THE

NATIONAL PHYSICAL LABORATORY.

REPORT OF THE OBSERVATORY DEPARTMENT

FOR THE YEAR 1907.

WITH APPENDICES.

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1908.

THE NATIONAL PHYSICAL LABORATORY.

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INTRODUCTION.

THE Report of the Observatory Department is in many respects complete in itself and appeals to a different class of workers to that interested in the Engineering and Physics Departments. It has, therefore, been thought desirable to issue it separately.

R. T. GLAZEBROOK.

NATIONAL PHYSICAL LABORATORY.

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OBSERVATORY DEPARTMENT.

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Boy Clerks—B. Johnson, W. R. Corrin, Jun., G. H. Harris, R. R. Strand, J. G. Durham, F. Levin.
Caretaker, &c.—W. R. Corrin, Sen., with wife as housekeeper.

REPORT ON THE OBSERVATORY DEPARTMENT FOR THE YEAR ENDING DECEMBER 31, 1907, MADE BY THE SUPERINTENDENT TO THE DIRECTOR.

The work at the Kew Observatory in the Old Deer Park at Richmond, now forming the Observatory Department of the National Physical Laboratory, has been continued during the year 1907 as in the past.

This work may be considered under the following heads :—

I. Magnetic observations.
II. Meteorological observations.
III. Seismological observations.
IV. Experiments and Researches in connection with any of the departments.
V. Verification of instruments.
VI. Rating of Watches and Chronometers.
VII. Miscellaneous.

I. Magnetic Observations.

The magnetographs have been in constant operation throughout the year, and the usual scale value determinations were made in March.

The ordinates of the photographic curves representing Declination and Horizontal Force, were then found to be as follows :—

Declinometer: 1 cm. = 0° 8′·7.

Bifilar, for 1 cm. $\delta H = 0{\cdot}000505$ C.G.S. unit.

On February 26, the clock was dismounted and cleaned, and the lenses carefully wiped. A new line was fitted to the driving weight.

The principal magnetic disturbance recorded during the year occurred on February 9–10, when a fine display of aurora was generally observed. An account of this disturbance—the largest recorded since October 31, 1903—appeared in "Nature," February 14, p. 367. With this exception the curves have not shown any specially large fluctuations. Amongst the principal movements registered besides the above, were those on March 10–12, 21, May 18, June 19, July 10–11, 28, September 10, October 13–14, and November 21.

The hourly means and diurnal inequalities of the Declination and Horizontal Force for 1906 for the quiet days selected by the Astronomer Royal have been tabulated as usual, and the results will be found in Appendix I, together with the monthly means of the Inclination as derived from the absolute observations. Owing, however, to the disturbance of the vertical force produced by electric trams, it has been found impossible to tabulate the curves for this element satisfactorily. This has led to the omission of the tables of diurnal inequalities of vertical force and inclination published previous to 1902.

A correction has been applied to the horizontal force curves for the diurnal variation of temperature, use being made of the records from a Richard thermograph as well as of eye observations of a thermometer.

The mean values at the noons preceding and succeeding the selected quiet days are also given, but these of course are not employed in calculating the daily means or

inequalities.

The following were the mean results for 1907 :—

From curves	Mean Westerly Declination.....	16° 23′·1 W.
	Mean Horizontal Force	0·18517 C.G.S. unit.
From absolute observations, corrected	Mean Inclination	67° 1′·6 N.
	Mean Vertical Force.....	0·43681 C.G.S. unit.

The absolute observations have been reduced to the mean value for the day by applying corrections based on the diurnal variation observed in previous years.

Observations of absolute declination, horizontal intensity, and inclination have been made weekly as a rule.

A table of recent values of the magnetic elements at the Observatories whose publications are received at Kew will be found in Appendix Ia.

At the request of the Hydrographer, a course of magnetic instruction has been given to Lieutenants F. May, R.N., J. D. Nares, R.N., and J. Knight, R.N.

A short course of instruction has also been given in the use of the dip circle to Lieutenant Adams, R.N.R., and Dr. Marshall of the British Antarctic Expedition.

Commander Beauchamp, of the Indian Marine Service, visited the Observatory in July and saw the methods employed in taking magnetic observations.

On the application of Mr. B. F. E. Keeling, superintendent of the Helwan Observatory, facilities were afforded to Mr. H. E. Hurst in October for taking magnetic observations in order to compare one of the Egyptian magnetometers with the Kew Instruments.

In connection with a scheme of observations undertaken by the Hydrographic Department of the Admiralty at some of the stations occupied by Sir A. Rücker and Dr. T. E. Thorpe in their survey of the British Isles, opportunities were afforded to Captain Smyth, R.N., Captain Pudsey Dawson, R.N., and Captain Combe, R.N., to observe in March and April with the instruments about to be used in the field. Further observations were taken by Captains Smyth and Pudsey Dawson in November after concluding their field work, and similar observations were made by the Observatory staff with the instruments employed by Captain Combe. Unifilar magnetometer Elliott No. 60 was lent to the Admiralty, and employed by Captain Dawson in his field observations. In March, Captain Johnston, R.E., was shown the method of observing the magnetic declination, and was lent unifilar magnetometer, Dover 140. He returned the instrument in May, after observing at various places throughout the country.

On July 31 and August 1 and 2, the Superintendent took a number of magnetic observations at Eskdalemuir to test the freedom of the magnetograph rooms from magnetic material. The results obtained showed no trace of local disturbance.

An analysis of the magnetic condition of each day as regards disturbance—in accordance with the scheme of the International Magnetic Committee—was sent to Dr. Snellen, and after his death to Dr. van Everdingen.

II. Meteorological Observations.

The several self-recording instruments for the continuous registration of Atmospheric Pressure, Temperature of Air and Wet-bulb, Wind (direction, pressure and velocity), Bright Sunshine and Rain have been maintained in regular operation

throughout the year, and the standard eye observations for the control of the automatic records have been duly registered.

The tabulations of the meteorological traces have been regularly made, and these, as well as copies of the eye observations, with notes of weather, cloud, and sunshine, have been transmitted, as usual, to the Meteorological Office.

With the sanction of the Meteorological Office, data have been supplied to the Institute of Mining Engineers, and the editor of "Symons Monthly Meteorological Magazine."

Regular cloud observations have also been made with the Fineman nephoscope on 44 days in connection with the International scheme of balloon ascents, the results being transmitted through the Meteorological Office.

Earth Thermometers.—The two Symons' earth-thermometers on the lawn, one at a depth of 1 foot and the other at a depth of 4 feet, have been read at 10 a.m., 4 p.m., and 10 p.m. daily throughout the year, and the 10 a.m. readings have been forwarded weekly to the Meteorological Office, together with the corresponding readings of the Solar Radiation and Terrestrial Radiation thermometers.

Electrograph.—This instrument worked generally in a satisfactory manner during the year.

The battery was overhauled and 3 defective cells replaced in April.

The electrometer was dismounted and cleaned in November, but there has been no serious stoppage.

The moving coil galvanometer to which reference was made in last year's Report has been regularly read, and its indications have led to the early detection of faulty cells.

Determinations of the scale value of the Electrograph were made on March 8, May 9, July 5, October 25, and November 22.

The portable Electrometer White No. 53, which is regularly used for taking eye observations of atmospheric electricity at the fixed station on the lawn, had its scale value determined in the Physics Department at Teddington on January 29, October 24, and December 14.

The value in volts corresponding to a complete revolution of the lifting-screw changed during the year from 290 to 300.

A series of curves—ten a month—have been selected as representative of the variations of potential on electrically "quiet" days, defined as days when irregular fluctuations of potential are fewer than usual. These curves have been tabulated and the results appear, with the permission of the Meteorological Office, in Appendix II., Tables IV. and V. Owing presumably in large measure to the fewness of the selected days, the values deduced from the actual curve measurements show in some months a considerable non-cyclic element. This element has been eliminated from the diurnal inequality in the way customary in dealing with meteorological data.

Observations on the rate of loss of electric charge have been made throughout the year with an Elster and Geitel "Dissipation Apparatus." The observations were made in a systematic way between the hours of 2 and 4 p.m., except on days when rain was falling or the wind was high. An abstract of the results appears in Appendix II., Table VI. As usual a_+ and a_- denote the percentage losses per minute of plus and minus charges respectively.

Inspections—In compliance with the request of the Meteorological Office the following Observatories and Anemograph Stations have been visited and inspected:—Radcliffe Observatory, Oxford, Falmouth and Pendennis, Scilly Isles and Plymouth, by Mr. Baker; and Aberdeen, Glasgow, Deerness (Orkney), Stonyhurst, Yarmouth, and Shoeburyness, by Mr. Constable.

III. Seismological Observations.

Professor Milne's "unfelt tremor" pattern of seismograph has been maintained in regular operation throughout the year; particulars of the time of occurrence and the amplitude in millimetres of the largest movements are given in Table I, Appendix III. The largest disturbances recorded took place on April 15, September 2, and December 30.

A detailed list of the movements recorded from January 1 to December 31, 1907, has been made and sent to Professor Milne, and will be found in the 'Report' of the British Association for 1907, "Seismological Investigations Committee's Report."

The original seismogram of the Valparaiso earthquake of August 17, 1906, was lent to the International Bureau at Strassburg for an investigation in progress there and was duly returned.

IV. Experimental Work.

Fog and Mist.—The observations of a series of distant objects, referred to in previous Reports, have been continued. A note is taken of the most distant of the selected objects which is visible at each observation hour.

Atmospheric Electricity.—The comparisons of the potential, at the point where the jet from the water-dropper breaks up, and at a fixed station on the Observatory lawn, referred to in previous Reports, have been continued, and the observations have been taken every day when possible, excluding Sundays and wet days. The ratios of the "curve" and the "fixed station" readings have been computed for each observation. Besides checking the action of the self-recording electrometer, these serve to reduce the curve readings. Some experiments, still incomplete, have been made with a view to higher accuracy in the reductions.

Solar Radiation.—Experimental observations have been in progress throughout the greater part of the year with four Radio-integrators designed by Dr. W. E. Wilson, F.R.S. The results of the observations, which are still in progress, have been communicated to Dr. Wilson and the Meteorological Office.

In May, observations were commenced with an old Angström Pyrheliometer No. 24. In August, a new instrument, No. 100, was purchased, and after a comparison with No. 24, was brought into regular use.

V. Verification of Instruments, exclusive of Watches and Chronometers.

The subjoined is a list of the instruments—exclusive of watches and chronometers—examined in the year 1907, compared with a corresponding return for 1906:—

	Number tested in the year ending December 31.	
	1906.	1907.
Air-meters	9	5
Anemometers	30	18
Aneroids	224	209
Artificial horizons	18	1
Barometers, Marine	137	95
„ Standard	125	92
„ Station	39	71
Binoculars	390	787
Compasses	48	29
Hydrometers	571	480
Inclinometers	9	8
Levels	12	—
Magnetographs	3	—
Magnets	6	5
Milk-test apparatus	153	72
Rain Gauges	26	10
Rain-measuring Glasses	36	17
Sextants	1,096	1,261
Sunshine Recorders	1	5
Telescopes	4,657	5,376
Theodolites	40	15
Thermometers, Clinical	17,518	20,427
„ Deep sea	40	70
„ High Range	37	41
„ Hypsometric	96	42
„ Low Range	64	32
„ Meteorological	3,875	5,397
„ Solar radiation	129	5
„ Standard	77	109
„ Other Forms	48	3
Unifilars	7	5
Miscellaneous	46	13
Total	29,567	34,700

Duplicate copies of corrections have been supplied in 34 cases.

