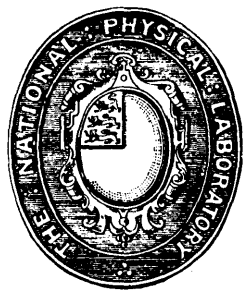

THE

NATIONAL PHYSICAL LABORATORY.

REPORT OF THE OBSERVATORY DEPARTMENT

FOR THE YEAR 1906.

WITH APPENDICES.

TEDDINGTON:
PARROTT & ASHFIELD, PRINTERS, THE CAUSEWAY.

1907.

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.

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Chief Assistant—T. W. Baker.
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Caretaker, &c.—W. R. Corrin, Sen., with wife as housekeeper.

REPORT ON THE OBSERVATORY DEPARTMENT FOR THE YEAR ENDING DECEMBER 31, 1906, 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 1906 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 May.

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

Declinometer: 1 cm. = 0° 8′·7.

Bifilar, May, 1906, for 1 cm. $\delta H = 0{\cdot}00050$ C.G.S. unit.

Again this year the curves have been free from any large disturbances. Amongst the principal movements registered were those on February 24 to 26 and 28; May 15; June 1 to 2; July 11, 29; August 7 to 8; September 22; and December 22.

The distance between the dots of light upon the Horizontal Force Cylinder having become too small for safe registration, the dots were separated on September 20 by slightly turning the torsion head.

On May 24 an experiment was made on the Declination Magnetograph to determine the torsion effect of the suspension. A rotation of the torsion head through 90° turned the magnet through approximately 15′. Thus in actual use the angle through which the needle turns is less than it would be in the total absence of torsion by about 0·3 per cent. The effect of torsion is thus negligible to the degree of accuracy ordinarily aimed at.

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 1906 :—

From Curves	Mean Westerly Declination.....	16° 28′·5 W.
	Mean Horizontal Force	0·18520 C.G.S. unit.
From absolute observations, corrected	Mean Inclination	67° 2′·2 N.
	Mean Vertical Force.....	0·43709 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.

The testing of the two Vertical Force Magnetographs of the Watson pattern referred to in last year's Report was completed in July, and the instruments were then forwarded to India.

A complete set of Magnetographs of the Watson type has also been tested for Egypt.

At the request of the Hydrographer a course of Magnetic Instruction has been given to Lieutenants B. O. M. Davy, R.N., W. Brandon, R.N., H. P. Douglas, R.N., T. W. Edgell, R.N., and J. R. Lay, R.N.

Magnetic observations were taken at the Observatory by Commander J. Chetwynd, R.N., and Lieutenant Reinold, R.N., and also by Commander F. H. Walter, R.N.

Magnetic data were supplied to various people, including Mr. P. L. Gray and Professor G. B. Rizzo. The data supplied to the latter were employed by him in his study* of the effects of the Calabrian Earthquake of September, 1905.

In the end of October and beginning of November magnetic observations were taken by the Superintendent at various spots inside the enclosure of the new Observatory at Eskdalemuir.

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 Council, data have been supplied to the Council of the Royal Meteorological Society, the Institute of Mining Engineers, and the editor of "Symons' Monthly Meteorological Magazine." On the initiative of the

* "Terrestrial Magnetism," Vol. XI., p. 113, 1906.

Meteorological Office, regular cloud observations have been made with the Fineman nephoscope in connection with the International scheme of balloon ascents.

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 5 defective cells replaced in May, but there has been no serious stoppage.

To obtain more definite information as to the behaviour of the battery used to charge the electrometer quadrants, a moving coil galvanometer with additional high resistances was fitted up in May. The arrangements admit of measurements being made of the potential of the whole battery, of groups of cells, or of individual cells. Observations have been taken regularly since June.

Determinations of the scale value of the Electrograph were made on May 11, 18 and 22, August 3, September 27, and November 30.

On March 7th, the suspension-wire of the portable Electrometer White No. 53—which is regularly used for taking eye observations of atmospheric electricity at the fixed station on the observatory lawn—was accidentally broken. It was sent to the makers to be repaired, and advantage was taken of this to have it generally overhauled and some slight improvements carried out. On its return it was tested in the Physics Department at Teddington, and the scale value determined. One whole turn of the screw was found to equal 290 volts. It was again tested in October, and found to be unaltered.

The second portable Electrometer No. 80 has also been sent to the makers to be overhauled.

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.

Inspections—In compliance with the request of the Meteorological Office the following Observatories and Anemograph Stations have been visited and inspected:—Stonyhurst, Aberdeen, Deerness (Orkney), Glasgow, by Mr. Baker; and Fleetwood Armagh, Dublin, Kingstown, Falmouth and Scilly Isles, 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 occurence and the amplitude in millimetres of the largest movements are given in Table I, Appendix III. The largest disturbances recorded took place on January 31 (Colombia),

April 18 (San Francisco), and August 17 (Valparaiso). On all three occasions the maximum amplitude exceeded 16 mm.

A detailed list of the movements recorded from January 1 to December 31, 1906, has been made and sent to Professor Milne, and will be found in the 'Report' of the British Association for 1906, "Seismological Investigations Committee's Report."

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, and these throw considerable light upon the action of the self-recording electrometer, especially with reference to the insulation problem.

The results obtained from the electrograph on selected days during the seven years 1898 to 1904 have been discussed by the Superintendent in a paper which has been published by the Royal Society (Phil. Trans. A. Vol. 206, 1906, p. 299. Printed also in Collected Researches, Vol. II).

Electrical Dissipation.—A Dissipation Apparatus of the Elster and Geitel type which has been in occasional use during the last year or two has had some improvements introduced by the makers, and it is hoped that regular observations will be taken in future.

Effects of Pressure on Watch Rates.—The experiments on the effect of varied barometric pressure on watch rates referred to in last year's Report were discussed by the Superintendent in a paper which appeared in the Horological Journal Vol. 48, 1906, pp. 91, 109 and 123.

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 1906, compared with a corresponding return for 1905:—

	Number tested in the year ending December 31.	
	1905.	1906.
Air-meters	7	9
Anemometers	7	30
Aneroids	143	224
Artificial horizons	45	18
Barometers, Marine	114	137
,, Standard	94	125
,, Station	36	39
Binoculars	554	390
Compasses	16	48

	1905.	1906.
Hydrometers	530	571
Inclinometers	9	9
Levels	15	12
Magnetographs	1	3
Magnets	18	6
Milk-test apparatus	137	153
Rain Gauges	35	26
Rain-measuring Glasses	54	36
Sextants	1,044	1,096
Sunshine Recorders	3	1
Telescopes	3,627	4,657
Theodolites	65	40
Thermometers, Clinical	16,089	17,518
,, Deep sea	56	40
,, High Range	50	37
,, Hypsometric	39	96
,, Low Range	30	64
,, Meteorological	3,626	3,875
,, Solar radiation	44	129
,, Standard	109	77
,, Other Forms	12	48
Unifilars	6	7
Miscellaneous	43	46
Total	26,658	29,567

Duplicate copies of corrections have been supplied in 65 cases.

The number of instruments rejected in 1905 and 1906 on account of excessive error, or for other reasons, was as follows:—

	1905.	1906.
Thermometers, clinical	72	111
,, ordinary meteorological	50	34
Sextants	128	137
Telescopes	93	192
Binoculars	21	23
Various	99	120

There were at the end of the year at the Observatory, undergoing verification, 28 Barometers, 1 Aneroid, 380 Thermometers, 2 Hydrometers, 25 Sextants, 408 Telescopes, 328 Binoculars, 1 Unifilar Magnetometer, 9 various.

VI. Rating of Watches and Chronometers.

The number of watches sent for trial this year was 272, as compared with 456 in 1905. The falling off in numbers was mainly in watches of other than English manufacture.

The "especially good" class A certificate was obtained by 76 movements. The high degree of excellence to which attention was called in last year's Report has been maintained, and there have been some fine performances.

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.
	16·6	30·5	28·0	22·1	26·6	35·4	35·5	31·6	42·4	50·2	44·7	47·5.

The 272 watches received were entered for trial as below :—

For Class A, 195 ; class B, 44 ; and for the subsidiary trial, 33. Of these, 160 were awarded class A certificates, 37 obtained class B certificates, 26 passed the snbsidiary test, and 49 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 place was taken by the keyless going barrel Tourbillon lever watch, No. $\frac{09182}{11487}$, sent by C. Frodsham & Co., London, which obtained 93·9 marks. This is the highest number of marks yet obtained here by an English watch.

Eleven watches obtained 90 marks and upwards.

Marine Chronometers.—There has been a marked increase in the number of marine chronometers submitted to the trials, the total entry being 91. This is much in excess of any previous year.

Of the 91 movements, 72 obtained certificates, and 19 failed to pass.

The double casing of sheet-iron surrounding the chamber used for keeping the chronometers at temperatures of 70° and 95° Fht. was found to be defective in the autumn, and it was thought advisable to have the chamber overhauled throughout, and new casings and covings fitted.

VII. Miscellaneous.

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

For the Observatory, Palermo, 1 inclinometer with 2 needles.

