothing process. More recently the factor used for a given month was the mean of the values determined during that month, occasional smoothing being adopted. Commencing in 1925 the value of the factor adopted for a given month has been $(a + 2b + c)/4$, where *a*, *b* and *c* are the unsmoothed monthly means for the three successive months centred in the given month. The final values for 1928, given in Table 264, range from 6.30 in April to 6.10 in November; the mean of the twelve adopted monthly factors being 6.20, as compared with 6.19 in 1927.

All determinations of electrograph scale value and reduction factor for 1928 are based on the indications of one Wulf quartz-thread electrometer, and the 1927 calibration of this instrument was employed for the 1928 readings. A calibration of the Wulf electrometer carried out (employing a potentiometer and Weston standard cell) in January, 1929, is in close agreement with the 1927 calibration.

The electrograph curves are read by means of a millimetre scale ruled on glass, the assigned hourly values being the estimated means for the 60-minute periods centring at exact hours G.M.T. The estimate of the mean curve ordinate is made to 0.1 millimetre which, during the years 1926-8, was equivalent to about 0.3 volts at the jet and to about 1.9 volts in potential gradient per metre in the open. The readings of the curve ordinates are converted directly into volts per metre in the open by multiplying by the product of the appropriate scale value and electrograph factor.

IDENTIFICATION NUMBER OF INSTRUMENT USED IN 1928.

Wulf bifilar electrometer 3040

Notes on the Tables and Results.

As far as possible an electrical character figure is assigned to each day and values of potential gradient are assigned for 3h, 9h, 15h and 21h G.M.T. on all days, while values for all hours are assigned on days classified as *oa*, *1a* or *2a*. The character figures are given in Table 267, the significance of these symbols being as follows:—

- o, denotes a day during which from midnight to midnight no negative potential was recorded.
- 1, denotes one or more excursions of limited duration to the negative side of the scale during the same period.
- 2, denotes negative potential extending in the aggregate over three hours or more during the same period.
- a*, denotes that within the 25 periods of 60 minutes for which an estimate of the mean potential gradient has to be made in the process of tabulation there was in no case a range of potential gradient in the open exceeding 1,000 volts.
- b*, denotes that, during the same period, a range of 1,000 volts or more was reached in one hour at least but in fewer than six hours.
- c*, denotes that, during the same period, a range of 1,000 volts or more was reached in at least six hours.

Table 264 contains the values of electrical potential gradient at 3h, 9h, 15h and 21h G.M.T. daily, the value for a given hour representing the mean for the period of 60 minutes centring at that hour. With a view to having no blanks in this table, or even where record was missing or defective, values have been estimated where necessary and are enclosed in brackets. In arriving at these estimates account has been taken of the following considerations,—(i) character of the trace before and after the defective period, (ii) meteorological conditions prevailing at the time, (iii) potential gradient records on days of similar meteorological conditions, (iv) diurnal inequality curves of past years, (v) average values at 3, 9, 15, and 21h, for normal days, and (vi) absolute values observed near the time of missing value. The reduction factors used in converting the potential at the water-jet to potential gradient in volts per metre, in the open are also given.

In Table 265 are given, for *oa* days, (1) the mean diurnal inequalities for the months, seasons and year, (2) particulars of the number of days and of the non-cyclic changes and (3) the corresponding mean values of potential gradient. The inequalities or the mean values for the year and seasons are the means of the inequalities or means, respectively, for the appropriate months. There were no *oa* days with complete record in January or March.

Corresponding data for *1a* and *2a* days combined appear in Table 266.

It should be noted that, in these tables, *Winter* denotes the four months January, February, November, December; *Equinox* the four months March, April, September, October; and *Summer* the four months May to August.

In addition to the electrical character for each day, Table 267 contains the daily, monthly and annual values of duration (in hours and tenths) of negative potential gradient. 18 days of defective record when negative potential may have occurred are left blank; the sign of the gradient has been assumed positive during periods of defective records in which no precipitation was observed. When, during highly oscillatory gradients, there was uncertainty as to the times of changes of sign, half of the total duration of doubtful sign was accounted negative. The total duration of negative potential gradient in each month and the average daily duration are entered in the lower part of the table. For the 348 days of assignable duration of negative potential gradient the total number of hours was 1006.0, an average of 2.89 hours per day.

Following the practice adopted in 1923 the mean values of potential gradient given in Table 264 are of two kinds, viz., (*a*) the mean of all the positive values of potential in the column and (*b*) the algebraic mean derived from all days on which all four hours were represented. The mean values for the month, as derived from the (*a*) and (*b*) values respectively, are shown in the last line, and the means for the year are given at the foot of the December table. It is to be expected that the mean derived from the values at 3h, 9h, 15h and 21h, on a sufficiently large number of days, will approximate closely to the mean value derived from all hourly values of all the days.

The mean (*a*) exceeds the mean (*b*) in all months of the year. In the three months June, July and December, the mean (*a*) also exceeds the mean value for *oa* days.

Annual mean values for recent years, derived by giving equal weight to the twelve monthly means, of the (*a*) and the (*b*) means and of the means for *oa* days are as follow:—

				<i>oa</i>	(<i>a</i>)	(<i>b</i>)
				v/m.	v/m.	v/m.
1922	..	..	..	257	225	182
1923	..	..	..	278	235	159
1924	..	..	..	236	214	157
1925	..	..	..	284	243	209
1926	..	..	..	249	201	177
1927	..	..	..	259	223	193
1928	..	..	..	237	219	150

Judged by any one of the three annual values the potential gradient has decreased from 1927 to 1928. Except that the *oa* day mean for the equinoctial months of 1928 exceeds, though only by 3 v/m, the corresponding mean for 1927, the seasonal mean values for *oa* days and the seasonal means for (*a*) and (*b*) days for 1928 are all exceeded by the corresponding values for 1927.

In 1928, February with a mean of 301 v/m was the month of highest value of potential gradient based on *oa* days, while December was outstandingly high in respect of the means (*a*) and (*b*). Both the mean wind speed and the rainfall for this month were considerably lower than those for any other of the winter months. January and March, the months with the highest average daily duration of negative potential on days of complete record, 5.4h and 4.9h respectively, had the low values derived from the four hours on all complete days of 104 v/m and 123 v/m. October and June, next in order of decreasing average duration of negative potential, had the even lower values of 91 v/m and 68 v/m respectively.

Noteworthy occasions of high potential gradient were as follow :—

January 20d 17h to 21d 7h. Uniformly high gradient about 600 v/m throughout the period associated with mist and light wind.

February 20d 19h to 21d 11h. Continuous run of sixteen hours with a mean of 550 v/m. Prevailing conditions were calm, with mist and hoar frost.

February 27d 18h to 29d 2h. During this time the wind was light between NNE and ENE and visibility was good. The high potential gradient exhibited the regular diurnal variation of a typical quiet day but the mean value was 600 v/m and the daily range 700 v/m.

August 31d 19h to September 1d 8h. On this night the wind dropped to calm and a mist formed in the valley, the air above being clear. The potential gradient was high all night, reaching a maximum of 1200 v/m in the early hours of the morning and falling quickly to 150 v/m at 8h on the dispersal of the mist.

November 28d 13h to 22h. A NNW wind dropped from force 4 to calm and the gradient rose quickly from 300 v/m to 800 v/m, reaching a maximum of 1200 v/m at 19h. It gradually decreased until 22h. Soon afterwards rain fell. Previously the air was dry.

December 18d 7h to 19d 22h. The morning was calm and foggy with a potential gradient of 500 v/m. The fog dispersed at 11h and the gradient fell to 250 v/m. In the next hour a light SSE wind sprang up and the gradient rose to a maximum of 1300 v/m at 18h 30m, then gradually fell to midnight when drizzle set in. Visibility was very good.

December 20d 14h to 21d 0h. During this 10 hours the potential gradient rose to 1600 v/m and then steadily declined. The wind was NW, light to calm, and visibility was very good.

December 21d 14h to 22d 1h. After rain and fog in the morning the gradient increased to 1000 v/m and remained at this average value for eight hours during continuous wet fog and drizzle.

The following were the more noteworthy occasions when for several hours the potential remained continuously negative, save for an isolated excursion to the positive side on one of the occasions :—

- (i) January 12d 5h 5m to 15h 0m. For two hours the potential gradient was less than -1700 v/m.
- (ii) January 21d 7h 20m to 17h 45m. The potential gradient was rarely greater than -1700 v/m.
- (iii) January 23d 8h 50m to 19h 40m. For about an hour the potential gradient was below -1700 v/m.
- (iv) June 14d 0h 30m to 11h 30m. The minimum value of the potential gradient during this period was about -1700 v/m.
- (v) October 26d 3h 0m to 22h 20m. Save for a break of 10 mins. about 13h when a violent oscillation occurred and a large positive value of about $+1700$ v/m was attained, the potential gradient was frequently less than -1500 v/m.

In all the above cases continuous rain was falling.

On the following occasions long periods of negative potential gradient were broken by short excursions to the positive side :—

- (i) March 5d 2h 53m to 18h 0m. This was a period of continuous rain, light at first, moderate later. During the first period the potential was mainly negative except that there were occasional excursions to the positive side of short duration and of small intensity save in one instance when a value of $+1200$ v/m was reached. The potential gradient exceeded the limit of registration on the negative side (-1700 v/m.) only once, when the excess persisted for 18 minutes. During the period of moderate rain large indeterminate values were reached on both sides.
- (ii) March 19d 20h 23m to 21d 9h 57m. This period was broken by a long interval of $6\frac{1}{2}$ hours and two short intervals of less than an hour each when the potential gradient was persistently positive, though small, during breaks in a spell of otherwise continuous rain. Apart from these intervals there were occasional small excursions to the positive side. The trace was persistently off the sheet for several long periods but there is no indication that the potential gradient was ever positive during these periods.
- (iii) June 19d 2h 4m to 15h 12m. During continuous rain the potential gradient was negative except for excursions to the positive side of short duration and not of great intensity. The trace was off the sheet for three short intervals totalling 20 minutes though large oscillations were taking place on the negative side. At the close of the period the rain became very heavy and many violent oscillations occurred for nearly an hour during which the limit of registration was exceeded on both sides several times.
- (iv) October 11d 6h 10m to 23h 36m. During continuous rain the potential gradient was mainly negative but highly oscillatory, and the limit of registration was exceeded intermittently for about four hours. Half way through the period, as the rainfall became lighter, the gradient increased but remained negative except for a short interval of half an hour ; the minimum value reached was about -900 v/m.

- (v) December 16d 6h 50m to 16h 26m. From 2h on the 16th the potential gradient had been positive and abnormally high during a fall of snow though there was an interval of negative potential gradient of about three quarters of an hour's duration when the limit of registration was exceeded at times. At 6h 30m a peak corresponding to about +800 v/m was reached, and from that time onward the potential gradient decreased steadily, the snow having become sleet. The trace was off the sheet persistently from 11h 40m to 15h 10m save that it reappeared for an interval of about 5 minutes just before 14h. During the latter period continuous rain was falling and there is every indication that the gradient was uniformly negative.

Despite the lack of January and March inequalities for oa days the annual and seasonal mean daily inequalities show the characteristics of the seasonal change in daily variation with tolerable regularity. From the single principal wave having early morning minimum and late evening maximum with a very imperfect secondary maximum at 9h in winter, the type changed to a double wave in the equinoctial months in which the forenoon maximum increased relatively to the principal maximum, at the same time advancing its culmination to 7h. Since the evening maximum remained stationary two minima, one at 2h and the other at 12h, therefore became prominent. In the summer months a further advance of the time of the morning maximum to 5h and retardation of the evening maximum to 23h made the afternoon minimum the most conspicuous feature of the daily variation. Though the range of the monthly mean diurnal inequality for oa days was greatest in November (305 v/m) and least in May (87 v/m), owing to the lack of a contribution from January, the range of the mean inequality for winter (191 v/m) was less than that for the equinoctial months (207 v/m), the latter being largely attributable to the high value (268 v/m) from the 3-day mean inequality for October. For the summer months the mean range was 110 v/m.

TERRESTRIAL MAGNETISM.

Notes on the Instruments.

The standard magnetographs,¹ which have been in regular use for several years, are situated in the east chamber of the underground magnet house and are arranged so as to record changes of the three geographical components of terrestrial magnetic force, viz., the north component, N (or + X), west component, W (or - Y), and the vertically downward component, V (or + Z).

The instruments for the north and west components are of the Adie bifilar type, in which torsion of the bifilar suspension, of fine tungsten or steel wire, is utilised to bring the magnets into an azimuth approximately perpendicular to the directions of the components whose changes they respectively record. In each of these instruments the magnet is about 13.8 cm. in length and is suspended within a copper shell, or frame, of suitable dimensions to ensure that the movements of the magnet are sufficiently damped. To the magnet is rigidly attached a semi-circular plane mirror, immediately beneath which is a fixed mirror of similar form and dimensions. Each magnet and mirror system is contained within a brass cylindrical case, cemented on to a pier and surmounted by a tall bell-jar shaped cover of glass. Light from a brightly illuminated slit passes through a collimator, is incident upon the two mirrors and after reflection passes along a wooden channel and thence, through a horizontal hemi-cylindrical lens, to photographic paper wound on a clock-driven cylinder. The hemi-cylindrical lens is set in the side of the case containing the recording drums, and matters are so arranged that the beams of light reflected from the two mirrors are brought to a focus at the lens which condenses the two vertical images to two sharply focussed dots on the paper. Hence the record obtained consists of two traces, the one straight and known as the base line, the other curved and representing the angular movements of the suspended magnet, and, therefore, the changes in the component of terrestrial magnetic force.

¹ For a general description of magnetograph arrangements see "A Dictionary of Applied Physics," Vol. II, Macmillan, London.

The standard instrument for the vertical component is a Watson multiple-magnet balance.¹ In this instrument the magnet system consists of eight magnetised steel rods, each 10 cm. long and 0.2 cm. in diameter, carried by an aluminium frame to the centre of which are attached the moving mirror and also the knife-edge, which bears upon an agate plane and about which the system balances. Copper damping plates and a temperature-compensating device are provided. The recording arrangements are similar to those described above, save that the hemi-cylindrical condensing lens and the recording drum are vertical.

One clock serves to operate the three drums and also makes the time marks at two-hourly intervals.

To the containing case of each instrument is fitted a suitably designed drying tube containing calcium chloride.

Determinations of the azimuth of the magnets of the north and west component magnetographs are carried out, at intervals of a year or two, by comparing the deflections produced by an auxiliary magnet with its axis (*a*) true north-south, or east-west and (*b*) inclined at a known small angle to those azimuths. Drift of the magnet system of the Watson balance has been compensated from time to time by adjusting the position of a small control magnet which is fixed vertically to the lower part of the pier on which the balance stands. No adjustments were made to the standard magnetographs in 1928.

The azimuth lines in use in the east chamber are those which were determined in 1914 and of which particulars are given on p. 70 of *Hourly Values from Autographic Records, Geophysical Section, 1913*.

The diurnal range of temperature in the east chamber of the magnet house is normally negligible. Temperature is ascertained daily at 9h 30m by the thermometers within the instrument cases. The daily values appear in Tables 271, 275, etc.; the monthly means of the readings so obtained during 1928, together with the mean values for the years 1911-27, were as follow:—

EXCESS OF MEAN TEMPERATURE ABOVE 280a.

Month.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Mean 1928	3.6	3.0	2.8	2.8	3.3	4.1	4.8	5.7	6.4	6.1	5.4	4.8
Mean 1911-27	3.6	3.0	2.7	2.5	2.8	3.7	4.7	5.8	6.4	6.3	5.6	4.6

The annual range of temperature during 1928 was 4° 0 C., the mean range for the previous sixteen years being 4° 2 C.

The constants of the standard magnetographs were as follow:—

	North.	West.	Vertical.
Time scale 1 hour =	15.5 mm.	15.5 mm.	15.5 mm.
Time marks	Every two hours, beginning at exact hour.		
Error of time mark	Not more than \pm 1 min.		
Period of vibration, seconds	13.9	9.9	7.4
Logarithmic decrement ² .. .. .	.365	.569	—
Angular equivalent of 1 mm. on paper, radians .. .. .	.00032	.00032	.0003
Twist of bifilar suspension	60°	30°	—
Ratio $\frac{\text{length of bifilar suspension}}{\text{mean breadth of suspension}}$	66	100	—
Temperature coefficient, per 1° C.	-9 γ	-2 γ	+26 γ
Direction of marked pole	West.	North.	—
Azimuth of magnet	270°	0°	346°

¹ Terrestrial Magnetism, Vol. VI.

² Log. decr. = $\text{Log}_e a_n - \text{log}_e a_{n+1}$; where a_n, a_{n+1} are the amplitudes of two successive swings on the same side of the zero position.

Determinations of scale value of the standard magnetographs are carried out at intervals of two weeks. The method adopted consists essentially in measuring the photographically recorded deflection of the suspended or pivoted magnet produced by an auxiliary or test magnet of known magnetic moment situated at a known distance from the deflected magnet. Two sets of relative positions of the deflecting and deflected magnets are used; for the north and west instruments they may be termed the "end on" and "broadside on" positions, the magnet axes being in one plane: while in the case of the vertical instrument the deflecting magnet is vertical; in one position the line joining its centre to that of the deflected magnet is collinear with the axis of the latter, but in the other position it is perpendicular thereto. On a given occasion deflections are produced with the test magnet first on one side of the deflected magnet and then, at the same distance, on the other side, two deflections being produced at each side by reversal of the test magnet. Thus four deflection dots are obtained on the record. The two sets of relative positions of the magnets are employed on alternate occasions. The distance between the deflected and deflecting magnets is about 90 cm. and approximate values of the double deflections produced are 44 and 87 mm. for the north instrument, 33 and 65 mm. for the west, and 51 mm. for the vertical. In deducing the scale values allowance is made for the distribution of magnetism in the magnets by assuming that the latter consists of point poles separated by four-fifths of the length of the steel¹ and thence computing values of P , the distribution coefficient, for the different relative positions of the magnets. The moment of the auxiliary or test magnet is determined at intervals of about one month by deflections at two distances on the Kew magnetometer, the value of the horizontal component of the earth's field being obtained from the result of an absolute observation made on the same day.

In the following table are given the scale values, obtained by overlapping means, which were employed in reducing the curve readings for 1928.

SCALE VALUES OF THE MAGNETOGRAPHS (γ per mm. on the paper).

Month.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
North Instrument.. ..	5·03	5·03	5·03	5·04	5·03	5·02	5·01	5·00	5·01	5·00	5·00	5·01
West Instrument	6·68	6·68	6·68	6·67	6·66	6·67	6·67	6·68	6·66	6·66	6·66	6·65
Vertical Instrument ..	4·32	4·32	4·30	4·31	4·31	4·27	4·23	4·21	4·23	4·23	4·24	4·24

In addition to the standard magnetographs there are in the west chamber of the underground magnet house auxiliary instruments of the Adie pattern (formerly the standard instruments at Kew Observatory) which record changes in declination, D , horizontal force, H , and also vertically downward force, V . Declination records have been obtained since August, 1927, while the vertical force (Adie) and horizontal force records commenced in March and December, 1928. The general arrangements of these instruments are similar to those of the instruments in the east chamber. The declination magnet is suspended by a bundle of silk fibres (the torsion effect of which is negligible) and the scale value of the record is 1'·17 to 1 mm. The vertical force balance consists of a single magnet, of which the dimensions are approximately 13·5 cm. \times 2 cm. \times 0·2 cm. With the object of reducing loss of record during magnetic storms the scale values of the auxiliary H and V records are arranged to be considerably greater than those of the standard N and V records. Thus, in the earlier part of 1929 the scale values of the Adie H and V records were approximately 10 γ and 9 γ per mm. respectively. Determinations of scale value are made by the method due to Broun. To facilitate the necessary adjustment, from time to time, of the

¹ Chree, Phil. Mag., 1904.

azimuth of the horizontal force magnet, magnetic meridian lines (and lines perpendicular thereto) representing a sufficient range of values of declination were laid down in the west chamber in December, 1928, on the basis of simultaneous observations of declination in the chamber and in the east magnetic hut.

The routine absolute observations of the magnetic elements are made in the east magnetic hut ; as a rule two complete sets of observations are made every week, but in 1928 a determination of declination was made on nearly every week-day. Declination and horizontal force were determined by means of the Kew pattern unifilar magnetometer (which was employed by Rücker and Thorpe in their magnetic surveys of the British Isles, 1886-1892) placed on Pier No. 5. Determinations of inclination (dip) are made by means of the Schulze inductor placed on Pier No. 6.

For a detailed description of the method of observation with the Kew pattern magnetometer reference should be made elsewhere.¹

In determining declination four readings are taken, two with the magnet erect, two with the magnet inverted. A correction is applied to the mean of the observations for the observed torsion in the silk suspending fibre. The fixed mark is about one half-mile (0.8 km.) distant from Pier No. 5, and its bearing is taken as $8^{\circ} 12' 30''$ west of south.

Determination of the horizontal intensity comprises observations of (a) the time of vibration of the collimator magnet, and (b) the deflection of a mirror magnet by the collimator magnet. Deflection observations are made for three distances of the collimator magnet, the order of the position of the latter being : on east arm at 35 cm., 30 cm., 25 cm. ; on west arm at 25 cm., 30 cm., 35 cm. Thus the mean times for the deflections at the three distances are very nearly, if not exactly, identical and the observations are concentrated at the 25 cm. distance. The time interval between the mean times of the vibration and deflection experiments is usually about half an hour. The horizontal intensity, H , is calculated from $H = \sqrt{mH_V \times H_R/m}$ where mH_V is obtained from the vibration experiment and H_R/m from the deflections made at the 25 cm. distance, m being the moment of the collimator magnet. H_R/m is corrected for the distribution of magnetism in the magnets. From the latter part of 1913 until the end of 1923 the value of this correction, viz., $\log_{10}(1 + P/25^2 + Q/25^4)$, applied to the observations of a given month was a mean value derived from the observations obtained during the seven months including the given month as fourth of the seven. The monthly values so derived show considerable fluctuations, and it is improbable that P and Q actually varied to the extent implied. Commencing in 1924 the value of the correction used in reducing the horizontal intensity observations has been the mean of the mean values for each of the years 1917-24, 1917-25, etc. The value employed for 1928 is .00541. A variation of .00020 in the value of $\log_{10}(1 + P/25^2 + Q/25^4)$ corresponds with a variation of about 4γ in the derived value of H .

The values of P , Q , and $\log_{10}(1 + P/25^2 + Q/25^4)$ for individual years are as follow :—

Year.		P.		Q.		$\log_{10}(1 + P/25^2 + Q/25^4)$.
1917	....	+6.862	....	+418.9	....	.00520
1918	....	+7.604	....	+ 68.6	....	.00533
1919	....	+9.126	....	-603.5	....	.00563
1920	....	+8.224	....	-216.6	....	.00544
1921	....	+7.978	....	+ 25.3	....	.00554
1922	....	+6.607	....	+513.1	....	.00513
1923	....	+6.371	....	+614.3	....	.00508
1924	....	+7.899	....	-128.6	....	.00531
1925	....	+8.214	....	-261.7	....	.00538
1926	....	+9.675	....	-938.4	....	.00564
1927	....	+10.422	....	-1265.0	....	.00580
1928	....	+ 8.713	....	- 547.2	....	.00541

The Schulze inductor¹ consists essentially of a coil of insulated wire which can be rotated continuously and rapidly about an axis which coincides with a diameter of the coil. This axis is capable of rotation about a horizontal and vertical axis. The inclination and azimuth of the coil axis are read off on a vertical and a horizontal scale respectively. The windings of the coil are led off from a commutator to a Broca galvanometer. To effect a determination of magnetic inclination, the coil is set so that its axis of rotation lies in the plane of the magnetic meridian. The coil is then rotated steadily at the rate of about 360 revolutions per minute and the inclination of the axis of rotation is adjusted until the galvanometer deflection is the same in magnitude and sign whether the sense of rotation is positive or negative. In this position the rotation axis of the coil coincides with the direction of the earth's field and the inclination to the horizontal may be read off from the vertical circle. Two series of settings are made, one with the vertical circle facing east, the other with the circle facing west.

The base line values of the magnetograph records are deduced from the results of the absolute observations, any of the latter obtained during times of considerable disturbance being excluded. For a set of absolute observations on a given day the mean ordinates of the north and west component curves are determined for the periods of time corresponding to the declination, the vibration, and the 25 cm. deflection observations.

From these values, and from the value of H obtained as described above, the value of H corresponding to the mean ordinates during the declination observation is derived, and thence the base line values of N and W are computed. Similarly, by the combined use of the curve ordinates at the times of the inclination and horizontal force observations the value of H corresponding to the inclination observation is obtained and thence the base value for V. The base line values finally adopted are obtained from a curve drawn smoothly through points given by the deduced values, due allowance being made for discontinuities in the records.

The results of the absolute determinations of D, I and H are summarized in the subjoined table, and the values of m , the moment of collimator magnet 60a, are also given. For each set of absolute observations are shown the deduced base line values of N, W, and V and, in brackets, the adopted base line values. Thus, the entry 15823 (18) signifies:—deduced base line value 15823, adopted base line value 15818. The adopted values were obtained as described in the foregoing, and therefore the base line values corresponding to dates between those given in the table may be obtained by interpolation.

¹ For descriptions of, and discussion of method of observation with, earth inductors see papers by—
H. Wild. *Met. Zeit.*, 1895, p. 41.
O. Venske. *Ber. über die Tät. des Preuss. Met. Inst.* in 1924, p. 91 (and references given therein).
N. E. Dorsey. *Terr. Mag.*, Vol. 18, p. 1, 1913.

ABSOLUTE DETERMINATIONS OF D, I AND H, AND BASE LINE VALUES OF N, W, AND V.

Eskdalemuir:

1928.

Date.	Declination.				Inclination.				Horizontal Force.			Base Line Values (deduced and adopted).		
	Mean Time.	D.			Mean Time.	I.			Mean Time.	H.	m.	North.	West.	Vertical.
	h. m.	°	'	"	h. m.	°	'	"	h. m.	γ		15,000 γ +	4,000 γ +	44,000 γ +
Jan. 2	14 15	15	19	33	12 48	69	40	·5	11 33	16620	906 ·1	763 (71)	66 (66)	808 (16)
6	14 30	15	18	40	12 52	69	40	·2	11 37	16632	906 ·1	772 (70)	65 (66)	833 (20)
11	14 21	15	17	37	11 5	69	39	·9	11 39	16635	906 ·3	772 (68)	67 (66)	823 (24)
13	14 31	15	17	20	11 10	69	40	·0	11 53	16639	906 ·1	763 (67)	64 (66)	819 (26)
16	14 21	15	19	13	11 29	69	40	·5	12 7	16636	907 ·1	773 (67)	68 (66)	845 (29)
20	11 7	15	17	7	10 19	69	39	·5	—	16625	—	766 (66)	65 (66)	807 (33)
23	14 17	15	23	17	11 25	69	41	·4	12 11	16623	905 ·9	766 (66)	66 (66)	845 (36)
26	14 21	15	18	49	11 19	69	41	·3	11 59	16628	906 ·3	765 (65)	65 (66)	852 (39)
30	14 45	15	18	1	11 31	69	41	·1	12 6	16626	906 ·3	766 (65)	64 (66)	836 (42)
Feb. 3	14 27	15	21	9	11 23	69	40	·7	12 0	16610	905 ·7	751 (64)	60 (66)	794 (846)
6	14 17	15	19	43	11 23	69	41	·1	11 59	16621	906 ·0	758 (64)	63 (66)	832 (48)
10	11 21	15	15	2	10 34	69	40	·1	—	16609	—	757 (64)	62 (66)	830 (52)
14	14 25	15	23	41	11 17	69	40	·2	11 57	16623	906 ·2	756 (63)	66 (66)	812 (55)
17	14 21	15	20	3	—	—	—	—	11 58	16636	906 ·8	773 (63)	71 (66)	—
20	14 27	15	21	16	11 33	69	39	·8	12 11	16617	906 ·7	766 (63)	67 (66)	800 (59)
23	—	—	—	—	16 31	69	39	·8	—	—	—	—	—	865 (61)
24	11 45	15	17	24	10 31	69	40	·4	11 6	16615	906 ·8	771 (62)	69 (66)	838 (62)
25	—	—	—	—	12 13	69	42	·3	—	—	—	—	—	871 (62)
27	14 39	15	20	0	11 27	69	40	·6	12 9	16626	907 ·1	777 (62)	68 (66)	861 (64)
28	—	—	—	—	15 43	69	40	·6	—	—	—	—	—	858 (65)
Mar. 2	14 17	15	17	7	11 15	69	38	·9	11 55	16631	906 ·1	767 (62)	65 (65)	833 (66)
5	14 17	15	18	47	11 17	69	40	·0	12 1	16627	906 ·1	756 (62)	64 (65)	801 (68)
9	11 55	15	16	54	10 38	69	40	·3	11 15	16607	906 ·5	768 (62)	66 (65)	817 (70)
10	—	—	—	—	11 47	69	41	·3	—	—	—	—	—	867 (70)
13	14 37	15	25	13	11 38	69	42	·2	12 15	16638	906 ·6	766 (62)	67 (65)	827 (71)
16	14 15	15	21	47	11 15	69	41	·2	12 1	16613	906 ·7	773 (62)	66 (65)	853 (72)
19	14 19	15	20	20	11 26	69	40	·5	12 11	16617	905 ·9	759 (62)	63 (65)	821 (72)
23	9 15	15	16	53	10 29	69	39	·2	11 11	16606	906 ·0	759 (62)	64 (65)	825 (73)
26	14 25	15	20	35	11 21	69	41	·2	12 3	16626	906 ·0	762 (62)	65 (65)	853 (74)
30	14 19	15	18	11	11 10	69	40	·4	11 45	16643	907 ·0	775 (62)	68 (65)	863 (75)
Apr. 2	—	—	—	—	11 37	69	42	·3	12 14	16663	907 ·1	—	—	891 (76)
3	14 39	15	19	50	—	—	—	—	—	—	—	777 (62)	72 (66)	—
5	14 33	15	22	39	12 29	69	43	·1	11 49	16614	906 ·6	763 (62)	67 (66)	893 (76)
9	14 41	15	21	17	12 29	69	42	·5	11 45	16617	906 ·5	766 (63)	67 (66)	889 (76)
13	12 31	15	20	1	—	—	—	—	11 53	16596	906 ·8	767 (63)	67 (66)	—
14	—	—	—	—	12 17	69	42	·0	—	—	—	—	—	884 (76)
16	14 33	15	18	41	11 25	69	41	·9	12 4	16631	906 ·7	768 (63)	66 (66)	889 (76)
20	11 55	15	17	51	11 38	69	44	·0	10 55	16576	906 ·0	763 (63)	64 (66)	874 (75)
23	13 27	15	19	1	8 35	69	41	·5	11 6	16630	906 ·4	773 (63)	69 (66)	920 (875)
26	—	—	—	—	11 13	69	41	·6	—	—	—	—	—	876 (74)
26	—	—	—	—	14 22	69	40	·3	—	—	—	—	—	875 (74)
27	13 33	15	17	20	8 51	69	40	·6	11 12	16608	905 ·9	767 (63)	68 (66)	875 (74)
28	—	—	—	—	9 0	69	40	·9	—	—	—	—	—	879 (74)
30	8 19	15	4	50	9 22	69	40	·1	14 45	16618	905 ·6	759 (63)	65 (66)	825 (73)

ABSOLUTE DETERMINATIONS—continued.

Date.	Declination.			Inclination.		Horizontal Force.			Base Line Values (deduced and adopted).				
	Mean Time.	D.			Mean Time.	I.		Mean Time.	H.	m.	North.	West.	Vertical.
		h. m.	°	'		"	h. m.							°	'	h. m.	γ
Sept. 3	8 31	15	4	47	9 6	69	44.7	11 3	16585	905.4	15,000 γ + 779 (90)	4,000 γ + 66 (67)	44,000 γ + 801 (37)
6	13 41	15	15	3	—	—	—	10 52	16585	905.5	780 (91)	65 (67)	—
7	14 31	15	16	15	10 39	69	43.7	11 17	16654	905.3	775 (91)	64 (67)	788 (834)
10	14 23	15	13	47	11 37	69	43.1	10 54	16600	905.9	786 (92)	67 (67)	813 (33)
14	14 31	15	17	30	10 41	69	44.1	11 19	16612	905.6	790 (93)	68 (68)	820 (31)
17	11 47	15	12	29	13 28	69	42.1	11 11	16597	906.1	795 (93)	68 (68)	846 (30)
21	8 43	15	3	57	8 25	69	42.1	10 21	16615	906.0	799 (94)	72 (68)	842 (29)
24	14 1	15	15	1	13 39	69	42.3	11 19	16598	905.9	788 (94)	66 (68)	832 (29)
28	11 37	15	12	23	10 23	69	44.2	10 59	16580	905.9	793 (95)	69 (68)	820 (30)
Oct. 1	14 17	15	14	7	10 48	69	44.1	11 23	16628	906.6	810 (795)	74 (68)	869 (31)
5	13 41	15	15	40	10 39	69	44.7	11 16	16599	906.5	798 (94)	69 (68)	849 (34)
8	14 45	15	13	20	11 19	69	44.3	11 55	16606	905.6	793 (93)	68 (68)	881 (36)
12	14 45	15	10	44	11 9	69	43.1	11 51	16581	905.9	782 (92)	58 (68)	808 (39)
15	14 49	15	14	19	11 19	69	44.9	11 56	16637	906.6	803 (791)	73 (68)	887 (41)
19	11 45	15	10	13	10 28	69	47.7	11 6	16538	905.8	782 (89)	68 (68)	830 (43)
23	14 35	15	9	7	11 19	69	44.6	11 56	16599	906.5	787 (87)	72 (68)	854 (45)
26	12 37	15	11	33	11 15	69	43.9	11 57	16570	905.7	769 (85)	63 (68)	809 (45)
29	14 25	15	8	39	11 29	69	44.1	12 5	16579	906.1	782 (84)	63 (68)	839 (46)
Nov. 2	11 35	15	11	50	10 19	69	44.9	10 56	16576	906.3	782 (82)	67 (67)	860 (46)
6	14 51	15	9	40	11 23	69	43.0	12 3	16584	906.0	772 (80)	66 (67)	827 (46)
9	12 17	15	7	30	10 57	69	42.3	11 33	16610	906.3	784 (79)	68 (67)	851 (46)
12	14 31	15	9	45	11 23	69	42.9	12 3	16598	906.4	781 (78)	67 (67)	857 (46)
16	12 49	15	12	20	10 33	69	45.0	11 11	16593	906.4	771 (76)	71 (67)	837 (47)
20	14 7	15	7	33	11 24	69	43.1	12 0	16593	905.7	775 (75)	66 (67)	838 (47)
23	12 15	15	10	55	10 59	69	41.8	11 36	16589	906.1	773 (75)	62 (66)	826 (47)
26	14 45	15	12	17	14 25	69	44.3	11 53	16583	906.2	780 (74)	69 (66)	874 (47)
Dec. 3	15 3	15	7	33	11 19	69	42.1	11 57	16607	906.3	771 (73)	68 (66)	837 (48)
7	12 19	15	9	9	10 58	69	43.4	11 38	16581	905.9	774 (72)	62 (65)	825 (49)
10	14 9	15	6	27	11 31	69	43.0	12 11	16575	906.1	765 (71)	62 (65)	855 (50)
11	—	—	—	—	10 59	69	42.7	—	—	—	—	—	823 (50)
14	11 7	15	7	4	10 25	69	42.7	—	16565	—	773 (70)	67 (65)	862 (50)
15	—	—	—	—	10 36	69	42.9	—	—	—	—	—	858 (51)
17	12 31	15	6	55	12 7	69	42.0	14 37	16608	905.9	774 (69)	65 (65)	861 (52)
21	14 39	15	10	33	11 11	69	41.4	12 2	16608	906.0	769 (68)	63 (65)	858 (54)
25	14 7	15	7	3	11 19	69	42.2	11 59	16609	906.2	773 (66)	66 (64)	873 (56)
27	12 39	15	7	57	11 23	69	42.1	11 59	16588	905.9	763 (65)	64 (64)	851 (58)
28	14 19	15	7	10	12 41	69	41.5	11 25	16623	905.9	768 (65)	64 (64)	887 (59)
31	11 55	15	6	49	12 36	69	42.3	—	16604	—	768 (64)	65 (64)	868 (62)

The hourly readings are obtained from the magnetograms, standardized as described in the foregoing, by means of a ruled glass scale. The reading for any given hour G.M.T. is that ordinate estimated to be the mean reading for 60-minutes centring at the given hour. The product of this ordinate and the scale value is added to the adopted base line value, and the sum so obtained is the hourly value printed in the tables.

IDENTIFICATION NUMBERS OF INSTRUMENTS IN USE IN 1928.

- Unifilar Magnetometer, Kew pattern Elliott, No. 60.
(with collimator magnet, 60a, and mirror magnet, 60c).
- Dip Inductor Schulze, No. 103.

Notes on Tables.

The hourly values of N, W, and V, obtained as described above, appear in three of the four monthly tables. The mean value for the day is computed according to the expression

$$x = \left\{ \frac{1}{2} (x_0 + x_{24}) + x_1 + x_2 + \dots + x_{23} \right\} / 24.$$

The letters "Q" and "D" denote the five quiet and the five most disturbed days as selected at De Bilt.

In the fourth table for each month are given :—

- (a) the values and times of the daily maximum and minimum and the values of the absolute daily range for each of the components N, W and V.
- (b) the value of ΣR^2 ^① for each day. ΣR^2 is written for $R_N^2 + R_W^2 + R_V^2$ where R_N , R_W , R_V denote the absolute ranges for a calendar day of the north, west and vertical components.
- (c) the daily magnetic character figures, assigned according to the international scheme wherein "0," "1," "2," respectively, denote quiet, moderately disturbed and highly disturbed conditions.
- (d) the daily values of temperature in the underground magnetograph chamber

In *The Observatories' Year Book* for the years 1922–6 the fourth table for each month contains the values of the "characteristic ratio," ρ , which is the ratio of the value of ΣR^2 for a given day to the mean monthly value of ΣR^2 . To some extent this ratio serves as an index of the degree of disturbance on a given day relatively to other days of the same month. It enables the most highly disturbed days to be identified with fair certainty, but is of less use in distinguishing between the quieter days of a month, especially in summer months, when even the quiet day range is large, and in months in which very large disturbance occurs. Another defect is the great difference in the significance, in different months, of one and the same value of the ratio. Further, as long as record is liable to be lost during the larger disturbances the exact value of the ratio cannot be computed in some cases. Some of the drawbacks mentioned could be diminished by relating the ratio of the daily value of ΣR^2 not to the mean value of ΣR^2 for the month but to a quantity which approximates to the mean value of ΣR^2 for a long period, e.g., for 11 years. It is considered that, on the whole, the application of ΣR^2 as a criterion of disturbance or activity is not materially increased by the publication of the values of " ρ ," and it was decided as from 1927 to discontinue the publication of this ratio.

Hourly values of declination are not given in this volume. They have been published weekly, primarily for the use of mine surveyors, in "The Colliery Guardian" and "The Iron and Coal Trades' Review."

Mean diurnal inequalities of the components N, W, V, H, D, and I on "all" days and on international quiet and disturbed days are given, for the months, seasons and year, in Tables 316 to 333. In calculating diurnal inequalities the non-cyclic change has been eliminated on the assumption that its time-rate is linear. Inequality values are first calculated to 0.01 γ and then rounded off to 0.1 γ . The inequalities of H, D, and I have been computed from those of N, W, and V by means of the formulae :

$$\begin{aligned} \delta D &= \frac{180 \times 60}{\pi} \left(\frac{\delta W \cos D - \delta N \sin D}{H} \right) \\ \delta H &= \delta N \cos D + \delta W \sin D \\ \delta I &= \frac{180 \times 60}{\pi} \cos I \left(\frac{\delta V \cos I - \delta H \sin I}{H} \right) \end{aligned}$$

^① See also p. 176.

in which δD and δI are expressed in minutes of arc, and where H, D, and I for any given month are the respective mean values for that month as published in Table 337. The values of the range of the mean diurnal inequalities of the several elements on the three different types of day are brought together in Table 334, and the values of the non-cyclic change of N, W, and V are given in Table 335.

The results of harmonic analysis of the mean diurnal inequalities of N, W, and V for the months, seasons¹ and year are to be found in Tables 338 and 339, in which are given the values of a_n , b_n , c_n , and α_n , in the two equivalent series $\sum (a_n \cos 15nt^\circ + b_n \sin 15nt^\circ)$ and $\sum c_n \sin (15nt^\circ + \alpha_n)$. In the former series t is reckoned in hours from midnight G.M.T., whilst the published values of α_n refer to Local Mean Time. The values of the harmonic coefficients have been computed from the unrounded values of the inequalities and have been corrected, where necessary, on account of the fact that the hourly values are not instantaneous values but are mean values. The factors by which the coefficients have to be multiplied (*vide* Report of the British Association, 1883, p. 98) are 1.00286 for a_1 , b_1 , c_1 ; 1.01152 for a_2 , b_2 , c_2 ; 1.02617 for a_3 , b_3 , c_3 ; and 1.04720 for a_4 , b_4 , c_4 . Finally, the values were rounded off to 0.1 γ .

The mean values of the squares of the absolute daily ranges are summarized in Table 336.

In Table 337 appear for the months and year the mean values of N, W, V, D, I, H and Total Force, T. The means of the four latter elements are derived from the corresponding mean values of N, W and V, which are the means of hourly values on "all" days in the month or year. Tables 340 and 341 contain mean values of the magnetic elements for 1928 and recent years at a number of observatories.

Review of Results of Magnetic Observations.

Mean and Extreme Values of the Magnetic Elements, 1928.—The mean values² are given below in Table I along with the corresponding values for the previous year. The values of N, W, and V have been computed from the hourly values derived from the autographic records of "all" days, standardized by means of the absolute observations; those of H, D, I, and T have been deduced from the values of N, W, and V.

TABLE I.

Year.	H.	D. (West).	I.	N.	W.	V.	T.
	γ	° ' "	° ' "	γ	γ	γ	γ
1927	16631	15 22.7	69 40.2	16036	4410	44887	47869
1928	16619	15 10.5	69 41.2	16039	4350	44894	47871

Westerly declination was on the average 12'.2 less in 1928 than in 1927. The rate of decrease is slightly less than the average rate, 12'.4, during the years 1920–1927. Between 1913 and 1920 the average rate of decrease was 9'.3. As compared with the 1927 value horizontal force shows a fall of 12 γ , which is less than the average annual rate of decrease between 1912 and 1927. Practically no change in the average value of the north component has occurred since 1925, but as in recent years the west component decreased by some 60 γ . Inclination has increased appreciably, the change having apparently set in about the middle of the year. The values of vertical and total force obtained for 1928 differ little from the corresponding values for 1927.

¹ The seasons are defined for this purpose as follows:—*Winter*, January, February, November, December; *Equinox*, March, April, September, October; *Summer*, May, June, July, August.

² See remarks on p. 168.

Reference must here be made to the apparently permanent or semi-permanent effects of the magnetic storm of 7th-8th July, 1928. Consideration of smoothed curves of the daily mean values of the magnetic elements suggests that this particular storm was responsible at Eskdalemuir for discontinuities in H of -16γ , in D of $-2'$, in V of $+17\gamma$, in I of $+1'4$ and in T of $+10\gamma$. It will be noted that the change in H corresponds closely to the average annual rate of decrease since the year 1912. The changes in H and D are supported by similar results for Lerwick Observatory, where H changed by -17γ and D by $-2'$. The changes in V at Lerwick for some time before and after this storm are so irregular that it is not possible to estimate the exact nature of the change in that element. The five-day means of the elements at Eskdalemuir for some weeks before and after the storm are set out below in tabular form; the values enclosed within the vertical lines are for the period centring at the time of the storm.

MEAN VALUES OF THE MAGNETIC ELEMENTS FOR 5-DAY PERIODS CENTRED AT THE DATES SHOWN.

	June.						July.						August.				
	2	7	12	17	22	27	2	7	12	17	22	27	1	6	11	16	21
H, 16,000+	626	629	625	630	630	631	636	564	604	617	616	615	617	613	621	619	620
D, 15°	+10.7	10.8	10.8	10.9	11.2	10.2	10.6	8.9	9.4	9.3	9.2	9.4	9.0	10.1	10.1	9.3	8.8
V, 44,000+	898	895	892	893	891	890	890	882	910	904	902	909	909	908	913	911	909
I, 69°	+40.8	40.5	40.7	40.4	40.4	40.3	39.9	44.6	42.6	41.6	41.6	41.8	41.7	41.9	41.6	41.6	41.5
T, 47,000+	878	875	872	874	872	871	874	841	881	880	877	884	885	882	890	887	886

Mean values derived from (a) international quiet days and (b) international disturbed days are as follow: (a) N, 16043 γ ; W, 4352 γ ; V, 44893 γ ; (b) N, 16036 γ ; W, 4349 γ ; V, 44896 γ .

The differences between the mean annual values of N, W, and V, derived from "all," international quiet, and international disturbed days in 1926, 1927 and 1928, are given below, together with the mean differences for the years 1915-1925. In every year of the series quoted the mean value of N and of W on quiet days exceeded the mean value on "all" and on disturbed days. The only years in the period 1915-25, for which either the "all" or the disturbed day mean value of V exceeded the quiet day value were 1917, 1919, 1921.

	Quiet day mean-"All" day mean.			Quiet day mean-Disturbed day mean.			
	N	W	V	N	W	V	
	γ	γ	γ	γ	γ	γ	
1928	..	+4.5	+1.4	-1.6	+7.7	+2.6	-3.4
1927	..	+2.9	+1.1	-0.3	+9.1	+2.4	-2.7
1926	..	+4.8	+2.0	-0.7	+16.1	+5.7	-1.4
1915-1925		+2.7	+1.2	+0.7	+8.5	+3.3	+1.5

The resultant vector representing the average excess of the mean values on "all" days over the mean values on quiet days, for the years 1915-1925, has a magnitude of 3 γ ; its azimuth is 156°, measured from true north through east, and it is inclined at about 77° to the upwardly directed vertical. The vertical plane which contains this vector approximates very closely in azimuth to the vertical plane passing through Eskdalemuir and the pole (taken as 78°N, 68°W) of the axis of magnetization of the earth. (cf. S. Chapman, *On certain average characteristics of world-wide magnetic disturbance* Lond. Proc. Roy. Soc. Series A. Vol. 115, p. 242).

The extreme values of N, W, and V recorded during 1928 are given in Table II.

TABLE II.

Component.	Maximum.			Minimum.			Absolute Annual Range.				
	Value.	Date, 1928.			Value.	Date, 1928.					
North	γ >16354	July	Between 7 23 34 and 7 23 40			γ <14948	July	Between 8 5 and 8 10			γ >1406
			„	8 00 10							
West	4577	July	7	23	38	<3845	July	8	6	50	> 732
Vertical	45245	Oct.	18	18	3	<44372	July	Between 8 1 7 and 8 1 30			> 873

Magnetic Character of the Year.—General agreement not having been reached yet as to the most suitable method of obtaining a numerical measure of magnetic activity, the Eskdalemuir practice of tabulating for each day the value of $\Sigma R^{2\text{①}}$, *i.e.*, the sum of the squares of the absolute daily ranges of N, W and V, has been continued. The evaluation of the mean daily values of Σr^2 , the sum of the squares of the hourly ranges of N, W, and V, has not been carried out since 1925, but the values of hourly ranges have been tabulated and are available for the purposes of investigation. The magnetic character figures which were assigned in accordance with the international scheme are summarized in Table III. These character figures were assigned quite independently of knowledge of the values of ΣR^2 . Table III contains also the monthly mean value of the international character figures, which for 1928 are based on the estimates made at 41 observatories, and the mean monthly values of ΣR^2 for “all,” “0,” “1,” “2,” international quiet (Q), and international disturbed (D) days.

The Eskdalemuir mean character figure for the year is slightly less than for 1927, though the international mean character figure is the same; and both remain below their respective values for the year 1926. The mean sunspot numbers for the years 1923–28 are, in order, 5.8, 16.7, 44.3, 63.9, 69.0 and 76.8. Both the Eskdalemuir and the international mean character figures increased concurrently with the sunspot numbers up to 1926, but the concurrence since then has not been maintained.

The Eskdalemuir character figures suggest that September was the most disturbed month, but on the basis of mean values of ΣR^2 it will be seen that July stands higher, higher even than the very disturbed month of October, 1926. According to either criterion January was the quietest month.

① See p. 173.

ESKDALEMUIR 1928

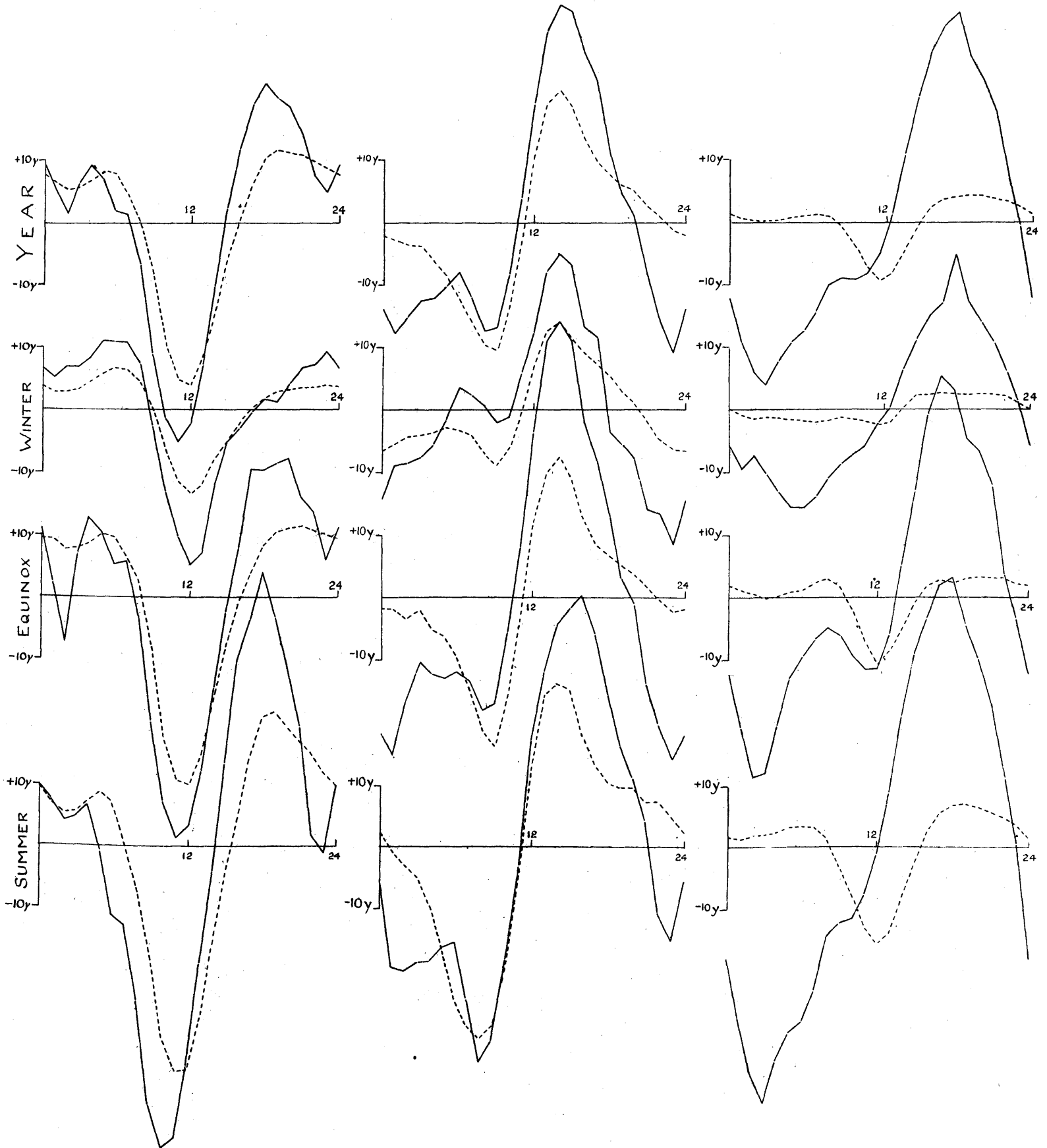
Quiet days.....

Disturbed days —

North Component

West Component

Vertical Component



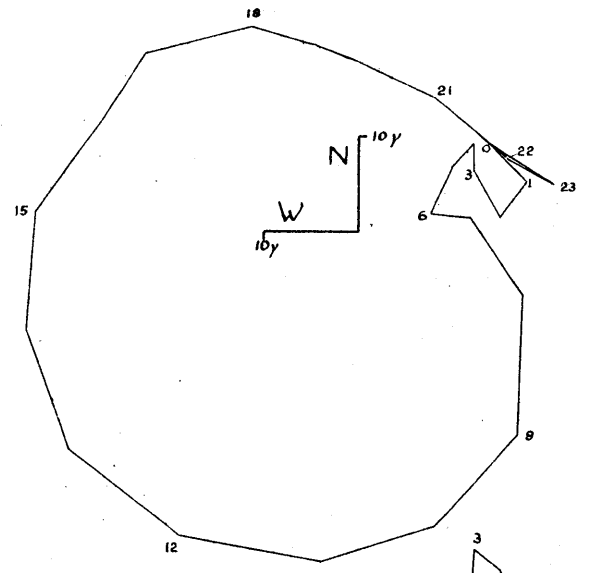
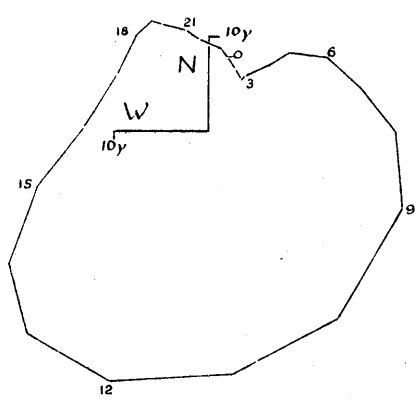
VECTOR DIAGRAMS ILLUSTRATING DIURNAL VARIATION OF MAGNETIC FORCE

ESKDALEMUIR 1928

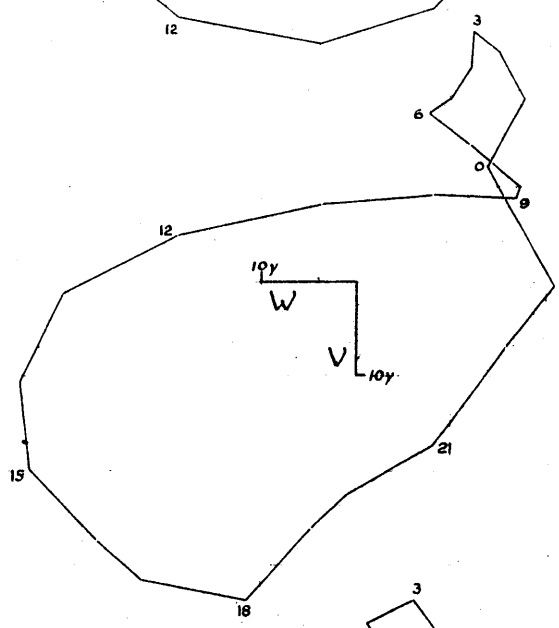
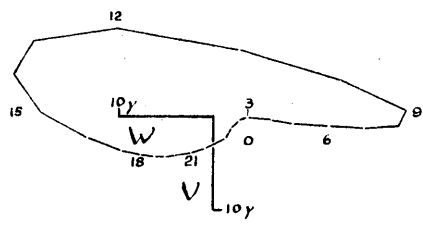
Quiet days

Disturbed days

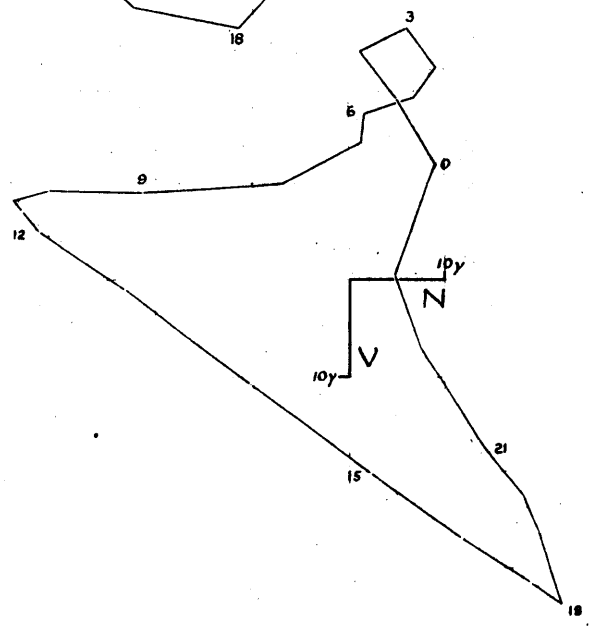
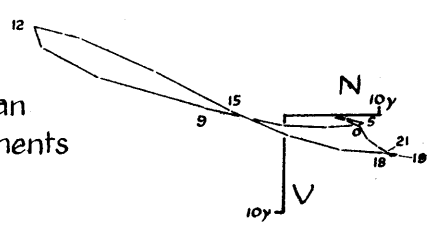
Horizontal
Components



Prime
Vertical
Components



Meridian
Components



In Table III the annual mean values are the means of the monthly values entered in the corresponding columns. If equal weight be allowed to individual " 2 " days the mean annual value of $\Sigma R^2/100$ on these days is 2693. The mean values of ΣR^2 for all, " 2 " and D days for July, August, October, and the year are less than the true values because in either or both of N and V the limits of registration were exceeded on three days. The mean value of ΣR^2 for all days is considerably less than in 1926 ; it exceeds the value for any of the other years since 1919. In the months May to August and in November the value of ΣR^2 on all or D days is greater than in 1926. The value of ΣR^2 for January is notably small even for a winter month.

TABLE III.

Month.	Magnetic Character Figures.			Mean Character Figure.		Mean Value of $\Sigma R^2/100$.					
	" 0 " days.	" 1 " days.	" 2 " days.	Eskdale-muir.	Inter-national.	" All " days.	Q days.	" 0 " days.	" 1 " days.	" 2 " days.	D days.
1928.						γ^2	γ^2	γ^2	γ^2	γ^2	γ^2
January ..	13	17	1	0.61	0.44	65	16	22	77	430	202
February ..	6	23	0	0.79	0.62	105	34	37	122	—	202
March ..	12	15	4	0.74	0.48	151	49	56	122	540	468
April ..	10	20	0	0.67	0.52	183	80	98	226	—	336
May ..	8	18	5	0.90	0.75	503	111	125	273	1937	1892
June ..	6	23	1	0.83	0.72	267	113	108	257	1446	623
July ..	6	24	1	0.84	0.72	1288	123	117	350	30838	935
August ..	9	19	3	0.81	0.56	275	97	112	191	1292	922
September ..	5	20	5	1.00	0.75	324	84	92	207	1024	1024
October ..	4	25	2	0.94	0.83	543	82	91	287	4648	1483
November ..	9	20	1	0.73	0.65	238	20	26	281	1307	783
December ..	8	22	1	0.77	0.54	105	27	27	117	465	289
Year, 1928 ..	96	246	24	0.80	0.63	337	70	76	209	4393	763
Year, 1927 ..	95	231	39	0.85	0.63	258	66	68	164	1244	908
Year, 1926 ..	90	227	48	0.89	0.65	465	63	65	180	2167	2048
Year, 1925 ..	145	191	29	0.69	0.56	172	48	56	154	767	541
Year, 1924 ..	191	153	22	0.54	0.55	121	39	43	113	715	424
Year, 1923 ..	235	111	19	0.41	0.48	115	32	42	129	776	408
Year, 1922 ..	174	145	46	0.65	0.65	205	47	64	221	720	601

Diurnal Inequalities.—The mean diurnal inequalities for " all " days, international quiet and disturbed days, for the months, seasons and the year, are given in Tables 316–333, and the corresponding inequality ranges in Table 334. The inequalities of N, W, and V for international quiet and disturbed days are shown graphically in Plates III and IV, the representation in the latter plate being in the form of vector diagrams.

The ranges of the mean diurnal inequalities of N, W and V on " all " days in 1928, as compared with 1926 and 1927, are in the main rather higher in summer months and lower in winter months. This is in general agreement with the behaviour of ΣR^2 referred to above. The same is true in the main of the ranges of the mean diurnal inequalities on both quiet and disturbed days. In the case of the equinoctial months the most conspicuous feature is the considerable drop in the range of the disturbed day inequality of V, the values in 1926, 1927 and 1928 being respectively 147.7, 95.1 and 64.17.

The average values of the diurnal inequality ranges for the year and seasons for the period 1916-26 (not the values of the range of the representative mean diurnal inequalities for this period) are given below, along with the 1928 values expressed as a percentage of the average values. The units employed are γ for force and γ' for declination. The mean sun-spot number for 1916-26 is 46.7; that for 1927 is 69.0 and for 1928 is 76.8. It was only on international quiet days that the 1927 ranges exceeded the average values for 1916-26 in all seasons and for all components, the excess being greatest for winter and equinox. The 1928 values are nearly all above the average, the excess being greatest in summer. The most conspicuous deficiency is in V in winter in all three classes of days.

		" All " days.					International quiet days.					International disturbed days.				
		N.	W.	V.	H.	D.	N.	W.	V.	H.	D.	N.	W.	V.	H.	D.
Year,	1916-26 ..	36.6	38.7	21.9	35.6	8.26	32.7	37.0	12.1	32.4	8.00	48.3	53.7	65.6	49.7	11.14
	1928 % ..	120	122	102	124	120	116	112	112	118	111	118	104	103	115	107
Winter,	1916-26 ..	22.1	27.7	15.9	18.3	6.31	19.0	19.4	5.2	15.9	4.42	30.1	49.5	53.8	27.5	10.50
	1928 % ..	118	107	82	121	107	104	117	96	104	112	119	94	90	116	99
Equinox,	1916-26 ..	41.5	44.2	27.2	39.0	9.57	37.8	42.0	13.1	37.2	9.04	56.0	65.3	82.0	55.4	13.76
	1928 % ..	118	126	95	121	123	110	110	105	110	108	109	107	105	109	110
Summer,	1916-26 ..	54.0	55.6	26.5	56.1	11.33	45.6	53.4	19.8	46.7	11.12	78.3	67.9	70.2	85.5	12.80
	1928 % ..	123	115	117	125	111	126	107	114	127	110	118	110	113	117	101

Daily Range.—The values of mean absolute daily range for the months and seasons of the year, together with the corresponding means for 1916-26 are given in Table IV; the ranges are also expressed as percentages of the mean absolute daily range for the year.

TABLE IV.—ABSOLUTE DAILY RANGE. MEAN MONTHLY VALUES.

Month.	Mean Absolute Daily Range.						Mean Daily Range expressed as Percentage of Yearly Mean.					
	1928.			Mean 1916-26.			1928.			Mean 1916-26.		
	N.	W.	V.	N.	W.	V.	N.	W.	V.	N.	W.	V.
January ..	γ	γ	γ	γ	γ	γ	%	%	%	%	%	%
February ..	47	50	17	69	73	39	51	57	35	80	88	81
March ..	60	70	24	69	76	38	65	81	50	80	92	80
April ..	68	77	37	95	94	57	74	88	77	110	113	119
May ..	86	88	40	98	88	54	93	101	81	114	106	113
June ..	133	106	74	102	88	59	145	121	153	119	106	123
July ..	109	94	49	92	85	46	119	108	101	107	102	96
August ..	149	117	77	86	82	43	162	135	158	100	99	90
September ..	95	88	59	98	88	55	103	101	122	114	106	115
October ..	102	103	65	100	92	63	110	118	135	116	111	131
November ..	118	111	69	94	93	57	129	127	143	109	112	119
December ..	82	77	46	62	66	34	89	89	95	72	80	71
Year ..	55	67	25	60	64	33	60	76	50	70	77	69
Winter ..	61	66	28	65	70	36	66	76	58	76	84	75
Equinox ..	93	95	53	97	92	58	102	108	109	113	111	121
Summer ..	121	101	65	95	86	51	132	116	134	110	104	106
Year ..	92	87	49	86	83	48	—	—	—	—	—	—

Owing to the limits of photographic registration being exceeded in the storm of 7-8 July, the absolute daily range values given in the above table for N, W and V are less than the true values. The values of the mean daily range for the year are from 3 to 5% greater than for 1927 but less than the corresponding values for 1926. The mean ranges for the months May to August, November and December have risen as compared with the two previous years, but for the months January to April the ranges are lower.

The frequency distribution of absolute daily ranges recorded in 1928 is shown in Table V, which also contains the percentage distribution for the period 1916-1926.

TABLE V.—FREQUENCY DISTRIBUTION OF ABSOLUTE DAILY RANGE.

Range.	Number of Cases 1928.			Percentage Distribution.					
				N.		W.		V.	
	γ	N.	W.	V.	1928.	1916-26.	1928.	1916-26.	1928.	1916-26.
0-9	0	0	21	0.0	0.0	0.0	0.0	5.7	6.3
10-19	2	0	61	0.5	1.7	0.0	0.9	16.7	20.2
20-29	10	11	83	2.7	4.9	3.0	4.5	22.7	24.8
30-39	30	19	74	8.2	7.8	5.2	7.5	20.2	14.3
40-49	23	26	33	6.3	9.9	7.1	10.6	9.0	8.1
50-59	35	34	22	9.6	12.2	9.3	12.0	6.0	4.8
60-69	42	53	17	11.6	12.9	14.5	13.1	4.6	4.2
70-79	41	53	12	11.2	10.3	14.5	12.4	3.3	3.1
80-89	42	43	9	11.6	8.1	11.7	8.6	2.5	2.3
90-99	35	29	3	9.6	6.5	7.9	7.5	0.8	2.1
100-109	21	32	3	5.7	5.3	8.7	4.7	0.8	1.1
110-119	21	9	2	5.7	4.0	2.5	3.5	0.5	1.2
120-129	15	12	5	4.1	3.5	3.3	2.7	1.4	0.8
130-139	11	11	2	3.0	2.6	3.0	2.2	0.5	0.8
140-149	11	6	1	3.0	1.7	1.6	2.2	0.3	0.5
150-159	4	3	1	1.1	1.3	0.8	1.2	0.3	0.7
160-169	2	7	2	0.5	1.2	1.9	0.9	0.5	0.5
170-179	5	4	2	1.4	0.8	1.1	1.0	0.5	0.4
180-189	1	0	2	0.3	0.6	0.0	0.7	0.5	0.5
190-199	2	1	1	0.5	0.5	0.3	0.6	0.3	0.3
200+	13	13	10	3.6	4.4	3.6	3.1	2.7	3.1
Days omitted	0	0	0	..	..	..	..	..	..

TABLE VI.—PRINCIPAL MAGNETIC DISTURBANCES RECORDED AT ESKDALEMUIR, 1928.

Where the beginning of a disturbance has been marked by a "sudden commencement," the serial number is followed by an asterisk (*), and the time entered in the second column is that of the sudden commencement, estimated to the nearest minute. In other cases, the exact hour nearest the time at which disturbance began is regarded as having begun is entered in the second column. To the tabulated values of maximum and minimum the following have to be added:—N, 15000 γ; W, 4000 γ; V, 44000 γ.

Table with columns: No., From (d. h. m.), To (d. h. m.), North Component (Max., Time, Min., Time, Range), West Component (Max., Time, Min., Time, Range), Vertical Component (Max., Time, Min., Time, Range). Rows 1-40 detailing magnetic disturbances.

The intervals of maximum frequency in 1926 and 1927 were 70–79 γ for N, 60–69 γ for W, and 20–29 γ for V. In the present year the maximum frequency for W is about one interval higher. In 1923, the year of the last sunspot minimum, the intervals were 40–49 γ for N and W, 10–19 γ for V.

On 48 days in 1928 the absolute range in either N or W was 160 γ or more. The numbers of such days in the years 1915 to 1927 were, in order, 30, 47, 35, 56, 58, 36, 27, 32, 11, 10, 24, 46, 41. The frequency of occurrence in 1928 of ranges in excess of 199 γ is about one-half that in 1926 and much the same as in 1927. There were five days on which the range in each of N, W, and V was 200 γ or more, as compared with 18 such days in 1926 and seven in 1927.

Irregular changes in Declination.—In connexion with the supply of declination data to mine surveyors it has been the practice since May, 1928, to classify the hourly periods between the exact hours G.M.T. into four groups according to the range in declination within each period. The range limits, which were adopted in consultation with representative mine surveyors, are :—less than 5', between 5' and 15', between 15' and 30', and greater than 30'. This method of classification has been applied to the declination records obtained in the year 1928, and the actual frequencies of occurrence of hourly ranges in the last three of the four divisions mentioned are set out below. Owing to defects in the record ranges could not be assigned in the intervals January 6d 23h–7d 10h, March 19d 9h–16h, November 28d 1h–11h and 30d 6h–10h. Inspection of the N and W traces shows that in none of these intervals did the hourly range (as defined) definitely exceed 5'. A range of 30' is equivalent to a change of 145 γ in the component of horizontal force perpendicular to the magnetic meridian.

Number of cases per month.

Range Interval.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
5' to 15' ..	25	49	50	58	86	89	77	62	104	89	79	60	828
15' to 30' ..	0	3	5	3	14	3	9	6	9	17	18	8	95
>30' ..	0	0	0	0	3	0	10	0	0	5	1	0	19

Hourly Distribution. 1928.

Hour ending at (G.M.T.).

Range Interval	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
5' to 15' ..	57	54	43	39	28	27	31	19	19	25	35	39	21	21	18	27	27	22	31	44	53	47	48	53
15' to 30' ..	9	4	6	3	1	2	0	3	1	0	1	1	0	1	1	5	4	11	4	5	8	11	6	8
>30' ..	0	1	1	1	1	1	1	1	2	1	1	0	0	0	0	0	1	1	3	1	0	1	0	1

On the average quiet day the most conspicuous change in declination is that from the most easterly value at about 8h or 9h to the most westerly value at about 13h or 14h; the rate of change being greatest between 10h and 12h. The hourly range due to the regular diurnal variation at this time of day is less than 5', but doubtless it happens at times that the occurrence of slight disturbance will result in the hourly range exceeding 5', whereas the occurrence of the same degree of irregularity at another hour of the day would not cause the hourly range to exceed 5'. Thus the figures given above for the range interval 5'–15' tend to exaggerate somewhat the incidence of irregular changes between 9h and 13h. The hourly distributions of the frequency of occurrence of ranges between 5' and 15' and between 15' and 30' exhibit the well known tendency for irregular changes to occur predominantly during the "night" hours—at least in Europe. Ranges in the first interval were nearly twice as frequent, and in the second interval five times as frequent, between 16h and 4h as between 4h and 16h.

Principal Magnetic Disturbances during 1928.—Particulars of the principal magnetic disturbances recorded during the year are given in Table VI. Corresponding information for the same disturbances is given in the Lerwick Section. The magnetograms for the most highly disturbed days are not reproduced in this volume, but photographic copies may be obtained on application to the Director, Meteorological Office, Air Ministry, Kingsway, London, W.C. 2.

Remarks on Magnetic and Allied Phenomena, 1928.

January.—(Average Character Figure 0·61). Until the 26th magnetic conditions were very quiet. Some disturbance occurred from 26d 19h to 27d 13h but the ranges recorded were small, 144 γ in N, 103 γ in W and 108 γ in V; thereafter until the end of the month conditions were rather less quiet. Character figure 0 was assigned to no less than 13 days and character figure 2 to only one day (27th).

Several sunspots, just visible to the naked eye, are noted as having occurred during this month, the dates of their passing of the sun's central meridian having been 3rd, 22nd, 25th and 30th. The third of these in Latitude 8°N occurred about the time of the only appreciable magnetic disturbance and is described¹ as having been associated with a large metallic prominence of the "rocket" type, which had nearly disappeared round the sun's limb by the end of the month.

February.—(Average Character Figure 0·79). In slight disturbance on the first two days of the month the chief feature is a "bay" in W between 20h and 20h 30m on the 1st, which is repeated between 18h 45m and 20h 45m on the 2nd; in both cases the extreme depression below the undisturbed value is about 127 γ and is reached some 25 minutes after the commencement of the movement. The simultaneous movements on the N traces are roughly wave-shaped, first down and then up, and of about 15 γ amplitude* on 1st and 24 γ on 2nd. A rather sudden rise in N of about 40 γ and fall in W of 20 γ occur at 2d 22h 27m.

Conditions then remained rather quiet until 12d 7h 15m when a "sudden commencement" (initial changes:—N + 10 γ , W - 5 γ) marked the beginning of slight disturbance which lasted until 15d 3h, but gave an extreme range of only 88 γ (in W). Few notable features occurred in this period, but mention may be made of a sudden rise of some 60 γ in N commencing at 15d 21h 57m, with a recurrence some 22 hours later in the form of a rise of 47 γ . On the 14th a somewhat similar but less marked movement had commenced at 20h 30m. Slight, but only slight, disturbance occurred on several days later in the month, though a large sunspot (Central Meridian Passage Feb. 21·6), possibly a return or a revival of the spot of Jan. 25th, was plainly visible about this period.²

Character figure 2 was not assigned to any day in this month.

March.—(Average Character Figure 0·74). Until 10th conditions were very quiet. A "sudden commencement" at 10d 22h 16m followed by a rapid rise of N through 35 γ and rapid oscillatory movement of small amplitude for 1½ hours in both N and W, was succeeded by quiet conditions until 11d 8h and thereafter a rather disturbed period of two days. The ranges in N and W were not great, but the period from noon of 11th to 8h of 12th showed a well-developed disturbed day oscillation of V with a range of 248 γ . It is to be noted that this storm is separated from the smaller storm of February 12-15 by an interval of 27 days 15 hours and from that of April 6-8 by an interval of 26 days 20 hours.

A further disturbance of small magnitude is regarded as having lasted from 13d 10h to 15d 6h. Thereafter conditions were quiet until the end of the month.

The Sunspots of March 18, 19³ do not seem to have been associated with any noticeable magnetic activity.

Character figure 0 was assigned to 12 days in March, including the first nine days, and character 2 to the four days 11th to 14th inclusive.

April.—(Average Character Figure 0·67). The first few days of April were not entirely quiet, but the first disturbance to be mentioned is that which lasted from 6d 17h to 8d 6h. During the period 21h to 23h of 7th, N and W each fluctuated in

¹ *Nature*, Vol. CXXI, p. 220.

² *Nature*, Vol. CXXI, p. 335.

³ *Nature*, Vol. CXXI, p. 806.

* *i.e.* the range of the oscillation was about 30 γ . The word amplitude is used in this sense throughout these notes.

value by 133γ , whilst V showed a "pit" of some 47γ below the undisturbed value; again, around 8d 1h V showed another "pit" of about 53γ in depth. By the 11th conditions had again become very quiet; they continued so until the afternoon of 14th when slight disturbance recommenced.

The period 19d 2h to 21d 20h was sufficiently disturbed for mention, at least in the case of W; a fairly large spot (in Lat. 16°S) was nearest the centre of the sun's disc on 19th.¹ The remainder of the month was quiet.

Character figure 2 was not assigned to any day of the month.

May.—(Average Character Figure 0.90.) Disturbance was of more frequent occurrence, the character figure 2 being assigned to five days and character 1 to 18 days.

The first four days of the month were quiet. A "sudden commencement" at 5d 2h 47m was followed by slight disturbance lasting till midnight, but the first noteworthy disturbance began about 10d 8h with small oscillations (period about two minutes) in N and W; these continued till 12h 15m, when the larger movements began with a sharp rise in N and W and a drop in V. In their main outlines the curves of all three components are similar to those of Lerwick, and show a maximum about 17h and a minimum shortly before midnight. The ranges during this period were 174γ in N, 176γ in W, 180γ in V.

After a brief quiet interval from 11d 9–13h, disturbance was renewed, and continued with greater or less intensity till the early hours of the 15th. It is worth noting that the largest group of sunspots seen since February was on the sun's disc during the period 2nd to 14th, the time of Central Meridian Passage being May 8.4.¹ Further moderate disturbance occurred between the morning of the 16th and the evening of the 17th, with ranges of 171γ in N, 147γ in W, and 80γ in V.