The number of instruments rejected in 1906 and 1907 on account of excessive error, or for other reasons, was as follows:—

	1906.	1907.
Thermometers, clinical	111	144
„ ordinary meteorological	34	59
Sextants	137	179
Telescopes	192	184
Binoculars	23	57
Various	120	89

There were at the end of the year at the Observatory, undergoing verification, 6 Barometers, 546 Thermometers, 1 Hydrometer, 39 Sextants, 357 Telescopes, 20 Binoculars, 2 Unifilar Magnetometers, 16 various.

VI. Rating of Watches and Chronometers.

The number of watches sent for trial this year was 246, as compared with 272 in 1906.

The "especially good" class A certificate was obtained by 49 movements. The high degree of excellence to which attention was called in previous Reports has been fairly well maintained, but the percentage number of movements obtaining the especially good class A certificate has fallen somewhat; only 4 watches obtained 90 marks and upwards, and the average number of marks obtained by the first 50 watches is lower.

The following figures show the percentage number of watches obtaining the distinction "especially good," as compared to the total number obtaining class A certificates:—

Year	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907
	16·6	30·5	28·0	22·1	26·6	35·4	35·5	31·6	42·4	50·2	44·7	47·5	43·0.

The 246 watches received were entered for trial as below:—

For Class A, 155; class B, 55; and for the subsidiary trial, 36. Of these, 114 were awarded class A certificates, 44 obtained class B certificates, 29 passed the subsidiary test, and 59 failed from various causes to gain a certificate.

In Appendix IV. will be found a table giving the results of trial of the watches which gained the highest number of marks during the year. The first two places were taken by the keyless going barrel Bar-lever watches, Nos. 132700 and 132676, sent by Messrs. Patek, Philippe & Co., Geneva, which obtained respectively 92·2 and 91·9 marks.

Marine Chronometers.—There has been an unusually large number of marine chronometers submitted for trial during the year, the entries having risen to 174.

Of these 134 received certificates, and 40 failed.

VII. Miscellaneous.

Commissions.—The following instruments have been procured, examined, and forwarded to the institutions on whose behalf they were purchased:—

For Melbourne Observatory, 3 thermometers.
,, Coimbra ,, 1 solar and 1 grass thermometer.
,, Sydney ,, 1 collimator magnet and inertia bar.
,, Survey Department, Egypt, 1 dip circle, with ordinary and total force needles.
,, Colaba Observatory (through the India Office) 2 thermograph tubes.

Paper.—Prepared photographic paper has been supplied to the Observatories at Hong Kong, Oxford (Radcliffe); and through the Meteorological Office to Aberdeen and Valencia.

Photographic paper has also been sent in quarterly instalments to the India Office for use in Indian observatories.

Anemograph and Sunshine Sheets have been sent to Hong Kong, and

Anemograph Sheets to St. Petersburg.

Kew Declination Results.—The grant obtained in 1903 from the Government Grant Committee has been expended in the reduction and tabulation of the declination curves. A paper embodying an analysis of the results from all days of the eleven years 1890 to 1900 has been communicated to the Royal Society.

Antarctic Observations.—The reduction of the pendulum observations having been completed by Mr. Bernacchi, who acted as physicist to the "Discovery" Expedition, the accuracy of the reductions was checked by Mr. E. G. Constable and the Superintendent, and the latter contributed a discussion of the results to the memoirs of the Expedition. The measurement of the magnetic curves has been proceeded with by Mr. A. E. Gendle. Serious difficulties have been encountered, more especially in the reduction of the vertical force curves, but the work is now rapidly approaching completion.

Mr. de Graaff Hunter, who has been appointed mathematical adviser to the Indian Survey, spent a short time at the Observatory in July to familiarize himself with the methods employed in reducing observations.

Mr. Travis Rimmer spent the greater part of the year at the Observatory, engaged in observations of solar and nocturnal radiation, for which facilities were afforded him. He instructed the staff in the use of the Ängström pyrheliometer and himself took a good many observations.

Owing to outbreaks of dry rot, extensive repairs had to be undertaken in the magnetograph and seismograph rooms. The former room was repainted throughout and whitewashed.

The tanks for holding ice and hot water in connection with the watch trials having become worn out, new tanks were fitted and the arrangements for heating the hot water tank were re-organised. Leakage from the old ice tank had rotted some of the timbers in the floor of the barometer room; the necessary repairs were promptly effected by H.M. Office of Works.

New ventilation and other improvements have been introduced in the thermometer room, which has been re-painted and its ceiling whitewashed.

The oak fence surrounding the Observatory enclosure has undergone extensive repairs during the year, and new gates have been fitted.

Library.—During the year the Library has received publications from :—

18 Scientific Societies and Institutions of Great Britain and Ireland,

119 Foreign and Colonial Scientific Establishments

as well as from several private individuals.

The card catalogue has been proceeded with.

CHARLES CHREE,

Superintendent.

List of Instruments, Apparatus, &c., the Property of the National Physical Laboratory Committee, at the present date out of the custody of the Director, on Loan.

To whom lent.	Articles.	Date of loan.
The Science and Art Department, South Kensington.	Articles specified in the list in the Annual Report for 1893	1876
Lord Rayleigh, P.R.S.	Standard Barometer (Adie, No. 655).....	1885
New Zealand Government.	Dip Circle, by Barrow, with one pair of Needles and Bar Magnets.....	1899
	Tripod Stand	1899
Lieut. Shackleton	Unifilar Magnetometer, by Jones, marked N.A.B.C.	1907

APPENDIX I TO REPORT OF SUPERINTENDENT OF OBSERVATORY DEPARTMENT.

MAGNETIC OBSERVATIONS, 1907, KEW OBSERVATORY.

Latitude 51° 28′ 6″ N., and Longitude $0^h\ 1^m\ 15^s.1$ W.

The results in the following Tables I to IV are deduced from the magnetograph curves, which have been standardised by observations of Declination and Horizontal Force. The observations were made with the Collimator Magnet K.C.I. and the Declinometer Magnet K. O. 90 in the 9-inch Unifilar Magnetometer, by Jones.

Inclination observations were also taken with the Inclinometer, No. 33, by Barrow with needles $3\frac{1}{2}$ inches in length. Table V gives the monthly means of these observations as actually taken, and also as corrected to the mean of the day from previous years' results. It also gives monthly values of the Vertical Force, calculated from the corrected values of the Inclination and the mean monthly values of the Horizontal Force.

The values of Inclination and Vertical Force are a little influenced by electric tram currents, which produce apparently a slightly enhanced value of Vertical Force throughout the day. The Declination and Horizontal Force inequalities are not absolutely above suspicion in this respect, but any uncertainty that may exist in their case is undoubtedly small.

The Declination and Horizontal Force values given in Tables I to IV are prepared in accordance with the suggestions made in the fifth report of the Committee of the British Association on comparing and reducing Magnetic Observations.

The following is a list of the days during the year 1907 which were selected by the Astronomer Royal, as suitable for the determination of the magnetic diurnal inequalities, and which have been employed in the preparation of the magnetic tables :—

January	3, 6, 19, 21, 31.
February	4, 5, 6, 18, 27.
March	3, 8, 16, 17, 31.
April	3, 9, 12, 21, 30.
May	1, 8, 9, 26, 30.
June	5, 8, 15, 17, 29.
July	4, 16, 17, 21, 24.
August	6, 12, 13, 15, 29.
September	2, 14, 22, 23, 24.
October	4, 7, 19, 20, 24.
November	1, 6, 18, 20, 30.
December	3, 9, 16, 23, 24.

Table I.—Hourly Means of Declination as determined from the selected

Hours	Preceding noon.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	(16° + West.)				Winter.								
1907. Months	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan. ...	27·2	23·7	23·9	24·0	24·1	24·3	24·5	24·5	24·5	24·5	24·8	**25·8**	**26·8**
Feb. ...	28·2	23·9	24·1	24·3	24·3	24·2	24·3	24·1	24·0	23·0	22·2	**22·9**	**25·0**
Mar. ...	28·4	24·1	24·1	24·0	24·0	24·1	24·6	24·2	23·1	21·7	21·0	22·7	**25·2**
Oct. ...	24·0	20·4	20·7	20·2	20·4	20·4	20·3	20·0	19·6	18·4	18·0	18·9	22·4
Nov. ...	22·8	19·8	20·0	20·4	20·5	20·7	20·6	20·0	20·1	19·7	19·5	20·7	22·1
Dec. ...	21·4	18·6	18·9	19·0	19·2	19·5	19·7	19·3	19·6	19·2	19·1	19·7	21·1
Means	25·3	21·8	22·0	22·0	22·1	22·2	22·3	22·0	21·8	21·1	20·8	21·8	23·8
					Summer.								
	′	′	′	′	′	′	′	′	′	′	′	′	′
April ...	28·4	23·6	23·4	23·6	23·3	23·3	23·0	21·9	20·5	19·1	19·5	22·2	26·0
May ...	27·8	24·0	23·5	23·3	23·4	23·1	22·6	21·5	20·9	20·5	19·4	23·5	26·4
June ...	27·0	22·2	21·6	21·3	21·8	21·4	20·8	19·6	19·3	18·6	19·4	20·5	23·2
July ...	25·3	20·9	21·1	20·7	20·2	20·3	19·6	19·0	18·7	18·4	19·4	21·4	23·7
Aug. ...	26·9	21·7	21·2	21·1	21·1	21·2	21·4	19·5	19·2	19·2	20·2	22·4	25·3
Sept....	25·9	21·6	21·6	21·5	21·4	21·4	21·4	20·4	19·7	18·9	19·5	21·6	24·4
Means	26·7	22·3	22·1	21·9	21·9	21·8	21·5	20·3	19·7	19·1	19·9	21·9	24·8

Table II.—Diurnal Inequality of the

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−0·9	−1·2	−1·3	−1·4	−1·5	−1·8	−2·9	−3·5	−4·1	−3·4	−1·3	+1·6
					Winter Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−1·2	−1·0	−1·0	−0·9	−0·8	−0·6	−0·9	−1·1	−1·9	−2·2	−1·2	+0·8
					Annual Means.							
	′	′	′	′	′	′	′	′	′	′	′	′
	−1·1	−1·1	−1·2	−1·1	−1·1	−1·2	−1·9	−2·3	−3·0	−2·8	−1·2	+1·2

Note.—When the sign is + the magnet
,, ,, − ,,

Quiet Days in 1907. Mean for the Year = 16° 23′·1 West.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.	Succeeding noon.
						Winter.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
27·4	27·9	27·5	26·6	25·8	25·7	25·6	25·3	25·1	25·0	24·7	24·7	24·3	27·8
27·7	28·8	29·0	28·0	26·7	26·1	25·6	25·2	24·8	24·3	23·9	24·0	24·0	28·3
28·5	30·7	30·9	30·1	28·3	26·6	25·9	25·5	25·3	25·2	24·9	24·8	24·6	28·7
25·2	26·1	25·4	24·3	22·6	21·5	21·0	21·0	20·6	20·1	19·9	20·0	20·1	24·8
23·9	24·2	23·2	22·6	21·7	21·3	21·0	21·0	20·3	19·7	19·6	19·5	19·8	23·5
22·0	22·3	21·7	21·3	20·7	20·3	20·2	19·9	19·6	19·6	19·4	19·4	19·5	22·0
25·8	26·7	26·3	25·5	24·3	23·6	23·2	23·0	22·6	22·3	22·1	22·1	22·1	25·9
						Summer.							
′	′	′	′	′	′	′	′	′	′	′	′	′	′
29·7	31·2	30·8	28·8	27·2	25·6	24·7	24·7	24·7	24·9	24·5	24·4	24·0	29·1
28·6	29·5	29·0	28·1	26·8	25·6	24·5	24·0	23·9	24·0	23·8	23·6	23·5	29·3
26·1	27·6	27·9	27·3	26·2	25·2	24·0	23·2	22·8	22·6	22·7	22·6	22·4	27·0
26·3	27·9	28·2	27·4	25·8	24·8	23·6	22·9	22·7	22·1	22·4	21·5	21·3	26·6
27·2	27·8	27·6	26·4	25·0	23·7	23·1	23·2	23·1	22·9	22·3	22·3	21·6	27·0
26·3	27·3	27·3	25·8	24·2	23·0	21·9	21·6	21·6	21·6	21·2	21·4	21·3	25·5
27·4	28·6	28·5	27·3	25·9	24·6	23·6	23·3	23·1	23·0	22·8	22·6	22·4	27·4

Kew Declination as derived from Table I.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Summer Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+4·1	+5·3	+5·2	+4·1	+2·6	+1·4	+0·4	0·0	−0·1	−0·2	−0·4	−0·6	−0·9
					Winter Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+2·8	+3·7	+3·3	+2·5	+1·3	+0·6	+0·3	0·0	−0·3	−0·6	−0·9	−0·9	−0·9
					Annual Means.							
′	′	′	′	′	′	′	′	′	′	′	′	′
+3·5	+4·5	+4·3	+3·3	+2·0	+1·0	+0·3	0·0	−0·2	−0·4	−0·7	−0·8	−0·9

points to the West of its mean position.