For the Observatory, Coimbra, 2 dip needles, 1 maximum, 1 minimum and 1 solar radiation thermometer, and 4 evaporation measures.

For the Observatory, Melbourne, 1 Fortin barometer and 1 aneroid barometer reading to 40 inches,

6 ordinary Fortin and 6 Station barometers,
12 pairs dry and wet bulb thermometers,
12 maximum and 12 minimum thermometers,
12 rock temperature thermometers,
24 grass minimum thermometers, and
36 solar radiation thermometers.

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, Rain, and Sunshine Sheets have been sent to Hong Kong, and *Sunshine Cards* to St. Petersburg.

Falmouth Magnetic Results.—A paper by the Superintendent embodying a comparison of the results from the Falmouth Declination and Horizontal Force

Magnetographs on quiet days in years of sun-spot maximum and minimum was contributed to the Cambridge Philosophical Society in February, and has appeared in their Transactions Vol. 20, p. 165. (Reprinted also in Collected Researches, Vol. II.)

Antarctic Magnetic Observations.—The National Antarctic Expedition having undertaken the reduction of the magnetic observations obtained in the South Orkneys during 1903 and 1904 by the Scottish Antarctic Expedition, these observations were reduced under the general direction of the Superintendent. The discussion has been completed and sent to press.

Considerable progress has been made with the measurement and reduction of the magnetic curves obtained by the National Antarctic Expedition in Victoria Land. Mr. H. A. Maudling, the junior assistant engaged in the work having accepted a post in Japan, his place has been taken by Mr. A. E. Gendle.

Mr. H. E. Wood, of the Transvaal Meteorological Service, Mr. G. C. Simpson, of the Indian Meteorological Service, and Mr. E. Gold, of the Meteorological Office, London, spent some time at the Observatory studying the general character of the observational work. Mr. H. E. Hurst, of the Egyptian Survey Department, also spent a few days, devoting his attention to the magnetic instruments.

With the sanction of the Admiralty, at the request of the representatives of the Imperial Japanese Navy in London, opportunities have been given to Mr. Katori to familiarise himself with the methods employed for the verification of most of the species of instruments tested in the Observatory Department. Mr. Katori's attendance at the Observatory commenced in the middle of November and is not yet concluded.

During the year there were outbreaks of dry rot in several parts of the building, including the caretaker's apartments, the photographic room, the sextant testing room and the magnetograph room. A very large portion of the woodwork in the basement and some other parts of the building has been affected. The structural work has been repaired by the Office of Works, but the cost to the Laboratory has been considerable.

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

17 Scientific Societies and Institutions of Great Britain and Ireland,

112 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.	Unifilar Magnetometer, by Jones, marked N.A.B.C., complete	1899
	Dip Circle, by Barrow, with one pair of Needles and Bar Magnets.....	1899
	Tripod Stand	1899

APPENDIX I TO REPORT OF SUPERINTENDENT OF OBSERVATORY DEPARTMENT.

MAGNETIC OBSERVATIONS, 1906, 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 1906 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	2, 3, 20, 24, 29.
February	3, 13, 14, 20, 22.
March	2, 16, 20, 21, 22.
April	6, 7, 15, 16, 27.
May	5, 7, 17, 23, 26.
June	6, 10, 14, 23, 27.
July	3, 9, 16, 20, 22.
August	5, 6, 18, 23, 30.
September	8, 9, 10, 19, 28.
October	10, 17, 18, 20, 24.
November	2, 14, 16, 17, 27.
December	1, 5, 18, 25, 30.

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.							
1906. Months.	′	′	′	′	′	′	′	′	′	′	′	′	′
Jan. ...	31·6	29·0	29·0	28·9	28·6	28·5	28·6	28·5	28·4	28·1	28·1	29·3	30·4
Feb. ...	32·1	29·8	29·9	30·1	30·1	30·1	30·2	29·9	29·7	28·8	28·2	29·1	31·4
Mar. ...	32·6	29·1	29·2	29·7	29·6	29·5	29·7	29·3	28·6	27·2	26·6	27·5	29·7
Oct. ...	32·0	27·5	27·3	27·4	27·2	27·5	27·4	27·0	26·9	26·2	25·9	27·2	29·4
Nov. ...	30·5	26·6	26·8	27·2	27·2	27·2	27·1	26·7	26·8	26·6	26·3	27·3	29·0
Dec. ...	27·1	24·9	24·9	25·0	25·2	25·3	25·3	25·1	25·0	24·8	24·6	25·4	26·7
Means	31·0	27·8	27·8	28·0	28·0	28·0	28·0	27 7	27·6	27·0	26·6	27·6	29·4
						Summer.							
	′	′	′	′	′	′	′	′	′	′	′	′	′
April ...	33·2	27·8	27·5	27·4	27·2	26·9	27·0	26·5	25·5	24·3	24·2	25·8	29·1
May ...	33·8	29·0	28·2	28·5	28·4	28·0	27·0	26·2	25·7	25·4	26·6	29·2	31·9
June ...	31·7	28·4	28·2	28·0	28·0	27·1	25·9	24·9	24·1	23·5	24·1	26·1	29·9
July ...	33·9	29·0	28·9	28·8	28·4	27·9	26·9	25·6	25·2	25·2	25·4	26·9	29·9
Aug. ...	32·7	28·2	27·9	28·0	28·1	27·6	27·1	26·4	25·9	25·8	26·8	28·7	31·5
Sept....	32·8	27·8	27·8	27·8	27·8	27·6	27·7	27·3	26·4	25·9	26·3	27·7	30·4
Means	33·0	28·4	28·1	28·1	28·0	27·5	26·9	26·2	25·5	25·0	25·6	27·4	30·4

Table II.—Diurnal Inequality of the

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

NOTE.—When the sign is + the magnet
" " − "

Quiet Days in 1906. Mean for the Year = 16° 28′·5 West.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.	Succeeding noon.
					Winter.								
′	′	′	′	′	′	′	′	′	′	′	′	′	′
31·3	32·1	31·6	30·7	29·7	29·8	29·6	29·3	29·1	28·8	28·7	28·6	28·6	31·1
32·4	33·5	32·9	32·0	30·8	30·6	30·2	30·1	29·6	29·5	29·3	29·0	29·0	33·2
32·4	34·0	34·2	33·9	32·8	31·4	30·6	30·6	30·1	29·9	29·5	29·4	29·1	32·2
31·1	31·5	30·6	29·8	28·6	28·3	27·8	27·8	27·6	27·5	27·1	27·1	26·8	33·1
30·3	30·6	30·0	29·3	28·6	28·2	27·9	27·5	27·3	26·9	26·8	26·9	26·8	30·4
27·5	27·8	27·4	26·8	26·2	26·1	25·8	25·7	25·3	25·1	24·8	25·1	24·9	27·6
30·8	31·6	31·1	30·4	29·4	29·1	28·6	28·5	28·2	27·9	27·7	27·7	27·5	31·3
					Summer.								
′	′	′	′	′	′	′	′	′	′	′	′	′	′
32·9	35·2	34·6	32·7	30·8	29·4	28·7	28·6	28·5	28·3	28·3	28·2	27·9	32·7
33·5	34·0	32·9	31·8	30·0	28·5	28·0	28·3	28·4	28·4	28·4	28·6	28·6	34·3
32·5	34·2	34·2	33·3	31·9	30·1	28·5	28·0	27·9	28·0	28·1	28·2	27·7	32·6
32·2	33·6	34·0	33·0	30·8	28·6	27·2	26·9	27·4	27·7	28·3	28·5	28·5	32·7
33·0	33·2	32·3	30·9	29·0	27·9	27·2	27·2	27·4	27·4	27·6	27·7	27·5	33·0
32·8	33·3	32·1	30·3	28·6	27·7	27·6	27·3	27·1	27·1	27·4	27·8	27·5	32·5
32·8	33·9	33·4	32·0	30·2	28·7	27·9	27·7	27·8	27·8	28·0	28·2	28·0	33·0

Kew Declination as derived from Table I.

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

points to the West of its mean position.

,, ,, East ,, ,,

Table III.—Hourly Means of the Horizontal Force in C.G.S. Units in 1906. (Mean for the

Hours.	Preceding Noon.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
0·18000 +						Winter.							
1906. Months.													
Jan.	501	515	513	512	514	515	516	517	517	514	507	501	498
Feb.	486	509	508	506	507	508	510	512	513	510	500	491	487
March ...	492	521	519	516	517	519	519	522	523	517	510	501	497
Oct.	509	526	525	525	525	528	528	528	527	521	512	506	503
Nov.	503	519	518	515	516	516	519	523	523	518	510	504	502
Dec.	516	520	521	519	519	519	522	523	523	520	517	513	512
Means ...	501	518	517	516	516	518	519	521	521	517	509	503	500
						Summer.							
April	503	528	526	522	521	522	523	524	523	517	506	499	496
May	506	527	523	522	523	522	518	515	511	506	502	500	503
June	512	530	528	526	524	527	526	521	516	506	496	496	498
July	517	537	534	532	532	534	533	527	521	513	504	502	510
Aug.	523	532	529	527	525	524	522	517	513	505	500	501	508
Sept.	504	525	523	521	521	520	517	515	511	502	495	493	497
Means ...	511	530	527	525	524	525	523	520	516	508	501	499	502

Table IV.—Diurnal Inequality of the Kew

Hours.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Summer Means.							
	+·00006	+·00003	+·00001	+·00001	+·00001	−·00001	−·00004	−·00008	−·00016	−·00023	−·00025	−·00022
					Winter Means.							
	+·00002	+·00001	−·00001	·00000	+·00001	+·00003	+·00004	+·00005	·00000	−·00007	−·00014	−·00017
					Annual Means.							
	+·00004	+·00002	·00000	·00000	+·00001	+·00001	·00000	−·00002	−·00003	−·00015	−·00020	−·00019

NOTE.—When the sign is + the

(Corrected for Temperature) as determined from the Selected Quiet Days Year = ·18520).