After a quiet period from the 20th to 26th, one of the largest disturbances of the year began on the morning of the 27th. As is the rule, the initial movements consisted of small and rapid oscillations in N and W, beginning about 6h. During the afternoon all three components rose irregularly; the curve of N has several peaks between 15 and 18h and then falls gradually to a minimum at 28d 9h; the main features of the W curve are a rapid fall of 100γ after 17h, and another of 180γ between 21h and 21h 40m, followed by an irregular rise to a maximum at 28d 6h. V rose rapidly to a maximum shortly after 17h on the 27th, continued near the same value for 4 hours, and fell by 85γ between about 21h 30m and 22h 10m; then followed a rounded hump and a fall to two minima at about 4h and 6h 30m on the 28th. The ranges during this period were:—N 417γ , W 287γ , V 217γ . During the second day (28th–29th) the disturbance was much more intense in N and V. All three components underwent large oscillations, with a period of the order of $\frac{1}{2}$ –1 hour, superposed on those of shorter and longer periods, especially after the time of maximum in the afternoon. It is noticeable that sometimes during these large oscillations those of very short period (a few minutes), which are scarcely ever absent, are temporarily invisible; this is especially the case where the curve makes a complete oscillation of sine-wave shape. The long-period oscillation is particularly well developed in V, where in its main outline the curve is a wave of amplitude 160γ , with maximum at 28d 15h and minimum at 29d 2h. The absolute ranges during the afternoon and night of the 28th–29th were:—N 466γ , W 264γ , V 379γ . At Lerwick this disturbance, though large in H, was very small in V.

Disturbance continued with moderate intensity during the 29th; perhaps the most notable feature of it is the fairly regular period of about 50 minutes, which can be distinguished in the oscillations of N between 12h and 20h; the corresponding amplitude is of the order of 25γ .

¹ *Nature*, Vol. CXXI, p. 806.

June.—(Average Character Figure 0·83). No large disturbance occurred in this month. During the first eight days there was continued activity, one feature of which was the frequent appearance of small oscillations of a few minutes' period in the horizontal components from about 6h onwards, followed by a sharp rise of some 50 γ about 15h marking the onset of more vigorous movements. On the 7th the activity was rather greater. N rose by 160 γ between 13h 30m and 14h 40m, immediately falling again and continuing to do so irregularly till it reached a minimum at 8d 1h 35m; the maximum in W occurred at practically the same time as that of N; V rose in a rounded hump to a maximum about 7d 17h, falling gradually to a minimum shortly before 8d 2h.

A period of small activity followed, during which the 10th, 11th and 16th were among the quietest days of the month, although seldom free from small and rapid oscillations, especially during the daylight hours.

The largest disturbance of the month occurred on the 22nd. After several quiet hours, small oscillations of about 1½ minutes' period began in N and W at oh 18m. After a few minutes W fell by 25 γ and continued to fall slowly till about 8h; N had no conspicuous changes till 6h, when a fall began, which became increasingly rapid at 8h and resulted in a total drop of some 200 γ below the undisturbed value, with a minimum at 8h 39m and a rapid recovery soon after. W fell slightly at 8h, beginning to rise rapidly at 9h and reaching a maximum at 9h 20m, 100 γ above the undisturbed value. The course of the V curve shows a slight dip between oh and 4h, and a fall around 9h to a minimum about 10h. After this the horizontal components continued with much agitation of small amplitude till 20h 40m, when a fall took place in both; this reached 130 γ in W by 23h, but in N was soon turned into a rapid rise to a peak about 100 γ high at 21h 19m; both components then underwent considerable fluctuations till 23d 5h, when these died out and the small rapid oscillations began. On the 22nd V rose between 12h and 14h to a rounded maximum, followed by a gradual fall; this was broken by more rapid falls beginning at about 21h and 22h 40m, the latter leading to a minimum at 23d oh 20m and followed by an irregular rise till 10h.

The succeeding two days, until the end of the 25th, were of the type described at the beginning of the month. The remainder of the month was moderately quiet. The sunspot in Lat. 19°S and of Central Meridian Passage June 28.9 was apparently not associated with any noteworthy magnetic disturbance.

July.—(Average Character Figure 0·84). Apart from one very large magnetic storm, this was a month of little disturbance. A "sudden commencement" at 2d 8h 33m was followed by very moderate activity during the rest of the day. The succeeding days were also moderately active, until the greatest storm of the year began with irregular oscillations in N at 7d 18h. These continued until shortly after 22h, when the larger movements began with a fall in N and W. At 23h 26m an abrupt movement in all three components marked the beginning of very large and rapid fluctuations which lasted till noon of the next day; N rose rapidly and passed off the sheet at 23h 35m; W rose by some 250 γ to a sharp peak at 23h 37m, and V fell by 85 γ in 14 minutes. Soon after midnight N fell irregularly, and passed off the bottom of the sheet at about 8d 1h 30m, remaining off (with temporary returns between 2h and 5h) till about 11h; V also fell beyond the limit of registration, but reappeared in several large peaks during the night and morning, the largest being at 2h 15m and 4h 15m, the latter the absolute maximum for the storm; W underwent large and rapid fluctuations, but was below its undisturbed value during practically the whole night after a drop of 470 γ from a peak at 1h 10m. Considering its intensity the disturbance died out quickly, the largest oscillations ceasing about 8d 11h, though considerable agitation continued till 22h, to be renewed soon after midnight.

At Lerwick the disturbance was very similar in the horizontal components; in V many of the features were the same, e.g. the disturbance began with a rapid drop

at 7d 23h 26m, which was continued till soon after 8d 1h, and there was a very large and rapid rise at 4h; but whereas at Eskdalemuir V was below its normal value from 8d 0–10h, at Lerwick it was greatly above normal from 2h onwards.

The ranges recorded were :—N 1406 γ , W 732 γ , V 796 γ , but these must have been greatly exceeded in N and V, and somewhat in W as well.

The values of ΣR^2 printed in Table 295 might suggest that this month was more disturbed at Eskdalemuir than at Lerwick; but the limits of registration were exceeded at both places, and the figures given, being for the ranges actually recorded, depend in this month mainly upon the range of registration of the instrumental equipment at the two observatories. At the time of the storm there was a moderate-sized group of sunspots just past the sun's central meridian and in Lat. 8°N. The time of Central Meridian Passage was July 12.4.¹ Certain other matters, apparently associated with this storm are referred to above in the Review of Results.

There was slight magnetic agitation on the succeeding days until the end of the 12th, when a quiet period began; conditions were very quiet until 17d 10h, and rather less so until the 21st. Another group of sunspots occurred about this time in Lat. 18°S, its time of Central Meridian Passage being July 17.5.¹

On the 21st at about noon, small, rapid and irregular fluctuations began; these increased about midnight, but died away during the succeeding day and night, and do not present the usual features of a noteworthy disturbance. There was a dip in V during the early hours of the 22nd, with several irregular waves, the absolute minimum occurring at 3h 40m. At Lerwick this disturbance was of similar type, but of rather greater intensity in the horizontal components, though less in V.

During the rest of the month, though the only really quiet period was from 29d 6h to 30d 15h, there was nothing to remark upon except a slight disturbance on the 31st. This was preceded by small fluctuations beginning at 30d 15h, and continuing at intervals through the night, and by very small and rapid oscillations from about 31d 10–13h (period about 1½ minutes). A naked eye sunspot is noted as having been present in Lat. 14°N from about July 27th to August 6th, its time of Central Meridian Passage having been July 31.8.²

August.—(Average Character Figure 0.81). Considerable disturbance followed a well-marked "sudden commencement" at 4d 17h 7m. The fluctuations were at first irregular, but a fall in W of 85 γ in 35 minutes may be mentioned, beginning at 20h 10m. At 22h V began to fall, and the fall became increasingly rapid after midnight, until a minimum was reached at 5d 1h 48m, after which V rose rapidly for 25 minutes. Two further dips occurred, with minima at about 3h and 6h, separated by a large rounded hump. Between 1h 6m and 3h 6m there was an abrupt dip in N of 110 γ , with a temporary rise around 2h; the corresponding movements of W consisted of two dips of about 55 γ at 1h 20m and 2h, separated by a peak at 1h 34m and followed by another at 3h 2m. N underwent two further sharp dips at 5h 35m and 6h 59m, after which set in the small and rapid oscillations which are usual in the morning hours. W rose irregularly to a maximum at 5h 46m.

During the 5th the disturbance was of about the same degree of intensity. V rose during the afternoon to a pronounced maximum between 17 and 18h, afterwards falling until 6d 1h. N and W rose irregularly, the general outlines of the curves showing maxima at about 16 and 17h respectively, but the absolute maximum of N occurred in an abrupt peak at 17h 55m; after this both components fell slowly, and the disturbance died away temporarily soon after midnight.

The ranges during the period discussed were :—N 258 γ , W 200 γ , V 300 γ . The disturbance was of similar type as recorded at Lerwick, but the ranges were much greater, especially in H.

¹ *Nature*, Vol. CXXII, pp. 108 and 142.

² *Nature*, Vol. CXXII, p. 453.

Disturbance was renewed on the evening of the 6th, and lasted for some 24 hours. The movements were irregular in the horizontal components, and present no marked features for description. Beginning at 19h 36m, N fell by 70γ to a minimum at 20h, rising again rapidly till 20h 20m, thereafter falling irregularly for 3 hours; at 23h 22m, a rapid rise of 80γ began, followed by a dip of about 80γ between 23h 45m, and 1h 55m, and this was accompanied by a dip of about 65γ in W. The oscillation of V was more regular; the curve rises gently to a maximum soon after 6d 20h; it then falls steadily by 150γ to a minimum shortly before 7d 2h, and thereafter rises at about the same rate till 4h 30m.

After the end of the 7th, conditions were mainly quiet for nearly three weeks, broken by a slight disturbance on the 12th. The next disturbance to be noted occurred after a "sudden commencement" at 25d 22h 35m. During the rest of the night and early morning the fluctuations of N and W were irregular, becoming small after 26d 6h. After a rapid rise to a maximum at 0h 44m, N fell gradually until about noon. V fell by 50γ to a rounded minimum at 1h, followed by a slight hump during the next 4 hours, another minimum at 3h 25m, and a gradual rise until the afternoon. During the afternoon of the 26th rather rapid oscillations occurred, N rising to a maximum around 21h, and V showing slight undulations with maxima near 14h, 17h, and 20h. The largest movements took place in the early hours of the 27th; N fluctuated irregularly, with small minima roughly 60γ in depth at 0h 29m, 2h 33m, 6h 17m, and 9h 14m. Dips occurred in W, centred near 1h and 4h, separated by a small peak at 2h 5m. V fell to a small minimum at 0h 25m, separated by a temporary rise from a much deeper fall at 2h, which reached some 200γ below the undisturbed value at 2h 36m; after remaining near this low value for 2 hours, V began to rise soon after 4h 30m, and continued to do so, with a temporary fall at 6h 10m, till 9h.

The disturbance was of similar type at Lerwick, but more intense, especially in the horizontal plane.

Moderate disturbance continued until the morning of the 29th, and the remainder of the month was quiet.

September.—(Average Character figure 1.00). Judged by the mean character figure this was the most disturbed month of the year, though three months have larger mean values of ΣR^2 . The month was similar to May in that there was a large amount of moderate disturbance.

The 1st was quiet, but shortly before 23h a slight disturbance began. This consisted of two shallow dips in W from 22h 30m to 24h, and from 0h 30m to 4h 30m on the 2nd, accompanied by small humps of about 30γ in N at 23h 5m, 0h 30m and 4h 40m, and a dip of about 55γ in V between 0h and 8h. The first half-hour (22h 30m–23h) was marked by extremely small and rapid oscillations in N and W, such as are frequently seen near midnight. The remainder of the 2nd was fairly quiet until 23h, when a rather rapid rise of 30γ in N and 25γ in W, and a gradual fall of 15γ in V, began. A shallow dip in V persisted till about 3d 4h, and small fluctuations occurred in N and W during the morning hours. N fell to a minimum at about 10h, afterwards rising irregularly till about 17h. V also rose during the afternoon, and the unusual feature of the disturbance was a rapid rise of 120γ in V between 16h 30m and 17h 20m, followed immediately by a rapid fall which continued, with a brief break at 19h 20m, until 20h 20m. The maximum value of N occurred in a small irregular peak at 17h 11m. W fell gradually from its maximum at about 14h, undergoing an abrupt drop of 80γ between 17h 9m and 17h 12m. Moderate fluctuations took place in all components between 19h and 20h 30m, and the disturbance died away soon after midnight.

At Lerwick the remarkable feature was the very large and sudden rise and fall in H corresponding to those in V at Eskdalemuir; but it may be remarked that the drop in H was arrested abruptly at 17h 30m, the time when the Eskdalemuir V curve is steepest and shows the merest trace of discontinuity.

After three quiet days a "sudden commencement" at 7d 13h 44m marked the beginning of a large disturbance. N and W continued their normal diurnal variation, but with greatly increased fluctuations. V rose rapidly in three waves to a maximum at 17h 35m, and then fell irregularly till 8d 2h; three marked dips occurred, with minima at 19h 23m, 22h 21m and 2h 11m, the last being the absolute minimum. In N and W fluctuations of the order of 50γ, but without any very marked features, continued through the night and for the next two days, dying away in the early hours of the 10th. The variations of V during the 8th–10th were of similar type to those of the 7th–8th, but of decreasing amplitude. At Lerwick the disturbance was very great in H, the main features of which were similar to those of V at Eskdalemuir rather than to those of N. Conditions were calm for the next 8 days, during which the 15th–17th were among the quietest days in the month. The large sunspot in Latitude 14°N, time of Central Meridian Passage, September 12·7, was thus not associated with noteworthy magnetic activity.¹

A "sudden commencement" at 18d 15h 42m was followed immediately by considerable agitation. N and W rose abruptly and continued to oscillate rapidly until about 20h 20m, when a fall began in both, which in less than 20 minutes reached 75γ in N and 120γ in W; this was followed by a rapid recovery in N. V changed little until 19h, when it began to rise, reaching a rounded maximum at 20h 46m. Between 22h 40m and midnight there was a marked outburst of activity, all three components falling to a pronounced minimum preceded by a smaller one; the times of minima were:—N, 22h 55m and 23h 8m; W, 22h 55m and 23h 19m; V 22h 56m and 23h 6m. Slight agitation continued during the morning of the 19th, increasing during the afternoon and dying away before midnight. The ranges during the period discussed were:—N, 237γ; W, 220γ; V 158γ. At Lerwick the disturbance in H was similar to, but greater than, that in N at Eskdalemuir, while in V the dip at 23h was inverted into a sharp rise and fall.

The period 20d 18h to 22d 8h was calm, on the next two days there was considerable activity of a small order, and on the 24th a well-marked "sudden commencement" occurred at 16h 22m. In this connection it is to be remarked that the time of Central Meridian Passage of a large sunspot in Lat. 15°N is given as September 24·4.²

Considerable magnetic activity continued through the night and the following day, the hours from 6 to 13 on the 25th being marked by rapid oscillations of relatively large amplitude, particularly between 7 and 8h. At 21h larger oscillation of a different character set in in N and W; after rising rapidly to maxima at 21h 36m and 21h 44m respectively each component made two complete and very smooth oscillations; the maxima of N occurred at 21h 59m and 22h 15m, while those of W were at 22h 2m and 22h 20m, about $\frac{1}{4}$ period later than N; after this the oscillations became less regular, but the same phase-relation can be detected until midnight. Concurrently with these there was a fall in V to an irregular minimum soon after 22h, separated by a small hump from another at about 0h 30m.

The rest of the month was quiet, especially 28d 0h and 29d 8h. The very large sunspot in Lat. 15°S, time of Central Meridian Passage September 27·4, was not apparently coincident with noteworthy magnetic disturbance.²

October.—(Average Character Figure 0·94). There was considerable activity of a low order throughout most of the month, but the only large disturbances occurred on the 18th and the 24th–25th. A small "sudden commencement" at 1d 19h 17m was followed by very moderate agitation. A few minor fluctuations took place till

midnight ; the hours from 0 to 6 on the 2nd were quiet ; and soon after 6h small and rapid oscillations began in N and W, superposed on oscillations of about 1 hour period and amplitude in N of about 15γ , which lasted till 21h. V rose during the afternoon to a rounded maximum soon after 17h, afterwards falling gradually ; a small hump occurred at about 19h, shortly before a dip of 60γ in W and a peak of 75γ in N.

The succeeding fortnight, though not entirely quiet, was without any large disturbance. The period 9d 0h to 13d 12h was one of the quietest of the month.

After eight very quiet hours, a well marked " sudden commencement " at 18d 7h 23m was followed immediately by great activity. N and W fluctuated rapidly and irregularly during the morning and afternoon. The most prominent feature of the N curve is a rapid rise of some 180γ shortly before 16h, followed by large oscillations of 40γ amplitude, during which the maximum occurred at 17h 19m, and a large drop beginning at 18h. W made several large and smooth oscillations between 17h 30m and 18h, a rapid fall occurring at the same time as that in N. V rose in three large waves with maxima at about 12, 15, and 18h ; the absolute maximum occurred at 18h 3m, and was followed immediately by an abrupt fall of 140γ . From 18h 20m to 19h 20m the fall in V was still rapid, but marked by six small waves ; during this hour there was also a temporary lessening of activity in N and W. At 19h 20m disturbance began again. After rising by 70γ to a small peak at 19h 40m, V continued to fall, reaching its minimum at about 21h ; after a small and rapid rise at 21h 30m, the disturbance ceased except for very small oscillations. N and W fluctuated rapidly from 19h 20m ; large oscillations occurred in both between 20h 30m and 21h 30m, and after this the oscillations were small and rapid for 48 hours. The ranges during the storm were 488γ in N, 426γ in W and 363γ in V. At Lerwick the disturbance was comparatively small in V, but great in H. The H curve has points in common with both N and V curves at Eskdalemuir, while the V shows a small dip at 18h, in place of the large rise at Eskdalemuir.

Among the features of the succeeding days we may notice a sudden rise of 75γ in N to a sharp peak at 20d 20h 49m, accompanied by an oscillation in W, reaching a small peak at 20h 51m, and a drop of 12γ in V ; this would not be worthy of remark were it not that movements of very similar shape occur again twice, at about 48 hour intervals, viz., at 22d 18h 29m, and 24d 19h 6m.

The last of these was preceded by a small movement of the type of a " sudden commencement " at 24d 17h 50m. During the rest of the night a considerable disturbance took place ; this was characterised by large dips in all components, of which the times and greatest depth below the undisturbed value were roughly as follows :—N, 25d 0—3h, 380γ ; W, 24d 23h to 25d 3h, 270γ ; V, 24d 22h to 25d 5h, 280γ (the minimum of V occurs after a rapid drop in the middle of the rather rounded dip).

Before this, between 19 and 22h on the 24th a small dip occurred in W and a small hump in V. After 25d 6h there were no large movements, but small and rapid oscillations persisted in all components throughout the 25th. At 16h 55m an abrupt rise of 110γ occurred in N, preceded by a small drop, and accompanied by small movements in W and V.

The ranges were 394γ in N, 340γ in W, 364γ in V. At Lerwick the main point of difference was in V ; for although this component shows a considerable dip corresponding to that at Eskdalemuir, it is broken at about 2h by a sharp peak in which the maximum value occurs shortly after the time of minimum at Eskdalemuir.

Further outbreaks of activity on a small scale occurred between 12 and 24h on the 26th, and between 3 and 9h on the 27th, and for the rest of the month few hours were free from minor activity.

November.—(Average Character Figure 0·73). A small disturbance began on the 1st with a drop of 27γ in N at 19h 39m, accompanied by a small rise in V. Between 3 and 7h on the 2nd several marked oscillations took place in N and W, accompanied by a dip in V. During the afternoon V rose, with a hump at 15h, to a maximum at 18h, falling to a rounded minimum shortly before 3d 1h. No large fluctuation occurred in N and W, but we may mention a dip of about 75γ in both shortly before 18h. (At Lerwick the corresponding movement in H was a rise; but the D curve is similar to W at Eskdalemuir). This seems to have been the beginning of a series of oscillations in W, with a period of about 2h, which appear for the next 24 hours, and less obviously until 4d 8h; the amplitude is of the order of 20γ . Dips of about 120γ occurred in W, with minima at 3d 18h 2m and 19h 25m, the former accompanied by a peak about 115γ high in V, the latter by a peak of 110γ in N at 19h 32m* ; this is repeated on the next day in another peak in N and a dip in W at 19h.

The next 7 days were fairly quiet, especially 8d 0h to 10d 3h. A very small "sudden commencement" at 10d 6h 55m was preceded by four hours of very small and rapid oscillations, and followed by slight agitation during the rest of the day. The time of Central Meridian Passage of a large group of sunspots in Lat. 16°S and associated with metallic prominences is given as Nov. 9·4.¹ After another "sudden commencement" at 11d 16h 58m there was considerable activity, lasting (with a break from 12d 23h to 13d 2h) till the early hours of the 14th. The most remarkable of the oscillations occurred between 22h and midnight on the 11th. N underwent a complete oscillation like an angular sine-wave of amplitude nearly 120γ , with maximum at 22h 35m and minimum at 23h 16m; W fell slightly at 22h, rose to a tall hump at 22h 48m and fell by 122γ to a minimum at 23h 35m; V fell by 68γ to a rounded minimum shortly before 23h. Very similar movements occurred again at 12d 21h.

The early hours of the 13th were marked by irregular fluctuations, with increasing activity during the afternoon and evening. V rose in four increasingly irregular waves (maxima near 14h 30m, 16h 0m, 17h 30m and 18h 20m), the absolute maximum occurring at 18h 26m, and fell rapidly by 119γ to a minimum at 19h 19m, followed by a gentle rise and fall during the rest of the night. N and W oscillated rapidly between 18 and 20h, the maximum and minimum values of each for the day occurring close together in this period; N reached its maximum in a sharp peak at 18h 18m, and fell rapidly to the minimum 3 minutes later; the maximum of W was very close to that of N, the minimum at 18h 30m; the ranges were 212γ in N, and 207γ in W.

There was little worthy of note during the rest of the month, but we may mention a sharp peak of about 100γ in N at 15d 21h 12m; a small peak occurred in W a few minutes later, followed by a dip of some 90γ between 21h 50m and 23h 20m; while V fell by 66γ between 20h 40m and 21h 19m, afterwards rising gradually till 22h 45m. On the 17th a sharp rise of 125γ took place in N between 15h 42m and 16h 2m; there was no corresponding movement in W, but a small peak in V.

Very quiet periods were:—21d 2h to 22d 11h, 23d 10h to 24d 4h, 25d 16h to 26d 2h, and 29d 0h to 30d 9h.

December.—(Average Character Figure 0·77). The only considerable disturbance of the month took place between 5d 16h and 7d 7h, being probably associated with a large sunspot in Lat. 9°N , time of Central Meridian Passage Dec. 5·6.² The

* It is frequently found that where smooth humps or dips occur in both N and W, the maximum or minimum in one component coincides with the greatest rate of change in the other, i.e., there is a phase difference of $\pi/2$.

¹ *Nature*, Vol. CXXII, p. 783. ² *Nature*, Vol. CXXII, p. 936.

disturbance began with small irregular fluctuations. Between 22 and 24h there was a large dip in W of some 170 γ ; this was accompanied by two peaks 60 γ high in N, at 23h 2m and 23h 43m, and a rounded dip in V beginning soon after 22h and separated by a hump from another at about 6d 3-4h, during which the minimum value of V occurred at 3h 20m. At 2h 50m a dip in N coincided approximately with a peak in W, which was followed by a dip in W with a minimum at 4h 2m. From 6 to 15h on the 6th there were small and rapid oscillations in N and W; after 15h the fluctuations became larger, and included two small humps in V at about 16 and 18h, accompanied by dips in W. 20-22h was rather quieter, and after an irregular hump in N from 22 to 23h, and a hump in W shortly before midnight, the disturbance gradually died away; a shallow dip occurred in V from 6d 22h till 7d 8h. The ranges during the period under discussion were:—103 γ in N, 222 γ in W, 127 γ in V. It is interesting to note that the peaks in N at 5d 23-24h were represented at Lerwick by dips in the H curve; the V curves are of very similar characteristics.

A small disturbance began at 11d 17h and continued during the whole of the succeeding two days. A noticeable feature of the period is (as is usual at a time of even minor disturbance) the rapid oscillations between about 6 and 15h.

Between 10 and 15h on the 14th a rather regular dip of about 30 γ occurred in N, accompanied by a low hump in V.

The rest of the month was quiet, with occasional periods of slight activity. Among the quietest periods may be mentioned 19d 1-22h, 22d 22h to 24d 4h and 28d 14h to 29d 13h.

Readings in millibars at exact hours, Greenwich Mean Time.

167. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

February, 1928.

Table with 25 columns for hours (1-24) and a Mean column. Rows represent station levels from 1 to 31. Data is in millibars (mb.). Includes mean values for station and sea level.

168. Eskdalemuir : H_b = 237.3 metres.

February, 1928.

Table with 25 columns for hours (1-24) and a Mean column. Rows represent station levels from 1 to 29. Data is in millibars (mb.). Includes mean values for station and sea level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

169. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

March, 1928.

Table for Eskdalemuir in March 1928. Columns: Hour, G.M.T., 1-24, Mean. Rows: Day 1-31, Station Level (1-31), Mean (Station level), Mean (Sea level). Values in millibars.

170. Eskdalemuir : H_b = 237.3 metres.

April, 1928.

Table for Eskdalemuir in April 1928. Columns: Hour, G.M.T., 1-24, Mean. Rows: Day 1-30, Station Level (1-30), Mean (Station level), Mean (Sea level). Values in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

171. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

May, 1928.

Table for station 171, Eskdalemuir, May 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours of data.

172. Eskdalemuir : H_b = 237.3 metres.

June, 1928.

Table for station 172, Eskdalemuir, June 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours of data.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

173. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

July, 1928.

Table for July 1928 at Eskdalemuir. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours, Mean, Sea level.

174. Eskdalemuir : H_b = 237.3 metres.

August, 1928.

Table for August 1928 at Eskdalemuir. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours, Mean, Sea level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

175. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

September, 1928.

Table for September 1928 showing barometric pressure readings at Eskdalemuir. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station level/Sea level).

176. Eskdalemuir : H_b = 237.3 metres.

October, 1928.

Table for October 1928 showing barometric pressure readings at Eskdalemuir. Columns include Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level).

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

177. Eskdalemuir : H_b (height of barometer cistern above M.S.L.) = 237.3 metres.

November, 1928.

Table for station 177 showing hourly pressure readings from 1 to 30 days in November 1928. Columns include Hour, G.M.T., Station Level (1-30), and Mean (Station level/Sea level).

178. Eskdalemuir : H_b = 237.3 metres.

December, 1928.

Table for station 178 showing hourly pressure readings from 1 to 31 days in December 1928. Columns include Hour, G.M.T., Station Level (1-31), and Mean (Station level/Sea level).

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

182. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulb above ground) = 0.9 metres.

January, 1928.

Table with 25 columns for hours (1-24) and a Mean column. Rows include Day 1-31 and a Mean row. Data points are temperature readings in degrees absolute.

183. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

February, 1928.

Table with 25 columns for hours (1-24) and a Mean column. Rows include Day 1-29 and a Mean row. Data points are temperature readings in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is printed 75.0.

TEMPERATURE.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

184. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulb above ground) = 0.9 metres.

March, 1928

Table with 24 columns (Hour, G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Each data cell contains two temperature readings in degrees absolute (e.g., 76.0, 75.8).

185. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

April, 1928.

Table with 24 columns (Hour, G.M.T. 1-24, Mean) and 30 rows (Day 1-30). Each data cell contains two temperature readings in degrees absolute (e.g., 76.1, 76.2).

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is printed 75.0.

Readings in degrees absolute at exact hours. Greenwich Mean Time.

186. Eskdalemuir : Louvred Hut : ht (height of thermometer bulb above ground) = 0.9 metres.

May, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Contains temperature readings in degrees absolute for May 1928.

187. Eskdalemuir : Louvred Hut : ht = 0.9 metres.

June, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 30 rows (Day 1-30). Contains temperature readings in degrees absolute for June 1928.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is printed 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

192. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulb above ground) = 0.9 metres.

November, 1928.

Table with 25 columns (1-24, Mean) and 31 rows (Day 1-30, Mean). Each cell contains a temperature reading in degrees absolute. The 'Mean' row at the bottom shows the average for each column.

193. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

December, 1928.

Table with 25 columns (1-24, Mean) and 31 rows (Day 1-30, Mean). Each cell contains a temperature reading in degrees absolute. The 'Mean' row at the bottom shows the average for each column.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is printed 75.0.

TEMPERATURE: ANNUAL MEANS OF HOURLY VALUES.

From readings in degrees absolute at exact hours, Greenwich Mean Time.

194. Eskdalemuir: Louvred Hut: h_t = 0.9 metres.

1928.

Table with 25 columns (1-24 hours + Mean) and 2 rows (a. values). Values range from 78.28 to 79.87.

TEMPERATURE: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

195. Eskdalemuir: Louvred Hut: h_t = 0.9 metres.

1928.

Large table with 26 columns (Month, Mean, Hour 1-24) and 12 rows (Jan-Dec, Year). Values range from 276.40 to 285.05.

ABSOLUTE EXTREMES OF TEMPERATURE FOR EACH DAY.

Maximum and minimum for the interval 0h. to 24h., Greenwich Mean Time.

196. Eskdalemuir: Louvred Hut: h_t = 0.9 metres.

1928.

Table with 25 columns (Month, Day, Max., Min.) and 31 rows (Days 1-31). Values range from 74.7 to 82.5.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is printed 75.0.

Percentages at exact hours, Greenwich Mean Time.

197. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulbs above ground) = 0.9 metres.

January, 1928.

Table for January 1928 showing relative humidity percentages (1-24) and mean values for each hour (Day 1-31). Includes Vapour Pressure* in mb. at the bottom.

198. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

February, 1928.

Table for February 1928 showing relative humidity percentages (1-24) and mean values for each hour (Day 1-29). Includes Vapour Pressure* in mb. at the bottom.

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

199. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulbs above ground) = 0.9 metres.

March, 1928.

Table for 199. Eskdalemuir : Louvred Hut : h_t = 0.9 metres. March, 1928. Columns: Hour G.M.T., 1-24, Mean, Vapour Pressure. Rows: Day 1-31. Data: % relative humidity for each hour and mean values.

200. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

April, 1928.

Table for 200. Eskdalemuir : Louvred Hut : h_t = 0.9 metres. April, 1928. Columns: Hour G.M.T., 1-24, Mean, Vapour Pressure. Rows: Day 1-30. Data: % relative humidity for each hour and mean values.

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

203. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulbs above ground) = 0.9 metres.

July, 1928.

Table for July 1928 showing relative humidity percentages and vapour pressure for Eskdalemuir. Columns include Hour G.M.T (1-24, Mean), Vapour Pressure* (mb.), and Vapour Pressure* (mb.).

204. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

August, 1928.

Table for August 1928 showing relative humidity percentages and vapour pressure for Eskdalemuir. Columns include Hour G.M.T (1-24, Mean), Vapour Pressure* (mb.), and Vapour Pressure* (mb.).

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

205. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulbs above ground) = 0.9 metres.

September, 1928.

Table with 26 columns (Hours 1-24, Mean, Vapour Pressure) and 31 rows (Days 1-30, Mean). Columns 1-24 show relative humidity percentages. Column 25 shows mean percentage. Column 26 shows vapour pressure in mb. Mean values are at the bottom.

206. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

October, 1928.

Table with 26 columns (Hours 1-24, Mean, Vapour Pressure) and 31 rows (Days 1-30, Mean). Columns 1-24 show relative humidity percentages. Column 25 shows mean percentage. Column 26 shows vapour pressure in mb. Mean values are at the bottom.

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

207. Eskdalemuir : Louvred Hut : h_t (height of thermometer bulbs above ground) = 0.9 metres.

November, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure*) and 31 rows (1-30, Mean). Columns 1-24 show relative humidity percentages. Column 25 shows mean percentage. Column 26 shows vapour pressure in mb. Values range from 75 to 99% and 6.3 to 11.0 mb.

208. Eskdalemuir : Louvred Hut : h_t = 0.9 metres.

December, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure*) and 31 rows (1-30, Mean). Columns 1-24 show relative humidity percentages. Column 25 shows mean percentage. Column 26 shows vapour pressure in mb. Values range from 75 to 100% and 3.9 to 8.5 mb.

* Computed from the mean temperatures and mean relative humidities.

† Mean of the column.

‡ Mean of the row.

For exact hours, Greenwich Mean Time.

209. Eskdalemuir : (Louvred Hut) $h_t = 0.9$ metres.

1928.

G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean
Relative Humidity ...	% 88.5	% 88.7	% 88.4	% 88.6	% 88.6	% 88.1	% 87.3	% 85.2	% 83.4	% 81.4	% 79.0	% 77.2	% 75.6	% 75.4	% 75.0	% 76.5	% 78.3	% 80.7	% 82.8	% 84.8	% 86.3	% 87.3	% 87.8	% 88.3	% 83.5
Vapour Pressure (in millibars)*	mb. 7.9	mb. 7.8	mb. 7.8	mb. 7.7	mb. 7.8	mb. 7.9	mb. 8.1	mb. 8.2	mb. 8.5	mb. 8.7	mb. 8.7	mb. 8.8	mb. 8.8	mb. 8.8	mb. 8.7	mb. 8.7	mb. 8.6	mb. 8.5	mb. 8.4	mb. 8.3	mb. 8.2	mb. 8.1	mb. 8.0	mb. 8.0	mb. 8.3

*Computed from the mean temperature and mean relative humidity.

RELATIVE HUMIDITY: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

210. Eskdalemuir : (Louvred Hut) $h_t = 0.9$ metres.

1928.

Month	Mean	Hour 1	G.M.T. 2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
Jan.	% 88.5	% 0.0	% +0.4	% +0.3	% -0.7	% 0.0	% +0.5	% +0.9	% +0.4	% +1.0	% +1.2	% -0.5	% +0.3	% -0.5	% -2.2	% -2.8	% -1.4	% -0.2	% +0.2	% -1.0	% +0.4	% +1.7	% +1.0	% +0.4	% +0.6
Feb.	% 85.5	% +4.3	% +3.9	% +3.9	% +4.3	% +4.4	% +2.9	% +3.1	% +2.8	% +1.6	% -0.7	% -3.7	% -5.4	% -7.0	% -6.7	% -7.8	% -7.5	% -4.6	% -1.3	% -0.3	% +0.4	% +2.5	% +3.0	% +3.2	% +4.3
Mar.	% 87.9	% +2.8	% +2.3	% +1.9	% +3.3	% +3.5	% +3.8	% +3.6	% +2.7	% +0.9	% -1.1	% -1.6	% -3.9	% -5.4	% -5.7	% -5.7	% -4.5	% -4.1	% -1.3	% -0.2	% +0.1	% +0.7	% +2.3	% +2.5	% +3.0
April	% 76.5	% +8.1	% +8.7	% +7.9	% +8.7	% +8.0	% +8.1	% +7.8	% +2.5	% +0.6	% -3.9	% -7.4	% -9.9	% -9.6	% -12.7	% -13.6	% -10.7	% -9.5	% -6.4	% -1.8	% +1.5	% +3.5	% +5.3	% +6.7	% +8.0
May	% 73.2	% +12.2	% +13.0	% +12.0	% +11.9	% +11.7	% +7.9	% +4.6	% -1.2	% -3.1	% -2.4	% -5.6	% -11.9	% -15.5	% -16.3	% -18.4	% -16.0	% -13.2	% -7.7	% -1.7	% +3.0	% +6.9	% +8.2	% +9.7	% +11.8
June	% 77.8	% +8.7	% +9.3	% +8.5	% +8.6	% +8.1	% +6.7	% +4.7	% +0.2	% -2.5	% -3.3	% -5.2	% -7.0	% -9.0	% -8.6	% -8.7	% -9.6	% -7.7	% -8.8	% -6.5	% -1.5	% +3.2	% +5.5	% +6.7	% +7.8
July	% 83.3	% +6.4	% +6.7	% +6.3	% +6.6	% +6.1	% +4.9	% +2.9	% +0.3	% -2.8	% -5.0	% -7.2	% -6.4	% -8.6	% -7.3	% -8.4	% -8.7	% -5.9	% -3.5	% +0.1	% +2.7	% +3.9	% +5.1	% +6.2	% +5.8
Aug.	% 84.8	% +5.6	% +6.3	% +7.0	% +6.4	% +7.0	% +6.2	% +3.1	% -0.5	% -4.1	% -8.8	% -11.7	% -11.9	% -9.5	% -9.5	% -7.1	% -6.6	% -2.9	% +0.5	% +2.6	% +3.7	% +5.3	% +5.8	% +6.0	% +6.0
Sept.	% 83.8	% +7.8	% +7.3	% +6.7	% +7.2	% +7.2	% +7.1	% +6.7	% +4.0	% +0.8	% -5.3	% -8.7	% -11.0	% -13.3	% -14.2	% -13.2	% -11.3	% -6.5	% -0.7	% +2.2	% +4.3	% +5.3	% +5.5	% +6.1	% +6.0
Oct.	% 86.6	% +3.3	% +3.7	% +3.3	% +3.3	% +3.4	% +4.3	% +3.6	% +3.2	% +0.4	% -3.5	% -5.7	% -7.8	% -9.1	% -8.8	% -8.2	% -4.0	% -1.5	% +1.1	% +1.7	% +2.2	% +3.8	% +3.5	% +4.0	% +3.6
Nov.	% 86.1	% -0.4	% -0.1	% 0.0	% +0.8	% +1.1	% +1.8	% +1.8	% +1.6	% +2.1	% +1.5	% +1.0	% +0.7	% -2.1	% -1.9	% -1.9	% -0.5	% -1.5	% -1.1	% -0.8	% -0.2	% -0.7	% -0.5	% -0.6	% -0.3
Dec.	% 87.3	% +1.7	% +1.1	% +1.6	% +1.3	% +0.5	% +0.4	% +0.7	% +0.7	% +0.9	% +1.6	% -0.5	% -1.0	% -3.0	% -3.3	% -3.3	% -2.5	% -1.0	% -0.8	% -0.6	% +0.3	% +0.1	% +1.3	% +1.7	% +2.3
Year	% 83.5	% +5.0	% +5.2	% +4.9	% +5.1	% +5.1	% +4.6	% +3.9	% +1.7	% -0.1	% -2.1	% -4.5	% -6.3	% -7.9	% -8.1	% -8.5	% -7.0	% -5.2	% -2.8	% -0.7	% +1.3	% +2.9	% +3.8	% +4.4	% +4.5

RAINFALL: ANNUAL TOTALS OF HOURLY VALUES.

† Amounts, in millimetres; durations, in hours, for periods of sixty minutes between the exact hours, Greenwich Mean Time.

211. Eskdalemuir : $H_t = 242.0$ metres + 0.4 metres.

1928.

Hour G.M.T.	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to Noon	Noon to 13	13 to 14	14 to 15	15 to 16	16 to 17	17 to 18	18 to 19	19 to 20	20 to 21	21 to 22	22 to 23	23 to 24	0 to 24
Amount	mm. 72.1	mm. 74.5	mm. 99.1	mm. 94.3	mm. 67.5	mm. 63.6	mm. 70.7	mm. 83.3	mm. 96.9	mm. 124.9	mm. 151.0	mm. 133.9	mm. 119.6	mm. 101.1	mm. 125.2	mm. 102.4	mm. 81.1	mm. 79.1	mm. 74.2	mm. 82.0	mm. 81.9	mm. 71.4	mm. 89.8	mm. 83.0	mm. 222.4
Duration	hr. 58.3	hr. 51.6	hr. 57.6	hr. 64.8	hr. 61.9	hr. 66.1	hr. 62.8	hr. 63.4	hr. 73.1	hr. 65.6	hr. 76.1	hr. 75.3	hr. 74.5	hr. 69.9	hr. 65.0	hr. 61.7	hr. 60.2	hr. 58.8	hr. 52.9	hr. 54.5	hr. 60.2	hr. 52.5	hr. 59.6	hr. 57.0	hr. 1503.0

† The totals and durations for individual months are printed in the tables on the following pages.

NOTES ON RAINFALL.

1928.

212. Eskdalemuir.

Rainfall Duration.—There were 118 days on which no duration of rainfall was registered. There were 42 days on which the duration of rainfall was registered as 0.1 hour to 1.0 hour, 27 days with 1.1 to 2.0 hours, 73 days with 2.1 to 6.0 hours, 69 days with 6.1 to 12 hours, and 37 days with more than 12 hours. The day with the greatest duration was September 4th, when the duration was 19.1 hours, the amount falling being 18.2 mm.

Notable Falls of the Year.

(a) The greatest amount in a 60-minute period was 11.2 mm., which was recorded between 2h. and 3h., September 10th. On August 27th, 5 mm. fell in 10 minutes, and on September 10th 5 mm. fell in 12 minutes. Falls of 5 mm. in less than one hour occurred on 40 days.

(b) Details of the greatest continuous falls are as follows:—

Date.	Amount. mm.	Duration. hrs.
January 12th	43	10.7
January 21st	26	11.9
January 23rd	33	12.0
February 4th	31	11.7
June 19th	25	12.9
July 1st	32	11.8
August 6th—7th	52	17.7
October 7th—8th	34	17.4
November 23rd	25	6.5
December 16th	37	13.7
December 25th—26th	27	7.5

Wet Periods.

(a) There were two "rain spells" (i.e., periods of fifteen or more consecutive days on each of which 0.2 mm. or more of rain fell), viz., January 4th to January 21st, and January 31st to February 18th.

(b) There were no "wet spells" (i.e., periods of fifteen or more consecutive days on each of which 1.0 mm. or more of rain fell). The "rain spell" of January 4th to 21st failed to classify as a "wet spell" in having only 0.4 mm. on January 17th.

Dry Periods.

(a) There were no periods of "absolute drought" (i.e., fifteen or more consecutive days on each of which less than 0.2 mm. of rain fell), or of "partial drought" (i.e., twenty-nine or more consecutive days, the mean rainfall of which did not exceed 0.2 mm. per day).

(b) Two relatively dry periods were February 19th to February 29th, and July 13th to July 22nd, during which 0.2 mm. and 0.5 mm. fell respectively.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

213. Eskdalemuir : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 242.0 metres + 0.4 metres.

January, 1928.

Table with 24 columns for hourly rainfall (0-1 to 23-24) and 2 columns for duration (0-24). Rows include hourly data for days 1-31 and summary rows for total duration and sum.

214. Eskdalemuir : H_r = 242.0 metres + 0.4 metres.

February, 1928.

Table with 24 columns for hourly rainfall (0-1 to 23-24) and 2 columns for duration (0-24). Rows include hourly data for days 1-29 and summary rows for total duration and sum.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

215. Eskdalemuir : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 242.0 metres + 0.4 metres. March, 1928.

Table with 25 columns for hourly rainfall (0-1 to 24) and 25 rows for hours (1 to 31). Includes a 'Total Duration' row and a 'Sum.' row. Values are in mm or hr.

216. Eskdalemuir : H_r = 242.0 metres + 0.4 metres.

April, 1928.

Table with 25 columns for hourly rainfall (0-1 to 24) and 31 rows for hours (1 to 30). Includes a 'Total Duration' row and a 'Sum.' row. Values are in mm or hr.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

219. Eskdalemuir : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 242.0 metres + 0.4 metres. July, 1928.

Table for July 1928 rainfall data at Eskdalemuir. Columns include Hour G.M.T., Day, and 24 hourly intervals (0-1 to 24) in mm, followed by Total Duration in hr. and a final Duration column.

220. Eskdalemuir : H_r = 242.0 metres + 0.4 metres.

August, 1928.

Table for August 1928 rainfall data at Eskdalemuir. Columns include Hour G.M.T., Day, and 24 hourly intervals (0-1 to 24) in mm, followed by Total Duration in hr. and a final Duration column.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

221. Eskdalemuir : Hr (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + hr (height of receiving surface above ground) = 242.0 metres + 0.4 metres.

September, 1928.

Table with 24 columns for hourly intervals (0-1 to 23-24) and a 25th column for duration. Rows include hourly rainfall (mm) and total duration (hr) for each day from 1 to 30. Summary row shows total rainfall and duration.

222. Eskdalemuir : Hr = 242.0 metres + 0.4 metres.

October, 1928.

Table with 24 columns for hourly intervals (0-1 to 23-24) and a 25th column for duration. Rows include hourly rainfall (mm) and total duration (hr) for each day from 1 to 31. Summary row shows total rainfall and duration.

Amounts in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

223. Eskdalemuir: H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height receiving surface above ground) = 242.0 metres + 0.4 metres. November, 1928.

Table with columns for Hour G.M.T., 0-1 to 24, and Duration 0-24. Rows list hourly rainfall in mm and total duration in hours for each hour, with a final 'Sum.' row and 'Total Duration.' row.

224. Eskdalemuir: H_r = 242.0 metres + 0.4 metres.

December, 1928.

Table with columns for Hour G.M.T., 0-1 to 24, and Duration 0-24. Rows list hourly rainfall in mm and total duration in hours for each hour, with a final 'Sum.' row and 'Total Duration.' row.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

225. Eskdalemuir : h, (height of recorder above ground) = 1.5 metres.

January, 1928.

Table with 26 columns (3 to 21 hours, Total for Day, Per cent. of Possible, Radiation by Angström Pyrheliometer) and 31 rows (Day 1 to 31, Sum., Mean.).

226. Eskdalemuir : h, = 1.5 metres.

February, 1928.

Table with 26 columns (3 to 21 hours, Total for Day, Per cent. of Possible, Radiation by Angström Pyrheliometer) and 31 rows (Day 1 to 29, Sum., Mean.).

DURATION OF BRIGHT SUNSHINE.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

229. Eskdalemuir : h_s (height of recorder above ground) = 1.5 metres.

May, 1928.

Table for May 1928 showing hourly sunshine duration (3 to 4 to 21 hours) and radiation data (Total for Day, Per cent. of Possible, Time G.M.T., Intensity, p/p sec. Z., Sky) for Eskdalemuir. Includes a summary row and a mean row.

230. Eskdalemuir : h_s = 1.5 metres.

June, 1928.

Table for June 1928 showing hourly sunshine duration (3 to 21 hours) and radiation data (Total for Day, Per cent. of Possible, Time G.M.T., Intensity, p/p sec. Z., Sky) for Eskdalemuir. Includes a summary row and a mean row.

DURATION OF BRIGHT SUNSHINE.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

235. Eskdalemuir : h_s (height of recorder above ground) = 1.5 metres.

November, 1928.

Table for station 235, Eskdalemuir, November 1928. Columns include Hour (L.A.T.), 30 hourly intervals, Total for Day, Per cent. of Possible, and Radiation by Ångström Pyrheliometer (Time, Intensity, p/p_0, Sky). Rows are numbered 1 to 30, followed by Sum. and Mean. values.

236. Eskdalemuir : h_s = 1.5 metres.

December and Year, 1928.

Table for station 236, Eskdalemuir, December and Year 1928. Columns include Hour (L.A.T.), 30 hourly intervals, Total for Day, Per cent. of Possible, and Radiation by Ångström Pyrheliometer. Rows are numbered 1 to 31, followed by Sum. and Mean. values, and Annual Total and Annual Mean. values.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

January, 1928.

M.S.L. + ha (height of anemograph above ground) = 235 metres + 15 metres.

Table with columns for hours (13-24) and Mean/Day. Each hour column contains two columns of wind speed data (m/s and degrees). The 'Mean' column shows the average wind speed for each hour, and the 'Day' column shows the day number from 1 to 31.

February, 1928.

Table with columns for hours (13-24) and Mean/Day. Each hour column contains two columns of wind speed data (m/s and degrees). The 'Mean' column shows the average wind speed for each hour, and the 'Day' column shows the day number from 1 to 29.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°), Speed in metres per second.

239. Eskdalemuir :

H_a (height of anemograph above M.S.L.) = Height of ground above.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 2 rows per hour (Day, m/s). Contains wind speed data for Eskdalemuir.

240. Eskdalemuir : H_a = 235 metres + 15 metres.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 2 rows per hour (Day, m/s). Contains wind speed data for Eskdalemuir at a higher height.

† Mean for 30 days only: 12th omitted.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + ha (height of anemograph above ground) = 235 metres + 15 metres.

March, 1928.

Table for March 1928 showing wind direction and speed data for days 1 to 31 across 13 to 24 hours.

April, 1928.

Table for April 1928 showing wind direction and speed data for days 1 to 30 across 13 to 24 hours.

† Mean for 30 days only : 12th omitted.

* Speed record defective.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 235 metres + 15 metres.

May, 1928.

Table for May 1928 showing wind direction and speed data for days 1 through 31. Columns include day number, time intervals, and wind speed in m/s.

June, 1928.

Table for June 1928 showing wind direction and speed data for days 1 through 30. Columns include day number, time intervals, and wind speed in m/s.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°). Speed in metres per second.

243. Eskdalemuir :

H_a (height of anemograph above M.S.L.) = Height of ground above

Table with columns for Hour G.M.T., Day, and wind data for 12 directions (I, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11) and Noon. Includes a Mean row at the bottom.

244. Eskdalemuir : H_a = 235 metres + 15 metres.

Table with columns for Hour G.M.T., Day, and wind data for 12 directions (I, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11) and Noon. Includes a Mean row at the bottom.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°). Speed in metres per second.

245. Eskdalemuir :

H_a (height of anemograph above M.S.L.) = Height of ground above

Table with 21 columns (Hour, G.M.T., 1-11, Noon) and 2 rows (Day, m/s). Contains 30 rows of hourly wind data for Eskdalemuir.

246. Eskdalemuir : H_a = 235 metres + 15 metres.

Table with 21 columns (Hour, G.M.T., 1-11, Noon) and 2 rows (Day, m/s). Contains 31 rows of hourly wind data for Eskdalemuir at a higher elevation.

* Defective record

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + ha (height of anemograph above ground) = 235 metres + 15 metres.

September, 1928.

Table showing wind direction and speed data for the month of September 1928. Columns include days 13-24, Mean, and Day. Each day's data is organized by time intervals (e.g., 0, 10, 20, 30 minutes) with wind speed in m/s.

October, 1928.

Table showing wind direction and speed data for the month of October 1928. Columns include days 1-31, Mean, and Day. Each day's data is organized by time intervals (e.g., 0, 10, 20, 30 minutes) with wind speed in m/s.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°). Speed in metres per second.

247. Eskdalemuir :

H_a (height of anemograph above M.S.L.) = Height of ground above

Table with 24 columns (Hour, Day, 1-11, Noon) and 2 rows per hour (m/s, °). Contains wind speed and direction data for Eskdalemuir.

248. Eskdalemuir : H_a = 235 metres + 15 metres.

Table with 24 columns (Day, 1-11, Noon) and 2 rows per day (m/s, °). Contains wind speed and direction data for Eskdalemuir at a higher elevation.

MINIMUM TEMPERATURE "ON THE GRASS" DURING THE INTERVAL 18H. TO 7H. G.M.T.

Readings, in degrees absolute.

251. Eskdalemuir.

1928.

Month.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Day.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	
1	59·3	74·8	74·5	72·0	79·2	79·0	78·0	73·6	74·9	65·0	76·6	80·4	
2	72·3	70·9	75·8	73·8	79·5	72·0	82·0	75·1	76·0	74·5	—	67·1	
3	71·5	71·8	74·0	77·0	79·2	72·8	80·4	79·7	83·1	70·4	72·2	73·6	
4	67·4	67·7	74·0	73·5	77·9	72·0	74·2	79·5	86·6	71·9	71·9	66·4	
5	73·5	75·0	75·5	69·5	73·5	69·0	81·9	76·1	86·1	75·3	69·4	77·9	
6	73·5	72·8	74·7	71·4	74·0	69·8	82·3	75·6	80·8	80·9	72·1	72·3	
7	71·2	75·2	67·9	69·0	76·8	77·6	76·0	85·3	83·0	77·2	73·2	72·0	
8	73·9	79·4	72·8	76·0	70·3	78·6	74·4	77·8	84·9	84·8	68·1	65·1	
9	75·0	74·6	69·9	75·1	68·8	78·6	80·1	81·2	83·6	80·0	63·7	64·9	
10	73·3	73·1	69·9	79·3	65·5	81·1	78·2	78·3	80·7	78·1	71·8	73·9	
11	73·5	69·0	67·4	72·8	66·9	72·5	84·8	83·7	77·5	74·5	78·0	68·4	
12	70·0	69·8	68·9	75·8	79·6	75·6	85·0	86·2	73·2	76·5	78·3	74·1	
13	76·8	70·1	64·6	76·6	79·3	78·7	83·3	82·9	75·0	68·4	80·5	73·2	
14	75·2	73·3	69·6	74·6	73·5	78·1	84·8	83·8	76·4	71·0	76·3	72·2	
15	75·0	75·1	69·3	72·3	69·4	72·1	85·1	80·7	75·1	77·8	77·8	66·0	
16	76·2	77·9	70·7	70·3	73·8	72·0	75·0	82·0	73·1	71·8	74·0	71·9	
17	70·2	71·0	77·9	72·0	73·1	74·9	79·5	80·6	81·1	77·7	74·2	75·0	
18	70·3	73·6	75·9	66·5	75·0	72·6	83·0	77·9	81·1	79·6	76·3	66·4	
19	74·0	77·8	75·9	68·2	74·2	77·9	81·9	75·6	70·0	77·8	80·3	74·1	
20	72·9	76·1	81·0	68·1	73·1	74·2	82·5	84·5	73·5	79·5	77·8	72·0	
21	72·8	70·0	75·2	68·2	74·7	72·1	81·0	82·6	69·1	75·9	78·9	66·3	
22	74·0	78·1	69·2	70·1	71·1	83·1	81·0	79·3	69·6	71·3	81·3	74·4	
23	71·9	74·0	72·5	73·2	74·3	80·1	83·0	83·6	68·5	70·5	76·3	64·3	
24	72·0	75·0	78·1	79·6	75·3	74·1	84·0	84·1	79·1	79·0	75·0	75·6	
25	72·9	66·9	77·1	75·2	72·3	81·2	77·9	82·8	76·0	79·1	77·0	71·7	
26	71·2	70·3	71·8	78·1	73·5	82·3	83·0	83·9	76·1	75·7	75·2	74·9	
27	64·8	68·9	74·8	80·6	82·2	76·2	83·8	83·4	72·2	79·9	73·7	70·7	
28	69·9	69·1	70·0	78·3	83·8	77·3	79·5	79·1	78·7	73·1	68·4	66·8	
29	72·0	72·1	71·1	76·9	82·1	83·4	74·4	79·2	69·2	72·6	68·1	72·9	
30	70·2	—	73·0	77·8	82·3	80·8	77·3	76·3	70·0	79·8	81·1	69·9	
31	70·7	—	73·0	—	78·3	—	73·9	77·8	—	79·8	—	68·8	
Mean	...	71·9	72·9	72·8	73·7	75·2	76·3	80·4	80·4	76·8	75·8	74·7	71·1

- NOTES.—(1) The initial 2 or 3 of the readings is omitted, *i.e.*, 275·0 is written 75·0.
(2) The minimum refers to the interval from 18h. the previous day to 7h. on the day to which it is entered.
(3) Annual Mean 275·2.
(4) Mean for November is for 29 days only.

252. Eskdalemuir.

Table for station 252, Eskdalemuir, January 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-31 show various cloud types like St., Fr-Cu, Nb., and cloud amounts ranging from 0 to 10.

253. Eskdalemuir.

Table for station 253, Eskdalemuir, February 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-29 show various cloud types and amounts, with remarks including precipitation amounts like '10 cms.' and '16 cms.'

Summary table for station 253, Eskdalemuir, February 1928. Columns include 7h, 13h, 18h, Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Summary values for cloud amounts and visibility are provided.

254. Eskdalemuir.

Table for Eskdalemuir, March 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-31.

255. Eskdalemuir.

April, 1928.

Table for Eskdalemuir, April 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-30.

256. Eskdalemuir.

Table for station 256, Eskdalemuir, May 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day.

257. Eskdalemuir.

Table for station 257, Eskdalemuir, June 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day.

Summary table for station 257, June 1928, showing mean cloud amount and a final set of headers for Cloud Forms, Cloud Amount, Visibility, and Precipitation.

258. Eskdalemuir.

Table for July 1928 at Eskdalemuir. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows are numbered 1 to 31.

259. Eskdalemuir.

August, 1928.

Table for August 1928 at Eskdalemuir. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows are numbered 1 to 31.

260. Eskdalemuir.

Table for station 260, Eskdalemuir, covering the month of September 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (All Forms) (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

261. Eskdalemuir.

Table for station 261, Eskdalemuir, covering the month of October 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (All Forms) (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

Summary table for station 261, Eskdalemuir, for October 1928. It includes columns for Cloud Forms, Cloud Amount (All Forms), Visibility, Precipitation, and Remarks on the Weather of the Day, with sub-columns for 7h, 9h, 13h, 15h, 18h, and 21h.

262. Eskdalemuir.

Table for station 262, Eskdalemuir, covering the month of November 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day.

263. Eskdalemuir.

Table for station 263, Eskdalemuir, covering the month of December 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day.

Summary table for station 263, Eskdalemuir, December 1928. Includes Mean Cloud Am't, Mean Ann'l Cloud Am't, and Remarks on the Weather of the Day.

Month.		January. Factor 6.23.				February. Factor 6.23.				March. Factor 6.23.			
Hour.	G.M.T.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
Day.		v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1		320	460	390	z-	40	5	z+	z+	(-1375)	(-440)	20	180
2		-510	445	785	715	295	100	(450)	(600)	350	95	195	-50
3		230	170	270	840	(400)	(300)	470	660	90	450	365	325
4		55	-245	-65	z±	345	-40	-575	-510	250	65	290	675
5		105	115	210	155	z-	165	135	170	-355	-370	z-	325
6		-890	-395	100	305	130	z±	185	130	110	70	150	245
7		190	230	-720	215	-15	-550	155	195	230	60	80	130
8		75	130	115	-25	95	100	15	-10	100	130	(90)	(180)
9		145	95	(30)	180	75	100	75	-395	(380)	(475)	130	(330)
10		z-	-525	145	250	175	-1145	115	125	(95)	110	560	155
11		110	(-10)	205	365	240	140	175	170	95	210	155	(375)
12		170	-1170	-335	-400	115	155	195	275	(475)	(575)	z+	315
13		50	30	-880	65	190	650	50	115	225	(290)	135	215
14		80	260	145	225	-35	125	125	105	150	105	(300)	(475)
15		95	50	0	80	295	135	55	60	(230)	(290)	(200)	(250)
16		235	230	(400)	(515)	-505	-325	-365	225	(210)	(-200)	(250)	510
17		300	155	(170)	335	775	135	220	155	755	-15	-1240	405
18		355	20	150	z-	-215	-245	155	80	195	-10	-25	135
19		110	100	155	365	145	165	185	500	370	190	20	-790
20		265	-1035	145	545	195	315	210	695	-260	-150	235	-200
21		535	-1415	-880	30	565	530	290	230	-425	(-1030)	275	345
22		235	130	185	525	155	190	230	260	215	190	60	185
23		390	-175	z-	5	115	90	65	25	415	425	(95)	(230)
24		140	105	315	365	190	170	155	170	(60)	(100)	(190)	435
25		275	455	65	100	265	325	225	345	(-1205)	150	125	320
26		55	160	155	360	280	435	195	325	305	195	110	490
27		210	325	310	435	135	225	195	575	275	10	170	430
28		-120	65	10	250	325	615	440	615	345	170	170	370
29		355	330	-450	440	270	320	365	520	170	-465	-580	-120
30		480	290	280	250	-	-	-	-	-60	575	110	375
31		320	210	-565	85	-	-	-	-	150	285	105	115
(a)		218	198	206	308	242	239	197	293	250	227	176	316
(b)		125	2	8	282	187	116	149	235	84	80	94	232
Mean	...		(a) 233.	(b) 104.		(a) 243.	(b) 172.			(a) 242.	(b) 123.		

Month.		April. Factor 6.30.				May. Factor 6.27.				June. Factor 6.17.			
Hour.	G.M.T.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
Day.		v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1		105	160	305	330	405	460	135	250	120	190	170	185
2		170	200	210	75	405	210	(150)	(350)	120	135	135	265
3		80	210	(10)	350	(70)	95	40	225	265	280	150	265
4		135	190	150	370	295	350	215	345	190	70	120	190
5		255	340	245	315	150	225	265	250	65	115	160	135
6		565	235	235	245	220	175	100	135	295	75	160	220
7		95	270	170	320	150	85	135	95	415	205	z+	110
8		35	(-1160)	245	310	120	40	155	135	70	-65	-5	-85
9		230	115	250	195	210	165	150	185	0	-350	205	45
10		285	(445)	50	275	140	135	105	115	245	80	90	170
11		75	(60)	230	190	135	135	115	180	215	50	535	240
12		210	440	210	80	65	115	165	230	95	-70	130	185
13		30	140	255	330	160	90	150	145	95	-340	-415	-10
14		180	130	215	135	95	150	145	200	-565	-410	110	230
15		100	100	135	130	120	0	125	210	290	-940	100	-205
16		10	140	145	195	170	-355	60	125	560	205	110	350
17		70	195	125	135	390	95	-125	265	150	-785	300	245
18		235	145	95	245	25	75	85	-135	120	95	130	315
19		215	220	140	290	110	95	445	-150	-460	-1305	-485	335
20		255	155	115	330	175	-785	105	150	250	245	130	275
21		120	100	100	325	75	95	115	115	265	95	570	205
22		100	170	105	160	115	110	135	(100)	285	115	120	-385
23		95	-210	255	115	(75)	(100)	95	100	135	115	-265	235
24		255	195	210	150	95	95	115	155	185	40	130	190
25		205	245	155	195	85	115	110	(230)	z-	280	0	55
26		160	235	180	340	(100)	(120)	155	190	445	205	-165	115
27		245	195	210	150	185	80	190	-110	100	95	115	210
28		310	115	230	370	-55	230	145	205	265	-1090	300	190
29		290	350	190	340	210	260	205	300	-760	210	60	120
30		350	205	120	220	170	150	150	315	120	115	(190)	155
31		-	-	-	-	340	170	125	150	-	-	-	-
(a)		182	204	176	240	168	146	146	195	206	144	176	201
(b)		182	144	176	240	161	99	137	163	113	-101	103	157
Mean	...		(a) 201.	(b) 185.		(a) 164.	(b) 140.			(a) 182.	(b) 68.		

NOTE.—The Potential Gradient is reckoned as positive if the potential increases upwards. For indeterminate potential gradient the following notation is used: z+, Indeterminate, positive value; z-, Indeterminate, negative value; z±, Indeterminate in magnitude and sign.
 (a) Mean of all positive readings. (b) Mean from all complete days using both positive and negative readings.

Month. Hour. G.M.T.	July. Factor 6·15.				August. Factor 6·17.				September. Factor 6·19.			
	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
Day.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1	135	105	-20	100	150	40	65	55	1000	230	155	415
2	155	155	130	+15	120	230	115	195	385	390	210	400
3	130	105	125	270	305	115	135	170	210	220	220	105
4	415	160	190	135	195	130	125	175	140	405	150	135
5	-1135	325	145	250	190	155	95	410	150	360	265	-180
6	-225	195	125	215	345	190	135	60	150	170	115	315
7	245	175	170	320	55	-380	230	170	150	15	185	250
8	260	255	425	190	150	135	-380	455	25	245	215	125
9	250	115	150	170	120	90	95	145	360	150	170	185
10	280	120	70	35	95	180	130	210	z-	135	205	-95
11	-225	395	385	230	135	220	-220	z-	140	135	190	210
12	320	230	200	285	z±	220	150	195	100	250	240	320
13	300	225	115	70	(570)	(300)	-245	-150	290	190	185	380
14	240	(200)	120	275	-20	-435	z-	225	210	230	230	460
15	295	250	110	145	225	-60	160	170	115	140	110	180
16	115	130	200	210	95	150	115	325	180	120	170	95
17	190	115	130	285	175	210	90	550	(75)	(-400)	130	35
18	130	95	130	100	260	170	155	250	-75	140	115	170
19	75	95	95	40	185	210	150	325	155	155	-600	290
20	90	85	65	95	200	z-	150	135	230	-160	250	205
21	225	110	150	175	-605	170	(-1050)	270	240	305	130	480
22	345	350	(150)	(175)	170	170	150	190	110	145	130	250
23	(200)	(170)	30	305	425	420	140	205	125	190	-215	290
24	200	110	150	210	180	(230)	210	250	235	185	175	250
25	200	60	70	115	(350)	z±	145	230	-200	160	180	260
26	75	80	60	115	10	160	150	(-1330)	135	160	145	245
27	30	150	70	-20	-10	15	150	345	115	115	180	330
28	-95	140	90	55	175	150	15	410	135	-155	170	170
29	260	90	95	130	305	250	z±	185	95	155	200	700
30	155	65	65	435	150	100	130	170	190	210	235	380
31	245	215	140	190	130	200	10	575				
(a)	206	164	138	184	202	177	128	252	202	196	181	263
(b)	125	164	133	171	154	139	43	184	178	154	139	257
Mean ...		(a) 173. (b) 148.			(a) 190. (b) 130.				(a) 211. (b) 182.			
Month. Hour. G.M.T.	October. Factor 6·16.				November. Factor 6·10.				December. Factor 6·16.			
	3 h.	9 h.	15 h.	21 h.	3 hr.	9 h.	15 h.	21 h.	3 h.	9 h.	15 h.	21 h.
Day.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.
1	150	345	175	230	45	75	215	335	110	220	405	360
2	100	130	245	395	150	40	105	90	140	450	310	135
3	305	285	250	325	130	135	780	190	45	115	245	420
4	190	170	205	500	55	490	265	415	245	400	360	205
5	495	-170	0	910	270	245	255	355	10	15	210	285
6	-10	270	165	415	415	170	115	210	435	z-	185	z±
7	340	40	-180	-1085	140	165	215	225	300	200	300	180
8	75	195	190	225	215	185	190	280	505	210	405	305
9	-390	305	(-950)	60	155	210	420	520	315	425	z-	220
10	-185	95	175	400	230	(970)	205	150	255	285	305	210
11	90	(-1350)	(-950)	-70	105	240	-225	230	55	310	190	115
12	135	125	155	305	215	110	355	130	-60	85	130	170
13	140	365	150	390	65	5	200	250	95	110	165	225
14	135	145	265	-755	195	255	430	-880	230	150	465	650
15	330	375	260	660	355	260	170	105	320	150	280	265
16	420	220	340	230	105	375	(-1270)	395	540	-990	z-	130
17	(110)	245	230	125	75	30	50	75	95	115	225	220
18	115	-75	z+	225	60	155	-280	-95	130	440	850	680
19	75	115	235	565	-1120	320	-430	125	130	440	740	z±
20	0	75	-150	250	20	95	95	225	125	525	465	950
21	(65)	250	-5	685	-20	-970	-75	205	225	380	455	945
22	(-435)	135	110	425	160	-860	-215	80	450	155	-130	645
23	325	265	150	(350)	120	-205	-135	40	240	390	525	425
24	z±	450	-55	70	95	-110	120	100	185	z-	125	100
25	95	120	190	550	-700	335	95	155	170	265	210	z-
26	-50	(-1120)	(-1000)	-255	75	95	170	170	105	130	510	215
27	-75	325	185	675	110	115	205	505	110	270	525	395
28	195	85	155	225	185	240	545	730	480	320	405	340
29	160	235	335	300	295	385	435	165	z+	280	545	260
30	-635	210	165	-460	125	200	320	165	230	z±	320	565
31	-910	190	(-1200)	115					250	105	125	475
(a)	184	213	197	369	154	227	259	236	225	257	359	360
(b)	43	92	-4	231	77	125	111	188	194	240	338	383
Mean ...		(a) 241. (b) 91.			(a) 219. (b) 125.				(a) 300. (b) 289.			
Annual Means ...									(a) 203	199	195	268
									(b) 135	105	119	227
									(a) 216.	(b) 147.		

The Potential Gradient is reckoned as positive if the potential increases upward. For indeterminate potential gradient the following notation is used:

POTENTIAL GRADIENT (reduced to level surface : DIURNAL INEQUALITIES (in volts per metre).

The departures from the mean of the day are adjusted for non-cyclic change.

265. Eskdalemuir.

* 0a DAYS ONLY.

1928.

Month and Season.	Hour G.M.T.																								Non-cyclic change 24-0.	No. of Days used.	Mean Values.	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.				
Jan. ...	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	v/m.	—	—	v/m.
Feb. ...	0	-20	-39	-51	-22	-18	+19	+36	+31	-2	-9	-50	-77	-63	-55	-48	-15	+22	+78	+87	+112	+63	+9	+13	+23	10	301	
Mar. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
April ...	-1	-35	-12	+19	-34	-18	-18	-43	-49	-56	-59	-64	-47	-38	-22	-12	-5	+9	+27	+81	+72	+87	+113	+96	-148	9	225	
May ...	+9	+28	+23	+6	+14	+45	+37	+32	+28	-14	-18	-32	-42	-40	-38	-37	-35	-19	-15	-1	+7	+12	+39	+18	+44	8	189	
June ...	+14	+11	-11	+6	+14	-1	+4	0	-3	-14	-20	-29	-27	-33	-37	-40	-35	-30	-3	+45	+49	+58	+54	+19	+36	7	173	
July ...	+47	+62	+37	+37	+26	+4	+8	+8	-26	-42	-45	-47	-45	-42	-42	-45	-41	-41	-9	+2	+12	+71	+66	+47	+5	7	154	
Aug. ...	+14	-12	+2	+18	+65	+59	+25	-20	-20	-28	-33	-53	-56	-63	-84	-77	-69	-30	+13	+62	+87	+65	+80	+52	+29	6	200	
Sept. ...	+11	+21	+31	+31	+63	+77	+42	+20	-63	-77	-103	-104	-85	-92	-105	-91	-71	+29	+139	+144	+99	+50	+18	+11	+31	6	299	
Oct. ...	-64	-46	-53	-35	-9	+3	+50	+80	+82	-5	-51	-87	-104	-116	-104	-79	+20	+105	+152	+141	+104	+76	-1	-61	+83	3	290	
Nov. ...	+4	-41	-113	-105	-117	-97	-118	-105	-117	-121	-93	-18	+44	+75	+23	+97	+120	+184	+180	+131	+153	+81	-26	-18	-96	6	286	
Dec. ...	-7	+7	-24	-72	-92	-93	-71	-69	-34	-35	-2	+11	+12	+10	+99	+90	+63	+74	+16	+61	+77	+16	-28	+17	+2	8	254	
Year	+3	-3	-16	-15	-9	-4	-2	-6	-17	-39	-43	-47	-43	-40	-37	-24	-7	+30	+58	+75	+77	+58	+32	+16	—	—	237	
Winter	-1	-18	-59	-76	-77	-69	-57	-46	-40	-53	-35	-19	-7	+7	+22	+46	+56	+93	+91	+93	+114	+53	-15	-7	—	—	280	
Equinox	-18	-20	-11	+5	+7	+21	+25	+19	-10	-46	-71	-85	-79	-82	-77	-61	-19	+48	+106	+122	+92	+71	+43	+15	—	—	271	
Summer	+21	+22	+13	+17	+30	+27	+19	+5	-5	-25	-29	-40	-43	-45	-50	-50	-45	-30	-3	+27	+39	+51	+60	+34	—	—	179	

266. Eskdalemuir.

* 1a AND 2a DAYS ONLY.

1928.

Month and Season.	Hour G.M.T.																								Non-cyclic change 24-0.	No. of Days used.	Mean Values.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.			
Jan. ...	+81	+100	+69	+37	-5	+137	+96	+14	-52	+43	+59	-71	-44	-75	-102	-12	-47	-74	-2	-59	-18	-66	+21	-38	+245	3	330
Feb. ...	-88	+1	+42	-8	+5	+19	-167	-119	-186	-125	-25	-28	-18	+27	+27	+61	+66	+64	+84	+94	+41	+101	+61	+64	-50	3	71
Mar. ...	+59	+49	-54	-1	-3	-42	-37	-34	-40	-42	-51	-69	-39	-55	-77	-67	+5	+37	+96	+75	+76	+44	+20	+52	+31	4	173
April ...	-39	-39	-33	-25	-38	-13	+32	+24	-2	-24	-14	-23	-14	-4	+4	-13	-31	-6	+104	+103	+78	+30	-42	-23	+60	7	190
May ...	-17	-6	-48	-20	+34	+51	+40	+47	-67	-41	-11	0	+12	-11	+13	-2	+6	-19	+14	+55	+33	-14	-19	-31	+10	2	145
June ...	+14	+83	+83	+96	+107	+54	-30	-58	-72	-63	-31	-47	-50	-6	+15	+3	+6	-6	-18	-4	+22	-25	-39	-7	-20	4	110
July ...	+49	+27	+56	+22	+10	-48	-62	-4	-15	-19	-11	-49	-58	-45	+35	-4	-21	-19	+1	+15	+14	+6	+65	+48	-1	5	176
August	+35	+72	+1	+4	-4	+14	+38	+29	-37	-22	-55	-82	-85	-177	-183	-29	-80	+58	+40	+122	+67	+112	+124	+36	+220	2	209
Sept. ...	-81	-112	-161	-82	-42	+2	+31	+20	-9	+23	+21	+10	+13	-9	-61	+37	+95	+151	+57	+65	+16	-8	+44	-24	-105	4	178
Oct. ...	+40	+47	-60	-53	-1	-2	+9	+17	+2	+28	+36	+39	+34	+34	+50	+74	+60	+137	+42	-147	-195	-251	+3	+49	+121	3	133
Nov. ...	-46	-13	-21	-23	-69	-57	-56	-13	-25	+1	+41	+32	+19	+67	+56	+23	+42	+83	+49	+1	+23	-36	-44	-37	+35	6	197
Dec. ...	-125	-128	-161	-168	-83	+24	+10	+60	+12	-55	-103	-43	+33	-2	+46	+119	+126	+87	+105	+91	+92	+72	+24	-23	+31	6	260
Year	-10	+7	-15	-18	-7	+12	-8	-1	-41	-25	-12	-28	-16	-21	-17	+16	+19	+41	+48	+34	+21	-3	+18	+5	—	—	181
Winter	-45	-10	-18	-41	-38	+31	-29	-15	-63	-34	-7	-27	-3	+4	+7	+48	+47	+40	+59	+32	+35	+18	+15	-9	—	—	215
Equinox	-5	-14	-50	-40	-21	-14	+9	+7	-12	-4	-2	-11	-1	-9	-21	+8	+32	+80	+75	+24	-6	-46	+6	+13	—	—	169
Summer	+20	+44	+23	+25	+37	+18	-3	+3	-48	-36	-27	-45	-45	-60	-37	-8	-22	+3	+9	+47	+34	+20	+33	+11	—	—	160

* NOTE.—For explanation of 0a, 1a and 2a Days, see page 231.