,, ,, East ,, ,,

Table III.—Hourly Means of the Horizontal Force in C.G.S. Units in 1907. (Mean for the

Hours	Preceding Noon.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
0·18000+						Winter.							
1907. Months.													
Jan.	513	514	514	513	511	511	517	519	520	517	513	512	509
Feb.	496	520	520	519	519	521	522	525	528	521	510	501	496
March ...	498	522	522	517	518	516	517	520	519	514	503	495	495
Oct.	490	517	517	513	514	514	514	515	517	512	499	490	489
Nov.	505	513	513	510	511	511	513	516	516	514	506	498	499
Dec.	511	514	516	514	516	517	518	523	524	522	519	515	513
Means ...	502	517	517	514	515	516	517	520	521	517	508	502	500
						Summer.							
April	498	527	527	523	521	522	522	524	521	512	498	488	487
May	504	532	526	522	522	521	519	518	514	507	504	497	501
June	494	522	520	516	515	515	516	512	508	502	495	493	494
July	504	523	523	520	517	516	517	512	506	502	498	495	500
Aug.	504	525	522	518	518	519	516	512	509	501	495	494	497
Sept.	494	524	520	519	518	516	516	517	515	509	501	494	492
Means ...	500	526	523	520	519	518	518	516	512	506	499	494	495

Table IV.—Diurnal Inequality of the Kew

Hours.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	+·00007	+·00004	+·00001	·00000	·00000	−·00001	−·00003	−·00007	−·00013	−·00020	−·00025	−·00024
					Winter Means.							
	+·00001	+·00001	−·00002	−·00001	·00000	+·00001	+·00004	+·00005	+·00001	−·00008	−·00014	−·00016
					Annual Means.							
	+·00004	+·00003	·00000	·00000	·00000	·00000	·00000	−·00001	−·00006	−·00014	−·00020	−·00020

NOTE.—When the sign is + the

(Corrected for Temperature) as determined from the Selected Quiet Days Year = 0·18517).

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.	Succeeding Noon.
Winter.													
511	517	521	521	521	521	520	522	524	522	521	520	518	514
499	502	512	520	521	523	527	528	526	526	527	525	524	493
499	508	517	522	525	523	526	527	528	528	528	527	525	502
495	501	509	508	509	515	518	521	519	518	518	520	520	496
504	511	514	514	514	516	518	516	519	518	516	517	518	511
514	518	520	523	522	523	522	522	521	521	519	521	518	513
504	509	516	518	519	520	522	523	523	522	522	522	521	505
Summer.													
495	505	512	521	526	529	529	532	532	531	532	530	527	495
508	511	513	523	530	534	535	535	535	536	535	532	531	510
502	508	515	522	524	531	536	539	538	537	533	529	526	503
508	516	521	525	525	529	533	533	539	537	535	531	527	495
507	512	517	523	528	529	532	533	534	532	532	530	527	508
497	507	515	516	521	524	527	529	529	530	529	528	528	502
503	510	516	522	526	529	532	534	535	534	533	530	528	502

Horizontal Force as deduced from Table III.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Summer Means.												
−·00016	−·00009	−·00003	+·00003	+·00007	+·00011	+·00014	+·00015	+·00016	+·00015	+·00014	+·00012	+·00009
Winter Means.												
−·00012	−·00007	·00000	+·00002	+·00003	+·00004	+·00006	+·00007	+·00007	+·00006	+·00006	+·00006	+·00005
Annual Means.												
−·00014	−·00008	−·00002	+·00003	+·00005	+·00007	+·00010	+·00011	+·00012	+·00011	+·00010	+·00009	+·00007

reading is above the mean.

Table V.—Mean Monthly Values of Inclination and Vertical Force during the Year 1907.

1907.	Mean time of Observation. p.m.	Inclination Observed.	Inclination reduced to the mean value for the day.	Vertical force (mean value for the day.) C.G.S. Units.
	h. m.	° ′	° ′	
January	2 51	67 2·1	67 1·9	·43691
February	3 1	67 3·1	67 3·0	·43730
March	3 19	67 2·0	67 2·0	·43694
April	3 2	67 1·1	67 1·1	·43666
May	2 56	67 0·8	67 1·0	·43668
June	3 27	67 1·4	67 1·7	·43684
July	3 18	67 1·2	67 1·6	·43683
August	3 24	67 1·1	67 1·3	·43671
September	3 15	67 1·5	67 1·7	·43680
October	3 33	67 2·2	67 2·1	·43682
November	3 3	67 1·5	67 1·3	·43660
December	2 52	67 1·3	67 1·1	·43668
Mean for year	...	...	° ′ 67 1·6	·43681

APPENDIX Ia.

MEAN VALUES, for the years specified, of the Magnetic Elements at Observatories whose Publications are received at the National Physical Laboratory.

Place.	Latitude.	Longitude.	Year.	Declination.	Inclination.	Horizontal Force, C.G.S. Units.	Vertical Force, C.G.S. Units.
	° ′	° ′		° ′	° ′		
Pawlowsk.....	59 41 N.	30 29 E.	1904	0 55·1 E.	70 35·6 N.	·16552	·46983
Sitka (Alaska)...	57 3 N.	135 20 W.	1905	29 59·5 E.	74 43·5 N.	·15484	·56697
			1906	30 3·3 E.	74 41·7 N.	·15502	·56646
Katharinenburg	56 49 N.	60 38 E.	1904	10 22·9 E.	70 46·7 N.	·17721	·50826
Copenhagen ...	55 41 N.	12 34 E.	1900	10 12·2 W.	68 39·0 N.	·17513	·44803
Flensburg	54 47 N.	9 26 E.	1903	11 28·0 W.	68 12·5 N.	—	—
Barth	54 22 N.	12 45 E.	1903	9 52·9 W.	67 37·6 N.	·18261	·44363
Stonyhurst	53 51 N.	2 28 W.	1907	17 43·8 W.	68 46·4 N.	·17398	·44795
Hamburg.....	53 33 N.	9 59 E.	1903	11 10·2 W.	67 23·5 N.	·18126	·43527
Wilhelmshaven	53 32 N.	8 9 E.	1906	12 5·4 W.	67 39·3 N.	·18178	·44224
Potsdam	52 23 N.	13 4 E.	1906	9 29·6 W.	66 18·4 N.	·18879	·43022
Irkutsk	52 16 N.	104 16 E.	1904	1 59·4 E.	70 22·7 N.	·20043	·56220
			1905	13 28·5 W.	66 48·5 N.	·18560	·43322
de Bilt (Utrecht)	52 5 N.	5 11 E.	1906	13 24·2 W.	66 53·3 N.	·18569	·43508
Valencia (Ireland)	51 56 N.	10 15 W.	1907	21 1·4 W.	68 17·0 N.	·17870	·44866
Kew	51 28 N	0 19 W.	1907	16 23·1 W.	67 1·6 N.	·18517	·43681
Greenwich	51 28 N.	0 0	1906	16 3·6 W.	66 55·3 N.	·18524	·43474
Uccle (Brussels)	50 48 N.	4 21 E.	1904	13 57·7 W.	66 4·8 N.	·19075	·43006
Falmouth.....	50 9 N.	5 5 W.	1907	18 0·4 W.	66 32·7 N.	·18799	·43330
Prague	50 5 N.	14 25 E.	1906	8 38·2 W.	—	—	—
Cracow	50 4 N.	19 58 E.	1907	5 47·9 W.	—	—	—
St. Helier (Jersey)	49 12 N.	2 5 W.	1907	16 27·4 W.	65 34·5 N.	—	—
Val Joyeux (near Paris)	48 49 N.	2 1 E.	1906	14 51·3 W.	64 47·9 N.	·19740	·41945
Munich.....	48 9 N.	11 37 E.	1906	9 59·5 W.	63 10·0 N.	·20657	·40835
O'Gyalla (Pesth)	47 53 N.	18 12 E.	1905	7 3·0 W.	—	·21151	—
Pola	44 52 N.	15 51 E.	1906	8 54·4 W.	60 6·0 N.	·22225	·38652
Agincourt (Toronto)	43 47 N.	79 16 W.	1905	5 42·2 W.	74 34·7 N.	·16422	·59535
			1902	14 10·5 W.	60 57·0 N.	·21989	·39452
			1903	14 6·5 W.	60 52·0 N.	·22010	·39490
Toulouse	43 37 N.	1 28 E.	1904	14 1·7 W.	60 50·7 N.	·21997	·39432
			1905	13 56·3 W.	60 49·1 N.	·22025	·39439