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.	Succeeding Noon.
Winter.													
504	508	515	517	518	520	522	521	521	520	520	519	518	502
488	493	501	507	510	512	513	514	515	514	511	509	508	490
498	504	512	518	521	521	522	524	526	525	523	522	520	504
509	519	526	527	524	526	530	530	530	530	533	532	533	506
506	511	515	517	517	520	521	521	522	521	520	519	520	503
515	519	524	525	526	527	527	525	524	523	522	522	522	518
503	509	516	518	519	521	522	523	523	522	522	521	520	504
Summer.													
499	512	520	526	527	529	529	533	534	533	532	530	530	510
511	519	524	529	533	535	537	538	537	536	534	533	533	519
505	514	518	525	531	535	538	541	539	539	540	539	538	509
517	524	528	540	546	546	545	545	546	544	542	539	537	515
523	529	534	533	533	535	538	539	539	540	538	537	535	520
506	514	520	526	528	528	528	530	530	530	531	529	528	512
510	519	524	530	533	535	536	538	538	537	536	535	534	514

Horizontal Force as deduced from Table III.

Noon.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Summer Means.												
−·00014	−·00005	·00000	+·00006	+·00009	+·00011	+·00012	+·00014	+·00014	+·00013	+·00012	+·00011	+·00010
Winter Means.												
−·00013	−·00007	−·00001	+·00002	+·00003	+·00005	+·00006	+·00006	+·00007	+·00006	+·00005	+·00004	+·00004
Annual Means.												
−·00013	−·00006	·00000	+·00004	+·00006	+·00008	+·00009	+·00010	+·00010	+·00009	+·00009	+·00007	+·00007

reading is above the mean.

Table V.—Mean Monthly Values of Inclination and Vertical Force during the Year 1906.

1906.	Mean time of Observation. p.m.	Inclination Observed.	Inclination reduced to the mean value for the day.	Vertical force (mean value for the day.)
	h. m.	° ′	° ′	
January	3 13	67 3·1	67 3·0	·43722
February	3 17	67 3·5	67 3·3	·43714
March	3 13	67 3·0	67 2·9	·43726
April	3 38	67 2·6	67 2·7	·43729
May	3 39	67 2·3	67 2·6	·43728
June	3 20	67 1·7	67 2·0	·43709
July	3 30	67 1·1	67 1·5	·43707
August	3 28	67 1·5	67 1·7	·43703
September	3 55	67 2·0	67 2·0	·43699
October	3 32	67 2·0	67 1·9	·43706
November	2 59	67 1·7	67 1·6	·43677
December	2 54	67 1·8	67 1·7	·43693
Mean for year	...	...	° ′ 67 2·2	·43709

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.	1903	0° 50′·6 E.	70° 35′·5 N.	·16559	·46999
Sitka (Alaska)...	57 3 N.	135 20 W.	1904	29 56·7 E.	74 44·5 N.	·15461	·56678
Katharinenburg	56 49 N.	60 38 E.	1903	10 18·4 E.	70 45·6 N.	·17738	·50821
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.	1905	17 53·5 W.	68 46·5 N.	·17368	·44718
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.	1904	12 12·6 W.	67 41·5 N.	·18163	·44268
			1905	12 8·2 W.	67 40·2 N.	·18169	·44235
			1906	12 5·4 W.	67 39·3 N.	·18178	·44224
Potsdam	52 23 N.	13 4 E.	1905	9 34·5 W.	66 19·3 N.	·18879	·43051
Irkutsk.....	52 16 N.	104 16 E	1903	1 59·9 E.	70 21·4 N.	·20068	·56220
de Bilt (Utrecht)	52 5 N.	5 11 E.	1904	13 32·7 W.	66 49·2 N.	·18561	·43346
Valencia (Ireland)	51 56 N.	10 15 W.	1906	21 6·3 W.	68 16·9 N.	·17867	·44856
Kew	51 28 N	0 19 W.	1906	16 28·5 W.	67 2·2 N.	·18520	·43709
Greenwich	51 28 N.	0 0	1905	16 9·9 W.	66 55·9 N.	·18523	·43494
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.	1906	18 5·3 W.	66 33·7 N.	·18790	·43344
Prague	50 5 N.	14 25 E.	1905	8 43·3 W.	—	—	—
Cracow	50 4 N.	19 58 E.	1906	5 57·0 W.	—	—	—
St. Helier (Jersey)	49 12 N.	2 5 W.	1906	16 31·7 W.	65 35·0 N.	—	—
Val Joyeux (near Paris)	48 49 N.	2 1 E.	1905	14 55·7 W.	64 50·5 N.	·19728	·42008
			1906	14 51·3 W.	64 47·9 N.	·19740	·41945
Munich.....	48 9 N.	11 37 E.	1903	10 13·5 W.	63 11·4 N.	·20647	·40856
			1904	10 8·7 W.	63 10·7 N.	·20648	·40838
			1905	10 4·6 W.	63 10·4 N.	·20652	·40836
O'Gyalla (Pesth)	47 53 N.	18 12 E.	1905	7 3·0 W.	—	·21151	—
Odessa	46 26 N.	30 46 E.	1899	4 36·7 W.	62 18·2 N.	·21869	·41660
Pola	44 52 N.	15 51 E.	1905	9 0·1 W.	60 7·6 N.	·22226	·38695
Agincourt (Toronto)	43 47 N.	79 16 W.	1905	5 42·2 W.	74 34·7 N.	·16422	·59535
Nice	43 43 N.	7 16 E.	1899	12 4·0 W.	60 11·7 N.	·22390	·39087
Toulouse	43 37 N.	1 28 E.	1901	14 13·7 W.	60 56·5 N.	·21963	·39527

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 51·1 W.	56 15·3 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.	1904	8 26·4 E.	68 40·9 N.	·21866	·56029
Cheltenham (Maryland) ...	38 44 N.	76 50 W.	1904	5 13·6 W.	70 25·1 N.	·20103	·56517
Lisbon	38 43 N.	9 9 W.	1900	17 18·0 W.	57 54·8 N.	·23516	·37484
San Fernando ...	36 28 N.	6 12 W.	1905	15 40·3 W.	54 54·2 N.	·24762	·35237
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.	1903	2 27·3 W.	45 38·8 N.	·32957	·33708
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.	1904	3 17·1 W.	40 34·3 N.	·30161	·25825
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.	1905	0 8·9 E.	31 6·6 N.	·36975	·22317
Honolulu (Hawaii).....	21 19 N.	158 4 W.	1904	9 20·0 E.	40 10·0 N.	·29179	·24628
Taungoo	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
Vieques (Porto Rico)	18 9 N.	65 26 W.	1904	1 18·7 W.	—	·29025	—
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.	1904	0 57·5 E.	30 33·2 S.	·36697	·21662
Dar-es-Salaam	6 49 S.	39 18 E.	1903	7 35·2 W.	—	—	—
Mauritius.....	20 6 S.	57 33 E.	1905	9 11·3 W.	53 55·5 S.	·23584	·32371
Rio de Janeiro...	22 55 S.	43 11 W.	1905	8 46·6 W.	13 51·7 S.	·24769	·06104
Santiago (Chile)	33 27 S.	70 42 W.	1904	14 31·3 E.	30 31·8 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.

1906.