Month.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.	
	Day.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.
		hours.		hours.		hours.		hours.		hours.		hours.
1	2b	4.4	2c	9.2	2c	8.7	1a	0.3	0a	...	0a	...
2	2b	4.4	—	—	1b	2.9	1b	2.5	—	—	0a	...
3	1b	0.3	—	—	1b	0.5	2c	5.1	—	—	0a	...
4	2b	6.4	2c	15.4	1b	1.1	1b	0.7	0a	...	1a	...
5	1b	2.7	2c	6.4	2c	13.6	1b	1.8	0a	...	0a	...
6	2c	8.1	2c	4.6	1a	0.3	0a	...	0a	...	1a	1.2
7	2c	9.8	2a	10.0	1a	0.5	1a	0.7	0a	...	1b	0.7
8	1c	2.8	2b	5.7	—	—	2c	6.7	1a	0.3	2a	9.3
9	2c	4.0	2c	4.1	—	—	1a	0.3	1a	0.1	2c	11.1
10	2c	7.5	2c	6.5	1c	1.4	1b	1.9	1a	0.2	1a	0.6
11	1b	0.7	1b	0.7	—	—	1b	2.0	1a	0.3	1b	1.4
12	2c	14.0	1c	1.1	—	—	1b	0.1	1a	0.4	1b	2.9
13	2c	6.8	1b	2.4	—	—	1a	0.1	—	—	2b	11.8
14	2c	5.5	1b	2.1	—	—	0a	...	0a	...	2b	11.5
15	2c	8.8	1a	0.3	—	—	1b	0.2	1b	0.7	2c	5.0
16	2c	5.8	2c	11.7	—	—	1b	0.3	2c	4.7	1b	1.0
17	1b	2.7	1b	1.8	2c	10.7	1b	1.0	2c	9.4	2c	4.3
18	2c	11.8	2b	5.3	2c	5.1	1c	2.7	2b	5.0	0a	0.0
19	1b	1.9	0a	...	2c	9.1	0a	...	2c	3.9	2c	10.9
20	2b	6.6	0a	...	2b	14.0	0a	...	2c	3.6	0a	...
21	2c	11.2	0a	...	2b	10.5	1a	0.7	0a	...	1b	0.3
22	1a	0.2	0a	...	1a	0.1	0a	...	0a	...	1b	2.5
23	2c	12.8	1a	0.8	—	—	2b	3.6	0a	...	2b	4.0
24	2c	3.1	0a	...	—	—	0a	...	0a	...	1b	1.6
25	2c	4.9	0a	...	1b	2.3	1a	1.3	0a	...	2c	6.7
26	1c	2.9	0a	...	1a	0.1	1a	0.8	—	—	2b	7.6
27	1a	0.2	0a	...	2b	4.5	0a	...	1b	0.9	0a	...
28	2c	8.1	0a	...	1b	1.1	0a	...	1a	1.1	2b	9.9
29	2b	4.1	0a	...	2c	6.7	0a	...	0a	...	2c	9.1
30	1a	0.1	—	—	2c	4.4	1b	1.2	0a	...	2c	3.0
31	2c	5.1	—	—	1b	2.6	—	—	0a	...	—	—
Total ...	—	167.7	—	88.1	—	100.2	—	34.0	—	30.6	—	116.4
No. of days used	—	31	—	27	—	21	—	30	—	27	—	30
Mean ...	—	5.4	—	3.3	—	4.8	—	1.1	—	1.1	—	3.9

Month.	JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
	Day.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.	Character	Duration of Negative Pot. Grad.
		hours.		hours.		hours.		hours.		hours.		hours.
1	2c	5.6	0a	...	0a	...	0a	...	2b	7.8	0a	...
2	1b	1.1	0a	...	0a	...	0a	...	2b	4.8	1a	0.1
3	1b	0.4	0a	...	2b	4.6	0a	...	2b	4.2	1a	0.1
4	2b	4.1	1b	1.2	1b	1.1	0a	...	1b	2.7	0a	...
5	2c	6.8	0a	...	2a	3.0	1b	2.8	2c	3.3	1b	2.5
6	1b	1.6	2b	3.0	1a	0.4	1b	0.4	0a	...	2c	5.3
7	0a	...	2b	9.5	1a	1.8	2c	6.7	1b	0.9	1b	...
8	1a	0.5	1c	2.1	1a	0.5	2c	5.4	1a	0.1	0a	...
9	1a	0.2	1a	0.6	1b	2.3	2c	5.4	1a	...	2b	5.9
10	2b	4.0	0a	...	2c	4.1	1a	0.9	2b	6.6	1b	0.9
11	1b	2.1	2c	4.7	0a	...	2c	16.1	2b	4.3	1a	0.6
12	1a	0.2	2c	4.4	0a	...	1a	...	1a	0.6	2a	4.2
13	1a	0.1	2c	6.3	0a	...	0a	...	1b	1.4	0a	...
14	1a	0.1	2c	8.6	1a	0.1	2a	4.1	2c	5.3	0a	...
15	0a	...	1b	1.5	0a	...	0a	...	2b	3.9	0a	...
16	0a	...	1b	0.7	0a	...	1b	1.8	2b	5.4	2c	11.0
17	0a	...	0a	...	2b	5.8	1b	2.9	1a	1.7	0a	0.0
18	1a	0.1	0a	...	1b	1.9	2c	6.4	2b	5.8	1b	0.4
19	0a	...	1b	1.1	2c	4.5	2c	8.2	2c	9.9	1c	2.5
20	0a	...	2c	9.5	1b	2.4	2c	6.6	1a	0.2	0b	...
21	0a	...	2c	10.7	0a	...	2c	4.3	2c	7.4	1a	0.4
22	—	—	0a	...	0a	...	2b	5.6	2c	9.4	2b	3.7
23	—	—	1b	2.6	1a	1.1	1b	2.7	2c	9.2	0a	...
24	1a	0.1	1a	0.3	1b	2.4	2c	4.4	2b	4.5	2c	7.2
25	0a	...	1c	1.3	1a	1.7	2c	3.3	2c	8.6	2b	6.1
26	1b	1.9	2b	3.7	0a	...	2c	19.7	1b	0.7	2c	3.0
27	2b	4.2	1c	2.4	0a	...	1b	2.5	0a	...	1a	0.2
28	2c	5.0	2b	3.9	1a	1.7	1b	0.3	0a	...	1b	1.4
29	1b	1.5	1b	2.4	0a	...	1b	1.5	1a	0.8	2c	4.1
30	1b	0.8	1b	2.4	0a	...	2c	8.5	0a	...	2c	3.0
31	0a	...	1a	0.9	—	—	2c	12.7	—	—	0b	0.1
Total ...	—	40.4	—	83.8	—	39.4	—	133.2	—	109.5	—	62.7
No. of days used	—	29	—	31	—	30	—	31	—	30	—	31
Mean ...	—	1.4	—	2.7	—	1.3	—	4.3	—	3.7	—	2.0

TERRESTRIAL MAGNETIC FORCE: NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

268. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

January, 1928.

Table with 25 columns (Hour, 0-24, Mean) and 31 rows (Day 1-31). Values range from 1022 to 1049.

TERRESTRIAL MAGNETIC FORCE: WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

269. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

January, 1928.

Table with 25 columns (Hour, 0-24, Mean) and 31 rows (Day 1-31). Values range from 350 to 399.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

270. Eskdalemuir. (Z.) Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time. 44,000 γ (·44 C.G.S. unit) +

January, 1928.

Table 270: Eskdalemuir. (Z.) Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time. Columns include Hour G.M.T., Day, and magnetic force components 0-24, with a Mean column.

DAILY EXTREMES OF EACH COMPONENT OF TERRESTRIAL MAGNETIC FORCE : MAGNETIC CHARACTER FIGURES : TEMPERATURE IN MAGNET HOUSE.

January, 1928.

271. Eskdalemuir.

Table 271: Eskdalemuir. Daily extremes of each component of terrestrial magnetic force, magnetic character figures, and temperature in magnet house. Columns include Day, North Component (Maximum, Minimum, Range), West Component (Maximum, Minimum, Range), Vertical Component (Maximum, Minimum, Range), Character Figure, Magnetic Character, and Temperature.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

272. Eskdalemuir. (X.)

15,000γ (.15 C.G.S. unit) +

February, 1928.

Table with 25 columns (Hour G.M.T. to Mean) and 29 rows (Day 1 to 29). Values range from 1021 to 1066.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

273. Eskdalemuir. (-Y.)

4,000γ (.04 C.G.S. unit) +

February, 1928.

Table with 25 columns (Hour G.M.T. to Mean) and 29 rows (Day 1 to 29). Values range from 352 to 399.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333. † Mean of 28 days; 23rd omitted. * Clock stopped.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

276. Eskdalemuir. (X.)

15,000 γ (-15 C.G.S. unit) +

March, 1928.

Table with 26 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from approximately 983 to 1058.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

277. Eskdalemuir. (-Y.)

4,000 γ (.04 C.G.S. unit) +

March, 1928.

Table with 26 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from approximately 340 to 385.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

280. Eskdalemuir. (X.)

15,000 γ (.15 C.G.S. unit) +

April, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 30 rows (Day, 1D-30). Values range from 1040 to 1066.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

281. Eskdalemuir. (-Y.)

4,000 γ (.04 C.G.S. unit) +

April, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 30 rows (Day, 1D-30). Values range from 340 to 388.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

284. Eskdalemuir. (X.)

15,000 γ (-15 C.G.S. unit) +

May, 1928.

Table with 24 columns (0-24) and 25 rows (Day, 1Q, 2Q, 3Q, 4, 5, 6, 7, 8, 9, 10D, 11, 12D, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22Q, 23, 24, 25, 26Q, 27D, 28D, 29D, 30, 31, Mean). Each cell contains a numerical value representing magnetic force.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

285. Eskdalemuir. (-Y.)

4,000 γ (-04 C.G.S. unit) +

May, 1928.

Table with 24 columns (0-24) and 25 rows (Day, 1Q, 2Q, 3Q, 4, 5, 6, 7, 8, 9, 10D, 11, 12D, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22Q, 23, 24, 25, 26Q, 27D, 28D, 29D, 30, 31, Mean). Each cell contains a numerical value representing magnetic force.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

288. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

June, 1928.

Table with 25 columns (Hours G.M.T. 0-24) and 25 rows (Days 1-30). Values range from 1022 to 1066. Includes a 'Mean' row at the bottom.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

289. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

June, 1928.

Table with 25 columns (Hours G.M.T. 0-24) and 25 rows (Days 1-30). Values range from 318 to 388. Includes a 'Mean' row at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.
Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

July, 1928.

292. Eskdalemuir. (X.)

15,000 γ (.15 C.G.S. unit) +

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (Day 1-31, Mean). Values range from 977 to 1114.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

July, 1928.

293. Eskdalemuir. (-Y.)

4,000 γ (.04 C.G.S. unit) +

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (Day 1-31, Mean). Values range from 266 to 408.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : VERTICAL COMPONENT. Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time. 44,000 γ ('44 C.G.S. unit) +

July, 1928.

294. Eskdalemuir. (Z.)

Table with 25 columns (0-24 hours) and 25 rows (1-31 days). Columns represent hours of the day (0 to 24) and rows represent days of the month (1 to 31). Each cell contains a numerical value representing the vertical component of terrestrial magnetic force in units of 44,000 gamma. The table includes a 'Mean' row at the bottom.

DAILY EXTREMES OF EACH COMPONENT OF TERRESTRIAL MAGNETIC FORCE : MAGNETIC CHARACTER FIGURES : TEMPERATURE IN MAGNET HOUSE.

July, 1928.

295. Eskdalemuir.

Table with 13 columns: Day, North Component (Maximum, Minimum, Range), West Component (Maximum, Minimum, Range), Vertical Component (Maximum, Minimum, Range), Character Figure (2R/100γ), Magnetic Character of Day (0-2), and Temperature in Magnet House (200+). Rows represent days from 1 to 31. Includes a 'Mean' row at the bottom and a 'No. of Days used' row at the very bottom.

§ For explanation see page 176. Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

296. Eskdalemuir. (X.)

15,000 γ (.15 C.G.S. unit) +

August, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from 994 to 1066.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

297. Eskdalemuir. (-Y.)

4,000 γ (.04 C.G.S. unit) +

August, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from 311 to 388.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : VERTICAL COMPONENT. Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time. 44,000 γ (·44 C.G.S. unit) +

August, 1928.

298. Eskdalemuir. (Z.)

Table with 25 columns (Hour G.M.T., 0 to 24, Mean) and 31 rows of data representing magnetic force values.

DAILY EXTREMES OF EACH COMPONENT OF TERRESTRIAL MAGNETIC FORCE : MAGNETIC CHARACTER FIGURES : TEMPERATURE IN MAGNET HOUSE.

August, 1928.

299. Eskdalemuir.

Table with 14 columns (Day, North Component, West Component, Vertical Component, Character Figure, Magnetic Character, Temperature) and 31 rows of data representing daily extremes.

§ For explanation see page 176. Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

300. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

September, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 30 rows (Day 1-30). Values range from 985 to 1066.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

301. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

September, 1928.

Table with 25 columns (Hour, G.M.T., 0-24, Mean) and 30 rows (Day 1-30). Values range from 273 to 354.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

TERRESTRIAL MAGNETIC FORCE : NORTH COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

304. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

October, 1928.

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from 888 to 1066.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

305. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

October, 1928.

Table with 25 columns (Hour G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Values range from 181 to 388.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

November, 1928.

308. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

Table with 25 columns (0-24 hours) and 30 rows (Day 1-30). Columns include hour labels (o, I, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, Noon, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24) and a Mean column. Rows include day labels (Day, 1, 2D, 3D, 4, 5, 6, 7, 8Q, 9Q, 10, 11, 12, 13D, 14, 15D, 16, 17D, 18, 19, 20, 21, 22Q, 23, 24, 25, 26, 27, 28Q, 29Q, 30) and numerical values.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

November, 1928.

309. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

Table with 25 columns (0-24 hours) and 30 rows (Day 1-30). Columns include hour labels (o, I, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, Noon, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24) and a Mean column. Rows include day labels (Day, 1, 2D, 3D, 4, 5, 6, 7, 8Q, 9Q, 10, 11, 12, 13D, 14, 15D, 16, 17D, 18, 19, 20, 21, 22Q, 23, 24, 25, 26, 27, 28Q, 29Q, 30) and numerical values.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

312. Eskdalemuir. (X.)

15,000 γ (·15 C.G.S. unit) +

December, 1928.

Table with 25 columns (0-24 hours) and 25 rows (Day 1-31). Each cell contains a magnetic force value in γ. Includes a 'Mean' row at the bottom.

TERRESTRIAL MAGNETIC FORCE : WEST COMPONENT.

Mean values for periods of sixty minutes centred at the Hours of Greenwich Mean Time.

313. Eskdalemuir. (-Y.)

4,000 γ (·04 C.G.S. unit) +

December, 1928.

Table with 25 columns (0-24 hours) and 25 rows (Day 1-31). Each cell contains a magnetic force value in γ. Includes a 'Mean' row at the bottom.

Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

MEAN VALUES FOR PERIODS OF SIXTY MINUTES CENTRED AT THE HOURS OF GREENWICH MEAN TIME. 44,000 γ (·44 C.G.S. unit) +

314. Eskdalemuir. (Z)

December, 1928.

Table with 26 columns (Hour, G.M.T., 0-24, Mean) and 31 rows (Day 1-31). Contains magnetic force data for Eskdalemuir.

DAILY EXTREMES OF EACH COMPONENT OF TERRESTRIAL MAGNETIC FORCE: MAGNETIC CHARACTER FIGURES: TEMPERATURE IN MAGNET HOUSE.

315. Eskdalemuir.

December, 1928.

Table with 15 columns (Day, North/West/Vertical Components, Character Figures, Magnetic Character, Temperature) and 31 rows (Day 1-31). Contains magnetic character and temperature data for Eskdalemuir.

§ For explanation see page 176. Q denotes an "International Quiet Day," while D denotes a disturbed day used for the computation of Tables 322-333.

DIURNAL INEQUALITIES OF THE GEOGRAPHICAL COMPONENTS OF MAGNETIC FORCE.—" ALL " DAYS.

Not corrected for the effect of the North Force on the West Magnetograph, or vice versa, or for the effect of the Horizontal Force on the V.F. Balance

Departures from mean of the day adjusted for non-cyclic change.

Table 316: Eskdalemuir. NORTH COMPONENT (all days except Feb. 23). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data (Jan-Dec, Year, Winter, Equinox, Summer).

Table 317: Eskdalemuir. WEST COMPONENT (all days except Feb. 23). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data (Jan-Dec, Year, Winter, Equinox, Summer).

Table 318: Eskdalemuir. VERTICAL COMPONENT (all days except Feb. 23). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data (Jan-Dec, Year, Winter, Equinox, Summer).

DIURNAL INEQUALITIES OF THE MAGNETIC COMPONENTS, DECLINATION, INCLINATION, AND HORIZONTAL FORCE.

"ALL" DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table 319: Declination (measured positive towards the West) for Eskdalemuir, 1928. Columns: Hour (1-24), Month and Season, and values for each hour.

Table 320: Inclination (all days except Feb. 23) for Eskdalemuir, 1928. Columns: Hour (1-24), Month and Season, and values for each hour.

Table 321: Horizontal Force (all days except Feb. 23) for Eskdalemuir, 1928. Columns: Hour (1-24), Month and Season, and values for each hour.

DIURNAL INEQUALITIES OF THE GEOGRAPHICAL COMPONENTS OF MAGNETIC FORCE.—
INTERNATIONAL QUIET DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table 322: Eskdalemuir. NORTH COMPONENT (Quiet Days). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data for North Component.

Table 323: Eskdalemuir. WEST COMPONENT (Quiet Days). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data for West Component.

Table 324: Eskdalemuir. VERTICAL COMPONENT (Quiet Days). 1928. Columns: Hour (1-24), G.M.T., and monthly/seasonal data for Vertical Component.

DIURNAL INEQUALITIES OF THE MAGNETIC COMPONENTS, DECLINATION, INCLINATION AND HORIZONTAL FORCE.—INTERNATIONAL QUIET DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table for Station 325, Eskdalemuir, 1928. Columns: Hour (1-24), G.M.T. (1-24), Declination (measured positive towards the West). Rows: Jan, Feb, Mar, April, May, June, July, Aug, Sept, Oct, Nov, Dec, Year, Winter, Equinox, Summer.

Table for Station 326, Eskdalemuir, 1928. Columns: Hour (1-24), G.M.T. (1-24), Inclination (Quiet Days). Rows: Jan, Feb, Mar, April, May, June, July, Aug, Sept, Oct, Nov, Dec, Year, Winter, Equinox, Summer.

Table for Station 327, Eskdalemuir, 1928. Columns: Hour (1-24), G.M.T. (1-24), Horizontal Force (Quiet Days). Rows: Jan, Feb, Mar, April, May, June, July, Aug, Sept, Oct, Nov, Dec, Year, Winter, Equinox, Summer.

DIURNAL INEQUALITIES OF THE GEOGRAPHICAL COMPONENTS OF MAGNETIC FORCE.—SELECTED DISTURBED DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table 328: Eskdalemuir. NORTH COMPONENT (Disturbed Days). 1928. Columns: Hour (1-24), G.M.T., Month and Season, and 24 columns of magnetic data.

Table 329: Eskdalemuir. WEST COMPONENT (Disturbed Days). 1928. Columns: Month and Season, and 24 columns of magnetic data.

Table 330: Eskdalemuir. VERTICAL COMPONENT (Disturbed Days). 1928. Columns: Month and Season, and 24 columns of magnetic data.

DIURNAL INEQUALITIES OF THE MAGNETIC COMPONENTS, DECLINATION, INCLINATION AND HORIZONTAL FORCE.— SELECTED DISTURBED DAYS.

Departures from mean of the day adjusted for non-cyclic change.

Table 331: Declination (measured positive towards the West) (Disturbed Days). 1928. Columns: Hour (G.M.T.) 1-24, Noon. Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer).

Table 332: Inclination (Disturbed Days). 1928. Columns: Hour (G.M.T.) 1-24, Noon. Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer).

Table 333: Horizontal Force (Disturbed Days). 1928. Columns: Hour (G.M.T.) 1-24, Noon. Rows: Month and Season (Jan-Dec, Year, Winter, Equinox, Summer).

RANGE OF MEAN DIURNAL INEQUALITIES FOR THE MONTHS, YEAR, AND SEASONS OF 1928.

NOTE.—The ranges are those shown in Tables 316 to 333, in the preparation of which the non-cyclic change has been eliminated.

334. Eskdalemuir.

1928.

Table with columns: Month and Season, All Days (N, W, V), Quiet Days (N, W, V), Disturbed Days (N, W, V), All Days (D, I, H), Quiet Days (D, I, H), Disturbed Days (D, I, H). Rows include months from January to December, Year, Winter, Equinox, and Summer.

NON-CYCLIC CHANGE (24h.—0h.).

335. Eskdalemuir.

1928.

Table with columns: Month, All Days (N, W, V), Quiet Days (N, W, V), Disturbed Days (N, W, V). Rows include months from January to December and Year, 1928.

MEAN VALUE OF THE SQUARES OF THE ABSOLUTE DAILY RANGES.

(Unit, 100γ².)

336. Eskdalemuir.

1928.

Table with columns: Rₙ², R_w², R_v², Rₙ² + R_w², Rₙ² + R_v² + R_w², Mean Character Figure. Rows include months from January to December and Year, 1928.

MEAN MONTHLY AND ANNUAL VALUES OF TERRESTRIAL MAGNETIC ELEMENTS.

(All days except those noted in monthly tables.)

337. Eskdalemuir.

1928.

Table with columns: Month, North, West, Vertical, Total, Declination (West), Inclination (North), Horizontal Force. Rows include months from January to December and Year.

340. MEAN VALUES, FOR THE YEARS SPECIFIED, OF THE MAGNETIC ELEMENTS AT OBSERVATORIES IN COMMUNICATION WITH THE ROYAL OBSERVATORY, GREENWICH.

Table with columns for Place, Latitude, Longitude, and magnetic elements (Declination, Inclination, Horizontal Force, Vertical Force) for the years 1928, 1927, and 1926. Includes locations like Godhavn, Copenhagen, Potsdam, and various international sites.

NOTES.—* Results derived from absolute observations only. † A local anomaly is known to exist at the site of the Observatory. Potsdam.—Magnetic Observation at Potsdam Observatory ceased after the middle of 1928 on account of electrification of Berlin railways. San Juan, Porto Rico.—The results for 1927 are from the months January to May only. Apia, Samoa.—The results for 1928 are for five months only. La Quiaca, Argentina.—Results for 1928 are from hourly values January–April, combined with absolute observations May–December.

341. ADDITIONAL VALUES FOR EARLIER YEARS.

Stara Dala, Czecho Slovakia Lat. 47°53' N., Long. 18° 11' E. Declination: 1924, 4°18'6" W.; 1925, 4° 8'9" W.

ERRATA. In 1926 Year Book, Vassouras, Brazil. Declination 1924–26, for E read W. In 1927 Year Book, " " " " " Apia, Samoa. Declination 1925–26, for E read W. Declination 1927, for 10° 9'5" read 10° 29'5".

M.O. 320
(Cahirciveen)

Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

CAHIRCIVEEN (VALENTIA OBSERVATORY)

Published by the authority of the
METEOROLOGICAL COMMITTEE



LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

1929

CAHIRCIVEEN (VALENTIA OBSERVATORY).

Latitude	..	..	..	..	..	51°	56'	N.
Longitude	..	..	..	..	..	10°	15'	W.
G.M.T. of Local Mean Noon	..	..	..	..	..	12h	41m.	

Heights in metres above Sea Level.

Barometer	..	..	..	..	..	..	13·7
Rain-gauge	..	..	..	..	..	..	9·1
Robinson Cup Anemograph	..	..	..	..	..	..	26
Dines Tube Anemograph	..	..	..	..	..	..	30

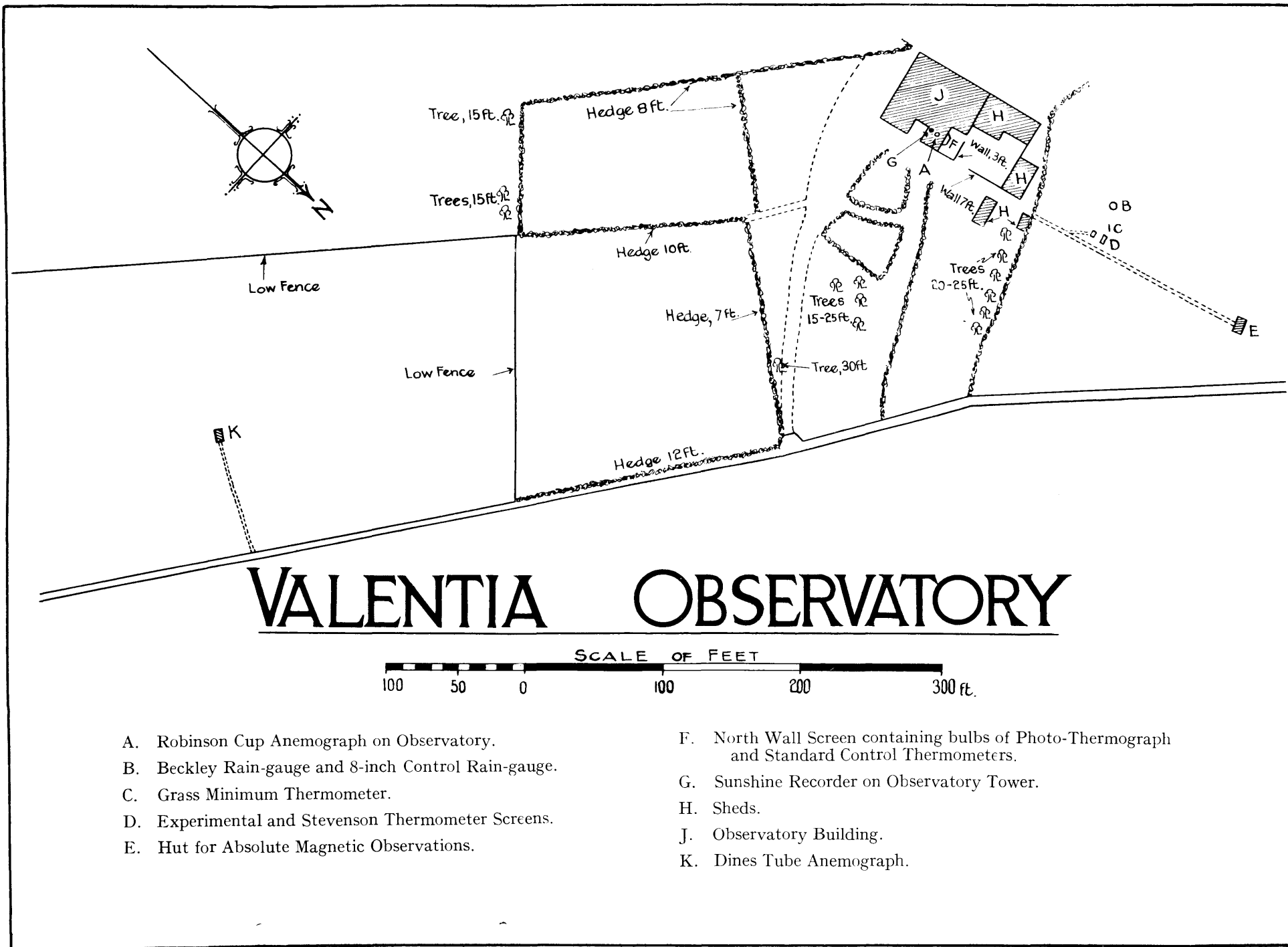
Heights in metres above Ground.

Thermometer Bulbs	..	..	..	..	..	..	1·3
Sunshine Recorder	..	..	..	..	..	..	12·8
Robinson Cup Anemograph	..	..	..	..	..	..	14
Dines Tube Anemograph	..	..	..	..	..	..	13
Beckley Rain-gauge Rim	..	..	..	..	..	..	0·5

INTRODUCTION.

SITE.

Valentia Observatory derives its name from the fact that it was originally established on Valentia Island in 1867. It was removed to the mainland in March, 1892, and now lies in a direct line between the old site on Valentia Island and the town of Cahirciveen, about $2\frac{1}{2}$ miles (4 km.) north-east from the former, and three-quarters of a mile (1 km.) south-west of the latter. It is quite remote from any other buildings. The general character of the country surrounding the Observatory is hilly. The eastern bank of the Cahir river is about 150 metres to the westward, and in that direction there is no very high ground between the Observatory and the open sea, some $3\frac{1}{2}$ miles (6 km.) away. To the north-west, however, are hills varying in height from 400 (120 m.) to 900 feet (275 m.), the highest being less than 3 miles (5 km.) distant. These are only separated by a narrow gully running in a N N W direction from other hills equally high, which stretch away to the northward: the nearest of these is but little more than a mile ($1\frac{1}{2}$ km.) from the Observatory. Beyond the town of Cahirciveen to the north-east the river opens out considerably, and the country in this direction becomes an open boggy basin, rising by only a gentle gradient. Southward of this, however, it soon rises again, and at about a mile south-east of the Observatory it culminates in the hill Bentee upwards of 1,245 feet (380 m.) in height. Still further south it opens out once more to a distance of nearly 5 miles (8 km.) from the Observatory, where there is a range of hills running east and west, and varying in height from 400 (120 m.) to 1,300 feet (400 m.). To the south-west there is an opening to the sea, between Valentia Island and the mainland; and the circle of hills is completed by those on the island itself, the highest of which is about 800 feet (240 m.) high, and bears about west-south-west from the Observatory. Photographs of the Observatory building, together with a site plan, showing the disposition of the various instruments are reproduced in Figs. 14, 15 and 16.



VALENTIA OBSERVATORY.

- A. Robinson Cup Anemograph on Observatory.
- B. Beckley Rain-gauge and 8-inch Control Rain-gauge.
- C. Grass Minimum Thermometer.
- D. Experimental and Stevenson Thermometer Screens.
- E. Hut for Absolute Magnetic Observations.

- F. North Wall Screen containing bulbs of Photo-Thermograph and Standard Control Thermometers.
- G. Sunshine Recorder on Observatory Tower.
- H. Sheds.
- J. Observatory Building.
- K. Dines Tube Anemograph.

[To face p. 282.

FIG. 14. SITE PLAN.

VALENTIA OBSERVATORY.

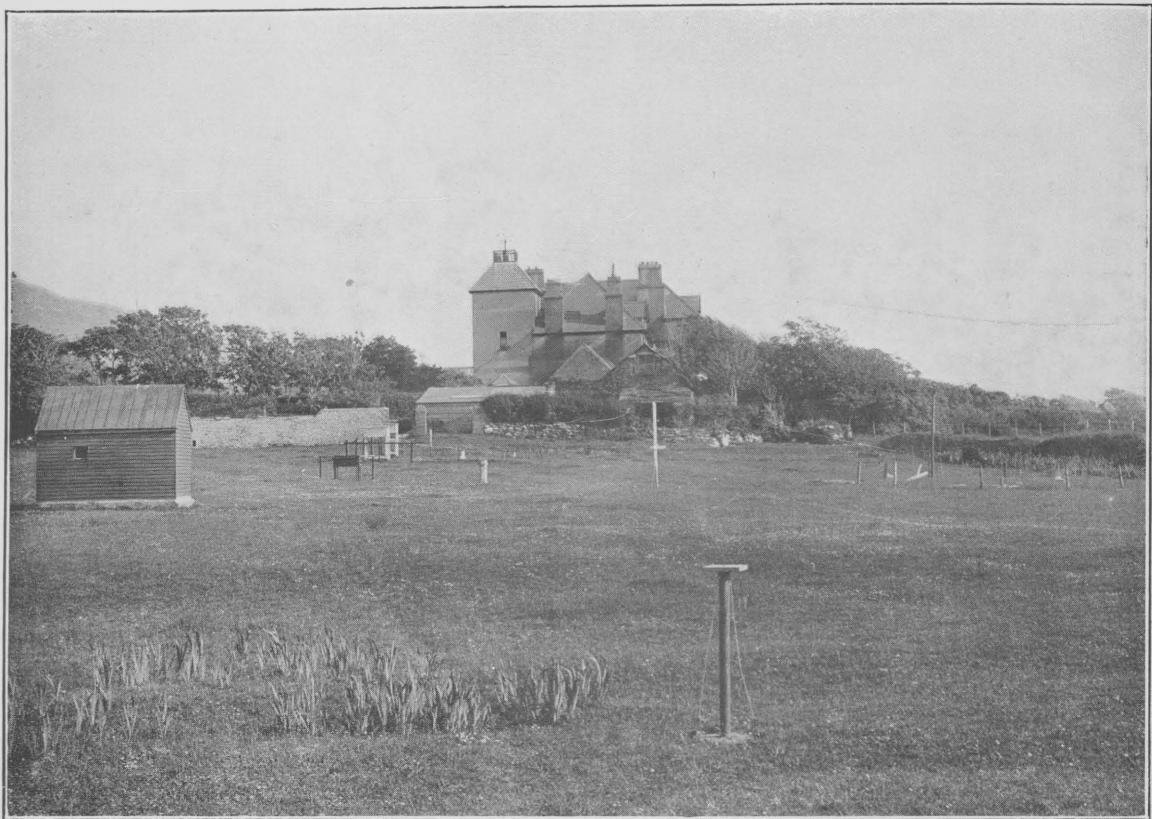


FIG. 15. GENERAL VIEW FROM NORTH.

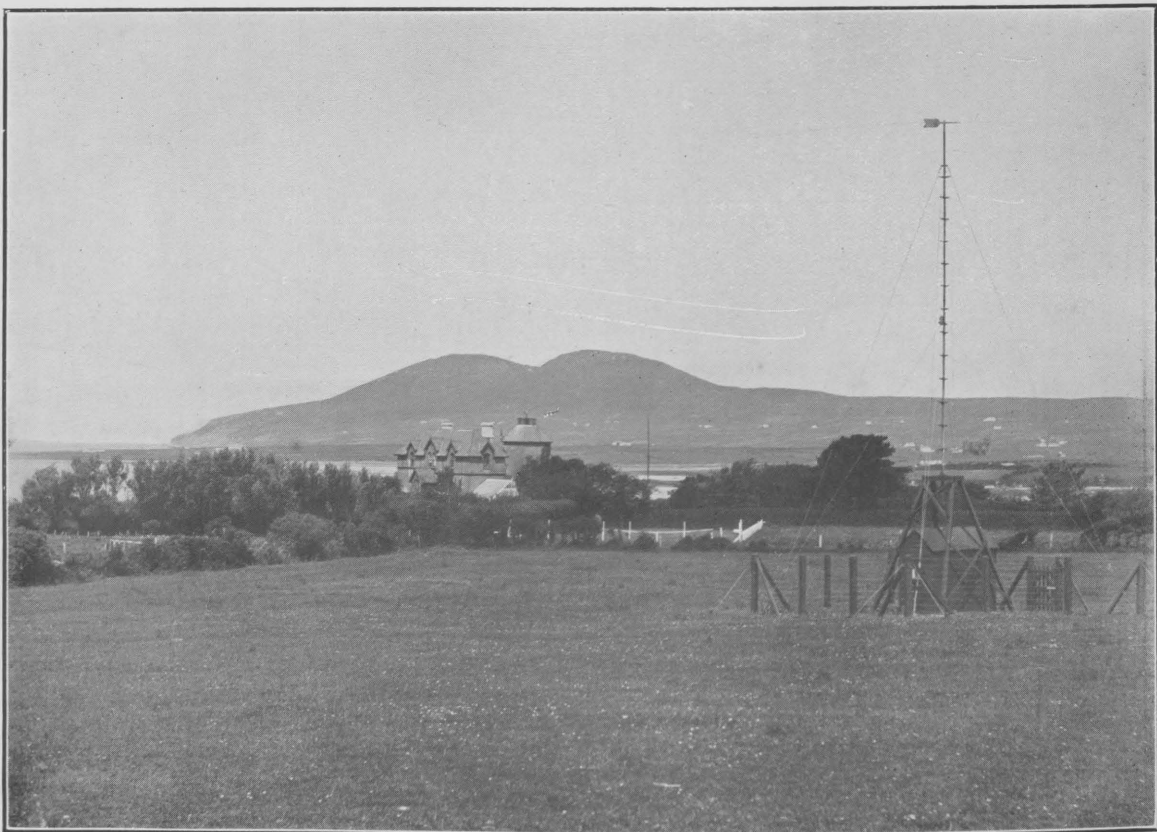


FIG. 16. GENERAL VIEW FROM SOUTH-EAST SHOWING DINES ANEMOGRAPH.

[To face p. 283.]

METEOROLOGY.

The elements dealt with in the following tables are : atmospheric pressure, air temperature, humidity, rainfall, sunshine, wind speed and direction, minimum temperature on the grass, together with a diary of cloud visibility and weather.

Pressure and Temperature.—The photographic barograph and thermograph are installed in a room on the ground floor of the Observatory tower. The standard Fortin barometer, from which the control readings at 9h, 15h and 21h are taken, is mounted in the same room beside a window which faces the north-east. The stems of the dry and wet bulb thermometers pass out into the screen placed against the north wall of the tower. Close to the bulbs of these thermometers are the bulbs of the standard thermometers from which the control readings at 9h, 15h and 21h are taken.

Rainfall.—The Beckley raingauge and the 8-inch (20.3 cm.) check gauge are placed in a railed-off enclosure about 40 metres to the north of the tower.

Sunshine.—The recorder is cemented to a wooden rail on the roof of the tower. The exposure of the sunshine recorder is such that there is no appreciable loss of record due to obstructions in the months of May, June, July and August. During the remainder of the year the hill Benteo lying to the south-east cuts off early morning sunshine. The reduction in possible record, assuming that the recorder becomes sensitive to sunshine only when the sun is at an altitude of more than three degrees, is shown in the following table for the 1st and 15th of each month :—

Reduction in Possible Record in Tenths of an Hour.								
Month.	Jan.	Feb.	Mar.	Apr.	Sept.	Oct.	Nov.	Dec.
1st.	.5	.5	.7	.5	.3	.7	.5	.6
15th.	.6	.5	.7	.3	.5	.7	.5	.5

Wind, Speed and Direction.—Up to 1925 the measurements of Wind Speed and Direction, as given in Tables 412-423, were obtained from the Robinson Cup Anemograph on the roof of the Observatory tower. Commencing with the 1926 values, measurements of Wind Speed and Direction published in the Observatories' Year Book are taken from the records of the Dines Pressure-tube Anemograph. This instrument stands in an open field, about 250 metres S E by E of the Observatory tower. The field slopes northwards and downwards to the river Cahir. About 1 mile (1½ km.) to the south-east is the highest point (1,245 feet) of the hill Benteo which extends for some little distance in a northerly and south-westerly direction. A description of the surrounding country has already been given.

In a few instances where records of the Pressure-tube Anemograph have been defective, the required values have been obtained from the records of the Cup Anemograph, a suitable adjustment of such values having been made in accordance with the table in the General Introduction showing the effect of exposure on the two instruments. Values thus obtained are entered as interpolated values.

Minimum Temperature on the Grass.—The grass minimum thermometer is of the type described in the General Introduction. It is exposed over short grass in the field enclosure. It is set at 18h and read at 7h on the succeeding day, the observation being entered to the day of reading.

Visibility.—Lists of the objects used for visibility observations and their distances and bearings from the point of observation are given on p. 288-289.

Notes on the Meteorological Summaries.

Pressure.—No change in the values used for reducing pressure at station level to pressure at mean sea level is made at Valentia Observatory by the introduction of the revised scheme as set out in the General Introduction (pp. 15-16).

The mean pressure for the year was 1·8 millibars below normal. Of the monthly mean pressures five were higher and seven lower than normal. The departures ranged from an excess of about five millibars in December to a deficiency of eight millibars in March.

The highest pressure of the year, 1034·6 millibars, was recorded on the 22nd February and the lowest, 960·5 millibars, on the 16th November, giving a total range for the year of 74 millibars. October, November and December had ranges of more than 50 millibars. The smallest range for any month was 26·1 millibars recorded in July.

The diurnal inequality of pressure for the year as a whole shows the usual well marked double oscillation with maxima at 11h and 22h of which the second is the principal one; and minima at 5h and 16h, the principal of these two being the morning one. In the inequalities for the individual months it is found that the double oscillation is much more prominent in some months than in others. The morning maximum occurs at 11h or 12h, except in July (13h) and August (15h). The morning minimum which is the principal one for eleven months of the twelve occurs each month at 4h, 5h, 6h or 7h. The afternoon minimum appears at 14h or 15h in the winter months; in other months it is seen at 16h, 17h, 18h or 19h. The night maximum occurs between 19h and 23h.

The range of the mean inequality for the year is 1·01 mb. while for the months considered individually it varies from ·79 mb. for May to 2·13 mb. for January. These ranges represent only the regular periodic changes in pressure and are small compared with the ranges obtained from the mean values of the daily maximum and minimum pressures found in Table 356, which vary from 4·01 mb. for July to 10·89 mb. for October.

Comparison of diurnal inequalities may be made by means of analysis into harmonic components. The details of the Fourier analysis of the diurnal inequalities for the year 1928 are given in Table A. The figures in the line immediately following the monthly values are the arithmetic means for the year of the monthly amplitudes. On account of the very large changes in phase throughout the year in some of the terms the amplitudes obtained from the annual inequality are not adequate as measures of the effectiveness of such terms relative to others whose phase angles show less variation from month to month. In these cases comparison of the arithmetic means of the monthly amplitudes is more satisfactory.

The most important terms are the 24-hour and 12-hour terms. For the year considered as a whole the amplitude of the 24-hour term is considerably higher than for the period 1871-1882; the arithmetic mean for the twelve months is also higher than that of the period, which points apparently to a normal amount of variation in the 24-hour term phase angles throughout the year. The seasonal amplitudes show considerable variation, the winter one being the highest and that for the equinoxes the lowest. The 24-hour term always shows wide and somewhat irregular variations from month to month both in phase and amplitude.

The 12-hour term is more nearly constant during the year, both in amplitude and phase. For the year considered as a whole the amplitude is decidedly higher than average. The highest phase angle appears at the equinoxes and the lowest in summer.

In the mean inequality for the year the 8-hour term appears almost negligible when its amplitude is compared with those of the two terms already considered, but that this is due mainly to the very wide variations in phase of this term during the year is seen quite clearly by reference to the individual months. The phase of this term has a fairly regular seasonal variation, changing somewhat rapidly at the equinoxes by approximately two right angles. The effect of the phase variation at this season is seen in the comparatively small amplitude which appears for the equinoctial mean. In the 6-hour term, amplitudes are small throughout and for this reason not very much weight can be attached to the individual phase angles. Nevertheless it is possible to detect an annual variation in the latter in which the movement is generally in the opposite sense to that of the 8-hour term.

Temperature.—The mean temperature for the year 1928 was 0.30a (0.54° F.) above normal. The highest temperature of the year, 294.9a (71.4° F.), was registered on the 21st July. Very low temperatures were not common, the freezing point being passed only on four days. The lowest temperature 269.0a (24.8° F.), was registered on the 13th March. The full range of temperature for the year was thus 25.9a (46.6° F.). For the individual months mean temperatures did not differ greatly from normal. February, with an excess of 1.71a (3.08° F.) showed the greatest departure. The monthly ranges of temperature varied from 16.1a (29.0° F.) in March to 9.8a (17.6° F.) in January.

The mean diurnal inequality for the year shows a single oscillation in the 24 hours with its maximum at 14h and 15h and its minimum at 5h and with a range of 2.52a (4.54° F.). Each of the monthly inequalities has a well marked single oscillation with its maximum at 13h, 14h, 15h or 16h. The time of minimum does not show the same constancy. In January it is 19h, in November 24h, in December 2h, in October 8h, and in other months 5h, 6h or 7h.

The harmonic analysis of the monthly and seasonal diurnal inequalities of temperature is given in Table B. The 24-hour term is in all cases predominant. Neither in the 24-hour term nor in the 12-hour term is there any very large variation in phase angle throughout the year, the effect of this being seen in each case in the slight differences between the mean amplitude for the year and the amplitude computed directly from the annual inequality. The highest of the seasonal amplitudes for the 24-hour term is found in summer, as is usual. The amplitudes at equinox and summer are about normal but the winter amplitude is below normal. For the 12-hour term the seasonal values follow the normal sequence in amplitude but the values at all seasons are low. Phase angles both for equinox and summer, normally about the same, are high, the summer one in particular having a value decidedly higher than normal.

The 8-hour term amplitude for the year is so small as to be negligible compared with the two terms already considered but this is due in large measure to the variations of phase angle in this term from month to month. There is approximate opposition of phase as between winter and summer, while for the equinoctial months a rapid change takes place from winter to summer values. The equinoctial amplitude thus appears much smaller than those for the individual months which make up this season. The summer 8-hour term amplitude is greater than the 12-hour term amplitude. The equinoctial amplitude is considerably higher than normal, otherwise the seasonal changes in the 8-hour term accord fairly well with those found in a normal year.

The 6-hour term amplitude is greatest at the equinoctial seasons and smallest in winter but variable phase angle has much to do with the small winter amplitude.

Relative Humidity.—The highest mean daily value of the relative humidity was 98.0 per cent., recorded for the 1st December. The lowest value was 45.9 per cent. for the 3rd June. The highest mean daily vapour pressure was 18.1 millibars for the 24th July and the lowest was 4.2 millibars for the 11th March. The diurnal inequality for the year shows a maximum in the early morning and a minimum in the afternoon; the morning maximum is not very sharply defined as to time of occurrence. There is only one well marked oscillation in the 24 hours. The individual months show, on the whole, similar features but there is a slight indication in some cases of a secondary maximum.

Rainfall.—The total rainfall for the year was 26 per cent. above normal, the actual excess being 368 millimetres. The month with the highest rainfall was October, with 228 millimetres, this amount being 61 per cent. more than normal. August with 221 millimetres had 81 per cent. more than normal. The lowest monthly total was that for July, the 52 millimetres which fell during that month being only 54 per cent. of the normal amount. The greatest hour's rainfall was 16.7 millimetres which fell between 20h and 21h on the 10th October.

Bright Sunshine.—The total amount of bright sunshine for the year 1928 was about 3 per cent. less than the normal. Only four months had more than average sunshine, the greatest excess being about 26 per cent. for August. The most notable deficiency was for December, the total sunshine for this month being 77 per cent. of normal. The greatest recorded sunshine for any one day was 15.5 hours, on the 16th June. The day with the greatest proportion of the total possible sunshine was the 16th July with 95 per cent.

Wind Speed.—Gales were experienced on three days in January, one day in February, one day in June, two days in October, two days in November and one day in December.

The highest hourly wind speed recorded was 24 metres per second (54 miles per hour) on the 19th October, on which day occurred also the highest gust of the year 38 metres per second (85 miles per hour).

Grass Minimum Temperature.—The mean of the monthly means given in Table 426 is 279.4a (43.5° F.). For no single month is the mean grass minimum temperature lower than the freezing point of water. The lowest value recorded in five months out of the twelve is below the freezing point.

Cloud and Weather.—The mean amount of cloud at all observation hours was 7.3. The most cloudy month was December, with a mean cloud amount of 7.9. The month with least cloud was May with a mean of 6.5. The mean values at the individual observation hours for the whole year show a steady decrease in cloud amount from 7h to 13h, followed by a slight increase to 15h and a further decrease to 21h. The number of occasions of cloudless sky during 1928 was only 19 in more than 2,000 observations; on no day in the whole year was the sky without cloud at all observation hours.

Visibility.—Two observations, one in a landwards direction, the other in a seawards direction, are made at each hour of observation. The objects used, together with their actual distances and bearings from the point of observation, the Observatory tower, are given in the tables on pages 288, 289. The position of the Observatory is such that a distinction between visibility landwards and seawards cannot be made when the range of visibility is less than 1,000 yards. Objects corresponding with the letters A to E have therefore been included in the table of landwards objects only. Kilkeaveragh Mountain is used as both a landwards and seawards object corresponding with J.

The observations of visibility in tables 427-438 refer to visibility in a landwards direction. The observations, when the range of visibility seawards differs from the range landwards, are shown in the following table:—

Date.	Hour.	Visibility Landwards	Visibility Seawards.	Date.	Hour.	Visibility Landwards	Visibility Seawards.
Jan. 23	18	I	J	July 5	21	k	H
" 31	15	J	k	" 9	7	J	k
" 31	21	J	k	" 9	9	J	k
Feb. 28	18	J	k	" 10	15	J	k
Mar. 21	7	J	k	" 10	18	J	k
April 2	18	J	k	" 11	18	h	I
" 5	7	k	l	Aug. 6	7	G	H
" 7	7	J	k	" 10	7	J	k
" 9	15	k	J	" 13	9	J	k
" 13	7	k	l	" 19	7	J	k
" 14	21	J	k	Sept. 4	9	h	I
" 24	18	J	k	" 11	7	J	k
" 27	7	J	k	Oct. 8	7	J	k
" 27	13	J	k	" 9	13	J	k
" 30	15	J	k	" 9	18	J	k
" 30	18	J	k	Nov. 10	15	h	k
May 4	18	l	m	" 25	7	h	I
" 20	7	l	m	" 30	7	h	I
" 21	7	J	l	Dec. 1	15	I	G
" 27	21	h	I	" 2	9	J	k
June 28	13	J	k	" 4	13	J	k
" 24	18	J	k	" 10	9	J	k
" 25	9	I	J	" 13	13	J	k
" 28	7	h	I	" 21	21	G	F

Entries of "l" and "m" for visibility in a landwards direction are made:—

(a) When Croaghmarhin Mountain (see table of seawards objects) is clearly visible and there is reason to believe that the range of visibility in a landwards direction is as good as, or nearly as good as, visibility seawards.

(b) When Croaghmarhin Mountain is invisible but there is reason to believe from the appearance of Drung Hill (see table of landwards objects) that the range of visibility landwards is greater than the range seawards and is sufficiently good to justify the entry made.

When the mountains used as objects at 3,500 metres and beyond are cloud capped the appropriate entries for the range of visibility are determined by the clearness or otherwise with which the lower parts of the mountains can be seen.

There is a complete absence of industrial activity within a radius of about a hundred miles from the Observatory; the observations are therefore not much affected by smoke pollution of the atmosphere.

LANDWARDS VISIBILITY OBJECTS AT VALENTIA OBSERVATORY.

Indication letter of object.	Standard distance of object.	Actual distance of object.	Bearing of object in degrees from N.	Description of object.
A	Metres. 25	Metres. 25	350°	Gate near workshop.
B	50	50	345°	North fence of enclosure.
C	100	100	125°	Hedge at S. end of vegetable garden.
D	200	200	330°	Notice board on beach.
E	500	500	360°	Hulk on shore.
F	1,000	1,100	50°	Parsonage.
G	2,000	1,910	55°	Wireless school.
Intermediate object	—	3,500	20°	Top of Castlequin Mountain.
h	4,000	—	—	No object available. (Top of Castlequin well visible).
I	7,000	7,600	40°	Top of Knocknadober Mountain.
J	10,000	10,000	220°	Kilkeaveragh Mountain.
Intermediate object	—	17,000	55°	Drung Hill.
k	20,000	—	—	No object available. (Drung Hill well visible).
l	30,000	—	—	No object available.
m	50,000	—	—	No object available.

SEAWARDS VISIBILITY OBJECTS AT VALENTIA OBSERVATORY.

Indication letter of object.	Standard distance of object.	Actual distance of object.	Bearing of object in degrees from N.	Description of object.
F	Metres. 1,000	Metres. 1,000	205°	Farmhouse on skyline.
G	2,000	2,200	265°	Laght Point.
H	4,000	3,760	280°	Black Rock.
I	7,000	6,500	250°	Ridge between two hills on Valentia.
J	10,000	10,000	220°	Kilkeaveragh mountain.
k	20,000	—	—	No object available.
Intermediate objects	— —	23,500 25,500	320° 325°	Mount Eagle. Croaghmarhin Mountain.
l	30,000	—	—	No object available. (Croaghmarhin well visible).
m	50,000	—	—	No object available. (Croaghmarhin exceptionally visible).

IDENTIFICATION NUMBERS OF INSTRUMENTS IN USE IN 1928.

Standard Fortin Barometer	M.O. 463	
Standard Dry Bulb Thermometer ..	M.O. 1701	Corrections Nil.
Standard Wet Bulb Thermometer ..	M.O. 1702	Corrections $\left\{ \begin{array}{l} 255^\circ - 266^\circ + \cdot 2^\circ \\ 267^\circ - 268^\circ + \cdot 1^\circ \\ 269^\circ - 272^\circ \text{ Nil.} \\ 273^\circ \text{ and above, } - \cdot 1^\circ \end{array} \right.$
Recording Beckley Raingauge	—	
Control Raingauge	M.O. 402	
Glass for Control Raingauge	M.O. 1662 and 1627	
Campbell Stokes Sunshine Recorder	M.O. 5	
Robinson Cup Anemograph	Beck 46	
Dines Tube Anemograph	—	
Grass Minimum Thermometer	M.O. 17684	Corrections $\left\{ \begin{array}{l} 2\cdot 0^\circ \text{ F. } - \cdot 2^\circ \text{ F.} \\ 12\cdot 0^\circ \text{ F. } - \cdot 1^\circ \text{ F.} \\ 32\cdot 0^\circ \text{ F. } \text{ Nil.} \\ 52\cdot 0^\circ \text{ F. } - \cdot 1^\circ \text{ F.} \\ 72\cdot 0^\circ \text{ F. } \text{ Nil.} \end{array} \right.$

All thermometer corrections are applied at the Observatory before tabulation.

TABLE A.

Diurnal Variation of Barometric Pressure, 1928. Fourier Coefficients.

Cahirciveen (Valentia Observatory), Longitude 10° 15' W.

Values of c_n, α_n in the series $\sum c_n \sin(15nt^\circ + \alpha_n)$, t being Local Mean Time reckoned in hours from midnight.

Month or Season.	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	mb.	°	mb.	°	mb.	°	mb.	°
January .. ..	.744	175	.364	143	.256	360	.085	250
February .. ..	.341	130	.326	132	.131	320	.058	125
March .. .. .	.183	121	.409	156	.043	30	.035	25
April .. .. .	.050	123	.374	146	.018	160	.044	20
May .. .. .	.137	139	.284	140	.078	155	.013	25
June .. .. .	.256	240	.261	147	.082	165	.012	130
July .. .. .	.280	168	.270	131	.083	145	.040	55
August .. .. .	.446	178	.275	146	.078	140	.036	0
September .. ..	.163	182	.361	147	.004	315	.054	0
October .. .. .	.369	291	.288	131	.062	60	.023	180
November .. ..	.782	167	.278	121	.194	340	.065	145
December .. ..	.093	183	.328	153	.157	15	.087	220
Arithmetic Mean ..	.320	..	.318	..	.099	..	.046	..
Year .. .. .	.242	174	.313	143	.042	5	.002	220
Winter .. .. .	.467	164	.318	139	.176	350	.051	195
Equinox .. .. .	.057	225	.353	149	.026	60	.028	15
Summer .. .. .	.230	184	.271	140	.078	155	.019	35

TABLE B.

Diurnal Variation of Temperature, 1928. Fourier Coefficients.

Cahirciveen (Valentia Observatory), Longitude 10° 15' W.

Values of c_n, α_n in the series $\sum c_n \sin(15nt^\circ + \alpha_n)$, t being Local Mean Time reckoned in hours from midnight.

Month or Season.	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	a.	°	a.	°	a.	°	a.	°
January .. .. .	.317	296	.223	50	.092	230	.031	140
February .. .. .	.593	238	.290	54	.115	255	.058	210
March	1.269	236	.406	59	.121	330	.058	200
April	1.787	239	.276	105	.197	45	.053	260
May	2.036	240	.223	112	.283	75	.026	285
June	1.739	242	.176	58	.266	70	.034	355
July	1.703	243	.106	64	.117	65	.013	35
August	2.053	238	.236	84	.180	45	.044	250
September	1.866	237	.434	65	.105	345	.082	240
October	1.009	236	.452	65	.120	300	.053	195
November .. ..	.587	255	.184	60	.095	265	.023	300
December .. ..	.521	235	.146	22	.096	240	.044	55
Arithmetic Mean ..	1.290	..	.263	..	.149	..	.043	..
Year	1.267	241	.236	70	.058	30	.021	240
Winter .. .. .	.472	251	.208	49	.096	245	.010	150
Equinox	1.477	237	.376	69	.103	355	.055	230
Summer	1.842	242	.163	93	.213	65	.020	300

NOTE.—The seasonal means are derived from the following grouping of months:—*Winter*: January, February, November and December; *Equinox*: March, April, September and October; *Summer*: May to August, inclusive.

TERRESTRIAL MAGNETISM.

Notes on the Magnetic Observations for the Year 1928.

Absolute observations of declination, horizontal force and inclination were made weekly at the Valentia Observatory during the year 1928. The instruments in use were the same as in previous years, namely, the Dover unifilar, No. 139, with collimator magnet 139A and mirror magnet 139C, and the Dover dip circle, No. 118. The mean times of observation were 10.22 for the declination, 11.42 for the horizontal force and 14.31 for the inclination, all according to Greenwich Mean Time. In the individual observations the greatest departure from the mean time in any element was 7 minutes. The deflection of the mirror magnet was measured for two distances of the collimator magnet, namely, 30cm. and 40cm. The complete deflection observation consisted of eight readings of the mirror magnet. The distribution constant, P, used for 1928 was computed from the mean deflections for 30cm. and 40cm. for the seven years 1921-1927 inclusive. The mean P so obtained was 7.55. The moment of the collimator magnet has decreased at the rate of about 1.5 unit per annum.

The values of the declination, horizontal force and inclination obtained in the absolute observations are given in detail in Table C. All the observations made are included in this table, but in Table D the mean monthly values are computed from only such of the absolute observations as were taken at times subsequently found, by reference to the Eskdalemuir magnetograph curves to be free from serious disturbance. Observations in Table C taken at disturbed times, and not, therefore, utilised for the mean values in Table D, are marked with an asterisk. The north, west and vertical components and the total force for each month and the year are computed from the corresponding mean values of the observed elements.

Westerly declination has diminished by 11'.5 as compared with 1927. From 1926 to 1927 the decrease was 11'.3 and in the previous 12 months 11'.6. The average annual decrease for the five years 1920-1925 was 11'.1, for the five years 1915-1920 it was 9'.2, and for the five years 1910-1915 it was 8'.2. During the five years ending in 1928 the average annual decrement is 11'.7 so that the rate of the eastward movement of the magnetic needle appears to have increased slowly.

Northerly inclination increased by 0'.1 from 1927 to 1928. The corresponding change for the preceding year was -0'.9, and for the year previous to that +0'.1. From 1910 to 1915 the average yearly decrease was 1'.0, from 1915 to 1920 0'.5, and from 1920 to 1925 1'.1. For the five years 1923-1928 the average change per year is -0'.4. Inclination, therefore, continues to diminish at a slow rate.

Up to 1920 the mean annual values of horizontal force had shown a steady decline from year to year. From 1921 to 1924 and from 1926 to 1927 the change was in the opposite direction, each year having a mean value higher than that of the preceding year. It would appear that the increase was temporary since a decline was in evidence from 1924 to 1926 and again from 1927 to 1928. The amount of annual change is shown in the following table:—

Period.	Annual Change.
1910-15	5γ decrease (mean value).
1915-20	6γ „ (mean value).
1920-21	8γ increase
1921-22	1γ „
1922-23	3γ „
1923-24	2γ „
1924-25	5γ decrease.
1925-26	14γ „
1926-27	2γ increase.
1927-28	11γ decrease.

Reference to the last column of Table D shows that the reversal of the annual change in the horizontal force from 1920 to 1924 and from 1926 to 1927 was not accompanied by any such reversal in the total force. From 1910 to 1915 the average yearly change in the total force was -49γ , from 1915 to 1920 it was -33γ and from 1920 to 1925 it was -32γ . From 1923 to 1928 the mean annual change is -29γ , so that the total force has continued to decrease, but at a rate which is apparently diminishing gradually. The individual changes from year to year as shown in the table are somewhat irregular, but this may be due in considerable measure to instrumental uncertainties. The total force is computed from the horizontal force and the inclination, using the formula $T = H \sec I$, so that an error of 0.1 in I would give an error approximately 4γ in T at Valentia. In addition, it is to be remembered that the secular change data for Valentia are obtained from absolute observations made at fixed hours at any of which the value obtained for an element may differ, by an amount which is not necessarily constant, from its true mean value for the day of observation. It is by no means improbable that owing to this and errors of observation, uncertainties to the extent of several tenths of a minute of arc may be introduced into the mean value of I for the year. For the average change over a series of years these possible errors are naturally much diminished and the average fall of 36γ per annum in the total force obtained from the values in Table D is probably a close approximation to the true change. This continued decrease in the total force indicates that the rise in the value of the horizontal force observed from 1920 to 1924 was not a true increase in the magnetic field but merely a component increase arising from the continued fall in the inclination, which becomes proportionally more effective in the horizontal component as the actual inclination angle itself becomes smaller. The magnetic field in the Valentia district continues to become less year by year, therefore, although without observations of inclination the opposite would have appeared to be the case in some recent years.

TABLE C.

Cahirciveen (Valentia Observatory). Absolute Magnetic Observations, 1928.

Latitude 51° 56'N. Longitude 10° 15'W.

Date.	Westerly Declination	Horizontal Force	Northerly Inclination	Date.	Westerly Declination	Horizontal Force	Northerly Inclination
January 7 ..	17 55.2	17846	67 59.1	July 6 ..	17 45.9	17826	67 58.3
" 14 ..	17 54.1	17852	67 59.2	" 13 ..	17 47.4	17802	68 0.6
" 20 ..	17 53.6	17851	67 59.9	" 20 ..	17 41.6	17812	67 59.4
" 27 ..	..	..	68 0.8*	" 27 ..	17 45.4	17832	67 59.4
" 28 ..	17 55.0	17806*	..	August 2 ..	17 45.9	17830	67 59.7
February 9 ..	17 53.1	17839	67 59.8	" 10 ..	17 46.7	17818	68 0.2
" 17 ..	17 52.1	17840	67 59.1	" 17 ..	17 46.4	17811	67 59.7
" 23 ..	17 53.2	17829	67 58.9	" 24 ..	17 46.8	17818	67 58.6
" 28 ..	17 51.6	17824	68 1.4	" 31 ..	17 45.2	17831	67 57.6
March 8 ..	17 49.2	..	..	September 7 ..	17 46.7	17809	67 59.7*
" 9 ..	..	17826	67 57.8	" 14 ..	17 45.4	17811	68 0.0
" 17 ..	17 49.2	17822	67 59.6	" 21 ..	17 44.9	17815	67 59.7
" 23 ..	17 52.5	17860	67 58.2	" 28 ..	17 45.6	17808	68 0.3
" 30 ..	17 50.7	17833	67 58.5	October 5 ..	17 45.2	17790	68 0.3
April 6 ..	17 47.4	17816	67 59.7	" 11 ..	17 43.1	17823	..
" 13 ..	17 50.4	17802	..	" 12 ..	..	..	68 0.6
" 14 ..	..	..	67 58.4	" 19 ..	17 45.5	..	68 3.3*
" 19 ..	17 48.2	17841	67 58.5	" 20 ..	..	17774	..
" 27 ..	17 48.4	17827	67 59.3	" 26 ..	17 46.8	17801	67 59.7
May 4 ..	17 46.8	17827	67 58.8	" 30 ..	17 46.7	17827	67 59.7
" 11 ..	17 49.4	17806	68 0.7*	November 2 ..	17 47.3	17806	68 1.7*
" 18 ..	17 50.9	17818	67 59.8	" 9 ..	17 45.2	17832	67 59.7
" 25 ..	17 47.0	17830	67 58.7	" 16 ..	..	..	68 0.1
June 1 ..	17 47.4	17827	67 58.7	" 17 ..	17 49.2*	17823*	..
" 8 ..	17 47.0	..	68 0.4*	" 23 ..	17 46.9	17837	68 0.0
" 15 ..	17 47.5	17838*	67 58.0	" 30 ..	17 44.7	17848	67 58.5
" 22 ..	17 48.8	17844*	68 1.6*	December 7 ..	17 47.3	17817	68 0.0
" 29 ..	17 46.7	17835	67 59.1	" 14 ..	17 45.2	17809*	68 0.2
				" 21 ..	17 43.7	17849	67 59.9
				" 28 ..	17 45.0	17847	67 58.3

* Disturbance at these times. Values not utilised in computing means given in Table D.

TABLE D.

Valentia Observatory, Cahirciveen.
Magnetic Data for the Year 1928.

1928.	Declination (West).	Inclination (North).	Horizon- tal Force.	North.	West.	Vertical.	Total.
	° ' "	° ' "	γ	γ	γ	γ	γ
January	17 54·5	67 59·4	17850	16985	5489	44158	47630
February	17 52·5	67 59·8	17833	16972	5474	44132	47598
March	17 50·4	67 58·5	17835	16977	5464	44088	47559
April	17 48·6	67 59·0	17821	16967	5451	44070	47537
May	17 48·5	67 59·1	17820	16966	5450	44074	47540
June	17 47·5	67 58·6	17831	16979	5448	44082	47552
July	17 45·1	67 59·4	17818	16970	5433	44081	47545
August	17 46·2	67 59·2	17822	16972	5439	44081	47548
September	17 45·7	68 0·0	17811	16962	5433	44084	47547
October	17 45·5	68 0·1	17803	16955	5430	44066	47526
November	17 46·0	67 59·6	17831	16981	5441	44117	47585
December	17 45·3	67 59·6	17838	16989	5440	44136	47605
Year, 1928	17 48·0	67 59·3	17826	16973	5449	44096	47563
Year, 1927	17 59·5	67 59·2	17837	16965	5509	44119	47588
Year, 1926	18 10·8	68 0·1	17835	16945	5565	44147	47612
Year, 1925	18 22·4	68 0·0	17849	16939	5626	44177	47646
Year, 1924	18 34·9	68 0·6	17854	16923	5689	44213	47682
Year, 1920	19 17·9	68 5·3	17840	16837	5896	44353	47806
Year, 1915	20 3·8	68 7·9*	17869	16785	6130	44519*	47972*
Year, 1910	20 44·6	68 13·0	17892	16732	6337	44771	48215

* Mean of 11 months only.

342. Cahirciveen (Valentia Observatory) : H_b (height of barometer cistern above M.S.L.) = 13.7 metres.

January, 1928.

Table with columns for Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Rows contain hourly pressure readings in millibars for January 1928.

343. Cahirciveen (Valentia Observatory) : H_b = 13.7 metres.

February, 1928.

Table with columns for Hour G.M.T., Station Level (1-29), and Mean (Station level/Sea level). Rows contain hourly pressure readings in millibars for February 1928.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

344. Cahirciveen (Valentia Observatory) : Hb (height of barometer cistern above M.S.L.) = 13.7 metres.

March, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Data includes pressure readings in millibars for each hour and station level, with mean values at the bottom.

345. Cahirciveen (Valentia Observatory) : Hb = 13.7 metres.

April, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Data includes pressure readings in millibars for each hour and station level, with mean values at the bottom.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

346. Cahirciveen (Valentia Observatory) : H_b (height of barometer cistern above M.S.L.) = 13.7 metres.

May, 1928.

Table with 25 columns (Hour GMT. 1-24, Mean) and 31 rows (Station Level 1-31). Includes mean values for station and sea level.

347. Cahirciveen (Valentia Observatory) : H_b = 13.7 metres.

June, 1928.

Table with 25 columns (Hour GMT. 1-24, Mean) and 31 rows (Station Level 1-31). Includes mean values for station and sea level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1001.7 mb. is written 001.7. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

348. Cahirciveen (Valentia Observatory) : H_b (height of barometer cistern above M.S.L.) = 13.7 metres.

July, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Includes sub-headers for Day, mb., and Mean (Station level/Sea level).

349. Cahirciveen (Valentia Observatory) : H_b = 13.7 metres.

August, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Includes sub-headers for mb., Mean (Station level/Sea level), and Hour G.M.T.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1001.7 mb. is written 001.7. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

350. Cahirciveen (Valentia Observatory) : H_b (height of barometer cistern above M.S.L.) = 13.7 metres.

September, 1928.

Table for Cahirciveen (Valentia Observatory) in September 1928. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station level/Sea level). Rows show hourly pressure readings in millibars.

351. Cahirciveen (Valentia Observatory) : H_b = 13.7 metres.

October, 1928.

Table for Cahirciveen (Valentia Observatory) in October 1928. Columns include Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Rows show hourly pressure readings in millibars.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

352. Cahirciveen (Valentia Observatory) : H_b (height of barometer cistern above M.S.L.) = 13.7 metres.

November, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Includes mean values for station level and sea level.

353. Cahirciveen (Valentia Observatory) : H_b = 13.7 metres.

December, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Station Level 1-31). Includes mean values for station level and sea level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

PRESSURE AT STATION LEVEL AND AT SEA LEVEL.
ANNUAL MEANS FROM HOURLY VALUES.

From readings in millibars at exact hours, Greenwich Mean Time.

354. Cahirciveen (Valentia Observatory) : H_b = 13·7 metres.

1928.

Table with 26 columns (Hour G.M.T. 1-24, Mean) and 4 rows (Station Level, Sea Level, etc.). Data includes pressure readings in millibars for each hour and monthly means.

PRESSURE AT STATION LEVEL: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

355. Cahirciveen (Valentia Observatory) : H_b = 13·7 metres.

1928.

Table with 26 columns (Month, Mean, Hour G.M.T. 1-24) and 13 rows (Jan. to Dec., Year). Data includes monthly means and diurnal inequalities in millibars.

ABSOLUTE EXTREMES OF PRESSURE AT STATION LEVEL FOR EACH DAY.

Maximum and minimum for the interval 0 h. to 24 h., Greenwich Mean Time.

356. Cahirciveen (Valentia Observatory) : H_b = 13·7 metres.

1928.

Table with 27 columns (Month, Jan. to Dec., Day) and 26 rows. Data includes daily maximum and minimum pressure readings in millibars for each day of the year.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005·6 mb. is written 005·6. This rule does not, however, apply to monthly means.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

357. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1·3 metres.

January, 1928.

Table with 25 columns (Hour G.M.T. 1-24) and 25 rows (Day 1-31). Columns include 'a.' (degrees absolute) and 'Mean'.

358. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1·3 metres.

February, 1928.

Table with 25 columns (Hour G.M.T. 1-24) and 25 rows (Day 1-29). Columns include 'a.' (degrees absolute) and 'Mean'.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275·0 degrees absolute is written 75·0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

359. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

March, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Contains temperature readings in degrees absolute.

360. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

April, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 30 rows (Day 1-30). Contains temperature readings in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

361. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

May, 1928.

Table with 24 columns (Hour G.M.T. 1-24) and 1 row (Mean). Rows represent days 1-31. Each cell contains a temperature reading in degrees absolute.

362. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

June, 1928.

Table with 24 columns (Hour G.M.T. 1-24) and 1 row (Mean). Rows represent days 1-30. Each cell contains a temperature reading in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

363. Cahirciveen (Valentia Observatory) : North Wall Screen : ht (height of thermometer bulbs above ground) = 1.3 metres.

July, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Each cell contains a temperature reading in degrees absolute.

364. Cahirciveen (Valentia Observatory) : North Wall Screen : ht = 1.3 metres.

August, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Each cell contains a temperature reading in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

365. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

September, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-30, Mean). Each cell contains a temperature reading in degrees absolute.

366. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

October, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31, Mean). Each cell contains a temperature reading in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

367. Cahirciveen (Valentia Observatory) : North Wall Screen : h₂ (height of thermometer bulbs above ground) = 1.3 metres.

November, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-30, Mean). Contains temperature readings in degrees absolute.

368. Cahirciveen (Valentia Observatory) : North Wall Screen : h₂ = 1.3 metres.

December, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-30, Mean). Contains temperature readings in degrees absolute.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

TEMPERATURE: ANNUAL MEANS OF HOURLY VALUES.

From readings in degrees absolute at exact hours, Greenwich Mean Time.

369. Cahirciveen (Valentia Observatory): North Wall Screen: ht = 1.3 metres.

1928.

Table with 24 columns (Hour 1 to 24) and 2 rows (Mean and a.). Values range from 82.92 to 84.99.

TEMPERATURE: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

370. Cahirciveen (Valentia Observatory): North Wall Screen: ht = 1.3 metres.

1928.

Table with 25 columns (Month, Mean, Hour 1-24) and 12 rows (Jan to Dec, Year). Values range from 281.27 to 286.53.

ABSOLUTE EXTREMES OF TEMPERATURE FOR EACH DAY.

Maximum and minimum for the interval 0 h. to 24 h., Greenwich Mean Time.

371. Cahirciveen (Valentia Observatory): North Wall Screen: ht = 1.3 metres.

1928.

Large table with 24 columns (Month, Day, Max, Min) and 31 rows (Days 1-31). Values range from 75.0 to 85.5.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Percentages at exact hours, Greenwich Mean Time.

372. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

January, 1928.

Table with 25 columns for hours (1-24) and Mean, and 2 columns for Vapour Pressure* and mb. Rows include Day (1-31), Mean, and Vapour Pressure*.

373. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

February, 1928.

Table with 25 columns for hours (1-24) and Mean, and 2 columns for Vapour Pressure* and mb. Rows include Day (1-29), Mean, and Vapour Pressure*.

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

374. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

March, 1928.

Table with 25 columns for hours (1-24), Mean, and Vapour Pressure. Rows show data for each hour of the day from 1 to 31 March 1928.

375. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

April, 1928.

Table with 25 columns for hours (1-24), Mean, and Vapour Pressure. Rows show data for each hour of the day from 1 to 30 April 1928.

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

378. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t (height of thermometer bulbs above ground) = 1.3 metres.

July, 1928.

Table for July 1928 showing relative humidity percentages and vapour pressure for each hour of the day. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure.*

379. Cahirciveen (Valentia Observatory) : North Wall Screen : h_t = 1.3 metres.

August, 1928.

Table for August 1928 showing relative humidity percentages and vapour pressure for each hour of the day. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure.*

* Computed from the mean temperatures and the mean relative humidities.

† Mean of the column.

‡ Mean of the row.

Percentages at exact hours, Greenwich Mean Time.

382. Cahirciveen (Valentia Observatory) : North Wall Screen : ht (height of thermometer bulbs above ground) = 1.3 metres.

November, 1928.

Table for November 1928 showing relative humidity percentages and vapour pressure for Cahirciveen. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure.*

383. Cahirciveen (Valentia Observatory) : North Wall Screen : ht = 1.3 metres.

December, 1928.

Table for December 1928 showing relative humidity percentages and vapour pressure for Cahirciveen. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure.*

* Computed from the mean temperatures and the mean relative humidities.

† Mean of column.

‡ Mean of row.

HUMIDITY: ANNUAL MEANS FROM HOURLY VALUES.

For exact hours, Greenwich Mean Time.

384. Cahirciveen (Valentia Observatory) : North Wall Screen : $h_t = 1.3$ metres.

1928.

Hour G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean
Relative Humidity ...	% 84.8	% 85.1	% 84.8	% 85.1	% 85.1	% 85.1	% 84.5	% 83.9	% 82.3	% 80.5	% 79.1	% 78.1	% 77.7	% 77.6	% 77.2	% 77.7	% 78.2	% 79.7	% 80.6	% 82.2	% 83.0	% 83.7	% 83.9	% 84.5	% 81.9
Vapour Pressure in millibars*	mb. 10.3	mb. 10.3	mb. 10.3	mb. 10.2	mb. 10.2	mb. 10.2	mb. 10.4	mb. 10.6	mb. 10.7	mb. 10.8	mb. 10.9	mb. 11.0	mb. 11.0	mb. 11.0	mb. 11.0	mb. 10.9	mb. 10.9	mb. 10.8	mb. 10.6	mb. 10.6	mb. 10.5	mb. 10.5	mb. 10.4	mb. 10.3	mb. 10.6

* Computed from the mean temperature and mean relative humidity.

RELATIVE HUMIDITY: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

385. Cahirciveen (Valentia Observatory) : North Wall Screen : $h_t = 1.3$ metres.

1928.

Month.	Mean.	Hour. G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
Jan.	82.9	%	+2.1	+0.7	-0.2	+1.0	+1.1	+1.9	+1.3	+2.4	+0.2	+0.3	-0.9	-1.8	-1.2	-2.0	-1.7	-0.8	-0.6	-0.1	-0.8	-0.6	-1.2	-0.1	-0.4	+1.2
Feb.	80.9	%	+0.5	+1.1	+2.0	+2.9	+1.2	+0.9	+2.9	+1.5	+1.3	-0.1	-1.4	-2.3	-2.6	-3.2	-4.3	-4.0	-0.7	-0.3	-1.2	+0.7	+1.0	+1.2	+1.3	+1.5
Mar.	80.1	%	+2.9	+3.4	+2.5	+2.6	+2.0	+2.4	+3.6	+2.8	+1.8	-0.4	-3.0	-5.5	-5.5	-4.1	-4.8	-3.8	-4.3	-2.9	-0.9	+1.0	+2.0	+1.5	+3.4	+3.6
April	78.2	%	+3.7	+4.9	+4.8	+4.1	+4.6	+4.1	+2.0	+1.8	-3.0	-5.2	-5.3	-6.2	-6.4	-5.0	-5.8	-3.9	-3.5	-2.1	-0.3	+1.9	+3.3	+3.6	+3.7	+4.2
May	76.4	%	+5.1	+5.4	+5.6	+6.8	+6.8	+5.2	+4.5	+2.3	-0.1	-3.4	-4.0	-5.5	-5.3	-5.9	-5.8	-7.2	-7.7	-4.9	-2.3	+0.3	+1.0	+2.4	+2.6	+4.3
June	79.3	%	+4.1	+5.3	+5.9	+6.4	+6.3	+5.5	+2.4	-0.2	-2.1	-2.4	-3.5	-3.9	-4.2	-4.2	-5.0	-5.5	-5.9	-4.2	-3.2	-1.4	+0.9	+3.3	+2.7	+2.9
July	85.4	%	+3.8	+4.6	+4.1	+2.9	+4.0	+4.0	+2.3	+0.8	-0.6	-1.8	-3.3	-4.6	-4.3	-5.2	-5.7	-4.1	-4.3	-3.2	-1.5	+0.7	+1.4	+3.2	+3.1	+3.5
Aug.	85.2	%	+4.3	+4.6	+4.3	+4.3	+5.1	+4.8	+4.5	+1.1	-0.5	-3.1	-4.3	-4.6	-5.2	-5.8	-5.2	-5.4	-6.3	-3.8	-1.9	+0.7	+2.2	+3.3	+3.5	+3.5
Sept.	82.4	%	+3.6	+3.5	+4.4	+3.2	+3.5	+4.0	+4.2	+4.8	+2.9	-0.3	-2.2	-3.8	-6.4	-7.1	-7.6	-6.4	-4.8	-2.8	-1.0	+0.2	+0.6	+1.3	+2.3	+3.8
Oct.	84.1	%	+0.6	+0.6	-0.4	+1.5	+1.6	+2.5	+1.5	+3.8	+3.1	+0.2	-0.3	-2.3	-3.6	-3.1	-3.2	-2.7	-2.3	-1.4	0.0	+1.1	+1.6	+1.0	-0.3	+0.5
Nov.	82.8	%	+2.0	+2.4	+2.7	+2.6	+2.7	+2.8	+2.4	+2.4	+2.0	-0.2	-3.7	-3.4	-4.3	-4.8	-3.8	-3.1	-1.6	-0.5	-0.5	-0.2	+0.5	+0.3	+1.6	+1.9
Dec.	84.5	%	+1.7	+2.1	+1.8	+0.7	+0.2	+1.1	+0.5	+0.6	+0.7	+0.3	-0.1	-0.7	-0.9	-1.1	-3.3	-2.7	-1.6	-0.4	-0.9	-0.6	-0.1	+0.7	+1.0	+1.0
Year	81.9	%	+2.9	+3.2	+2.9	+3.3	+3.3	+3.3	+2.7	+2.0	+0.5	-1.3	-2.7	-3.7	-4.1	-4.3	-4.7	-4.1	-3.6	-2.1	-1.2	+0.3	+1.1	+1.8	+2.1	+2.7

RAINFALL: ANNUAL TOTALS OF HOURLY VALUES.