APPENDIX 1A—*continued.*

Place.	Latitude.	Longitude.	Year.	Declination.	Inclination.	Horizontal Force, C.G.S. Units.	Vertical Force, C.G.S. Units.
Perpignan	42 42 N.	2 53 E.	1900	13 37 ·3 W.	59 58 ·4 N.	·22441	·38828
Capodimonte (Naples)	40 52 N.	14 15 E.	1904	8 50 ·4 W.	56 15 ·5 N.	—	—
			1905	—	56 15 ·0 N.	—	—
			1906	—	56 13 ·5 N.	—	—
Madrid	40 25 N.	3 40 W.	1901	15 35 ·6 W.	—	—	—
Coimbra	40 12 N.	8 25 W.	1905	17 1 ·5 W.	59 6 ·4 N.	·22900	·38273
Baldwin (Kansas)	38 47 N.	95 10 W.	1905	8 28 ·0 E.	68 43 ·1 N.	·21841	·56072
			1906	8 30 ·1 E.	68 45 ·1 N.	·21807	·56081
Cheltenham (Maryland) ...	38 44 N.	76 50 W.	1905	5 18 ·0 W.	70 26 ·0 N.	·20075	·56481
			1906	5 22 ·0 W.	70 27 ·3 N.	·20035	·56436
Lisbon	38 43 N.	9 9 W.	1900	17 18 ·0 W.	57 54 ·8 N.	·23516	·37484
Athens	37 58 N.	21 23 W.	1900	5 42 ·3 W.	52 7 ·7 N.	·26063	·33514
			1901	5 34 ·1 W.	52 7 ·4 N.	·26090	·33541
			1902	5 26 ·6 W.	52 4 ·7 N.	·26141	·33541
			1903	5 20 ·2 W.	52 4 ·2 N.	·26114	·33508
San Fernando ...	36 28 N.	6 12 W.	1906	15 36 ·5 W.	54 52 ·6 N.	·24796	·35251
Tokio	35 41 N.	139 45 E.	1901	4 36 ·1 W.	49 0 ·0 N.	·29954	·34459
Zi-ka-wei	31 12 N.	121 26 E.	1904	2 28 ·2 W.	45 38 ·3 N.	·32985	·33729
			1905	2 30 ·3 W.	45 37 ·1 N.	·33009	·33729
Dehra Dun	30 19 N.	78 3 E.	1905	2 39 ·9 E.	43 24 ·2 N.	·33383	·31572
Helwan.....	29 52 N.	31 21 E.	1905	3 12 ·7 W.	40 36 ·2 N.	·30159	·25852
Havana.....	23 8 N.	82 25 W.	1905	2 58 ·0 E.	52 57 ·4 N.	·30531	·40452
Barrackpore.....	22 46 N.	88 22 E.	1905	1 18 ·0 E.	30 22 ·5 N.	·37242	·21828
Hong Kong	22 18 N.	114 10 E.	1906	0 7 ·0 E.	31 5 ·8 N.	·37037	·22339
Honolulu (Hawaii).....	21 19 N.	158 4 W.	1905	9 20 ·9 E.	40 5 ·4 N.	·29238	·24612
			1906	9 21 ·7 E.	40 1 ·8 N.	·29220	·24545
Toungoo	18 56 N.	96 27 E.	1905	0 48 ·4 E.	22 58 ·3 N.	·38675	·16394
Colaba (Bombay)	18 54 N.	72 49 E.	1905	0 14 ·0 E.	21 58 ·5 N.	·37382	·15084
Alibag ,,	18 39 N.	72 52 E.	1906	1 5 ·5 E.	23 8 ·7 N.	·36874	·15762
Vieques (Porto Rico)	18 9 N.	65 26 W.	1905	1 25 ·8 W.	49 40 ·9 N.	·28987	·34158
			1906	1 33 ·2 W.	49 47 ·7 N.	·28927	·34224
Manila	14 35 N.	120 59 E.	1904	0 51 ·4 E.	16 0 ·2 N.	·38215	·10960
Kodai-Kanal ...	10 14 N.	77 28 E.	1905	0 31 ·9 W.	3 16 ·7 N.	·37403	·02142
Batavia.....	6 11 S.	106 49 E.	1905	0 55 ·0 E.	30 39 ·7 S.	·36690	·21752
Dar-es-Salaam	6 49 S.	39 18 E.	1903	7 35 ·2 W.	—	—	—
Mauritius	20 6 S.	57 33 E.	1906	9 12 ·8 W.	53 52 ·9 S.	·23527	·32243
Rio de Janeiro...	22 55 S.	43 11 W.	1906	8 55 ·3 W.	13 57 ·1 S.	·24772	·06164
Santiago (Chile)	33 27 S.	70 42 W.	1905	14 27 ·0 E.	30 25 ·0 S.	—	—
Melbourne	37 50 S.	144 58 E.	1901	8 26 ·7 E.	67 25 ·0 S.	·23305	·56024
Christchurch (N. Z).....	43 32 S.	172 37 E.	1903	16 18 ·4 E.	67 42 ·3 S.	·22657	·55259

APPENDIX II.—Table I.

Mean Monthly Results of Temperature and Pressure for Kew Observatory.

1907.

Months.	Thermometer.								Barometer.*					Mean vapour tension.
	Means of—				Absolute Extremes.					Absolute Extremes.				
	Mean.	Max.	Min.	Max. and Min.	Max.	Date.	Min.	Date.	Mean.	Max.	Date.	Min.	Date.	
	°	°	°	°	°		°		ins.	ins.		ins.		in.
January ...	39·2	43·1	34·8	39·0	50·9	1st 10 P.M.	23·3	27th 1 A.M.	30·332	30·833	23rd 9 A.M.	29·108	2nd 8 A.M.	·192
February ...	38·2	42·9	33·4	38·2	51·3	20th 0.23 A.M.	24·0	23rd 7 ,,	30·026	30·609	28th 10 ,,	29·037	12th 4 P.M.	·180
March	43·9	52·8	35·2	44·0	66·4	31st 3 P.M.	26·9	12th 6 ,,	30·187	30·563	21st 9 ,,	29·434	17th 0·5 and 1 A.M.	·212
April	46·8	54·3	40·1	47·2	69·8	24th 2 and 3 P.M.	33·1	18th 5 ,,	29·779	30·382	22nd 10 P.M.	29·227	3rd 11 ,,	·243
May	53·3	60·5	46·0	53·3	76·0	12th NOON.	36·0	20th 4 ,,	29·873	30·255	17th 10 ,,	29·292	3rd 11 P.M.	·298
June	56·9	64·0	50·6	57·3	73·3	9th ,,	44·3	17th 4 ,,	29·877	30·228	17th 6 A.M.	29·438	1st 3 A.M.	·347
July	59·2	67·1	52·0	59·6	76·3	19th 5 P.M.	43·5	11th 4 ,,	30·045	30·489	11th 8 ,,	29·617	4th 6 ,,	·378
August	60·4	68·0	53·1	60·6	74·9	4th 3 ,,	45·2	2nd 5 ,,	30·008	30·381	21st 11 P.M.	29·628	15th 3 ,,	·401
September	57·8	66·9	49·8	58·4	77·7	25th 1 ,,	37·0	23rd 6 ,,	30·125	30·493	9th 9 A.M.	29·554	2nd 7 P.M.	·382
October.....	51·2	57·5	44·0	50·8	65·1	1st 11 A.M.	35·8	26th 6 ,,	29·660	30·121	5th 9 ,,	29·078	17th 1 A.M.	·325
November...	45·5	50·6	39·7	45·2	59·6	9th 1 P.M.	31·1	21st 11 P.M. and MIDT.	29·982	30·478	30th 10 and 11 A.M.	29·127	26th 3 P.M.	·266
December...	42·6	46·5	38·1	42·3	56·6	8th 1 ,,	30·3	16th 2 A.M.	29·773	30·374	1st 0·5 ,,	28·768	13th 9 ,,	·225
Means	49·6	56·2	43·1	49·7	...	...	...	...	29·972	...	...	...	...	·287
Means for 30 years, 1871—1900	49·3	56·1	42·7	49·4					29·963					

* Reduced to 32° at M.S.L.

This table has been compiled at the Meteorological Office from values intended for publication in the volume of "Hourly Means" for 1907.

APPENDIX II.—Table II.

Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=overcast).	Rainfall.*			Weather. Number of days on which were registered.							Wind.† Number of days on which it was								
		Total.	Maximum.	Date.	Rain.‡	Snow.	Hail.	Thunder storms	Clear sky.	Overcast sky.	Gales.§	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.‖
1907.		ins.	ins.																	
January	7·2	0·665	0·360	1	6	1	0	0	3	17	4	3	2	5	1	0	4	11	5	6
February	6·8	1·150	0·400	10	10	2	0	0	3	12	2	4	4	1	1	2	6	4	6	4
March	4·2	0·895	0·230	12	12	0	0	0	12	6	3	3	2	4	1	3	7	7	4	8
April	7·4	3·155	0·720	6	16	1	0	0	1	15	1	6	3	3	2	4	4	5	3	4
May	8·0	1·685	0·320	7	18	0	0	2	0	20	1	4	6	5	2	6	4	3	1	2
June	7·9	2·810	0·930	1	18	0	0	2	0	18	0	1	1	0	1	3	11	11	2	1
July	6·7	1·795	0·380	22	15	0	0	2	4	14	0	4	4	2	1	2	9	5	4	7
August	7·1	1·795	0·450	14	13	0	0	3	2	15	0	1	2	1	0	4	13	7	3	5
September	4·8	0·530	0·190	2	7	0	0	0	11	9	0	4	4	8	2	4	4	2	2	12
October	7·6	3·670	0·795	14	23	0	0	1	0	17	0	1	1	5	3	10	8	2	1	7
November	7·5	2·080	0·450	18	12	0	0	0	1	14	0	6	2	3	2	5	6	5	1	8
December	7·4	3·615	0·780	11	12	0	0	0	2	17	2	2	4	5	2	6	8	3	1	1
Totals and Means	6·9	23·845			162	4	0	10	39	174	13	39	35	42	18	49	84	65	33	65

* Measured at 10 A.M. daily by gauge 1·75 feet above ground. † As registered by the Robinson anemograph.

‡ The number of rainy days are those on which 0·01 inch rain or melted snow was recorded.

§ In a "gale" the mean wind velocity has exceeded 25 miles an hour in at least one hour of the twenty-four } using the factor 2·2.

‖ In a "calm" the mean wind velocity for the twenty-four hours has not exceeded 3·7 miles an hour }

APPENDIX II.—Table III.

Kew Observatory.

Months.	Bright Sunshine.				Maximum temperature in sun's rays. (Black bulb *in vacuo*.)			Minimum temperature on the ground.			Horizontal movement of the air.* Miles per hour.		
	Total number of hours recorded.	Mean percentage of possible sunshine.	Greatest daily record.	Date.	Mean.	Highest.	Date. †	Mean.	Lowest.	Date. ‡	Average hourly velocity.	Greatest hourly velocity.	Date.
1907.	h. m.		h. m.		°	°		°	°		Miles.	Miles.	
January	57 0	22	6 36	26	62	87	13	29	11	27	8·3	29	23
February	80 42	29	7 48	20	73	94	11	29	11	23	8·2	29	19
March	183 0	50	10 30	14	98	113	31	27	15	12	8·1	26	16, 19, & 20
April	136 12	33	11 6	22, 24	102	127	24	33	22	19	7·3	25	12
May	150 12	31	13 24	4	123	135	11	40	25	20	8·1	26	5
June	154 42	31	14 30	16	120	133	17	46	35	17	9·5	23	10
July	192 30	39	14 0	15	121	137	13	46	34	11	6·6	19	29
August	179 54	40	12 12	25	123	135	14	47	34	1	7·3	20	12
September	149 36	39	9 48	22	109	129	6	44	28	23	5·0	17	28
October	91 42	28	7 48	10	96	113	5	39	30	5	6·9	24	10, 20
November	39 54	15	6 30	24	70	94	9	34	22	16, 30	6·0	23	26
December	47 6	19	5 48	6	64	83	20, 22	32	23	6, 7, 18	11·0	32	14
Totals and Means	1462 30	33									7·7		

* As indicated by a Robinson anemograph, 70 feet above the general surface of the ground, the new factor 2·2 being used.

† Read at 10 A.M., and entered to previous day. ‡ Read at 10 a.m., and entered to same day.