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 ...	42·6	47·1	38·1	42·6	52·7	26th 2 P.M.	27·0	23rd 9 A.M.	29·971	30·703	23rd 10 and 11 A.M.	29·159	7th 11 P.M.	·230
February ...	39·0	44·0	34·3	39·2	49·7	16th 2 ,,	25·6	22nd 5 ,,	29·789	30·378	1st 0.5 and 1 A.M.	28·851	10th MIDT.	·192
March	41·9	47·9	36·2	42·1	61·2	17th 3 ,,	28·0	23rd 3 ,,	30·012	30·490	3rd NOON.	29·044	11th 7 P.M.	·212
April	46·2	55·7	36·8	46·3	71·1	12th 2 ,,	30·6	20th 5 ,,	30·083	30·636	9th 9 A.M.	29·350	29th 2 ,,	·209
May	53·2	60·7	45·9	53·3	73·3	8th 3 ,,	33·1	18th 5 ,,	29·870	30·239	5th 7 ,,	29·449	16th 3 ,,	·309
June	59·1	68·6	49·9	59·3	81·6	23rd 4 ,,	41·2	5th 4 ,,	30·126	30·425	5th 9 ,,	29·520	1st 2 ,,	·343
July	63·6	73·0	54·7	63·9	80·8	18th 4 ,,	47·0	{ 1st 4 ,, / 13th 4 ,, }	30·038	30·284	9th 8 ,,	29·798	19th 6 A.M.	·404
August	64·7	74·6	55·8	65·2	90·9	31st †	46·0	29th 6 ,,	30·002	30·452	28th 10 ,,	29·611	13th 6 P.M.	·425
September	58·8	67·9	50·3	59·1	91·8	1st †	37·4	29th 6 ,,	30·199	30·654	27th 9 ,,	29·547	15th 5 A.M.	·360
October.....	54·0	60·1	47·8	54·0	69·3	11th 2 P.M.	35·0	26th 5 and 7 A.M.	29·851	30·455	25th 7 P.M.	29·197	30th NOON.	·355
November...	46·5	51·0	40·8	45·9	59·0	22nd 2 ,,	29·4	12th 4 ,,	29·887	30·578	23rd 11 A.M.	28·925	4th 9 P.M.	·274
December...	38·2	42·6	33·3	38·0	55·0	3rd NOON.	23·3	26th 11 P.M.	29·970	30·654	20th 11 ,,	28·965	26th 8 A.M.	·186
Means	50·7	57·8	43·7	50·7	...	...	...	...	29·983	...	...	...	...	·292

* Reduced to 32° at M.S.L. † From Weather Register—trace lost.

This table has been compiled at the Meteorological Office from values intended for publication in the volume of "Hourly Means" for 1905.

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. ‖
1906.		ins.	ins.																	
January	7·1	3·365	0·560	12	17	0	1	1	2	15	4	3	0	2	2	2	14	6	2	1
February	7·0	1·715	0·350	17	19	7	2	1	1	16	0	2	3	0	1	2	7	8	5	1
March	7·3	1·050	0·325	10	17	7	0	0	3	18	1	8	5	1	0	0	11	4	2	2
April	4·9	0·450	0·230	27	6	2	1	0	11	9	1	4	7	5	4	2	4	3	1	3
May	7·7	1·805	0·780	8	15	0	0	1	1	20	0	4	4	1	2	5	8	4	3	2
June	5·9	2·830	2·360	28	7	0	0	3	5	10	0	5	4	4	1	2	6	4	4	2
July	6·0	1·010	0·745	27	7	0	0	1	2	9	0	4	2	5	1	1	11	6	1	3
August	5·6	0·775	0·225	24	9	0	0	1	5	9	0	0	0	3	0	7	13	8	0	4
September	5·4	1·750	0·820	4	10	0	0	0	6	10	0	9	3	4	2	5	3	2	2	6
October	7·3	3·190	0·625	29	17	0	0	0	2	16	0	2	0	2	1	9	10	3	4	2
November	7·7	3·885	0·630	8	16	0	0	0	3	20	0	3	4	2	1	3	10	6	1	5
December	7·5	1·850	0·290	15	16	6	1	0	2	20	0	4	3	2	1	3	6	9	3	4
Totals		23·675			156	22	5	8	43	172	6	48	35	31	16	41	103	63	28	35

* 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.

In previous years when the original Robinson factor of 3 was in use, the above two limits were respectively 35 and 5 miles.

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.
1906.	h. m.		h. m.		°	°		°	°				
January	65 0	25	6 24	10	74	94	27	31	16	23, 24	10·5	32	6
February	88 54	32	8 0	12, 20	81	97	27	27	14	13	9·6	24	10
March	109 42	30	10 24	17	95	109	17	29	14	23, 30	10·5	27	11
April	218 36	53	12 36	27	108	124	12	27	16	15	8·3	29	18
May	152 18	32	13 30	29	113	133	23, 28	40	22	1	7·9	21	3
June	247 12	50	14 30	26	121	138	22	43	29	7	6·6	23	29
July	248 36	50	13 36	5	122	138	7, 8, 23	47	35	1	6·1	18	30
August	237 48	53	13 0	22	127	140	7	48	35	29	6·9	22	25
September	167 24	44	12 12	1	114	137	1, 2	43	30	11, 26	6·0	21	18
October	100 42	31	9 36	14	105	116	24	41	28	15, 28	6·8	18	2, 17
November	39 24	15	7 18	5	74	98	3	36	20	19	7·5	21	30
December	47 12	19	6 18	1, 10	61	89	3	27	14	11, 28	7·4	22	3
Totals and Means	1722 48	39									7·8		

* As indicated by a Robinson anemograph, 70 feet above the general surface of the ground, the new factor 2·2 being used in place of Dr. Robinson's original factor 3, employed in previous years.

† 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	234	215	199	191	189	193	209	237	264	294	297	274
February	237	224	205	179	158	164	186	230	276	312	315	290
March	249	232	218	205	197	207	237	267	279	267	245	235
April	205	179	162	158	146	147	165	200	228	228	216	181
May	107	107	101	88	94	106	123	138	140	132	108	79
June	157	148	141	136	129	131	139	168	182	171	157	136
July	145	113	104	108	110	122	138	167	197	196	177	144
August	122	118	103	100	103	118	158	178	180	172	154	132
September ...	151	128	108	94	93	112	135	147	172	173	179	169
October.....	147	134	124	123	125	133	159	166	186	198	186	159
November ...	183	187	182	177	176	171	182	200	223	233	218	194
December.....	241	218	222	223	216	215	236	264	281	297	310	296

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	−34	−45	**−50**	**−50**	−45	−30	− 6	+17	+43	**+47**	+30	+35	− 9
February	−20	−35	−55	**−72**	−68	−52	−10	+14	+40	+42	+22	+ 6	−13
March	− 7	−17	−28	**−34**	−26	− 5	+18	+27	+17	0	− 8	−14	−25
April	−14	−27	−31	**−40**	−39	−25	+ 3	+25	+25	+16	−12	−27	−35
May	− 2	− 7	−18	−13	− 3	+12	+26	+28	+21	0	−25	−19	−24
June	+ 2	− 4	− 8	−14	−11	− 3	+25	**+39**	+31	+17	− 2	−14	−17
July	−29	**−44**	−33	−31	−20	− 6	+20	**+47**	+46	+29	+ 1	−11	−13
August	− 2	−16	−18	−16	− 5	+28	+44	**+46**	+38	+23	+ 4	−11	−25
September ...	−24	−43	−55	**−57**	−41	−21	−11	+11	+11	+16	+ 7	−14	−17
October.....	−26	−33	**−34**	−33	−25	− 2	+ 4	+23	+33	+23	0	−22	−21
November ...	−15	−20	−24	−26	**−30**	−22	− 8	+10	+18	+ 5	−14	−14	−11
December.....	−47	−43	−42	**−49**	**−49**	−31	− 5	+10	+24	**+36**	+23	+26	+20
Winter	−29	−36	−43	**−49**	−48	−34	− 7	+13	+31	+32	+15	+13	− 3
Equinox	−18	−30	−37	**−41**	−33	−13	+ 3	+21	+21	+14	− 3	−19	−24
Summer	− 8	−18	−19	−18	−10	+ 8	+29	**+40**	+34	+17	− 5	−14	−20
Year	−18	−28	−33	**−36**	−30	−13	+ 8	+25	+29	+21	+ 2	− 7	−16

*Principal maxima and

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

06.

Noon.	1 h.	2 h.	3 h.	4 h.	5 h.	6 h.	7 h.	8 h.	9 h.	10 h.	11 h.	Midt.
278	222	202	213	232	253	274	276	255	228	218	204	187
270	246	229	231	241	282	323	347	348	344	327	303	264
226	212	209	213	222	247	268	276	285	293	300	281	258
163	152	162	164	167	180	207	243	276	286	268	233	205
86	80	75	79	83	89	118	140	138	142	136	115	105
122	117	111	104	100	106	121	135	150	156	151	142	137
131	128	117	108	104	113	128	152	174	195	189	169	139
114	98	85	81	81	92	113	122	146	172	167	154	137
147	144	144	144	157	180	195	234	248	228	204	183	167
134	135	142	152	158	181	202	199	191	171	157	153	139
195	200	206	226	240	250	255	259	273	259	220	202	195
299	292	294	300	297	294	301	290	290	287	281	264	241

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

06.