Amounts, in millimetres; durations in hours for periods of sixty minutes between the exact hours, Greenwich Mean Time.

386. Cahirciveen (Valentia Observatory) : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 9.1 metres + 0.5 metre.

1928.

Hour G.M.T.	0 to 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	21 to 22.	22 to 23.	23 to 24.	0 to 24.
Amount	mm. 73.5	mm. 103.8	mm. 92.4	mm. 97.3	mm. 110.0	mm. 109.6	mm. 94.1	mm. 85.1	mm. 69.8	mm. 46.8	mm. 56.1	mm. 53.1	mm. 73.5	mm. 73.8	mm. 70.4	mm. 59.1	mm. 52.0	mm. 46.1	mm. 63.5	mm. 65.3	mm. 83.1	mm. 58.9	mm. 77.1	mm. 67.3	mm. 1781.7
Duration	hr. 50.4	hr. 56.4	hr. 49.7	hr. 56.6	hr. 61.5	hr. 57.8	hr. 63.8	hr. 52.9	hr. 42.1	hr. 25.0	hr. 33.5	hr. 34.6	hr. 38.3	hr. 33.9	hr. 36.3	hr. 34.1	hr. 33.0	hr. 36.9	hr. 40.7	hr. 43.6	hr. 47.9	hr. 47.4	hr. 48.0	hr. 47.9	hr. 1072.3

387. Cahirciveen (Valentia Observatory).

NOTES ON RAINFALL.

1928

Notable Falls of the Year.—The heaviest rain of the year was experienced on August 6th when 21.2 mm. fell between 3 h. 55 m. and 7 h. The day's total rainfall was 44.3 mm. this being also the highest total rainfall for any day of the year. The highest hour's fall of the year occurred on October 10th when 16.7 mm. fell between 20 h. and 21 h.

Dry Periods.—The only dry period of any note was the 12 days May 5th to 16th, when no measurable rain fell

Wet Periods.—The thirty-one days of January and the first eighteen days of February were part of a period of 151 days beginning on December 30th, 1927, on all of which rain was measured; on none of these days was the measured amount less than 0.4 mm. There was a period of 31 days from March 12th to April 11th on only one of which no rain was recorded. During the 41 days, November 10th to December 31st, there were only three days without rain. During the 35 days, September 27th to October 31st, there were only two days without rain.

Amounts in millimetres for periods of sixty minutes between the exact hours, Greenwich Mean Time.

392. Cahirciveen (Valentia Observatory) : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 9.1 metres + 0.5 metre. May, 1928.

Table for Cahirciveen (Valentia Observatory) in May 1928. Columns: Hour G.M.T., 0-1 to 24, Duration 0-24. Rows: Day 1-31, Sum, Total Duration. Data includes rainfall in mm and duration in hr.

393. Cahirciveen (Valentia Observatory) : H_r = 9.1 metres + 0.5 metre.

June, 1928.

Table for Cahirciveen (Valentia Observatory) in June 1928. Columns: Hour G.M.T., 0-1 to 24, Duration 0-24. Rows: Day 1-30, Sum, Total Duration, G.M.T. Data includes rainfall in mm and duration in hr.

RAINFALL.

Amounts in millimetres for periods of sixty minutes between the exact hours, Greenwich Mean Time.

396. Cahirciveen (Valentia Observatory) : Hr (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + hr (height of receiving surface above ground) = 9.1 metres + 0.5 metre. September, 1928.

Table with 25 columns for hourly intervals (0-1 to 24-0) and a final column for Duration (0-24). Rows include Hour G.M.T., Day, rainfall in mm., and Total Duration in hr. Summary row shows total rainfall of 119.2 mm and duration of 68.0 hr.

397. Cahirciveen (Valentia Observatory) : Hr = 9.1 metres + 0.5 metre.

October, 1928.

Table with 25 columns for hourly intervals (0-1 to 24-0) and a final column for Duration (0-24). Rows include Hour G.M.T., Day, rainfall in mm., and Total Duration in hr. Summary row shows total rainfall of 228.4 mm and duration of 121.4 hr.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

400. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12.8 metres.

January, 1928.

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.	
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%	
1	—	—	—	—	—
2	—	—	—	—	—	3.0	39
3	—	—	—	—	—	4.9	63	
4	—	—	—	—	—
5	—	—	—	—	—
6	—	—	—	—	—	0.2	3	
7	—	—	—	—	—
8	—	—	—	—	—	0.4	5	
9	—	—	—	—	—	3.9	49	
10	—	—	—	—	—	2.6	32	
11	—	—	—	—	—	4.5	56	
12	—	—	—	—	—
13	—	—	—	—	—	3.9	48	
14	—	—	—	—	—	4.5	55	
15	—	—	—	—	—	0.1	1	
16	—	—	—	—	—	0.9	11	
17	—	—	—	—	—	0.6	7	
18	—	—	—	—	—
19	—	—	—	—	—	2.6	31	
20	—	—	—	—	—	3.8	45	
21	—	—	—	—	—
22	—	—	—	—	—	3.5	41	
23	—	—	—	—	—
24	—	—	—	—	—	2.1	24	
25	—	—	—	—	—	0.4	5	
26	—	—	—	—	—	1.1	13	
27	—	—	—	—	—	1.9	22	
28	—	—	—	—	—	4.3	49	
29	—	—	—	—	—	3.5	40	
30	—	—	—	—	—	1.5	17	
31	—	—	—	—	—	0.2	2	
Sum.	—	—	—	—	...	0.3	5.4	9.6	10.7	11.5	9.5	6.4	1.0	...	...	...	...	...	54.4	—
Mean	—	—	—	—01	.17	.31	.35	.37	.31	.21	.03	...	...	...	...	...	1.75	21	

401. Cahirciveen (Valentia Observatory) : h_s = 12.8 metres.

February, 1928.

Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%	
1	—	—	—	—
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	—	—	—	—
15	—	—	—	—
16	—	—	—	—
17	—	—	—	—
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	—	—	—	—
22	—	—	—	—
23	—	—	—	—
24	—	—	—	—
25	—	—	—	—
26	—	—	—	—
27	—	—	—	—
28	—	—	—	—
29	—	—	—	—
Sum.	—	—	—	...	0.7	6.5	8.5	9.3	8.9	9.1	9.9	6.8	3.6	1.5	...	...	...	...	...	64.8	—
Mean	—	—	—02	.22	.29	.32	.31	.31	.34	.23	.12	.05	...	...	...	...	...	...	...
Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.	

* Record lost owing to sphere having been displaced.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

402. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12.8 metres.

March, 1928.

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%
1	—	—	—	5	...	7	1.0	1.0	1.0	1.0	1.0	.9	...	—	—	—	7.1	66
2	—	—	—	...	4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.1	—	—	—	9.5	88
3	—	—	—	2	1.0	.7	1.0	1.0	1.0	.1	.1	...	—	—	—	—	5.1	47
4	—	—	—	...	4	1.0	1.0	1.0	1.0	.5	.4	1.0	1.0	1.0	.1	—	—	—	8.4	76
5	—	—	—3	1.0	.9	.3	.4	.5	...	—	—	—	3.4	31
6	—	—	—	—	—	—
7	—	—	—1	.1	...	...	...	...	...	—	—	—	0.2	2
8	—	—	—	—	—	—
9	—	—	—	—	—	—
10	—	—	—	...	5	1.0	1.0	.9	.5	.1	...	.5	.6	...	...	—	—	—	5.1	45
11	—	—	—1	...	.1	1.0	1.0	1.0	1.0	1.0	1.0	.1	—	—	—	6.3	55
12	—	—	—	...	5	1.0	1.0	1.0	1.0	1.0	1.0	.7	.3	.1	...	—	—	—	7.6	66
13	—	—	—	...	3	.8	1.0	1.0	1.0	1.0	1.0	1.0	.3	...	—	—	—	—	7.4	64
14	—	—	—1	...	...	...	.1	...	—	—	—	0.2	2
15	—	—	—	5	.8	.9	.7	...	...	...	...	...	...	—	—	—	2.9	25
16	—	—	—	—	—	—
17	—	—	—2	...	—	—	—	0.2	2
18	—	—	—1	.2	.8	1.0	.7	.3	...	...	...	...	—	—	—	3.1	26
19	—	—	—	—	—	—
20	—	—	—1	...	—	—	—	0.1	1
21	—	—3	1.0	1.0	.9	.6	1.0	.6	...	—	—	5.4	45
22	—	—	1	1.0	.4	.7	.8	.2	...	...	...	...	...	...	—	—	3.2	26
23	—	—1	...	.1	.1	...	...	...	...	...	...	...	—	—	0.3	3
24	—	—2	.7	.1	.3	.6	...	...	.2	...	—	—	2.1	17
25	—	—	5	.7	.8	1.0	.9	1.0	1.0	1.0	.5	.4	.3	...	—	—	8.1	65
26	—	—1	...	...	...	...	...	...	...	...	...	...	—	—	0.1	1
27	—	—5	.8	.2	.2	.7	.5	.5	.6	.9	.2	...	—	—	5.1	41
28	—	—	3	.3	.3	.3	.4	.9	.7	.4	.5	...	...	...	—	—	3.8	30
29	—	—1	.9	.4	.1	...	—	—	1.5	12
30	—	—	1	.6	.5	.4	.4	...	...	...	...	...	...	...	—	—	2.0	16
31	—	—1	.3	.9	1.0	.9	1.0	.6	1.0	.5	.3	...	—	—	6.6	52
Sum.	—	—	...	0.2	4.6	8.8	10.4	12.1	13.8	12.9	11.8	10.8	9.4	8.0	2.0	...	—	—	104.8	—
Mean	—	—01	.15	.28	.34	.39	.45	.42	.38	.35	.30	.26	.06	...	—	—	3.38	28

403. Cahirciveen (Valentia Observatory) : h_s = 12.8 metres.

April, 1928.

1	—	—	...	1	1.0	1.0	.3	.7	.9	.3	.8	1.0	...	...	...	...	—	—	6.1	47
2	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	—	—	...	...
3	—	—	...	...	...	.2	.4	.3	.8	.8	1.0	.6	.7	.4	.2	.4	...	—	5.8	45
4	—	—	...	3	.6	.5	.1	.8	.5	.7	1.0	.8	.6	1.0	.4	.1	...	—	7.4	57
5	—	—	...	...	.6	.6	.3	.1	...	.5	...	.1	.3	.5	.3	.1	...	—	3.4	26
6	—	—	...	...	.9	.8	.8	.8	.4	.4	...	...	...	...	...	...	—	—	4.1	31
7	—	—	...	...	...	...	...	...	...	...	...	...	.2	.8	...	...	—	—	1.0	8
8	—	—	...	...	...	...	...	.2	.1	...	...	...	...	...	...	...	—	—	0.4	3
9	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	—	—	...	...
10	—	—	...	...	...	.1	.1	.1	.6	.6	.9	1.0	1.0	.1	.2	...	—	—	4.7	35
11	—	—	...	...	...	...	...	...	...	...	.2	...	.6	.6	...	...	—	—	1.4	10
12	—	—	...	...	...	.5	.8	.1	.6	.4	.4	.8	.6	.7	.4	.3	...	—	5.6	41
13	—	—	...	...	...	...	...	...	...	...	...	.1	...	...	.2	.1	...	—	0.4	3
14	—	—	...	3	.9	.2	...	...	...	...	...	...	...	...	...	...	—	—	1.4	10
15	—	—	...	...	...	...	...	.9	.9	.3	.5	.4	1.0	.4	...	...	—	—	4.4	32
16	—	—	...	...	3	.8	.3	.7	.5	.7	.7	.3	.6	.1	.3	...	—	—	5.3	38
17	—	—	3	1.0	1.0	1.0	1.0	.3	.8	.6	1.0	1.0	1.0	.6	1.0	.6	...	—	11.2	80
18	—	—	...	...	...	.1	.1	...	.2	.4	.2	.2	.9	.8	.4	...	—	—	3.5	25
19	—	—	4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.7	1.0	.8	.5	.4	...	—	—	10.8	77
20	—	...	5	1.0	1.0	1.0	.9	.9	1.0	.4	...	.8	1.0	.8	.3	.2	...	—	9.8	70
21	—	...	5	1.0	1.0	1.0	1.0	1.0	.6	.7	.9	.7	.7	1.0	1.0	.8	...	—	11.9	84
22	—	...	...	3	.8	.3	...	.5	...	.1	.1	...	...	...	...	...	—	—	2.1	15
23	—	...	...	...	...	...	...	...	...	.1	.2	.1	...	...	...	...	—	—	0.4	3
24	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	—	—	...	...
25	—	...	...	...	4	1.0	1.0	1.0	.9	.5	.7	1.0	.4	...	...	...	—	—	6.9	48
26	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	—	—	...	...
27	—	...	...	...	...	...	...	...	...	.5	.2	.5	.8	1.0	.7	...	—	—	3.7	25
28	—	...	...	7	.7	1.0	.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.4	...	—	11.7	80
29	—	...	...	...	...	...	...	...	...	.2	.1	...	1.0	.9	.9	.1	...	—	3.2	22
30	—	...	...	...	...	.1	...	...	...	...	...	...	...	...	...	...	—	—	0.1	1
Sum.	—	...	1.7	5.9	10.9	12.1	9.9	11.5	11.2	9.7	11.2	11.1	12.3	11.6	8.9	4.2	...	—	132.2	—
Mean	—	...	.06	.20	.36	.40	.33	.38	.37	.32	.37	.37	.41	.39	.30	.14	...	—	4.41	32
Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

404. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12.8 metres.

May, 1928.

Table for Cahirciveen (Valentia Observatory) in May 1928. Columns include Hour L.A.T. (3 to 4 to 21), Total for Day, and Per cent. of Possible. Rows list days 1 through 31, with a final Sum and Mean row.

405. Cahirciveen (Valentia Observatory) : h_s = 12.8 metres.

June, 1928.

Table for Cahirciveen (Valentia Observatory) in June 1928. Columns include Hour L.A.T. (3 to 4 to 21), Total for Day, and Per cent. of Possible. Rows list days 1 through 30, with a final Sum and Mean row.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

406. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12·8 metres. July, 1928.

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Percent. of Possible.	
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%	
1	0·3	2
2	...	...	·8	1·0	1·0	1·0	1·0	1·0	1·0	·9	·6	·6	·9	1·0	1·0	1·0	·4	...	13·2	80
3	...	...	·7	·8	·5	1·0	1·0	1·0	1·0	·5	·4	1·0	1·0	1·0	1·0	1·0	·1	...	12·0	72
4
5	·1	·2	·3	·1	...	·6	·3	·5	·8	·8	·3	...	4·0	24
6	...	...	...	...	·1	...	...	·1	·1	·3	·5	·2	·7	·8	·3	·1	...	...	3·2	19
7	...	...	...	·6	·9	·4	...	...	...	...	·2	...	...	...	...	...	...	...	2·1	13
8	...	...	...	...	...	·6	·2	·1	...	...	·3	·3	1·0	1·0	1·0	·2	·4	...	4·1	25
9	...	...	...	·4	...	...	...	·1	·3	·2	·5	·8	1·0	1·0	1·0	1·0	·3	...	6·6	40
10
11
12	...	...	...	...	...	...	...	·2	1·0	·8	·7	·6	·1	·1	·3	·1	·1	...	4·0	25
13	...	...	...	...	...	...	...	...	...	...	·2	·3	...	...	...	...	...	...	0·5	3
14	...	...	...	...	...	·9	·6	·6	·9	1·0	1·0	1·0	1·0	1·0	1·0	·2	...	...	9·2	57
15	...	...	·1	...	...	...	...	...	...	...	·3	·1	...	·4	...	...	...	...	0·9	6
16	...	·7	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·7	...	15·4	95	
17	...	·2	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·4	...	14·6	90	
18	—	...	...	...	...	·2	·9	·8	·5	·8	1·0	·9	·4	·5	·2	·6	...	...	6·8	42
19	—	...	...	...	...	·5	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·3	...	8·2	51
20	—	...	...	...	...	·6	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·4	...	11·0	69
21	—	...	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·5	...	13·5	84	
22	—
23	—
24	—
25	—	...	...	...	...	...	...	...	...	...	·1	...	...	...	...	...	...	...	0·1	1
26	—
27	—	...	...	...	...	...	...	...	...	·2	...	...	...	...	...	...	...	...	1·7	7
28	—	...	...	·4	·5	·3	1·0	·9	·4	·3	·6	1·0	·7	1·0	1·0	·4	...	...	8·5	54
29	—	...	...	·5	1·0	·9	·9	·8	·2	·7	·4	·1	...	·6	·9	·1	·1	...	7·2	46
30	—	...	...	...	...	...	...	...	·1	·2	...	...	...	...	·1	·7	...	...	1·1	7
31	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	·2	...	...	0·2	1
Sum.	...	0·9	4·6	6·7	7·0	8·8	11·1	11·0	10·9	11·0	11·5	12·5	11·8	14·0	12·9	10·4	3·3	...	148·4	—	
Mean.	...	·03	·15	·22	·23	·28	·36	·35	·35	·35	·37	·40	·38	·45	·42	·34	·11	...	4·79	30	

407. Cahirciveen (Valentia Observatory) : h_s = 12·8 metres.

August, 1928.

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Percent. of Possible.	
1	—	·4	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·9	...	...	14·3	93
2	—	·2	1·0	1·0	1·0	·8	...	·3	·4	...	...	...	...	...	...	...	...	...	4·8	31
3	—	...	·3	·1	·2	·8	·8	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·1	...	11·3	74	
4	—	...	·5	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·9	·2	...	13·6	89	
5	—	...	...	·2	·7	·8	·8	·9	·9	·7	·7	·1	...	...	...	...	...	...	5·8	38
6	—
7	—	...	...	...	...	...	·1	...	·1	1·0	·9	1·0	1·0	1·0	1·0	·9	...	...	6·9	46
8	—	...	·4	·4	·2	·4	·9	·8	·9	1·0	1·0	1·0	1·0	1·0	1·0	·2	...	...	10·2	68
9	—	...	...	...	·1	·1	...	...	...	·1	·4	·9	·9	·8	·2	...	...	...	3·5	23
10	—	...	...	...	...	...	·5	·3	...	·7	·2	...	...	...	...	...	...	...	1·7	11
11	—	...	...	·1	·1	...	...	...	...	...	...	...	·1	1·0	·8	·2	...	...	2·3	15
12	—	...	·5	·4	·9	·4	...	·8	·4	·2	·2	...	...	...	...	...	...	...	4·8	32
13	—	...	...	...	...	...	·5	·5	·3	·5	...	...	·1	...	·1	...	...	...	2·0	14
14	—	...	·2	·7	·2	·4	·1	·5	·2	·5	·6	·6	·9	·6	·9	·1	...	...	6·5	44
15	—	...	·2	·6	...	·5	·8	·2	·2	·7	...	·6	·9	·2	·2	...	...	...	5·1	35
16	—	...	...	...	...	...	...	1·0	1·0	·7	·7	1·0	1·0	·9	·2	...	...	...	6·5	44
17	—	...	...	·3	·8	·3	·4	·8	·4	...	·7	·7	...	...	...	...	...	...	4·2	29
18	—	...	...	...	·3	·6	·5	·5	·3	·2	·3	·1	...	...	...	...	...	...	2·8	19
19	—	...	...	...	...	...	·1	·3	·7	·5	·7	1·0	·9	·5	·5	·1	...	...	5·3	37
20	—	...	...	·9	·3	·6	·9	1·0	1·0	1·0	1·0	1·0	1·0	·7	...	...	...	...	9·4	66
21	—	...	...	·2	·2	·8	·8	·9	·4	·1	...	·1	...	...	...	...	...	...	3·5	24
22	—	...	...	...	...	...	...	...	...	...	...	·5	·1	·7	·3	...	...	...	1·7	12
23	—	...	...	...	·4	·7	·5	·2	·6	·1	·7	·9	·7	·4	·2	...	...	...	5·4	38
24	—	...	...	...	...	·6	·8	·2	1·0	1·0	1·0	1·0	·6	·1	...	...	...	...	6·3	45
25	—	...	...	...	...	·1	·3	...	·4	1·0	·6	·1	...	·5	·4	...	...	...	4·2	30
26	—	...	...	...	...	...	...	...	·2	·6	·7	·9	·6	·9	·3	...	...	...	4·2	30
27	—	...	...	·2	1·0	1·0	1·0	1·0	·9	1·0	1·0	1·0	1·0	1·0	1·0	·3	...	...	10·4	75
28	—	...	·2	1·0	1·0	1·0	1·0	1·0	·6	1·0	1·0	1·0	1·0	1·0	1·0	·6	...	...	9·7	70
29	—	...	...	·7	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·6	...	...	12·3	89
30	—	...	·2	·8	·4	·3	·4	·5	·6	1·0	1·0	1·0	1·0	1·0	1·0	...	...	...	6·6	48
31	—	...	...	...	...	·3	1·0	·7	1·0	1·0	1·0	1·0	1·0	1·0	1·0	·7	...	...	9·7	71
Sum.	—	0·6	4·5	9·6	10·8	13·5	15·6	16·0	16·3	18·2	18·1	18·7	17·8	14·8	13·7	6·5	0·3	...	195·0	—	
Mean.	—	·02	·14	·31	·35	·44	·50	·52	·53	·59	·58	·60	·57	·48	·44	·21	·01	...	6·29	43	
Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Percent. of Possible.	

For periods of sixty minutes, between the exact hours of Local Apparent Time.

408. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12·8 metres. September, 1928.

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Percent. of Possible.	
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%
1	—	—	...	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	11·5	85
2	—	—	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	3·5	26
3	—	—
4	—	—
5	—	—	5·1	38
6	—	—	3·1	23
7	—	—	1·6	12
8	—	—	1·5	11
9	—	—	6·6	50
10	—	—	2·3	18
11	—	—	6·1	47
12	—	—	3·4	26
13	—	—	1·2	9
14	—	—	5·4	42
15	—	—	10·3	81
16	—	—
17	—	—	0·3	2
18	—	—	8·9	71
19	—	—	3·9	31
20	—	—	1·0	8
21	—	—	2·6	21
22	—	—	7·9	65
23	—	—	7·8	64
24	—	—	9·3	77
25	—	—	10·1	84
26	—	—	10·4	87
27	—	—	2·8	24
28	—	—
29	—	—	4·7	40
30	—	—	10·1	87
Sum.	—	—	...	3·9	10·3	12·8	11·5	13·8	14·9	13·8	13·4	14·8	12·0	13·1	6·8	0·3	—	—	—	141·4	—
Mean.	—	—	...	·13	·34	·43	·38	·46	·50	·46	·45	·49	·40	·44	·23	·01	—	—	—	4·71	37

409. Cahirciveen (Valentia Observatory) : h_s = 12·8 metres.

October, 1928.

Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%		
1	—	—	8·9	77
2	—	—	7·5	65
3	—	—	9·5	83
4	—	—
5	—	—	2·8	25
6	—	—	3·6	32
7	—	—
8	—	—	2·4	21
9	—	—	0·2	2
10	—	—
11	—	—	3·1	28
12	—	—	5·2	48
13	—	—	6·6	61
14	—	—	2·4	22
15	—	—
16	—	—
17	—	—	3·4	32
18	—	—	3·5	33
19	—	—
20	—	—	(2·5)*	(24)
21	—	—	1·7	17
22	—	—	7·9	77
23	—	—	3·1	31
24	—	—	2·5	25
25	—	—	5·2	52
26	—	—	1·7	17
27	—	—	3·4	34
28	—	—
29	—	—	1·9	19
30	—	—
31	—	—	2·8	29
Sum.	—	—	...	2·0	6·8	9·0	11·1	13·5	13·5	13·1	10·5	8·0	4·2	0·1	—	—	—	—	—	—	—	91·8	28
Mean.	—	—	...	·06	·22	·29	·36	·44	·44	·42	·34	·26	·14	·00	—	—	—	—	—	—	—	2·96	28
Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Percent. of Possible.			

* Record lost owing to sphere having been blown out of position.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

410. Cahirciveen (Valentia Observatory) : h_s (height of recorder above ground) = 12·8 metres. **November, 1928.**

Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%
1	—	—	—	—8	1·0	1·0	1·0	1·0	1·0	1·0	1·0	.4	—	—	—	—	8·2	85
2	—	—	—	—8	1·0	1·0	.8	...	...	...	...	...	—	—	—	—	3·6	38
3	—	—	—	—7	1·0	1·0	.3	.9	1·0	1·0	.3	—	—	—	—	6·2	65
4	—	—	—	—5	1·0	.9	.7	.9	.3	—	—	—	—	4·3	46
5	—	—	—	—5	1·0	.9	.5	...	...	...	...	...	—	—	—	—	2·9	31
6	—	—	—	—	—	—	—	—
7	—	—	—	—2	1·0	.6	.4	.2	.7	.2	.2	...	—	—	—	—	3·5	38
8	—	—	—	—5	1·0	1·0	1·0	1·0	1·0	1·0	.9	...	—	—	—	—	7·4	80
9	—	—	—	—5	.8	...	.2	.3	...	...	...	...	—	—	—	—	1·9	21
10	—	—	—	—	—	—	—	—
11	—	—	—	—	—	—	—	—
12	—	—	—	—1	...	...	...	—	—	—	—	0·1	1
13	—	—	—	—2	1·0	.8	1·0	.8	.9	1·0	.5	...	—	—	—	—	6·2	70
14	—	—	—	—	—	—	—	—
15	—	—	—	—1	.6	.7	.5	...	...	...	...	—	—	—	—	1·9	22
16	—	—	—	—	—	—	—	—
17	—	—	—	—8	.7	.8	1·0	.8	.4	.4	...	—	—	—	—	4·9	56
18	—	—	—	—	—	—	—	—
19	—	—	—	—6	1·0	.4	...	...	—	—	—	—	2·0	23
20	—	—	—	—1	...	...	...	...	...	...	—	—	—	—	0·1	1
21	—	—	—	—	—	—	—	—
22	—	—	—	—1	...	...	...	—	—	—	—	0·1	1
23	—	—	—	—2	.6	.6	.2	...	...	...	—	—	—	—	1·6	19
24	—	—	—	—	—	—	—	—
25	—	—	—	—1	...	...	—	—	—	—	0·1	1
26	—	—	—	—	—	—	—	—
27	—	—	—	—2	.2	.3	.6	.7	.4	...	...	—	—	—	—	2·4	29
28	—	—	—	—1	...	...	...	—	—	—	—	0·1	1
29	—	—	—	—	—	—	—	—
30	—	—	—	—1	...	.1	...	...	...	...	—	—	—	—	0·2	2
Sum.	—	—	—	—	...	3·5	8·6	8·4	8·9	7·7	8·5	6·2	4·9	1·0	—	—	—	—	57·7	—
Mean	—	—	—	—12	.29	.28	.30	.26	.28	.21	.16	.03	—	—	—	—	1·92	22

411. Cahirciveen (Valentia Observatory) : h_s = 12·8 metres. **December and Year, 1928.**

	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%	
1	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·2	2
2	—	—	—	—	...	...	...	.2	...	...	...	...	...	...	...	...	...	...	...	...	...
3	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	—	—	—	—	...	...	...	.3	1·0	.8	...	...	...	...	...	...	...	...	...	2·1	26
6	—	—	—	—	...	...	.1	.5	.6	1·0	.8	.3	...	...	...	...	...	...	...	3·3	42
7	—	—	—	—	...	...	...	...	.1	.2	.9	...	...	...	...	...	...	...	...	1·2	15
8	—	—	—	—	...	...	.1	.2	...	.1	...	.2	...	...	...	...	...	...	...	0·6	8
9	—	—	—	—	...	...	...	...	...	.2	.1	...	...	...	...	...	...	...	...	0·3	4
10	—	—	—	—	...	...	...	.3	.2	.8	.4	.4	...	...	...	...	...	...	...	2·1	27
11	—	—	—	—	...	...	...	.1	...	...	.1	...	...	...	...	...	...	...	...	0·2	3
12	—	—	—	—	...	...	.6	1·0	.5	...	.3	...	...	...	...	...	...	...	...	2·4	31
13	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	—	—	—	—	...	...	...	...	...	.3	.2	...	...	...	...	...	...	...	...	0·5	7
17	—	—	—	—	...	...	.8	1·0	1·0	1·0	.3	.5	...	...	...	...	...	...	...	4·6	60
18	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	—	—	—	—	...	...	...	...	...	.1	...	...	...	...	...	...	...	...	...	0·2	3
20	—	—	—	—	...	...	.1	.2	...	...	...	...	...	...	...	...	...	...	...	0·3	4
21	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	—	—	—	—	...	...	.2	.2	.2	1·0	.9	.5	...	...	...	...	...	...	...	3·0	39
23	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	—	—	—	—	...	...	...	...	...	...	.3	.3	.2	...	...	...	...	...	...	0·8	10
25	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	—	—	—	—	...	...	.3	.6	...	...	...	...	...	...	...	...	...	...	...	0·9	12
27	—	—	—	—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	—	—	—	—	...	...	...	...	...	...	.2	.1	...	...	...	...	...	...	...	0·3	4
29	—	—	—	—	...	...	.1	...	.2	.7	.6	.2	...	...	...	...	...	...	...	1·8	23
30	—	—	—	—	...	...	.2	.1	.3	.2	.2	.2	...	...	...	...	...	...	...	1·2	16
31	—	—	—	—	...	...	.4	1·0	1·0	1·0	1·0	1·0	.4	...	...	...	...	...	...	5·8	75
Sum.	—	—	—	—	...	...	2·9	5·7	5·2	7·6	6·4	3·6	0·4	—	—	—	—	—	...	31·8	—
Mean	—	—	—	—	...	...	.09	.18	.17	.25	.21	.12	.01	—	—	—	—	—	...	1·03	13
Annual Total	...	6·0	24·2	47·1	70·9	96·6	121·5	139·5	144·7	144·4	144·7	132·1	111·8	99·4	72·2	41·7	9·5	...	1406·3	—	
Annual Mean	...	.02	.07	.13	.19	.26	.33	.38	.40	.39	.40	.36	.31	.27	.20	.11	.03	...	3·84	31	
Hour. L.A.T.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Total for Day.	Per cent. of Possible.	

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + ha (height of anemograph above ground) = 17 metres + 13 metres.

January, 1928.

Table for January 1928 showing wind direction and speed in m/s for days 13 to 24, with columns for each day and sub-columns for different time intervals.

February, 1928.

Table for February 1928 showing wind direction and speed in m/s for days 13 to 24, with columns for each day and sub-columns for different time intervals.

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 17 metres + 13 metres.

March, 1928.

Table with columns for days 13-24, Mean, and Day. Each day has two columns of wind speed data (m/s) and one column for wind direction (°). Values range from 0 to 350 m/s.

April, 1928.

Table with columns for days 13-24, Mean, and Day. Each day has two columns of wind speed data (m/s) and one column for wind direction (°). Values range from 0 to 350 m/s.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°): Speed in metres per second.

416. Cahirciveen (Valentia Observatory) :

H_a (height of anemograph above M.S.L.) = Height of ground above

Dines Anemograph from Jan., 1926.

Table with 12 columns (1-11, Noon) and 2 rows per day (Day, G.M.T.). Columns contain wind direction and speed in degrees and m/s.

417. Cahirciveen (Valentia Observatory) : H_a = 17 metres + 13 metres.

Table with 12 columns (1-11, Noon) and 2 rows per day (Day, G.M.T.). Columns contain wind direction and speed in degrees and m/s.

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 17 metres + 13 metres.

May, 1928.

Table with columns for days 13-24, Mean, and Day. Each day has two columns of wind speed data (m/s) and one column of wind direction data (degrees).

June, 1928.

Table with columns for days 13-24, Mean, and Day. Each day has two columns of wind speed data (m/s) and one column of wind direction data (degrees).

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°): Speed in metres per second.

418. Cahirciveen (Valentia Observatory) :

H_a (height of anemograph above M.S.L.) = Height of ground above

Dines Anemograph from Jan., 1926.

Table with 13 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s for two different anemograph heights.

419. Cahirciveen (Valentia Observatory) : H_a = 17 metres + 13 metres.

Table with 13 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed data in m/s for two different anemograph heights.

Averages for periods of sixty minutes centred at exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 17 metres + 13 metres.

July, 1928.

Table with columns 13-24, Mean, Day. Rows contain wind speed data in m/s for various heights and stations.

August, 1928.

Table with columns 13-24, Mean, Day. Rows contain wind speed data in m/s for various heights and stations for August 1928.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°) : Speed in metres per second.

420. Cahirciveen (Valentia Observatory) : Dines Anemograph from Jan., 1926.

H_a (height of anemograph above M.S.L.)=Height of ground above

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-30, Mean). Each cell contains two values: direction (degrees) and speed (m/s).

421. Cahirciveen (Valentia Observatory) : H_a = 17 metres + 13 metres.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-30, Mean). Each cell contains two values: direction (degrees) and speed (m/s).

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 17 metres + 13 metres.

September, 1928.

Table with columns for days 13-24, Mean, and Day. Each column contains wind speed data in m/s. Includes a summary row at the bottom with values like 6.7, 6.5, 6.0, 5.6, 5.4, 5.1, 5.2, 5.3, 5.1, 4.9, 5.6.

October, 1928.

Table with columns for days 13-24, Mean, and Day. Each column contains wind speed data in m/s. Includes a summary row at the bottom with values like 8.0, 7.9, 8.1, 7.9, 7.9, 7.6, 7.9, 8.2, 8.0, 7.9, 7.7, 7.5.

Averages for periods of sixty minutes centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 17 metres + 13 metres.

November, 1928.

Table with columns for days 13-24, Mean, and Day. Each day column contains two columns of wind speed data (m/s) at different heights. The 'Day' column shows the day of the month.

December and Year, 1928.

Table with columns for days 27-31, Mean, and Day. Each day column contains two columns of wind speed data (m/s) at different heights. The 'Day' column shows the day of the month.

424. Cahirciveen (Valentia Observatory) : H_a = 17 metres + 13 metres.

1928.

Month	Jan.		Feb.		Mar.		April		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
Day.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.
	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.
1	26	11 30	25	0 55	6	15 15	10	11 10	8	10 20	15	19 35	19	10 30	9	18 30	8	13 25	6	12 20	18	3 35	7	0 45
2	20	13 35	25	11 15	7	10 30	17	19 05	6	21 50	16	14 20	11	13 05	5	13 40	12	12 25	7	23 35	11	0 30	10	23 25
3	16	3 45	27	0 20	7	13 30	20	13 40	13	22 35	13	10 35	8	14 25	7	17 10	15	12 00	17	16 10	13	7 20	9	23 30
4	17	20 25	21	11 00	8	3 25	15	1 05	13	2 20	16	22 15	18	12 40	6	15 25	15	13 25	22	10 50	6	12 20	13	21 05
5	19	23 55	21	16 50	7	18 15	16	0 20	10	14 50	13	15 30	14	0 30	15	22 10	15	12 45	13	12 10	10	16 45	13	0 55
6	20	0 05	17	21 25	13	12 05	13	23 30	9	22 20	11	7 10	16	3 50	20	6 10	18	22 55	18	23 35	23	5 00	23	13 35
7	18	15 10	20	1 15	12	22 15	20	9 30	14	6 45	10	17 20	17	17 00	21	4 20	22	11 00	20	4 05	13	9 10	15	5 05
8	23	2 45	23	18 55	12	2 35	24	17 15	12	9 25	16	23 15	11	0 15	13	20 40	10	22 10	21	23 30	4	21 05	11	12 40
9	20	6 35	16	0 40	16	10 40	20	15 15	7	0 00	15	23 25	12	9 55	12	13 20	17	17 40	19	12 20	16	23 25	23	22 30
10	27	6 25	37	16 50	10	10 10	18	5 30	8	21 10	16	1 30	19	11 15	9	8 40	16	0 30	20	16 45	16	4 55	15	4 35
11	16	23 35	22	0 25	21	8 50	7	17 40	8	12 30	10	12 40	14	3 05	17	12 15	9	16 30	14	11 45	18	10 10	11	15 50
12	25	5 50	15	11 25	13	4 35	7	14 50	11	16 25	19	15 15	9	13 45	21	20 25	12	23 50	9	11 45	23	10 15	10	1 55
13	20	3 10	23	5 00	19	22 40	19	12 00	10	19 00	13	10 55	12	15 15	19	9 00	15	13 30	18	24 00	14	11 25	20	22 05
14	19	14 45	20	24 00	23	9 50	25	22 30	12	16 45	21	4 45	13	12 05	12	12 05	15	7 00	20	4 25	23	16 25	23	3 00
15	22	12 35	22	3 05	14	22 40	25	0 40	15	23 35	13	5 45	9	5 45	13	11 30	7	16 50	12	20 25	16	2 30	20	23 15
16	16	2 10	29	18 30	21	4 10	13	16 20	21	11 30	10	15 25	11	14 20	8	8 20	*	*	13	18 35	23	5 55	18	0 45
17	16	21 00	27	1 40	20	5 15	9	14 05	22	17 25	9	15 40	9	15 50	15	14 25	17	12 40	16	17 35	14	10 00	16	23 00
18	21	23 10	11	12 45	28	21 25	13	15 05	16	1 35	13	12 30	8	11 15	15	13 05	7	15 55	20	17 15	26	23 00	16	10 15
19	22	23 50	14	8 40	25	15 10	9	17 05	13	11 55	11	3 20	7	16 10	10	17 25	9	14 45	40	20 10	21	19 40	14	20 55
20	21	23 15	16	24 00	12	4 55	8	11 05	15	17 25	17	22 35	6	1 10	10	18 30	7	4 05	24	0 05	18	1 55	12	12 50
21	27	5 00	15	2 20	12	10 40	10	15 05	12	14 05	18	4 50	12	14 00	9	15 15	7	19 00	17	15 25	19	9 40	7	0 35
22	15	23 25	13	23 40	15	17 25	16	19 15	10	12 25	17	15 35	7	9 20	15	7 45	10	23 30	10	1 15	24	8 50	13	8 00
23	19	3 20	11	23 35	14	20 15	18	22 50	10	14 45	11	13 25	7	16 20	16	21 30	8	10 25	23	20 50	31	21 25	17	23 40
24	31	11 40	17	13 50	11	22 55	23	2 55	14	23 15	15	23 45	10	23 50	17	3 20	8	14 45	26	10 55	29	0 05	20	2 40
25	29	18 50	13	23 15	13	10 50	10	10 35	22	14 25	23	4 55	10	5 10	14	14 20	11	13 50	17	20 30	21	9 25	27	19 40
26	27	3 20	15	15 40	16	16 35	16	17 25	19	6 30	26	3 45	11	13 25	11	2 55	11	12 35	27	23 20	23	21 10	12	9 35
27	23	1 15	18	23 55	17	23 10	18	20 50	14	9 00	13	22 50	11	12 55	9	2 45	17	23 40	28	0 35	22	14 20	15	13 45
28	17	7 55	27	16 10	22	3 00	18	2 30	5	13 40	23	20 45	13	14 05	12	16 30	21	19 10	11	0 20	11	1 35	23	15 00
29	18	8 45	8	15 40	23	12 15	9	22 40	7	16 20	17	21 50	11	1 05	10	3 45	22	4 55	18	20 00	11	18 45	19	0 40
30	15	10 40	—	—	24	16 15	14	13 10	7	14 45	15	4 00	11	11 45	7	12 35	13	10 15	25	10 40	8	1 30	17	6 45
31	25	23 40	—	—	20	5 45	—	—	13	19 05	—	—	11	9 15	7	13 55	—	—	27	6 15	—	—	18	18 10

DISTRIBUTION OF WIND SPEED: EXTREME VELOCITIES AS RECORDED BY THE DINES TUBE ANEMOGRAPH.

425. Cahirciveen (Valentia Observatory) : H_a = 17 metres + 13 metres.

1928.

Month.	DISTRIBUTION OF WIND.								EXTREME VELOCITIES.					
	More than 17.2 m/s.		10.8 to 17.1 m/s.		5.5 to 10.7 m/s.	1.6 to 5.4 m/s.	0 to 1.5 m/s.	No Record.	Highest Hourly Wind.			Highest Gust.		
	Dates of Occurrence.	Duration.	No. of Days.	Duration.	Duration.	Duration.	Duration.	Duration.	Veer from N.	Speed.	Mid. Time.	Speed.	Time.	
Jan. ...	10th, 24th, 25th	hr. 3	20	hr. 198	hr. 387	hr. 137	hr. 19	hr. 0	° 210	m/s. 18	day. 25	hour. 13	m/s. 31	day. h. m. 24 11 40
Feb. ...	10th	4	15	146	378	134	34	0	260	22	10	17	37	10 16 50
Mar. ...	—	—	10	95	323	246	80	0	160	16	19	15	28	18 21 25
Apr. ...	—	—	10	46	353	262	59	0	100	17	15	3	25	15 0 40
May ...	—	—	5	44	274	302	124	0	350	15	17	14	22	17 17 25
June ...	26th	1	8	63	375	252	29	0	345	17	26	4	26	26 3 45
July ...	—	—	3	11	319	351	63	0	200	14	1	11	19	10 11 15
Aug. ...	—	—	3	20	308	334	82	0	195	13	7	4	21	12 20 25
Sept. ...	—	—	6	41	313	292	74	0	60	15	29	5	22	7 11 0
Oct. ...	19th, 26th	6	16	133	391	173	41	0	240	24	19	21	38	19 20 10
Nov. ...	22nd, 23rd	8	15	122	298	217	75	0	230	20	23	7	31	23 21 25
Dec. ...	25th	1	9	47	327	264	105	0	220	17	25	19	27	25 19 40
Year ...	10 days	23	120	966	4,046	2,964	785	0	240	24	Oct. 19	21	38	Oct. 19 20 10

MINIMUM TEMPERATURE "ON THE GRASS" DURING THE INTERVAL 18H. TO 7H. G.M.T.

Readings in degrees absolute.

426. Cahirciveen (Valentia Observatory).

1928.

Month.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Day.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	
1	72.9	75.2	72.4	73.9	77.8	85.6	83.2	74.6	76.8	78.1	78.7	82.4	
2	78.8	75.6	71.6	76.0	78.8	85.0	82.8	76.3	81.2	74.6	73.5	82.4	
3	75.9	73.6	72.4	80.3	81.9	81.8	78.8	78.6	84.1	78.6	71.8	78.6	
4	75.8	77.8	74.9	75.3	84.4	82.7	79.8	77.2	86.9	82.9	72.1	76.9	
5	77.4	77.1	73.2	73.6	79.7	84.4	85.8	78.8	84.7	83.3	72.3	79.7	
6	80.4	76.1	77.7	74.0	78.1	84.2	83.9	88.0	81.0	81.7	79.9	79.8	
7	79.8	80.1	81.6	79.7	79.2	83.7	84.3	87.6	85.8	86.4	80.3	74.6	
8	78.4	82.6	81.3	78.5	77.1	82.8	86.3	83.6	79.7	84.2	72.3	70.6	
9	77.4	78.1	77.0	80.3	77.4	81.8	82.3	83.6	80.1	82.8	73.1	73.0	
10	77.9	78.1	70.3	81.4	73.6	79.7	81.9	86.1	84.9	80.2	82.5	76.0	
11	75.9	75.7	74.6	77.1	76.7	75.0	87.1	85.7	82.6	80.8	84.2	71.8	
12	75.5	76.0	69.9	75.4	82.6	76.4	86.6	81.7	83.4	76.9	84.1	74.1	
13	78.4	81.6	66.8	78.7	81.3	85.0	84.1	83.1	82.5	74.9	80.2	77.1	
14	77.4	80.2	75.4	78.7	78.3	82.0	86.2	81.3	86.4	83.3	76.8	78.8	
15	76.3	83.7	79.7	78.5	80.8	77.4	86.7	81.9	74.7	80.8	81.6	79.0	
16	78.6	83.3	82.1	74.2	80.9	76.9	80.9	81.4	75.9	83.9	79.0	83.1	
17	78.8	76.3	81.9	69.8	80.2	74.6	78.7	82.0	86.4	81.9	74.7	74.6	
18	80.2	78.0	77.9	76.5	79.7	82.8	80.9	85.2	79.9	83.5	79.2	78.6	
19	75.7	76.8	81.1	71.4	79.7	84.2	85.4	85.8	79.0	79.9	82.6	74.4	
20	82.4	81.3	79.3	74.1	75.8	76.9	85.1	80.2	78.4	78.6	78.6	77.7	
21	80.2	81.8	78.7	71.7	77.8	84.1	80.3	81.2	82.6	78.6	83.6	79.2	
22	76.2	75.4	72.3	70.4	78.8	83.6	87.1	83.8	75.8	75.7	81.9	79.6	
23	77.0	78.1	78.2	82.1	78.6	83.7	86.9	83.2	78.7	76.9	80.4	73.5	
24	78.2	79.1	77.3	82.7	78.6	79.2	88.8	84.8	74.3	81.3	78.0	83.6	
25	75.0	81.4	77.8	78.5	80.8	83.1	88.7	84.1	83.2	80.2	81.5	76.3	
26	74.9	81.0	75.8	79.9	84.8	83.4	88.2	82.6	84.2	81.1	78.8	77.9	
27	75.9	81.1	77.4	80.1	85.0	83.0	86.9	81.6	79.5	81.8	77.6	74.7	
28	79.6	80.8	75.2	78.2	78.5	84.2	80.3	79.5	81.7	81.4	76.8	80.1	
29	76.9	78.8	78.3	75.9	75.8	81.6	82.2	80.3	81.3	79.8	80.9	74.8	
30	75.1	—	77.6	80.2	76.9	81.4	80.8	79.3	74.1	79.8	81.9	73.1	
31	73.7	—	77.1	—	84.2	—	81.7	80.3	—	79.7	—	73.7	
Mean	...	77.3	78.6	76.3	76.9	79.3	81.7	84.0	82.0	81.0	80.2	78.6	77.1

NOTES:—(1) The initial 2 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.
 (2) The minimum refers to the interval from 18h. the previous day to 7h. on the day to which it is entered.
 (3) Annual Mean 279.4.

427. Cahirciveen (Valentia Observatory).

Table for January 1928 at Cahirciveen (Valentia Observatory). Columns include Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day. Rows are numbered 1 to 31.

428. Cahirciveen (Valentia Observatory).

Table for February 1928 at Cahirciveen (Valentia Observatory). Columns include Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day. Rows are numbered 1 to 29.

NOTE.—Visibility in these tables refers to a landwards direction; visibility seawards, when it differs from visibility landwards, is given on p. 287.

429. Cahirciveen (Valentia Observatory).

Table for March 1928 at Cahirciveen (Valentia Observatory). Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

430. Cahirciveen (Valentia Observatory).

Table for April 1928 at Cahirciveen (Valentia Observatory). Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

NOTE.—Visibility in these tables refers to a landwards direction; visibility seawards, when it differs from visibility landwards, is given on p. 287.

31. Cahirciveen (Valentia Observatory).

Table with columns for Cloud Forms, Cloud Amount (All Forms), Visibility, Precipitation, and Remarks on the Weather of the Day. Rows are numbered 1 through 10, with sub-rows for each hour (7h, 13h, 18h).

32. Cahirciveen (Valentia Observatory).

Table with columns for Cloud Forms, Cloud Amount (All Forms), Visibility, Precipitation, and Remarks on the Weather of the Day. Rows are numbered 1 through 10, with sub-rows for each hour (7h, 13h, 18h).

NOTE.—Visibility in these tables refers to a landwards direction; visibility seawards, when it differs from visibility landwards, is given on p. 287.

433. Cahirciveen (Valentia Observatory).

Table for 433. Cahirciveen (Valentia Observatory) showing weather data for July 192. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

434. Cahirciveen (Valentia Observatory).

August, 1928

Table for 434. Cahirciveen (Valentia Observatory) showing weather data for August 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

NOTE.—Visibility in these tables refers to a landwards direction; visibility seawards, when it differs from visibility landwards, is given on p. 287.

35. Cahirciveen (Valentia Observatory).

Table for September 1928 at Cahirciveen. Columns include Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows are numbered 1 through 30.

36. Cahirciveen (Valentia Observatory).

Table for October 1928 at Cahirciveen. Columns include Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows are numbered 1 through 30.

NOTE.—Visibility in these tables refers to a landwards direction ; visibility seawards, when it differs from visibility landwards, is given on p. 287.

DIARY OF CLOUD, VISIBILITY AND WEATHER.

437. Cahirciveen (Valentia Observatory).

November, 192.

Table for 437. Cahirciveen (Valentia Observatory) covering November 192. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (All Forms) (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

438. Cahirciveen (Valentia Observatory).

December, 1928.

Table for 438. Cahirciveen (Valentia Observatory) covering December 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (All Forms) (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

NOTE.—Visibility in these tables refers to a landwards direction; visibility seawards when it differs from visibility landwards is given as a separate entry.

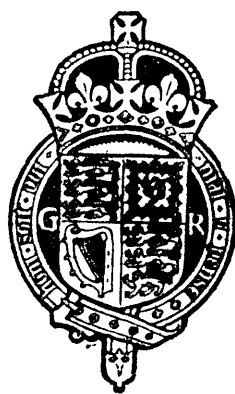
Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

RICHMOND (KEW OBSERVATORY)

Published by the authority of the
METEOROLOGICAL COMMITTEE



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1930

RICHMOND (KEW OBSERVATORY).

Latitude	51° 28' N.
Longitude	0° 19' W.
G.M.T. of Local Mean Noon	12h 1m.

Heights in Metres above Sea Level.

Barometer	10·4
Raingauge Site	5·5
Robinson Cup Anemograph	25
Dines Tube Anemograph	25

Heights in Metres above Ground.

Thermometer Bulbs	3·0
Sunshine Recorder	13·3
Robinson Cup Anemograph	20
Dines Tube Anemograph	20
Beckley Rain-gauge Rim	0·53

INTRODUCTION.

The Observatory was built in 1769 as the private observatory of King George III. Since 1842 it has been devoted to physics and meteorology. The meteorological records are continuous from 1854. The Observatory is in the Old Deer Park, Richmond (Surrey), about 10 miles (16 km.) to the west of the City of London. The Observatory stands on a low artificial mound whose level is about 1½ metres higher than that of the surrounding park. The river Thames is distant about 300 metres on the north and west. Kew Gardens, which are extensively wooded, lie to the east-north-east, the nearest point of the Gardens being about 600 metres away. The town of Richmond, to the south-east, is about 1,100 metres distant. On the east side of the Park is the main road from Richmond to Kew; on the south side the railway from Richmond to Twickenham. The Old Deer Park is mainly open pasture. Round the Observatory a golf course has been laid out. Another open area partly wooded, Syon Park, lies to the north-north-east across the river. Richmond Park is about 1½ miles (2½ km.) to the south-east. General views of the Observatory building and the exposure lawn are to be found in this volume. The photographs were taken in 1925 but the only change (before the end of 1928) which need be noted is the substitution of other experimental screens for the small marine screens which were being tested in 1925. For the early history of the Observatory reference may be made to papers by S. P. Rigaud (The Observatory 1882, p. 279), R. H. Scott (Royal Society's Proceedings, Vol. 39 (1885), pp. 37-86), C. Chree (The Record of the Royal Society, 1897), and R. S. Whipple (Proceedings of the Optical Convention, 1926).

METEOROLOGY.

The elements dealt with in the following tables are: atmospheric pressure, temperature, humidity, rainfall, sunshine, solar radiation, wind speed and direction, earth temperature, minimum temperature on the grass, level of underground water; there is also a diary of cloud and weather.

For brief descriptions of most of the instruments from which values of the above elements have been obtained and of the methods of tabulating the records, reference should be made to the General Introduction. The following notes supplement, where necessary, the information contained therein.

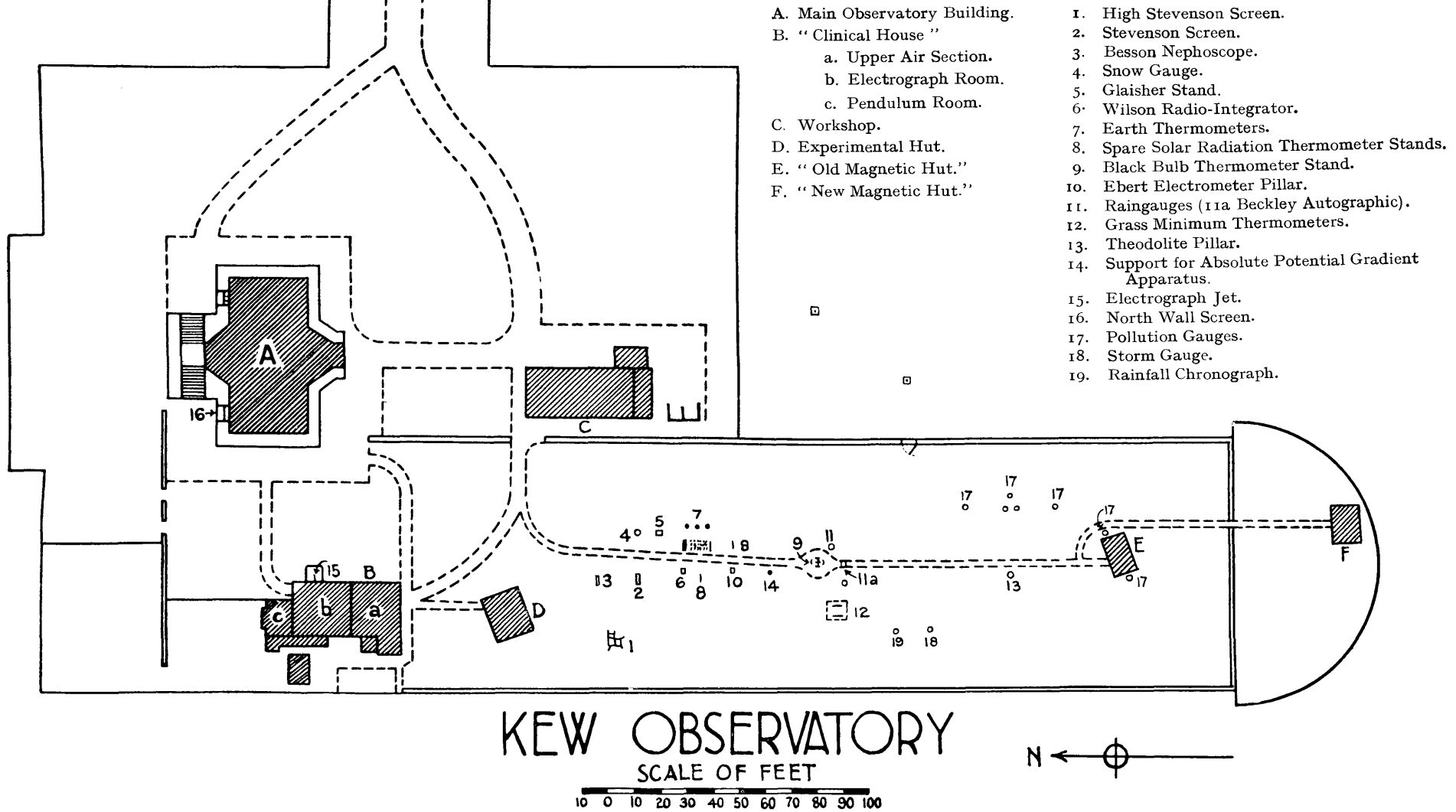


FIG. 17. SITE PLAN, 1928.

KEW OBSERVATORY.

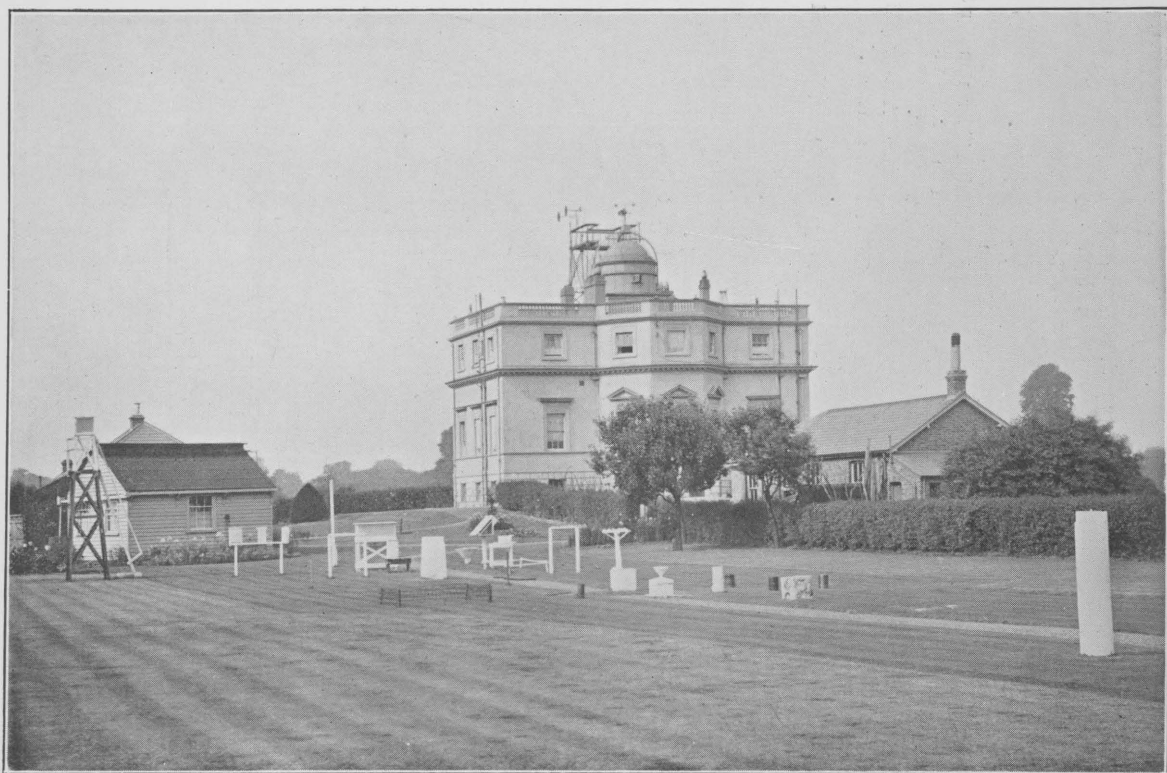


FIG. 18. GENERAL VIEW FROM SOUTH-WEST, 1925.



FIG. 19. VIEW FROM NORTH SHOWING NORTH WALL SCREEN, 1925.

[To face p. 351.

Notes on Instruments.

Pressure.—The barograph* is mounted in the basement of the Observatory, where the diurnal variation of temperature is very small. The normal position of the instrument has been in the north room occupied by the magnetographs. When the magnetographs were removed and the preparations for the installation of the seismographs were commenced, the barograph was placed in the photographic dark-room (June 16th, 1925). The instrument remained in that position until May 21st, 1928, when it was restored to its original site and electric lighting installed. The barograph magnifies barometric changes in the ratio 1.553:1, i.e., the change of ordinate equivalent to a change of 1 mm. in the height of the barometer is 1.553 mm. "Residual corrections," obtained from the control observations taken daily with the Newman barometer at 9h, 15h and 21h, are applied to the hourly measurements. The same correction is applied to all the readings on the same photographic sheet, i.e., generally for forty-eight hours. The individual entries published for the hours of the control observations may differ by .3 mb. from those observations. The Newman barometer is compared from time to time with the two large mercury barometers, which were set up in 1855 and 1860 respectively and are still recognised as standards. A zero correction is based on these comparisons. The correction + 0.2 mb. (+ .006 mercury inch) which has been applied for many years, remained in use during 1928. Comparisons are made on the assumption that the value of the acceleration due to gravity is $g=981.199$ cm./sec². This is the value given by pendulum observations.† The departure from the value given for the latitude by Helmert's formula is insignificant. On occasions when a loss of trace occurred, the missing hourly values were derived from the Dines Float Barograph.* There were 54 hours in the year for which this was necessary.

Temperature and Humidity.—The thermograph is mounted in the West Room on the first floor of the Observatory, the thermometer bulbs being exposed in the screen attached to the north wall of the building. This screen has single louvres and the bottom is open. There is an additional flat louvred screen which shields the main screen from direct sunshine when the sun is in the West and not too low. The height of the bottom of the bulbs of the recording thermometers above the bottom of the sides of the screen containing them is 30 cm. in summer, 33 cm. in winter. The height of the bulbs above the top of the artificial mound on which the Observatory stands is approximately 3 metres; the height above the lawn where the raingauge is situated is approximately 5 metres. The scale values of the photographic records are not identical for the dry- and wet-bulb curves. For the dry-bulb, tube No. 4 II. was in use and the scale value was 1 mm. = 0.3336a; for the wet-bulb, the old Falmouth wet-bulb tube (no number) was in use and the scale value was 1 mm. = 0.290a.

The control thermometers, which were graduated and mounted by Messrs. Negretti & Zambra in 1915, had been made and filled many years before and were therefore well seasoned. The National Physical Laboratory certificates dated 1916 give corrections to the nearest 0.05° C., the largest being 0.10°. The thermometers are tested each January in ice. According to tests made in January, 1928, there was no indication of any change of zero. The water for the wet-bulb thermometers used to be supplied from a small open tank inside the screen and it was customary to fill the tank to overflowing several times each day. In November, 1925, a tank was fitted outside the screen. A tube leads from this tank to two cups from which

* For descriptions of this instrument see *Observatories' Year Book*, 1923, p. 94, and *R. Met. Soc. Q. J.*, 1929, Vol. 55 (229), p. 37.

† A comparison between the values of "g" at Cambridge and Kew Observatory was made during the year 1925 by Sir G. Lenox Conyngham with the assistance of Mr. G. Manley. A similar comparison between Potsdam and Cambridge was made by Prof. Meinesz earlier in the year. These observations are in accord with those made at Kew and Potsdam by Putnam in 1900, from which the value stated above was derived. The value for Potsdam, $g=981.274$, based on the observations of Kühnen and Furtwängler, is adopted as the standard of reference.

wicks are taken to the wet-bulbs. A further improvement was made in July, 1926, when a large inverted bottle was set up over the tank. Water flowing from this bottle keeps the level constant in the tank and the cups. The height of the apparatus is adjusted so that water drips slowly from the wet-bulbs. A bottleful of water lasts about a week. It is found that the bottle survives severe frost.

Control eye-readings of the standard thermometers are taken daily at 9h, 15h and 21h. Residual corrections obtained from the control observations are applied to the hourly measurements of the curves. The same correction is applied to all the readings on the same photographic sheet, i.e., generally for forty-eight hours. The individual entries published for the hours of the control observations may differ by 0.3a from these observations. The larger departures refer to occasions when temperature is oscillating or changing rapidly.

In cases of loss of the dry-bulb record owing to the failure of the electric light or any other cause the readings of a thermograph in a second North-wall screen are adopted. There were 45 hours in the year for which this was necessary.

When the wet-bulb trace is missing or defective, the missing values are derived from the dry-bulb trace and the records of a hair hygograph. The same procedure is always adopted when the wet-bulb reading is below 273a. 289 hours had thus to be dealt with during the year. Humidity was determined from the dry- and wet-bulb readings by the procedure described in the General Introduction to this Volume.*

It may be noted that during 1928, as in previous years, the temperatures published for Kew Observatory in the Daily Weather Report and elsewhere also refer to the North-wall screen. For the daily and weekly reports the readings of maximum and minimum thermometers exposed in that screen are utilised.

Rainfall.—As from January, 1921, the standard raingauge for the Observatory has been an 8-inch gauge with the deep "Snowdon" funnel. The site is level and protected from wind, principally by hedges about 1½m. high and distant 11 metres to East and 17 metres to West. The readings of this standard gauge are at 7h and 18h. The hourly readings of the Beckley gauge are adjusted to give totals in agreement with the standard gauge.

Sunshine.—The sunshine recorder is mounted on the south parapet of the roof. The same frame has been in use since 1880 and it is believed that the ball has not been changed. The ball is now somewhat yellow. The exposure is satisfactory. The greatest elevations of the sky line in the azimuths in which the sun can rise and set are 1° and 3° respectively.

Solar Radiation.—Observations are made with an Ångström pyrliometer, which measures the intensity of the direct radiation received from the sun by a surface which is normal to the sun's rays. The observations are made within half an hour of noon on all days except Sundays, provided that the sun is visible and not too much obscured by cloud, fog or thick haze. The conditions of the intervening atmosphere are indicated in Tables 497-508 in the column "sky." The amount of radiation is given in milliwatts per square centimetre in the column headed "total." For conversion to the unit more ordinarily employed abroad, the following relation may be used, 1mw. per sq. cm. = 0.01435 gramme-calorie per sq. cm. per minute. The vertical component, i.e., the direct radiation received per square centimetre of a horizontal surface, is also given.

* Prior to 1926 the tables, based on Glaisher's factors, published in *The Computers' Handbook*, were used.

The Ångström instruments in use are by Rose, Stockholm. No. 24 was in use throughout the year. The ammeter is No. 68956, which was certified at the National Physical Laboratory in 1919.* The readings are evaluated according to Ångström's original instructions.† To bring the readings into accordance with the scale adopted by the Smithsonian Institution, a correction of + 3·5 per cent. would be required.‡

Wind Speed and Direction.—To the end of 1925 the record of wind velocity was based on the readings from the Robinson-Beckley cup-anemograph. From the beginning of 1926, readings of the Dines tube-anemograph have been used for all the wind data. The vane of the Dines instrument is at the same level as the cups of the other anemograph, 20 metres above the lawn. There are trees in the neighbourhood reaching greater heights. Those along the river to the west of the Observatory and about 280 metres away average 25 metres. The head of the present Dines instrument, set up at the beginning of the year 1923, is of the Mark II pattern. In the vertical tube there are 80 holes in 4 rows of 20. The diameter of each hole is 3 mm. The connecting tubes, 17 metres long, have the internal diameter 12 mm.

Wind direction is given by a twin-lever recorder attached to the vane of the Dines instrument. In accordance with an old convention, wind direction is not printed when the speed of the wind averages less than 1·6 metres per second, though the present vane is sensitive to lighter currents.

Earth Temperature.—The two thermometers in use were at 30 cm. and 122 cm. The ground in which the tubes for the thermometers are sunk is under grass. The soil is gravel. The site is well exposed. There are, however, three fruit trees about 9 metres to the east and 6 metres high. The bulb of the lower thermometer is 430 cm. above sea level. As will be seen from Table 525 the surface of the underground water surpassed this level at the beginning of the year when the park was flooded.

Minimum Temperature on the Grass.—The grass minimum thermometer is set at 18h and read at 7h on the succeeding day, the reading being assigned to the day of reading.§ The thermometer is placed with the bulb about 25 mm. above the turf. The exposure is good, there being no obstruction within 76° from the zenith. The thermometer in use throughout the year was M.O. 23006. This thermometer has a spherical bulb, diameter 17 mm.

Identification Numbers of Instruments in use in 1928.

Control Barometer	.. .. .	Newman 34
Control Dry Bulb Thermometer	.. .. .	Negretti & Zambra 173971
Control Wet Bulb Thermometer	.. .. .	Negretti & Zambra 173969
Control Raingauge (8-inch)	.. .. .	M.O. 1271
Measuring Glass for the Control Raingauge	.. .. .	M.O. 1425, 1617
Campbell-Stokes Sunshine Recorder	.. .. .	M.O. 12
Dines Tube Anemograph Head	.. .. .	M.O. 1017
Dines Tube Anemograph Recorder	.. .. .	M.O. 1017
Earth Thermometer 1 ft.	.. .. .	M.O. 5
Earth Thermometer 4 ft.	.. .. .	M.O. 10
Grass Minimum Thermometer	.. .. .	M.O. 23006
Photo-thermograph { Dry Bulb	.. .. .	4 II.
{ Wet Bulb (Old Falmouth Wet Bulb)	.. .. .	No number
Photo-barograph	.. .. .	..

* In view of the discovery by Marten (*Preuss. Met. Inst. Ann. Rep.*, 1928, p. 64) that errors are likely to be caused by temperature changes produced in a microammeter when sunshine falls on it, it may be noted that the instrument used at Kew is always in shadow.

† Report of the International Meteorological Committee, St. Petersburg, 1899, p. 57.

‡ R. E. Watson. *Geophysical Memoir*, No. 21, 1923.

§ The hour of the readings to be published in the Year Book was changed from 9h to 7h as from January 1st, 1924.

Thermometer Corrections, 1928.

	173971. N.P.L. 1915.				173969. N.P.L. 1915.				MO 5. N.P.L. 1913.		MO 10. N.P.L. 1913.		MO 23006. N.P.L. 1918.	
	°		°		°		°		°		°		°	
Certified.	255 ^a	+0.20	285 ^a	-0.10	255 ^a	+0.15	285 ^a	-0.10	260 ^a	+0.1	260 ^a	+0.3	253 ^a	-0.1
	260	+ .15	290	- .10	260	+ .15	290	- .10	273	.0	273	+ .1	263	- .1
	265	+ .10	295	- .05	265	+ .10	295	- .05	280	.0	280	+ .2	273	- .1
	270	+ .05	300	- .10	270	+ .10	300	- .05	290	.0	290	+ .1	283	- .0
	273	- .05	305	- .05	273	.00	305	- .05	300	.0	300	.0	293	- .0
	275	.00	310	- .05	275	.00	310	- .05	310	.0	316	+ .1	303	- .0
	280	- .05	—	—	280	- .05	—	—	—	—	—	—	—	—
Applied.	260 } 270 }	+ 0.1	—	—	260 } 270 }	+ 0.1	—	—	—	—	275 } 285 }	+ 0.2	253 } 278 }	- 0.0
	270.1 } 283.0 }	0.0	—	—	270.1 } 283.0 }	0.0	—	—	260 } 310 }	0.0	285.1 } 295 }	+ 0.1	278.1 } 303 }	+ 0.1
	283.1 } 310.0 }	-0.1	—	—	283.1 } 310.0 }	-0.1	—	—	—	—	—	—	—	—

Notes on the Meteorological Tables.

The Weather of 1928.—The year was notable for the very wet January and October and the dry, sunny periods of July, August and September.

Flood water invaded the Observatory grounds on the night of January 7, flooding the rain gauges. The flood was general throughout the Thames valley and the highest of which we have any knowledge. Loss of life and great damage to property occurred in some districts.

Rainfall for the whole year was 5 per cent. above normal.

Sunshine was 170 hours in excess of normal. On July 13, 15h. 12m. of sunshine was recorded, this being 94 per cent. of the total amount possible.

The highest temperature recorded in the north wall screen was 303.5^a (87° F.) on July 15.

The lowest temperature recorded was 269.0^a (25° F.) on December 9 and 15.

December 15 was the only "ice day," i.e., a day with the maximum temperature in the screen below 273^a.

During the gale of November 16 the wind reached a velocity of 65 miles per hour, the second highest gust ever recorded at Kew Observatory.

Diurnal Variation of Pressure and Temperature.—Harmonic Analysis. In accordance with the precedent of the last six years, the first four harmonic components have been computed for each month. The results are tabulated in Tables A and B.

The inequality is supposed to be given by the expression

$$c_1 \sin (15 t^\circ + \alpha_1) + c_2 \sin (30 t^\circ + \alpha_2) + \dots$$

t being the time in hours since midnight. The angles α are the phases of the several sine-waves at midnight. The curves are tabulated according to Greenwich mean time but the phases in Table A have been reduced to local mean time. The difference in Longitude between Kew and Greenwich being only 19' the correction is hardly appreciable in the figures, which are rounded to the nearest degree.

TABLE A.

Diurnal Variation of Barometric Pressure. Fourier Coefficients. $\Sigma c \sin (nt + \alpha)$.
 Richmond (Kew Observatory), Longitude $0^{\circ} 19' W$. 1928. Local Mean Time.

Month or Season.	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	mb.	$^{\circ}$	mb.	$^{\circ}$	mb.	$^{\circ}$	mb.	$^{\circ}$
January ... ..	.243	38	.289	157	.206	348	.109	227
February ... ..	.431	12	.379	153	.097	337	.020	60
March ... ..	.251	61	.375	149	.089	3	.050	357
April ... ..	.295	20	.427	154	.029	181	.058	354
May ... ..	.265	24	.330	151	.074	152	.009	330
June ... ..	.355	42	.371	139	.058	148	.012	275
July ... ..	.382	349	.339	138	.104	144	.015	335
August ... ..	.127	324	.253	154	.048	150	.031	323
September ... ..	.269	16	.433	157	.028	26	.053	12
October ... ..	.048	64	.323	171	.107	345	.009	330
November ... ..	.634	49	.351	157	.114	350	.024	305
December ... ..	.149	190	.306	156	.129	350	.101	212
Arithmetic Mean ...	.287	—	.348	—	.090	—	.041	—
Year ... ..	.237	28	.346	153	.041	2	.018	297
Winter ... ..	.280	38	.331	156	.136	347	.048	225
Equinox ... ..	.201	33	.386	157	.047	356	.042	359
Summer ... ..	.250	11	.321	145	.070	148	.016	317

Note.—*Winter* comprises the four months, January, February, November, December.
Equinox the months March, April, September, October, and *Summer* May to August.

TABLE B.

Diurnal Variation of Temperature. Fourier Coefficients. $\Sigma c \sin (nt + \alpha)$.
 Richmond (Kew Observatory), Longitude $0^{\circ} 19' W$. 1928. Local Mean Time.

Month or Season.	c_1	α_1	c_2	α_2	c_3	α_3	c_4	α_4
	a.	$^{\circ}$	a.	$^{\circ}$	a.	$^{\circ}$	a.	$^{\circ}$
January	1.388	218	.474	45	.171	218	.027	119
February	2.231	213	.805	26	.175	197	.057	176
March	2.291	225	.524	57	.092	307	.094	174
April	2.950	226	.528	79	.263	35	.067	216
May	3.426	225	.306	80	.223	18	.024	11
June	3.514	229	.010	229	.243	45	.144	25
July	4.434	219	.096	330	.336	22	.130	34
August	3.493	228	.363	69	.316	32	.047	233
September	4.345	226	.812	53	.231	4	.160	199
October	2.492	230	.801	56	.077	262	.091	182
November	1.542	223	.510	45	.240	227	.051	60
December	1.103	217	.438	40	.177	215	.041	92
Arithmetic Mean ...	2.767	—	.472	—	.212	—	.078	—
Year	2.757	224	.448	51	.071	9	.021	151
Winter	1.562	218	.550	37	.187	215	.030	112
Equinox	3.018	226	.657	60	.123	2	.101	196
Summer	3.707	225	.160	65	.276	29	.064	23

NOTE.—*Winter* comprises the four months January, February, November, December,
Equinox the months March, April, September, October, and *Summer* May to August.

Level of Underground Water.—In Table 525 there is given for each day the mean height above sea level of the surface of the underground water. The level actually measured is the surface of water in a pipe which passes through the floor of the basement into the ground. The water level depends mainly on the state of the river Thames. The Observatory is close to Richmond lock, which is half-tidal, and the underground water is in summer a little below the level of low water above the lock (220 cm. above M.S.L.). The effects of the spring and neap tides are conspicuous in the fluctuations of level in summer.

Cloud Amount.—The mean cloud amounts for the six hours of observations are given month by month in the diary of cloud and weather. The following means are derived from these data :—

Mean Amount of Cloud from Six Observation Hours.

Month	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Cloud ...	7.0	6.4	7.6	7.4	6.9	6.7	5.4	6.8	4.9	6.2	7.1	7.4	6.6

Mean Amount of Cloud for the Year at the Six Observation Hours.