APPENDIX II.—Table IV.—Hourly Means of Atmospheric Electric Potential Kew Observatory, on selected 19

Month.	Midt.	1 h.	2 h.	3 h.	4 h.	5 h.	6 h.	7 h.	8 h.	9 h.	10 h.	11 h.
January	194	183	175	156	141	142	149	168	212	247	248	243
February	272	251	227	215	214	214	214	251	303	337	327	300
March	227	204	198	189	171	170	179	197	227	270	297	263
April	181	168	153	142	141	160	178	208	209	199	186	171
May	156	138	137	132	127	137	146	162	173	171	175	150
June	102	90	93	91	91	117	127	132	138	122	107	99
July	151	144	133	126	127	127	136	164	192	201	191	183
August	128	109	116	115	116	125	141	164	180	184	167	130
September ...	98	83	80	83	82	99	120	139	151	160	166	170
October.....	143	134	125	135	142	148	154	164	165	157	138	113
November ...	267	261	254	253	250	251	254	249	241	251	267	263
December.....	191	178	177	163	164	177	184	200	222	245	258	258

APPENDIX II.—TABLE V.—Diurnal Inequality of Atmospheric Electric Potential 19

Month, &c.	1 h.	2 h.	3 h.	4 h.	5 h.	6 h.	7 h.	8 h.	9 h.	10 h.	11 h.	Noon.	1 h.
January	−28	−35	−53	**−67**	**−67**	−60	−44	− 5	+26	+26	+21	+17	+14
February	−25	−44	−54	**−55**	**−55**	**−55**	−25	+17	+45	+37	+15	−13	−24
March	−20	−24	−31	**−47**	**−47**	−38	−20	+ 5	+44	**+68**	+39	+13	− 1
April	−16	−27	−36	−36	−19	− 3	+23	+23	+15	+ 6	− 6	−15	−20
May	−17	−18	−23	**−28**	−19	−11	+ 3	+13	+12	+15	− 8	−24	−19
June	− 9	− 7	−10	−10	+13	+22	+26	**+31**	+15	0	− 7	−10	−15
July	−22	−33	**−38**	−37	−37	−29	− 2	+25	+33	+33	+17	− 1	−10
August	**−27**	−20	−21	−19	−11	+ 3	+24	+37	**+41**	+25	− 4	−20	−18
September ...	−48	**−50**	−48	−49	−35	−17	− 2	+ 8	+15	+20	+23	+20	+15
October.....	− 4	−12	− 4	+ 2	+ 7	+12	+20	+21	+14	− 3	**−26**	−20	−19
November ...	− 7	−12	−12	−13	−12	− 7	−11	**−17**	− 6	+ 9	+ 6	− 7	−12
December.....	−44	−44	**−56**	−54	−43	−36	−22	− 1	+19	+31	+31	+17	+24
Winter	−26	−34	−44	**−47**	−44	−40	−25	− 1	+21	+26	+18	+ 3	0
Equinox	−22	−28	−30	**−32**	−23	−11	+ 5	+14	+22	+23	+ 8	0	− 6
Summer	−19	−20	−23	**−24**	−14	− 4	+13	+26	+25	+18	− 1	−14	−16
Year	−22	−27	−32	**−34**	−27	−18	− 2	+13	+23	+22	+ 8	− 4	− 7

*Principal maxima and

(in volts) from the Self-recording Kelvin Water-dropping Electrograph at "Quiet" Days (10 each month).
07.

Noon.	1 h.	2 h.	3 h.	4 h.	5 h.	6 h.	7 h.	8 h.	9 h.	10 h.	11 h.	Midt.
239	237	237	234	253	259	251	258	262	269	266	244	208
265	252	251	267	276	290	321	357	359	347	334	312	273
233	217	190	188	197	208	225	236	239	255	241	219	210
158	151	136	130	145	166	182	220	239	238	215	185	160
132	138	146	154	149	145	164	188	196	200	191	177	158
97	92	84	82	82	88	100	114	130	142	129	124	119
164	154	143	148	154	165	175	198	215	213	191	167	145
111	112	107	107	107	114	122	154	166	159	143	129	113
168	163	164	166	170	193	204	197	177	158	148	129	112
119	121	120	121	128	155	174	167	155	144	140	146	149
246	239	235	244	255	261	264	263	267	272	270	260	234
241	248	244	250	276	281	267	244	241	214	198	193	178

Gradient at Kew Observatory near the Ground in volts per metre of height.*
07.

2 h.	3 h.	4 h.	5 h.	6 h.	7 h.	8 h.	9 h.	10 h.	11 h.	Midt.	Range of inequality.	Monthly and seasonal mean absolute values.
+14	+11	+28	+32	+24	+31	+33	**+40**	+36	+16	−17	107	198
−25	−12	− 4	+ 7	+32	+61	**+63**	+53	+43	+25	− 7	118	228
−23	−24	−16	− 5	+10	+20	+24	+38	+27	+ 8	+ 1	115	192
−32	**−37**	−23	− 6	+ 8	+41	**+57**	**+57**	+39	+15	− 5	94	147
−11	− 3	− 8	−12	+ 6	+27	+33	**+37**	+29	+16	− 2	65	144
−23	−26	**−27**	−22	−11	+ 1	+15	+26	+13	+ 8	+ 3	58	100
−20	−15	− 9	+ 1	+11	+33	**+49**	+47	+27	+ 5	−16	87	155
−22	−21	−20	−14	− 7	+21	+32	+27	+13	+ 2	−12	68	115
+16	+17	+20	+39	**+48**	+42	+24	+ 8	− 2	−18	−34	98	124
−20	−19	−13	+11	**+26**	+20	+10	0	− 4	+ 1	+ 3	52	125
−14	− 5	+ 6	+13	+16	+17	+21	**+27**	**+27**	− 1	− 3	44	226
+21	+27	+50	**+55**	+43	+23	+21	− 2	−16	−20	−33	111	195
− 1	+ 5	+20	+27	+29	+33	**+34**	+30	+22	+ 5	−15	—	212
−15	−16	− 8	+10	+23	**+31**	+29	+26	+15	+ 1	− 9	—	147
−19	−16	−16	−12	0	+20	+32	**+34**	+20	+ 8	− 7	—	129
−12	− 9	− 1	+ 8	+17	+28	**+32**	+30	+19	+ 5	−10	—	163

minima are in heavy type.

APPENDIX II.—Table VI.

Electric Dissipation (with Elster and Geitel apparatus).

Months. 1907.	Number of Days of Observation.	Mean Values.			Greatest Values.			Least Values.			$\frac{\Sigma a_-}{\Sigma a_+}$
		a_+	a_-	$\frac{a_-}{a_+}$	a_+	a_-	$\frac{a_-}{a_+}$	a_+	a_-	$\frac{a_-}{a_+}$	
January ...	14	·168	·234	1·52	·296	·361	3·65	·075	·099	0·75	1.39
February ...	14	·176	·280	1·73	·595	·649	2·35	·098	·174	1·09	1·59
March ...	10	·169	·349	2·12	·247	·732	3·27	·051	·128	1·47	2·07
April ...	7	·208	·486	2·38	·325	·861	4·84	·129	·128	0·99	2·34
May ...	13	·487	·746	1·58	·982	1·261	2·20	·201	·318	1·11	1·53
June ...	9	·670	·862	1·36	1·264	1·320	2·15	·365	·474	0·98	1·29
July ...	13	·386	·579	1·63	0·731	0·890	2·45	·096	·136	0·94	1·50
August ...	10	·473	·663	1·40	·596	·909	1·91	·242	·335	1·02	1·42
September ...	16	·373	·609	1·97	·925	1·140	5·18	·096	·177	1·11	1·63
October ...	10	·429	·679	1·72	·946	1·799	3·27	·139	·242	0·66	1·58
November ...	11	·284	·469	2·44	·626	0·947	8·91	·023	·205	0·85	1·65
December ...	8	·344	·474	1·42	·578	0·680	1·80	·156	·271	0·89	1·38
Year ...	135	·347	·536	1·77	1·264	1·799	8·91	·023	·099	0·66	1·61

APPENDIX III.—Table 1.

Register of principal Seismograph Disturbances at Kew Observatory. 1907.

No. in Kew register.	Date.	Commencement.	Time of Max.	Max. Amplitude.	Duration.	Remarks.
		hr. min.	hr. min.	mm.	hr. min.	
753	Jan. 2	12 35·6	13 37·8	2·0	3 15	
754	,, 4	5 35·7	6 41·7	2·8	2 55	Ceylon earthquake.
765	April 15	6 20·2	7 0·4	15·0	3 36	Mexican earthquake.
766	,, 18	21 24·0	22 4·5	3·0	1 30	
767	,, 19	0 21·0	1 4·1	1·7	1 26	
771	May 7	11 6·2	11 17·8	1·4	42	
779	June 1	9 3·5	9 38·4	1·0	1 1	
786	July 9	19 37·0	19 52·4	1·0	1 35	
793	Aug. 17	17 48·0	17 50·5	1·0	1 2	
796	Sept. 2	16 19·8	16 54·2	4·5	3 25	
804	,, 23	23 18·0	23 23·7	1·0	34	
806	Oct. 23	12 18·5	12 20·2	1·0	10	Seismic character doubtful.
807	,, 23	20 40·0	20 41·8	1·1	20	,, ,, ,,
812	Dec. 15	18 4·9	18 54·8	1·0	1 35	
815	,, 30	5 38·9	6 19·3	5·0	2 18	

During the greater part of October the instrument was not working, the Seismograph-room being under repair.

The times recorded are G.M.T., midnight = 0 or 24 hours.

The figures given above are obtained from the photographic records of a Milne Horizontal Pendulum ; they represent E—W displacements.

The scale value has been 1 mm. = 0″·56 from January to March.

,, ,, ,, = 0″·55 from March to July.

,, ,, ,, = 0″·56 from July to October.

,, ,, ,, = 0″·55 from October to December.

APPENDIX IV.—Table I.

RESULTS OF WATCH TRIALS. Performance of the Watches which obtained the highest number of marks during the year.