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.
−23	−13	+ 4	+23	+41	+45	+30	+ 9	+ 3	− 7	−20	97	190
−26	−26	−19	+21	+41	**+59**	**+59**	+55	+41	+22	− 9	131	199
−28	−25	−19	0	+15	+21	+28	+33	**+36**	+24	+ 7	70	184
−27	−26	−23	−13	+ 9	+37	+64	**+72**	+57	+29	+ 7	112	157
−29	−25	−22	−17	+10	+29	+27	**+30**	+25	+ 7	− 2	59	94
−22	−28	**−31**	−25	−10	+ 4	+18	+25	+20	+13	+ 9	70	126
−22	−30	−34	−26	−12	+10	+29	**+47**	+43	+25	− 1	91	126
−36	−40	**−41**	−32	−16	− 8	+11	+32	+28	+16	+ 1	87	106
−18	−18	− 7	+13	+25	+59	**+71**	+52	+31	+12	− 3	128	143
−14	− 5	0	+21	**+40**	+37	+31	+13	+ 1	− 2	−14	74	140
− 6	+ 9	+20	+27	+31	+33	**+45**	+33	+ 2	−13	−19	75	168
+22	+27	+24	+22	+28	+18	+18	+15	+10	− 5	−26	85	243
− 8	− 1	+ 7	+23	+35	**+39**	+38	+28	+14	− 1	−19	...	200
−22	−18	−12	+ 5	+22	+38	**+48**	+42	+31	+16	− 1	...	156
−27	−31	**−32**	−25	− 7	+ 9	+21	+34	+29	+15	+ 2	...	113
−19	−17	−12	+ 1	+17	+29	**+36**	+35	+25	+10	− 6	...	156

minima are in heavy type.

APPENDIX III.—Table 1.

Register of principal Seismograph Disturbances at Kew Observatory. 1906.

No. in Kew register.	Date.	Commencement.	Time of Max.	Max. Amplitude.	Duration.	Remarks.
		hr. min.	hr. min.	mm.	hr. min.	
661	Jan. 21	14 3·7	14 39·8	1·6	1 5	
663	,, 27	10 21·4	10 45·4	1·0	56	
665	,, 31	15 48·9	16 25·0 16 26·5 16 29·0	>17·0	3 58	Colombian earthquake.
669	Feb. 19	2 21·5	3 48·3	2·0	2 16	
674	Mar. 2	6 36·6	6 48·7	1·1	20	
675	,, 3	9 2·8	9 30·1	1·6	1 1	
677	,, 10	7 59·2	8 14·3	1·0	42	
680	,, 16	23 7·0	23 35·7	2·5	1 0	
681	,, 19	8 3·0	8 5·2	1·5	25	
685	April 10	21 45·8	22 10·8	8.9	2 3	
686	,, 13	20 7·2	20 11·1	1·1	50	
689	,, 18	13 25·7	h.m. h.m. 13 57to14 2 hr. min.	>17·0	3 46	Californian earthquake.
696	June 1	5 3·2	5 46·8	2·0	2 19	
698	,, 19	12 3·5	12 25·4	1·5	59	
701	,, 24	11 42·3	12 14·2	1·3	1 0	
705	July 14	0 0·4	0 17·7	2·5	49	
710	Aug. 17	0 33·3	1 5·2 1 50·4	13·1 16·0	4 36	Chilian earthquake.
722	Sept. 7	19 22·5	19 47·9	3·3	1 47	
725	,, 14	16 27·7	17 16·7	3·0	2 45	
731	,, 28	15 27·0	15 48·0	1·5	1 20	
732	Oct. 2	2 13·7	2 59·8	1·2	2 41	
737	,, 17	10 4·0	10 46·5	1·0	1 21	
742	Nov. 19	7 38·5	8 32·3	1·3	2 25	
748	Dec. 19	1 54·3	2 48·6	2·2	2 16	
749	,, 22	18 20·3	18 55·0	11·4	2 31	
751	,, 23	17 36·6	18 6·8	3·2	1 40	

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″·55 from January to June.

,, ,, ,, = 0″·54 from June to August.

,, ,, ,, = 0″·56 from August to December.

APPENDIX IV.—Table I.

Results of Watch Trials. Performance of the 50 Watches which obtained the highest number of marks during the year.

Watch deposited by	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—100.
Chas. Frodsham & Co., London	09182	D.r., fusee, s.o., Tourbillon lever	−0·1	−0·6	−0·4	−0·3	−0·2	22	17	1·8	35·6	39·4	18·9	93·9
Patek Philippe & Co., Geneva	11487	D.r., g.b., s.o., Bar lever	+0·8	+2·0	−0·2	+0·3	+1·2	26	3	2·7	34·8	37·5	19·8	92·1
John Hewitt, Coventry	131221	D.r., g.b., s.o., Tourbillon lever	+0·7	+0·4	+0·1	+0·4	+1·5	17	49	3·0	36·6	38·4	16·8	91·8
Vacheron & Constantin, Geneva	59728	D.r., g.b., s.o., Bar lever	+0·3	−2·2	−0·2	+0·2	+0·1	22	13	3·3	35·6	37·1	19·1	91·8
" " "	318943	D.r., g.b., s.o., Bar lever	−1·4	−1·1	−1·5	−0·4	−0·3	25	22	3·0	34·9	38·1	18·6	91·6
Patek Philippe & Co., Geneva	332638	D.r., g.b., s.o., Bar lever	−0·3	−1·3	+0·4	−1·0	+0·9	27	11	3·0	34·7	37·1	19·3	91·1
" " "	128389	D.r., g.b., s.o., Bar lever	+1·6	+1·0	+0·5	+1·3	+2·7	27	22	2·8	34·7	37·7	18·5	90·9
Chas. Frodsham & Co., London	129674	D.r., fusee, s.o., Tourbillon lever	+2·6	+1·8	+2·6	+1·0	+1·9	25	30	4·8	34·9	37·9	18·0	90·8
Vacheron & Constantin, Geneva	09133	D.r., g.b., s.o., Bar lever	−2·2	−2·6	−1·8	−1·5	−1·7	36	8	2·5	32·8	38·6	19·4	90·8
H. Golay, London	330158	S.r., g.b., s.o., Karrusel	+2·4	+2·0	+1·7	+0·6	+2·7	31	15	5·0	33·8	37·6	19·0	90·4
Patek Philippe & Co., Geneva	51238	D.r., g.b., s.o., Bar lever	+0·4	+0·7	+0·6	+1·6	+2·3	31	13	3·0	33·8	37·3	19·1	90·2
Newsome & Co., Coventry	116502	S.r., g.b., s.o., Karrusel	+0·8	+1·1	+0·9	+0·7	+0·8	31	59	4·2	33·8	39·6	16·1	89·5
Patek Philippe & Co., Geneva	151020	D.r., g.b,, s.o., Bar lever	−0·7	−0·3	−0·1	−1·8	+0·1	31	18	3·2	32·7	37·8	18·8	89·3
B. Bonniksen, Coventry	116503	S.r., g.b., s.o., Karrusel	+3·8	+4·2	+4·3	+5·0	+2·7	36	44	3·2	34·3	37·6	17·1	89·0
Stauffer, Son & Co., London	57678	D.r., g.b., s.o., min. and split seconds, chronograph	+1·8	+2·9	+2·3	+1·1	+1·9	28	58	3·5	34·5	38·1	16·1	88·7
S. Smith & Son, London	203026	D.r., fusee, s.o., Tourbillon lever	+1·6	+0·9	+2·9	+0·5	+1·0	35	27	4·2	32·9	37·2	18·2	88·3
Carley & Clemence, London	302—6	D.r., g.b., d.o., Annular tourbillon	+3·0	+3·1	+2·5	+0·5	+2·4	34	33	5·2	33·2	37·1	17·8	88·1
Patek, Philippe & Co., Geneva	51606	D.r., g.b., s.o., bar lever	+2·2	+2·5	+2·2	+1·1	+3·5	41	22	3·8	31·8	37·7	18·6	88·1
W. Vasel, London	131217	S.r., g.b., s.o., Tourbillon lever	+2·1	+2·7	+2·7	+1·4	+4·8	25	56	7·2	35·1	36·7	16·2	88·0
Stauffer, Son & Co., London	6246	D.r., g.b., s.o., minute & split seconds chronograph	−0·1	+0·1	−1·3	−2·9	−1·8	34	30	5·2	33·3	36·1	18·0	87·4
Thos. Peake, London	203157	S.r., g.b., s.o., Karrusel	−0·6	−2·1	−1·8	+1·7	+0·3	39	14	5·3	32·3	35·3	19·1	86·7
Robert Milne, Manchester	56910	S.r., g.b., s.o., Karrusel	−1·4	−0·6	−1·6	−0·4	−2·8	41	40	4·8	31·9	37·2	17·3	86·4
W. E. Hurcomb, London	1412	S.r., g.b., s.o., Karrusel	−1·4	−0·4	−1·1	+0·3	−0·1	34	74	4·0	33·2	37·7	15·1	86·0
Usher & Cole, London	7693	S.r., g.b., s.o., Karrusel	+2·3	+3·0	+3·7	+3·1	+5·8	38	40	6·0	32·4	36·3	17·3	86·0
S. Yeomans, Coventry	57679	S.r., g.b., s.o., Karrusel	−2·3	−1·8	−1·8	−0·1	+2·2	35	24	6·0	33·1	34·2	18·4	85·7
Robert Milne, Manchester	76645	S.r., g.b., s.o., Karrusel	+0·2	+0·5	+0·6	+2·5	+1·5	36	61	4·3	32·9	36·9	15·9	85·7
" " "	76687	S.r., g.b., s.o., Karrusel	−1·3	−0·4	−0·3	+1·2	−0·2	36	74	6·0	32·8	37·7	15·0	85·5
Joseph White & Son, Coventry	1402	S.r., g.b., s.o., Karrusel	−1·0	−0·6	−0·5	−1·0	−2·4	54	26	3·5	29·2	38·0	18·3	85·5
	37867	S.r., g.b., s.o., Tourbillon												