Hour ...	7h	9h	13h	15h	18h	21h
Cloud ...	6.8	6.8	7.1	7.2	6.4	5.5

Visibility.—The objects used for the classification of visibility are enumerated below. The Observatory is on very low ground. The view is bounded on the south-east by Richmond Hill and on the west by the trees near the river. For object H a church tower seen through trees and with high ground behind it has to be used. There is no conspicuous object at the appropriate distance to serve as I, and interpolation is necessary. The object J is in London and is therefore more affected by atmospheric pollution than the other objects.

VISIBILITY AND FOG.

LIST OF OBJECTS.

Identification Letter.	Actual Object.	View Point.	Bearing.	Actual Distance.	Standard Distance.
X	Verification House (Not Visible).	S.W. Corner of Ob- servatory Bldg.	S.W.	<25 metres	25 metres
A	Verification House ...	S.W. "	S.W.	25 "	25 "
B	17ft. Stevenson Screen	S.E. " Corner " Ob- servatory Bldg.	S.W.'S.	50 "	50 "
C	New Magnetic Hut ...	SW. Corner of Ob- servatory Bldg.	S.'W.	110 "	100 "
D	S.W. Tree ...	"	S.W.	200 "	200 "
E	Golf Club House ...	Observatory " ...	S.E.'E.	500 "	500 "
F	Orange Tree Hotel ...	" ...	S.E.'E.	970 "	1,000 "
G	St. Matthias Church ...	" ...	S.E.	1,900 "	2,000 "
H	South Ealing Church	" ...	N.'W.	4,000 "	4,000 "
	(Mortlake Chimney well visible.	"	E.	3,500 "	} 7,000 "
i	{ Chelsea Chimneys not visible.	" ...	E.	9,300 "	
J	Chelsea Chimneys ...	" ...	E.	9,300 "	10,000 "
K	Surrey Hills ...	" ...	S.'E.	20,000 "	20,000 "
l	Surrey Hills well visible	" ...	S.'E.	> 20,000 "	30,000 "
m	Surrey Hills, excep- tionally visible.	" ...	S.'E.	> 20,000 "	50,000 "

ATMOSPHERIC ELECTRICITY.

The systematic observations in atmospheric electricity are devoted to potential gradient, air-earth current and ionization. In the case of potential gradient there is continuous autographic registration ; the other elements are observed each afternoon when conditions are favourable.

Potential Gradient.—The Kelvin water-dropper electrograph has been housed since 1915 in a low building known as the Clinical House. The pipe carrying the jet projects through a hole in a window and is adjusted so that the point where the jet breaks into spray is 1.50 m.* from the window and 1.73 m. above the pool into which the water falls.† The electrogram is a record of the difference of potential between the ground and the point where the jet breaks. The aim is, however, to obtain the potential gradient in the open. For this purpose observations are made at a site in the Observatory garden. The apparatus for these "absolute" observations consists essentially of a long insulated rod carrying at the end a lighted fuse, which is connected to an electrostatic voltmeter. Readings are taken with the fuse at one metre and at two metres above the ground, the grass on which is kept short. The observations are taken about noon on all convenient dry days. From the observations the ratio of the potential gradient in the garden to the potential recorded by the electrograph is computed. Such a ratio is given for each month in Table 540.

The water dropper was out of action for eight days in March. It was again dismantled later on in the year when the Clinical House was being redecorated. During this second period of inaction however a subsidiary electrograph consisting of a radio-active collector attached to a Dolezalek quadrant electrometer was run in the Observatory building. The values of potential gradient from 16h. on August 27 until 10h. on October 2 are derived from this instrument, and in addition those during the night and early morning of October 7-8 when the insulation of the water dropper was not very good.

The exposure factor for the subsidiary electrograph is naturally different from that for the water dropper. The factor applicable to the Dolezalek electrograph, is that given for the month of September.

Two exposure factors are given for November, the reason being that the water dropper was taken down on November 15 to be cleaned and dried. The factor prior to this date is 2.06, that for the last half of the month is 2.07.

During the year‡ two electrostatic voltmeters, No. 1684 and No. 1685, were used for the absolute observations. The voltmeters and also the electrograph are calibrated at frequent intervals by means of a Cambridge and Paul potentiometer, a high tension dry battery being used as a source of potential difference.

The data appearing in Table 539 include the electrical character figure assigned to each day from the consideration of the electrograms. Of the character figures, 0 denotes the absence of negative potential, 1 implies the existence of negative potential at one or more times during the day but with a total duration of less than 3 hours, while 2 implies the existence of negative potential with a total duration of 3 hours or more. As a negative potential gradient hardly ever occurs except when rain is in the neighbourhood, character 0 occurs on dry days and character 2 on days with

* This measurement was made in July, 1926. It is believed that there has been no appreciable change since 1915.

† This height is regulated and has been kept the same.

‡ As from January 1st, 1923, the electrostatic voltmeters took the place of the Kelvin portable electrometer, No. 81, previously used for this purpose.

continuous rainfall. For the eight days in March during which the electrograph was out of action, the characters 0 or 1 have been assigned from information as to rainfall; the figures are in brackets to indicate that they are not derived from electrical records.

The present criteria for character figures were adopted as from the beginning of 1914. Correcting for missing days, the average frequency of character figures 0, 1, and 2 during the years 1914-1927 inclusive were 186 : 139 : 40. The corresponding figures for 1928 are 176 : 150 : 40. In accordance with a resolution of the International Union for Geodesy and Geophysics (Section for Terrestrial Magnetism and Atmospheric Electricity: Prague Meeting 1927) tabulations of the duration of negative potential gradient are included in the present issue of the Year Book. The total duration of negative gradient is given for each day for which the electrographic record is satisfactory.

Table 540 gives daily data derived from measurements of the electrograms. They represent means for 60-minute intervals centred at the exact hours 3h, 9h, 15h, and 21h G.M.T. On occasions when the trace was defective, either through failure of insulation or some other cause, values of potential gradient have been interpolated, reference being made to the weather conditions as well as to the curve on either side of the defect. Such values are printed in brackets. On some occasions the curve, though existent, is so oscillatory that no satisfactory estimate is possible of the mean value of the ordinate. Such occasions are indicated by the letter z . If there is no doubt as to the sign of the hourly mean value, though a numerical measure is unobtainable, the sign is indicated by a + or a - attached to the z . The symbol $z \pm$ indicates that there were oscillations on both sides of the zero line, and that the sign of the mean value was uncertain.

The extreme hourly mean values in Table 540 are 1405 v/m at 9h. on November 10 and - 1030 v/m at 9h. on April 1. The former value is representative of foggy conditions; on this particular occasion the fog developed about 21h. on November 9 after a fine day. The potential gradient fell rapidly as the fog increased, even to the extent of assuming negative values at times between midnight and 2h. After 2h. the potential gradient rose rapidly, reaching a maximum at 9h. The fog cleared at 11h. 40m. The extreme negative potential of April 1 was associated with light intermittent rain which continued at intervals throughout the day. The potential gradient was persistently negative and free from large oscillations from 8h. to 13h.

Of the two sets of mean monthly values at 3h, 9h, 15h and 21h given in Table 540 at the foot of each month's data, the first set (a) represents the arithmetic means of all the positive potentials in the column, the second set (b) represents the algebraic mean derived from all days on which all four hours were represented. The last line gives the mean value for each month as derived from the (a) and the (b) values respectively.

For reasons explained in the 1922 Year Book, it is believed that the values (a) may be expected to give approximately the true monthly mean from all days when negative potentials are excluded, while the values (b) may be expected to give approximately the true monthly mean when negative potentials are included. But a reservation is necessary in both cases, for the highly oscillatory occasions such as are met with during thunderstorms have been omitted, and this omission may have a sensible effect.

If the monthly means in Tables 540 and 541 be compared, it will be found that the quiet day mean is in excess of the mean (b) in nine months out of the twelve. It is greater than the mean (a) in six months and is equal to the mean (c) in one month.

In only two months, January and November, is the excess of the quiet day mean over the mean (*a*) notable. For the year as a whole, allowing equal weight to the twelve months, the quiet day mean, the mean (*a*) and the mean (*b*) are respectively 298 v/m, 301 v/m and 282 v/m. The corresponding values for 1927 were 315 v/m, 303 v/m and 278 v/m.

As to comparison with earlier years it is to be noted that the present method of making the "absolute" observations was initiated at the beginning of 1910. Since then there has been no considerable change in the exposure at the control station.* The annual mean potential gradient for selected quiet days is available from that date onwards.†

1910	310 v/m	1917	354 v/m	1923	318 v/m
11	301 v/m	18	346 v/m	24	329 v/m
12	300 v/m	19	331 v/m	25	326 v/m
13	335 v/m	20	315 v/m	26	279 v/m
14	345 v/m	21	281 v/m	27	315 v/m
15	354 v/m	22	318 v/m	28	298 v/m
16	367 v/m				

The average for the 19 years is 322 volts per metre.

The mean for 1926 is a minimum. Along with the low value for 1921 it was probably to be attributed in part to the exceptional atmospheric conditions prevailing during the coal strikes of those years. Apart from these abnormalities a smooth change of potential gradient is to be noticed. In fact, the figures have been quoted‡ by Dr. Bauer as evidence for a connection between atmospheric electricity and solar activity.

The diurnal inequalities and the mean monthly and annual values in Table 54I are based on the curves of quiet days selected from those entirely free from negative potential. Other objects aimed at in the selection of the days are freedom from large irregular movements, absence of indications of inferior insulation in the electrograph, and the avoidance, so far as possible, of large non-cyclic changes. The quiet days numbered 10 in each month; but to complete that number in January and October it was necessary to include several 24-hour periods which did not commence at midnight.

Except in these cases the non-cyclic change is given explicitly in Table 54I, so that anyone who may desire to reproduce the figures as they were before the non-cyclic correction was applied can easily do so.

All the inequalities show a well marked double oscillation with minima in the early morning and early afternoon, maxima in the late morning as well as in the evening. The diurnal inequality for the whole year shows the higher maximum at 9h, the lower minimum at h3. This is not the case in every year. The hours of the extremes and the range of the inequality is given for each year from 1910 in the following list.

Year.	Max. hr.	Min. hr.	Range v/m	Year.	Max. hr.	Min. hr.	Range v/m	Year.	Max. hr.	Min. hr.	Range v/m
1910	20	4	138	1917	20	4	154	1923	9	4	160
1911	9	4	154	1918	20	2	139	1924	20	4	133
1912	9	4	149	1919	8	4	124	1925	19	3	129
1913	19	3, 4	160	1920	9	3	122	1926	20	4	118
1914	20	3	169	1921	20	3, 4	132	1927	19	3	129
1915	19	5	173	1922	20	4	144	1928	9	3	124
1916	20	4	151								

It will be seen that the range has been considerably lower in most recent years than it was in the years 1911 to 1917.

* cf. Year Book, 1926, p. 327.

† Estimates for the years 1898-1909 are given by Chree, *Phil. Trans. A* (1915) p. 141. The change of site of the electrograph in 1915 is discussed in *Hourly Values*, 1916.

‡ Washington, Carnegie Institution. Researches of the Dept. of Terr. Mag., Vol. V. (1926) pp. 361-384.

If the inequalities for the year and the seasons are compared with the corresponding inequalities for atmospheric pollution given in Table 543, the remarkably close similarity in the hours of occurrence of the principal maxima and minima noted in previous years is not borne out. There is, however, the same marked double oscillation throughout the day in both elements, a principal maximum or minimum of one falling at the same time as the secondary maximum or minimum of the other.

Conductivity and Air-earth Current.—To determine the current flowing from air to earth, the conductivity of the atmosphere at one metre above the ground is measured by means of the Wilson universal electrometer.* For calculating the conductivity at 15h. four observations, each giving the leakage from a charged plate in 5 minutes, are averaged. The product of the conductivity so determined and the potential gradient at 15h (as given in Table 540) is taken as the measure of the air-earth current. The conductivity is not observed during rain nor when the potential gradient is negative. Data are available for about one-third of the days of the year 1928.

In Table 538, in addition to the air-earth current, the "Wilsonian" conductivity is published this year for the first time.

In the Table we have ventured to use λ_+ as the symbol for the Wilsonian conductivity, so implying that the conductivity measured is that due to positive ions. This interpretation of the observations is not accepted by all physicists.

The conditions under which the air-earth current is measured are maintained as uniform as possible, but they differ from the conditions under which the vertical current passes from the air to the earth in the absence of the apparatus. The presumption is that the results obtained would require to be multiplied by a factor to represent the true air-earth current.† The monthly mean of the observed values of the current varied from 49 in November to 102 in June in terms of the unit 1×10^{-18} ampere per square centimetre. Allowing equal weight to each month we find that the mean for the year in terms of the above unit is 74. The mean derived directly from the 126 observations is also 74. There is very little difference from the corresponding values for other years.

There is some doubt as to the comparability of observations made with the Wilson apparatus and other estimates of the air-earth current. Determinations based on separate measurements of the conductivity for positive and negative electricity have yielded on the continent averages of about 2×10^{-16} amperes per square centimetre. On the hypothesis that it is only λ_+ that governs the transport of electricity from air to ground this estimate must be reduced to 1×10^{-16} amperes per square centimetre.

Ionic Charges.—Table 538 also gives the volume-charges carried by such positive and negative ions (including all of the more mobile type) as are caught by the Ebert apparatus.‡ The instruments are exposed in the open on a stone pedestal 1 metre high, and the observations extend over some 20 minutes near 15h, being simultaneous with the experiments with the Wilson electrometer.

Normally, two Ebert instruments are in use, one charged positively, the other negatively, the signs alternating from day to day. The initial voltage is about 180.

* *Proceedings of the Cambridge Philosophical Society*, Vol. 13, p. 184 (1906).

† When the current passing into a metal plate at ground level is taken as the standard the factor is found to be about 1.2. A discussion of this question has been published in a memoir by Dr. R. E. Watson.—*Geophysical Memoirs*, No. 45. 1928.

‡ *Physikalische Zeitschrift*, Vol. 8, No. 8, p. 246 (1907).

In interpreting the observations it is to be borne in mind that even in pure mountain air the greater part of the electric charge is carried by the sluggish "Langevin" ions. In less pure air a still higher proportion of the ions is immobilised and there is a decrease in the number of the small ions, i.e., of ions such as are effective in producing the conductivity of the atmosphere.

As is usual at Kew the highest values of the measured ionization occurred during the summer half of the year. Positive ionization exceeding 100×10^{-18} coulomb per cc. occurred on days in all months save January, November and December. The negative ionization exceeded the same limit in the months April to September inclusive. In foggy weather the number of small ions is very small and uncertain. The lowest ionizations tabulated were $+21 \times 10^{-18}$ coulomb per c.c. on January 31, and -11×10^{-18} coulomb per c.c. on January 17. The averages for the year were $+64$ and -48×10^{-18} coulomb per c.c. According to Millikan's experiments* the ionic charge is 15.9×10^{-20} coulomb, so that these averages correspond respectively with 400 positive and 300 negative ions per c.c. These averages are much lower than those obtained in clean country air. According to Bauer and Swann† the means for the principal observations reported at land stations before 1917 were 737 positive and 668 negative ions per c.c.

ATMOSPHERIC POLLUTION.

The Owens atmospheric pollution recorder or air filter No. 1‡ is situated in the Clinical House, and the level of the intake is about 1½ m. above that of the adjacent ground. The weight of the pollution is not obtained directly but is deduced from shade numbers 0, 1, 2, etc., assigned to the deposit left on the filter paper through which the air is drawn. The equivalents of the shade numbers are allotted in accordance with the results of an investigation carried out for the Atmospheric Pollution Committee by Mr. J. G. Clark.§ When the normal volume of air, 2 litres, is aspirated (it is drawn through a hole 3.2 mm. in diameter) shade number 1 answers to 0.32 milligrams per cubic metre. The Owens apparatus was designed in the first place for dealing with the air of cities and the amount of pollution at the Observatory is usually so small that the shade recorded when the 2 litres are aspirated is either 0 or 1.

Preliminary experiments with a spare recorder having justified the assumption that increasing the volume of air would increase the shade number in proportion an auxiliary tank was brought into use at the beginning of July, 1928. With this tank in operation each spot on the filter paper corresponds with 6.4 litres of air. The unit shade is therefore equivalent to 0.1 mg./m³. When fog prevails the auxiliary tank is put out of action and the unit shade reverts to the value 0.32 mg./m³.

This improvement in the recording system must of itself introduce a discontinuity in the published data. It is anticipated however that the results will be much more reliable.

In this connection it is to be noted that new scales of shades were taken into use on the following dates:—

June 7, 1925; July 1, 1926; and (retrospectively) January 1, 1928.

Table 542 gives mean hourly values derived from all the days of the month for which complete records were obtained. There were 356 such days in the year. The highest and lowest of these hourly values are in heavy type.

* Phil. Mag. (6) 34 (1917) 3.

† Washington, Carnegie Institution. *Researches Dept. of Terr. Mag.*, Vol. III (1917) p. 411.

‡ A description of the instrument is given in the *Report of the Advisory Committee for Atmospheric Pollution*. 4th Report, 1917-1918 (p. 20).

§ London, M.O. *Report of the Advisory Committee for Atmospheric Pollution*. 3rd Report, 1916-1917, (p. 20).

Table 543 gives diurnal inequalities derived from the data in Table 542 after the application of non-cyclic corrections. The principal reason for computing the diurnal inequalities was to facilitate comparison with the corresponding diurnal variations in barometric pressure and the potential gradient of atmospheric electricity.

The mean values computed for the several years since the recorder has been in operation are given in the following table, together with the means for the summer months (May to August) for the equinoctial months (March, April, September, October) and for the winter months. The unit is 1 mg/m^3 .

	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
Summer	·13	·27	·27	·25	·15	·08	·06	·07
Equinox	·27	·45	·30	·50	·24	·25	·13	·15
Winter	·53	·46	·35	·39	·39	·27	·24	·23
Year	·31	·39	·31	·32	·26	·20	·14	·15

In any discussion of these mean values it should be borne in mind that before the introduction of the auxiliary tank the great majority of estimates were shade 0 or shade 1. To discriminate between these two shades is difficult, and the decision depends on the "personal equation" of the observer as well as on the colour of the scale of shades. Some change in standard from year to year has been inevitable.

The nature of the diurnal variation is most easily recognised in Table 543. There is always a well defined minimum during the night and another in the early afternoon. The first maximum of the day usually occurs about 9h and the second one follows about 12 hours later. This double oscillation is apparently due to two causes, the variation in human activity in producing pollution and the variation in the wind which disperses it. In 1928 the principal maximum was in the forenoon in every month except April and December. The principal minimum occurred in the early morning in January, November and December and in the afternoon in the remaining months. Curves illustrating the diurnal variation of atmospheric pollution will be found in the Annual Reports of the Advisory Committee on Atmospheric Pollution and in a paper by Dr. F. J. W. Whipple in the Quarterly Journal of the Royal Meteorological Society, Volume 55, No. 231.

SEISMOLOGY.

Notes on Instruments.—The instruments which were transferred from Eskdalemuir Observatory during the latter part of 1925 have been in regular operation since the beginning of 1926. They consist of three Galitzin pendulums, with galvanometric registration arranged to record earth displacements in the north, east and vertical directions. The installation is situated in the basement rooms of the Observatory building, the pendulums being placed on a massive concrete pillar, separated from the floor, in the old magnetograph room. The galvanometers and recording apparatus are accommodated on slate slabs in the old seismograph room, which housed the Milne instrument until it was put out of action on June 17th, 1925. In order to eliminate temperature variation as far as possible, the windows of the pendulum room are provided with triple glass and also shielded by louvred screens from direct sunshine which might fall on them morning and evening. The annual range of temperature variation is about 10°C . and the mean daily range about 0.2°C .

The concrete pillar rests on gravel. The underlying geological strata are shown in the diagram on this page. The diagram is based on the results obtained * in sinking a well near Richmond Bridge. The Richmond boring terminated at a depth of 440 metres in Old Red Sandstone. At Stonebridge Park, 8 km. to the north, a boring was carried down † to a depth of 600 metres, the last 280 metres being in Old Red Sandstone. There is no information as to deeper strata near Richmond. It may be noted, however, that the sandstone beds dip at about 30° and that a boring at Little Missenden, Bucks, entered Silurian rocks at a depth of 370 metres with no evidence of the presence of Old Red Sandstone.

For detailed description of the Galitzin seismograph and for particulars of interpretation of the records, reference may be made to Fürst B. Galitzin's "Vorlesungen über Seismometrie" (Leipzig, 1914), or to G. W. Walker's "Modern Seismology" (London, 1913).

Timing is controlled by a half-seconds clock (Morrison 8587) which is rated daily by comparison with the Greenwich wireless time-signal relayed from Daventry. Time breaks are made electro-magnetically every minute and seismometric readings can be determined to the nearest second.

The free periods of the galvanometers (T_1), were determined in November, 1925, and were found to have suffered very little change since the original determinations at Eskdalemuir were made. The lengths of the simple equivalent pendulums (l), are assumed to have remained unaltered. These constants are as follows:—

	N	E	Z
T_1	24.68 sec.	24.80 sec.	13.04 sec.
l	118 mm.	118 mm.	360 mm.

N, E, and Z indicate the north, east and vertical components respectively.

In June and August standardisation tests were carried out in order to determine the values of the other constants which are used for deriving the scale values. In the case of the horizontal instruments it was found that the values agreed to within 3 per cent. of those obtained in the previous tests in August, 1927. Some adjustments to the north component pendulum were deemed necessary and a second standardisation of this instrument was carried out. In order to diminish the sensitivity of the vertical pendulum to temperature changes the steel controlling spring was replaced in May by one made of elinvar alloy which has a temperature coefficient of elasticity about one tenth of that of steel. ‡ The full advantage of this modification was not gained immediately owing to the large rate of natural "creep" shown by the elinvar spring, but after about four months this effect became smaller than the temperature effect. A detailed report on the behaviour of the spring has been published in a paper § by F. J. Scrase. The difficulties usually associated with the operation of the vertical pendulum have been greatly diminished. The values of the constants of the instrument which were obtained in a test made in August, 1927, have been used up to May 23, 1928, when the new spring was fitted. Approximate interpolated values were used from the latter date until August 21, 1928, when a new standardisation test provided values which were adopted for the remainder of the year.

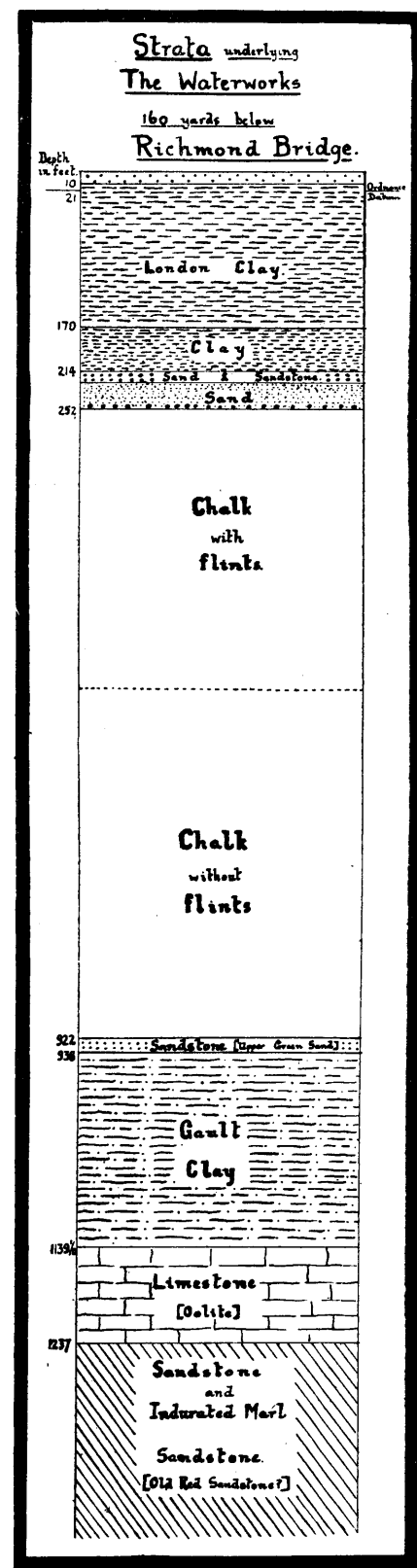
The table given below summarises the values of the constants obtained from the standardisation tests. The figures in brackets are interpolated values. T is the free period of the pendulum, μ is a damping co-efficient which vanishes when the free movement of the pendulum is just aperiodic, A is the length of the beam of light from the galvanometer mirror to the recording drum (usually about 1100 mm), and k is the "transmission" factor. The quantity $\frac{kA}{\pi l}$ may be regarded as a relative measure of the nominal magnification. A more detailed explanation of the meaning of these constants is given in the works referred to above.

* London. J. Geological Soc., Vol. 40 (1884), Vol. 41 (1885), p. 523.

† Records of London Wells, Mem. Geol. Survey 1913.

‡ Y. Dammann, "Contribution à l'étude des propriétés élastiques de l'élinvar. Son utilisation dans les séismographes." Publications du Bureau Central Séismologique International, Série A, Fascicule No. 5, pp. 122-129, 1927.

§ J. Sci. Instruments, Vol. VI., No. 12 (1929), p. 385.



A. Strahan
Prof. Paper No. 19, Survey of India.

Component.	Readjusted.	Tested.	Used in 1928.	T (sec.)	μ^2	$\frac{kA}{\pi l}$ (sec. ⁻¹)
N.	Aug. 3, 1927	Aug. 3, 1927	Jan. 1 to June 13	24.8	0.01	46.5
	June 13, 1928	June 13, 1928	June 13 to Dec. 31	24.8	0.01	46.9
E.	Nov. 2, 1926	Aug. 4, 1927	Jan. 1 to June 18	23.9	0.12	41.2
	—	June 18, 1928	June 18 to Dec. 31	24.7	0.02	43.3
Z.	*Nov. 11, 1926	Aug. 17, 1927	Jan. 1 to May 21	12.7	0.35	115
	New spring	May 23, 1928	May 23 to Aug. 21	(12)		(112)
	May 23, 1928	Aug. 21, 1928	Aug. 21 to Dec. 31	14.2	0.08	113
	Aug. 21, 1928	Aug. 21, 1928				

* The frequent adjustments of zero are ignored.

The expression used for the determination of the scale value was:—

$$\text{Magnification of record} = \frac{kAT_p}{\pi l} \cdot \frac{1}{(1+u^2)(1+u_1^2)\sqrt{1-\mu^2}f(u)}$$

where T_p is the period of the earthwave considered, $u = \frac{T_p}{T}$, $u_1 = \frac{T_p}{T_1}$ and $f(u) = \left[\frac{2u}{1+u^2} \right]^2$

During December, 1927, and January, 1928, when abnormally high tides occurred in the River Thames, water rose in the pit in which the seismograph pillar stands. The pillar was caused to tilt about 8 seconds of arc (0.04 milliradian). The effect on the constants of the pendulums was calculated and found to be negligible. As soon as the water subsided adjustments were made to bring the pendulums back to their original tilts.

In windy weather the seismographs, especially the horizontal components, are affected by slow oscillations, which are attributed to the tilting of the ground, the movement being conveyed through the foundations of the Observatory. On occasions the reading of an earthquake record is rendered very difficult, if not impossible, by these irregular disturbances.

Notes on Tables.—The *Seismological Diary*, Table 544, contains the particulars of the earthquakes recorded at the Observatory. The notation employed is as follows:—

P is the normal first phase (longitudinal waves). P^1 is a special case of P in which the waves penetrate the earth's central core.

$PR_1, PR_2 \dots$ are longitudinal waves reflected once, twice . . . at the earth's surface.

S is the normal second phase (transverse waves). $ScPcS$ is a special case of S in which the waves penetrate the central core and pass through it as longitudinal vibrations.

PS and PPS are waves which suffer a change or changes from longitudinal to transverse oscillation, or vice versa, on reflexion at the surface.

$SR_1, SR_2 \dots$ are transverse waves reflected once, twice . . . at the surface.

L indicates long waves (surface waves).

$\dot{}$ is the sudden commencement of a phase. e means a gradual or indistinct commencement. These letters are used as prefixes to the phase symbols, but where the character of the phase is not assignable the letters are used as independent symbols. When the commencement of a phase is moderately clear the prefixes are not used.

The suffixes N, E, Z indicate that the estimates refer to the records from the north-south, east-west and vertical seismographs respectively. The absence of all these suffixes indicates that the estimates refer to all three records.

All times entered against the above phases are the times of arrival of the phases at the station.

$m_1, m_2 \dots$ are successive prominent maxima of sinusoidal waves occurring in the preliminary phases. $M_1, M_2 \dots$ are successive prominent maxima occurring during the principal or surface phase. Galitzin's formula for the lag of the displacement shewn by the galvanometer after the maximum displacement of the ground, viz. :—

$$\tau + \tau_1 = \frac{T_p}{2\pi} \left[\tan^{-1} \frac{2u\sqrt{1-\mu^2}}{u^2-1} + \tan^{-1} \frac{2u_1}{u_1^2-1} + \frac{\pi}{2} \right]$$

is used for computing the times of m and M each inverse tangent being taken as between 0 and π .

The period is the duration of a double oscillation (to and fro movement).

A_x, A_y, A_z are the amplitudes, in microns ($\mu=0.001$ mm.), of the components of the true displacement of the ground from the position of rest. Displacements to the north, east and upwards are regarded as being positive. When successive positive and negative displacements have the same magnitude the time of occurrence is given for the positive one. When no sign is given the measurement refers to a long group of waves the amplitudes of which are the same.

Δ is the distance in kilometres of the epicentre measured along the arc of the great circle passing through the station. This distance is derived from the interval between P and S, by the tables, due to Zeissig, given in Klotz's "Seismological Tables" (Publication of the Dominion Observatory, Ottawa, Vol. III, No. 2). The azimuth of the epicentre (0° to 360°) is measured from north through east. When an estimation of the azimuth is possible, it is used, together with Δ , to determine the co-ordinates of the epicentre. In other cases where co-ordinates are given, the information has been obtained from other sources; the origin of the determination is inserted in brackets.

Brackets enclosing figures or phase symbols indicate that the information is uncertain.

The Diary contains some amendments to the information which has already been issued in the Observatory Seismological Bulletin. Attention is drawn to revised readings for the disturbances on March 13th 18h and on March 26th 5h. In these two cases misinterpretation of the phases led to estimates of the epicentral distances which were quite incompatible with information received subsequently

The total number of shocks recorded during the year was 339. The phases being sufficiently well defined, estimates of the epicentral distance were obtained for 96 shocks, whilst in 19 cases the records of the initial impulses were sufficiently sharp to allow of computations of azimuth and so of estimates of the co-ordinates of the epicentres. There were 18 earthquakes which produced a disturbance at the observatory with an amplitude exceeding 0.1 mm. in a horizontal component. These earthquakes originated in the Indian Ocean (March 9th), in the South Pacific Ocean (March 16th), near the Pacific Coast of Mexico (March 22nd, July 17th, August 4th and October 9th), in the Carinthian Alps (March 27th), near Smyrna (March 31st), in Bulgaria (April 14th and April 18th), at Corinth (April 22nd), in Anatolia (May 2nd), in Peru (May 14th and July 18th), near Japan (May 27th), in Baluchistan (October 15th), in Chile (December 1st) and near the South of Mindanao (December 19th). The large number of destructive earthquakes in South East Europe will be noticed.

For comparison the statistics for the three years in which the Galitzin seismographs have been in operation at Kew Observatory are given:—

	Shocks recorded.	Epicentral distances.	Azimuths estimated.	Shocks exceeding 0.1 mm.
1926	306	55	—	10
1927	314	78	6	9
1928	339	97	19	18

Microseisms.—In Table 544 are given the amplitude (A) and period (T_p) of the microseisms shown by the north component seismograph on each day at 0h, 6h, 12h, and 18h*. On a few occasions (about 2 per cent. of the total number) when the north component record was not available measurements of the east component record have been included. The group of waves of greatest amplitude occurring in the 30 minutes centering at the hour in question is selected, and the amplitude tabulated is the mean obtained from the three largest complete waves in that group. The period is derived from a measurement made on the same group, but the procedure adopted in previous years has been slightly modified as from January 1st in order to diminish

the tendency on the part of the tabulator to give preference to certain periods.* The total time, to the nearest second, for a number of complete consecutive waves is measured, the number of waves being chosen so that the time is between 23 and 30 seconds. The period is then derived from the following division table:—

Time interval in seconds.								
Number of Waves.	30	29	28	27	26	25	24	23
3	10	9.7	9.3	9.0	8.7	8.3	8.0	7.7
4	7.5	7.3	7.0	6.7	6.5	6.3		
5	6	5.8	5.6	5.4	5.2			
6	5	4.8	4.7	4.5				
7	4.3	4.1	4.0	3.9				
8	3.7	3.6	3.5					
9	3.3	3.2	3.1					
10	3.0	2.9	2.8					
11	2.7	2.6						
12	2.5							

In computing the mean period occasions of zero amplitude are omitted. The mean values of amplitude and period for each month of 1928 and for the year, together with the corresponding values for 1926 and 1927 are given below:—

MICROSEISMS—MONTHLY AND ANNUAL MEANS.

1926.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Amplitude (μ) ...	2.3	1.7	1.8	1.1	0.5	0.4	0.5	0.6	0.5	0.8	1.7	1.6	1.1
Period (secs.) ...	6.3	6.5	6.5	5.6	4.7	4.6	4.6	4.7	5.2	4.9	6.1	6.2	5.5
1927.													
Amplitude (μ) ...	2.8	1.6	1.7	1.1	0.5	0.6	0.5	0.8	0.9	1.1	1.9	2.5	1.3
Period (secs.) ...	6.6	6.1	5.8	5.5	4.5	4.6	4.0	4.7	4.8	5.1	6.1	6.3	5.3
1928.													
Amplitude (μ) ...	2.9	2.6	1.3	1.1	0.4	0.8	0.4	0.7	0.7	1.4	2.1	1.6	1.3
Period (secs.) ...	7.1	6.7	5.6	5.5	4.6	4.6	4.7	4.3	5.0	5.9	6.0	6.0	5.5

* F. J. W. Whipple and F. J. Scrase, "On the Frequency of Microseisms of Different Periods at Eskdalemuir and at Kew." Mon. Not. R.A.S., Geophys. Suppl. II. No. 2 (1928).

Readings in millibars at exact hours, Greenwich Mean Time.

439. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.)= 10.4 metres.

January, 1928.

Table with 25 columns (1-24 hours + Mean) and 31 rows (Day 1-31). Includes 'Station Level' indicator and 'Mean (Sea Level)' row at the bottom.

440. Richmond (Kew Observatory) : H_b=10.4 metres.

February, 1928.

Table with 25 columns (1-24 hours + Mean) and 29 rows (Day 1-29). Includes 'Station Level' indicator and 'Mean (Sea level)' row at the bottom.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

441. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.) = 10.4 metres.

March, 1928.

Table with 25 columns (1-24 hours + Mean) and 31 rows (Station Level 1-31). Columns include Hour G.M.T., Day, and Station Level. Values are in millibars, with some bolded for means. Includes sub-rows for Mean (Station level) and Mean (Sea level).

442. Richmond (Kew Observatory) : H_b = 10.4 metres.

April, 1928.

Table with 25 columns (1-24 hours + Mean) and 30 rows (Station Level 1-30). Columns include Day, Station Level, and Hour G.M.T. Values are in millibars, with some bolded for means. Includes sub-rows for Mean (Station level) and Mean (Sea level).

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

443. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.) = 10.4 metres.

May, 1928.

Table for Richmond (Kew Observatory) in May 1928. Columns: Hour G.M.T., Station Level (1-31), Mean (Station level), Mean (Sea level). Rows: 1-31 hours.

444. Richmond (Kew Observatory) : H_b = 10.4 metres.

June, 1928.

Table for Richmond (Kew Observatory) in June 1928. Columns: Hour G.M.T., Station Level (1-30), Mean (Station level), Mean (Sea level). Rows: 1-30 hours.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

445. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.) = 10.4 metres.

July, 1928.

Table with columns for Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Rows contain pressure readings in millibars for each hour.

446. Richmond (Kew Observatory) : H_b = 10.4 metres.

August, 1928.

Table with columns for Hour G.M.T., Station Level (1-31), and Mean (Station level/Sea level). Rows contain pressure readings in millibars for each hour.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

447. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.) = 10.4 metres.

September, 1928.

Table with 24 columns for hours (1-24) and a Mean column. Rows represent station levels from 1 to 30. Includes mean values for station level and sea level.

448. Richmond (Kew Observatory) : H_b = 10.4 metres.

October, 1928.

Table with 24 columns for hours (1-24) and a Mean column. Rows represent station levels from 1 to 31. Includes mean values for station level and sea level.

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

Readings in millibars at exact hours, Greenwich Mean Time.

449. Richmond (Kew Observatory) : H_b (height of barometer cistern above M.S.L.) = 10.4 metres.

November, 1928.

Table for Richmond (Kew Observatory) in November 1928. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station Level). Rows show hourly pressure readings in millibars.

450. Richmond (Kew Observatory) : H_b = 10.4 metres.

December, 1928.

Table for Richmond (Kew Observatory) in December 1928. Columns include Hour G.M.T., Station Level (1-30), and Mean (Station Level). Rows show hourly pressure readings in millibars.

NOTE.—When pressure exceeds 1000 mb, the leading figure 1 is not printed, i.e., 1005.6 mb. is written 005.6. This rule does not, however, apply to monthly means.

PRESSURE AT STATION LEVEL AND AT SEA LEVEL.
ANNUAL MEANS FROM HOURLY VALUES.

373

From readings in millibars at exact hours, Greenwich Mean Time.

451. Richmond (Kew Observatory) : H_b = 10.4 metres.

1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 3 rows (Station Level, Sea Level, Mean).

PRESSURE AT STATION LEVEL: MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-cyclic change.

452. Richmond (Kew Observatory) : H_b = 10.4 metres.

1928.

Table with 25 columns (Month, Mean, Hour G.M.T. 1-24) and 13 rows (Jan, Feb, Mar, April, May, June, July, Aug, Sept, Oct, Nov, Dec, Year).

ABSOLUTE EXTREMES OF PRESSURE AT STATION LEVEL FOR EACH DAY.

Maximum and Minimum for the interval 0h. to 24h., Greenwich Mean Time.

453. Richmond (Kew Observatory) : H_b = 10.4 metres.

1928.

Table with 23 columns (Month, Jan-Dec, Max, Min) and 31 rows (Day 1-31, Mean).

NOTE.—When pressure exceeds 1000 mb. the leading figure 1 is not printed, i.e., 1005.6 is written 005.6. This rule does not, however, apply to monthly means.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

454. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulb above the ground) = 3.0 metres.

January, 1928.

Table with 25 columns (1-24) and 31 rows (1-31). Columns 1-24 represent hourly temperature readings in degrees absolute. Column 25 is the Mean. Rows 1-31 represent the days of the month. The table shows a diurnal temperature cycle with a minimum around 5 AM and a maximum around 3 PM.

455. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

February, 1928.

Table with 25 columns (1-24) and 29 rows (1-29). Columns 1-24 represent hourly temperature readings in degrees absolute. Column 25 is the Mean. Rows 1-29 represent the days of the month. The table shows a diurnal temperature cycle with a minimum around 5 AM and a maximum around 3 PM.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

456. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulb above the ground) = 3.0 metres.

March, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is the Mean. Each cell contains a temperature reading in degrees absolute. The 'Day' column lists the day of the month. The 'Hour G.M.T.' column lists the hour of the day. The 'Mean' column shows the average temperature for each day.

457. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

April, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is the Mean. Each cell contains a temperature reading in degrees absolute. The 'Day' column lists the day of the month. The 'Hour G.M.T.' column lists the hour of the day. The 'Mean' column shows the average temperature for each day.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

458. Richmond (Kew Observatory): North Wall Screen: h_t (height of thermometer bulb above the ground) = 3.0 metres.

May, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is labeled 'Mean'. Each row contains temperature readings in degrees absolute. The table shows a diurnal cycle with temperatures peaking around 14:00 and dipping at night.

459. Richmond (Kew Observatory): North Wall Screen: h_t = 3.0 metres.

June, 1928.

Table with 25 columns (1-24) and 31 rows (Day 1-31). Columns 1-24 represent hourly readings from 1 to 24. Column 25 is labeled 'Mean'. Each row contains temperature readings in degrees absolute. The table shows a diurnal cycle with temperatures peaking around 14:00 and dipping at night.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

460. Richmond (Kew Observatory) : North Wall Screen : *h_t* (height of thermometer bulb above the ground) = 3.0 metres.

July, 1928.

Hour (G.M.T.)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean	
Day.	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	<i>a.</i>	
1	84.5	84.6	84.6	84.5	84.7	85.5	86.6	88.0	88.2	89.1	90.1	90.5	90.9	91.9	91.9	91.7	90.8	90.1	89.6	88.1	86.8	86.1	85.7	85.3	87.9	87.9
2	85.0	85.2	85.7	86.1	86.7	87.6	87.6	89.2	90.2	91.3	91.7	92.2	92.5	92.9	93.7	92.4	91.9	93.0	91.7	90.9	90.3	89.6	88.9	88.4	89.7	89.7
3	87.2	86.1	85.3	84.9	85.3	86.1	87.7	88.8	90.0	90.6	91.6	92.4	92.6	92.5	91.7	89.9	88.6	87.2	86.6	86.5	86.3	86.3	86.1	85.7	88.2	88.2
4	85.6	85.8	85.7	85.2	85.1	85.0	85.7	87.2	88.1	89.0	89.6	90.5	91.8	91.8	91.8	93.0	93.0	91.1	90.1	89.0	88.2	87.5	87.0	86.6	88.5	88.5
5	86.5	86.6	86.9	86.9	86.9	87.5	88.4	89.4	90.0	91.9	92.1	92.7	92.5	93.8	93.5	92.2	90.7	90.1	89.6	89.0	88.7	88.3	87.8	87.8	89.5	89.5
6	87.8	86.5	86.4	85.1	85.0	85.1	86.6	87.6	88.1	89.0	89.1	90.1	89.7	90.2	90.5	90.7	91.1	90.3	89.6	89.0	88.1	87.2	86.6	86.2	88.2	88.2
7	86.2	86.1	86.1	85.9	86.0	86.5	87.4	87.9	88.7	89.0	90.0	90.6	91.5	91.3	92.8	93.0	93.1	94.1	92.4	90.8	89.8	88.6	87.4	86.6	89.2	89.2
8	86.0	85.4	85.0	84.5	85.4	86.6	88.2	89.5	90.4	91.6	92.6	93.0	93.7	94.0	94.6	94.0	93.7	93.5	92.0	90.7	90.0	89.6	89.0	88.9	90.0	90.0
9	88.9	88.8	88.6	88.7	88.6	88.8	89.2	90.4	90.9	91.0	91.9	92.8	94.0	94.5	95.0	95.0	94.5	94.1	93.0	90.9	89.5	88.5	87.5	86.6	90.9	90.9
10	85.9	85.5	84.8	84.5	85.1	85.5	87.2	88.5	90.7	92.1	93.2	94.6	95.6	96.6	97.1	97.0	96.0	94.6	93.2	91.7	90.5	89.6	88.9	88.0	90.7	90.7
11	87.7	87.1	86.4	86.1	87.4	88.3	89.0	90.6	91.9	93.2	94.7	95.6	97.1	98.0	99.0	99.8	99.7	99.1	95.0	93.0	90.8	89.8	89.8	88.7	92.8	92.8
12	88.0	87.0	86.9	85.1	86.2	87.9	89.5	91.3	93.1	94.7	95.9	97.0	98.1	98.8	99.9	100.5	101.1	101.6	99.0	94.3	92.4	90.9	89.9	89.0	93.6	93.6
13	88.9	87.8	86.7	86.7	87.0	87.8	88.8	90.4	91.7	93.0	94.2	95.0	96.6	97.3	98.0	98.6	99.6	99.0	98.6	97.0	94.7	92.9	91.2	90.6	93.0	93.0
14	89.5	88.6	86.8	87.1	87.2	88.3	89.7	91.1	92.8	94.6	96.2	97.8	98.8	99.7	100.5	101.2	101.7	102.3	101.9	98.3	93.8	91.8	91.4	89.4	94.2	94.2
15	89.4	89.2	87.5	87.4	87.5	88.7	91.0	93.5	95.4	97.4	98.7	99.8	100.5	101.5	102.2	102.6	102.9	103.2	101.8	98.7	96.4	94.5	92.8	91.1	95.5	95.5
16	90.1	88.3	88.6	88.5	87.8	90.0	90.7	91.9	93.1	94.3	95.5	96.6	97.0	97.1	96.8	96.7	97.0	97.4	97.4	95.0	92.9	90.2	89.0	88.0	90.9	90.9
17	89.3	87.8	87.0	85.9	85.5	85.3	86.7	88.8	90.8	92.6	93.6	94.8	95.7	96.7	97.4	97.4	96.6	95.0	92.9	90.6	89.0	88.0	86.6	89.2	89.2	
18	86.3	86.4	85.7	84.1	85.3	87.1	88.9	90.4	92.6	94.6	96.1	98.0	99.3	100.1	100.9	100.6	100.2	99.8	98.6	96.1	93.3	91.7	90.6	90.4	93.1	93.1
19	90.0	89.6	89.5	89.4	89.5	89.6	89.9	91.1	90.5	91.6	92.4	92.9	94.1	94.0	94.8	94.8	95.0	95.4	94.6	93.2	91.8	90.7	89.8	89.2	91.8	91.8
20	89.7	89.0	88.7	88.6	88.6	89.2	90.0	90.5	91.1	92.1	93.1	93.9	94.9	96.2	97.0	97.5	97.6	98.0	96.8	94.7	93.3	92.4	91.4	90.2	92.7	92.7
21	89.6	89.2	88.6	87.8	87.5	88.3	88.9	89.3	90.5	91.7	92.8	93.7	94.5	95.5	96.5	96.8	97.2	96.9	96.5	94.3	92.6	89.9	88.8	88.1	91.9	91.9
22	86.9	87.1	86.8	85.4	86.4	87.1	88.6	91.6	93.4	95.5	97.4	99.0	100.4	101.1	100.7	101.0	100.0	99.0	97.5	96.0	94.4	93.7	93.0	92.2	94.8	94.8
23	91.2	90.9	89.5	89.7	89.7	90.3	91.0	92.5	93.6	95.9	94.2	95.4	96.0	95.9	96.7	97.0	97.1	96.9	96.0	94.9	93.9	93.2	92.6	92.0	93.5	93.5
24	91.5	91.1	90.6	90.5	90.6	91.0	91.8	92.5	93.4	94.4	95.4	96.6	98.2	98.9	99.0	99.4	98.8	98.8	97.5	96.4	95.8	95.5	94.6	93.9	94.8	94.8
25	92.9	92.5	91.9	91.8	92.0	92.5	93.5	93.6	94.5	95.1	96.4	96.5	97.8	98.0	97.6	98.0	98.1	97.7	96.4	94.4	93.0	91.8	90.9	90.4	94.5	94.5
26	90.0	90.2	89.4	89.5	89.8	90.7	91.1	92.6	93.8	93.1	93.5	94.6	96.0	97.4	98.5	99.6	99.2	98.7	96.2	94.4	93.0	92.2	91.1	90.5	93.6	93.6
27	90.0	89.5	89.5	89.4	89.4	89.5	89.6	89.9	90.6	92.9	94.6	96.3	94.9	94.1	93.6	93.1	91.4	90.0	91.0	90.6	90.4	90.2	89.8	89.5	91.2	91.2
28	87.4	85.4	84.7	84.8	85.0	85.5	86.1	86.8	87.9	88.6	89.4	89.7	89.8	90.6	91.3	91.9	92.1	92.6	91.2	89.9	88.4	87.0	86.1	85.5	88.3	88.3
29	85.0	84.3	83.7	83.4	83.2	84.0	85.1	86.8	88.0	89.0	89.1	90.1	90.7	91.5	91.7	91.1	92.3	92.1	91.4	89.9	87.5	86.6	85.8	84.9	87.8	87.8
30	84.4	84.0	83.9	83.6	83.5	84.9	86.5	88.6	89.9	90.6	90.8	92.5	91.9	90.6	91.7	92.3	91.3	90.7	89.1	88.9	88.3	88.4	88.5	88.3	88.4	88.4
31	87.5	87.5	87.6	87.5	87.4	87.5	88.0	87.6	88.2	89.6	89.9	91.5	92.5	92.1	91.6	91.6	90.9	91.2	90.8	90.2	89.7	89.4	89.1	89.0	89.5	89.5
Mean	...	88.0	87.5	87.1	86.7	86.9	87.7	88.6	89.9	91.0	92.2	93.1	94.0	94.8	95.3	95.7	95.7	95.6	95.4	94.3	92.7	91.3	90.2	89.4	88.7	91.3

461. Richmond (Kew Observatory) : North Wall Screen : *h_t* = 3.0 metres.

August, 1928.

Hour (G.M.T.)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean
1	89.1	89.0	89.1	89.1	89.0	89.5	89.9	89.9	90.5	91.4	92.9	94.0	93.5	93.1	93.3	93.3	91.5	90.6	89.3	88.8	88.1	87.6	86.9	86.5	90.3
2	86.5	86.4	86.6	86.6	86.5	86.6	87.0	87.9	88.5	89.2	89.9	91.1	91.4	92.0	92.6	93.1	92.5	91.1	90.6	89.1	88.4	87.8	87.3	87.3	89.0
3	87.6	87.8	87.3	87.0	87.1	87.5	87.5	87.6	88.4	88.6	88.7	88.8	88.9	88.9	88.7	88.0	87.0	86.7	86.7	86.2	86.0	85.9	86.2	86.4	87.6
4	86.3	86.3	86.0	85.9	86.1	85.9	84.9	84.7	84.9	84.9	85.0	86.3	87.4	87.5	88.5	88.5	88.9	88.5	87.7	86.3	85.3	83.5	83.6	83.1	86.2
5	82.5	81.5	82.0	81.9	81.9	82.4	83.9	85.7	87.8	89.6	91.5	92.7	93.8	94.7	95.1	95.1	95.2	94.8	93.6	90.9	88.9	87.3	85.9	85.0	88.5
6	84.5	84.1	83.7	83.5	83.1	83.6	86.1	88.9	91.6	93.0	93.9	94.5	95.6	96.3	95.7	94.8	93.7	92.9	91.9	90.8	89.9	89.2	88.1	88.5	89.8
7	87.9	87.5	87.3	87.6	87.6	88.8	90.4	91.1	93.0	93.9	94.5	95.1	96.3	96.0	96.8	96.5	95.8	94.1	93.3	92.8	92.7	92.7	92.7	92.2	92.3
8	90.3	89.4	88.3	88.3	87.9	87.8	88.1	89.2	90.4	91.2	92.1	92.6	93.3	92.8	92.1	92.0	92.2	92.3	91.5	89.5	88.4	87.7	87.3	86.9	90.2
9	86.3	85.8	85.3	84.8	84.7	85.9	87.1	88.8	89.9	90.6	91.8	92.0	92.9	93.4	93.2	92.9	92.5	93.0	92.1	90.0	88.7	87.7	86.9	86.2	89.3
10	85.4	85.3	84.7	83.3	83.2	83.7</																			

Readings in degrees absolute at exact hours, Greenwich Mean Time.

462. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulb above the ground) = 3.0 metres.

September, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Each cell contains a temperature reading in degrees absolute. The 'Mean' row at the bottom shows the average for each hour, with values ranging from 83.5 to 86.3.

463. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

October, 1928.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 31 rows (Day 1-31). Each cell contains a temperature reading in degrees absolute. The 'Mean' row at the bottom shows the average for each hour, with values ranging from 82.3 to 83.8.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Readings in degrees absolute at exact hours, Greenwich Mean Time.

464. Richmond (Kew Observatory): North Wall Screen : h_t (height of thermometer bulb above the ground) = 3.0 metres.

November, 1928.

Table with columns for Hour, G.M.T., Day, and 24 numbered columns, plus a Mean column. It contains temperature readings for each hour of each day in November 1928.

465. Richmond (Kew Observatory): North Wall Screen : h_t = 3.0 metres.

December, 1928.

Table with columns for Hour, G.M.T., Day, and 24 numbered columns, plus a Mean column. It contains temperature readings for each hour of each day in December 1928.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

TEMPERATURE : ANNUAL MEANS OF HOURLY VALUES. From readings in degrees absolute at exact hours, Greenwich Mean Time.

457. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

Table with 25 columns (Hour G.M.T. 1-24, Mean) and 2 rows of temperature data for Richmond (Kew Observatory).

TEMPERATURE : MONTHLY MEANS AND DIURNAL INEQUALITIES.

The departures from the mean of the day are adjusted for non-periodic change.

467. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

Large table showing monthly means and diurnal inequalities for Richmond (Kew Observatory) for each month from Jan to Dec, including a yearly mean.

ABSOLUTE EXTREMES OF TEMPERATURE FOR EACH DAY.

Maximum and Minimum for the interval 0h. to 24h., Greenwich Mean Time.

468. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

Table showing absolute extremes of temperature for each day of the year at Richmond (Kew Observatory), with columns for months and days, and rows for maximum and minimum temperatures.

NOTE.—The initial 2 or 3 of the readings is omitted, i.e., 275.0 degrees absolute is written 75.0.

Small table at the bottom right showing Year ... 87.3 79.5

RELATIVE HUMIDITY.

Percentages at exact hours Greenwich Mean Time.

469. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulbs above the ground)=3.0 metres.

January, 1928.

Hour. G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.	Vapour Pressure*
Day.	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	mb.
1	96	98	98	96	98	100	96	96	98	98	92	93	87	88	89	91	93	89	85	85	84	88	90	88	92.5	6.3
2	87	88	90	93	93	92	94	94	97	93	93	91	94	94	94	94	94	96	97	96	92	92	87	88	92.6	8.1
3	91	98	96	96	96	98	98	95	94	93	90	87	86	86	84	86	87	88	87	91	91	93	94	100	91.0	6.9
4	98	98	100	100	98	98	98	95	94	90	90	85	80	84	93	91	89	86	81	84	87	86	81	88	90.3	8.0
5	79	74	73	74	71	75	76	74	74	76	73	67	65	66	70	74	78	80	82	84	85	89	85	87	76.3	7.0
6	91	90	91	91	93	91	93	86	86	88	83	73	70	51	50	55	57	55	58	65	73	71	82	82	76.2	8.7
7	87	88	88	90	89	87	87	84	89	92	92	92	94	91	88	87	88	88	89	88	89	88	89	88	88.5	9.3
8	92	92	90	92	84	76	81	78	81	74	62	58	60	61	61	68	72	81	82	83	83	84	87	88	78.0	8.6
9	88	88	91	93	95	97	97	97	96	94	94	87	81	80	79	84	91	86	89	87	86	86	86	92	89.6	8.7
10	94	93	92	93	92	93	97	93	93	91	86	84	86	83	87	92	88	85	86	83	86	81	82	84	88.7	8.6
11	87	87	82	85	87	87	87	92	97	94	91	87	77	72	69	69	75	78	85	91	91	91	92	94	85.1	7.1
12	94	98	98	98	98	98	96	93	90	87	88	84	85	86	88	88	91	94	94	93	95	92	93	94	92.3	8.0
13	94	95	95	76	87	89	82	82	83	81	78	73	68	72	68	69	70	76	76	79	79	83	86	87	80.5	8.6
14	87	87	87	89	92	92	93	97	96	91	89	87	81	83	86	91	93	93	94	98	98	81	88	88	90.0	8.8
15	90	93	91	93	94	94	92	92	92	86	91	86	67	65	64	69	75	79	81	81	79	79	82	86	83.4	7.9
16	83	84	88	87	86	87	86	87	81	87	85	90	80	80	76	74	74	74	76	77	84	82	80	83	82.2	7.8
17	85	80	84	90	90	89	91	96	94	91	85	79	78	74	70	74	88	94	98	98	98	98	98	98	88.0	6.5
18	98	98	98	98	98	98	98	98	96	94	90	84	80	86	93	94	96	96	96	98	99	99	98	100	95.1	7.3
19	92	85	81	80	81	76	74	76	76	72	63	66	62	62	60	65	70	71	79	87	90	98	98	91	77.5	7.1
20	96	98	100	98	96	96	98	98	100	100	98	93	92	94	96	96	96	98	98	98	98	100	100	100	97.2	8.8
21	99	98	97	99	100	99	98	99	95	96	92	92	94	93	92	89	88	86	87	86	86	87	89	87	93.1	11.3
22	83	88	94	93	94	94	84	81	84	87	84	80	71	71	62	65	69	75	80	79	80	80	82	83	81.0	8.0
23	85	91	93	91	94	98	96	98	98	98	96	84	81	82	83	86	91	93	93	96	94	94	96	96	91.7	7.8
24	98	96	95	95	94	95	94	95	97	95	93	81	80	63	77	81	74	62	67	74	74	73	75	75	83.9	9.2
25	73	78	80	82	80	82	85	87	88	84	75	70	70	70	69	70	76	76	82	78	81	81	84	86	78.4	7.4
26	81	86	86	88	88	83	85	91	88	87	86	79	81	88	86	85	86	87	88	90	82	82	80	84	85.3	8.1
27	88	87	85	80	85	89	89	88	90	89	85	85	82	75	82	84	87	91	87	85	87	90	89	92	86.1	6.3
28	92	97	97	97	98	98	96	95	89	90	89	89	91	90	93	94	93	94	93	94	96	99	98	99	94.3	7.5
29	98	98	99	96	94	94	93	90	91	88	77	75	67	68	66	66	71	74	81	89	89	92	96	97	85.4	8.0
30	97	97	97	90	92	89	92	92	93	90	86	78	67	64	67	69	77	80	87	84	85	88	90	92	85.3	7.4
31	95	92	97	97	97	94	96	96	96	91	90	84	76	72	74	76	81	84	90	91	93	94	95	95	89.4	7.7
Mean	90.3	91.0	91.4	91.0	91.4	91.2	90.9	90.8	90.5	89.1	85.7	81.9	78.5	77.2	77.9	79.9	82.5	83.5	85.5	86.9	87.7	87.8	88.9	90.2	86.7	†8.0
Vapour Pressure*	mb. 7.8	mb. 7.7	mb. 7.7	mb. 7.6	mb. 7.7	mb. 7.6	mb. 7.6	mb. 7.7	mb. 7.9	mb. 8.1	mb. 8.2	mb. 8.2	mb. 8.1	mb. 8.0	mb. 8.1	mb. 8.1	mb. 8.1	mb. 8.1	mb. 8.1	mb. 8.0	mb. 8.1	mb. 8.0	mb. 8.0	mb. 8.0	mb. 8.0	mb. 7.9

470. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

February, 1928.

Hour. G.M.T.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean.	Vapour Pressure*
1	% 91	% 87	% 86	% 86	% 84	% 76	% 70	% 76	% 72	% 68	% 66	% 67	% 55	% 53	% 51	% 57	% 66	% 71	% 76	% 73	% 77	% 78	% 85	% 80	% 73.3	mb. 7.5
2	80	82	82	84	85	85	82	82	79	79	72	65	61	69	86	81	78	77	86	90	88	87	88	88	80.6	6.6
3	85	82	80	83	85	87	87	87	84	77	71	68	62	58	57	66	63	69	74	74	77	78	82	84	75.9	6.0
4	85	87	91	92	93	94	95	89	87	80	87	90	91	93	94	98	99	99	99	96	92	93	95	94	92.0	8.0
5	94	94	94	94	91	89	88	89	96	95	83	93	92	86	77	70	73	77	84	90	87	93	93	93	88.2	9.4
6	96	100	94	94	93	98	95	91	94	85	75	67	64	64	60	60	65	72	77	82	82	88	90	91	82.4	6.8
7	90	93	91	91	92	90	89	90	83	76	74	76	74	75	71	77	81	84	87	87	91	89	88	88	83.8	8.3
8	88	88	88	88	91	92	91	92	92	91	95	89	84	88	89	88	89	89	91	91	89	89	89	91	89.6	10.8
9	87	86	86	89	91	91	76	62	61	61	62	55	52	58	55	58	64	68	66	73	74	78	80	83	71.7	7.9
10	81	87	87	88	93	98	96	96	94	92	91	91	88	85	86	88	90	87	81	79	73	73	76	82	86.8	7.5
11	65	52	51	51	55	55	58	51	53	53	50	51	59	56	56	57	57	60	62	71	71	78	83	84	59.9	5.9
12	78	80	80	80	78	75	74	76	76	74	70	64	61	62	67	70	85	90	96	94	97	93	96	98	79.5	7.1
13	97	93	96	96	96	96	98	98	98	97	96	98	95	87	79	76	66	75	82	92	88	92	91	93	90.7	9.3
14	93	90	91	91	88	91	90	88	88	82	82	84	78	88	86	91	96	96	95	97	99	95	93	93	90.2	10.0
15	91	92	93	90	93	94	95	91	91	89	85	87	86	88	87	87	88	89	89	89	89	91	89	89	89.7	12.3
16	88	91	92	89	88	88	83	83	84	92	94	94	92	92	86	84	84	85	77	74	66	70	74	78	84.7	11.0
17	72	70	56	57	56	62	63	59	59	52	51	46	42	44	47	52	55	60	71	74	76	76	83	81	61.5	6.0
18	83	87	90	93	93	93	93	95	89	76	71	64	64	67	61	66	65	68	73	79	79	85	78	82	80.1	7.3
19	81	79	79	82	84	89	92	92	88	76	69	68	65	65	62	65	67	76	86	92	90	90	95	96	80.0	7.7
20	95	96	98	96	92	98	97	100	100	96	93	87	78	71	73	71	73	76	80	88	88	85	90	92	88.1	7.3
21	91	89	90	95	95	98	96	98	100	97	86	73	63	71	67	67	70	72	76	84	93	96	96	98	85.7	7.7
22	98	97	99	100	100	98	100	100	100	100	90	90	71	74	70	72	74	75	85	86	83	86	93	93	89.5	7.5
23	96	98	99	99	99	100	100	100	100	98	98	95	89	88	83	81	84	85	85	84	86	84	85	83	91.8	7.5
24	86	83	81	84	77	79	79																			

471. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulbs above the ground)=3.0 metres.

March, 1928.

Table with 25 columns (1-24) and 25 rows (1-24). Columns 1-24 show relative humidity percentages for each hour of the day. Column 25 shows the mean percentage. Column 26 shows Vapour Pressure in mb. The table includes data for each hour from 1 to 24, plus a 'Mean' row and a 'Vapour Pressure*' row.

472. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

April, 1928.

Table with 25 columns (1-24) and 25 rows (1-24). Columns 1-24 show relative humidity percentages for each hour of the day. Column 25 shows the mean percentage. Column 26 shows Vapour Pressure in mb. The table includes data for each hour from 1 to 24, plus a 'Mean' row and a 'Vapour Pressure*' row.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

Percentages at exact hours, Greenwich Mean Time.

473. Richmond (Kew Observatory) : North Wall Screen : ht (height of thermometer bulbs above the ground) = 3.0 metres.

May, 1928.

Table with 26 columns (Hour G.M.T., 1-24, Mean, Vapour Pressure) and 31 rows (Day 1-31, Mean). Contains percentage data for relative humidity and mb for vapour pressure.

474. Richmond (Kew Observatory) : North Wall Screen : ht = 3.0 metres.

June, 1928.

Table with 26 columns (Hour G.M.T., 1-24, Mean, Vapour Pressure) and 31 rows (Day 1-31, Mean). Contains percentage data for relative humidity and mb for vapour pressure.

* Computed from the mean temperatures and mean relative humidities.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

Percentages at exact hours, Greenwich Mean Time.

475. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulbs above the ground) = 3.0 metres.

July, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure*) and 31 rows (Day 1-31, Mean, Vapour Pressure*). Columns 1-24 show relative humidity percentages, Mean shows the average, and Vapour Pressure* shows values in mb. The table includes data for each hour of the day and a summary row for the month.

476. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

August, 1928.

Table with 26 columns (1-24, Mean, Vapour Pressure*) and 31 rows (Day 1-31, Mean, Vapour Pressure*). Columns 1-24 show relative humidity percentages, Mean shows the average, and Vapour Pressure* shows values in mb. The table includes data for each hour of the day and a summary row for the month.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

385

Percentages at exact hours, Greenwich Mean Time.

477. Richmond (Kew Observatory): North Wall Screen: h_t (height of thermometer bulbs above the ground) = 3.0 metres.

September, 1928.

Table with columns for Hour G.M.T., Day, and relative humidity percentages (1-24) plus Mean, Vapour Pressure, and Vapour Pressure*.

478. Richmond (Kew Observatory): North Wall Screen: h_t = 3.0 metres.

October, 1928.

Table with columns for Hour G.M.T., Day, and relative humidity percentages (1-24) plus Mean, Vapour Pressure, and Vapour Pressure*.

* Computed from the mean temperature and mean relative humidity.

† Mean of the column.

‡ Mean of the row.

RELATIVE HUMIDITY.

Percentages at exact hours, Greenwich Mean Time.

477. Richmond (Kew Observatory) : North Wall Screen : h_t (height of thermometer bulbs above the ground) = 3.0 metres.

November, 1928.

Table for Richmond (Kew Observatory) in November 1928. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure*. Rows show hourly data from Day 1 to 30, with percentage values and mean values.

478. Richmond (Kew Observatory) : North Wall Screen : h_t = 3.0 metres.

December, 1928.

Table for Richmond (Kew Observatory) in December 1928. Columns include Hour G.M.T., 1-24, Mean, and Vapour Pressure*. Rows show hourly data from Day 1 to 31, with percentage values and mean values.

* Computed from the mean temperature and mean relative humidity. † Mean of the column. ‡ Mean of the row.

Amounts, in millimetres, for periods of sixty minutes between the exact hours, Greenwich Mean Time.

485. Richmond (Kew Observatory): H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 5.5 metres + 0.53 metres.

January, 1928.

Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	Dura- tion. 0-24
Day.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	hr.
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	2	7	2	2	...	4	9	1.7	2.2	1.5	2.0	1.7	1.7	2.1	9	...	...	...	...	...	16.4	11.8
3	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.1	0.3
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.6	0.5
5	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.4	0.3
6	9	1.4	6	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3.6	3.7
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	...	...	...	...	...	...	0.4	0.8
10	...	...	...	(P)	(P)	(1)	(P)	(P)	...	...	...	...	...	...	...	4	1.9	...	...	...	...	...	...	...	2.4	1.2
11	...	...	...	...	...	...	1	2	2.0	1	...	...	...	...	...	...	...	...	...	...	...	(L)	(L)	(1)	2.5	1.8
12	(L)	(L)	(L)	(L)	(1)	(L)	(L)	...	...	...	...	...	...	2	...	...	2	3	4	2	9	1.1	1.3	8	5.5	7.9
13	9	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	2	1	...	...	...	1.3	1.5
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	3	2	1	...	...	...	0.7	1.4
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	0.9	2.0
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	1	3	...	1	1.4	1.1	1.2	9	1.3	...	1.7	8.1	5.2
19	5	8	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.4	1.1
20	...	...	...	...	...	...	...	...	...	...	...	...	3	1.1	8	...	...	...	...	...	...	(...)	(...)	(...)	2.2	2.2
21	(1)	...	...	...	...	...	(1)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(2)	...
22	...	...	...	7	5	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.4	1.8
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	7	1.1	1.5	1.4	8	4	...	6.3	6.5
24	...	1	...	...	...	...	...	...	...	4	1	2.5	...	...	3	4	...	...	...	...	...	...	...	...	3.8	1.3
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	2.7	2.9	0.9
26	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	1.4	1.1	4	...	...	...	...	...	...	3.3	2.5
27	...	...	...	...	...	...	...	3	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.5	0.8
28	...	...	...	...	...	...	...	...	...	...	1	3	4	8	9	1.1	1.0	7	6	2	5	2	...	...	6.8	9.5
29	...	...	...	...	2	3	2	2	2	1	4	...	...	...	...	...	...	...	...	...	1	7	6	2	3.2	7.3
30	1	2	3	6	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.4	3.5
31	...	...	2	...	...	(L)	(1)	(L)	...	...	...	...	...	...	...	1	1	7	8	5	...	...	...	...	2.5	3.7
Sum	2.9	2.7	1.4	1.6	1.5	1.3	0.8	0.9	2.5	1.3	1.8	4.8	2.9	3.9	4.5	3.6	7.2	6.5	5.5	4.1	4.5	4.2	2.3	6.1	78.8	79.5
Total Duration.	hr. 2.4	hr. 2.5	hr. 2.0	hr. 2.7	hr. 3.0	hr. 1.5	hr. 1.5	hr. 1.6	hr. 2.1	hr. 2.7	hr. 2.9	hr. 2.9	hr. 2.2	hr. 3.8	hr. 3.8	hr. 2.5	hr. 6.2	hr. 6.4	hr. 6.4	hr. 4.4	hr. 5.4	hr. 4.2	hr. 2.7	hr. 3.7	hr. 79.5	—

486. Richmond (Kew Observatory): $H_r = 5.5$ metres + 0.53 metres.

February, 1928.

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.1	0.1
2	2.0	1	1	9	3.7	6.1	...	...	...	...	12.9	3.1
3	(...)	(1)	...	...	...	...	...	...	...	...	...	...	...	0.1	...
4	(...)	(...)	(1)	(...)	3	5	...	1	...	...	...	...	...	...	1.0	1.1
5	3	1.1	1.1	4	...	...	...	...	...	...	...	...	...	...	...	2.9	2.8
6	(L)	(L)	(L)	(1)	(L)	(L)	(L)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.1	...
7
8
9	1.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.7	0.3
10	3.6	1	...	...	...	...	...	...	...	3.9	1.1
11	1	...	...	...	...	...	...	...	...	...	...	...	0.3	0.5
12	1	6	7	3	...	...	...	...	1.7	3.0
13	1	9	2.4	2.3	2	...	...	...	...	...	...	...	...	...	...	...	...	5.9	3.4
14	(...)	(1)	1	...	1.2	3	...	...	1.7	2.4
15	7	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.8	0.8
16	3	5	5	5	2	1	...	...	...	...	...	...	...	...	...	2.1	3.9
17	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.2	0.1
18
19
20
21
22
23
24
25
26
27
28	(L)	(L)	(L)	(1)	(L)	(1)	(L)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.2	...
29
Sum	0.2	...	...	0.1	...	0.8	1.9	1.1	2.4	2.9	1.8	1.6	1.0	0.4	2.1	0.4	4.3	1.7	4.6	6.4	1.2	0.5	...	0.2	35.6	22.6
Total Duration.	hr. 0.1	hr. ...	hr. ...	hr. ...	hr. ...	hr. 0.7	hr. 0.5	hr. 1.1	hr. 1.0	hr. 1.9	hr. 2.0	hr. 1.9	hr. 1.3	hr. 0.8	hr. 0.9	hr. 0.5	hr. 1.9	hr. 1.9	hr. 2.3	hr. 1.8	hr. 1.0	hr. 0.8	hr. ...	hr. 0.2	hr. 22.6	—
Hour. G.M.T.	0-1	1-2	-23	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	—

Amounts, in millimetres, for periods of sixty minutes between the exact hours, Greenwich Mean Time.

487. Richmond (Kew Observatory): H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 5.5 metres + 0.53 metres. March, 1928.

Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	Dura- tion. 0-24
Day.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	hr.
1	1	1.7	3	...	...	...	...	...	...	...	(...)	...	...	...	(.1)	...	...	...	...	...	...	...	2.2	2.1
2	...	1	2	2	3	3	3	...	...	...	...	...	...	1	1	1	...	...	...	...	...	...	...	...	1.7	5.0
3
4
5	1	5.0	6.3	...	11.4	1.7
6	2.3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2.4	0.8
7	2	2	2	1	2	1	...	2	...	...	...	...	...	...	...	...	...	1.2	4.0
8
9	3	1.0	2	...	...	...	...	...	1.3	7	...	...	...	...	...	...	...	3.5	2.5
10	2	...	...	...	...	...	...	...	...	0.2	0.2
11	3	2	...	0.5	1.0
12	0.1	0.5
13	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.1	0.7
14
15
16
17	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.2	0.2
18
19	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.2	0.2
20
21	1	3	1	...	...	...	...	...	...	...	...	...	1	1	3	8	4	3	1	...	...	2.6	4.7
22	(...)	...	(...)	0.1	0.3
23	2	...	...	...	2	2	3	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1.2	3.1
24	1	(...)	(.1)	...	...	...	3	4	...	...	...	...	...	...	...	...	...	...	0.9	1.2
25
26
27	4	5	6	3	...	...	...	...	...	...	...	...	...	1.8	2.4
28
29	3	2	3	4	4	2	3	3	...	...	4	1.0	...	8	4.6	6.4
30	2	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	3	1.0	1.1
31	1	1	4	...	1	1	...	4	...	...	7	5.4	7	...	...	...	...	...	...	...	...	8.0	2.8
Sum	0.4	0.1	0.3	4.5	1.4	1.3	0.7	0.7	1.4	0.4	0.4	1.2	1.0	1.6	2.2	7.8	1.9	0.6	0.8	0.4	0.8	6.4	6.5	1.1	43.9	40.9
Total Duration.	hr. 0.6	hr. 0.1	hr. 1.3	hr. 2.9	hr. 3.1	hr. 3.2	hr. 1.8	hr. 1.5	hr. 2.0	hr. 1.0	hr. 0.6	hr. 1.7	hr. 2.6	hr. 2.5	hr. 3.2	hr. 3.0	hr. 1.6	hr. 1.0	hr. 1.0	hr. 1.0	hr. 1.0	hr. 2.0	hr. 0.9	hr. 1.3	hr. 40.9	—

488. Richmond (Kew Observatory): $H_r = 5.5$ metres + 0.53 metres.

April, 1928.

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	hr.	
1	(...)	(.1)	...	1	2	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	0.8	1.6	
2	
3	1	8	5	5	1	4	7	9	8	7	...	...	...	...	...	...	...	5.5	7.0	
4	2	...	...	...	...	...	2	...	...	...	...	...	...	...	0.4	0.4	
5	
6	
7	
8	1	2	1.1	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	0.1	0.1
9	2.0	2.4
10	6	3	...	...	...	...	...	...	...	0.9	1.3	
11	2.2	4	1	...	...	2.7	0.7	
12	...	1.7	4	3	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	2.6	2.5
13	
14	
15	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.1	0.1	
16	...	1.0	2.5	1.6	1.3	1.7	1.2	1.2	6	8	1.3	2	...	...	...	...	...	...	...	...	...	...	...	...	13.4	10.5
17	
18	2	9	1.1	0.8
19	
20	
21	1	...	...	3	2.7	1	...	3	...	1	...	...	...	...	3.6	2.1	
22	
23	
24	
25	
26	
27	
28	
29	0.1	0.2	
30	1.4	1.2	...	...	...	...	1	...	...	...	2.6	0.9	
Sum	0.1	2.9	4.0	2.5	1.3	1.8	1.4	2.1	1.3	1.5	1.9	0.6	0.7	1.2	3.5	2.9	1.8	0.5	0.9	2.4	0.4	0.1	...	0.1	35.9	30.6	
Total Duration.	hr. 0.2	hr. 1.9	hr. 3.0	hr. 2.4	hr. 1.0	hr. 1.1	hr. 1.1	hr. 2.4	hr. 2.3	hr. 2.5	hr. 2.0	hr. 1.3	hr. 0.8	hr. 1.2	hr. 1.8	hr. 1.9	hr. 1.2	hr. 0.8	hr. 0.5	hr. 0.7	hr. 0.3	hr. 0.1	...	hr. 0.1	hr. 30.6	—	
Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	—	

Amounts, in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

493. Richmond (Kew Observatory): H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 5.5 metres + 0.53 metres. September, 1928.

Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	Dura- tion.
Day.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	hr.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25	3.8	.6	.5	.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26
27
28
292	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30
Sum.	3.8	0.8	0.5	0.3	...	...	0.3	...	0.2	...	0.2	1.3	0.9	0.8	4.2	6.4	4.9	0.9	0.4	...	...	...	...	0.2	26.1	12.2
Total Duration	hr. 1.0	hr. 0.8	hr. 0.5	hr. 0.6	...	...	hr. 0.4	...	hr. 0.3	...	hr. 0.3	hr. 0.9	hr. 0.9	hr. 1.0	hr. 1.1	hr. 1.8	hr. 1.0	hr. 1.0	hr. 0.5	...	...	...	...	hr. 0.1	hr. 12.2	—

494. Richmond (Kew Observatory): H_r = 5.5 metres + 0.53 metres.

October, 1928.