Name.	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ± Unit 0·01 second.	Mean change of rate for 1°F. Unit 0·001 second.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
											0—40	0—40	0—20	0—100.
			secs.	secs.	secs.	secs.	secs.			secs.				
Patek Philippe & Co., Geneva	132700	D.r., g.b., s.o., Bar lever	+1·2	+1·6	+2·0	+1·8	+2·5	27	16	2·25	34·6	38·7	18·9	92·2
,, ,, ,,	132676	D.r., g.b., s.o., Bar lever	+0·1	+1·1	−0·3	+1·0	+0·4	29	5	2·5	34·3	38·0	19·6	91·9
Vacheron & Constantin, Geneva	323178	D.r., g.b., s.o., Bar lever	−0·5	−1·4	−1·6	−0·2	−1·5	33	16	3·0	33·4	37·8	18·9	90·1
,, ,, ,,	327955	D.r., g.b., s.o., Bar lever	−4·9	−6·2	−5·1	−3·7	−4·2	34	5	3·75	33·1	37·2	19·7	90·0
Chas. Frodsham & Co., London	09171	D.r., fusee, d.o., Tourbillon	+1·8	+0·3	+1·5	+0·5	+1·0	29	38	3·5	34·2	37·9	17·5	89·6
Patek Philippe & Co., Geneva	129654	D.r., g.b., s.o., Bar lever	+2·2	+1·2	+1·3	+1·8	+2·5	43	7	2·75	31·5	38·3	19·6	89·4
,, ,, ,,	132698	D.r., g.b., s.o., Bar lever	+2·2	+1·0	+2·1	+1·7	+2·9	38	21	3·75	32·5	38·0	18·6	89·1
,, ,, ,,	132696	D.r., g.b., s.o., Bar lever	+0·1	−0·1	−0·4	+1·7	+2·2	28	25	3·75	34·5	36·0	18·3	88·8
,, ,, ,,	132703	D.r., g.b., s.o., Bar lever	+0·8	+0·9	+0·1	+2·0	+2·6	30	30	3·75	34·0	36·7	18·0	88·7
John Adams, Coventry	6984	S.r., g.b., s.o., Karrusel	−1·0	−1·3	−0·9	−1·2	+2·0	22	43	4·25	35·5	36·0	17·1	88·6
Newsome & Co., Coventry	149659	D.r., g.b., s.o.	+1·0	+1·2	+2·3	+2·2	+1·9	41	19	3·25	31·9	38·0	18·7	88·6
Nicole, Nielsen & Co., London	12243	Fusee, s o., Tourbillon-chronometer	+1·8	+0·3	+0·6	+1·6	+1·3	46	15	3·75	30·7	37·8	19·0	87·5
Russells, Ltd., Liverpool	88322	S.r., g.b., s.o.	+0·5	−1·5	−0·1	−1·0	−1·3	50	74	5·5	34·1	37·2	15·1	86·4
Nicole, Nielsen & Co., London	12165	D.r., fusee, d.o., Tourbillon	+1·4	+1·0	+1·1	+0·6	−0·3	44	45	4·0	31·3	38·1	17·0	86·4
W. Vasel, London	4069	S.r., g.b., d.o., Tourbillon	−0·1	−0·3	+0·3	+1·2	−0·2	46	40	4·5	30·7	38·2	17·4	86·3
S. Smith & Son, London	302—7	D.r., fusee, s.o., Tourbillon	+2·2	+1·4	+1·5	+1·1	+3·8	37	54	4·25	32·6	36·8	16·4	85·8
Victor Kullberg, London	7827	D.r., g.b., s.o., Karrusel	−1·9	−0·2	+0·2	+0·5	−1·8	36	55	5·25	32·9	36·1	16·4	85·4
Newsome & Co., Coventry	152242	S.r., g.b., s.o., Karrusel	+2·6	+2·4	+3·2	+3·1	+4·1	44	59	5·75	31·2	3 8·1	16·1	85·4
C. J. H. Marlow, Coventry	22603	S.r., g.b., s.o., minute and seconds chronograph	+0·2	+1·5	+0·9	+0·1	−0 1	40	69	5·5	32·0	37·9	15·4	85·3
John Adams, Coventry	9857	S.r., g.b., s.o.	+0·5	+0·4	+1·9	+0·3	+4·2	44	15	5·5	31·3	35·0	19·0	85·3
Russells, Ltd., Liverpool	88209	S.r., g.b., s.o.	+2·9	−0·7	+3·8	+2·2	+0·1	27	43	5·5	34·5	33·6	17·1	85·2
Newsome & Co., Coventry	143408	S.r., g.b., s.o.	+2·1	+2·8	+2·1	+2·2	+4·0	44	57	5·25	31·3	37·5	16·2	85·0
Carley & Clemence, London	51239	S.r., g.b., d.o., Karrusel	+3·6	+3·7	+4·1	+5·1	+1·1	46	41	5·0	30·9	36·2	17·3	84·4
J. Hewitt, Coventry	59703	D.r., g.b., s.o.	+0·4	−0·5	+0·6	+0·3	0·0	37	108	5·5	32·5	38·7	12·8	84·0
W. Matthews, Coventry	41698	S.r., g.b., s.o.	+1·3	−1·6	+0·4	+1·5	+1·3	44	58	5·25	31·3	36·2	16·1	83·6
J. Hewitt, Coventry	57660	D.r., g.b., s.o.	−1·1	+0·5	−1·1	−1·5	+0·2	41	78	6·5	31·7	37·0	14·8	83·5
Army & Navy C.S., London	9008	S.r., g.b., s.o., Karrusel	−1·8	−1·5	−2·0	+1·2	+0·4	40	57	5·0	32·0	35·0	16·2	83·2
Newsome & Co., Coventry	151214	S.r., g.b., s.o.	+1·3	−0·3	+0·1	+1·1	−0·1	57	44	4·75	28·7	37·4	17·1	83·2

TABLE I.—*continued.*

Name.	Number of watch.	Escapement, balance spring, &c.	Mean daily rate.					Mean variation of daily rate. ± Unit 0·01 second.	Mean change of rate for 1° F. Unit 0·001 second.	Difference between extreme gaining and losing rates.	Marks awarded for			Total Marks.
			Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.				Daily variation of rate.	Change of rate with change of position.	Temperature compensation.	
			secs.	secs.	secs.	secs.	secs.			secs.	0—40	0—40	0—20	0—10
J. Hewitt, Coventry	59158	D.r., g.b., s.o.	+1·3	+0·9	−1·5	+0·4	+0·7	40	88	5·25	31·9	37·0	14·2	83·1
Chas. Frodsham & Co., London	09152	D.r., g.b., s.o., min. and split seconds chronograph and minute repeater	−2·3	−1·3	+1·3	−2·2	−1·7	40	72	8·0	32·1	35·7	15·2	83·0
S. Yeomans, Coventry	90911	S.r., g.b., s.o.	+0·4	+1·9	+1·5	+3·9	+2·3	44	71	5·2	31·3	36·4	15·3	83·0
Audemars Piguet & Co., London	8939	S.r., g.b., s.o., Karrusel	−2·3	−3·1	−2·8	−1·6	+1·2	54	24	6·5	29·1	35·3	18·4	82·8
Jos. White & Son, Coventry	38060	S.r., g.b., s.o., Tourbillon	−0·7	−0·2	−0·5	+1·5	−0·7	29	137	8·5	34·3	37·4	10·8	82·5
W. Matthews, Coventry	41254	S.r., g.b., s.o., Tourbillon	−1·0	−2·4	−0·7	−1·8	+3·9	40	43	9·0	32·0	33·1	17·1	82·2
J. Hewitt, Coventry	59700	D.r., g.b., s.o.	−1·1	−2·5	−3·0	+0·2	−3·8	58	23	5·75	28·5	34·9	18·4	81·8
C. J. H. Marlow, Coventry	23035	S.r., g.b., s.o.	+0·1	−4·5	−1·7	−1·0	+0·6	57	19	8·25	28·6	34·2	18·8	81·6
J. Hewitt, Coventry	59702	D.r., g.b., s.o.	+1·1	−2·1	−1·1	+2·0	+3·3	35	64	6·5	33·0	32·7	15·8	81·5
John Adams, Coventry	19762	D.r., g.b., s.o.	+1·0	+0·3	−1·2	−2·4	−1·3	49	62	6·25	30·2	35·5	15·8	81·5
Stauffer, Son & Co., London	203155	D.r., g.b., s.o., minute and split seconds chronograph	+1·8	+1·4	+4·1	+3·1	+0·3	51	56	5·75	29·9	35·3	16·3	81·5
,, ,, ,,	203165	D.r., g.b., s.o., 1-10th second chronograph	+6·1	+5·2	+3·5	+6·5	+8·7	50	51	6·75	30·0	34·7	16·6	81·3
,, ,, ,,	203160	D.r., g.b., s.o., minute and split seconds chronograph	−5·7	−6·0	−4·1	−7·3	−4·5	46	85	4·75	30·8	36·0	14·4	81·2
Jos. White & Son, Coventry	38181	S.r., g.b., s.o.	−0·9	−1·2	+3·2	+1·5	−1·1	31	93	6·5	33·8	33·5	13·8	81·1
Usher & Cole, London	30098	D.r., g.b., s.o.	+3·2	+0·8	+1·3	+0·4	−1·1	61	37	6·5	27·7	35·8	17·5	81·0
Cary Porter, Ltd., London	2 / 1282	S.r., fusee, s.o.	+2·3	+5·0	+4·0	+0·6	−0·5	51	28	7·75	29·9	32·9	18·1	80·9
Jos. White & Son, Coventry	38182	D.r., g.b., s.o.	+1·6	+1·3	−2·3	+2·7	+4·6	56	18	9·75	28·7	33·4	18·8	80·9
Stauffer, Son & Co., London	203161	D.r., g.b., s.o., minute and split seconds chronograph	−3·6	−4·0	−3·3	−7·3	−1·9	48	66	6·25	30·4	34·6	15·6	80·6
W. Richardson & Son, Coventry	190511	g.b., s.o., Tourbillon chronometer	+1·3	−0·4	−0·1	+2·0	+3·4	68	17	6·25	26·4	35·3	18·9	80·6
Newsome & Co., Coventry	144775	D.r., g.b., s.o.	+1·0	−0·5	−0·5	+2·7	+1·1	48	89	5·25	30·5	35·9	14·1	80·5
J. W. Benson, London	2399	D.r., g.b., d.o., minute and seconds chronograph	−1·0	−0·0	−3·0	−0·2	+1·6	50	72	6·0	30·0	35·3	15·2	80·5

d.r. = double roller. s.r. = single roller.
d.o. = double overcoil spring. s.o. = single overcoil spring. g.b. = going barrel.

APPENDIX IV.—TABLE II.

Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Name.	Marks awarded for			Total Marks.
			Variation.	Position.	Temperature.	
			0—40	0—40	0—20	0—100
Minute and seconds chronograph, minute repeater, perpetual calendar and moon's phases	2266	J. W. Benson, London	31·1	30·3	14·8	76·2
Minute and split seconds chronograph and minute repeater	09152	Chas. Frodsham & Co., London	32·1	35·7	15·2	83·0
Minute and split seconds chronograph	203155	Stauffer, Son & Co., London	29·9	35·3	16·3	81·5
	203160	,, ,, ,,	30·8	36·0	14·4	81·2
	203161	,, ,, ,,	30·4	34·6	15·6	80·6
	11904	John Walker, London	28·2	34·4	13·7	76·3
	22709					
Minute and seconds chronograph	22603	C. J. H. Marlow, Coventry	32·0	37·9	15·4	85·3
	2399	J. W. Benson, London	30·0	35·3	15·2	80·5
	92295	Newsome & Co., Coventry	32·1	30·9	14·5	77·5
$\frac{1}{10}$ second chronograph	203165	Stauffer, Son & Co., London	30·0	34·7	16·6	81·3

APPENDIX V.

MAGNETIC OBSERVATIONS, 1906, FALMOUTH OBSERVATORY.

Latitude, 50° 9′ 0″ N.; Longitude, 5° 4′ 35″ W. Height, 167 feet above mean sea level.

Photographic curves of magnetic Declination and of Horizontal and Vertical Force variations have been regularly taken during the year.

The scale values of the instruments were determined on 29th December, 1906. The following values of the ordinates of the photographic curves were then found:—

Declination, 1 cm. = 0° 11′·7.
Bifilar, 1 cm. δ H. = 0·00052 C.G.S. unit.
Balance, 1 cm. δ V. = 0·00051 C.G.S. unit.

Deflections of the Vertical Force Magnet were again made on 28th February, 1907, when the value of the ordinate was found to be

Balance, 1 cm. δ V. = 0·00048 C.G.S. unit.

The scale values of the instruments were again determined on the 31st October, 1907, and were found to be

Bifilar, 1 cm. δ H. = 0·00052 C.G.S. unit.
Balance, 1 cm. δ V. = 0·00048 C.G.S. unit.

The principal variations of the Magnetic Curves that were recorded took place on the following dates:—January 14; February 9, 10, 11; March 10, 11, 12, 21; May 18; June 19; July 10, 11; September 10; October 13, 14; November 21.

Observations with the Absolute Instruments have been made four times a month, of which the following is a summary:—

Determinations of	Horizontal Intensity,	48.
,,	Inclination,	48.
,,	Declination,	49.

The mean values of the Magnetic Elements for the year 1907 are as follows:—

Declination, 18° 0′·4 W.; Horizontal Force, 0·18799 C.G.S.; Vertical Force, 0·43330 C.G.S.; Inclination, 66° 32′·7 N.

The results in the following Tables are deduced from the Magnetograph Curves which have been standardized by the absolute observations. These were made with the Collimator Magnet 66A and the Mirror Magnet 66C in the Unifilar Magnetometer No. 66, by Elliott Brothers, of London, and with the Inclinometer No. 86 by Dover, of Charlton, Kent, employing needles 1 and 2, which are $3\frac{1}{2}$ inches in length.

The effects of temperature on the Horizontal Force Curves are very small and have been neglected, but a temperature correction has been determined and applied to the Vertical Force Curves.

The tables are prepared in accordance with the suggestions made in the Fifth Report of the Committee of the British Association on comparing and reducing magnetic observations. The time given is Greenwich Mean Time, which is 20 minutes 18 seconds earlier than local time.