TABLE I.—*continued.*

Watch deposited by	Number of watch.	Escapement, balance spring, &c.	Mean daily rate. Pendant up.	Pendant right.	Pendant left.	Dial up.	Dial down.	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: Daily variation of rate. 0—40	Change of rate with change of position. 0—40	Temperature compensation. 0—20	Total Marks. 0—100.
			secs.	secs.	secs.	secs.	secs.			secs.				
W. Matthews, Coventry	40693	S.r., g.b., s.o.	+0·6	−1·0	−1·4	−0·4	+2·2	48	9	5·2	30·5	35·5	19·4	85·4
H. Hughes & Son, London	1314	S.r., g.b., s.o.	+1·9	+2·2	+2·3	+0·2	−1·8	30	47	5·0	34·1	34·4	16·8	85·3
B. Bonniksen, Coventry	57693	S.r., g.b., s.o., Karrusel	+2·1	+1·7	+1·9	+4·4	+1·7	39	59	4·0	32·2	36·7	16·1	85·0
Vacheron & Constantin, Geneva	332637	D.r., g.b., s.o., Bar lever	+0·1	−1·2	+0·1	+0·5	+1·8	33	83	5·2	33·4	37·1	14·4	84·9
Stauffer, Son & Co.	203154	D.r., g.b., s.o., minute and split seconds chronograph	−1·5	−2·1	−0·9	−3·2	−0·6	41	58	6·0	31·8	36·8	16·1	84·7
S. Yeomans, Coventry	82311	S.r., g.b., s.o.	+3·1	+0·5	+4·3	+1·7	+2·3	42	37	6·0	31·5	35·7	17·5	84·7
Nicole, Nielsen & Co., London	12127	D.r., g.b., s.o., Tourbillon lever	+2·9	+3·3	+2·8	+3·4	+4·2	47	72	7·0	30·6	38·5	15·2	84·3
W. Matthews, Coventry	41151	S.r., g.b., s.o.	−0·1	+1·5	+1·4	−0·5	+1·3	50	40	8·7	30·1	36·8	17·3	84·2
Wright & Craighead, London	8404	S.r., g.b., s.o., Karrusel	−2·8	−0·9	−0·8	+0·5	+0·0	48	52	8·2	31·0	36·6	16·5	84·1
S. Smith & Son, London	192—255	S.r., g.b., s.o., Karrusel	−3·9	−4·3	−4·4	−1·8	−4·9	37	81	4·5	32·6	36·8	14·6	84·0
Vacheron & Constantin, Geneva	332167	D.r., g.b., s.o., minute and split seconds chronograph	−0·3	−0·0	−2·7	+0·3	+1·1	45	50	4·5	31·1	36·1	16·7	83·9
Wales & Mc Culloch, London	3644	S.r., g.b., d.o.	−1·9	−0·5	−2·1	+0·4	−0·7	35	88	5·3	33·0	36·7	14·1	83·8
B. Bonniksen, Coventry	57569	S.r., g.b., s.o., Karrusel	−4·0	−3·7	−3·5	−4·5	−3·0	47	78	5·2	30·7	38·3	14·8	83·8
Barraud & Lunds, London	3	S.r., fusee, d.o., Karrusel	+2·3	+1·4	+1·6	+0·6	+0·3	44	77	7·2	31·3	37·4	14·9	83·6
	4625													
Stauffer, Son & Co., London	203025	D.r., g.b., s.o., minute and split seconds chronograph	+2·3	−0·4	+3·8	+2·1	+2·4	50	37	5·7	29·9	36·1	17·5	83·5
Newsome & Co., Coventry	151019	S.r., g.b., s.o., Karrusel	+1·8	+1·7	+2·5	−0·6	+2·7	59	18	5·7	28·3	36·4	18·8	83·5
B. Bonniksen, Coventry	57630	S.r., g.b., s.o., Karrusel	−0·4	0·0	+1·0	+2·9	+4·5	36	39	7·2	32·8	33·2	17·4	83·4
,, ,,	57273	S.r., g.b., s.o., minute and seconds chronograph and Karrusel	+0·5	+1·7	+3·0	+1·8	−0·3	41	67	4·7	31·8	36·0	15·6	83·4
S. Smith & Son, London	189—258	S.r., g.b., s.o., Karrusel	−2·1	−0·6	−1·8	−1·0	−2·2	46	74	5·3	30·7	37·7	15·0	83·4
Chas. Frodsham & Co., London	09097	S.r., g.b., s.o., Karrusel	+1·3	+3·3	+3·8	−1·7	−0·4	35	34	8·2	33·0	32·6	17·7	83·3
Stauffer, Son & Co., London	203024	D.r., g.b., s.o., minute and split seconds chronograph	+0·5	+0·7	+2·6	+1·9	−1·2	26	114	6·0	34·8	35·7	12·4	82·9
Chas. Frodsham & Co., London	09099	S.r., g.b., s.o., Tourbillon lever	+4·5	+4·0	+4·6	+3·2	+2·2	54	47	6·0	29·2	36·8	16·9	82·9

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

APPENDIX IV.—TABLE II.

Highest Marks obtained by Complicated Watches during the year.

Description of watch.	Number.	Deposited by	Marks awarded for			Total Marks.
			Variation.	Position.	Temperature.	
			0—40	0—40	0—20	0—100
Minute and seconds chronograph and minute repeater	22642	W. Vasel, London	28·6	33·8	16·5	78·9
Do. do. do. and split seconds	152–11	S. Smith & Son, London	22·7	31·6	16·9	71·2
Minute and split seconds chronograph	203026	Stauffer, Son & Co., London	34·5	38·1	16·1	88·7
	203157	,, ,, ,,	33·3	36·1	18·0	87·4
	203154	,, ,, ,,	31·8	36·8	16·1	84·7
	332167	Vacheron & Constantin, Geneva	31·1	36·1	16·7	83·9
Minute and seconds chronograph	57273	B. Bonniksen, Coventry	31·8	36·0	15·6	83·4
	36935	W. Matthews, Coventry	31·5	34·4	10·4	76·3
	300082	Baume & Co., London	27·7	29·2	16·6	73·5
Minute repeater	48902	Jas. Gent & Co., London	31·0	35·2	16·1	82·3
	11287	Nicole, Nielsen & Co., London	27·1	31·9	11·7	70·7
"Non-magnetic"	129118	Newsome & Co., Coventry	29·1	37·0	12·5	78·6
	176299	Rotherham & Sons, Coventry	29·9	34·3	13·6	77·8

APPENDIX V.

MAGNETIC OBSERVATIONS, 1906, FALMOUTH OBSERVATORY.

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

MAGNETICAL DEPARTMENT.

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 30th December, 1905. The following values of the ordinates of the photographic curves were then found :—

Declination, 1 cm. = 0° 11′·7.
Bifilar, 1 cm. δ H. = 0·00053 C.G.S. unit.
Balance, 1 cm. δ V. = 0·00048 C.G.S. unit.

Deflections of the Vertical Force Magnet were again made on 30th June, 1906, when the value of the ordinate was found to be

Balance, 1 cm. δ V. = 0·00050 C.G.S. unit.

The scale values of the instruments were again determined on the 29th December, 1906, and were found to be

Bifilar, 1 cm. δ H. = 0·00052 C.G.S. unit.
Balance, 1 cm. δ V. = 0·00054 C.G.S. unit.

The principal variations of the Magnetic Curves that were recorded took place on the following dates:—January 21; February 24, 26; April 28; May 15; June 2; July 11; September 22; December 22. Disturbances of a smaller but noteworthy character were recorded on February 19, 28; March 4; May 20; June 1; July 29, 30; August 7, 8; September 3, 4; November 21; December 16.

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

Determinations of	Horizontal Intensity,	47.
,,	Inclination,	47.
,,	Declination,	47.

The mean values of the Magnetic Elements for the year 1906 are as follows :—

Declination, 18° 5′·3 W.; Horizontal Force, 0·18790 C.G.S.; Vertical Force, 0·43344 C.G.S.; Inclination, 66° 33′·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 3½ 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, 1906.