	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	hr.
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15	2.9	.3	3.0	.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	.5	2.3	.2	.5	2.7	.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	1.0	.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	(...)	(...)	(...)	(.1)	(...)	(...)	(...)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	...	.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sum.	4.4	3.3	3.8	0.8	5.6	2.5	2.4	6.5	2.1	3.5	4.3	0.5	1.0	3.7	2.0	2.3	2.8	2.1	6.6	12.1	12.0	3.3	1.5	3.0	92.1	51.6
Total Duration	hr. 2.5	hr. 2.3	hr. 1.8	hr. 0.6	hr. 2.8	hr. 2.8	hr. 2.8	hr. 3.2	hr. 1.7	hr. 1.4	hr. 1.9	hr. 1.4	hr. 1.0	hr. 1.8	hr. 1.2	hr. 1.1	hr. 1.4	hr. 2.8	hr. 2.9	hr. 3.7	hr. 3.5	hr. 2.6	hr. 1.9	hr. 2.5	hr. 51.6	—
Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	—	—

Amounts, in millimetres, for periods of sixty minutes, between the exact hours, Greenwich Mean Time.

495. Richmond (Kew Observatory) : H_r (height of receiving surface above M.S.L.) = H (height of station above M.S.L.) + h_r (height of receiving surface above ground) = 5.5 metres + 0.53 metres. **November, 1928.**

Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	Dura- tion. 0-24
Day.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
1
2
3
4	0.2	0.3
5
6
7
8
9
10	3.5	3.1
11	5.7	5.6
12	(...)	(.1)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.6	1.3
13	0.5	0.6
14	2.8	2.0
15	4.9	3.5
16	8.7	4.8
17	0.4	0.7
18	0.6	0.7
19
20
21	(...)	(.1)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4.0	3.0
22	2.5	3.2
23	5.4	2.8
24
25	5.6	2.8
26
27
28
29	0.5	1.3
30
Sum.	1.5	0.3	0.2	2.7	4.6	1.1	0.8	2.9	3.8	1.1	3.3	0.6	1.9	0.6	1.5	5.2	2.6	1.7	1.4	1.8	1.6	1.2	2.6	0.9	45.9	35.7
Total Duration.	hr. 1.8	hr. 0.2	hr. 0.5	hr. 1.0	hr. 1.9	hr. 1.9	hr. 1.5	hr. 3.0	hr. 2.3	hr. 1.3	hr. 1.1	hr. 0.5	hr. 1.2	hr. 0.8	hr. 1.0	hr. 2.5	hr. 2.8	hr. 2.8	hr. 1.6	hr. 0.9	hr. 2.3	hr. 0.8	hr. 1.4	hr. 0.6	hr. 35.7	—

496. Richmond (Kew Observatory) : $H_r = 5.5$ metres + 0.53 metres. **December, 1928.**

Hour. G.M.T.	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	0-24	Dura- tion. 0-24
Day.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
1	0.1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Sum.	6.2	6.2	3.6	4.5	1.6	1.0	1.3	0.8	0.5	2.8	2.3	1.2	1.4	0.7	1.0	0.4	2.7	1.8	2.3	1.8	3.0	3.5	5.2	4.0	59.8	58.6
Total Duration.	hr. 3.5	hr. 3.4	hr. 2.9	hr. 3.0	hr. 2.7	hr. 1.0	hr. 1.3	hr. 1.3	hr. 1.5	hr. 2.2	hr. 3.5	hr. 2.1	hr. 2.2	hr. 0.6	hr. 1.4	hr. 1.5	hr. 3.3	hr. 2.8	hr. 1.9	hr. 2.8	hr. 4.0	hr. 2.9	hr. 3.5	hr. 3.3	hr. 58.6	—

NOTE.—For Annual Totals, see Table 483.

DURATION OF BRIGHT SUNSHINE.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

497. Richmond (Kew Observatory) : h_s (Height of recorder above ground) = 13.3 metres.

January, 1928.

Table with 24 columns for hours (3 to 4 to 20 to 21) and 4 columns for radiation (Sky, Total, Vertical). Rows include Day 1-31, Sum., and Mean. Values include hours, percentages, and radiation in mw/cm².

498. Richmond (Kew Observatory) : h_s = 13.3 metres.

February, 1928.

Table with 24 columns for hours (3 to 4 to 20 to 21) and 4 columns for radiation (Sky, Total, Vertical). Rows include Day 1-29, Sum., and Mean. Values include hours, percentages, and radiation in mw/cm².

DURATION OF BRIGHT SUNSHINE.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

503. Richmond (Kew Observatory) : h_s (Height of recorder above ground) = 13.3 metres.

July, 1928.

Hour. L.A.T.																					Total for Day.	Per cent. of Possible.	Radiation at Noon. Angström Pyrheliometer.		
	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Sky.	Total.			Vertical.		
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%		mw/cm ²	mw/cm ²
1	4	1.0	.9	.3	.5	.6	.7	.5	.8	.8	.7	.8	.4	.2	.2	...	...	...	8.8	53	...	...	...
2	...	3	4	...	...	.9	1.0	1.0	.4	.1	.1	.3	...	...	.3	.3	...	...	...	...	5.2	32	...	...	...
3	...	4	1.0	1.0	.7	.6	.8	1.0	.9	.2	...	...	...	...	...	...	...	...	...	...	6.6	40	Haze	60	53
46	1.0	1.0	1.0	1.0	1.0	1.0	.9	.8	...	.2	.5	...	...	...	...	...	...	9.0	55	Clear	78	69
51	.9	.9	.7	.9	.5	.8	.9	.9	.3	...	...	...	...	...	...	...	...	6.9	42	...	...	...
66	1.0	1.0	.8	.3	...	.1	...	...	...	...	.2	...	...	...	...	...	...	4.0	24	...	...	...
75	1.0	1.0	1.0	.6	.7	.3	.6	.7	.9	.9	.8	...	...	...	...	...	8.9	54	...	...	...
8	...	5	1.0	1.0	1.0	1.0	.1	.2	.2	1.0	.8	.4	...	.1	.9	.4	...	...	...	...	8.6	53	...	...	...
97	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	1.0	.5	.1	...	...	...	11.2	69	Clear	84	73
104	1.0	1.0	1.0	.6	1.0	1.0	1.0	1.0	1.0	.9	.4	...	...	...	...	...	...	10.3	63	Clear	84	73
11	...	4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.7	...	...	...	15.1	93	Clear	87	76
12	...	3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.6	...	...	...	14.9	92	Clear	83	72
13	...	6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	1.0	1.0	1.0	1.0	1.0	.7	...	...	...	15.2	94	Cirrus	72	63
14	...	5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.7	...	...	...	15.2	94	Clear	73	64
153	.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.7	...	...	...	13.5	84	...	...	...
16	...	2	1.0	1.0	1.0	1.0	1.0	1.0	.9	.6	...	...	...	.1	.9	.9	...	...	...	...	9.6	60	Clear	83	72
175	1.0	1.0	1.0	.6	.8	.4	1.0	1.0	1.0	1.0	1.0	1.0	.8	.9	...	...	...	12.1	75	...	...	...
189	1.0	1.0	1.0	1.0	1.0	.9	1.0	.9	1.0	1.0	.8	.9	.9	.1	...	...	...	13.4	84	...	...	...
191	.1	...	.7	.9	.8	.9	.9	1.0	1.0	1.0	1.0	.7	...	...	...	...	9.1	57	...	...	...
201	.5	.1	.2	.3	.5	.9	1.0	1.0	1.0	1.0	1.0	1.0	.7	...	...	...	...	9.3	58	...	...	...
218	.9	.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	...	...	...	...	13.5	85	...	...	...
22	...	1	.9	1.0	1.0	1.0	1.0	1.0	.9	.8	.7	.4	...	...	...	...	...	...	...	...	9.8	62	...	...	...
239	.9	.7	.3	.1	.4	.2	.1	.2	.4	.4	...	...	...	...	...	...	4.6	29	...	...	...
244	.2	.9	.9	1.0	1.0	1.0	.5	1.0	.5	...	.1	.2	...	...	...	...	7.7	49	...	...	...
253	...	.5	.3	.8	.3	.7	.9	.8	.4	.9	.9	.7	.3	...	...	...	7.8	50	...	...	...
26	1.0	1.0	.9	.3	...	...	...	.2	.9	1.0	.8	.7	.5	...	...	...	...	...	7.3	47	...	...	...
278	.9	...	...	...	...	...	...	...	...	...	...	...	...	...	1.7	11	...	...	...
283	.9	1.0	1.0	.9	.7	.8	.7	.8	1.0	1.0	1.0	1.0	.7	...	...	...	...	11.8	76	...	...	...
29	1.0	1.0	1.0	1.0	.9	.8	.9	.9	1.0	.9	.5	.6	.7	1.0	.4	...	...	...	12.6	81	...	...	...
30	...	2	.8	...	.7	.3	.4	.7	.7	.1	...	...	.1	...	...	...	...	...	...	...	4.0	26	...	...	...
311	.7	.7	.9	.2	...	...	...	...	...	...	...	...	...	...	2.6	17	...	...	...
Sum.	0.0	3.5	16.1	21.9	23.1	24.1	22.7	23.0	22.3	21.6	20.8	20.3	17.8	17.3	17.4	13.9	4.5	0.0	290.3	—	—	—	—	—	
Mean	0.00	0.11	0.52	0.71	0.75	0.78	0.73	0.74	0.72	0.70	0.67	0.65	0.57	0.56	0.56	0.45	0.15	0.00	9.36	58	—	—	—	—	

504. Richmond (Kew Observatory) : h_s = 13.3 metres.

August, 1928.

Hour. L.A.T.																					Total for Day.	Per cent. of Possible.	Radiation at Noon. Angström Pyrheliometer.		
	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8.	8 to 9.	9 to 10.	10 to 11.	11 to Noon	Noon to 13.	13 to 14.	14 to 15.	15 to 16.	16 to 17.	17 to 18.	18 to 19.	19 to 20.	20 to 21.	Sky.	Total.			Vertical.		
Day.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	hr.	%		mw/cm ²	mw/cm ²
11	...	.3	.6	.1	...	.3	.2	...	...	...	...	...	...	1.6	10	...	...	...
21	.8	.6	.5	.9	.8	.4	.7	...	...	...	...	5.6	37	...	...	...
3
4
53	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.5	...	...	...	...	12.8	84	...	...	...
64	.7	.9	1.0	.9	...	.9	.8	.3	...	...	...	...	...	...	...	...	5.9	39	...	...	...
73	...	.1	.1	.2	.6	.7	1.0	.8	.2	...	...	...	...	...	...	...	4.1	27	...	...	...
85	.8	1.0	.6	.9	.9	.8	.2	...	...	.6	.9	1.0	...	...	...	...	8.2	55	Clear	75	61
96	1.0	1.0	1.0	.9	.9	.9	.3	...	.3	...	.9	.9	...	...	...	...	...	8.9	60	...	...	...
104	1.0	.8	...	...	...	...	...	...	.2	...	...	...	...	...	...	...	...	2.4	16	...	...	...
112	.3	1.0	1.0	.9	.9	.8	1.0	1.0	1.0	.9	.9	.6	...	...	...	...	...	10.5	71	...	...	...
121	.7	.8	1.0	.5	1.0	.9	.9	.7	...	...	...	...	6.6	45	...	...	...
138	.9	.9	.8	1.0	.7	.2	...	.1	.8	...	.7	.1	...	...	...	...	...	7.0	48	...	...	...
147	.6	.8	1.0	.9	.9	.9	.7	.6	.8	.9	1.0	.9	.3	...	...	...	...	11.0	75	Clear	92	74
158	1.0	1.0	.9	1.0	.9	.9	.8	.7	.2	.2	.6	.6	.3	...	...	...	...	9.9	68	Clear	92	73
161	.6	1.0	.8	.5	.6	.7	.1	...	.3	.9	.1	.2	...	...	...	...	...	5.9	41	Clear	89	70
175	1.0	.3	.6	1.0	.9	.3	...	...	...	.1	.9	...	...	...	...	...	...	5.6	39	...	...	...
182	1.0	.9	1.0	.9	1.0	1.0	.9	.5	...	...	...	...	7.4	51	...	...	...
191	1.0	1.0	1.0	1.0	1.0	.9	.1	.1	.2	...	.3	.3	.2	...	...	...	...	7.2	50	...	...	...
206	.4	.6	.3	.9	1.0	.9	1.0	1.0	.3	.4	...	...	...	...	...	...	...	7.4	52	Clear	90	70
215	1.0	1.0	1.0	1.0	1.0	.5	...	...	...	.2	...	...	...	...	...	...	...	6.2	44	...	...	...
222	.8	.8	1.0	1.0	.8	.6	.2	...	...	...	...	...	...	...	...	...	...	5.4	38	...	...	...
233	...	...	...	.1	...	...	...	...	...	...	...	...	...	...	...	0.4	3	...	...	...
242	.6	.1	...	...	...	...	...	.5	.9	.9	...	...	...	...	...	...	3.2	23	...	...	...
252	.6	.6	.6	.9	1.0	1.0	.9	.4	.4	.3	.9	.5	...	...	...	...	...	8.3	59	...	...	...
269	.6	.3	.1	...	...	...	...	...	...	...	...	...	...	...	...	1.9	14	...	...	...
274	1.0	1.0	.9	.7	.4	.4	.9	.7	1.0	1.0	.8	.8	.1	...	...	...	...	10.1	73	...	...	...
284	1.0	.8	1.0	1.0	1.0	1.0	1.0	.9	.9	1.0	1.0	1.0	.4	...	...	...	...	12.4	90	Clear	85	64
294	1.0	1.0	1.0	1.0	1.0	.8	...	.1	...	.4	1.0	1.0	.3	...	...	...	...	9.0	66	...	...	...
306	.5	1.0	1.0	1.0	.9	1.0	1.0	1.0	1.0	.9	.3	...	...	...	...	...	10.2	75	Clear	75	55
31																									

For periods of sixty minutes, between the exact hours of Local Apparent Time.

505. Richmond (Kew Observatory) : h_s (Height of recorder above ground)=13.3 metres.

September, 1928.

Table for Richmond (Kew Observatory) in September 1928. Columns include Hour L.A.T., hours from 3 to 21, Total for Day, Per cent. of Possible, and Radiation at Noon (Sky, Total, Vertical) in mw/cm².

506. Richmond (Kew Observatory) : h_s =13.3 metres.

October, 1928.

Table for Richmond (Kew Observatory) in October 1928. Columns include Hour L.A.T., hours from 3 to 21, Total for Day, Per cent. of Possible, and Radiation at Noon (Sky, Total, Vertical) in mw/cm².

DURATION OF BRIGHT SUNSHINE.

For periods of sixty minutes, between the exact hours of Local Apparent Time.

507. Richmond (Kew Observatory) : h_s (Height of recorder above ground)=13.3 metres.

November, 1928.

Table with 22 columns (3 to 21 hours, Total for Day, Per cent. of Possible, Radiation at Noon) and 31 rows (Day 1 to 30, Sum, Mean). Includes weather notes like 'Slight Mist' and 'Slight Haze'.

December and Year, 1928.

508. Richmond (Kew Observatory) : h_s=13.3 metres.

Table with 22 columns (hr. 1 to 24, Total for Day, Per cent. of Possible, Radiation at Noon) and 31 rows (Day 1 to 31, Sum, Mean). Includes weather notes like 'Slight Haze', 'Mist', and 'Clear'.

Summary table with 12 columns (Annual Total, Annual Mean, Hour. L.A.T., Total for Day, Per cent. of Possible, Radiation at Noon) and 4 rows.

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°). Speed in metres per second.

509. Richmond (Kew Observatory) :

H_a (height of vane of anemograph above M.S.L.) = Height of ground above

Dines Anemograph from Jan., 1926.

Hour. G.M.T.	1.		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		Noon.	
Day.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.
1	—	0.2	—	0.3	—	0.5	—	0.2	—	0.0	—	0.1	—	0.1	—	0.1	—	0.1	160	1.9	—	0.2	—	0.2
2	175	7.0	175	6.3	175	6.8	175	7.1	180	7.4	175	8.1	180	8.0	180	7.6	185	7.9	180	8.2	180	8.1	180	7.1
3	—	0.6	—	0.1	—	0.1	—	1.4	—	0.2	250	1.8	205	2.0	—	1.5	280	3.0	310	2.5	320	2.9	325	2.5
4	255	2.9	245	2.7	235	2.4	230	2.8	220	2.6	225	3.7	220	4.6	220	4.6	230	5.6	220	5.4	225	6.9	220	7.0
5	290	5.4	260	3.6	260	4.1	260	4.0	275	4.2	270	4.2	260	4.7	260	4.5	255	4.8	265	5.5	265	5.9	275	6.5
6	220	6.4	215	7.3	215	7.8	220	8.1	225	8.0	230	7.9	235	6.5	250	7.1	250	8.1	250	9.0	255	10.5	260	11.5
7	205	2.6	205	2.4	—	1.2	195	1.8	190	2.2	200	3.0	185	2.5	195	3.7	200	6.3	205	5.6	210	6.4	220	5.5
8	230	6.9	225	6.3	230	6.6	240	6.4	245	5.7	250	5.5	245	4.5	260	4.8	250	4.1	255	4.9	255	5.5	260	5.9
9	230	1.9	235	2.0	210	3.0	210	3.5	220	3.5	210	3.1	215	3.9	220	3.6	210	4.8	220	4.5	205	4.1	220	6.1
10	220	4.1	215	4.0	220	4.9	210	4.6	200	4.0	190	3.5	195	4.0	195	4.3	200	7.3	205	7.8	205	8.6	205	9.5
11	220	5.2	230	4.6	235	3.7	225	3.6	230	3.8	230	3.2	225	3.4	225	2.7	230	2.9	225	2.6	220	2.8	230	3.1
12	220	2.3	230	1.9	—	0.7	—	1.1	205	1.9	200	2.9	195	3.9	195	4.5	205	5.1	210	5.3	210	6.1	205	7.1
13	220	8.7	225	6.6	230	5.9	250	6.2	240	4.1	235	5.0	245	5.5	245	5.8	235	5.4	225	5.5	230	6.2	235	6.8
14	220	4.8	225	5.0	230	3.7	225	3.1	210	3.7	200	2.9	195	2.4	200	2.2	190	4.2	185	3.6	190	5.7	195	6.1
15	220	3.6	215	3.4	220	3.8	210	4.0	210	4.0	210	4.1	210	3.6	200	5.0	200	5.3	210	5.3	215	6.4	215	6.5
16	200	7.3	200	6.9	200	5.9	200	6.5	205	6.5	210	6.5	215	4.7	215	4.5	215	6.0	225	5.4	245	6.1	260	5.5
17	240	3.1	250	3.6	245	2.9	235	1.6	—	1.3	—	0.8	200	2.0	200	1.9	—	1.5	—	1.4	255	2.0	255	2.1
18	—	0.1	—	0.0	—	0.0	—	0.1	—	0.0	—	0.2	—	1.3	90	2.0	85	2.5	105	1.7	135	3.7	140	4.2
19	285	6.2	295	6.4	300	3.6	275	2.8	270	4.3	270	4.9	270	4.8	275	5.0	270	5.4	285	6.6	280	6.7	280	6.6
20	—	0.5	—	0.5	—	0.7	—	0.5	—	0.7	—	1.5	—	1.5	180	2.2	185	2.6	190	3.9	190	4.2	205	5.0
21	—	1.4	210	3.1	215	3.1	210	3.3	190	3.5	195	4.4	200	5.0	205	5.3	210	6.3	205	7.0	205	6.9	205	6.9
22	170	6.1	175	6.5	180	5.7	180	4.6	190	4.5	255	5.0	305	6.0	305	5.6	290	5.5	290	3.5	290	4.5	290	5.4
23	225	3.1	215	2.5	225	2.1	240	2.1	225	2.1	—	0.9	—	1.3	210	2.1	210	1.6	—	0.0	—	1.5	190	3.5
24	205	7.4	200	6.6	210	7.6	210	8.5	205	7.1	210	9.1	205	8.8	210	9.5	210	9.6	215	8.4	220	7.5	245	7.1
25	235	7.0	235	5.5	240	6.3	230	6.2	235	6.5	240	6.0	235	5.6	230	5.1	225	4.5	240	5.9	240	5.9	230	5.9
26	235	6.8	220	7.3	230	5.0	220	4.0	215	3.6	210	4.9	190	3.1	190	4.1	195	5.5	205	5.9	205	5.0	205	7.1
27	230	2.8	220	3.6	210	3.4	210	4.7	215	5.0	210	4.9	225	4.1	240	4.1	255	3.5	280	3.1	335	4.0	340	4.3
28	—	1.0	200	2.0	215	2.0	205	2.0	—	1.5	—	1.0	—	1.1	190	2.4	200	3.6	200	4.6	200	5.3	195	5.6
29	180	2.9	180	3.5	180	4.4	180	4.3	180	4.6	175	4.6	175	5.5	175	6.0	170	6.9	170	7.4	175	9.4	175	7.3
30	190	2.1	210	1.9	260	2.5	305	2.4	295	1.9	310	1.9	—	1.5	—	1.5	255	1.6	—	1.5	270	2.5	275	2.9
31	—	1.3	235	1.9	—	0.8	—	1.3	—	0.6	—	0.8	—	1.0	—	0.8	—	0.9	235	1.6	220	2.0	220	3.1
Mean ...	—	3.9	—	3.8	—	3.6	—	3.6	—	3.5	—	3.8	—	3.8	—	4.0	—	4.6	—	4.7	—	5.3	—	5.6

510. Richmond (Kew Observatory) : H_a = 5 metres + 20 metres.

1	220	7.5	230	6.6	220	8.3	230	7.6	240	6.4	245	7.2	245	7.0	250	6.0	250	6.1	255	6.5	250	6.4	245	8.0
2	240	3.4	235	3.6	225	3.8	230	3.8	225	4.1	225	4.5	225	5.0	225	6.0	225	6.0	225	5.6	225	6.8	225	7.9
3	235	3.1	245	3.4	245	3.1	220	3.3	225	2.6	225	4.0	220	2.8	240	3.3	240	3.4	260	4.5	280	4.7	285	5.5
4	230	2.4	215	2.5	215	2.2	—	1.5	200	1.6	—	1.1	—	1.1	180	1.9	195	3.2	195	4.5	195	5.1	200	6.5
5	220	8.4	220	9.0	220	8.6	220	8.8	220	9.4	215	9.8	210	9.1	210	9.7	205	9.1	210	9.0	245	8.0	240	4.8
6	215	2.4	230	2.5	240	3.3	245	3.3	250	2.6	240	2.0	245	2.5	240	2.6	235	2.6	245	3.4	255	4.4	265	4.5
7	225	2.7	230	3.7	225	3.9	220	3.3	215	4.0	215	5.3	210	4.9	215	5.7	225	6.6	240	6.6	245	7.1	240	6.6
8	240	6.6	240	5.7	240	5.2	240	5.8	240	5.0	235	4.5	230	4.7	230	5.4	230	5.9	225	5.7	230	5.7	235	6.9
9	225	10.5	225	10.2	230	9.1	230	8.7	230	7.9	245	6.4	270	5.5	290	5.0	280	4.1	260	3.8	255	4.5	265	5.4
10	225	2.4	220	2.0	215	2.0	215	2.5	210	2.1	200	2.6	175	2.6	190	1.6	190	2.6	190	3.9	190	5.8	205	6.6
11	250	11.1	255	12.0	255	11.3	255	10.2	260	10.5	255	10.0	255	10.5	255	10.6	255	11.4	260	11.9	265	12.3	265	12.0
12	290	4.3	300	5.2	290	5.1	290	4.3	285	4.5	295	5.5	285	3.5	260	3.4	250	4.4	255	4.6	250	4.7	255	5.1
13	230	1.9	—	1.5	—	1.5	—	1.1	—	1.0	—	—	—	1.3	165	2.7	170	2.5	165	4.2	180	5.0	220	5.1
14	240	2.9	240	3.0	230	3.1	230	3.0	235	3.1	220	3.4	230	3.6	230	3.5	230	2.9	235	4.9	230	5.1	230	4.2
15	250	5.0	245	5.0	250	3.9	255	5.4	240	4.4	235	4.5	240	4.5	250	6.4	250	7.0	245	7.0	250	7.7	240	7.3
16	230	7.7	230	7.4	235	6.9	230	6.4	235	6.6	230	7.1	230	8.6	230	9.6	225	11.2	225	10.9	225	9.5	225	9.0
17	245	8.1	260	7.6	265	8.1	265	8.1	270	8.2	270	7.7	265	6.9	265	7.1	270	8.1	275	7.8	280	9.5	285	8.7
18	255	3.5	240	2.4	235	2.7	230	2.1	230	2.1	230	1.9	210	2.0	220	2.3	—	1.5	235	2.0	255	3.3	260	3.5
19	250	1.9	250	2.0	250	2.3	250	2.0	250	1.8	230	2.1	230	2.0	235	1.7	—	1.5	265	2.5	275	3.0	270	2.1
20	—	0.8	—	0.5	—	0.2	—	0.3	—	0.3	—	0.4	—	0.1	—	0.4	—	0.3	—	0.1	—	0.3	—	0.9
21	130	1.6	—	1.4	—	1.0	—	1.0	—	1.0	—	1.1	—	0.7	—	1.5	—	0.6	175	2.2	195	3.3	180	3.7
22	—	0.0	—	0.3	—	0.4	—	0.5	—	0.5	—	0.0	—	0.7	—	0.1	—	0.3	—	—	—	0.3	—	1.0
23	—	0.2	—	0.0	—	0.1	—	0.1	95	1.9	105	1.8	75	2.6	40	1.9	60	2.0	70	2.5	80	3.0	90	4.0
24	105	5.0	100	4.9	80	6.5	90	6.0	85	7.3	80	6.5	80	6.1	85	5.2	90	6.5	90	6.2	95	6.0	80	5.5
25	100	4.0	90	3.8	95	3.0	95	3.8	85	2.9	85	2.9	90	2.0	—	1.3	—	1.5	85	1.6	55	2.0	—	1.4
26	85	1.6	85	2.8	70	2.0	65	1.6	75	2.8	70	1.9	65	1.8	—	1.5	80	3.3	90	3.5	85	2.4	140	4.1
27	—	0.9	75	2.2	—	1.																		

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 5 metres + 20 metres.

January, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day.	
°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.			
160	1.8	170	3.2	150	1.6	150	2.4	150	3.1	160	4.1	160	3.6	165	4.2	165	5.1	170	5.6	175	5.5	175	6.0	2.0	1	
185	6.6	185	6.0	190	5.0	190	4.1	190	3.2	—	0.6	325	1.7	325	2.4	320	2.4	320	1.9	320	2.1	—	1.4	5.4	2	
230	2.5	330	2.0	335	1.6	—	—	—	0.7	—	1.5	320	1.9	320	1.8	—	1.4	—	0.9	—	0.2	260	2.3	1.5	3	
230	7.0	230	7.2	230	7.2	235	6.8	235	6.9	250	8.2	250	6.9	250	6.5	245	6.7	250	5.1	260	6.0	265	3.9	5.4	4	
270	6.1	275	6.0	260	4.0	245	3.0	235	3.6	235	4.4	240	4.4	230	3.2	245	4.4	230	4.2	220	5.4	220	5.6	4.6	5	
270	12.1	275	12.5	280	12.0	285	11.0	290	9.1	310	7.2	305	7.2	320	3.5	290	3.0	280	3.2	240	1.9	225	2.3	7.7	6	
230	5.3	225	5.0	225	6.0	235	4.9	225	6.5	225	6.8	230	6.6	230	6.2	230	5.6	230	5.7	220	7.3	230	6.9	4.7	7	
255	4.6	255	5.3	255	4.9	240	3.5	235	3.5	230	3.9	230	4.0	225	3.6	220	3.6	220	3.9	230	3.2	220	2.9	4.8	8	
210	7.0	210	7.0	220	7.7	220	7.9	220	6.4	240	4.4	245	4.1	255	4.9	255	4.0	230	2.3	210	3.0	225	3.7	4.4	9	
215	10.3	220	11.0	215	11.1	230	8.7	245	6.0	245	5.2	240	5.0	240	5.2	230	5.5	240	5.0	235	4.5	230	4.7	6.2	10	
270	3.5	265	3.1	270	2.2	280	2.6	270	2.1	260	1.6	215	1.6	215	2.5	230	2.4	220	2.1	215	2.0	220	2.6	3.0	11	
205	7.4	210	8.5	210	8.5	205	8.3	210	9.0	205	10.0	205	9.3	210	10.1	215	10.5	210	10.9	220	10.6	220	9.5	6.3	12	
235	7.3	225	6.6	240	6.6	235	6.4	240	7.1	235	6.5	235	5.4	230	4.9	230	4.8	225	4.8	230	4.9	220	5.6	6.0	13	
190	6.8	185	8.1	190	7.9	185	7.1	180	7.3	185	7.0	190	5.7	195	5.1	215	4.4	240	4.2	230	3.5	225	2.6	4.9	14	
210	7.0	210	7.2	210	7.4	200	6.5	195	6.5	195	6.8	200	7.5	200	8.2	200	8.7	200	8.9	230	7.6	200	6.7	5.9	15	
270	5.4	280	6.4	285	7.0	285	5.5	285	5.0	290	4.9	270	3.5	260	3.3	240	2.4	245	2.6	255	4.3	250	3.1	5.3	16	
250	2.3	260	2.0	265	2.0	—	0.3	—	0.1	—	0.1	—	0.0	—	0.0	—	0.0	—	0.0	—	0.0	—	0.0	1.4	17	
140	4.4	130	4.3	125	4.0	120	3.6	120	3.3	125	3.7	150	4.7	160	5.0	165	4.7	170	4.2	180	3.9	220	3.6	2.6	18	
280	7.0	285	6.1	280	6.0	275	4.1	270	3.5	265	2.9	220	2.0	220	2.4	210	2.1	210	1.9	200	1.9	—	1.4	4.4	19	
210	5.1	210	4.5	200	5.3	210	5.1	215	4.2	210	3.9	210	3.6	220	2.8	210	2.5	210	2.5	200	2.3	190	1.6	2.8	20	
200	6.9	205	6.7	200	6.1	205	7.0	205	7.5	195	7.0	190	6.9	190	8.0	190	8.1	185	8.0	180	7.5	175	7.1	5.8	21	
295	6.1	300	5.5	305	5.9	295	5.5	290	4.1	275	3.0	265	2.8	265	2.9	255	3.0	270	3.2	270	3.2	250	2.9	4.7	22	
190	4.6	200	5.5	200	7.0	200	7.1	195	6.2	195	7.4	195	7.5	200	7.8	195	8.2	195	8.1	200	8.4	200	8.5	4.4	23	
240	8.4	250	9.0	240	6.9	255	7.6	245	6.6	250	8.6	250	8.7	240	6.7	240	7.6	240	7.2	240	7.1	235	7.0	7.9	24	
230	6.5	225	6.3	210	6.7	210	8.8	215	9.1	215	9.4	210	9.0	215	11.5	220	11.6	220	12.9	225	12.0	245	6.6	7.5	25	
210	7.0	200	5.9	200	6.5	200	7.0	210	7.6	210	5.2	225	5.3	240	4.0	255	4.0	255	4.5	260	3.9	250	2.1	5.3	26	
340	3.5	345	4.5	340	2.5	—	1.0	—	0.5	—	0.5	—	1.1	—	0.9	—	1.5	—	1.2	—	0.7	—	1.5	2.8	27	
200	7.0	200	7.6	200	8.1	200	8.0	205	8.2	205	7.9	205	6.1	220	4.2	205	3.5	205	3.0	200	2.3	185	2.7	4.2	28	
170	8.8	175	7.7	175	7.0	175	5.5	175	5.9	180	4.6	185	5.0	185	5.7	190	5.2	190	4.1	185	3.9	190	3.0	5.5	29	
280	3.4	255	3.5	255	2.6	250	1.9	—	1.5	190	1.9	200	2.0	195	1.9	200	2.3	205	1.9	—	1.5	—	1.1	2.1	30	
205	4.1	215	5.5	200	4.5	200	5.2	200	5.7	200	6.4	200	7.7	205	8.6	205	8.3	210	7.6	210	7.1	220	7.1	3.8	31	
—	6.0	—	6.1	—	5.9	—	5.4	—	5.2	—	5.0	—	4.9	—	4.8	—	4.8	—	4.8	—	4.6	—	4.4	—	4.6	—

February, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day.
°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.		
255	8.3	260	8.1	265	7.5	260	5.1	245	3.6	240	2.9	240	4.1	245	2.9	245	3.0	260	3.0	235	2.9	240	3.5	5.8	1
215	8.4	210	7.7	210	7.6	200	8.5	200	9.7	205	12.6	230	11.0	210	5.1	220	5.5	230	5.0	230	3.7	230	3.8	6.2	2
295	6.5	300	5.7	295	5.0	280	3.0	295	2.0	270	2.3	—	1.2	265	1.9	260	1.6	250	2.0	240	2.0	230	2.5	3.3	3
205	7.5	200	6.7	200	7.2	200	6.1	205	7.0	210	5.9	205	6.5	215	7.5	220	7.6	220	8.1	220	8.5	220	7.9	4.9	4
230	4.2	250	4.8	275	3.9	275	3.0	275	3.5	260	3.5	270	3.1	260	1.9	265	2.0	—	1.5	240	2.7	230	3.0	5.9	5
265	5.4	265	5.0	270	4.9	270	3.9	250	3.1	245	3.2	235	2.9	245	3.0	230	3.4	235	3.0	230	3.8	230	3.0	3.4	6
235	7.5	235	7.1	240	6.9	240	7.3	240	6.7	235	6.3	230	6.4	230	7.0	230	6.3	235	6.5	235	6.7	240	6.8	5.8	7
235	7.2	230	7.1	230	7.5	220	7.5	225	7.5	230	7.5	225	8.5	225	8.9	225	9.6	230	8.9	230	9.5	225	10.0	6.9	8
260	6.6	260	5.9	260	5.8	255	5.0	250	4.9	250	4.4	245	3.4	250	2.7	235	2.9	225	2.4	225	2.4	225	3.1	5.6	9
220	8.0	215	9.5	220	11.1	230	10.5	275	5.9	235	5.7	240	5.7	235	6.4	240	7.4	230	8.4	230	10.9	240	10.4	5.5	10
265	11.2	265	11.1	265	11.0	260	9.9	265	8.6	270	8.2	275	7.8	280	8.0	290	6.8	285	5.2	280	4.6	280	4.0	9.7	11
255	4.9	255	5.2	245	4.5	235	4.3	215	3.5	190	2.4	175	1.6	—	1.5	—	1.2	—	0.3	—	0.4	230	1.6	3.6	12
255	5.6	270	7.0	275	6.2	290	5.7	300	4.9	265	2.0	220	3.4	230	4.0	245	3.5	235	3.5	240	3.4	240	3.2	3.4	13
240	4.9	220	4.7	215	4.3	200	2.2	200	2.6	210	4.0	230	4.5	240	4.1	240	4.5	245	5.0	250	4.9	250	4.5	3.8	14
240	6.8	240	6.9	240	6.9	235	6.5	235	6.5	230	7.0	230	5.6	235	5.8	235	6.5	235	6.1	235	6.1	235	6.5	6.0	15
225	8.6	230	7.9	235	7.6	230	7.6	230	7.8	225	7.6	250	8.4	260	6.9	250	7.6	250	7.2	240	6.6	235	7.3	8.0	16
285	7.8	285	8.1	285	7.9	280	6.3	270	5.3	245	3.8	250	5.1	250	4.8	255	4.9	260	4.5	255	3.5	260	4.1	6.8	17
280	3.7	265	4.0	265	4.3	275	4.6	265	3.9	265	2.5	230	2.1	225	2.3	230	2.4	220	2.5	250	2.8	240	2.5	2.8	18
265	2.0	—	1.5	255	1.6	—	1.0	—	1.0	—	0.8	—	0.6	—	0.5	—	0.9	—	1.5	—	1.0	—	1.0	1.6	19
—	1.3	185	2.5	—	1.5	170	1.7	160	2.4	160	2.0	—	1.5	125	1.9	130	1.6	130	1.6	—	0.5	—	0.5	1.0	20
170	4.0	190	3.0	195	2.9	205	3.0	210	2.6	195	2.4	—	1.4	—	1.1	—	0.6	—	0.9	—	0.5	—	0.0	1.7	21
—	0.4	—	0.1	—	0.3	—	1.1	—	1.5	—	1.1	30	1.9	30	2.5	35	1.8	—	0.9	—	1.4	—	1.5	0.8	22
90	3.9	85																							

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°) : Speed in metres per second.

511. Richmond (Kew Observatory) :

H_a (height of vane of anemograph above M.S.L.)=Height of ground above

Dines Anemograph from Jan., 1926.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed in m/s and direction in degrees.

512. Richmond (Kew Observatory) : H_a = 5 metres + 20 metres.

Table with 23 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains wind speed in m/s and direction in degrees.

WIND: DIRECTION AND SPEED.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 5 metres + 20 metres.

March, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day.
m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°
170	4.9	180	4.0	185	2.9	180	2.5	—	1.1	180	2.0	185	1.9	175	2.4	180	2.2	—	1.5	190	1.7	—	0.5	3.0	1
130	6.3	120	4.8	115	4.5	120	4.1	125	3.6	110	2.9	90	3.1	90	3.1	90	2.4	—	0.4	—	0.4	—	0.5	2.6	2
140	3.9	155	3.8	150	3.6	170	3.1	130	2.5	—	1.5	—	1.3	—	1.1	75	1.9	80	2.9	80	3.1	90	2.0	1.9	3
145	3.6	170	3.5	175	3.6	130	3.4	175	2.9	—	1.1	—	1.4	—	0.5	—	1.2	105	1.6	—	1.3	90	1.7	1.9	4
—	1.5	245	2.1	225	2.1	230	2.0	220	2.9	215	3.0	205	2.5	210	1.8	—	1.3	190	1.9	—	1.0	—	0.5	1.3	5
15	2.8	30	3.8	35	2.4	30	1.6	—	1.5	40	2.0	—	1.5	45	2.6	40	2.0	—	1.3	100	1.9	115	2.1	2.1	6
—	0.8	—	0.8	—	1.4	—	0.2	—	0.1	—	0.2	—	0.8	—	0.9	—	0.7	—	0.5	—	1.1	20	3.4	0.9	7
35	5.0	53	4.7	30	4.4	35	5.9	35	5.9	45	5.3	40	4.3	50	5.0	35	4.0	35	4.3	25	3.4	50	3.1	4.0	8
100	5.2	50	3.4	35	3.1	40	4.5	45	3.4	50	3.5	40	4.0	50	5.9	45	4.9	40	4.1	20	3.1	20	3.2	4.0	9
35	6.4	20	6.0	40	6.9	50	6.2	20	6.0	15	4.0	15	3.5	5	3.3	5	3.0	5	3.5	5	3.4	5	2.9	4.7	10
360	3.2	350	3.4	340	2.9	340	2.4	25	3.5	—	1.2	—	0.9	—	1.4	—	1.0	—	1.5	—	1.5	360	2.4	2.8	11
155	2.9	135	4.0	115	3.5	150	2.0	160	2.0	135	2.5	120	2.4	110	3.0	115	2.1	110	1.6	—	0.7	—	1.5	1.7	12
5	3.3	360	3.4	345	2.9	345	3.0	350	2.8	335	2.2	—	1.3	320	1.6	335	1.9	345	1.6	—	0.5	—	0.5	2.1	13
—	0.2	—	0.1	—	1.5	75	2.9	90	3.1	120	2.8	115	3.0	120	2.1	120	3.0	115	2.1	120	2.3	115	2.1	1.5	14
155	3.1	140	3.5	120	3.0	125	3.4	135	3.3	140	2.9	130	2.4	115	2.0	105	1.9	105	1.8	—	1.5	—	0.8	2.2	15
175	6.5	175	6.3	165	6.4	175	5.4	160	4.5	145	4.5	150	4.7	150	5.0	150	4.5	160	3.7	165	4.2	170	5.2	3.9	16
105	6.5	165	5.5	155	6.4	155	6.2	145	6.1	130	4.9	140	5.1	130	4.4	130	3.0	125	3.0	130	0.1	160	7.1	5.1	17
210	5.8	210	7.3	210	7.5	210	5.9	210	5.1	185	4.5	185	4.3	180	3.6	175	2.9	150	1.9	—	1.5	160	2.0	4.8	18
175	5.5	170	4.5	160	4.9	160	4.6	140	4.4	150	3.6	145	4.6	150	4.6	150	4.5	160	4.3	160	5.0	150	5.0	4.2	19
140	9.5	135	9.6	130	9.5	140	9.0	135	8.5	125	7.9	120	6.9	115	6.5	120	6.9	125	7.5	125	7.1	110	5.8	6.8	20
105	7.1	100	7.0	100	6.4	100	6.9	100	6.1	100	6.1	90	5.9	95	5.6	100	5.7	110	3.2	165	2.4	190	3.6	5.6	21
175	5.0	180	4.9	180	4.7	180	4.4	170	3.9	150	3.3	125	3.9	120	4.9	120	4.5	140	6.0	130	5.0	140	5.0	4.3	22
190	7.4	105	6.9	200	7.8	205	7.4	210	7.4	195	4.8	195	4.6	190	3.7	180	3.4	185	3.7	180	2.5	175	2.6	5.4	23
200	3.4	220	2.6	180	2.7	200	1.6	210	5.0	200	2.8	—	1.5	175	1.9	—	0.5	—	0.1	—	0.6	—	0.1	2.6	24
330	4.1	330	4.3	330	4.5	325	4.3	320	3.9	315	3.3	320	3.0	305	2.1	310	2.4	325	2.5	320	3.0	310	2.0	2.3	25
310	2.2	330	2.0	285	2.4	270	3.0	255	2.3	235	2.0	230	3.5	225	3.1	230	2.6	215	2.7	210	2.1	205	2.5	2.3	26
185	4.3	200	3.7	225	3.1	275	2.5	280	1.7	—	1.5	235	1.7	235	2.6	260	2.3	250	2.5	245	2.0	250	1.6	3.1	27
270	4.0	260	3.7	280	4.1	300	2.9	280	5.1	260	2.6	270	2.5	245	2.1	240	2.4	255	2.0	—	1.5	215	2.1	2.5	28
185	9.2	190	7.2	195	6.1	205	7.1	215	8.2	215	8.9	215	10.2	215	10.5	230	8.7	240	5.8	235	5.6	250	4.0	6.0	29
210	8.0	235	6.7	205	5.3	210	4.5	210	7.0	210	6.7	205	6.2	200	5.3	200	4.4	190	4.3	190	3.7	180	3.3	6.1	30
120	6.3	115	5.8	145	5.0	135	2.0	100	3.5	90	2.5	85	4.4	85	4.0	70	2.9	55	3.5	50	3.9	45	4.5	4.1	31
—	4.8	—	4.5	—	4.4	—	4.0	—	4.1	—	3.5	—	3.5	—	3.4	—	3.1	—	2.8	—	2.7	—	2.7	3.4	—

April, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day.
m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°
15	5.5	15	5.4	20	5.2	20	4.3	15	4.2	10	2.6	15	2.8	15	2.0	5	2.0	360	2.3	360	2.6	355	3.6	4.2	1
340	1.8	285	1.6	280	2.5	270	2.4	280	2.1	—	1.4	—	0.7	—	1.1	200	2.1	210	1.6	220	2.3	—	1.1	1.7	2
205	7.0	205	7.1	210	7.6	215	7.2	230	5.5	240	3.4	240	3.1	240	2.7	245	2.1	235	1.8	230	2.1	240	3.2	4.3	3
275	3.7	270	3.9	270	4.2	270	4.5	305	3.6	260	3.4	245	3.1	235	2.6	245	2.7	235	3.0	240	2.2	240	2.1	3.1	4
225	5.0	225	5.0	215	5.9	225	5.2	225	4.1	240	4.1	260	2.4	240	2.0	230	1.9	240	1.8	—	1.5	—	1.0	3.1	5
185	2.5	180	2.9	190	3.0	190	3.1	190	4.1	190	4.4	180	3.0	160	2.5	150	2.0	—	1.3	—	0.7	—	0.8	1.8	6
90	7.7	90	9.5	90	10.0	95	8.6	90	7.7	95	7.0	90	6.6	85	4.9	100	3.7	105	3.5	120	4.8	120	5.2	4.9	7
190	5.0	190	5.0	190	4.9	185	5.3	170	5.0	160	3.6	145	4.1	125	3.5	125	4.1	130	4.5	145	4.9	145	5.1	4.3	8
170	7.5	170	8.6	175	8.9	165	7.6	155	6.9	145	6.4	145	6.2	140	6.1	140	6.1	145	5.3	150	5.0	150	4.2	5.3	9
195	6.9	201	5.7	185	3.3	200	3.5	200	2.6	190	1.9	—	1.5	—	1.4	—	1.1	—	1.3	—	1.3	185	1.6	4.1	10
170	4.7	170	5.5	170	4.3	150	4.4	170	2.3	125	3.0	80	4.8	80	3.0	60	3.4	60	2.5	65	1.6	—	0.9	3.4	11
—	0.3	95	3.9	115	2.3	—	1.1	—	1.0	—	0.8	—	0.7	50	1.8	100	1.6	100	2.1	100	2.1	90	3.1	1.7	12
105	3.1	80	3.8	85	3.0	80	5.3	90	5.2	90	5.9	80	6.1	80	5.9	80	5.9	85	5.2	90	5.6	90	6.0	4.0	13
80	10.5	85	10.9	80	10.5	80	10.1	70	11.0	75	11.6	75	11.8	80	11.6	75	10.6	70	10.8	80	11.6	75	11.6	9.7	14
55	5.7	55	6.2	50	7.1	60	6.9	60	7.3	60	8.0	45	7.3	45	6.9	50	6.5	40	6.5	40	5.8	50	6.3	7.7	15
20	7.5	20	7.4	15	6.8	10	6.6	5	7.1	5	6.8	5	5.5	5	4.3	360	3.7	360	4.4	360	4.1	350	3.5	6.0	16
345	3.6	360	3.7	330	3.4	25	3.1	25	3.4	35	2.4	—	1.1	—	0.0	40	4.0	50	3.7	50	2.4	—	0.5	2.6	17
270	3.4	275	3.5	260	4.0	255	4.1	265	4.5	310	5.3	270	2.4	230	2.5	225	2.8	265	2.3	275	2.8	270	2.4	2.3	18
295	6.6	295	6.8	310	5.5	315	6.6	340	5.3	325	5.2	345	3.4	325	4.2	320	2.4	305	2.1	305	1.8	270	1.6	3.8	19
290	5.2	285	4.2	280	4.5	305	3.6	300	3.9	320	4.0	320	3.3	310	2.4	295	2.0	300	2.0	285	1.8	—	1.1	3.0	20
215	6.0	130	2.9	75	3.4	—	1.5	—	1.5	—	0.3	—	0.5	10	1.8	5	2.5	10	3.2	10	3.0	360	2.6	2.3	21
5	4.4	355	3.4	335	3.5	340	2.8	360	3.5	—	0.2	—	0.5	—	0.9	—	1.0	—	0.9	—	0.7	—	1.1	2.5	22
230	6.1	230	6.7	225	6.6	225	6.3	225	5.2	225	5.2	220	5.5	250	4.9	200	4.1	200	3.9	200	4.4	200	3.5	4.4	23
175	6.1	170																							

Direction expressed in degrees from North (E=90°, S=180°, W=270°, N=360°) : Speed in metres per second.

513. Richmond (Kew Observatory) :

H_a (height of vane of anemograph above M.S.L.)=Height of ground above

Dines Anemograph from Jan., 1926.

Hour. G.M.T.	1.		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		Noon.	
Day.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.
1	270	1.8	—	1.1	—	1.0	—	1.4	—	1.1	—	1.1	260	1.7	260	2.5	280	2.4	290	2.2	305	1.6	290	1.6
2	—	1.0	—	0.9	—	1.3	30	2.5	25	2.0	20	2.4	20	2.2	20	2.1	30	2.4	60	2.5	80	2.5	110	2.5
3	10	2.0	15	2.4	15	2.4	—	1.4	15	2.1	15	2.0	15	2.1	30	2.3	—	1.3	—	1.5	—	0.6	—	0.0
4	55	3.9	60	4.5	60	4.0	60	4.0	55	4.0	55	3.9	65	5.0	65	5.5	55	5.5	55	6.5	65	6.5	75	7.9
5	65	3.9	75	5.0	70	3.5	70	2.5	80	1.8	—	1.5	80	2.4	60	2.0	45	3.0	85	4.0	85	7.0	80	7.9
6	50	3.9	35	2.5	15	2.6	15	2.7	20	1.7	10	2.5	10	2.1	20	1.9	40	2.6	45	5.0	25	4.1	20	3.1
7	—	0.6	—	0.6	—	0.5	—	0.5	—	0.6	—	0.9	30	3.5	35	3.8	60	5.0	60	5.1	50	5.0	65	5.7
8	20	3.1	10	2.7	345	2.1	—	1.5	—	1.1	—	1.5	—	0.5	—	1.1	—	1.3	—	1.2	280	1.9	275	1.9
9	320	2.1	320	2.0	—	1.5	—	1.3	—	1.4	310	2.0	335	3.3	340	4.1	340	4.3	335	3.9	330	4.4	330	4.5
10	330	1.7	—	0.8	—	0.6	—	0.7	—	0.5	—	0.1	—	0.2	—	0.3	—	0.8	325	1.8	315	2.5	345	2.5
11	15	3.5	40	5.5	40	5.0	45	4.2	25	3.0	25	2.2	35	3.5	25	4.5	60	4.5	35	3.4	25	3.0	25	2.2
12	225	2.5	220	2.5	230	2.9	220	2.3	235	1.8	235	1.6	205	2.4	275	2.1	300	3.0	310	3.5	310	2.5	320	2.6
13	—	0.3	—	0.0	—	0.1	—	0.2	—	0.1	—	0.2	—	0.0	—	0.0	—	0.4	—	1.1	330	1.6	—	1.5
14	—	0.1	—	0.3	—	0.1	—	0.0	—	0.0	—	0.0	—	0.3	50	1.8	—	1.0	10	1.7	30	2.7	20	5.4
15	350	1.7	—	1.1	—	1.4	325	1.8	—	1.5	—	0.2	—	1.5	5	2.5	340	2.2	310	2.4	305	1.9	—	1.5
16	290	3.5	295	4.1	290	4.2	300	4.5	5	2.5	—	1.5	—	1.5	350	3.5	345	4.6	340	4.1	340	4.9	340	4.5
17	330	2.3	310	2.1	320	2.3	320	2.5	320	1.9	320	2.4	320	2.5	320	2.1	—	1.2	270	2.6	235	2.6	230	4.4
18	70	4.5	45	3.7	60	3.9	50	5.6	40	5.3	35	6.1	25	6.3	20	6.2	40	7.6	40	5.3	25	3.0	75	2.4
19	—	0.8	—	0.4	—	0.3	—	1.0	—	0.7	—	0.8	—	0.7	210	2.0	210	2.9	215	2.0	220	2.9	170	4.2
20	—	1.3	—	0.3	—	0.4	—	0.1	—	0.5	—	0.5	—	0.5	—	0.5	—	0.1	—	0.4	—	0.7	—	0.6
21	15	2.2	25	1.9	20	2.6	20	3.1	25	2.8	20	3.5	25	4.1	30	5.4	35	5.3	25	5.8	20	5.5	60	4.5
22	15	6.1	15	6.4	20	6.1	20	5.8	15	6.5	15	6.9	20	7.2	15	6.4	10	7.5	20	7.4	15	6.4	360	5.4
23	290	1.7	275	2.0	—	1.5	265	1.6	280	2.5	280	2.5	290	2.7	280	2.9	290	3.0	295	2.9	300	3.5	300	3.1
24	260	1.9	255	1.8	260	2.5	260	2.3	260	2.4	270	1.9	280	2.1	290	2.1	310	1.9	335	2.2	—	1.5	—	1.5
25	—	0.5	—	1.0	—	0.9	70	1.6	—	1.2	—	1.5	—	0.5	—	0.5	—	0.1	—	1.5	—	1.4	150	3.0
26	—	0.0	—	0.2	—	0.3	—	0.1	—	0.7	—	0.8	140	1.9	180	4.5	170	3.7	170	3.5	180	4.4	175	5.5
27	—	1.0	—	0.8	—	1.1	—	0.5	—	0.9	110	1.9	170	2.3	190	2.3	185	3.1	165	3.5	160	3.1	155	3.4
28	—	1.2	75	2.0	80	2.5	85	2.7	—	1.4	80	2.0	85	3.0	85	2.1	100	1.9	145	3.1	140	4.2	150	3.9
29	—	0.6	—	1.0	—	0.3	—	0.3	—	0.1	—	0.5	—	0.4	—	1.5	—	0.6	70	2.8	90	4.1	85	5.4
30	60	2.0	25	2.1	45	3.0	30	2.3	40	2.9	40	2.7	50	3.9	50	4.7	60	4.1	75	5.0	90	6.2	90	6.9
31	45	5.1	45	4.3	45	5.6	45	6.1	50	5.9	45	6.5	45	6.1	50	6.0	45	6.6	40	6.2	45	5.9	40	5.5
Mean	—	2.2	—	2.1	—	2.1	—	2.2	—	2.0	—	2.1	—	2.5	—	2.9	—	3.0	—	3.4	—	3.5	—	3.7

514. Richmond (Kew Observatory) : H_a=5 metres+20 metres.

1	45	4.5	50	4.5	45	5.2	45	4.7	45	4.8	50	4.9	60	6.0	65	6.8	60	7.5	70	7.5	65	7.1	65	7.1
2	50	5.2	50	4.9	40	4.9	55	5.6	60	6.1	65	7.9	70	9.5	75	10.2	85	10.0	85	10.4	85	12.0	80	11.5
3	45	2.5	45	2.5	—	0.6	—	0.6	—	0.8	—	1.3	85	2.8	90	3.4	95	4.5	75	6.0	90	5.1	70	6.4
4	—	1.2	—	0.5	—	0.1	—	0.2	—	0.3	—	1.0	70	2.8	65	2.0	55	2.3	50	3.1	60	3.4	65	3.0
5	75	5.6	65	4.5	85	4.1	80	3.9	55	3.4	55	3.6	60	3.6	80	4.0	80	3.9	95	3.7	95	3.0	105	2.8
6	—	1.1	—	1.3	—	0.0	—	0.0	—	0.1	—	0.4	—	1.0	—	0.8	—	0.7	170	2.0	190	3.9	175	4.1
7	—	0.1	—	0.5	—	0.4	—	0.8	—	0.2	—	0.9	145	1.9	180	2.1	200	3.2	220	5.1	235	5.0	230	5.1
8	—	1.3	175	1.9	—	1.0	—	0.5	—	1.4	—	0.6	—	0.6	—	0.5	—	1.0	270	1.8	235	3.1	225	4.4
9	165	4.0	175	3.5	175	3.7	175	3.5	165	3.6	160	5.4	190	6.8	230	5.9	225	6.2	220	7.5	215	8.3	215	9.5
10	200	8.4	200	7.1	195	6.8	200	6.9	210	6.8	210	7.1	215	7.4	215	8.5	210	8.8	215	9.1	215	8.9	215	9.5
11	225	2.6	230	2.1	220	1.6	215	1.9	—	1.4	—	1.5	—	0.9	—	1.5	250	3.0	240	3.9	250	4.8	295	5.0
12	210	2.2	225	1.9	210	2.3	—	1.5	220	2.6	—	1.5	—	1.1	220	2.8	225	4.2	235	3.9	230	3.5	220	3.6
13	—	0.5	—	1.0	—	1.0	—	1.3	—	0.5	—	0.2	185	2.4	185	3.5	190	3.1	185	3.5	185	4.2	175	4.8
14	190	3.5	190	4.2	195	3.6	225	5.2	240	6.0	240	5.4	240	6.1	250	6.6	240	6.4	245	7.2	240	7.1	235	7.0
15	320	2.2	—	1.4	295	1.6	—	1.5	—	1.5	280	1.8	280	2.0	260	1.9	270	1.8	270	3.7	265	4.2	265	4.8
16	265	1.6	—	1.1	—	1.5	—	1.4	290	2.4	300	2.5	315	3.8	310	4.3	320	4.3	320	4.3	310	3.9	305	4.0
17	—	0.7	—	0.8	—	1.0	—	1.1	—	0.6	—	0.2	—	0.4	250	2.4	270	3.5	260	4.3	255	4.7	255	4.7
18	240	2.2	235	2.5	230	1.9	230	1.9	230	1.8	250	1.9	255	3.0	245	3.1	255	2.2	255	2.5	260	2.9	265	2.4
19	200	1.6	—	0.9	210	2.0	—	0.9	210	1.9	205	2.0	220	2.9	225	2.6	220	3.0	205	3.4	225	4.1	210	4.0
20	240	2.5	240	2.2	—	1.2	250	1.9	265	1.8	290	2.1	300	2.6	310	3.2	315	3.6	310	3.8	300	3.7	305	3.7
21	—	0.2	—	0.2	—	0.6	—	0.2	—	0.2	—	0.9	—	1.0	225	4.5	230	4.2	220	4.3	225	4.4	210	5.2
22	210	4.6	210	4.7	210	4.6	225	4.0	220	4.6	215	5.1	220	5.3	220	6.0	225	4.9	215	5.1	215	5.5	235	4.1
23	230	2.1	225	2.7	220	2.4	—	1.1	—	1.3	230	2.0	—	1.5	265	2.0	240	2.5	240	2.8	255	3.3	245	4.0
24	—	1.2	245	1.6	225	2.0	220	1.6	—	1.5	—	1.5	270	2.3	—	1.0	—	1.4	280	2.4	265	2.3	265	2.5
25	—	0.4	—	1.0	—	0.5	—	0.1	—	0.0	—	0.2	—	1.2	170	3.6	180	4.0	185	4.2	195	4.4	190	5.7
26	220	7.3	220	5.9	210	5.9	205	6.1	210	6.3	215	7.2	215	7.8	210	7.5	205	7.8	220	9.0	210	9.1	210	9.1
27	295	5.1	295	4.0	285	3.9	275	3.0	260	2.9	250	2.8	250	3.4	285	3.8	305	4.6	300	5.2	300	5.2	275	4.4
28	230	2.0	220	2.6	210	2.4	220	3.1	215	3.2	210	3.2	230	3.2	235	4.5	230	5.9	225	6.3	220	7.0	215	7.5

Direction expressed in degrees from North (E=90°, S=180°, W=270°, N=360°): Speed in metres per second.

515. Richmond (Kew Observatory):

H_a (height of vane of anemograph above M.S.L.)=Height of ground above

Dines Anemograph from Jan., 1926.

Table with columns for Hour, G.M.T., and 11 numbered columns (1-11) plus Noon. Each column contains two rows of data: m/s and degrees. A 'Mean' row is at the bottom.

516. Richmond (Kew Observatory): H_a=5 metres+20 metres.

Table with columns for Hour, G.M.T., and 11 numbered columns (1-11) plus Noon. Each column contains two rows of data: m/s and degrees. A 'Mean' row is at the bottom.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 5 metres + 20 metres.

July, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day	
m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	°		
220	6.5	225	7.8	220	8.0	215	8.2	220	8.1	215	7.8	215	6.6	200	4.9	205	5.2	215	5.1	210	5.1	210	4.0	5.1	1	
220	6.4	225	6.7	215	6.8	215	6.1	215	5.7	215	5.2	215	5.0	215	4.6	215	4.1	220	3.9	215	2.6	—	1.3	5.3	2	
360	2.4	345	1.8	350	3.1	350	4.1	340	2.7	340	2.0	—	1.4	350	1.6	—	0.6	—	0.4	—	0.3	—	1.2	1.4	3	
245	3.9	240	3.8	245	4.0	235	4.0	220	4.4	220	5.7	210	5.6	215	5.2	210	4.9	210	5.0	205	4.5	215	5.6	3.2	4	
215	8.4	215	8.9	220	8.1	220	7.9	220	7.9	220	6.4	220	6.3	210	6.4	220	6.5	215	5.5	215	4.5	215	5.0	7.1	5	
245	6.1	250	6.4	255	5.6	260	5.3	260	4.5	255	5.2	255	3.8	250	4.0	250	2.9	245	2.7	230	2.6	235	2.3	4.3	6	
—	1.5	330	1.9	—	1.4	—	1.4	—	1.5	—	1.3	210	2.5	190	2.1	205	2.8	200	2.4	200	1.9	210	2.0	1.9	7	
200	6.0	215	5.9	220	5.7	230	5.4	215	5.9	220	5.5	220	5.9	220	5.3	210	4.0	215	4.0	210	3.7	220	3.6	4.1	8	
270	3.8	260	4.6	260	5.2	270	5.4	265	5.3	270	4.9	275	3.8	275	3.9	270	3.0	275	3.0	255	2.0	240	2.0	3.5	9	
240	4.2	225	5.0	230	5.0	230	5.2	215	6.0	215	5.9	215	5.5	205	4.6	210	4.0	225	2.5	220	3.0	220	2.0	3.4	10	
225	4.4	225	4.7	210	4.4	215	4.9	210	4.7	210	4.6	210	4.5	190	2.9	205	2.7	—	1.1	—	0.8	—	1.2	3.5	11	
215	3.7	240	3.5	235	3.9	230	3.6	225	3.9	220	4.2	215	3.5	220	2.6	—	1.4	—	1.1	—	0.5	—	0.5	1.9	12	
260	2.3	250	2.4	255	2.5	255	2.8	240	2.5	275	2.7	265	2.0	—	1.5	250	2.0	—	0.7	—	0.3	—	1.0	1.4	13	
255	2.7	265	2.6	260	2.0	250	2.0	245	1.9	—	1.0	—	0.6	—	0.4	—	0.2	—	0.1	—	0.2	—	0.2	1.3	14	
320	1.6	320	2.0	—	1.5	280	2.1	275	2.5	300	2.3	295	2.7	290	2.3	—	1.0	—	1.0	—	1.1	—	1.0	1.1	15	
355	3.6	350	2.7	10	3.1	5	2.8	360	2.5	5	2.5	15	1.6	—	1.0	75	6.0	85	4.6	85	3.4	50	2.0	2.5	16	
50	2.9	55	2.5	90	2.0	140	3.4	130	3.0	130	3.5	125	2.7	130	2.4	125	1.6	—	1.0	—	0.8	—	0.1	2.4	17	
255	4.4	275	5.0	300	4.9	300	4.6	290	4.5	305	3.9	310	2.6	325	2.5	5	3.7	360	2.2	—	1.1	—	2.0	2.6	18	
315	3.0	315	2.9	320	3.1	320	2.9	310	2.6	320	2.1	310	1.8	320	1.7	—	1.1	—	0.9	—	0.7	—	0.4	2.0	19	
305	3.2	300	3.3	300	3.0	305	3.0	315	2.8	320	2.0	—	1.4	—	2.0	3.6	350	3.4	325	1.9	330	2.0	330	2.6	2.4	20
315	2.7	320	2.6	320	2.5	320	2.6	320	2.1	325	2.0	—	1.1	—	1.5	—	0.8	—	0.3	—	0.5	—	0.2	1.9	21	
200	4.5	265	5.1	285	4.8	265	5.2	265	5.6	260	4.7	270	3.5	—	1.4	—	0.5	255	2.0	230	1.9	—	1.5	2.5	22	
275	2.4	290	2.4	290	2.6	300	2.6	305	2.6	300	1.6	275	2.0	290	3.2	280	2.9	285	2.6	280	2.7	275	2.8	2.0	23	
290	4.0	280	4.2	290	4.5	290	5.3	295	4.5	290	4.5	275	3.6	260	4.1	265	3.4	270	3.1	280	3.8	285	2.4	3.5	24	
270	5.2	265	6.0	265	5.7	250	5.8	260	5.5	265	4.5	260	4.6	255	4.6	255	3.5	255	2.8	255	3.0	240	1.9	3.8	25	
245	3.3	250	3.0	235	3.0	230	3.5	220	3.2	215	4.1	195	4.9	200	4.3	210	3.2	—	1.3	—	1.4	—	0.9	2.8	26	
—	1.1	315	1.7	305	2.5	—	1.1	—	1.3	215	2.1	225	3.0	220	2.9	230	1.9	230	2.1	—	1.5	—	1.0	1.4	27	
200	4.0	295	4.2	305	3.2	285	3.8	285	3.2	300	2.6	—	1.5	260	1.7	270	1.9	265	2.4	250	2.6	230	2.5	2.5	28	
200	5.5	260	5.5	255	5.9	255	4.3	255	4.5	255	5.2	250	4.5	250	2.7	230	2.6	235	2.9	230	2.5	230	2.6	3.5	29	
210	6.1	200	4.5	200	4.7	205	7.0	200	5.9	205	5.3	210	3.2	200	3.9	200	4.5	205	4.5	210	6.1	215	5.0	3.9	30	
—	0.2	—	0.4	160	2.2	145	3.4	150	2.9	130	2.5	125	3.0	130	3.1	125	2.4	145	3.0	140	2.4	170	2.5	2.1	31	
—	3.9	—	4.0	—	4.0	—	4.2	—	4.0	—	3.8	—	3.4	—	3.1	—	2.9	—	2.5	—	2.2	—	2.0	2.9	—	

August, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day	
m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	°		
315	3.3	320	2.6	320	2.6	320	2.2	320	2.9	335	2.6	325	2.5	320	2.0	315	1.6	330	2.0	360	3.2	360	3.0	1.9	1	
75	5.0	75	5.3	85	5.5	90	5.6	90	7.0	100	7.1	100	6.3	90	6.3	90	5.1	90	4.1	75	3.4	90	3.5	4.3	2	
80	6.9	75	6.8	70	5.8	55	5.7	60	6.0	60	5.8	55	5.0	45	4.0	45	4.1	50	4.1	55	4.5	50	4.0	4.7	3	
15	5.0	360	6.1	5	7.0	360	6.7	360	5.5	350	4.8	350	3.4	350	2.2	—	0.5	—	0.2	—	1.0	—	0.9	4.4	4	
350	2.4	355	2.5	350	2.1	360	2.1	25	2.1	30	1.8	45	2.0	—	1.3	—	0.5	—	0.7	—	0.1	—	0.0	1.2	5	
205	3.6	195	3.9	200	4.4	200	4.1	205	4.5	205	2.5	180	2.4	—	1.5	—	1.5	—	0.7	—	0.8	—	1.0	1.8	6	
205	7.6	200	7.7	200	7.2	215	7.7	210	7.6	220	7.6	220	7.0	220	6.4	215	6.8	220	6.6	215	6.5	230	5.1	4.9	7	
270	4.6	265	4.4	265	4.5	260	3.4	260	4.6	265	4.6	265	4.0	255	3.5	240	3.1	250	3.0	250	3.2	245	2.9	3.5	8	
245	5.8	260	5.0	275	5.0	260	4.6	255	4.0	255	4.5	255	3.1	250	2.3	250	1.9	230	1.9	220	2.3	220	1.6	3.3	9	
—	1.1	175	1.8	195	2.8	210	3.7	—	1.4	—	0.4	—	0.0	—	0.3	—	1.1	—	1.0	—	1.6	—	0.5	1.2	10	
205	2.7	210	3.3	220	3.5	200	3.3	185	3.9	185	2.6	185	1.6	175	2.0	175	2.2	—	1.2	—	0.5	—	0.0	2.0	11	
245	5.0	235	5.9	225	6.9	220	8.1	220	8.0	225	7.9	220	7.6	210	5.0	200	4.5	210	5.3	210	4.5	195	3.0	3.9	12	
225	6.6	230	9.0	220	9.5	225	6.8	215	9.2	220	8.6	215	7.5	205	5.7	215	6.3	210	5.7	210	4.8	200	4.0	6.4	13	
230	6.5	220	8.1	220	8.5	220	8.5	220	8.3	220	6.7	215	5.5	220	4.2	215	3.9	205	3.9	205	3.9	215	4.4	5.7	14	
275	3.2	280	2.8	250	2.9	260	2.5	315	2.5	—	1.5	—	1.0	—	1.5	—	1.5	—	1.1	—	0.9	—	1.1	2.6	15	
300	2.9	285	3.0	290	3.5	300	3.4	295	2.4	—	1.1	—	1.1	—	1.0	—	1.0	—	1.2	—	0.9	—	1.0	1.9	16	
285	2.1	300	1.9	—	1.2	275	2.0	285	1.9	—	1.5	—	0.1	—	0.1	—	0.1	—	1.2	—	0.9	—	0.5	1.5	17	
185	1.6	200	1.9	195	2.0	190	1.9	185	2.0	—	1.5	—	1.5	—	1.90	2.1	190	2.0	195	1.6	—	0.8	—	0.1	1.0	18
165	4.3	160	4.2	145	4.5	130	4.4	130	3.4	125	2.5	110	1.9	105	2.9	95	1.9	85	1.6	—	0.8	—	1.5	2.0	19	
245	7.6	240	7.1	240	5.4	220	6.4	230	4.7	220	5.3	230	3.9	240	3.8	215	3.0	220	3.4	220	3.5	220	3.8	4.8	20	
265	4.8	265	4.5	245	5.0	250	5.3	260	5.0	255	5.2	245	4.2	240	3.6	240	4.0	240	3.8	235	3.5	240	3.7	3.8	21	
245	4.9	250	4.1	235	3.0	230	1.9	—	0.3	—	1.4	—	0.4	—	1.0	220	2.4	215	3.0	210	2.7	205	2.4	3.2	22	
205	4.3	210	5.1	205	4.2	200	4.2	205</																		

Directions expressed in degrees from North (E=90°, S=180°, W=270°, N=360°) : Speed in metres per second.

517. Richmond (Kew Observatory) :

H_a (height of vane of anemograph above M.S.L.)=Height of ground above

Dines Anemograph from Jan., 1926.

Table with 13 columns (Hour G.M.T., 1-11, Noon) and 30 rows (Day 1-30). Each cell contains two values: a direction (degrees) and a speed (m/s). A 'Mean' row is at the bottom.

518. Richmond (Kew Observatory) : H_a=5 metres + 20 metres.

Table with 13 columns (Hour G.M.T., 1-11, Noon) and 31 rows (Day 1-31). Each cell contains two values: a direction (degrees) and a speed (m/s). A 'Mean' row is at the bottom.

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L.+h_a (height of anemograph above ground) = 5 metres + 20 metres.

September, 1928.

13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean	Day.																
110	2.7	75	5.0	95	5.7	95	5.9	100	5.3	105	4.6	90	4.5	100	4.2	215	4.0	210	3.3	210	2.6	230	1.8	220	1.8	—	1.4	4.4	6
95	4.5	100	3.6	90	4.1	100	4.0	85	4.0	105	4.1	105	3.4	100	3.5	95	3.0	—	—	—	—	—	—	—	—	—	0.5	2.5	2
210	4.0	210	4.8	200	5.0	195	5.4	200	4.7	195	4.0	195	3.4	210	3.1	200	1.9	205	2.5	220	2.0	235	1.9	—	—	—	0.1	2.2	3
220	5.8	220	5.9	230	5.8	225	5.4	210	4.7	195	3.1	195	2.3	190	2.1	—	—	—	—	—	—	—	—	—	—	—	0.0	2.8	4
200	5.5	205	6.5	205	6.0	195	5.7	180	4.5	205	5.8	215	5.5	210	4.3	205	3.9	190	3.1	190	3.9	200	4.5	—	—	—	4.5	2.9	5
265	5.3	245	4.6	240	4.5	240	4.5	245	4.0	230	4.2	215	4.0	210	3.3	210	2.6	230	1.8	220	1.8	—	—	—	—	—	1.4	4.4	6
180	6.0	175	6.1	180	5.6	170	5.8	175	4.7	165	3.0	—	1.3	—	0.5	—	0.4	—	—	—	—	—	—	—	—	—	0.1	2.5	7
160	6.0	175	6.5	190	5.6	190	5.0	200	4.9	200	3.1	205	2.5	—	1.0	—	0.6	—	—	—	—	—	—	—	—	—	0.6	2.3	8
—	1.2	—	0.6	270	3.2	—	1.1	—	0.2	—	0.0	—	0.6	215	1.6	230	1.9	230	1.9	225	2.0	235	2.0	—	—	—	2.0	1.2	9
235	4.6	230	4.6	225	5.0	230	4.8	230	4.2	245	3.2	240	2.9	225	2.5	220	2.8	230	3.0	225	2.6	225	2.2	—	—	—	2.2	3.8	10
275	1.8	—	1.5	—	1.0	—	0.6	—	1.0	—	0.1	20	1.6	—	0.5	—	1.2	—	—	—	—	—	—	—	—	—	1.0	1.6	11
—	1.2	70	1.9	100	2.5	90	2.5	110	3.1	100	3.0	105	3.5	100	3.1	—	0.8	—	—	—	—	—	—	—	—	—	0.1	1.0	12
60	5.3	70	4.4	70	4.5	100	4.7	105	4.3	110	4.0	105	2.7	—	1.2	—	0.9	50	2.0	40	1.7	—	—	—	—	—	1.4	2.1	13
90	6.7	100	5.7	80	5.3	80	5.0	65	4.3	70	3.5	75	2.7	70	2.8	55	2.5	30	2.0	330	1.6	—	—	—	—	—	1.2	3.5	14
350	4.4	10	4.3	10	4.2	10	4.3	20	3.6	25	2.5	—	1.3	—	1.1	—	0.7	—	—	—	—	—	—	—	—	1.6	2.4	15	
—	1.0	—	0.5	—	0.2	—	0.6	—	1.0	—	0.7	—	1.0	—	0.5	—	0.1	—	—	—	—	—	—	—	—	—	0.0	1.2	16
220	4.7	210	4.5	205	4.6	205	4.0	205	4.5	205	3.6	200	2.5	195	2.4	195	2.4	—	—	—	—	—	—	—	—	—	0.4	2.1	17
230	3.5	250	3.4	260	2.9	255	2.3	—	1.1	—	0.5	—	0.2	—	0.1	—	0.7	—	—	—	—	—	—	—	—	—	0.1	1.4	18
330	2.9	330	3.0	330	2.9	325	2.1	—	1.5	—	0.7	—	0.2	—	0.1	—	0.0	—	—	—	—	—	—	—	—	—	0.5	1.0	19
340	2.0	330	2.6	320	2.5	330	3.0	330	1.9	—	1.5	—	0.9	—	0.8	—	0.6	—	—	—	—	—	—	—	—	—	0.2	1.0	20
25	3.4	10	3.5	15	3.7	15	3.5	20	3.4	15	1.9	—	1.5	40	1.6	50	3.1	45	3.5	35	2.2	20	2.0	—	—	—	2.0	2.1	21
15	5.5	5	5.6	15	4.8	5	5.0	10	5.0	15	3.8	10	2.0	360	2.5	5	3.1	10	3.5	355	3.6	360	3.3	—	—	—	3.3	3.5	22
5	4.4	350	3.6	360	4.1	15	4.5	5	3.9	355	3.2	—	1.4	—	1.5	—	1.3	—	—	—	—	—	—	—	—	—	1.1	2.9	23
295	3.4	300	2.5	315	2.1	290	2.2	255	2.1	255	1.9	270	2.1	—	1.5	—	0.7	—	—	—	—	—	—	—	—	—	1.3	2.0	24
15	3.5	15	3.5	15	3.2	10	2.5	—	1.5	—	0.9	45	3.1	55	4.3	50	3.5	10	2.3	—	—	—	—	—	—	—	0.5	2.7	25
55	3.7	85	3.5	80	3.6	80	4.6	100	4.2	110	3.4	110	2.6	85	2.0	—	1.3	—	—	—	—	—	—	—	—	—	0.7	2.1	26
100	4.5	115	3.8	100	5.8	100	6.0	100	4.5	95	4.5	100	3.7	95	4.3	90	4.9	85	4.0	80	3.6	70	3.0	—	—	—	3.0	2.9	27
55	6.2	55	5.7	55	5.1	50	5.6	50	6.0	50	6.0	50	6.5	50	6.3	50	6.0	50	5.2	50	5.0	50	4.9	—	—	—	4.9	5.2	28
30	4.0	20	3.8	25	4.1	25	3.9	25	3.7	30	3.2	45	4.0	45	4.8	45	5.5	45	5.0	45	4.5	30	4.0	—	—	—	4.0	4.1	29
20	4.1	10	3.6	10	3.7	10	4.4	10	3.6	10	2.7	—	1.2	335	1.7	—	1.0	—	—	—	—	—	—	—	—	—	0.9	3.5	30
—	4.1	—	4.0	—	4.0	—	4.0	—	3.5	—	2.9	—	2.5	—	2.3	—	2.1	—	—	—	—	—	—	—	—	—	1.4	2.5	—

October, 1928.