The results are derived from the "quiet" days selected by the Astronomer Royal, mentioned on p. 13 above.

EDWARD KITTO,

Superintendent and Magnetical Observer.

Table I.—Hourly Means of Declination at Falmouth on Five selected Quiet Days in each Month, 1907.

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
	(18° + West.)				Winter.								
1907.	′	′	′	′	′	′	′	′	′	′	′	′	′
January	1·0	1·5	1·8	2·0	2·0	1·8	1·9	1·9	1·7	1·7	2·9	3·9	5·2
February	1·4	1·7	2·0	2·0	1·8	1·8	1·9	1·5	0·5	−0·4	−0·1	1·7	4·5
March	0·7	0·6	0·7	0·7	0·8	1·1	0·4	−0·4	−2·0	−3·1	−2·4	0·2	3·9
October.....	−2·0	−1·8	−2·1	−2·0	−2·1	−2·3	−2·6	−3·1	−4·1	−4·9	−4·3	−1·5	2·0
November.....	−3·4	−3·2	−2·9	−2·7	−2·7	−2·7	−3·2	−3·2	−3·8	−4·1	−3·5	−1·9	0·9
December.....	−3·9	−3·4	−3·0	−2·7	−2·6	−2·5	−3·0	−2·8	−3·1	−3·3	−2·8	−1·6	−0·2
Means	−1·0	−0·8	−0·6	−0·5	−0·5	−0·5	−0·8	−1·0	−1·8	−2·4	−1·7	0·1	2·7
					Summer.								
1907.	′	′	′	′	′	′	′	′	′	′	′	′	′
April	1·0	1·0	1·0	0·8	0·4	−0·1	−0·8	−2·7	−4·8	−4·9	−2·6	1·2	5·5
May	0·7	−0·2	−0·1	0·0	−0·3	−1·3	−2·3	−3·7	−4·6	−3·8	−1·2	1·7	4·6
June	1·1	0·8	0·3	1·1	0·4	−0·5	−2·0	−2·5	−3·2	−3·1	−1·7	1·1	4·2
July	−0·7	−0·5	−1·0	−1·5	−1·5	−1·9	−3·1	−3·7	−3·8	−3·0	−1·4	0·5	4·0
August	−1·4	−1·8	−2·0	−2·1	−2·3	−3·2	−4·3	−4·9	−4·8	−4·0	−1·8	0·9	3·5
September ...	−0·8	−0·4	−0·6	−0·8	−0·8	−1·3	−2·1	−3·2	−3·9	−3·6	−2·0	0·8	3·8
Means	0·0	−0·2	−0·4	−0·4	−0·7	−1·4	−2·4	−3·5	−4·2	−3·7	−1·8	1·0	4·3

Table II.—Diurnal Inequality of the Falmouth

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
					Summer Means.								
	′	′	′	′	′	′	′	′	′	′	′	′	′
	−0·6	−0·8	−1·0	−1·0	−1·3	−2·0	−3·0	−4·0	−4·8	−4·3	−2·4	+0·5	+3·7
					Winter Means.								
	′	′	′	′	′	′	′	′	′	′	′	′	′
	−1·3	−1·0	−0·8	−0·7	−0·7	−0·7	−1·0	−1·3	−2·0	−2·6	−1·9	−0·1	+2·5
					Annual Means.								
	′	′	′	′	′	′	′	′	′	′	′	′	′
	−0·9	−0·9	−0·9	−0·8	−1·0	−1·3	−2·0	−2·6	−3·4	−3·4	−2·1	+0·2	+3·1

Observatory, determined from the Magnetograph Curves
(Mean for the year = 18° 0′·4 W.)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Winter.						
′	′	′	′	′	′	′	′	′	′	′	′
6·1	5·8	4·6	3·5	3·2	3·0	2·4	2·0	2·1	1·7	1·3	1·3
6·1	6·8	6·0	4·9	4·1	3·4	2·6	2·3	1·7	1·2	1·5	1·5
6·9	7·6	7·0	5·3	3·4	2·3	1·7	1·4	1·1	1·0	0·9	0·9
3·6	3·8	3·6	0·8	−0·4	−0·9	−0·9	−1·5	−1·8	−2·2	−2·1	−1·8
1·9	1·5	0·8	−0·6	−1·1	−1·5	−2·0	−2·5	−3·2	−3·0	−3·0	−2·7
0·4	0·0	−0·8	−1·2	−1·8	−2·3	−2·6	−3·0	−3·0	−3·2	−3·4	−3·4
4·2	4·3	3·5	2·1	1·2	0·7	0·2	−0·2	−0·5	−0·8	−0·8	−0·7
					Summer.						
′	′	′	′	′	′	′	′	′	′	′	′
8·0	8·1	6·5	4·5	3·0	1·7	1·4	1·5	1·5	1·3	0·8	0·5
6·0	6·0	5·3	4·0	2·4	1·0	0·3	0·1	0·3	0·3	0·0	0·3
6·1	6·9	6·4	5·4	4·6	3·2	2·2	1·6	1·3	1·2	0·8	0·9
5·6	6·2	5·6	4·1	3·0	2·0	1·2	1·0	0·1	0·3	−0·2	−0·2
4·4	4·6	3·4	2·1	0·8	−0·2	−0·3	0·0	−0·5	−1·3	−1·2	−1·8
5·4	6·0	4·8	3·0	1·5	0·4	−0·5	−0·5	−0·5	−0·8	−0·4	−0·4
5·9	6·3	5·3	3·9	2·6	1·4	0·7	0·6	0·4	0·2	0·0	−0·1

Declination as deduced from Table I.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Summer Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+5·4	+5·7	+4·8	+3·3	+2·0	+0·8	+0·2	+0·1	−0·2	−0·7	−0·6	−0·7
					Winter Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+3·9	+4·0	+3·3	+1·9	+1·0	+0·4	0·0	−0·5	−0·8	−1·0	−1·0	−0·9
					Annual Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+4·6	+4·9	+4·0	+2·6	+1·5	+0·6	+0·1	−0·2	−0·5	−0·9	−0·8	−0·8

Table III.—Hourly Means of Horizontal Force at Falmouth
Five selected Quiet Days in each Month, 1907.

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
0·18000 + (C.G.S. units).						Winter.							
1907.													
January	790	790	790	792	792	793	795	795	794	790	786	783	783
February	793	792	795	794	795	796	797	796	793	784	774	766	767
March	802	802	801	801	800	801	802	801	797	785	777	774	777
October	804	805	804	805	804	805	805	805	800	789	777	774	778
November ...	810	811	810	811	812	813	814	813	811	804	795	795	798
December ...	796	798	798	798	799	801	803	804	802	798	794	790	791
Means.....	799	800	800	800	800	802	803	802	800	792	784	780	782
						Summer.							
1907.													
April	803	804	802	799	799	799	799	796	787	776	764	761	767
May	811	808	806	805	804	803	801	796	788	782	778	780	785
June	807	806	803	802	802	803	798	793	787	781	775	775	781
July	809	809	809	806	805	804	799	796	790	785	783	786	793
August	816	813	812	812	811	809	804	799	791	786	782	784	793
September ...	803	799	797	797	797	797	796	793	786	778	770	765	767
Means.....	808	807	805	804	803	803	800	796	788	781	775	775	781

Table IV.—Diurnal Inequality of the Falmouth

Hrs.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
						Summer Means.							
	+ ·00008	+ ·00007	+ ·00005	+ ·00004	+ ·00003	+ ·00003	·00000	− ·00004	− ·00012	− ·00019	− ·00025	− ·00025	− ·00019
						Winter Means.							
	+ ·00001	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00004	+ ·00005	+ ·00004	+ ·00002	− ·00006	− ·00014	− ·00018	− ·00016
						Annual Means.							
	+ ·00005	+ ·00004	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00002	·00000	− ·00005	− ·00012	− ·00019	− ·00021	− ·00017

Observatory determined from the Magnetograph Curves on Mean for the year = 0·18799).

1.	2.	3.	4.	5	6.	7.	8.	9.	10.	11.	Midt.
Winter.											
789	795	796	795	794	794	796	798	797	797	796	795
771	782	787	789	791	795	799	798	797	799	797	798
785	794	799	802	801	802	803	804	805	805	803	803
785	794	795	796	802	805	807	804	804	804	806	806
804	809	810	808	811	813	814	815	815	813	813	815
793	798	801	799	801	801	802	802	802	799	800	798
788	795	798	798	800	802	804	804	803	803	803	803
Summer.											
777	784	794	802	805	805	809	807	807	808	807	804
787	793	803	809	812	811	815	814	814	814	811	812
788	793	801	806	811	818	820	819	816	815	810	809
801	806	808	810	813	816	818	822	821	820	816	813
800	805	810	814	818	817	821	824	820	819	817	816
776	785	785	791	795	798	800	802	802	800	802	801
788	794	800	805	809	811	814	815	813	813	811	809

Horizontal Force as deduced from Table III.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Summer Means.											
−·00012	−·00006	00000	+·00005	+·00009	+·00011	+·00014	+·00015	+·00013	+·00013	+·00011	+·00009
Winter Means.											
−·00010	−·00003	00000	00000	+·00002	+·00004	+·00006	+·00006	+·00005	+·00005	+·00005	+·00005
Annual Means.											
−·00011	−·00004	00000	+·00003	+·00006	+·00008	+·00010	+·00010	+·00009	+·00009	+·00008	+·00007

Table V.—Hourly Means of Vertical Force at Falmouth
Five selected Quiet Days in each Month

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
0·43000 + (C.G.S. units).						Winter.							
1907.													
January	350	350	351	351	351	351	351	351	350	349	347	344	343
February	340	339	339	339	340	340	341	341	341	341	337	329	326
March	340	341	341	342	342	342	341	342	342	340	335	327	324
October.....	321	321	321	321	320	319	317	317	319	318	316	310	308
November ...	344	344	344	343	343	342	342	341	341	341	339	334	333
December.....	294	293	294	295	295	295	295	295	295	294	293	291	292
Means	331	331	332	332	332	331	331	331	331	330	328	323	321
						Summer.							
1907.													
April	343	343	343	343	344	344	345	345	344	340	333	326	323
May	333	334	334	335	335	336	336	336	334	328	323	317	317
June	305	304	303	304	305	306	306	306	305	302	299	296	294
July	336	335	335	335	335	336	337	336	336	334	330	327	324
August	339	340	339	340	341	341	342	342	339	334	331	327	326
September ...	303	303	303	305	305	306	306	307	305	302	298	294	292
Means	327	326	326	327	328	328	329	329	327	323	319	315	313

Table VI.—Diurnal Inequality of the Falmouth

Hrs.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.
						Summer Means.							
	+ ·00001	+ ·00001	+ ·00001	+ ·00002	+ ·00002	+ ·00003	+ ·00003	+ ·00003	+ ·00002	− ·00002	− ·00006	− ·00011	− ·00013
						Winter Means.							
	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00001	− ·00002	− ·00007	− ·00008
						Annual Means.							
	+ ·00001	+ ·00001	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00003	+ ·00003	+ ·00002	·00000	− ·00004	− ·00009	− ·00011

Observatory, determined from the Magnetograph Curves on during 1907. (Mean for the Year = 0·43330).