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
	(18° + West.)				Winter.								
1906.	′	′	′	′	′	′	′	′	′	′	′	′	′
January	7·8	8·1	7·9	7·6	7·8	7·7	7·6	7·6	7·4	7·4	8·3	9·5	11·0
February	8·2	8·3	8·5	8·5	8·5	8·3	7·9	7·6	6·7	5·8	6·6	9·2	11·0
March	6·2	6·5	6·9	6·9	6·9	6·8	6·6	6·0	4·5	3·5	4·5	6·7	9·5
October.....	2·7	2·9	2·9	2·8	3·0	2·6	2·3	1·9	0·8	0·4	1·6	4·0	6·9
November.....	0·7	1·4	1·7	1·7	1·8	1·2	0·9	0·7	0·4	0·2	1·3	3·2	5·2
December.....	0·9	1·2	1·3	1·5	1·4	1·5	1·0	0·9	0·7	0·3	1·0	2·7	4·0
Means	4·4	4·7	4·9	4·8	4·9	4·7	4·4	4·1	3·4	2·9	3·9	5·9	7·9
					Summer.								
1906.	′	′	′	′	′	′	′	′	′	′	′	′	′
April	6·7	6·5	6·4	6·1	6·2	5·9	5·5	4·4	3·0	2·4	3·6	6·1	9·5
May	5·0	4·3	4·5	4·4	3·4	2·0	1·0	0·0	−0·1	1·2	3·8	6·8	8·9
June	4·1	4·7	4·5	4·5	3·4	2·1	0·3	−0·6	−1·4	−0·7	1·4	4·1	7·9
July	5·0	4·8	4·5	3·9	3·3	2·5	0·9	0·4	0·3	0·7	2·5	5·3	9·0
August	4·9	4·5	4·7	4·6	3·8	2·9	2·1	1·3	1·0	2·1	4·7	7·7	10·2
September ...	4·0	4·0	4·0	3·7	3·4	3·0	2·7	1·8	1·0	1·2	2·8	5·4	8·9
Means	4·9	4·8	4·8	4·5	3·9	3·1	2·1	1·2	0·6	1·2	3·1	5·9	9·1

Table II.—Diurnal Inequality of the Falmouth

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

Observatory, determined from the Magnetograph Curves
(Mean for the year = 18° 5′·3 W.)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Winter.						
′	′	′	′	′	′	′	′	′	′	′	′
12·1	12·1	11·1	9·5	9·1	8·8	8·5	8·4	7·7	7·7	7·6	7·5
12·6	12·4	11·4	10·1	9·4	8·8	8·7	8·3	7·9	7·5	7·1	7·1
11·8	13·0	12·6	11·9	10·0	8·9	8·2	7·7	7·3	6·9	6·8	6·5
8·0	7·6	6·2	4·7	3·8	3·6	3·1	2·9	2·6	2·3	2·0	2·2
5·8	5·4	4·1	3·0	2·4	2·0	1·4	1·3	0·7	0·9	1·2	1·2
4·5	4·2	3·3	2·7	2·3	1·8	1·4	1·2	0·9	0·9	1·1	1·2
9·1	9·1	8·1	7·0	6·2	5·7	5·2	5·0	4·5	4·4	4·3	4·3
					Summer.						
′	′	′	′	′	′	′	′	′	′	′	′
12·5	13·1	11·8	10·0	8·4	7·4	7·0	6·8	6·8	6·9	6·8	6·7
10·1	9·5	7·8	6·2	4·9	4·5	4·5	4·7	4·6	4·9	5·0	4·8
9·9	10·6	10·0	9·0	7·7	6·1	5·4	4·7	4·8	4·9	4·6	4·7
10·4	11·8	10·8	8·4	6·5	5·4	5·0	5·2	5·1	5·2	5·0	4·9
11·5	11·1	9·5	7·5	6·1	5·1	5·1	5·1	4·6	4·8	4·8	4·9
10·2	9·9	8·4	6·6	5·3	4·9	4·7	4·2	4·1	4·3	4·4	4·4
10·8	11·0	9·7	8·0	6·5	5·6	5·3	5·1	5·0	5·2	5·1	5·1

Declination as deduced from Table I.

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

Table III.—Hourly Means of the Horizontal Force at Falmouth
Five selected Quiet Days in each Month, 1906.

Hours	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
0·18000 + (C.G.S. units).						Winter.							
1906.													
January	779	780	778	779	781	782	782	781	778	772	765	759	760
February	783	782	782	782	783	784	786	785	782	774	764	758	758
March	798	796	796	796	798	798	799	799	794	787	779	774	773
October	794	794	795	794	796	797	795	794	790	780	772	770	776
November ...	796	795	794	794	794	793	798	798	795	787	778	774	777
December ...	782	784	785	785	785	786	786	786	784	779	773	772	775
Means	789	789	788	788	789	791	791	791	787	780	772	768	770
						Summer.							
1906.													
April	800	798	798	796	796	796	799	797	791	783	772	767	770
May	799	798	796	798	798	793	790	784	780	775	772	773	780
June	802	802	800	799	801	801	797	789	781	771	769	770	776
July	805	805	804	804	805	804	799	791	784	777	773	777	784
August	803	801	801	800	799	797	793	787	778	772	771	778	788
September ...	798	798	798	796	795	795	791	786	777	772	766	768	775
Means	801	800	800	799	799	798	795	789	782	775	771	772	779

Table IV.—Diurnal Inequality of the Falmouth

Hrs.	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon
						Summer Means.							
	+ ·00006	+ ·00005	+ ·00005	+ ·00004	+ ·00004	+ ·00003	·00000	− ·00006	− ·00013	− ·00020	− ·00024	− ·00023	− ·00016
						Winter Means.							
	+ ·00003	+ ·00003	+ ·00002	+ ·00002	+ ·00003	+ ·00005	+ ·00005	+ ·00005	+ ·00001	− ·00006	− ·00014	− ·00018	− ·00016
						Annual Means.							
	+ ·00005	+ ·00004	+ ·00004	+ ·00003	+ ·00004	+ ·00004	+ ·00003	− ·00001	− ·00006	− ·00013	− ·00019	− ·00021	− ·00016

Observatory determined from the Magnetograph Curves on
Mean for the year = 0·18790).

1.	2.	3.	4.	5	6.	7.	8.	9.	10.	11.	Midt.
					Winter.						
769	778	778	781	782	785	785	784	784	784	782	782
764	771	777	781	783	784	785	789	787	784	782	783
780	787	791	796	795	798	799	801	800	799	799	797
785	791	792	791	792	795	796	796	796	799	799	799
782	787	788	789	795	796	796	798	796	795	795	796
778	785	785	785	788	788	785	785	784	783	782	783
776	783	785	787	789	791	791	792	791	791	790	790
					Summer.						
783	792	796	798	799	800	803	805	803	803	801	802
789	793	799	803	807	809	809	808	805	804	804	804
783	787	794	801	803	808	812	810	808	810	811	808
790	795	807	813	818	814	815	815	813	811	810	808
796	802	802	802	804	805	806	809	809	806	806	806
781	790	796	799	797	799	803	802	802	801	801	801
787	793	799	803	805	806	808	808	807	806	806	805

Horizontal Force as deduced from Table III.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
					Summer Means.						
− ·00008	− ·00002	+ ·00004	+ ·00008	+ ·00010	+ ·00011	+ ·00013	+ ·00013	+ ·00012	+ ·00011	+ ·00011	+ ·00010
					Winter Means.						
− ·00010	− ·00003	− ·00001	+ ·00001	+ ·00003	+ ·00005	+ ·00005	+ ·00006	+ ·00005	+ ·00005	+ ·00004	+ ·00004
					Annual Means.						
− 00009	− ·00003	+ ·00002	+ ·00005	+ ·00007	+ ·00008	+ ·00009	+ ·00010	+ ·00008	+ ·00008	+ ·00008	+ ·00007

Table V.—Hourly Means of the 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.							
1906.													
January	341	340	340	340	340	340	341	342	342	343	342	342	342
February	360	358	358	359	358	358	358	357	357	357	353	349	350
March	384	383	383	382	382	381	380	382	382	380	378	371	366
October.....	331	331	331	331	331	331	331	330	331	329	322	315	314
November ...	341	340	340	341	340	340	338	337	337	337	334	330	331
December.....	325	325	326	326	326	326	325	324	323	323	320	319	320
Means	347	346	346	347	346	346	346	345	345	345	342	338	337
						Summer.							
1906.													
April	364	364	364	364	364	364	364	365	365	362	357	348	341
May	323	323	323	323	323	324	322	321	318	311	304	399	300
June	345	345	346	346	348	350	350	349	347	341	334	324	322
July	348	348	348	348	349	350	350	348	345	340	335	328	327
August	342	343	343	344	344	346	345	345	343	339	334	329	329
September ...	356	356	356	357	358	358	359	360	359	354	346	339	334
Means	346	347	347	347	348	349	348	348	346	341	335	328	326

Table VI.—Diurnal Inequality of the Falmouth

H'urs	Midt.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Noon.
						Summe Means.							
	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00004	+ ·00005	+ ·00005	+ ·00004	+ ·00003	− ·00002	− ·00009	− ·00016	− ·00018
						Winter Means.							
	+ ·00003	+ ·00002	+ ·00002	+ ·00002	+ ·00002	+ ·00001	+ ·00001	+ ·00001	+ ·00001	·00000	− ·00003	− ·00007	− ·00007
						Annual Means.							
	+ ·00003	+ ·00002	+ ·00002	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00003	+ ·00002	− ·00001	− ·00006	− ·00011	− ·00013

Observatory, determined from the Magnetograph Curves on during 1906. (Mean for the Year = 0·43344).