13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	Mean	Day.																	
320	2.0	305	2.3	280	2.2	270	2.5	—	1.4	—	0.7	—	1.0	—	1.3	225	1.9	240	1.6	225	2.7	240	1.6	1.6	—	—	—	1.6	1	
330	2.9	325	2.4	330	2.5	335	1.6	—	0.9	—	0.1	—	0.4	—	0.1	—	0.1	—	—	—	—	—	—	—	—	—	0.0	1.4	2	
90	3.9	110	2.9	105	4.7	105	3.4	110	3.8	110	3.1	110	2.9	105	2.6	100	2.3	110	2.2	110	2.0	100	1.8	1.7	—	—	—	1.7	3	
110	6.0	105	5.3	90	5.8	90	5.8	90	5.8	100	4.9	105	4.0	100	4.0	100	3.8	100	3.4	90	2.6	100	2.9	4.1	—	—	—	4.1	4	
175	4.5	185	5.2	180	4.9	180	4.8	195	3.8	225	5.1	235	4.3	230	3.0	220	1.7	220	1.6	—	0.3	230	1.9	3.1	—	—	—	3.1	5	
255	4.4	265	3.6	265	4.3	250	3.3	245	2.6	210	1.6	215	2.1	—	1.5	225	2.2	225	2.0	235	2.1	230	1.8	2.8	—	—	—	2.8	6	
225	6.4	230	6.0	225	5.6	210	4.4	200	3.4	190	3.5	190	4.0	200	3.0	205	2.5	185	2.1	185	1.7	—	—	—	—	—	—	—	—	7
205	5.7	210	5.5	210	4.6	205	4.7	205	4.9	210	4.0	220	3.4	205	2.2	200	2.6	195	2.1	—	—	—	—	—	—	—	0.5	3.7	8	
225	4.4	220	4.1	220	5.3	240	4.9	220	2.9	—	1.5	—	1.5	—	1.5	—	2.6	—	—	—	—	—	—	—	—	—	0.0	3.0	9	
—	1.5	—	0.6	—	0.1	—	0.2	60	1.6	115	2.4	115	2.0	120	2.3	115	1.6	—	1.3	145	2.5	150	1.8	1.2	—	—	—	1.2	10	
260	6.8	255	7.5	265	7.1	260	6.0	260	5.1	250	4.5	250	3.8	245	3.3	250	1.8	230	2.3	210	1.8	—	—	—	—	—	0.6	4.5	11	
80	9.0	80	8.7	80	10.0	80	8.3	75	7.9	70	6.5	60	5.8	50	4.6	45	4.0	40	3.1	50	2.9	25	2.1	—	—	—	2.1	5.2	12	
315	3.1	315	3.1	335	2.5	340	2.3	—	0.9	—	0.6	—	0.5	—	0.3	—	0.3	—	—	—	—	—	—	—	—	—	0.7	1.4	13	
180	3.0	175	3.5	175	3.9	165	3.7	150	4.3	150	4.2	150	3.0	160	1.9	160	3.0	170	5.0	165	5.1	160	5.5	2.2	—	—	—	2.2	14	
340	3.3	335	3.2	325	3.1	345	2.6	340	1.6	—	1.5	—	0.8	—	0.7	—	0.4	—	—	—	—	—	—	—	—	—	0.9	2.2	15	
195	5.4	200	5.5	195	4.9	200	4.5	200	4.5	205	5.8	215	5.6	210	4.8	210	4.2	215	4.5	215	4.1	210	4.9	3.1	—	—	—	4.9	3.1	16
230	4.5	235	4.0	270	5.2	290	3.6	—	1.4	245	2.9	255	3.3	240	2.7	230	2.2	225	2.1	220	2.1	220	2.0	4.2	—	—	—	4.2	17	
195	6.4	200	7.2	220	9.0	230	8.4	240	5.5	235	5.9	230	7.1	235	6.3	235	5.5	235	5.5	225	6.2	235	5.2	4.6	—	—	—	4.6	18	
230	6.0	220	6.5	210	5.9	200	5.0	195	4.4	190	3.9	175	4.5	180	7.5	190	7.2	200	6.5	195	9.1	205	10.7	5.5	—	—	—	5.5	19	
230	5.9	220	6.0	210	5.0	230	4.9	210	4.4	205	4.1	205	5.2	220	3.7	200	3.2	195	3.7	200	2.9	190	2.8	5.3	—	—	—	5.3	20	
210	6.9	215	6.6	220	7.6	215	6.2	210	4.9	205	4.6	205	4.2	200	3.7	195	3.6	190	3.2	195	3.1	200	2.7	4.2	—	—	—	4.2	21	
200	4.8</																													

Direction expressed in degrees from North (E = 90°, S = 180°, W = 270°, N = 360°): Speed in metres per second.

519. Richmond (Kew Observatory):

H_a (height of vane of anemograph above M.S.L.) = Height of ground above

Dines Anemograph from Jan., 1926.

Hour.	1.		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		Noon.	
G.M.T.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.
Day.	—	0.7	—	0.5	—	1.0	—	1.4	—	1.2	—	1.7	—	2.0	—	2.5	—	2.9	—	3.5	—	4.5	—	5.6
1	—	0.7	—	0.5	—	1.0	—	1.4	—	1.2	—	1.7	—	2.0	—	2.5	—	2.9	—	3.5	—	4.5	—	5.6
2	10	5.1	360	4.5	360	4.6	5	4.5	10	4.8	360	5.7	5	4.8	10	5.2	15	5.3	360	4.5	360	4.7	360	4.3
3	45	4.0	45	3.4	35	3.0	30	2.5	30	2.5	15	1.6	25	2.9	30	4.7	35	2.8	20	1.7	20	2.6	15	3.1
4	45	3.4	60	3.2	50	2.5	45	3.0	50	3.0	50	2.3	55	2.8	70	2.3	90	2.8	105	2.0	—	1.2	—	1.2
5	95	1.7	—	1.1	—	0.5	—	0.8	—	1.0	—	0.6	—	1.1	—	0.2	—	0.5	—	0.2	—	1.1	—	1.05
6	—	0.0	—	0.5	50	1.9	55	1.8	—	0.9	—	0.7	—	1.3	45	1.7	60	2.5	80	2.3	95	2.3	70	2.0
7	55	3.7	50	3.4	50	2.1	40	2.9	40	3.0	40	1.7	—	0.5	—	1.4	25	1.6	50	3.5	55	3.7	55	5.4
8	25	4.9	30	4.6	30	4.2	25	4.3	25	4.7	30	4.8	35	5.6	30	6.0	35	6.3	35	6.5	35	7.1	35	8.0
9	15	4.5	15	4.1	10	4.2	15	4.5	10	3.6	15	3.8	10	2.9	10	3.0	15	3.8	30	5.3	30	5.9	30	6.0
10	—	0.5	—	1.5	—	1.1	—	1.4	—	0.4	—	0.1	—	0.3	—	0.0	—	0.0	—	0.0	—	0.2	—	205
11	260	2.5	250	2.3	245	2.4	250	2.0	245	2.1	225	2.0	220	1.7	225	1.8	230	2.5	225	2.7	220	2.9	220	4.1
12	225	4.5	225	5.0	225	5.1	225	4.9	230	5.8	220	5.6	220	6.3	225	6.4	220	5.9	225	6.6	225	6.3	225	6.5
13	220	6.7	215	6.3	220	7.5	210	6.4	215	6.7	205	6.0	205	6.0	205	5.5	205	6.1	215	7.1	215	7.0	220	7.0
14	215	2.5	225	2.5	220	2.9	225	3.1	235	2.3	230	2.5	220	2.4	215	2.5	230	2.9	235	4.2	230	5.5	230	5.4
15	200	7.6	200	7.9	200	8.5	200	8.0	195	8.0	205	9.0	200	10.3	200	9.8	190	8.3	200	8.4	210	8.3	230	7.0
16	225	3.9	235	4.0	225	3.8	210	3.2	185	1.6	180	1.6	175	3.1	170	4.0	170	5.0	180	7.7	195	8.2	230	10.8
17	250	4.5	235	5.1	240	5.7	240	4.6	235	3.0	230	3.0	—	1.3	—	1.1	270	1.6	290	4.2	285	5.0	270	5.7
18	250	4.4	250	4.3	255	4.4	255	5.1	250	3.6	240	4.8	240	6.0	235	4.9	235	3.5	245	3.3	250	3.9	255	5.0
19	205	5.6	205	6.0	200	6.9	205	7.4	200	6.6	200	7.1	200	7.1	195	6.7	200	8.0	205	7.7	205	7.9	195	7.5
20	225	5.4	230	5.5	230	6.0	225	4.9	215	4.1	210	3.7	205	3.6	210	2.9	205	3.5	220	6.0	225	5.5	230	5.2
21	165	3.4	150	3.6	160	5.3	165	5.4	175	5.4	180	5.0	190	5.2	195	6.6	195	6.1	190	6.2	200	7.5	200	7.0
22	230	5.6	230	5.8	225	5.0	230	5.7	240	5.9	235	6.4	230	5.9	230	5.1	240	5.9	220	7.8	225	7.8	230	7.7
23	240	4.5	240	5.2	245	4.6	230	5.9	230	6.5	225	6.6	210	6.9	200	6.0	200	7.4	205	10.5	220	12.5	235	12.3
24	245	7.8	250	8.1	245	8.1	250	8.7	255	9.6	260	10.3	265	10.0	265	9.6	270	8.6	275	8.8	280	9.1	280	9.0
25	235	4.9	220	5.5	225	7.2	225	6.4	225	6.1	230	7.1	245	7.7	250	7.8	250	7.3	260	8.5	260	8.9	270	11.6
26	280	6.5	280	6.2	280	6.9	275	6.0	275	6.0	285	6.6	280	6.6	285	6.6	285	6.4	285	6.4	290	7.0	300	7.1
27	275	4.0	280	4.0	280	3.6	285	4.1	270	3.5	275	3.8	280	4.0	280	4.4	290	5.8	300	5.6	300	6.5	295	6.8
28	315	4.0	320	3.5	310	3.6	310	4.1	315	3.5	310	3.1	310	2.2	310	3.0	310	2.9	315	4.1	320	4.1	330	4.4
29	320	2.6	320	2.6	—	0.9	—	1.2	225	1.9	225	2.1	240	2.0	—	1.5	255	2.2	—	1.5	230	2.1	230	2.4
30	270	1.8	265	1.6	270	2.0	285	1.6	—	1.2	320	1.9	320	1.6	320	2.3	325	2.9	320	3.0	315	2.6	315	3.4
Mean ...	—	4.0	—	4.1	—	4.2	—	4.2	—	3.9	—	4.0	—	4.1	—	4.2	—	4.4	—	5.0	—	5.4	—	6.0

520. Richmond (Kew Observatory): H_a = 5 metres + 20 metres.

Hour.	1.		2.		3.		4.		5.		6.		7.		8.		9.		10.		11.		Noon.	
G.M.T.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.
1	315	4.0	305	2.9	310	1.9	320	2.0	325	1.7	—	1.5	—	1.4	305	2.0	310	3.3	315	2.5	325	3.1	320	4.0
2	360	1.9	350	1.9	—	1.1	—	0.9	—	0.9	—	1.0	—	1.0	310	1.9	315	2.0	—	1.4	255	2.1	275	2.4
3	220	3.1	235	1.6	220	2.0	—	1.4	—	1.3	—	1.3	—	1.5	—	1.5	—	1.2	—	1.0	—	1.0	—	1.5
4	20	2.2	10	1.6	—	1.0	—	0.4	—	0.5	—	0.0	—	0.0	—	0.5	—	0.5	—	0.7	—	1.1	—	0.0
5	—	0.1	—	0.2	—	0.6	—	1.0	—	1.5	200	1.6	230	3.0	225	3.4	230	3.3	225	3.6	240	3.0	240	3.5
6	—	0.1	—	0.1	—	0.1	—	0.5	—	0.1	—	0.0	—	0.1	—	0.3	—	0.3	—	1.4	205	3.5	210	5.0
7	230	4.5	230	5.0	225	5.9	235	3.7	225	3.4	225	3.6	230	3.5	230	3.4	225	3.5	235	3.6	245	4.0	260	3.8
8	—	1.2	—	0.9	220	1.8	—	1.4	—	1.5	—	1.5	—	1.1	—	1.2	225	1.6	—	1.2	—	1.4	315	2.0
9	—	1.4	—	1.5	215	1.9	220	1.8	—	1.5	—	1.5	—	1.3	—	1.0	—	1.1	—	1.1	—	1.5	230	1.6
10	190	2.7	180	2.4	185	3.4	175	3.9	175	5.5	170	4.5	160	4.3	145	5.4	145	6.5	140	6.0	145	6.6	150	6.9
11	100	5.1	100	5.9	100	4.9	100	4.5	90	5.1	85	5.5	90	5.4	85	6.0	85	6.1	95	5.0	90	6.5	85	6.2
12	—	0.9	40	3.0	30	3.0	30	2.4	30	1.6	30	1.6	15	1.8	40	2.9	50	3.8	55	4.4	50	4.3	50	4.2
13	35	4.5	30	4.4	40	4.4	40	4.3	30	4.6	30	5.5	35	5.4	30	3.9	40	4.5	35	4.5	40	4.2	45	5.0
14	—	1.2	—	0.2	—	0.7	—	1.0	—	0.8	—	1.0	—	0.5	—	0.2	—	0.3	—	0.5	—	1.0	—	1.2
15	—	1.1	—	0.9	—	1.5	—	0.9	—	1.5	—	1.1	—	1.2	—	0.3	—	0.3	—	1.5	—	1.5	—	1.8
16	—	0.2	—	0.7	—	1.0	125	2.0	145	2.0	160	3.1	160	3.2	160	4.1	170	4.5	175	6.2	185	7.0	190	8.0
17	230	2.5	230	3.8	335	3.9	325	3.6	315	3.0	315	2.6	315	3.4	315	3.4	310	1.9	315	3.2	310	4.0	315	4.1
18	—	0.7	—	1.1	—	1.1	—	1.4	—	0.9	—	0.9	—	0.5	—	1.1	—	1.5	—	0.4	—	0.5	—	0.5
19	—	0.3	—	0.4	—	0.2	—	0.2	—	0.3	—	0.4	—	0.3	—	0.5	—	0.0	—	0.0	—	0.3	—	190
20	220	2.5	240	1.8	240	2.1	220	2.5	220	2.6	210	2.4	200	2.3	200	2.1	220	2.6	270	2.1	325	1.7	320	1.9
21	—	1.0	—	0.5	—	0.6	—	0.7	—	1.4	330	2.0	—	1.5	—	1.0	—	1.0	—	0.6	—	0.7	—	1.2
22	—	0.9	—	0.6	—	1.0	—	1.0	—	0.4	—	1.4	—	0.2	—	0.0	—	0.4	190	1.6	200	2.9	205	4.5
23	305	1.7	325	1.9	—	1.5	—	0.7	—	0.5	—	0.6	—	0.4	—	0.5	—	1.1	—	1.2	—	0.7	—	0.5
24	—	0.6	200	1.6	190	3.5	190	4.1	195	4.7	190	4.9	190	6.1	195	6.7	200	6.1	195	6.5	200	7.3	205	7.6
25	235	4.0	250	4.8	265	4.6	255	3.4	260	3.2	260	2.9	260	2.5	240	2.5	215	2.3	220	2.9	225	2.9	215	3.4
26	210	11.2	220	10.5	225	10.0	225	9.3	225	8.3	22													

Averages for periods of sixty minutes, centred at the exact hours, Greenwich Mean Time.

M.S.L. + h_a (height of anemograph above ground) = 5 metres + 20 metres.

November, 1928.

13.		14.		15.		16.		17.		18.		19.		20.		21.		22.		23.		24.		Mean	Day.
m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°
35	5.1	35	4.9	25	6.4	25	5.8	20	5.5	15	6.4	20	6.7	15	6.7	15	6.5	15	6.8	15	6.6	15	6.5	4.2	1
360	4.7	360	4.0	355	3.1	335	2.1	335	2.0	350	2.1	345	1.6	10	2.0	40	3.4	45	4.0	40	4.4	45	4.3	4.0	2
20	2.9	15	3.3	20	2.0	15	1.8	25	2.6	40	1.9	45	2.3	40	2.7	35	2.4	45	3.0	55	2.5	40	2.6	2.7	3
—	1.1	190	2.3	220	2.0	—	1.0	—	1.3	—	1.0	—	0.5	—	1.0	—	1.0	—	1.1	—	0.7	95	2.0	1.9	4
105	1.0	—	0.3	—	0.3	—	0.1	—	0.1	—	0.5	—	0.9	—	1.0	—	0.6	—	0.5	—	0.2	—	0.0	0.8	5
75	2.5	80	4.5	90	4.6	85	4.8	85	4.4	90	4.7	85	5.2	80	4.6	75	5.0	70	4.8	60	3.6	65	3.7	2.9	6
65	7.1	65	7.0	60	6.8	60	6.0	60	5.8	50	4.5	40	4.3	40	4.7	40	4.6	35	3.8	35	4.5	30	5.0	4.0	7
30	7.5	40	7.9	30	5.6	15	3.9	20	5.7	20	5.6	25	6.2	20	5.4	20	5.0	15	4.3	10	5.0	15	4.5	5.6	8
30	5.4	30	5.0	15	3.7	5	2.1	360	2.0	360	1.9	355	2.1	350	1.6	—	0.6	—	0.3	—	0.5	—	0.5	3.3	9
215	6.5	210	5.0	205	5.2	200	5.0	210	6.0	215	6.7	220	6.3	225	7.5	225	6.4	240	3.8	250	2.9	255	2.5	3.0	10
220	4.0	215	4.5	210	4.0	215	4.7	215	5.6	220	4.4	220	5.0	225	5.5	225	6.1	225	5.9	230	5.5	230	4.2	3.6	11
220	7.3	220	7.7	220	7.9	220	8.0	220	7.4	230	6.9	230	7.8	225	7.5	225	6.6	220	6.6	220	6.1	215	6.1	6.4	12
220	7.4	225	6.6	225	5.2	230	3.9	250	3.6	230	2.6	215	2.9	235	1.9	235	1.9	240	2.0	240	2.0	235	2.0	5.1	13
230	5.7	230	6.0	220	5.5	215	5.7	200	4.2	190	2.9	195	4.8	205	5.7	185	5.0	195	6.7	205	8.9	200	8.8	4.4	14
230	5.3	230	5.1	240	5.7	245	5.0	240	4.0	235	4.4	230	5.1	240	5.6	245	4.3	245	5.4	245	4.3	240	3.2	6.7	15
235	11.0	220	14.0	225	15.2	230	15.5	240	14.0	250	13.9	255	12.5	260	11.6	260	9.4	265	8.6	260	6.8	250	5.7	8.1	16
270	6.4	270	6.5	265	6.4	255	5.4	255	5.5	250	4.6	250	5.3	255	5.8	250	5.5	250	4.6	245	3.8	240	4.3	4.6	17
250	5.3	245	4.0	230	3.3	230	4.0	220	4.5	215	4.9	210	4.4	210	5.0	215	5.6	220	4.7	205	5.1	200	5.1	4.5	18
195	8.2	195	7.0	185	6.4	180	7.5	190	8.0	190	8.7	235	10.0	245	6.7	240	6.2	230	4.8	225	5.0	220	5.3	7.0	19
230	6.4	220	6.3	220	5.3	215	5.0	215	5.4	205	3.2	195	3.3	200	4.0	200	4.1	185	3.1	170	3.0	170	4.1	4.6	20
195	6.0	200	6.4	205	7.5	205	7.3	220	7.9	210	6.4	205	7.0	205	7.9	220	8.9	220	8.0	220	8.4	220	7.6	6.5	21
220	10.0	225	10.4	225	10.0	220	9.5	225	10.3	225	9.5	235	8.3	245	5.2	245	5.2	240	5.6	240	6.6	245	5.0	7.1	22
225	13.4	225	13.1	235	12.4	250	11.1	255	10.8	260	11.0	260	10.0	260	10.1	260	8.8	255	10.0	250	9.1	245	9.7	9.0	23
285	8.9	280	9.1	280	10.0	280	8.6	270	8.7	270	7.5	275	6.5	270	6.0	260	5.5	260	5.0	250	5.8	240	5.2	8.2	24
285	10.5	285	10.7	280	10.8	280	12.0	280	10.1	290	8.9	285	9.0	280	7.9	280	8.3	285	7.4	280	7.5	280	6.0	8.2	25
300	6.8	295	5.5	280	4.6	260	4.0	255	3.7	255	3.7	240	3.0	245	3.5	255	2.9	255	2.5	235	2.5	260	4.5	5.3	26
300	6.0	305	5.5	305	5.8	305	5.6	300	3.5	305	3.4	300	2.9	300	3.6	305	3.5	310	3.3	315	3.0	310	3.6	4.4	27
325	4.5	330	4.3	325	3.6	310	2.5	310	3.1	315	3.4	320	3.0	315	2.6	320	2.6	320	3.0	330	2.5	330	2.5	3.4	28
240	1.9	240	2.5	240	3.3	245	2.8	235	2.6	240	2.5	240	2.1	245	1.7	—	1.2	255	1.7	265	1.6	280	1.8	2.0	29
320	3.1	320	2.9	310	2.7	310	3.0	315	2.7	320	3.2	320	3.4	315	3.1	310	2.9	315	3.6	315	3.6	310	3.9	2.6	30
—	6.1	—	6.1	—	5.8	—	5.5	—	5.4	—	5.0	—	5.1	—	4.9	—	4.7	—	4.5	—	4.4	—	4.3	4.8	—

December and Year, 1928.

°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.	°	m/s.
320	4.0	325	3.7	320	3.3	330	2.6	335	3.0	335	3.0	360	4.1	20	4.4	25	3.1	10	1.9	20	4.3	20	2.6	3.0	1																
295	1.7	—	1.5	210	2.1	210	2.1	230	2.6	240	2.0	250	1.6	250	1.6	230	1.6	230	2.3	230	2.5	225	2.5	1.8	1.8	2															
320	1.8	—	1.4	355	2.5	10	2.0	10	2.1	25	3.3	30	2.9	40	3.0	25	2.3	40	2.5	50	2.0	30	1.7	1.9	3																
—	0.1	—	1.1	—	0.2	—	0.5	—	1.1	—	1.3	—	1.5	—	1.5	—	1.1	—	0.9	—	0.7	—	0.6	0.8	4																
245	2.7	240	2.0	240	1.8	—	0.9	—	0.6	—	0.5	—	0.3	—	1.5	215	1.6	—	0.4	—	0.4	—	0.2	1.6	5																
220	6.5	220	7.5	220	7.4	230	7.7	270	5.5	270	2.7	270	4.0	275	3.5	260	3.6	245	2.6	240	3.5	235	4.2	2.8	6																
275	3.4	270	3.7	265	2.9	250	2.0	—	1.5	—	0.9	—	0.9	—	0.9	—	1.2	—	1.2	—	1.5	—	1.5	2.9	7																
320	3.0	320	2.4	295	1.6	290	1.6	—	1.5	—	1.2	—	1.2	—	1.5	—	1.5	235	1.6	245	1.6	—	1.1	1.5	8																
215	2.1	210	2.6	210	2.6	205	1.7	—	1.5	180	1.8	—	1.0	—	1.5	180	1.9	175	3.1	175	3.2	170	3.0	1.7	9																
155	7.5	150	6.6	160	5.0	145	3.5	130	3.8	110	5.3	110	4.9	110	5.6	105	5.9	100	5.8	105	5.3	100	5.0	5.1	10																
90	5.8	95	5.2	100	4.5	105	4.0	110	2.6	100	3.1	90	2.8	100	3.0	100	3.0	85	4.0	95	2.9	120	1.6	4.6	11																
40	4.3	40	4.2	40	4.4	40	4.9	45	4.6	40	4.5	45	4.2	35	4.7	35	4.9	40	5.0	40	4.5	40	4.4	3.6	12																
45	4.9	45	4.5	45	4.2	45	3.9	50	4.0	55	4.0	55	3.4	50	3.0	45	2.5	40	2.5	40	2.0	40	1.8	4.1	13																
350	2.5	5	2.5	5	2.6	10	2.6	15	3.5	360	1.9	—	1.1	—	0.9	—	1.1	—	0.9	—	1.0	—	1.0	1.3	14																
270	1.9	—	1.5	265	1.9	—	1.0	—	1.0	—	0.5	—	0.4	—	0.2	—	0.2	—	0.3	—	0.2	—	0.5	1.1	15																
185	7.7	175	7.5	180	6.1	180	6.2	180	6.5	180	6.2	175	6.3	190	6.0	195	4.8	200	3.5	210	3.0	—	1.5	4.5	16																
305	3.8	310	3.5	310	3.4	300	2.9	280	2.0	270	2.4	275	2.6	285	1.9	—	1.4	—	1.2	305	1.6	—	0.8	2.8	17																
—	0.7	—	0.6	—	0.5	—	0.3	—	6.5	—	0.4	—	0.5	—	1.0	—	1.3	—	1.0	—	1.0	—	0.9	0.8	18																
195	3.3	190	2.9	190	2.4	190	2.0	—	1.3	190	2.0	195	2.9	200	2.8	190	2.7	205	2.9	215	3.1	200	3.0	1.5	19																
330	2.8	335	4.0	325	2.4	315	1.6	315	2.4	335	2.5	335	2.1	325	1.9	320	1.7	320	1.7	—	0.5	—	1.2	2.2	20																
—	1.2	—	0.9	—	1.4	—	1.1	—	0.2	—	0.7	—	1.4	—	0.8	—	0.6	—	0.9	—	0.4	—	0.5	0.9	21																
200	5.6	205	5.1	205	4.5	200	3.6	200	3.3	210	4.0	220	4.0	225	3.0	240	2.9	260	2.6	255	2.2	280	1.8	2.4	22																
—	0.5	—	0.6	—	1.1	—	1.2	—	1.5	—	1.2	—	0.9	—	1.4	—	1.5	—	1.5	—	215	1.6	205	1.8	1.1	23															
200	6.5	205	6.9	210	8.0	210	9.2	210	9.2	205	9.3	210	9																												

521. Richmond (Kew Observatory) : H_a = 5 metres + 20 metres.

Month	Jan.		Feb.		Mar.		April		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.	Max. in a Gust.	Time of Gust.
Day.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.	m/s.	h. m.
1	10	23 55	16	12 20	9	11 10	9	8 5	5	23 35	14	17 5	15	13 55	6	12 30	9	15 5	6	10 30	12	19 0	8	19 25
2	15	8 40 9 50 11 5	23	17 55	10	13 10	6	14 40	6	14 10	17	11 5	13	11 10	11	17 10	8	12 45	5	12 20	11	0 5	5	12 5
3	6	10 55	11	13 10	7	14 50	13	15 25	11	21 55	11	12 15	8	15 30	13	10 5	9	13 10	8	14 50	6	0 35	5	20 10
4	15	18 5	13	23 20	7	12 15	9	16 30	12	12 40	9	23 45	10	18 40	12	11 20	10	12 50	13	12 5	5	1 25	5	0 45
5	13	0 50	15	8 0	5	17 0 18 5	11	13 25	11	14 20	10	0 15	15	13 50	6	13 20	11	15 30	9	14 45	5	12 10	6	8 30
6	24	12 35	9	13 25	6	14 5	7	18 0	8	9 40	8	12 35	12	13 35	7	13 25	13	3 50	9	9 55	9	20 20	13	15 55
7	12	19 55	15	11 10	7	23 45	15	14 30	11	16 55	13	18 30	9	16 45	13	12 5	10	13 20	11	12 45	12	12 55	9	2 45
8	12	0 40	17	21 55	10	12 5	10	6 30	15	15 0	14	14 25	11	12 20	9	18 20	11	13 55	10	13 15	13	14 0	5	13 15
9	13	17 20	17	1 55	12	11 30	15	14 30	9	14 50	20	16 15	12	15 20	10	12 55	12	14 55	13	15 30	10	11 20	5	22 40
10	18	13 45	27	16 20	16	15 35	14	12 5	9	13 45	19	12 55	10	17 20	6	16 20	9	11 30	5	18 15	13	19 50	13	12 55
11	8	1 0	24	2 10	7	13 55	12	11 45	8	1 45	11	11 40	10	13 30	7	8 55	6	8 30	15	9 30	9	21 55	10	10 55
12	17	21 20	10	13 30	8	14 35	7	13 40	7	9 40	8	14 50	9	14 20	13	16 10	6	18 35	16	14 50	14	19 0	9	16 25
13	15	12 55	12	13 30	6	14 20	9	23 45	5	16 10	10	13 20	6	13 45	17	13 55	9	12 30	7	12 35	13	4 35	9	6 15
14	14	14 10	9	10 30	6	17 20	20	23 15	12	15 25	15	10 30	7	16 5	15	11 5	12	11 40	9	22 40	19	19 55	5	16 50
15	14	21 50	15	11 40	6	14 20	18	0 10	10	21 40	11	16 40	6	16 30	7	13 45	7	15 50	11	2 15	22	7 30	3	14 40
16	13	15 5	19	8 50	10	11 50	14	2 10	13	17 10	8	8 5	9	21 15	8	11 50	6	0 35	10	11 55	29	16 10	14	11 35
17	6	1 35	18	4 40	12	12 40	9	14 0	11	14 40	11	17 55	7	12 35	6	9 20	8	16 40	11	4 15	12	14 10 15 0	8	11 35
18	8	19 0	8	15 30	12	13 35	11	17 35	14	9 0	7	15 40	9	14 10	5	12 50	8	14 5	17	16 25	10	12 40	3	9 20
19	15	1 15	5	10 0	9	12 35 13 25	15	16 30	9	15 25	11	14 50	7	11 5	8	13 25	6	13 40	23	23 20	18	18 25	5	13 0
20	9	15 0	4	13 40	15	14 55	11	10 40	7	13 5	8	9 20 11 5	8	11 35	14	12 55	6	14 10	18	1 50	11	12 35	8	14 0
21	15	20 35	7	12 50	11	11 35	9	12 35	13	15 20	11	14 20	6	7 25	12	18 20	7	14 10	13	11 20	17	20 35	3	5 35
22	12	1 40	4	20 0	10	11 35	9	10 15	13	10 5	11	14 50	10	14 30	11	12 15	11	11 10	9	19 50	21	14 25	9	13 10
23	15	23 20	10	21 45	13	13 5	12	13 50	7	11 40	9	15 0	6	20 25	9	13 40	8	10 55	17	19 25	24	15 5	4	1 15
24	17	14 5	11	4 55	8	16 50	12	15 5	6	19 10	7	13 5	10	15 40	10	18 0	6	9 10	20	10 55	19	7 55	15	17 20
25	22	21 55	9	16 30	9	14 45	8	12 25	9	14 50	12	12 25	11	14 35	13	12 25	7	12 20	13	13 30	23	16 10	19	22 0
26	14	17 15	8	17 25	6	15 50	13	16 20	9	12 35	17	13 35	9	18 45	8	16 30	7	16 30	17	13 5	13	12 45	18	1 15
27	9	13 50	11	13 45	11	10 0	13	12 15	8	13 15 15 10	12	12 35	6	15 00	17	15 10	9	9 45	14	10 10	13	12 0	9	23 0
28	14	16 55	12	15 30	12	16 40	7	19 45	9	11 35	17	16 20	8	13 10	12	15 50	11	11 20	13	2 35	9	11 55	13	4 0
29	16	10 50	9	15 15	17	20 30	9	16 15	9	17 5	20	15 40	12	17 00	9	16 20	9	20 55 21 5	10	18 20	6	14 50	12	12 5
30	0	13 55	—	—	16	7 50	10	11 30	15	17 40	13	10 55	12	15 50	8	13 30	9	11 15	14	9 40	7	23 35	7	13 0
31	15	20 30	—	—	13	10 5	—	—	10	21 0 21 25	—	—	7	0 5	8	14 30	—	—	11	11 40	—	—	16	13 30

DISTRIBUTION OF WIND SPEED: EXTREME VELOCITIES AS RECORDED BY THE DINES TUBE ANEMOGRAPH.

522. Richmond (Kew Observatory) : H_a = 5 metres + 20 metres.

Month.	DISTRIBUTION OF WIND.								EXTREME VELOCITIES.					
	More than 17.1 m/s.		10.8 to 17.1 m/s.		5.5 to 10.7 m/s.	1.6 to 5.4 m/s.	Less than 1.6 m/s.	No Record.	Highest Hourly Wind.			Highest Gust.		
	Dates of Occurrence.	Duration.	No. of Days.	Duration.	Duration.	Duration.	Duration.	Duration.	Veer from N.	Speed.	Mid. Time.	Speed.	Date.	
Jan.	...	hr.	4	hr.	hr.	hr.	hr.	hr.	°	m/s.	day. hour.	m/s.	d. h. m.	
Feb.	...	0	4	12	275	369	88	0	220	13	25 22	24	6 12 35	
Mar.	...	0	4	16	221	370	89	0	205	13	2 18	27	10 16 20	
Apr.	...	0	0	0	124	471	149	0	215	11	29 20	17	29 20 30	
May	...	0	0	0	104	458	182	0	80	9	30 17	15	30 17 40	
June	...	0	3	5	187	406	122	0	85	12	2 11	20	29 15 40	
July	...	0	0	0	76	475	193	0	220	9	5 12	15	5 13 50	
Aug.	...	0	0	0	118	440	186	0	210	10	27 15	17	27 15 10	
Sept.	...	0	0	0	58	385	277	0	60	7	28 11	13	6 3 50	
Oct.	...	0	1	1	172	435	136	0	210	11	24 12	23	19 23 20	
Nov.	...	0	3	20	256	376	68	0	230	15	16 16	29	16 16 10	
Dec.	...	0	2	2	102	385	255	0	210	11	26 1	19	25 22 00	
Year	...	0	18	65	1852	5019	1848	0	230	15	Nov. 16 16	29	Nov. 16 16 10	

523. Richmond (Kew Observatory).

Readings, in degrees absolute, at 9h., Greenwich Mean Time.

1928.

Month	Jan.		Feb.		Mar.		April		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.			
	Day.	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	30 cm	122 cm	
1	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	
2	74.8	79.2	78.0	79.3	78.8	79.6	80.7	81.0	82.2	82.2	87.0	84.3	88.0	86.3	90.8	88.8	88.5	88.3	83.5	86.5	82.4	84.7	80.4	82.7	80.4	82.7
3	74.8	79.2	77.4	79.3	79.4	79.6	80.5	80.9	84.7	82.4	86.5	84.8	88.2	86.3	90.8	88.7	88.2	88.1	83.0	86.3	82.5	84.7	80.5	82.7	80.5	82.7
4	75.1	79.1	76.9	79.2	79.5	79.7	80.6	80.9	84.8	82.3	86.4	84.9	88.6	86.5	90.4	88.7	88.2	88.1	82.9	86.1	82.2	84.6	80.2	82.7	80.2	82.7
5	75.2	79.0	76.1	79.2	79.7	79.8	80.7	81.0	85.8	82.7	86.8	84.8	88.7	86.5	89.2	88.7	88.6	88.1	82.8	86.1	81.7	84.4	80.1	82.6	80.1	82.6
6	76.4	78.9	77.8	79.2	79.6	79.9	80.1	81.1	86.0	83.0	86.6	84.8	89.1	86.5	88.5	88.8	88.5	88.1	83.1	85.9	81.0	84.3	79.3	82.3	79.3	82.3
7	76.7	78.9	77.4	79.2	80.3	79.9	80.4	81.0	86.0	83.0	86.8	84.9	89.3	86.6	89.3	88.7	89.5	88.1	84.2	85.8	80.2	84.2	79.1	82.5	79.1	82.5
8	77.2	78.8	77.0	79.2	80.1	80.1	80.7	81.0	86.0	83.2	87.6	84.9	88.9	86.4	90.2	88.4	89.0	88.0	84.1	85.8	80.4	84.1	79.0	82.3	79.0	82.3
9	78.7	78.7	78.1	79.2	79.6	80.1	80.9	81.6	85.7	83.4	87.4	85.1	89.5	86.8	91.0	88.5	88.6	88.0	85.0	85.7	80.5	83.8	78.6	82.2	80.5	82.2
10	78.0	78.8	79.4	79.2	79.0	80.2	82.0	81.1	84.6	83.6	88.0	85.2	90.1	86.7	90.6	88.5	89.3	88.0	85.3	85.6	80.0	83.8	76.6	82.2	80.0	82.2
11	77.7	78.8	78.6	79.2	78.0	80.2	83.1	81.8	83.9	83.4	87.9	85.2	90.4	86.8	90.1	88.4	88.5	88.1	84.9	85.6	79.1	83.7	76.0	81.9	76.0	81.9
12	77.6	78.9	78.0	79.4	77.0	80.2	83.0	81.4	84.1	83.7	86.8	85.2	90.7	86.9	90.4	88.5	88.6	88.1	85.0	85.7	80.1	83.5	76.2	81.7	76.2	81.7
13	76.7	79.1	78.0	79.4	76.3	80.1	83.4	81.3	84.7	83.7	86.7	85.4	91.0	87.1	91.5	88.6	88.4	88.0	84.8	85.6	82.0	83.4	76.2	81.5	76.2	81.5
14	77.8	79.2	78.0	79.3	76.4	79.9	83.2	81.7	84.9	83.4	87.6	85.4	91.5	87.1	90.8	88.6	87.5	88.1	83.4	85.7	83.1	83.3	76.0	81.2	76.0	81.2
15	77.5	79.1	78.5	79.5	76.6	79.8	84.5	81.8	85.0	83.7	88.7	85.3	92.0	87.3	90.1	88.7	87.1	88.0	82.3	85.7	83.0	83.3	76.5	81.1	76.5	81.1
16	77.8	79.2	79.6	79.5	76.5	79.6	81.4	81.9	84.5	83.7	87.5	85.6	92.4	87.6	89.8	88.6	87.1	88.0	83.0	85.5	82.6	83.4	75.7	80.9	75.7	80.9
17	77.8	79.2	80.8	79.6	76.9	79.7	80.5	81.9	84.6	83.7	87.4	85.6	92.6	87.7	89.8	88.6	87.4	87.8	83.4	85.2	82.5	83.6	75.4	80.8	75.4	80.8
18	77.5	79.2	80.4	79.7	77.9	79.6	79.6	81.9	83.9	83.7	86.9	85.7	92.0	87.9	89.5	88.5	87.4	87.7	84.8	85.2	82.2	83.6	76.3	80.6	76.3	80.6
19	76.2	79.2	79.1	79.8	78.8	79.6	80.0	81.8	83.7	83.7	86.8	85.6	91.6	88.1	89.1	88.5	87.1	87.7	84.2	85.2	81.2	83.5	76.0	80.4	76.0	80.4
20	77.1	79.1	79.0	80.0	79.7	79.6	80.0	81.7	82.9	83.7	87.4	85.7	92.0	88.1	89.3	88.6	87.5	87.7	84.3	85.2	81.6	83.6	76.3	80.3	76.3	80.3
21	76.5	79.2	78.5	79.9	80.7	79.6	80.0	81.6	83.4	83.7	87.7	85.6	92.0	88.2	89.7	88.6	86.7	87.6	84.7	85.2	81.7	83.3	77.1	80.2	77.1	80.2
22	77.9	79.2	78.1	79.9	81.1	79.8	80.0	81.5	83.7	83.5	88.0	85.7	92.0	88.4	89.1	88.5	85.8	87.6	83.8	85.2	81.9	83.3	77.1	80.2	77.1	80.2
23	79.0	79.1	77.8	79.9	80.6	80.1	80.0	81.5	83.7	83.6	88.0	85.7	92.0	88.3	89.1	88.5	85.7	87.5	83.2	85.2	82.8	83.4	76.1	80.2	76.1	80.2
24	77.9	79.1	77.9	80.0	81.0	80.1	80.4	81.4	83.2	83.6	87.7	85.7	92.7	88.5	89.6	88.4	85.3	87.2	83.3	85.2	82.6	83.4	76.8	80.2	76.8	80.2
25	78.5	79.2	77.9	79.9	81.0	80.2	80.9	81.4	83.0	83.6	88.5	85.9	92.9	88.6	89.6	88.4	85.1	87.3	84.0	85.2	82.1	83.3	76.5	80.1	76.5	80.1
26	78.1	79.2	77.8	79.8	80.6	80.3	81.7	81.4	83.2	83.4	89.4	85.9	93.4	88.6	89.8	88.3	85.2	87.1	83.7	85.1	81.8	83.3	77.9	80.0	77.9	80.0
27	78.4	79.3	77.5	79.8	81.1	80.5	83.0	81.4	84.7	83.4	89.7	86.1	93.0	88.7	89.7	88.3	84.6	87.0	83.1	85.0	81.5	83.4	78.6	79.9	78.6	79.9
28	77.8	79.3	77.5	79.7	81.4	80.6	84.0	81.7	85.9	83.6	88.6	86.1	92.7	88.7	89.4	88.3	84.0	86.9	83.4	85.0	80.5	83.3	78.2	80.1	78.2	80.1
29	76.6	79.3	77.5	79.7	80.9	80.7	83.4	81.8	87.1	83.6	88.8	86.2	91.8	88.9	89.5	88.3	84.8	86.7	83.8	85.0	79.4	83.2	77.7	80.0	77.7	80.0
30	77.3	79.2	77.8	79.7	80.5	80.7	84.5	81.9	88.0	84.0	88.5	86.4	90.9	88.9	89.4	88.4	85.0	86.6	82.6	84.8	78.4	83.1	77.8	80.0	77.8	80.0
31	77.7	79.2	—	—	80.5	80.8	84.5	82.1	88.5	84.2	88.2	86.5	90.4	88.9	88.9	88.4	85.0	86.5	83.3	84.8	79.0	82.9	77.1	80.0	77.1	80.0
Mean	77.2	79.1	78.2	79.5	79.4	80.0	81.6	81.5	84.9	83.4	87.7	85.5	91.0	87.6	89.8	88.5	87.1	87.7	83.7	85.4	81.3	83.7	77.5	81.1	77.5	81.1

The initial 2 or 3 of the readings is omitted ; i.e., 275.0 degrees absolute is written 75.0.

Year | 83.3 | 83.6

MINIMUM TEMPERATURE "ON THE GRASS" DURING THE INTERVAL 18H. TO 7H. G.M.T.

HEIGHT IN CM. ABOVE M.S.L. OF SURFACE OF UNDERGROUND WATER.

Readings in degrees absolute.

Daily Means and Extremes for Months.

524. Richmond (Kew Observatory).

1928.

525. Richmond (Kew Observatory).

1928.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Day.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.	a.
1	72.7	78.4	79.5	77.1	82.2	83.8	80.9	87.8	79.3	69.2	74.0	80.8
2	74.2	71.3	76.0	69.7	78.8	80.5	82.5	85.9	74.6	69.8	78.6	75.5
3	69.9	70.4	72.6	71.4	80.9	70.8	78.3	84.6	75.3	71.4	75.7	77.5
4	69.9	68.5	71.2	74.7	83.2	74.2	82.7	84.5	77.2	73.2	77.8	71.0
5	74.6	80.3	70.5	69.9	81.5	82.4	85.6	76.0	76.8	75.0	70.7	71.0
6	76.5	70.1	75.5	69.0	73.5	77.3	82.4	78.4	86.8	80.9	71.7	70.4
7	72.1	73.0	75.0	70.6	73.6	79.8	83.9	83.7	77.9	74.3	74.0	72.0
8	83.2	79.9	72.2	80.4	72.5	83.5	79.9	86.2	76.0	80.6	77.5	64.0
9	73.3	80.4	71.7	79.4	67.1	84.6	87.9	81.3	83.3	79.8	74.1	63.4
10	72.7	71.4	70.1	83.6	69.6	84.8	79.7	78.3	81.9	75.6	67.3	65.7
11	74.1	74.1	67.0	74.4	76.8	74.8	81.9	84.4	80.4	80.9	79.5	73.9
12	67.0	75.0	67.0	79.3	73.7	74.3	78.5	86.3	76.6	76.6	84.8	73.0
13	78.6	74.9	69.4	81.1	80.7	82.3	79.0	84.4	75.7	69.1	84.8	75.1
14	73.4	76.1	71.0	79.8	80.0	86.0	81.0	84.5	75.7	69.4	75.3	66.0
15	74.8	82.3	66.6	74.8	70.7	76.4	82.6	82.8	77.2	79.4	79.0	64.1
16	76.4	84.0	67.2	73.3	78.5	76.0	81.5	79.3	77.0	78.8	76.7	71.2
17	69.5	75.0	76.4	70.2	75.1	72.9	83.0	81.5	77.0	86.1	78.0	74.5</

526. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in January 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day. Includes data for days 1 through 31 and mean cloud amount.

527. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in February 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day. Includes data for days 1 through 29 and mean cloud amount.

Note.—Observations are not taken at 15h. on Sundays, Good Friday and Christmas Day. * Mean of 26 days. † Mean of 24 days.

528. Richmond (Kew Observatory).

March, 1928.

Table for March 1928 with columns for Day, Cloud Forms, Cloud Amount, Visibility, Precipitation, and Remarks. Includes mean cloud amount at the bottom.

529. Richmond (Kew Observatory).

April, 1928.

Table for April 1928 with columns for Day, Cloud Forms, Cloud Amount, Visibility, Precipitation, and Remarks. Includes mean cloud amount at the bottom.

* Mean of 27 days.

† Mean of 25 days.

530. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in May 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-31 show various cloud types like A-St, St-Cu, and Fr-Cu, along with weather observations such as 'y a and p' and 'p a y p'.

531. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in June 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-31 show various cloud types like St, Fr-Cu, and A-St, along with weather observations such as 'c to b y p' and 'p a y p'.

* Mean of 27 days.

† Mean of 26 days.

532. Richmond (Kew Observatory).

Table for station 532, Richmond (Kew Observatory), July 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

533. Richmond (Kew Observatory).

Table for station 533, Richmond (Kew Observatory), August 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h, 9h, 13h, 15h, 18h, 21h), Visibility (7h, 9h, 13h, 15h, 18h, 21h), Precipitation (7h, 9h, 13h, 15h, 18h, 21h), and Remarks on the Weather of the Day.

* Mean of 26 days.

† Mean of 28 days.

534. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in September 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes mean cloud amount at the bottom.

535. Richmond (Kew Observatory).

Table for Richmond (Kew Observatory) in October 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Includes mean cloud amount at the bottom.

Summary table for M.T. (Month) and Day, showing Cloud Forms, Cloud Amount, Visibility, Precipitation, and Remarks on the Weather of the Day.

* Mean of 25 days. † Mean of 27 days.

536. Richmond (Kew Observatory).

November, 1928.

Table for station 536, Richmond (Kew Observatory), November 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-30 show various cloud types like St-Cu, Fr-Cu, and precipitation events.

537. Richmond (Kew Observatory).

December, 1928.

Table for station 537, Richmond (Kew Observatory), December 1928. Columns include Day, Cloud Forms (7h, 13h, 18h), Cloud Amount (7h-21h), Visibility (7h-21h), Precipitation (7h-21h), and Remarks on the Weather of the Day. Data rows 1-31 show cloud observations and weather notes.

* Mean of 26 days † Mean of 25 days

538. Richmond (Kew Observatory).

Month.	JANUARY.				FEBRUARY.				MARCH.				APRIL.				MAY.				JUNE.				
	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	
Day.	Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		
1	...	...	...	...	26	51	99	73	...	...	...	...	...	...	...	...	42	77	33	17	31	115	59	41
2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	42	...	...	...	...	...	...	...
3	14	71	...	31	...	...	...	...	...	...	...	...	...	...	...	...	27	114	56	26	...	...	...	...
4	...	...	26	...	...	...	...	...	...	...	...	...	...	...	...	...	15	98	51	39	...	...	...	...
5	9	47	...	28	...	...	...	...	20	32	62	39	...	...	...	...	...	...	...	...	54	76	56	...
6	...	...	...	...	16	52	35	29	...	...	...	...	...	...	80	70	...	...	...	...	100	115	153	124
7	...	...	...	...	13	43	54	31	...	...	...	...	...	...	51	47	46	101	...	...	50	115	...	...
8	19	49	45	...	...	...	...	...	9	...	61	37	...	...	...	...	...	...	...	...	...	...	...	...
9	8	29	...	19	25	67	52	41	4	...	59	43	...	...	...	...	25	40	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	9	66	35	...	...	...	...	...	...	...	...	...	49	120	127	115	53	64	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	35	114	...	24	...	...	...	...	...	...	40	31	...	...	48	31	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	48	35	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	20	...	18	20	...	...	...	...	40	40	...	...	35	36	50	45
16	...	...	...	...	...	...	...	...	...	...	31	...	...	...	...	...	...	...	...	...	...	...	...	...
17	13	66	26	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	12	47	34	45	...	...	...	...	15	45	31	25	...	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	11	41	47	27	43	131	107	64	23	38	104	57	...	...	...	...	39	74	101	103
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	3	19	31	26	58	126	93	81	...	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...	...	28	37	35	39	...	...	...	...	...	...	...	...
24	...	...	...	...	6	38	36	18	...	...	...	...	39	71	62	...	34	96	34	43	...	...	...	...
25	12	46	47	21	...	...	...	...	29	70	56	...	59	106	83	70	43	58	38	42	99	179	105	...
26	...	...	...	...	...	...	...	...	...	...	...	45	52	128	90	57	...	...	...	...	...	...	...	...
27	6	26	36	18	28	93	92	66	...	...	...	...	13	78	71	45	...	...	...	...	...	...	...	...
28	...	...	...	...	24	80	47	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	43	66	56	...	...	...	...	...	...	...	...	...
30	18	55	41	26	...	...	...	...	...	...	...	...	...	...	...	...	25	127	98	68	...	...	...	...
31	10	31	21	29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mean	14	54	35	25	17	54	53	36	25	81	55	42	38	81	69	55	35	81	52	39	60	102	81	68	
No. of days used	12	12	9	10	9	9	10	10	8	5	11	10	8	8	13	11	10	10	6	6	9	9	8	5	

Month.	JULY.				AUGUST.				SEPTEMBER.				OCTOBER.				NOVEMBER.				DECEMBER.			
	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$	λ_+ $\times 10^{18}$	i $\times 10^{18}$	E_+ $\times 10^{18}$	E_- $\times 10^{18}$
Day.	Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3		Ohm-1 cm-1	Amp cm-2	Coulomb cm-3	
1	...	...	...	...	69	145	64	38	...	...	...	...	32	80	67	50	20	76	47	31	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...	...	37	92	...	...	10	45	31	31	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...	...	18	77	54	33	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...	...	20	84	67	43	...	...	...	...	...	...	64	50
5	54	131	110	111	...	...	...	...	...	...	...	...	57	143	65	26	5	18	85	47	...	...	29	26
6	41	67	97	70	55	55	47	38	56	83	95	69	...	...	...	...	6	23	...	...	...	...	...	...
7	...	...	...	...	88	118	85	65	57	111	111	59	...	...	...	...	15	68	23	16	...	...	...	...
8	...	...	...	...	29	47	50	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	45	75	45	38	...	...	...	...	...	...	...	...	...	...	77	67	...	...	...	...	...	...	...	...
10	55	82	127	97	...	...	...	...	...	...	...	...	37	105	41	...	...	...	...	...	25	98	50	38
11	43	75	65	45	...	...	...	...	57	107	79	47	26	53	46	25	...	...	...	...	...	...	...	...
12	60	75	109	61	...	...	...	...	23	82	80	59	...	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	27	105	70	66	...	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	29	37	141	126	27	106	64	52	...	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	54	76	63	45	43	79	...	88	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	19	52	61	31	66	82	97	54	41	87	83	41	23	64	25	36	...	...	...	...	9	35	36	...
18	36	27	81	61	80	88	67	32	83	124	93	43	...	...	...	...	...	...	...	...	...	...	...	...
19	62	62	59	47	84	84	79	47	52	79	81	64	...	...	...	...	...	...	...	...	...	...	...	...
20	67	67	108	87	46	34	144	135	54	103	125	106	...	...	...	...	13	39	45	36	...	...	...	...
21	...	...	...	...	51	64	106	83	38	80	86	33	...	...	...	...	...	...	...	...	4	32	54	63
22	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	72	90	139	115	...	...	...	...	...	...	...	...	29	88	72	29	...	...	...	...	...	...	...	...
24	76	68	72	...	49	66	75	45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	75	68	85	67	...	...	...	...	39	139	80	56	23	82	61	49	...	...				

539. Richmond (Kew Observatory).

1928.

Month.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		MAY.		JUNE.	
Day.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.
		hours.		hours.		hours.		hours.		hours.		hours.
1	0	...	I	0.3	0	0.9	2	6.2	0	...	0	...
2	2	10.5	I	1.4	2	4.3	0	...	0	...	0	...
3	I	0.2	0	...	0	...	I	2.7	I	0.8	0	...
4	I	0.8	0	...	0	...	I	0.7	0	...	I	0.1
5	I	1.3	I	2.1	I	1.7	I	0.8	0	...	I	0.5
6	I	1.6	0	...	I	2.3	0	...	0	...	I	1.1
7	0	...	0	...	0	...	I	0.7	0	...	2	3.5
8	0	...	0	...	(0)	—	I	2.8	0	...	I	0.1
9	I	0.8	I	0.5	(I)	—	0	...	0	...	I	1.5
10	I	1.2	I	1.0	(I)	—	I	0.2	I	1.3	I	0.1
11	I	1.6	I	1.3	(I)	—	I	1.0	0	...	I	2.0
12	2	4.1	2	3.3	(I)	—	2	3.2	0	...	0	...
13	I	0.7	I	1.9	(I)	—	0	...	I	1.5	I	1.6
14	I	0.1	I	0.3	(0)	—	0	...	I	1.5	2	5.3
15	0	...	0	...	(0)	—	0	...	2	3.0	I	0.1
16	I	2.1	I	1.1	0	...	2	3.4	2	6.3	0	...
17	I	0.4	I	0.3	0	...	0	...	I	2.4	0	...
18	I	2.3	0	...	0	...	I	0.5	2	7.6	I	1.3
19	I	1.6	0	...	I	0.5	0	...	2	5.9	I	2.1
20	I	0.3	0	...	0	...	0	...	I	2.9	I	0.5
21	0	...	0	...	2	3.5	2	5.2	2	3.9	0	...
22	I	1.8	I	1.2	I	0.7	0	...	0	...	0	...
23	2	—	0	...	I	0.9	0	...	2	3.3	0	...
24	I	—	0	...	I	1.3	0	...	I	0.1	0	...
25	I	1.5	0	...	0	...	0	...	0	...	I	0.1
26	I	2.1	0	...	0	...	0	...	0	...	I	2.3
27	I	1.5	0	...	I	0.3	I	0.1	0	...	I	0.7
28	2	5.5	0	...	I	1.4	0	...	0	...	0	...
29	2	5.0	0	...	2	5.3	I	0.6	I	0.6	I	0.5
30	2	4.0	0	...	2	3.0	I	0.3	0	...	I	1.6
31	I	0.8	0	...	2	4.3	0	...	0	...	0	...
Total ...	—	51.8	—	14.7	—	30.4	—	28.4	—	41.1	—	25.0
No. of days used	—	29	—	29	—	23	—	30	—	31	—	30
Mean ...	—	1.8	—	0.5	—	1.3	—	0.9	—	1.3	—	0.8

Month.	JULY.		AUGUST.		SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
Day.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.	Character	Duration Negative Pot. Grad.
		hours.		hours.		hours.		hours.		hours.		hours.
1	0	...	I	1.2	0	...	0	—	I	0.1	0	...
2	0	...	0	...	0	...	I	0.1	0	...	0	...
3	2	3.5	I	0.1	0	...	0	...	0	...	0	...
4	I	1.2	2	5.3	0	...	0	...	I	0.5	0	...
5	I	0.2	0	...	0	...	0	...	0	...	I	0.1
6	I	0.1	0	...	0	...	0	...	0	...	I	1.6
7	0	...	0	...	0	...	0	...	0	...	0	...
8	0	...	I	0.1	0	...	I	0.2	0	...	0	...
9	I	1.0	0	...	I	1.4	I	1.6	0	...	0	...
10	0	...	0	...	0	...	0	...	I	1.6	I	0.4
11	0	...	0	...	0	...	I	0.8	I	2.5	I	0.1
12	0	...	I	0.8	0	...	I	2.7	0	...	2	5.7
13	0	...	I	0.8	0	...	0	...	I	0.2	0	...
14	0	...	I	0.5	0	...	I	1.7	I	2.1	0	...
15	0	...	0	...	0	...	2	3.8	2	3.1	0	...
16	0	...	0	...	I	0.1	I	0.4	2	4.0	I	0.9
17	0	...	0	...	0	...	I	1.6	0	...	I	0.6
18	0	...	0	...	0	...	I	1.5	0	...	0	...
19	0	...	I	0.5	I	0.1	I	1.4	I	0.3	I	0.6
20	0	...	2	3.4	0	...	2	3.4	0	...	I	1.4
21	0	...	0	...	0	...	I	1.7	I	2.1	I	0.1
22	0	...	I	0.1	0	...	2	6.7	I	1.7	0	...
23	0	...	I	0.2	0	...	I	0.3	I	2.7	0	...
24	0	...	I	1.0	I	0.2	I	1.4	I	0.2	I	2.0
25	0	...	0	...	I	2.6	I	0.4	I	1.8	I	0.1
26	0	...	2	4.1	0	...	2	9.3	0	...	I	0.5
27	I	2.7	I	—	0	...	I	2.4	I	0.8	2	3.2
28	2	3.7	0	...	I	2.4	0	...	0	...	2	6.9
29	0	...	I	0.6	0	...	0	...	0	...	I	1.7
30	I	0.7	I	1.0	0	...	I	0.2	0	...	2	6.7
31	I	1.5	I	1.5	0	...	I	0.3	0	...	2	4.1
Total ...	—	14.6	—	21.2	—	6.8	—	41.9	—	23.7	—	36.7
No. of days used	—	31	—	30	—	30	—	31	—	30	—	31
Mean ...	—	0.5	—	0.7	—	0.2	—	1.4	—	0.8	—	1.2

Mean Values for periods of sixty minutes, centered at the exact hours, Greenwich Mean Time.

540. Richmond (Kew Observatory).

Month.	January. Factor 2.04.				February. Factor 2.05.				March. Factor 2.19				
	Hour G.M.T.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.
Day.													
1		410	710	475	375	115	315	200	435	145	215	305	640
2		125	100	-625	550	315	475	z+	400	-720	320	145	720
3		695	585	510	585	(450)	535	375	625	305	695	375	720
4		400	(360)	175	225	485	600	175	275	480	385	225	990
5		(200)	425	500	500	75	115	285	625	(340)	465	160	-145
6		100	160	260	385	(400)	725	325	535	-95	415	465	680
7		550	425	350	175	335	375	325	200	280	320	400	400
8		60	285	250	535	115	175	225	175	255	440	—	—
9		325	435	335	525	85	305	265	550	—	—	—	—
10		350	400	85	450	500	325	15	300	—	—	—	—
11		200	-135	720	645	100	175	165	z+	—	—	—	—
12		475	460	210	-150	85	385	315	675	—	—	—	—
13		100	275	300	425	350	-300	335	485	—	—	—	—
14		200	550	275	300	215	365	350	50	—	—	—	—
15		225	450	300	375	125	115	125	250	—	—	—	615
16		185	185	350	585	100	150	125	215	585	345	360	535
17		275	535	500	200	125	250	200	265	215	375	375	455
18		1295	575	375	-125	235	600	200	375	160	265	200	415
19		50	710	385	660	235	450	200	200	200	345	295	345
20		550	535	235	310	225	615	365	685	160	295	305	305
21		160	110	135	200	(390)	435	335	700	40	465	505	240
22		100	85	335	695	500	825	585	550	175	240	215	505
23		510	695	400	(400)	675	225	375	425	105	215	215	425
24		(200)	(300)	300	250	325	525	665	525	175	80	135	655
25		125	375	375	60	425	585	615	585	185	495	240	215
26		100	300	410	375	450	475	185	425	255	585	225	425
27		350	-175	460	695	215	335	335	625	225	265	225	440
28		625	560	-25	210	450	650	335	500	335	-40	z+	545
29		125	50	300	-200	535	625	425	535	360	-25	160	-255
30		-135	625	300	150	—	—	—	—	215	320	z+	375
31		250	560	300	100	—	—	—	—	120	385	-440	640
Means (a)		311	408	342	391	298	421	301	435	242	360	277	513
Means (b)		296	371	299	338	304	402	306	437	176	340	242	445
Mean for day		(a) 363	(b) 326			(a) 364	(b) 362			(a) 348	(b) 301		
Month.	April. Factor 2.11.				May. Factor 2.00.				June. Factor 2.10.				
Hour G.M.T.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	
Day.													
1		285	-1030	50	540	145	330	185	340	75	435	370	500
2		410	385	270	670	185	390	390	415	305	435	370	475
3		385	115	25	615	120	390	425	355	305	385	255	410
4		245	410	320	540	(290)	535	635	450	255	435	450	295
5		270	515	310	630	(440)	550	450	440	255	335	140	100
6		540	630	255	670	255	270	100	280	165	155	115	205
7		375	475	525	590	120	525	220	270	-50	(60)	230	255
8		-195	230	230	270	220	270	220	355	130	305	155	295
9		90	115	205	295	245	295	160	295	75	205	140	205
10		155	205	140	465	245	305	-60	100	75	115	100	270
11		165	345	245	25	135	280	120	220	220	255	370	245
12		-65	490	465	505	60	230	145	220	230	205	155	345
13		310	490	590	360	195	205	60	295	245	295	180	295
14		285	435	425	425	85	305	355	500	z±	155	z±	130
15		130	230	375	375	315	205	100	-35	410	245	100	255
16		z±	195	230	320	100	120	z±	270	270	205	130	165
17		195	310	515	435	135	295	-230	340	230	140	65	245
18		345	255	165	335	-160	z±	z±	490	115	180	140	115
19		375	345	195	205	535	220	z-	-135	-385	230	165	305
20		155	360	165	425	280	245	z-	405	165	255	190	165
21		(250)	320	z±	465	245	465	z±	z+	155	295	130	230
22		295	230	165	220	195	295	255	340	140	230	205	220
23		155	255	130	320	330	170	120	205	220	270	155	230
24		180	245	180	425	120	280	280	440	205	165	90	140
25		255	285	180	695	450	475	135	270	100	280	180	180
26		400	515	245	580	340	230	145	390	100	230	75	65
27		360	615	605	400	220	205	145	315	90	255	130	230
28		360	450	205	255	255	415	145	380	155	205	130	165
29		(130)	130	155	140	-75	475	535	560	(100)	115	40	280
30		65	140	155	220	295	450	500	365	155	180	100	230
31						220	415	405	340				
Means (a)		265	335	266	416	234	328	260	344	183	242	174	241
Means (b)		238	292	267	417	213	338	228	325	156	245	174	245
Mean for day		(a) 321	(b) 304			(a) 291	(b) 276			(a) 210	(b) 205		

NOTE.—The Potential Gradient is reckoned as positive if the potential increases upwards. For indeterminate potential gradient the following notation is used: z+ Indeterminate, positive value; z- Indeterminate, negative value; z± Indeterminate in magnitude and sign.

(a) Mean from all positive readings.

(b) Mean from all complete days using both positive and negative readings.

Mean Values for periods of sixty minutes, centered at the exact hours, Greenwich Mean Time.

540. Richmond (Kew Observatory).

1928.

Month.	July. Factor 8.53.				August. Factor 2.01.				September. Factor 8.53.				
	Hour G.M.T.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.
Day.													
1	100	150	100	215	170	0	210	210	140	230	265	315	
2	125	275	200	215	125	500	355	365	150	330	180	320	
3	175	340	215	-705	220	415	490	135	210	345	175	250	
4	75	350	125	250	110	-110	(185)	515	205	235	155	345	
5	90	290	240	215	280	195	85	280	320	375	205	250	
6	125	250	165	250	100	235	100	320	95	210	150	340	
7	150	275	140	165	100	170	135	110	155	250	195	(300)	
8	100	265	150	200	75	280	160	255	(150)	(230)	150	100	
9	40	265	165	215	110	220	145	170	30	120	110	375	
10	175	300	150	315	170	280	195	170	210	250	175	250	
11	190	275	175	250	135	195	125	365	140	290	190	(390)	
12	190	340	125	165	-35	50	125	270	(300)	(390)	355	180	
13	175	315	175	140	135	195	145	220	80	410	385	210	
14	115	325	125	100	50	210	125	245	245	330	395	345	
15	65	150	90	100	60	220	135	210	265	300	265	345	
16	75	265	140	365	185	255	185	235	125	125	155	95	
17	190	465	275	140	135	245	125	255	125	345	210	220	
18	125	200	75	140	185	380	110	175	245	245	150	(280)	
19	90	150	100	150	245	255	110	235	95	375	150	155	
20	125	125	100	125	50	210	75	255	(120)	535	190	150	
21	115	215	150	190	170	245	125	135	250	370	210	745	
22	90	240	100	200	75	270	110	270	245	385	290	370	
23	50	200	125	125	100	195	135	320	210	230	220	180	
24	150	175	90	150	185	440	135	270	95	(390)	260	285	
25	125	165	90	125	165	135	135	270	-135	440	360	605	
26	90	115	115	215	125	195	75	z±	125	190	410	(550)	
27	50	350	165	15	145	245	(160)	235	(390)	(550)	415	510	
28	-225	300	125	200	175	190	(140)	355	(150)	(300)	(200)	(390)	
29	165	165	75	265	(230)	(300)	275	285	(120)	190	285	80	
30	200	225	140	25	190	245	220	235	40	300	260	(390)	
31	0	350	150	225	265	400	-10	260					
Means (a)	118	254	140	182	149	246	161	254	173	309	238	311	
Means (b)	107	254	140	153	143	235	158	254	163	309	238	311	
Mean for day		(a) 173	(b) 163		(a) 202	(b) 198			(a) 258	(b) 255			
Month.	October. Factor 2.04.				November. Factor 2.06. 2.07.				December. Factor 2.06.				
Hour G.M.T.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	3h.	9h.	15h.	21h.	
Day.													
1	(150)	(300)	250	390	(240)	(400)	375	265	100	300	255	580	
2	300	455	250	260	115	340	440	390	290	380	310	380	
3	235	685	425	600	300	425	415	525	180	455	310	515	
4	300	435	425	575	115	340	350	340	355	280	335	325	
5	(150)	425	250	350	755	790	375	450	(330)	415	355	255	
6	110	300	200	(300)	125	340	400	390	1035	515	445	455	
7	(230)	300	175	285	325	490	465	680	225	645	445	425	
8	100	140	175	310	390	575	600	550	370	590	570	625	
9	110	(180)	-10	325	250	640	(400)	550	445	600	660	780	
10	335	175	285	375	600	1405	-300	250	125	400	390	425	
11	135	75	200	485	-115	250	315	200	235	490	525	580	
12	z±	510	(380)	695	65	165	165	(240)	-336	355	445	380	
13	475	500	225	385	(110)	(400)	340	325	255	645	805	635	
14	525	550	210	-285	400	615	(380)	(500)	435	525	590	690	
15	-85	(350)	250	375	(250)	(300)	380	360	625	545	515	725	
16	210	300	210	200	215	-215	180	170	715	310	180	155	
17	75	275	285	385	110	595	200	260	110	570	400	535	
18	385	360	-185	335	170	345	300	335	470	735	500	670	
19	125	310	285	210	45	135	290	245	715	780	535	455	
20	85	-10	450	575	110	515	315	270	270	z±	415	760	
21	375	350	225	500	100	100	-145	125	535	690	790	515	
22	175	350	400	z±	110	180	90	235	635	790	370	435	
23	75	375	300	200	125	-20	65	190	335	745	445	355	
24	100	250	185	350	135	215	190	280	415	290	300	300	
25	150	325	350	460	80	110	90	180	145	800	645	190	
26	275	325	-60	-500	100	290	370	495	45	125	245	670	
27	250	75	485	350	155	110	z±	380	390	725	760	-280	
28	85	185	200	375	270	415	380	480	-210	470	555	-155	
29	385	525	275	150	470	615	370	190	-10	535	415	770	
30	50	150	175	335	225	245	335	270	-180	310	225	290	
31	175	210	(300)	(500)					z±	-570	660	580	
Means (a)	211	325	279	380	223	405	318	337	376	518	464	498	
Means (b)	202	306	234	316	213	379	280	336	303	518	459	437	
Mean for day		(a) 299	(b) 265		(a) 321	(b) 302			(a) 464	(b) 429			
									Annual Means (a)		(b)		
									232	346	268	359	
									209	332	252	335	
									(a) 301	(b) 282			

(a) Mean from all positive readings.

(b) Mean from all complete days, using both positive and negative readings.

NOTE.—The Potential Gradient is reckoned as positive if the potential increases upwards. For indeterminate potential gradient the following notation is used: z+ Indeterminate positive value; z- Indeterminate, negative value; z± Indeterminate in magnitude and sign.

The departures from the mean of the day are adjusted for non-cyclic change.

SELECTED QUIET DAYS.

541. Richmond (Kew Observatory).

1928.

Table with 25 columns (Hour 1-23, Midt., Non-cyclic change, Mean values) and 13 rows (Jan. to Dec., Year, Winter, Eqnx., Sumr.).

AIR POLLUTION : HOURLY MEANS FOR EACH MONTH (milligrams per cubic metre).

COMPLETE DAYS ONLY.

542. Richmond (Kew Observatory).

1928.

Table with 25 columns (Hour 1-23, Midt., Mean, No. of days used) and 13 rows (Jan. to Dec., Year, Winter, Eqnx., Spring Autm., Sumr.).

AIR POLLUTION : DIURNAL INEQUALITIES (milligrams per cubic metre).

The departures from the mean of the day are adjusted for non-cyclic change.

543. Richmond (Kew Observatory).

1928.

Table with 25 columns (Hour 1-23, Midt., Non-cyclic change, Range) and 13 rows (Jan. to Dec., Year, Winter, Eqnx., Sumr.).

SEISMOLOGICAL DIARY: Instruments.—Two horizontal and one vertical Galitzin Seismographs with galvanometric registration.

Lat. 51° 28' N. Long. 0° 19' W. Height above M.S.L. 5 metres.

1928.

544. Richmond (Kew Observatory).

Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△	Remarks.	Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△	Remarks.
				A _N .	A _E .	A _Z .							A _N .	A _E .	A _Z .		
		h. m. s.	s.	μ	μ	μ	km.			h. m. s.	s.	μ	μ	μ	km.		
Jan. 1	eL F	0 38 1 10	...	...	...	...	...		Jan. 26	eL F	22 40 23 10	...	...	...	...
1	ePz iPR _{1z} eSE LNE Lz MNE F	9 38 15 41 27 48 37 10 7 10 16 40	...	...	...	...	9230	Epicentre (from St. Louis, Tucson and Kew data) = 15° N, 98° 5 W; off Southern Coast of Mexico. Records interrupted between 9 ^h 54 ^m and 10 ^h 1 ^m , owing to changing of charts.	27	eL F	23 10 25	...	...	...	...	Disturbed by microseisms.
1	iPz eL L F	18 54 37 19 63 12 25	...	...	...	...	...	Kurile Isles, according to Osaka.	29	eL F	0 49 1 0	...	...	...	...
3	eL F	0 16 35	...	...	...	...	...		30	eLNE eLz M F	4 5 12 16-18 55	18	...	...	...
4	eLNE M ₁ M ₂ F	22 (27) 39 48 40 39 23 35	...	...	...	...	...		Feb. 3	iPz eSE LNE Lz M ₁ M ₂ M ₃ F	13 56 52 14 4 17 15 19 18 45 23 21 25 23 45	...	...	...	5800	Dilatation. Disturbed by microseisms and wind. Epicentre:—Siberia; 73° N., 139° E., according to Zürich.
5	e F	14 34 50	...	...	...	...	...	Disturbed by wind and microseisms.	4	eLNE Lz M F	7 5 12 21-22 50	23	...	...	...
6	ePz e _z ePR _{1z} eN iSEz SRNE LNE Lz	19 42 1 42 44 44 9 50 13 50 24 55 59 20 5	...	...	...	...	6890	Compression. Amplitude of P as read in mm. N E +3.3 -3.0 Azimuth: 134° ± 2°, giving epicentre near 0°, 39° E; near Mount Kenya.	6	eLNE M F	4 42 50 28 5 20	24	...	...	...	Disturbed by microseisms. Traces on Z component
6	M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ L ₂ F	20 5 5 5 7 8 16 10 7 11 34 11 52 22 3 50	22	+55	...	...	...	Long waves via the antipodes.	7	ePz ScPcSE eSN iPS iSR ₁ eNE Lz Lz M ₁ M ₂ M ₃ F	0 15 25 22 25 43 26 57 32 4 40.8 48 52 59 0 1 1 29 5 1 2 5	...	...	...	9780	Disturbed by microseisms. Strasbourg, Phu-lien and Helwan data indicate epicentre near 0°.5 S., 87°.5 E. (Indian Ocean).
10	eLNE eLz M ₁ M ₂ M ₃ F	2 53 58 3 4 16 5 16 5 28 30	...	...	...	...	...	Earlier phases masked by microseisms.	10	iPz iSE LNE M F	4 50 42 5 0 46 17 23 45	...	...	...	8880	Dilatation. Jesuit Seis. Assoc. gives tentative epicentre:—Mexico, 19°.8 N., 98°.5 W.
12	eL M ₁ M ₂ F	13 59 7 53 8 7 35	...	...	...	...	...	N record disturbed by wind.	13	e ene LNE F	6 3 8 30 45	...	...	...	...
14	eN eL F	0 19 13 19 42 ?	...	...	...	...	...	Extremely small movements. Felt in Belgium (according to press).	17	e F	23 39 50	...	...	...	...
14	iE F	4 10 32 ?			19	e F	22 31 37	
17	eL F	8 20 30	...	...	...	...	...		21	ePz iSNE LNE M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ F	19 59 24 20 7 40 18 26 11 30 38 32 45 33 49 36 51 38 0 21 40	...	...	...	6750	68° N., 173°.5 W., according to Jesuit Seis. Assoc. Felt in Seward, Alaska
18	—	—	...	...	...	...	...	No records from 10 ^h 15 ^m to 10 ^h 35 ^m .	23	e F	10 19 22	...	...	...	...
18	eL F	13 9 30	...	...	...	...	...		24	eL M F	14 30 58 15 40	19	...	...	...
20	eL F	0 0 50	...	...	...	...	...		25	eLNE eLz F	11 50 12 6 30	...	...	...	...
21	—	—	...	...	...	...	...	No records from 9 ^h 54 ^m to 10 ^h 45 ^m .								
24	e F	7 45 55	...	...	...	...	...	Disturbed by wind.								

SEISMOLOGICAL DIARY:—continued. Instruments.—Two horizontal and one vertical Galitzin Seismographs with galvanometric registration.

Lat. 51° 28' N. Long. 0° 19' W. Height above M.S.L. 5 metres.

544. Richmond (Kew Observatory).

1928.

Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△	Remarks.	Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△	Remarks.
				A _N .	A _E .	A _Z .							A _N .	A _E .	A _Z .		
Mar. 18	eN eZ F	h. m. s. 23 56·8 57 11 59	...	μ	μ	μ _s	km.	Very small. Jugo Slavia; 45° 25' N, 17° 10' E, according to Zagreb.	Mar. 31	iP S iN iE L _{NE} Lz M ₁ M ₂ M ₃ M ₄ M ₅ F	h. m. s. 0 35 2 39 15 40 21 40 34 40·8 43 19 43 32 43 39 44 11 45 6 45 8 2 0	s. ...	μ μ μ	km. 2600	Compression. Amplitudes of iP as read in mm.— N E Z +0·85 -1·1 Azimuth: 124° ± 3° giving epicentre near 36° N, 24° E. Destructive near Smyrna.		
22	iP _{EZ} PR _{1,EZ} PR _{3,E} iS _N iS _E iS _Z PS _Z SR ₁ SR ₂ L _N L _{EZ} M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ M ₇ M ₈ M ₉ M ₁₀ M ₁₁ M ₁₂ F	4 29 17 32 9 33 36 39 37 39 40 39 43 40 27 44·3 49·0 52 55 17 55 21 56 56 57 53 5 0 5 0 9 0 14 3 6 5·7 6 17 7 39 15 10 15 15 8 40	...	...	...	9190	Compression. Amplitudes of iP as read in mm.— N E Z -1·9 +6·0 +9·5 Azimuth = 285° ± 1° giving epicentre near 15° N, 97·5 W. Felt in Mexico.	31	eE LN MN F	5 21 57 24·6 25·8 33	...	...	...	...	Very small. Probably a repetition of pre- ceding shock.	
								*Negative maximum off chart.	Apr. 1	eL F	18 59 19 8	...	...	...	...
								†Negative and positive maxima off chart.	2/3	eL F	23 50 0 10	...	...	...	...
23	eL F	21 25 22 5	...	...	...	...	...		3	ePz eL _E M F	16 53 38 17 12 15 58 40	...	...	...	...
24	eL F	11 15 30	...	...	...	...	...		7	eZ L M _N F	20 53 21 4 9 30	...	...	...	...
26	ePR ₁ ePS L M ₁ M ₂ M ₃ F	5 45 50 54 54 6 19 36 24 36 41 36 44 7 15	...	...	...	...	12000	Epicentre: Menado, Celebes, according to Batavia.	9	eScPcSe eSE iPSEZ (SR ₁) (SR ₂) Le Lz M ₁ M ₂ M ₃ M ₄ M ₅ F	17 57 34 57 53 58 58 18 4·2 7·6 13 16 20 10 21 59 22 4 24 6 24 10 19 45	...	...	...	(9700)	Z record defective before 17 ^h 53 ^m . No N record. Felt in Peru. 12°·4 S., 69°·6 W., according to Jesuit Seis. Assoc.
26	eL _{NE} M F	7 35 46 8 15	...	...	...	...	...	Traces on Z compt.	10	e F	1 16 22	...	...	...	...
26	eL F	9 0 45	...	...	...	...	...		12	eL F	18 57 19 35	...	...	...	...
26	ePz eS _{NE} L M ₁ M ₂ M ₃ F	14 43 1 44 51 45 52 46 16 46 18 46 27 55	...	...	...	...	1020	? Compression. A fore-shock of the following disturbance	13/14	ePz eSE L _{NE} F	23 28 33 38 45 57 0 40	...	...	...	9030	Small disturbance. South of Mexico. 13° N., 95° W., ac- cording to Jesuit Seis. Assoc.
27	iP iS _{NE} iz(S) L _{NE} M ₁ M ₂ M ₃ M ₄ F	8 34 56 36 49 36 54 37 36 38 16 38 50 39 13 39 17 9 25	...	...	...	...	1050	Dilatation. Amplitudes of iP as read in mm.— N E -0·7 +1·2 Azimuth: 117° ± 3° giving epicentre near 47° N, 12° E (Carin- thian Alps). Destructive in Udine and Friuli, N.E. Italy.	14	iP iS LN L _{EZ} M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ M ₇ M ₈ M ₉ F	9 4 32 8 20 9 25 10·4 10·9 12 0 12·13 13·1 14·6 15 11 15 40 16 22 16 44 11 0	...	...	2290	Dilatation. Amplitudes of iP as read in mm.— N E Z -3·0 +8·5 -5·3 Azimuth = 107° ± 2° giving epicentre near 42° N, 27° E. Destructive in Bulgaria (Chirpan, etc.). *Both positive and negative maxima off the charts. †Negative maxima off the charts.	
27	e(S) _{NE} L M F	19 31 9 59 20 3 40	...	...	...	...	...		14	ePz eSE F	10 32 14 36 12 ?	...	...	...	2410	Probably a repetition of preceding shock. Overlapped.
28	e F	13 22 27	...	...	...	...	...		16	eL F	9 29 40	...	...	...	...
29	iPz iS _{NE} iSR ₁ iSR ₂ L M ₁ M ₂ F	5 18 19 28 24 31 22 34 36 51 56 44 6 0 38 40	8980	Compression. S very sharp and large. Epicentre near Japan.									

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Date.	Phase.	Time.		Period	Amplitudes.			△	Remarks.	Date.	Phase.	Time.		Period	Amplitudes.			△	Remarks.			
		h. m. s.	s.		A _N .	A _E .	A _Z .					h. m. s.	s.		A _N .	A _E .	A _Z .					
					μ	μ	μ	km.							μ	μ	μ	km.				
June I cont.	L _E	53	3		June 16	e(P) _Z	19	0					
	L _Z	58			e(S) _N	9	59		
	M ₁	14	0 48	21	...	+30			L	30		
	M ₂	2	42	20	...	+28			F	20	5		
	M ₃	3	31	22	+32			17	iP	3	31 49	9280	Compression. Amplitudes of iP as read in mm.— N E Z -2.75 +7.85 +12.0 Azimuth = 288° ± 1°, giving epicentre near 16° N., 100° W., off Pacific Coast of Mexico.
	M ₄	3	50	22	+30	...				iPR _{1E}	34	55	
F	15	45	...	...	...	...	...	ePR ₂	37	3	...	...	...	...	...		
I	eL	15	55	...	...	...	...	...	iS _E	42	13	...	...	...	...	...	
	F	16	20	...	...	...	...	...	SR _{1E}	47	3	...	...	...	...	...	
I	eL	19	12	...	...	...	...	...	SR _{2E}	51	5	...	...	...	...	...	
	F	22	...	...	...	...	...	...	L _N	58	16	...	...	...	...	...	
I	eL	22	53	...	...	...	...	...	L _E	58	27	...	...	...	...	...	
	F	23	10	...	...	...	...	...	M ₁	58	34	29	+215	...	...	...			
3	eL	4	0	...	...	...	...	...	L _Z	59	5	...	...	...	...	...	
	F	25	...	...	...	...	...	...	M ₂	4	0 9	30	...	+530†	...	...				
3	ePz	8	43 42	(9250)	Epicentre: 32° N., 129° 5 E. (Japan), according to Zurich.	M ₃	3	19	24	+520†					
	eS _E	54	(5)	...	...	...	...		M ₄	3	33	25	+250	...	...	...			
	L _{NE}	9	16	...	...	...	...		M ₅	3	4	24	...	> 440*	...	...				
	M ₁	21	34	18	...	+25	...		M ₆	7	24	21	+240	...	...	...			
	M ₂	27	2	14	-30		...	M ₇	7	44	20	+470†	...					
	M ₃	27	3	15	-40	-31	M ₈	10	12	17	...	> 340*					
3	eL	22	57	...	...	...	...	...	M ₉	11	22	17	...	...	+500†	...
	F	23	15	...	...	...	...	...	M ₁₀	12	59	17	-220	...	...	...			
5	eL	6	8 16	...	...	...	...	...	F	8	40	...	...	...	...	...	
	F	7	5	...	...	...	...	...	17	iz	7	0 37	...	...	...	...		
6	eL	20	26		F	?					
	F	50	17	iPEZ	22	33 27	9170	Probably a repetition of the shock at 3 ^h .				
F	5	...	...	...	...	...	...	eS _{NE}		43	46	...	...	...	...	...	
7	eL	3	58	...	...	...	...	...	L _{NE}	23	0	...	...	...	...	...	
	F	4	10	...	...	...	...	...	M _E	10	18	...	...	...	...	...	
7	eL	13	6	...	...	...	...	Damage at Corinth (according to press).	F	35	...	...	...	...	...	...
	F	10	17/18	iPEZ	23	37 8	9050	Probably a repetition of the shock at 3 ^h .			
8	ez	14	58(58)	eS _E		47	25					
	ez	15	0 31	...	...	...	...	...	L _{NE}	0	4	...	...	...	...	...	
13	L	(46)	...	...	...	...	...	N and E components disturbed by wind.	M _E	14	18	...	...	...	...	...	
	F	17	0	F	45					
14	e	8	1	...	...	...	...	Not very distant.	18	eL	16	27	...	...	...	...		
	F	4	F	35					
15	e	16	40	...	...	...	...	...	18	eL	22	55	...	...	...	...		
	F	17	5	F	23	10					
15	eL	4	56	...	...	...	...	...	21	ez	4	5 45	...	...	...	...		
	F	5	10	e _E	27	8					
15	eP	6	26 18	(11050)	Epicentre S.W. of Manila; 13° 5 N., 118° E., according to Strasbourg.	21	eP ₁	10	59 54	(16000)	Fiji Islands; 18° S., 178° W., according to U.S.C. & G.S. Very irregular long waves.				
	PR ₁	30	20	e _E	22	13			
	PR ₂	33	(2)	L	(41)			
	iScPcS	36	57	M ₁	12	36 14	21	+16			
	en(S)	38	1	M ₂	37	2	19	+12		...			
	ezPS	39	9	M ₃	39	4	18	-15		...			
	e _E (PPS)	40	3	F	13	50			
	eNSR ₁	44	7	21	iP	16	37 58	7340	Compression. Amplitudes of i as read in mm.— N E +4.5 -1.3 Azimuth = 342° ± 5°, giving epicentre near 59° N., 147° W. Felt on south coast of Alaska.	
	eESR ₂	49	0		i	38	10		
	eNSR ₃	53	7	PR _{1Z}	40	24			
	L _{NE}	7	1	PR ₂	41	47			
	L _Z	6	iS _{NE}	46	44			
	M ₁	5	42	26	...	-71	iz	46	58			
	M ₂	7	27	23	+100	-82	iE(PS)	47	53			
	M ₃	13	26	19	...	-64	SR _{1N}	51	0			
	M ₄	7	16 41	19	+62	SR _{2E}	54	31			
	M ₅	16	55	18	+60			...	L _{NE}	58			
F	9	25	...	...	...	...	...	L _Z	17	1	...	...	...	...	...		
15	e(P) _Z	17	30.7	...	...	...	(11000)	Repetition of preceding shock.	21	M ₁	1	41	25	-75	...	...				
	ePR _{1Z}	34	38	M ₂	3	49	20	...	+72	...					
	L _{NE}	18	5	M ₃	7	30	19	+85					
	M ₁	9	18	27	+55	-67	M ₄	7	45	18	+90					
	L _Z	10	M ₅	8	38	15	...	+60	...					
	M ₂	12	57	21	...	+42	M ₆	9	20	18	+80					
	M ₃	21	32	18	-30			...	L ₂	18	57					
F	20	0	F	19	55							

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Date.	Phase.	Time.		Period	Amplitudes.			Δ	Remarks.	Date.	Phase.	Time.		Period	Amplitudes.			Δ	Remarks.
		h. m. s.	s.		A _N .	A _E .	A _Z .					h. m. s.	s.		A _N	A _E	A _Z.			km.
July 23	e F	16 15 20			Aug. 10 cont.	eSR ₁ NZ L F	50 (53) 16 (4) 45	Surface waves very small and irregular.	
26	eL F	13 23 42	...	...	...	...	...	No E record.		12	ePz ePR ₁ Z	8 23.8 27.9	...	...	...	(12000)	Near Menado, East Indies, according to Batavia.
28	ez L F	20 8 39 21 15	...	...	...	...	...				ePSz eSR ₁ N L F	33 39 37 6 43.4 9 (0) 10 0	...	...	...	...	Surface waves very small and irregular.
29	e F	18 27 33	...	...	...	...	...			15	e(S) L M F	12 15 40 19 20 1 30	...	...	...	+ 3	
30	ez L M F	2 56.0 3 20 27 4 10	...	...	...	...	...			15	Pz e(S) L F	15 45 54 51.7 56.5 16 30	...	...	...	(4000)	Atlantic Ocean.
31	eL F	20 16 40			15	Pz ez iS ePS _N eSR ₁ N eSR ₂ N L _{NE} F	17 28 8 30 21 37 47 38 44 42.7 45 28 52.5 18 40	8380		
Aug. 1	ez L F	19 12 39 55 20 5	...	...	...	...	...	Felt in Iceland, according to Scoresby Sund.		16	eL F	8 3 20	...	...	...	...
1	e F	20 32 21 5	...	...	...	...	...			19	eP e(S) _N L M F	2 54 28 58 1 59 3 0 25	...	...	...	(2110)	
2	eL F	7 20 35	...	...	...	...	...			19	eL F	4 30 40	...	...	...	...
3	ez L F	7 20 16 30 50	...	...	...	...	...			20	eL F	2 45 3 0	...	...	...	...
3	ePNz iSN L M F	11 54 16 12 1 57 11.2 14 26 13 10	...	...	...	...	6100	Atlantic Ocean, near 3° S., 13° W.		20	...	...	...	...	...	...
4	ez eez F	4 24 54 27 12 29	...	...	...	...	...			21	eL F	19 30 50	...	...	...	...
4	ez Lz F	7 23 29 40	...	...	...	...	...	N and E records disturbed by wind.		22	eL F	7 17 30	...	...	...	...
4	iPz iPe, eN iPR ₁ iS iE PSz SR ₁ NE SR ₂ iN eN LNE Lz M ₁ M ₂ M ₃ M ₄ M ₅ M ₆ M ₇ M _{8F}	18 38 37 38 38 41 48 49 5 49 22 50 3 53 41 18 59 2 19 0 16 1.8 4.2 7 11 40 11 46 12 53 15 11 16 15 20 27 20 30 22 28 23 5	9360	Compression. Amplitudes of iP as read in mm.— N E Z -1.4 +4.05 +6.2 Azimuth = 288° ± 1°, giving epicentre near 15° N., 100° W. Destructive in province of Oaxaca, Mexico.		23	ez ez iNE F	1 28 40 30 44 37 30 45		
5	ePz e(ScPcS) _{NE} ene L M F	14 55 18 5 54 6 14 30 41 16 10	...	...	...	...	(12000)	East Indies. Shocks felt at Manila. Tidal wave near Island of Flores.		23	e(P) e(S) _N L M F	4 13.3 19.0 21 21 25 40	...	...	...	(3800)	Felt in Persia.
8	eL F	3 10 35	...	...	...	...	...			23	e F	35.1 40	...	...	...	...
10	iPz, eNE iPR _{1, 2, 3} eSN	15 42 30 43 46 48.4	(4200)			24	ePNz eSNz LNE M ₁ Lz M ₂ M _{3F}	9 48 (5) 51 (20) 52.2 53 (8) 53.8 54 (33) 54 (41) 10 15	1910	Absolute times uncertain. Epicentre: 36° N., 1° E., according to Almeria. Felt at Inkerman, Algeria.	
	eL F	22 2 38 6 24 25 (36) 23 55	...	...	...	...	...			24	cz enz ene LNE F	22 2 38 6 24 25 (36) 23 55	...	...	...	...	...

SEISMOLOGICAL DIARY :—continued. Instruments.—Two horizontal and one vertical Galitzin Seismographs with galvanometric registration.
 Lat. 51° 28' N. Long. 0° 19' W. Height above M.S.L. 5 metres.

544. Richmond (Kew Observatory).

1928.

Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△ km.	Remarks.	Date.	Phase.	Time. G.M.T.	Period	Amplitudes.			△ km.	Remarks.		
				A _N .	A _E .	A _Z .							A _N .	A _E .	A _Z .				
Aug.		h. m. s.	s.	μ	μ	μ				h. m. s.	s.		μ	μ	μ				
25	eL _{NE} F	0 22 50	...	...	...	...	...	} No Z record.	Sept.	eL F	3 18 40	...	...	...	...	...
25	eL _{NE} F	2 30 50	...	...	...	...	...		6	eL _{NE} F	7 16 40	...	...	...	...	...	...	No Z record. N and E records disturbed by wind.
25	eL F	17 4 20	...	...	...	...	...		6	eL _Z F	10 16 40	...	...	...	...	...	...
25	(ez) (eL) M _N F	21 10 15.5 16.0 25	...	...	...	...	...	Felt at Zagreb, Jugo Slavia.	7	e(P) _Z L _E M _E F	3 10 (17) 49 4 3 5 10	...	...	...	...	...	N record defective.	
26	eL F	5 10 6 30	...	...	...	...	...	Overlapping preceding disturbance.	11	ez ez en L M _N F	0 56 15 59 (58) 1 5 33 40 47 2 45	...	...	...	...	...	...
26	ez F	5 16 26 ?	...	...	...	...	...		11	eP _Z eS _E iS _E ePS _N eSR _{1NE} L _{NE} L _Z M ₁ M ₂ M ₃ F	12 48 10 57 49 57 56 58 29 13 2 39 10 16 18 53 20 29 22 12 14 50	...	...	...	...	...	8380 Epicentre: North Pacific Ocean, 43° N., 132° W., according to Jesuit Seis. Assoc.	
26	eL F	19 4 15	...	...	...	...	...		12	e(P) _Z i(PR) _{1Z} i(PR) _{2Z} e(SCPcS) _{NZ} e(PS) _{EZ} L _{NE} F	1 39 7 39 48 43 28 45 48 49 36 2 11-14 3 25	...	...	...	...	...	...	(12000) Probably near the East Indies.
28	eL F	1 50 55	N and E records disturbed by wind.	13	eP _Z ePR ₁ eS _{NE} i ez L M _N F	3 41 45 41 51 37 54 51 56 1 4 19 33 14 6 5	(12000) Menado, East Indies, according to Batavia.
28	eL _Z F	9 34 50	...	...	...	...	...		13	eL F	19 16.6 20	...	...	...	...	...	...
29	eL F	3 55 4 30	...	...	...	...	...		14	eP eS _N L _{NE} L _Z M _N F	8 10 23 17 (6) 22 23.1 24 50	...	...	...	...	...	...	(5000)
29	eL F	18 5 25	...	...	...	...	...	N and E records disturbed by wind.	16	e F	3 8 12	...	...	...	...	...	...
30	eP _Z ePR _{1Z} ePR _{2Z} eS _E ePS _{EZ} L _{NE} L _Z F	6 44 5 47 38 50 31 55 0 56 0 7 15 23 55	...	...	...	...	9940		18	eP _Z iS _N eS _{EZ} e(SR) _{1N} e(SR) _{2NZ} L M ₁ M ₂ M ₃ F	17 28 51 36 40 36 44 42 40 45.6 17 (46) 56 32 56 41 56 44 19 50	...	...	...	...	...	...	6240 Atlantic Ocean, near 2° N., 30° W. Commencement of L very indistinct.
30	ez F	11 51 55	...	...	...	...	...		18	(eP) _Z iP _Z iPR ₂ iS _{NE} e(SR) _{1E} e(SR) _{2N} L _{NE} L _Z M ₁ M ₂ M ₃ F	20 2 16 2 22 5 46 10 6 15 6 16 33 20 22 25 39 29 4 29 10 22 0	...	...	...	...	...	...	This may be a micro-seism. 6260 Epicentre near 12° N., 52° E. (Gulf of Aden).
30	eL F	12 56 13 10	...	...	...	...	...	Probably in Siberia.	1	eL _Z F	8 49 9 50	...	...	...	...	...	...	N and E records disturbed by wind.
30	ez L F	22 11.5 43 23 0	...	...	...	...	...		2	ePE _Z eS _E L M F	0 6 15 16 19 32.5 43 1 35	...	...	...	...	...	...	8840 Southern Mexico.
31	e L F	5 31 23 37 6 0	...	...	...	...	...		2	...	...	...	...	...	...	...	...	No records from 4 ^h 30 ^m to 7 ^h 25 ^m . No N record.
Sept. 1	eP _Z S _{NE} L _{NE} L _Z M ₁ M ₂ M ₃ F	6 18 39 26 27 38 40.5 48 35 48 37 48 40 8 35	...	...	...	...	6230	Probably in Siberia.	2	ez L _{EZ} F	17 16 35 18 16 19 10	...	...	...	...	...	...
1	eL _Z F	8 49 9 50	...	...	...	...	...	N and E records disturbed by wind.	3	eL F	22 5 20	...	...	...	...	...	...
2	ePE _Z eS _E L M F	0 6 15 16 19 32.5 43 1 35	...	...	...	...	8840		Southern Mexico.									
2	...	...	...	...	...	...	...		...	
2	ez L _{EZ} F	17 16 35 18 16 19 10	...	...	...	...	...	...					
3	eL F	22 5 20	...	...	...	...	...	...					

Derived from readings for the period of thirty minutes centering at the exact hour, Greenwich Mean Time.

544. Richmond (Kew Observatory).

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Month	January.								February.								March.							
	o h.		6 h.		12 h.		18 h.		o h.		6 h.		12 h.		18 h.		o h.		6 h.		12 h.		18 h.	
	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.
Day.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.
1	1.4	6.3	1.0	6.0	1.2	6.0	2.1	6.0	1.9	6.5	2.7	6.0	3.5	7.0	4.8	7.3	1.7	5.8	2.0	5.2	1.5	5.8	1.4	6.0
2	2.2	5.4	2.7	5.2	2.3	6.0	2.3	5.8	5.3	8.0	3.6	8.3	3.9	7.3	3.1	7.0	2.1	5.6	1.8	6.0	1.2	6.0	1.5	6.7
3	2.4	5.6	2.3	5.2	1.7	5.8	1.8	6.0	2.0	7.0	1.8	7.0	2.2	6.3	2.7	6.5	1.4	6.3	1.2	6.0	1.3	5.8	0.9	6.7
4	1.6	6.5	1.2	6.0	1.5	5.8	1.6	6.0	1.9	6.5	1.9	6.7	1.9	6.7	2.6	6.7	0.4	5.4	0.4	6.7	0.4	6.5	0.2	6.3
5	2.1	6.0	3.4	6.7	2.6	6.7	2.3	7.5	3.2	7.3	3.2	7.3	5.0	8.3	5.0	8.3	0.5	5.2	0.5	5.0	0.3	4.5	0.2	5.8
6	2.0	7.0	2.1	6.0	2.7	5.4	2.4	4.8	4.5	8.0	5.5	8.3	5.0	8.0	3.6	8.3	0.2	5.4	0.4	5.8	0.4	5.8	0.8	4.5
7	1.9	5.6	1.7	5.6	1.4	6.0	1.2	6.0	4.5	7.5	4.1	7.7	4.6	7.0	4.0	9.0	0.5	4.7	0.6	4.0	0.8	4.3	1.7	4.1
8	2.4	7.7	3.5	7.3	5.1	9.7	5.9	9.7	4.6	7.7	3.4	7.3	3.2	8.0	2.0	7.0	0.8	4.3	0.7	4.7	0.3	3.3	0.3	3.6
9	5.7	9.0	4.0	7.5	3.6	8.3	4.2	8.0	3.5	7.0	3.6	6.7	4.6	7.0	5.0	8.0	0.6	3.7	1.0	4.7	0.5	5.0	1.5	5.4
10	5.3	7.7	5.5	8.0	4.4	8.3	3.9	8.3	3.7	7.0	2.3	7.5	3.7	6.5	4.9	6.7	1.3	5.4	1.1	5.2	0.9	5.2	1.1	4.0
11	3.7	8.3	2.4	7.5	2.9	7.0	2.1	6.5	4.6	7.0	6.0	8.3	3.5	6.5	3.4	6.7	1.2	4.7	1.2	4.7	1.0	4.5	1.0	5.8
12	1.9	6.7	2.2	6.3	2.0	6.3	2.3	6.5	2.2	6.3	1.9	6.5	2.0	5.4	2.1	5.6	2.1	6.0	1.8	6.3	1.3	7.0	1.3	4.5
13	4.1	6.7	4.1	6.7	5.2	7.5	3.6	6.7	2.1	5.0	1.8	5.4	1.5	5.6	1.6	5.0	0.9	7.3	0.7	7.0	1.0	6.3	0.6	6.7
14	2.9	6.0	2.1	6.0	2.1	6.0	2.1	6.5	2.3	5.8	2.3	5.8	2.3	6.0	2.4	6.3	0.9	5.4	0.9	5.4	1.6	5.0	1.8	5.2
15	2.2	7.0	4.1	7.3	4.8	9.0	3.3	7.5	2.4	6.3	2.5	5.8	2.1	6.0	3.2	6.7	1.5	8.0	1.4	6.0	0.7	5.2	0.5	7.3
16	2.1	7.5	1.9	7.5	2.1	6.0	2.1	6.0	3.5	7.3	2.9	6.5	2.2	5.4	2.3	5.2	0.4	6.0	...	...	0.7	4.8	0.8	5.8
17	1.8	7.0	1.8	7.0	2.1	5.8	2.7	5.4	2.1	6.7	2.3	6.7	3.3	7.0	2.7	7.0	0.8	5.8	1.1	5.2	1.9	4.8	1.8	6.0
18	2.0	7.0	1.8	7.0	1.7	6.5	1.7	6.7	3.4	7.3	3.4	7.3	1.9	7.5	1.6	7.3	1.5	5.8	1.4	6.0	1.8	5.2	1.6	6.0
19	2.1	6.7	2.4	6.7	3.4	6.7	1.9	6.7	2.1	6.0	1.6	7.0	1.7	6.7	1.5	6.7	2.0	5.4	2.1	5.6	1.5	5.8	2.1	5.6
20	2.4	7.0	3.0	6.7	3.2	6.7	3.5	9.3	1.4	6.3	1.3	7.0	1.3	7.0	1.7	7.5	2.7	6.0	2.8	6.3	2.3	5.2	2.2	4.8
21	4.8	9.0	3.5	8.7	5.0	8.3	4.0	8.0	1.9	6.7	2.1	6.7	2.2	7.0	2.3	7.3	1.9	5.6	2.1	6.0	2.3	5.8	2.2	5.4
22	3.7	7.0	3.3	7.5	2.7	7.0	2.3	6.7	2.6	7.0	2.7	7.0	2.3	7.3	3.0	7.3	1.9	5.6	...	...	1.7	5.6	1.9	5.0
23	2.2	7.0	1.7	7.5	1.9	6.7	1.8	7.0	3.0	7.5	2.3	7.3	2.4	7.5	2.6	7.0	1.7	5.6	2.0	4.7	1.1	6.7	1.3	6.7
24	2.4	7.0	3.7	7.3	3.2	7.3	4.2	7.0	1.8	7.3	1.6	7.3	1.9	6.7	1.6	7.0	1.6	6.5	1.4	6.5	1.2	6.3	0.8	6.3
25	3.3	7.0	3.7	8.3	4.9	7.5	4.4	8.7	1.6	7.0	1.8	7.0	0.8	6.5	1.0	6.3	0.7	4.8	1.1	4.1	0.8	4.5	0.8	6.0
26	5.1	8.7	5.3	8.3	5.5	8.0	5.4	8.7	1.2	6.0	1.0	6.5	0.9	7.0	1.1	5.4	0.9	5.4	0.8	6.0	0.9	5.4	0.7	5.0
27	6.8	8.7	5.8	8.7	4.5	8.0	3.4	7.7	1.0	4.7	1.2	4.8	0.5	4.8	0.5	4.7	1.0	6.0	0.8	5.8	0.9	5.0	1.8	7.3
28	3.0	8.0	2.8	8.0	2.1	7.5	1.6	7.3	0.2	4.8	0.4	5.6	0.6	6.0	1.4	6.0	2.6	6.7	2.1	7.3	2.2	7.0	1.9	6.5
29	1.9	6.7	1.7	7.5	2.2	8.0	3.4	8.3	1.8	6.3	1.7	6.5	1.4	6.5	2.1	5.6	1.9	6.5	...	...	1.4	6.0	1.8	5.2
30	3.8	7.5	2.4	7.5	2.3	7.5	1.9	7.5	1.8	6.3	1.7	6.5	1.4	6.5	2.1	5.6	1.9	5.0	3.3	5.8	2.9	5.8	2.1	5.6
31	1.8	7.0	1.6	6.0	1.3	7.0	1.2	6.0	...	...	...	...	...	...	...	...	1.9	5.6	1.5	5.6	1.4	5.0	1.4	6.0
Mean ...	2.9	7.1	2.9	7.0	2.9	7.0	2.8	7.1	2.6	6.7	2.5	6.8	2.5	6.7	2.6	6.7	1.3	5.7	1.4	5.7	1.2	5.5	1.3	5.7
Mean for day ...	A = 2.9 μ ; T _p = 7.1s.								A = 2.6 μ ; T _p = 6.7s.								A = 1.3 μ ; T _p = 5.6s.							

Month	April.								May.								June.							
	o h.		6 h.		12 h.		18 h.		o h.		6 h.		12 h.		18 h.		o h.		6 h.		12 h.		18 h.	
	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.	A.	Tp.
Day.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.	μ	s.
1	0.8	6.5	0.8	4.3	0.6	3.7	0.6	3.9	0.2	5.6	0.2	6.0	0.5	5.0	0.5	5.0	1.0	4.5	1.1	4.1	1.1	3.9	1.1	4.0
2	0.3	3.7	0.3	3.1	0.6	3.5	0.7	5.2	0.4	5.6	0.2	5.0	0.2	4.8	0.3	3.6	0.9	3.9	0.3	3.2	0.3	3.6	0.6	4.0
3	0.6	6.0	1.0	5.8	2.3	7.3	3.3	7.5	0.3	4.0	0.3	3.3	0.3	3.3	0.3	3.5	0.6	3.9	0.3	4.3	0.2	4.7	0.7	4.8
4	1.9	7.3	2.1	5.8	1.6	7.0	1.6	7.3	0.3	3.9	0.3	3.2	0.3	3.7	0.3	3.3	0.6	4.0	0.6	4.0	0.3	4.0	0.3	4.0
5	1.6	6.3	1.7	6.5	1.4	6.5	1.1	7.0	0.3	3.2	0.4	3.0	0.4	2.6	0.3	3.2	0.3	4.0	0.5	4.3	0.5	4.3	0.5	4.8
6	1.6	6.5	1.2	6.5	1.0	6.5	1.3	5.8	0.4	3.0	0.3	3.1	0.0	...	0.0	...	0.8	4.5	0.7	5.0	0.7	4.7	0.5	4.8
7	1.0	6.7	1.2	6.5	1.2	6.5	1.2	6.5	0.0	...	0.0	...	0.0	...	0.3	3.2	0.5	4.5	0.7	4.7	0.3	4.3	0.3	4.3
8	1.1	7.0	0.9	7.0	1.0	6.5	1.0	7.3	0.2	4.7	0.3	3.6	0.2	4.7	0.3	4.3	0.6	3.9	0.6	4.0	0.6	3.5	0.6	4.0
9	1.8	5.0	1.9	5.6	1.6	7.5	...	...	0.5	7.5	0.5	5.0	0.9	5.6	0.6	5.6	1.3	4.3	1.9	5.0	3.4	4.8	3.6	5.8
10	1.3	6.7	1.9	7.7	1.7	6.7	1.2	7.3	0.4	5.8	0.5	5.0	0.5	4.7	0.2	5.0	3.7	5.0	2.1	5.8	2.1	5.0	2.0	5.2
11	1.1	6.0	0.7	6.3	1.3	5.4	0.7	5.4	0.2	4.7	0.3	3.2	0.0	...	0.0	...	1.1	5.4	0.9	5.0	0.9	5.0	0.7	4.7
12	1.2	5.0	0.7	5.0	0.5	4.7	0.7	5.0	0.0	...	0.0	...	0.2	5.0	0.0	...	0.7	5.4	0.5	5.0	0.5	4.7	0.7	4.8
13	0.7	5.4	0.5	5.0	0.7	4.7	0.5	4.5	0.3	4.1	0.2	7.0	0.0	...	0.3	3.6	1.1	4.3	0.8	4.3	0.8	4.3	1.1	4.3
14	0.5	4.7	1.2	5.0	1.6	5.0	2.5	4.7	0.3	3.5	0.3	3.9	0.3	3.2	0.3	3.6	0.8	4.3	0.5	4.1	0.6	3.6	1.9	4.3
15	2.7	4.7	2.5	5.2	2.7	4.7	2.5	4.7	...	...	0.2	6.0	0.3	3.9	0.2	5.6	1.1	3.9	1.2	3.6	0.3	3.2	0.3	3.2
16	2.8																							

Derived from readings for the period of thirty minutes centering at the exact hour, Greenwich Mean Time.

544. Richmond (Kew Observatory).

Table with columns for Month (July, August, September) and Hour G.M.T. (0 h., 6 h., 12 h., 18 h.). Each hour has sub-columns for Amplitude (A) and Period (Tp) in micrometers and seconds. Rows list days from 1 to 31, with a 'Mean' row at the bottom. Summary statistics for each month are provided at the bottom of the table.

Table with columns for Month (October, November, December) and Hour G.M.T. (0 h., 6 h., 12 h., 18 h.). Each hour has sub-columns for Amplitude (A) and Period (Tp) in micrometers and seconds. Rows list days from 1 to 31, with a 'Mean' row at the bottom. Summary statistics for each month are provided at the bottom of the table.

NOTE:—The symbol ... indicates that microseisms were not measured, either by reason of occurrence of earthquake or lack of record.

M.O. 320
(Aerological Section)

Air Ministry
METEOROLOGICAL OFFICE

THE
OBSERVATORIES' YEAR BOOK
1928

Comprising the meteorological and geophysical results obtained from autographic records and eye observations at the observatories at Lerwick, Aberdeen, Eskdalemuir, Cahirciveen (Valentia Observatory), and Richmond (Kew Observatory), and the results of soundings of the upper atmosphere by means of registering balloons.

AEROLOGICAL SECTION

Published by the authority of the
METEOROLOGICAL COMMITTEE



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1930

AEROLOGICAL SECTION.

Station.		Latitude.		Longitude.		Height above Sea Level.
Kew Observatory	..	51° 28' N.	..	0° 19' W.	..	7 metres.
Sealand .. ..	..	53° 14' N.	..	3° 0' W.	..	5 metres.
Calshot .. ..	..	50° 49' N.	..	1° 18' W.	..	4 metres.

INTRODUCTION.

Notes on the tables of Upper Air Temperatures obtained from soundings with registering balloons at Richmond, Sealand and Calshot. 1928.

The tables are presented in the same form as those appearing in the Observatories Year Book for 1927. The Dines pattern meteorograph was employed solely as before. About 40% of the instruments used had been constructed in the Observatory workshop, the rest being purchased from outside contractors.

The method of operation remained substantially the same as that described in the Computer's Handbook.* In the computation of pressure-heights the graphical method was employed, checked as to its main features by an arithmetical process. A value of gravity constant with height was assumed, and equal to 981.2; the effect of humidity on the density of the air was neglected.

A total of 47 soundings were made during the year, 28 from the Aviation Service Station of the Meteorological Office at Sealand Aerodrome, 16 from Kew Observatory, and three from the Aviation Service Station at Calshot. In the cases of 36 of these soundings the instruments were found and returned, the rest being lost. The choice of station from which a sounding was made was generally determined in view of the probable direction and length of the run of the balloon. The average height reached was not so good as in the previous year.

The ventilation of the Dines meteorograph is effected solely by the natural draught produced by its vertical velocity. The coned case referred to in the Year Book for 1925 was employed solely in 1928. The vertical velocity of the rising balloon was of the order of 220 metres per minute in about one-half of the soundings, and 330 metres per minute in the remainder. After the balloon burst the meteorograph fell in all cases at the rate of about 700 metres per minute.

As regards temperature, unless stated to the contrary the mean of the records on the ascent and descent was employed entirely in computing the published figures. Except in one or two cases of daylight soundings in which a small vertical velocity of the balloon was employed, and in a limited region near the top of another daylight sounding, the difference between the two records did not in general exceed 4a., with a mean of about half that value. Whenever direct evidence is available it is almost always found that in the troposphere the descending record is the colder of the two. An analysis of a large number of British soundings has led to the conclusion that as far as the troposphere is concerned this effect is mainly due to a temperature lag of the thermograph member, and that the mean of the two records gives in general a close approximation to the true air temperature.† Occasionally in exceptional circumstances it is deemed best to give greater weight to one record than to the other, or to publish the data from one record only. All such occasions are mentioned in the notes, they generally refer either to occasions of strong solar radiation when the less vigorous ventilation of the meteorograph on the ascent makes that record less reliable than that of the descent, or to the lowest layers of the troposphere only.

* M.O. 223, Section II, Sub-section II.

† See also :—Memoirs of the Indian Meteorological Department. Vol. XXIV. Part V. By J. H. Field.

In the case of high soundings made during the day-time a pronounced rise of temperature is sometimes observed over about a kilometre at the extreme top. There is good evidence that this is a fictitious effect due to solar radiation and that the ascent is a great deal more affected by it than the descent. The rise of temperature in such cases is therefore usually ignored, and in addition greater weight is given to the descent than to the ascent in the upper parts of such records as show an unusually large difference between them. All occasions on which such selection has been made are specifically mentioned in the notes. An account of this phenomenon is to be found in "Memoirs of the Royal Meteorological Society," Vol. 2, No. 18. By L. H. G. Dines.

In almost every case during 1928 the meteorograph was fitted with a hair hygroph. Only one record of relative humidity in each case has been published, which unless specifically mentioned to the contrary in the notes is that of the ascent. The record of the descent appears to be the less reliable for two reasons, first that the previous exposure of the hair to extreme cold and dryness makes it more sluggish in response to changes in the relative humidity, second that the higher velocity at which the meteorograph falls increases the lag in its response reckoned in terms of height. The hygrometer readily shows changes in the relative humidity in the lower part of the troposphere, but the absolute value of its readings may be subject to an uncertain error of five or more on the percentage scale. Below a temperature of 250 a. it seems very doubtful if in the ordinary way the record has any meaning, and the figures have therefore not been published. In some cases of a saturated atmosphere the hair appears to freeze up in some peculiar manner at a point near 273 a. and thereafter to become quite inert.

Data of well marked inversions and regions of zero lapse rate in the troposphere are included in the notes on the soundings. They are set out in a uniform manner on the principle that corresponding values of height, temperature and relative humidity are given for the salient points in each special case, the sequence being always from lesser heights to greater.

The figures given in the table of lapse rates do not in every case agree with the temperatures appearing in the table of temperature-heights. The reason for this is that both were determined independently from the original data, which can sometimes profitably be read to the nearest half degree, but are rounded off to whole degrees for publication.

The lapse rates given between ground level and 0.5 km. are determined from the reading in the thermometer screen at the station and that of the meteorograph at 0.5 km. A source of error arises here in that the two standards are independent and are not exposed in the same manner. A small difference is capable of making an appreciable error in the lapse rate, and it is possible that lapse rates apparently greater than 10a. per km. in this layer are sometimes due to this cause.

Whenever possible the meteorograph was calibrated again after return before the record plate had been disturbed, in order to discover whether any shift of zero had taken place since the previous calibration. Some disturbance is almost inevitable considering the rough treatment experienced, more especially in the shock of the fall. It is satisfactory to note that for the year 1928, omitting two cases in which the instrument was returned badly damaged, the mean values of the shift without regard to sign were small, being for the Pressure 4.6 mb, and for the Temperature 1.3 a.

All new meteorographs, and all old ones used again after repair, were seasoned in a vacuum chamber before use by being subjected to several slow reductions of pressure. This process has been found greatly to reduce the chance of a systematic difference occurring between the results of a fast and slow calibration. More detail is given in the Introduction to the tables for 1923, and within the limits of accuracy at present attainable in the measurement of upper air pressures, the results of the fast reduction of pressure in the calibration test may be taken as applying to the slow reduction in the actual sounding.

The lag, or difference in pressure reading as between a falling and a rising pressure, is of the order 3 or 4 millibars on the average in the middle region of a high sounding, falling off to lesser values on either side. If a correction be applied to the recorded temperature-pressures to allow for this error, it results, for an average sounding in the troposphere, in an increase in the difference between the temperatures recorded at any pressure on the ascent and descent. The effect is to make the recorded temperatures on the descent too high by about half a degree at a height of 6 or 7 kilometres, with a tendency for the error to fall off above and below. When the mean of the two records is employed the resultant error is halved and becomes negligible.

In Table 546 occur the entries "Type of Tropopause" and " H_0 = Height of Tropopause." These are defined as follows:—Type I. The stratosphere commences with an inversion, and H_0 is the height of the first point of zero temperature gradient. Type II. The stratosphere begins with an abrupt transition to a temperature gradient below 2a. per kilometre without inversion, and H_0 is the height of the abrupt transition. Type III. There is no abrupt change of temperature gradient, and the base of the stratosphere is taken at the point where the mean fall of temperature for the kilometre next above is 2 a. or less, provided that it does not exceed 2 a. for any subsequent kilometre. In the Remarks on the Soundings the pressure distribution is classified according to the types defined in "Aids to Forecasting." †

† E. Gold, F.R.S., Geophysical Memoir No. 16, M.O. 220f, London, 1920.

T = Temperature in Degrees absolute.
 H = Height in kilometres above M.S.L.

P = Pressure in millibars.
 RH = Relative Humidity as percentage.

546.

1928.

No. of Ascent.	674.	675.	676.	677.	678.	679.	680.	681.	682.
Date.	Jan. 10.	Jan. 23.	Feb. 23.	Feb. 27.	Mar. 8.	Mar. 9.	Mar. 10.	Mar. 11.	Mar. 12.
Station.	Calshot.	Sealand.	Kew.	Kew.	Sealand.	Sealand.	Sealand.	Kew.	Kew.
Start G.M.T.	12h. 37m.	13h. 10m.	16h. 51m.	16h. 0m.	7h. 15m.	7h. 30m.	7h. 10m.	7h. 2m.	12h. 34m.
H_1 = Greatest Height ... (km.)	14.79	7.76	2.31	13.61	17.21	19.78	19.40	8.24	12.89
T_1 = Corresponding Temperature (a.)	216	241	273	223	220	225	227	229	227
P_1 = Corresponding Pressure (mb.)	118	369	774	149	83	56	59	321	160
Place of Fall	Ashford, Kent.	Barrow, Oakham, Rutland.	Isleworth, Middlesex.	Woodford Halse, nr. Rugby, Warwickshire.	Lilleshall, Wellington, Salop.	Bagley, nr. Ellesmere, Salop.	Wellington, Salop.	Chipstead, Surrey.	Whaddon, Royston, Herts.
Distance (km.)	154	165	1	99	67	43	67	22	73
Bearing. Degrees from N....	78	110	273	321	145	170	151	154	14
Geostrophic Wind— Speed (m/s.)	26	28	9	13	12	9	6	12	6
Degrees from N.	250	220	130	130	90	75	90	20	150
Wind (Anemograph)— Speed (m/s.)	16	7	4	2	4	3	2	4	4
Degrees from N.	215	135	90	135	45	25	340	360	160
Humidity at surface (%)	86	92	86	56	85	85	85	86	63
Type of Tropopause	I.			I.	I.	II.	I.		I.
H_c = Height of ,, ... (km.)	10.49	—	—	10.64	10.33	9.38	9.51	—	9.44
T_c = Temp. at ,, ... (a.)	207	—	—	217	216	223	221	—	222
P_c = Pressure at ,, ... (mb.)	235	—	—	237	240	275	266	—	270
Mean Temp. in Stratosphere									
($H_c + 2$) to ($H_c + 5$) (a.)	—	—	—	—	223	224	225	—	—
($H_c + 5$) to ($H_c + 8$) (a.)	—	—	—	—	—	223	224	—	—
($H_c + 8$) to ($H_c + 11$) (a.)	—	—	—	—	—	—	—	—	—
T_m (Mean Temp. 1 to 9 km.) (a.)	251	—	—	252	247	243	241	—	242
P_s (Pressure at M.S.L.) ... (mb.)	1007	1010	1029	1024	1019	1020	1018	—	1014

547.

1928.

REMARKS ON THE SOUNDINGS AND THE PREVAILING WEATHER CONDITIONS, 1928.

No. of Ascent.

674. Weather cloudy. Cirrus from WSW, Stratus 6/10 from SW at 250 m. Surface wind from SW'S, gusty. Small inversion on descent from 1.36 km. to 1.46 km.; Temp. 272 a. to 273 a. Another small inversion on ascent from 1.65 km. to 1.73 km.; Temp. 273.5 a. to 274 a. Pressure distribution:—Barometer falling briskly. Deep depression to the north having two centres, one just east of Iceland and the other over the Shetland Isles, merging into one and moving slowly eastwards. Another low over the Mediterranean, high over Spain and the Azores, connecting up with another over the northern Balkans. Type V a.
675. Weather dull and overcast with continuous moderate rain. Clouds, Alto-Stratus, Nimbus from SSW at 500 m. Very small lapse rate from 0.9 km. to 1.9 km. The relative humidity was about 92 per cent. up to a height of 2.5 km., above that it is unknown as the hairs froze up. Ice formed on the record plate and interrupted the record in many places and entirely so from 8 km. upwards. The temperature record was taken from the record of the ascent only. Pressure distribution:—Barometer falling briskly. Extensive belt of low pressure over North western Europe, having its main centre over Iceland. A secondary depression off the west of Ireland moving rapidly eastwards. Shallow low over the Netherlands also moving eastwards. Highs over Spain and Russia. Type V a.
676. Weather hazy. Clouds, Stratus 9/10 from East. Balloon burst prematurely. Pronounced inversion on both records from 0.74 km. to 0.94 km.; Temp. 275 a. to 278.5 a. Relative humidity 100 per cent. to 65 per cent. Pressure distribution:—Anticyclone over most of Europe with centres over Southern Scandinavia, Germany and Austria moving slowly eastwards. A depression well to the west of Ireland moving south eastwards. Type VII b.
677. Weather slightly misty, no clouds. The hygrograph pointer did not mark at all well but sufficient record was made to indicate that the relative humidity was below 50 per cent. at all heights. Pressure distribution:—A high system existed over most of Europe with anticyclonic centres over the Baltic and the Mediterranean. Depression approaching Ireland from the West. Type VII b.
678. Weather dull. Clouds, St-Cu. 10/10 at about 0.7 km. Inversion on ascent from 1.61 km. to 1.81 km.; Temp. 265 a. to 266.5 a. Relative humidity 97 per cent. to 90 per cent. Inversion on descent from 1.25 km. to 1.54 km.; Temp. 266 a. to 267.5 a. Inversion on both ascent and descent from 3.16 km. to 3.40 km.; Temp. 258.5 a. to 259.5 a. Relative humidity 57 per cent. to 49 per cent. Pressure distribution:—Anticyclone over Iceland influencing the weather of the British Isles. Low over Spain extending eastwards to the Black Sea. Type VIII a.
679. Weather cloudy. St-Cu. 6/10 from NE'E at about 1.3 km. Small inversion on both ascent and descent from 2.80 km. to 2.99 km.; Temp. 255.5 a. to 256 a. Relative humidity 56 per cent. to 52 per cent. Pressure distribution:—Anticyclone centred between Iceland and the Faroes. Shallow low north west of Denmark. Stationary depression to the west of Ireland and another depression over the Western Mediterranean moving eastwards. Type VIII a.
680. Weather fair. Clouds, St-Cu. 7/10 from north east at about 1 km. Inversion on ascent from 3.35 km. to 3.43 km.; Temp. 249.5 a. to 251 a. Relative humidity 72 per cent. to 68 per cent. Also a small inversion on descent from 3.86 km. to 3.96 km.; Temp. 245.5 a. to 246 a. The mean of both temperature records was employed throughout except at and just below the top where a bias towards the colder one was made. Pressure distribution:—Anticyclone centred near the Faroes and over Scandinavia. Depressions over the Mediterranean and out on the Atlantic. Type VIII a.
681. Weather dull. Clouds, Stratus 10/10 at 0.5 km. Snow lying. The ascent was curtailed by means of an automatic releaser. The large lapse rate near the ground is apparently genuine. Small inversion from 4.76 km. to 4.95 km.; Temp. 235.5 a. to 236 a. Relative humidity, 74 per cent. to 71 per cent. Isothermal layer from 4.95 km. to 5.57 km.; Temp. 236 a. Relative humidity, 71 per cent. to 60 per cent. Pressure distribution:—Belt of high pressure persisting from Iceland to South Russia. Depressions over the Mediterranean and to the north of Scandinavia deepening. Type VIII a.
682. Weather fair. Clouds, Fr-Cu. 5/10 moving slowly from S'E. Isothermal layers occurred from 3.62 km. to 4.03 km.; Temp. 246.5 a. Relative humidity 52 per cent. to 45 per cent., and from 5.21 km. to 5.65 km.; Temp. 241.5 a. Relative humidity 36 per cent. to 34 per cent. The large lapse rate near the ground is apparently quite genuine. Pressure distribution:—Belt of low pressure extending from the Atlantic across Southern France to the Adriatic. Ridge of high pressure from Iceland across Southern Scandinavia to Russia becoming less pronounced. Depression over North-west Russia. Type VIII.

T = Temperature in Degrees absolute.
 H = Height in kilometres above M.S.L.

P = Pressure in millibars.
 RH = Relative Humidity as percentage.

1928.

No. of Ascent.	683.	684.	686.	687.	689.	690.	691.	692.	693.
Date.	Mar. 13.	Mar. 14.	Mar. 16.	Mar. 17.	Mar. 20.	Mar. 22.	Mar. 26.	Mar. 29.	Mar. 31.
Station.	Calshot.	Kew.	Sealand.	Sealand.	Kew.	Kew.	Sealand.	Sealand.	Kew.
Start G.M.T.	8h. 5m.	7h. 23m.	7h. 15m.	7h. 30m.	17h. 30m.	17h. 33m.	17h. 50m.	10h. 40m.	9h. 55m.
H_c = Greatest Height ... (km.)	17.75	13.94	13.19	14.35	21.51	11.73	12.82	13.98	13.02
T_c = Corresponding Temperature (a.)	221	219	210	215	209	221	221	219	221
P_c = Corresponding Pressure (mb.)	75	135	156	128	40	192	165	134	153
Place of Fall	Oxenwood, Hungerford, Berks.	Kemsing, Sevenoaks, Kent.	Croxden, Cheadle, Stoke-on- Trent, Staffs.	Pately Bridge, Harrogate, Yorks.	Farm Wicken, Soham, Cambs.	Beauchamp Roding, Ongar, Essex.	Ipstones, Stoke-on- Trent, Staffs.	Old Rossing- ton, Doncaster, Yorks.	Astwick, Hatfield, Herts.
Distance (km.)	69	42	78	125	103	53	72	132	34
Bearing. Degrees from N....	350	116	112	40	25	50	106	77	14
Geostrophic Wind— Speed (m/s.)	7	Indeterminate	21	27	15	13	5	26	13
Degrees from N.	45	Indeterminate	190	195	160	165	235	215	160
Wind (Anemograph)— Speed (m/s.)	5	1	8	4	9	4	Calm.	9	4
Degrees from N.	350	270	135	135	225	160	—	160	135
Humidity at surface (%)	85	91	90	85	67	71	89	90	74
Type of Tropopause	II.	I.	I.	I.	I.	I.	I.	I.	I.
H_c = Height of ,, ... (km.)	8.53	10.75	12.47	11.94	11.64	10.18	10.33	10.43	7.24
T_c = Temp. at ,, ... (a.)	219	213	207	202	205	215	214	213	224
P_c = Pressure at ,, ... (mb.)	311	224	175	190	198	244	244	234	370
Mean Temp. in Stratosphere	($H_c + 2$) to ($H_c + 5$) (a.)	—	—	—	213	—	—	—	223
($H_c + 5$) to ($H_c + 8$) (a.)	222	—	—	—	211	—	—	—	—
($H_c + 8$) to ($H_c + 11$) (a.)	—	—	—	—	—	—	—	—	—
T_m (Mean Temp. 1 to 9 km.) (a.)	243	246	253	258	254	251	251	252	245
P_c (Pressure at M.S.L.) ... (mb.)	1018	1022	1022	1016	1002	995	1010	983	985

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683. Weather misty. Clouds, A-Cu. 5/10 at about 4 km. from ESE. Cirrus clouds observed an hour later moving slowly from SE'E. An unusual type of record as the two traces agreed over most of the troposphere. The balloon was in the air about three hours. Pressure distribution:—Complex system of high pressure with centres over Iceland, North-west Scandinavia and South Russia: Shallow depression over France: Low over the Atlantic and Mediterranean Sea. Depression over Northern Russia moving south. Type VIII.
684. Weather dull. Clouds, Stratus 10/10 very low. Inversion from 1.36 km. to 1.52 km.; Temp. 265 a. to 267.5 a. Relative humidity 90 per cent. to 80 per cent. Isothermal layer from 6.92 km. to 7.21 km.; Temp. 233 a. Relative humidity 35 per cent. Pressure distribution:—Depression approaching Ireland from the west. Indefinite areas of high pressure over France, Spain and Scandinavia. Shallow depression over Italy. Type VII b.
686. Weather fair. Clouds, St-Cu., A-Cu. & Ci. 6/10. Low clouds at 1.2 km., middle clouds moving from SW and upper clouds from W'S. Inversion from 0.47 km. to 0.68 km.; Temp. 274.5 a. to 276 a. Relative humidity uncertain at bottom to 74 per cent. at top. Also inversion from 3.87 km. to 3.94 km.; Temp. 260 a. to 261 a. Relative humidity, 84 per cent. to 81 per cent. A large number of temperature oscillations of about one degree are shown in both troposphere and stratosphere. Some small inversions or isothermals occur near the top of the troposphere in both traces and appear to be genuine. The mean of both temperature records was employed throughout except at the extreme top where a rise of temperature was ignored. Pressure distribution:—A deep depression to the west of the British Isles. High over Central Europe. Complex area of low pressure over the Mediterranean. Type VI a.
687. Weather dull. Clouds, St. and St-Cu. 9/10 from S at 0.5 km. Inversion from 0.81 km. to 0.99 km. Temp. 277.5 a. to 278.5 a. Relative humidity 93 per cent. to 88 per cent. Inversion on up trace only from 1.19 km. to 1.31 km.; Temp. 279 a. to 280 a. Relative humidity 89 per cent. to 76 per cent. The record seemed to indicate the existence of a cloud of super-cooled water drops at the level of about 4 km. and a temperature of about 260 a. Pressure distribution:—Deep depression over Iceland. Anticyclone over Germany. Complex low area over Eastern Mediterranean. Type VI a.
689. Weather fair. Clouds, St-Cu. and Cu. 6/10, Ci-St. 1/10. Low clouds at 0.7 km. moving from SE. Inversion on ascent from 0.99 km. to 1.23 km.; Temp. 279 a. to 279.5 a. Relative humidity 66 per cent. to 61 per cent. Pressure distribution:—Deep depression south of Iceland remaining stationary. Anticyclone over Russia. Secondary depression forming off South-west England. Type V.
690. Weather fine. Clouds, Cu. 1/10, Ci. and Ci-St. 3/10. The lower clouds at about 0.7 km. moving from SSE, and the upper from W. Isothermal layer from 6.17 km. to 6.48 km.; Temp. 242 a. Relative humidity 23 per cent. Pressure distribution:—Secondary depression South-west Ireland, Anticyclone over Russia. Type VII.
691. Weather fair. Clouds, St-Cu. 7/10, Ci-St. 2/10. Lower clouds at 1.5 km. moving from SSW, upper clouds from NW. Inversion from 1.78 km. to 1.92 km., Temp. 268.5 a. to 269.5 a. Relative humidity, 96 per cent. to 70 per cent. Pressure distribution:—Depression to the North-west of the British Isles. Wedge of high pressure over England. High to the south-west of Spain and over Russia. Complex low area over the Mediterranean. Type IV.
692. Weather dull with slight rain. Clouds, Stratus and St-Cu. 10/10 at 0.2 km. from S'E. Barometer low and falling rapidly. Inversion on ascent only from 1.48 km. to 1.52 km.; Temp. 274.5 a. to 275 a. Relative humidity 100 per cent. to 96 per cent. The mean of both temperature records was used throughout except over the top 2.5 km. where a bias was made towards the colder. Pressure distribution:—High over Spain and the Azores and over Russia. Depression over Ireland and a complex system of low pressure stretching from the Baltic to the Mediterranean. Type IV a.
693. Weather fair. Clouds, Cu. 5/10, A-Cu. 2/10. Lower cloud from SE'S, upper clouds from S. The mean of both temperature records was used except near the top where a bias was given towards the descent. The very large lapse rate near the ground appears to be genuine. Pressure distribution:—Depression centred over the south-west of England and a complex system of low pressure from Finland to the Western Mediterranean. High over Iceland. Type XV.

T = Temperature in Degrees absolute.
 H = Height in kilometres above M.S.L.

P = Pressure in millibars.
 RH = Relative Humidity as percentage.

546.

1928.

No. of Ascent.	696.	697.	698.	699.	700.	701.	702.	703.	704.
Date.	May 21.	May 23.	July 3.	July 17.	July 17.	July 18.	July 18.	July 19.	July 19.
Station.	Kew.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.
Start G.M.T.	11h. 28m.	17h. 55m.	17h. 38m.	7h. 15m.	18h. 30m.	7h. 10m.	18h. 20m.	7h. 15m.	17h. 50m.
H = Greatest Height ... (km.)	2.03	10.38	12.95	—	10.96	13.49	15.53	17.02	12.56
T_c = Corresponding Temperature (a.)	272	217	227	—	221	221	219	221	215
P_c = Corresponding Pressure (mb.)	787	241	168	—	239	160	116	94	185
Place of Fall	Chertsey, Surrey.	Clyro, Hereford.	Milnrow, Rochdale, Lancs.	Hartington, Buxton, Derbyshire.	Stretton, Burton-on- Trent, Staffs.	Gumley, Market Harboro', Leicestershire.	Woodford Halse, Rugby, Warwickshire.	Pailton, nr. Rugby, Warwickshire.	Sulgrave, Banbury, Oxon.
Distance (km.)	15	127	74	80	102	156	168	144	175
Bearing. Degrees from N....	238	185	54	97	116	121	134	128	135
Geostrophic Wind— Speed (m/s.)	15	5	Indeterminate	< 6	< 9	13	11	7	9
Degrees from N.	75	330	Indeterminate	295	285	290	320	305	305
Wind (Anemograph)— Speed (m/s.)	4	4	4	4	7	8	7	7	7
Degrees from N.	90	295	295	305	315	295	295	305	295
Humidity at surface (%)	81	91	59	82	69	79	84	75	71
Type of Tropopause		?	I.	I.		I.	I.	I.	I.
H_c = Height of ,, ... (km.)	—	9.57	9.62	(11.53)	—	11.61	12.44	12.36	12.07
T_c = Temp. at ,, ... (a.)	—	217	224	217	—	216	211	217	214
P_c = Pressure at ,, ... (mb.)	—	273	278	(220)	—	215	190	194	200
Mean Temp. in Stratosphere ($H_c + 2$) to ($H_c + 5$) (a.)	—	—	—	—	—	—	—	223	—
($H_c + 5$) to ($H_c + 8$) (a.)	—	—	—	—	—	—	—	—	—
($H_c + 8$) to ($H_c + 11$) (a.)	—	—	—	—	—	—	—	—	—
T_m (Mean Temp. 1 to 9 km.) (a.)	—	250	254	263	262	262	263	264	263
P_s (Pressure at M.S.L.) ... (mb.)	1013	1015	1015	1032	1030	1027	1025	1024	1023

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No. of
Ascent.

696. Weather, Thunderstorm. Rain falling from thunder cloud overhead. The thunderstorm approached from the east, the centre passing to the south of the Observatory. Thunder and lightning occurred about every minute and the rain became heavy a few minutes after the release of the balloon. The sky to the north-east had cleared somewhat by 11.40. The ascent only was used for this sounding as the two traces differed at the bottom by 3 or 4 degrees. Pressure distribution:—Complex system of low pressure over Northern and Western Europe, one of the centres being over North-west France. A wedge of high pressure extended from North-east Atlantic through the Faroes to Scandinavia. Type IX a.
697. Weather continuous moderate rain. Clouds, Stratus and A-St. Stratus at 0.8 km. moving from NNW. Small isothermal at 3.82 km.; Temp. 259 a. Pressure distribution:—High to the north of Iceland and over Spain. Area of low pressure from the Atlantic over the British Isles to Central Europe. Type IV a.
698. Weather fair. Clouds, St-Cu. 1/10, Ci. and Ci-St. 7/10. St-Cu. at 1.2 km. moving from W, Ci. from SW. Pressure distribution:—Low over Scandinavia and depression over the Atlantic. Ridge of high pressure extending to South-west England from an Anticyclone over the Azores. Complex system of low pressure elsewhere except near Southern Europe where the pressure was relatively high. Type indefinite.
699. Weather fair. Clouds, St. and St-Cu. from N. Cirrus observed two hours before the sounding, moving from W'S, and A-Cu. one hour before moving from WSW. Inversion from 0.66 km. to 1.07 km.; Temp. 285 a. to 287 a. Relative humidity 93 per cent. to 47 per cent. Owing to the aneroid box leaking, only the lower portion of the sounding could be used with any degree of accuracy. Pressure distribution:—Belt of high pressure extending from the Atlantic over the British Isles to Western Germany. Low over Iceland and Northern Europe. Type I a.
700. Weather fine. Clouds, Ci. 2/10 moving from W. Inversion on ascent from 0.44 km. to 0.49 km.; Temp. 285.5 a. to 286 a. Relative humidity 82 per cent. to 83 per cent., Inversion from 0.57 km. to 0.76 km.; Temp. 285.5 a. to 287.5 a. Relative humidity 85 per cent. to 73 per cent. Isothermal layer on descent from 0.05 km. to 0.59 km.; Temp. 290 a., and several small isothermal layers on both ascent and descent between 1.09 km. and 1.75 km. Pressure distribution:—Anticyclone over the British Isles and Western Germany persisting. Low over Northern Europe and over the Mediterranean. Type I a.
701. Weather fair. Clouds, St-Cu. 6/10 at about 2 km. moving from W'N, and Ci. moving from WNW. Inversion from 0.75 km. to 0.92 km.; Temp. 285.5 a. to 287.5 a. Relative humidity 35 per cent. to 27 per cent. Isothermal layer from 1.48 km. to 1.78 km.; Temp. 284.5 a. Relative humidity 27 per cent. to 35 per cent. Isothermal layer on ascent from 3.30 km. to 3.35 km.; Temp. 274.5 a. Relative humidity 66 per cent. to 64 per cent. Mean of both records was used except near the top where a bias was made towards the descent. Pressure distribution:—A belt of high pressure extending from the Atlantic over England to Western Germany. Depression centred to the south of Spitzbergen beginning to influence the weather in Northern Scotland. Type I a.
702. Weather dull, slight drizzle. Clouds, St. 10/10 at 0.8 km. from WNW. Inversion from 1.66 km. to 1.95 km.; Temp. 279.5 a. to 283.5 a. Relative humidity 100 per cent. to 55 per cent. Pressure distribution:—Anticyclone persisting to the south-west of the British Isles extending a ridge of high pressure to Western Germany. Low over North-west Europe and Eastern Mediterranean. Type I a.
703. Weather fair. Clouds, St-Cu. and St. from NW. Inversion from 1.31 km. to 1.54 km.; Temp. 278 a. to 282 a. Relative humidity 100 per cent. to 56 per cent. Isothermal layer 3.30 km. to 3.48 km.; Temp. 275 a. Relative humidity 25 per cent. to 20 per cent. The mean of both records was used except near the top where a bias was given to the descent. The hygrogram shews great liveliness with many small oscillations on the ascent up to about the 700 mb. pressure surface. Pressure distribution:—Ridge of high pressure over Germany extending from a stationary Anticyclone to the south-west of the British Isles. Low to the north of Scandinavia and over South-eastern Europe. Type I a.
704. Weather fair. Clouds, St-Cu. and Cu. at 1.8 km. from WNW. Cirrus observed three hours earlier moving from WNW. Inversion shewn on ascent from 1.69 km. to 1.97 km.; Temp. 278.5 a. to 282 a. Relative humidity 95 per cent. to 58 per cent. Inversion also shewn on descent from 1.54 km. to 1.94 km.; Temp. 277 a. to 281 a., high lapse rate near the ground. Mean of both records used except at the top where a bias was made towards the descent. Pressure distribution:—Same as for Ascent No. 703. Type I a.

T = Temperature in Degrees absolute.
 H = Height in kilometres above M.S.L.

P = Pressure in millibars.
 RH = Relative Humidity as percentage.

1928.

546.

No. of Ascent.	705.	706.	708.	709.	710.	713.	717.	719.	720.
Date.	July 23.	Aug. 2.	Sept. 5.	Sept. 11.	Sept. 12.	Nov. 8.	Nov. 15.	Nov. 17.	Dec. 11.
Station.	Kew.	Sealand.	Kew.	Sealand.	Sealand.	Kew.	Sealand.	Sealand.	Kew.
Start G.M.T.	13h. 59m.	13h. 54m.	15h. 0m.	15h. 55m.	9h. 3m.	12h. 25m.	7h. 10m.	7h. 30m.	16h. 45m.
H_c = Greatest Height ... (km.)	10.17	16.45	14.41	18.93	10.32	12.79	17.34	17.90	18.91
T_c = Corresponding Temperature (a.)	233	223	219	222	237?	223	212	218	217
P_c = Corresponding Pressure (mb.)	273	102	139	68	260	165	81	72	60
Place of Fall	Hartfield, Sussex.	Arley, Northwich, Cheshire.	Walsham - le-Willows, Bury St. Edmunds, Suffolk.	Burton-on-Trent, Staffs.	Chorlton-cum-Hardy, nr. Manchester, Lancs.	Goose Green, Hadlow, Kent.	Bolton Percy, Yorks.	Rufford, Ollerton, Notts.	Woodford Halse, Rugby, Warwick.
Distance (km.)	51	36	126	104	53	53	139	132	100
Bearing. Degrees from N.	144	73	40	116	62	122	58	92	324
Geostrophic Wind— Speed (m/s.)	5	Indeterminate	9	3	4	18	22	20	11
Degrees from N.	310	Indeterminate	220	305	180	60	230	300	110
Wind (Anemograph)— Speed (m/s.)	4	4	7	6	4	7	5	7	2
Degrees from N.	295	295	205	315	160	45	215	270	110
Humidity at surface (%)	58	58	36	69	83	67	80	77	93
Type of Tropopause		I.	I.	I.	I.	II.	I.	I.	II.
H_c = Height of ,, (km.)	—	12.48	11.94	11.73	10.15	9.95	8.17	8.43	10.03
T_c = Temp. at ,, (a.)	—	214	217	215	227	217	227	222	215
P_c = Pressure at ,, (mb.)	—	191	205	209	267	258	330	311	244
Mean Temp. in Stratosphere									
$\left\{ \begin{array}{l} (H_c + 2) \text{ to } (H_c + 5) \text{ (a.)} \\ (H_c + 5) \text{ to } (H_c + 8) \text{ (a.)} \\ (H_c + 8) \text{ to } (H_c + 11) \text{ (a.)} \end{array} \right.$	—	—	—	220	—	—	227	224	217
$\left\{ \begin{array}{l} (H_c + 5) \text{ to } (H_c + 8) \text{ (a.)} \\ (H_c + 8) \text{ to } (H_c + 11) \text{ (a.)} \end{array} \right.$	—	—	—	—	—	—	218	218	217
T_m (Mean Temp. 1 to 9 km.) (a.)	265	264	264	260	259	251	251	245	247
P_s (Pressure at M.S.L.) ... (mb.)	1023	1023	1012	1025	1026	1010	984	987	992

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No. of Ascent.

705. Weather dull. Clouds, Fr-Cu. 3/10, St-Cu. 6/10. Fr-Cu. at about 0.6 km., the St-Cu. at a much higher level. Inversion from 2.43 km. to 2.58 km.; Temp. 277.5 a. to 278.5 a. Relative humidity 99 per cent. to 84 per cent. The ascent shewed temperature oscillations from about 3 km. upwards increasing in magnitude with height. Pressure distribution:—Anticyclone to the south-west of the British Isles extending a ridge of high pressure over Southern North Sea and Germany; high over Central, Southern and Eastern Europe. Depression centred over Northern Scandinavia and a shallow depression over Iceland. Type I.
706. Weather fine. Clouds, Cu. 3/10, direction indefinite. Small inversions at 2.84 km. and 3.87 km. Mean of both records used except at the top where a bias was given to the descent. The large lapse rate near the ground appears to be genuine. Pressure distribution:—Ridge of high pressure extending over the British Isles and France from an Anticyclone centred near the Azores. Depression south of Iceland, low pressure over Northern Russia. Type indefinite
708. Weather fine. Ci. 2/10, A-Cu. 1/10. Double ascent, two instruments were placed in tandem, each in its own spider, respectively 20 m. and 40 m. from the balloon. Mean values of inversion recorded on both instruments on ascent from 3.39 km. to 3.53 km.; Temp. 273 a. to 274 a. Relative humidity 73 per cent. to 57 per cent. Mean of the two instruments used throughout. Pressure distribution:—Complex system of low pressure over Northern and North-western Europe, having two of the centres over Scotland and over Ireland. High over the Azores, Eastern and Southern Europe. Type XIII.
709. Weather fine. Clouds, Cu. and St-Cu. at 0.9 km. moving from NW. Inversion from 2.56 km. to 2.83 km.; Temp. 270.5 a. to 273 a. Relative humidity 90 per cent. to 58 per cent. Isothermal layer shewn on ascent only from 0.77 km. to 0.86 km.; Temp. 282 a. Relative humidity 91 per cent. to 92 per cent. Mean of both records used except at the top where a bias was given towards the descent. The large lapse rate near the ground appears to be genuine. Pressure distribution:—A ridge of high pressure over the British Isles and the Azores; high over Northern Russia. Shallow depression over Southern Scandinavia; depression to the south-west of Iceland. Type indefinite.
710. Weather fine. Clouds, A-Cu. 1/10 from W'N. Double ascent. Instruments placed 20 m. and 40 m. respectively from the balloon, each in its own spider. The mean of the results obtained from both instruments was used throughout. A very rapid rise in temperature was shewn by both instruments just above H_c . It is possible that this may be partly due to insolation. Pressure distribution:—Anticyclone over England with a ridge of high pressure extending to the Azores and another up the coast of Norway. Shallow lows centred over Southern Scandinavia, to the north-west of Iceland and over the Atlantic, south-west of Ireland; low pressure over the Mediterranean. Type XI.
713. Weather fair. Clouds, St-Cu. 7/10, A-Cu. 1/10. Inversion from 1.79 km. to 1.93 km.; Temp. 269 a. to 271 a. Relative humidity 67 per cent. to 59 per cent. The mean of both up and down temperature records was used except near the top where a bias towards the colder one was made. At the greatest height the balloon had apparently floated about for some time and a large increase in temperature shewn by the record at this level was ignored. Temperature oscillations of as much as 2 a. were shewn on the up trace near the top. Pressure distribution: A wedge of high pressure stretching from an Anticyclone to the north-west of Iceland, developing over the British Isles. Complex area of low pressure over the Western Mediterranean and low again to the north of Scandinavia. Type IX.
717. Weather fair. Cirrus observed through Stratus clouds to be travelling from WSW. Pronounced fall of temperature in the stratosphere above 11½ km. Pressure distribution:—A depression just off the west coast of Scotland with a secondary centred close to Sealand moving northwards along the coast. High over Eastern Europe. Type V a.
719. Weather fine. Clouds, Cu. 1/10, at 1 km. moving from WNW, and A-Cu. 1/10 moving from W'N. The bursting of the balloon made the top of the trace unusually blurred, making the actual top a little uncertain. Pressure distribution:—A complex depression with centres over the Shetlands and Denmark and a secondary over the English Channel. Type XIV.
720. Weather overcast with rain and low clouds. Inversion on ascent from 1 km. to 1.14 km.; Temp. 270 a. to 271 a. Relative humidity 100 per cent. throughout. Inversion on descent from 1.23 km. to 1.42 km.; Temp. 268 a. to 269.5 a. The hyrogram was peculiarly sluggish, possibly the hairs were frozen whilst wet. Pressure distribution: A large low area centred off the mouth of the English Channel and a high over Scandinavia, a relatively stable distribution. Type VII b.

T = Temperature in Degrees Absolute.
H = Height in kilometres above M.S.L.

P = Pressure in millibars.
RH = Relative Humidity per cent.

Table with 10 columns for stations 683 to 693, including Date, Station, and Start (G.M.T.)

HEIGHTS, TEMPERATURES AND RELATIVE HUMIDITIES CORRESPONDING WITH ISOBARIC SURFACES—continued.

548.

1928.

Table with 27 columns for pressure levels (100-1000 Millibars) and 6 parameters (H, T, RH) for each of the 10 stations.

549.

PRESSURES, TEMPERATURES AND HUMIDITIES AT GIVEN HEIGHTS—continued.

1928.

Table with 27 columns for heights (21-0 Kilometres) and 6 parameters (P, T, RH) for each of the 10 stations.

Note.—The temperatures are derived from the original tabulations which are generally made to the nearest half-degree, and are shown to the nearest whole degree.

LAPSE RATE OF TEMPERATURE BETWEEN GIVEN HEIGHTS—continued.

550.

1928.

Table with 10 columns for height intervals (20 to 0 Kilometres) and 10 columns for lapse rate values.

T = Temperature in Degrees Absolute.
H = Height in kilometres above M.S.L.

P = Pressure in millibars.
RH = Relative Humidity per cent.

No.	696.	697.	698.	699.	700.	701.	702.	703.	704.
Date.	May 21.	May 23.	July 3.	July 17.	July 17.	July 18.	July 18.	July 19.	July 19.
Station.	Kew.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.	Sealand.
Start.	11h. 28m.	17h. 55m.	17h. 38m.	7h. 15m.	18h. 30m.	7h. 10m.	18h. 20m.	7h. 15m.	17h. 50m.
(G.M.T.)									

HEIGHTS, TEMPERATURES AND RELATIVE HUMIDITIES CORRESPONDING WITH ISOBARIC SURFACES—continued.

548.

1928.

Pressure.	696.			697.			698.			699.			700.			701.			702.			703.			704.		
	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.	H.	T.	RH.			
Millibars.	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%	km.	a. 200	%			
100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
200	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
300	...	...	...	8.98	21	9.12	25	...	...	9.50	29	...	9.46	31	...	9.44	30	...	9.48	32	...	9.47	34	...
400	...	...	...	7.05	37	7.16	40	28	...	7.50	45	29	7.45	45	62	7.44	45	54	7.45	49	28	7.44	50	19
500	...	...	...	5.46	49	5.56	51	23	...	5.86	59	21	5.81	57	59	5.80	59	39	5.79	59	20	5.77	60	21
600	...	...	...	4.11	57	4.20	60	27	4.45	69	18	4.41	67	65	4.39	66	35	4.38	69	23	4.36	71	13	
700	...	...	...	2.94	63	2.01	67	32	3.23	75	25	3.19	73	45	3.17	75	69	3.15	76	29	3.12	75	31	
800	1.91	73	100	1.91	69	1.95	73	63	2.13	81	33	2.11	80	27	2.09	82	46	2.05	83	52	2.04	81	40				
900	0.97	76	100	0.97	74	1.00	79	53	1.15	86	42	1.13	85	67	1.11	87	26	1.09	81	100	1.07	79	99				
1000	0.10	83	100	0.12	...	0.13	...	...	0.27	88	86	0.25	89	76	0.22	...	62	0.21	87	96	0.20	...	...		

549.

PRESSURES, TEMPERATURES AND HUMIDITIES AT GIVEN HEIGHTS—continued.

1928.

Heights.	696.			697.			698.			699.			700.			701.			702.			703.			704.		
	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.	P.	T.	RH.			
Kilometres	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%	mb.	a. 200	%			
21			
20			
19			
18			
17			
16			
15			
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2.5			
2	792	73	100	790	68	795	73	61	812	81	29	811	81	28	809	83	43	805	83	53	804	81	41				
1.5	842	73	100	842	71	846	76	65	863	85	34	861	83	38	858	85	27	856	79	97	854	81	61				
1	895	75	100	897	74	900	79	53	916	87	48	915	86	48	912	87	27	910	82	100	908	81	97				
0.5	952	80	100	954	77	956	83	56	973	86	90	971	88	84	968	87	44	966	85	98	965	84	76				
Ground.	1012	85	81	1014	81	1015	88	59	1031	88	82	1029	90	69	1026	88	79	1025	89	84	1024	88	75				

Note.—The temperatures are derived from the original tabulations which are generally made to the nearest half-degree, and are shown to the nearest whole degree.

LAPSE RATE OF TEMPERATURE BETWEEN GIVEN HEIGHTS—continued.

1928.

Kilometres	696.	697.	698.	699.	700.	701.	702.	703.	704.
20 to 21
19 to 20
18 to 19
17 to 18
16 to 17
15 to 16
14 to 15
13 to 14
12 to 13
11 to 12
10 to 11
9 to 10
8 to 9
7 to 8
6 to 7
5 to 6
4 to 5
3 to 4
2.5 to 3
2 to 2.5
1.5 to 2
1 to 1.5
0.5 to 1
Gd. to 0.5

* See Remarks.

T = Temperature in Degrees Absolute.
H = Height in kilometres above M.S.L.

P = Pressure in millibars.
RH = Relative Humidity per cent.

Table with 10 columns: No., Date, Station, Start, 705., 706., 708., 709., 710., 713., 717., 719., 720. Each column contains specific data for that station and date.

HEIGHTS, TEMPERATURES AND RELATIVE HUMIDITIES CORRESPONDING WITH ISOBARIC SURFACES—continued.

548.

1928.

Table 548: Heights, temperatures, and relative humidities corresponding with isobaric surfaces. Columns include Pressure (Millibars), Height (km), Temperature (a, %), and RH (%) for various pressure levels from 100 to 1000 mb.

549.

PRESSURES, TEMPERATURES AND HUMIDITIES AT GIVEN HEIGHTS—continued.

1928.

Table 549: Pressures, temperatures, and humidities at given heights. Columns include Heights (Kilometres), Pressure (P, mb), Temperature (T, a, %), and RH (%) for heights from 21 km down to Ground level.

Note.—The temperatures are derived from the original tabulations which are generally made to the nearest half-degree, and are shown to the nearest whole degree.

LAPSE RATE OF TEMPERATURE BETWEEN GIVEN HEIGHTS—continued.
Degrees absolute per kilometre.

550.

1928.

Table 550: Lapse rate of temperature between given heights. Columns show height intervals (e.g., 20 to 21 km) and the corresponding lapse rate in degrees absolute per kilometre.

Note.—The lapse rates are derived from the original tabulations, which are generally made to the nearest half-degree.