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Winter.											
342	346	350	351	352	351	351	350	349	347	346	346
327	330	334	337	338	340	339	338	338	337	336	336
325	330	336	341	345	345	346	343	341	340	339	338
309	312	317	320	321	320	319	318	318	318	318	317
337	340	343	343	342	340	339	338	337	337	337	337
294	296	298	398	298	297	296	295	295	295	294	294
322	326	330	332	333	332	332	330	330	329	328	328
Summer.											
327	333	340	344	345	345	345	343	342	341	341	341
321	326	332	336	339	340	340	338	337	336	335	335
296	301	304	308	310	312	312	312	311	310	309	308
324	326	328	332	334	336	336	336	336	335	335	334
329	332	339	343	346	346	345	344	344	342	341	341
293	296	301	307	310	310	310	308	307	306	306	305
315	319	324	328	331	331	331	330	329	328	328	327

Vertical Force as deduced from Table V.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Summer Means.											
−·00011	−·00006	−·00002	+·00003	+·00005	+·00006	+·00006	+·00005	+·00004	+·00003	+·00002	+·00002
Winter Means.											
−·00007	−·00004	·00000	+·00002	+·00003	+·00003	+·00002	+·00001	·00000	·00000	−·00001	−·00001
Annual Means.											
−·00009	−·00005	−·00001	+·00003	+·00004	+·00004	+·00004	+·00003	+·00002	+·00001	+·00001	00000

Table VII.—Hourly Means of Inclination at Falmouth (Mean for the

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
	(66° +		)			Winter.							
1907.	′	′	′	′	′	′	′	′	′	′	′	′	′
January	34·0	34·0	34·0	33·8	33·8	33·8	33·6	33·6	33·7	33·9	34·1	34·2	34·2
February	33·5	33·5	33·3	33·4	33·3	33·2	33·2	33·3	33·5	34·1	34·6	34·9	34·8
March	32·9	32·9	32·9	33·0	33·0	33·0	32·9	33·0	33·2	34·0	34·4	34·3	34·1
October	32·2	32·1	32·2	32·1	32·2	32·0	32·0	32·0	32·4	33·1	33·8	33·8	33·5
November ...	32·4	32·4	32·4	32·3	32·3	32·2	32·1	32·2	32·3	32·8	33·3	33·2	32·9
December.....	31·9	31·8	31·8	31·8	31·8	31·6	31·5	31·4	31·5	31·8	32·0	32·2	32·2
Means.....	32·8	32·8	32·8	32·7	32·7	32·6	32·6	32·6	32·8	33·3	33·7	33·8	33·6
						Summer.							
1907.	′	′	′	′	′	′	′	′	′	′	′	′	′
April	32·9	32·8	32·9	33·1	33·1	33·1	33·2	33·4	34·0	34·6	35·2	35·2	34·7
May	32·1	32·3	32·4	32·5	32·6	32·7	32·8	33·1	33·6	33·8	34·0	33·7	33·3
June	31·5	31·5	31·7	31·8	31·8	31·8	32·1	32·5	32·8	33·1	33·5	33·4	32·9
July	32·3	32·2	32·2	32·4	32·5	32·6	33·0	33·1	33·5	33·8	33·8	33·5	33·0
August	31·9	32·1	32·2	32·2	32·3	32·4	32·8	33·1	33·6	33·8	33·9	33·7	33·0
September ...	31·7	32·0	32·1	32·2	32·2	32·2	32·3	32·5	32·9	33·4	33·8	34·0	33·8
Means.....	32·1	32·2	32·3	32·4	32·4	32·5	32·7	33·0	33·4	33·7	34·0	33·9	33·5

Table VIII.—Diurnal Inequality of the Falmouth

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
						Summer Means.							
	′	′	′	′	′	′	′	′	′	′	′	′	′
	−0·5	−0·4	−0·3	−0·2	−0·2	−0·1	+0·1	+0·4	+0·8	+1·2	+1·5	+1·3	+0·9
						Winter Means.							
	′	′	′	′	′	′	′	′	′	′	′	′	′
	0·0	−0·1	−0·1	−0·1	−0·1	−0·2	−0·3	−0·3	−0·1	+0·4	+0·9	+0·9	+0·8
						Annual Means.							
	′	′	′	′	′	′	′	′	′	′	′	′	′
	−0·3	−0·2	−0·2	−0·2	−0·1	−0·2	−0·1	+0·1	+0·4	+0·8	+1·2	+1·1	+0·8

Observatory, calculated from Tables III. and V.
Year = 66° 32′·7).

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Winter.						
′	′	′	′	′	′	′	′	′	′	′	′
33·8	33·5	33·5	33·6	33·7	33·7	33·6	33·4	33·4	33·4	33·4	33·5
34·6	33·9	33·7	33·6	33·5	33·3	33·0	33·1	33·1	33·0	33·1	33·0
33·6	33·1	32·9	32·9	33·1	33·0	33·0	32·8	32·7	32·7	32·8	32·7
33·1	32·6	32·7	32·7	32·3	32·1	31·9	32·1	32·1	32·1	31·9	31·9
32·6	32·4	32·4	32·5	32·3	32·1	32·0	31·9	31·9	32·0	32·0	31·9
32·1	31·8	31·7	31·8	31·7	31·7	31·6	31·5	31·5	31·7	31·7	31·8
33·3	32·9	32·8	32·8	32·8	32·6	32·5	32·5	32·4	32·5	32·5	32·5
					Summer.						
′	′	′	′	′	′	′	′	′	′	′	′
34·1	33·9	33·4	33·0	32·8	32·8	32·5	32·6	32·6	32·5	32·6	32·8
33·3	33·0	32·6	32·3	32·2	32·1	32·0	32·0	32·0	31·9	32·1	32·0
32·5	32·3	31·9	31·7	31·4	31·0	30·8	30·9	31·1	31·1	31·4	31·5
32·5	32·2	32·1	32·1	31·9	31·8	31·7	31·4	31·5	31·5	31·8	31·9
32·7	32·4	32·3	32·1	32·0	32·0	31·7	31·5	31·8	31·8	31·9	31·9
33·2	32·7	32·9	32·6	32·5	32·3	32·1	31·9	31·9	32·0	31·9	31·9
33·1	32·8	32·5	32·3	32·1	32·0	31·8	31·7	31·8	31·8	31·9	32·0

Inclination, as deduced from Table VII.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Summer Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+0·5	+0·2	0·0	−0·3	−0·4	−0·6	−0·8	−0·8	−0·8	−0·8	−0·6	−0·6
					Winter Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+0·5	0·0	0·0	0·0	−0·1	−0·2	−0·3	−0·4	−0·4	−0·4	−0·4	−0·4
					Annual Means.						
′	′	′	′	′	′	′	′	′	′	′	′
+0·5	+0·1	0·0	−0·1	−0·3	−0·4	−0·5	−0·6	−0·6	−0·6	−0·5	−0·5

APPENDIX VI.

MAGNETIC OBSERVATIONS MADE AT THE VALENCIA OBSERVATORY, CAHIRCIVEEN, 1907.

Latitude, 51° 56′ N. Longitude, 10° 15′ W.

The absolute observations of Declination, Inclination and Horizontal Force have been regularly continued during the year.

On February 7th, and again on November 22nd, the magnets were disturbed and other observations made on later days, the original ones being rejected.

The result of the observations shows a considerable alteration in the secular change. While that for 1905-06 was:—

		For 1906-07 it is:—	
Declination	−4′·1.	Declination	−4′·9.
Inclination	−2′·3.	Inclination	+0′·1.
Hor. Force	+·00019.	Hor. Force	+·00003.
Vert. Force	−·00037.	Vert. Force	+·00010.
Total Force	−·00027.	Total Force	+·00011.

J. E. CULLUM,

Observer.

Table I.—Declination at Valencia Observatory, Cahirciveen, 1907.

(Dover Unifilar 139.)

Date.	Declination, West.	Monthly Mean.	Remarks.
	° ′	° ′	
January 7 ...	21 7·7	—	
,, 21 ...	21 6·8	21 7·3	
February 8 ...	21 5·5	—	
,, 21 ...	21 3·8	21 4·6	Disturbed on the 7th.
March 7 ...	21 2·3	—	
,, 21 ...	21 2·0	21 2·2	
April 8 ...	21 1·5	—	
,, 22 ...	21 0·6	21 1·0	
May 7 ...	20 59·0	—	
,, 22 ...	21 2·7	21 0·9	
June 7 ...	21 1·2	—	
,, 21 ...	21 0·3	21 0·8	
July 8 ...	21 2·7	—	
,, 22 ...	21 0·0	21 1·4	
August 8 ...	21 0·8	—	
,, 22 ...	20 59·7	21 0·2	
September 9 ...	21 2·0	—	
,, 23 ...	20 56·5	20 59·2	
October 7 ...	20 59·3	—	
,, 21 ...	20 57·5	20 58·4	
November 8 ...	20 59·2	—	
,, 25 ...	20 59·6	20 59·4	Disturbed on the 22nd.
December 9 ...	21 1·5	—	
,, 23 ...	21 0·7	21 1·1	
Mean ...	at 10 a.m., G.M.T.	21 1·4	

Table II.—Inclination at Valencia Observatory, Cahirciveen, 1907.

(Dover Circle 118.)

Date.	Mean of two needles.	Monthly Mean.	Remarks.
	° ′	° ′	
January 7 ...	68 16·7	—	
,, 21 ...	68 15·6	68 16·2	
February 8 ...	68 16·8	—	
,, 21 ...	68 17·4	68 17·1	
March 7 ...	68 17·1	—	
,, 21 ...	68 18·2	68 17·7	
April 8 ...	68 18·1	—	
,, 22 ...	68 17·1	68 17·6	
May 7 ...	68 18·8	—	
,, 22 ...	68 17·0	68 17·9	
June 3 ...	68 16·4	—	
,, 21 ...	68 18·3	68 17·3	
July 8 ...	68 15·2	—	
,, 22 ...	68 16·3	68 15·8	
August 8 ...	68 16·1	—	
,, 22 ...	68 18·8	68 17·5	
September 9 ...	68 16·1	—	
,, 23 ...	68 17·5	68 16·8	
October 7 ...	68 16·8	—	
,, 21 ...	68 16·2	68 16·5	
November 8 ...	68 16·4	—	
,, 25 ...	68 17·4	68 16·9	
December 9 ...	68 17·4	—	
,, 23 ...	68 15·2	68 16·3	
Mean ...	at 1 p.m., G.M.T.	68 17·0	

Table III.—Magnetic Force (C.G.S.) at Valencia Observatory, Cahirciveen, 1907
(Dover Unifilar 139, and Circle 118.)

Date.	H.F.	Mean.	V.F. H.F. × Tan. Dip.	T.F. H.F. × Sec. Dip.
January 7	0·17893	—	—	—
,, 21	0·17876	0·17885	0·44875	0·48307
February 8	0·17872	—	—	—
,, 21	0·17869	0·17870	0·44871	0·48298
March 7	0·17869	—	—	—
,, 21	0·17876	0·17873	0·44902	0·48328
April 8	0·17868	—	—	—
,, 22	0·17858	0·17863	0·44872	0·48297
May 7	0·17868	—	—	—
,, 22	0·17853	0·17860	0·44877	0·48299
June 7	0·17864	—	—	—
,, 21	0·17873	0·17869	0·44877	0·48303
July 8	0·17846	—	—	—
,, 22	0·17882	0·17864	0·44807	0·48264
August 8	0·17876	—	—	—
,, 22	0·17848	0·17862	0·44866	0·48291
September 9	0·17874	—	—	—
,, 23	0·17861	0·17868	0·44856	0·48283
October 7	0·17851	—	—	—
,, 21	0·17860	0·17855	0·44811	0·48237
November 8	0·17876	—	—	—
,, 25	0·17878	0·17877	0·44881	0·48310
December 9	0·17869	—	—	—
,, 23	0·17913	0·17891	0·44893	0·48310
Mean	at Noon, G.M.T.	0·17870	0·44866	0·48294