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Winter.											
341	344	347	348	347	347	347	346	346	344	343	343
352	355	358	362	361	359	358	358	357	357	358	357
366	367	373	377	380	381	382	382	382	381	381	381
319	324	329	332	332	331	330	328	326	326	325	324
335	340	343	343	342	340	337	335	334	335	335	337
321	325	327	328	327	325	322	320	319	318	319	319
339	343	346	348	348	347	346	345	344	344	344	344
Summer.											
341	349	359	362	366	368	368	368	367	367	367	367
304	310	319	323	325	325	324	323	322	321	322	322
326	329	338	343	350	353	353	351	348	347	347	346
331	336	342	346	352	354	354	351	349	348	347	348
333	339	345	349	351	350	348	346	345	345	345	345
337	345	351	355	356	356	356	355	354	353	352	352
329	335	342	346	350	351	351	349	348	347	347	347

Vertical Force as deduced from Table V.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Summer Means.											
−·00015	−·00009	−·00001	+·00003	+·00006	+·00007	+·00007	+·00005	+·00004	+·00003	+·00003	+·00003
Winter Means.											
−·00005	−·00002	+·00002	+·00004	+·00004	+·00003	+·00001	·00000	·00000	−·00001	−·00001	−·00001
Annual Means.											
−·00010	−·00005	+·00000	+·00003	+·00005	+·00005	+·00004	+·00003	+·00002	+·00001	+·00001	+·00001

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.							
1906.	′	′	′	′	′	′	′	′	′	′	′	′	′
January	34·4	34·3	34·5	34·4	34·3	34·2	34·2	34·3	34·5	34·9	35·4	35·8	35·7
February	34·7	34·7	34·7	34·7	34·6	34·6	34·4	34·5	34·7	35·2	35·8	36·1	36·1
March	34·4	34·5	34·5	34·5	34·3	34·3	34·2	34·3	34·6	35·0	35·5	35·6	35·5
October	33·1	33·1	33·1	33·1	33·0	32·9	33·1	33·1	33·4	34·0	34·3	34·3	33·8
November ...	33·3	33·3	33·4	33·4	33·4	33·3	33·1	33·0	33·2	33·8	34·3	34·4	34·3
December.....	33·8	33·6	33·6	33·6	33·6	33·5	33·5	33·4	33·6	33·9	34·2	34·3	34·1
Means.....	34·0	33·9	34·0	34·0	33·9	33·8	33·8	33·8	34·0	34·5	34·9	35·1	34·9
						Summer.							
1906.	′	′	′	′	′	′	′	′	′	′	′	′	′
April	33·7	33·8	33·8	34·0	34·0	34·0	33·9	33·9	34·3	34·8	35·3	35·4	35·0
May	32·6	32·6	32·8	32·6	32·6	33·0	33·1	33·5	33·7	33·8	33·8	33·6	33·2
June	33·0	33·0	33·2	33·2	33·2	33·2	33·5	34·0	34·5	35·0	34·9	34·5	34·1
July	32·9	32·9	33·0	33·0	32·9	33·0	33·3	33·8	34·2	34·5	34·6	34·2	33·7
August	32·8	33·0	33·0	33·1	33·2	33·4	33·6	34·0	34·5	34·8	34·8	34·1	33·5
September ...	33·6	33·6	33·6	33·7	33·8	33·8	34·1	34·5	35·1	35·3	35·4	35·1	34·5
Means.....	33·1	33·2	33·2	33·3	33·3	33·4	33·6	34·0	34·4	34·7	34·8	34·5	34·0

Table VIII.—Diurnal Inequality of the Falmouth

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

Observatory, calculated from Tables III. and V.
Year = 66° 33′·7).

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	Midt.
Winter.											
′	′	′	′	′	′	′	′	′	′	′	′
35·1	34·6	34·7	34·5	34·4	34·2	34·2	34·2	34·2	34·1	34·3	34·3
35·7	35·4	35·0	34·9	34·7	34·6	34·5	34·2	34·3	34·5	34·7	34·6
35·1	34·6	34·5	34·3	34·5	34·3	34·3	34·1	34·2	34·2	34·2	34·4
33·4	33·1	33·2	33·4	33·3	33·1	33·0	32·9	32·9	32·7	32·6	32·6
34·0	33·9	33·9	33·8	33·4	33·3	33·2	33·0	33·1	33·2	33·2	33·2
33·9	33·6	33·6	33·7	33·4	33·4	33·5	33·4	33·4	33·5	33·6	33·5
34·5	34·2	34·2	34·1	34·0	33·8	33·8	33·6	33·7	33·7	33·8	33·8
Summer.											
′	′	′	′	′	′	′	′	′	′	′	′
34·2	33·8	33·8	33·8	33·8	33·8	33·6	33·5	33·6	33·6	33·7	33·6
32·7	32·6	32·4	32·3	32·1	32·0	31·9	32·0	32·1	32·2	32·2	32·2
33·7	33·5	33·3	33·0	33·1	32·8	32·6	32·6	32·7	32·5	32·5	32·6
33·4	33·2	32·6	32·3	32·1	32·5	32·4	32·3	32·4	32·5	32·5	32·7
33·1	32·8	33·0	33·1	33·1	32·9	32·8	32·6	32·5	32·7	32·7	32·7
34·2	33·8	33·6	33·5	33·6	33·5	33·3	33·3	33·3	33·3	33·3	33·3
33·6	33·3	33·1	33·0	33·0	32·9	32·8	32·7	32·8	32·8	32·8	32·9

Inclination as deduced from Table VII.

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

APPENDIX VI.

MAGNETIC OBSERVATIONS MADE AT THE VALENCIA OBSERVATORY, CAHIRCIVEEN, 1906.

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

The absolute observations have been made without interruption during the year, in the same manner as reported last year.

Nothing calling for remark concerning them has occurred, and tables of monthly means of two determinations of Declination, Horizontal Force and Dip are appended, together with the calculated values of Vertical Force and Total Force.

The secular change is in Declination $-4'{\cdot}1$; Inclination $-2'{\cdot}3$; Horizontal Force $+{\cdot}00019$; Vertical Force $-{\cdot}00037$; Total Force $-{\cdot}00027$ C.G.S.

J. E. CULLUM,
Observer and Superintendent.

Table I.—Declination at Valencia Observatory, 1906.
(Dover Unifilar 139.)

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

Table II.—Inclination at Valencia Observatory, 1906.
(Dover Circle 118.)

Date.	Mean of two needles.	Monthly Mean.	Remarks.
	° ′	° ′	
January 9 ...	68 15·2	—	
,, 22 ...	68 18·6	68 16·9	
February 7 ...	68 18·9	—	
,, 20 ...	68 20·5	68 19·7	
March 7 ...	68 18·6	—	
,, 21 ...	68 17·3	68 17·9	
April 9 ...	68 18·5	—	
,, 20 ...	68 17·5	68 18·0	
May 8 ...	68 17·1	—	
,, 22 ...	68 16·7	68 16·9	
June 7 ...	68 16·9	—	
,, 22 ...	68 15·5	68 16·2	
July 7 ...	68 16·0	—	
,, 23 ...	68 15·6	68 15·8	
August 7 ...	68 15·4	—	
,, 21 ...	68 16·6	68 16·0	
September 7 ...	68 17·7	—	
,, 20 ...	68 15·9	68 16·8	
October 8 ...	68 16·7	—	
,, 22 ...	68 16·9	68 16·8	
November 7 ...	68 15·7	—	
,, 21 ...	68 16·0	68 15·8	
December 7 ...	68 15·5	—	
,, 21 ...	68 16·4	68 16·0	
Mean ...	at 1 p.m., G.M.T.	68 16·9	

Table III.—Magnetic Force (C.G.S.) at Valencia Observatory, 1906.
(Dover Unifilar 139, and Circle 118.)

Date.	H.F.	Mean.	V.F. H.F. × Tan Dip.	T.F. H.F. × Sec. Dip.
January 9	0·17885	—	—	—
,, 22	0·17880	0·17883	0·44896	0·48319
February 7	0·17867	—	—	—
,, 20	0·17811	0·17839	0·44892	0·48307
March 7	0·17869	—	—	—
,, 21	0·17857	0·17863	0·44883	0·48307
April 9	0·17858	—	—	—
,, 20	0·17871	0·17864	0·44890	0·48315
May 8	0·17879	—	—	—
,, 22	0·17842	0·17861	0·44841	0·48268
June 7	0·17874	—	—	—
,, 22	0·17871	0·17872	0·44841	0·48271
July 7	0·17852	—	—	—
,, 23	0·17870	0·17861	0·44800	0·48229
August 7	0·17861	—	—	—
,, 21	0·17876	0·17869	0·44827	0·48257
September 7	0·17856	—	—	—
,, 20	0·17869	0·17862	0·44840	0·48267
October 8	0·17866	—	—	—
,, 22	0·17866	0·17866	0·44851	0·48278
November 7	0·17889	—	—	—
,, 21	0·17874	0·17882	0·44853	0·48286
December 7	0·17892	—	—	—
,, 21	0·17874	0·17883	0·44862	0·48295
Mean	at Noon, G.M.T.	0·17867	0·44856	0·48283