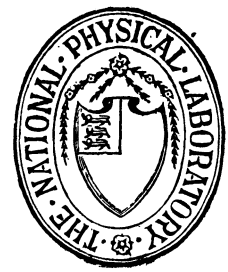


THE

# NATIONAL PHYSICAL LABORATORY.

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# REPORT OF THE OBSERVATORY DEPARTMENT

FOR THE YEAR 1905.

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**WITH APPENDICES.**

TEDDINGTON:
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1906.

# NATIONAL PHYSICAL LABORATORY.

*Director*—R. T. GLAZEBROOK, D.Sc., F.R.S.

## OBSERVATORY DEPARTMENT.

*Superintendent*—Charles Chree, LL.D., F.R.S.
*Chief Assistant*—T. W. Baker.
*Senior Assistants*—E. G. Constable, J. Foster, T. Gunter, W. J. Boxall.
*Junior Assistants*—E. Boxall, G. Badderly, A. C. Cooper, B. Francis, A. G. Williams, H. A. Maudling.
*Boy Clerks*—W. J. Stockwell, A. E. Gendle, A. F. Clayden, B. Johnson, W. R. Corrin, Jun., A. H. Bell.
*Caretaker, &c.*—W. R. Corrin, Sen., with wife as housekeeper.

# REPORT ON THE OBSERVATORY DEPARTMENT FOR THE YEAR ENDING DECEMBER 31, 1905, 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 1905 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 February.

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, February, 1905, for 1 cm. $\delta H = 0{\cdot}00050$ C.G.S. unit.

The curves have been again free from any very large disturbances. The principal movements registered were those on January 5 ; February 3–5 ; March 2 ; April 1 ; June 9 ; July 6 ; August 2–3 ; November 12 and 15.

Perhaps the most interesting were those of November 12 and 15. On the latter date an auroral display was generally observed. A short account of these two disturbances appeared in " Nature," November 30, p. 101.

The hourly means and diurnal inequalities of the Declination and Horizontal Force for 1905 for the quiet days selected by the Anstronomer 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 the 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 are the mean results for 1905 :—

| | | |
|---|---|---|
| From Curves ..... | Mean Westerly Declination..... | 16° 32′·9 W. |
| | Mean Horizontal Force ..... . | 0·18510 C.G.S. unit. |
| From absolute observations, corrected | Mean Inclination ..... | 67° 3′·8 N. |
| | Mean Vertical Force..... | 0·43742 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 to the present Report.

Mr. Kitto visited the Observatory from February 16 to March 4 and assistance was given him in the reduction of the Falmouth Vertical Force Curves.

In September Mr. T. W. Baker inspected the magnetic instruments in use at the Falmouth and Valencia Observatories and took some absolute observations.

At the request of the Hydrographer a course of magnetic instruction has been given to Commander Hardy, R.N., Commander F. C. Learmonth, R.N., and Lieut. F. H. Walter, R.N.

Magnetic instruction has also been given to Mr. W. R. Bruce, and to Messrs. Rankin, Bee and MacDougal—late of the Ben Nevis Observatory—who have entered the meteorological and magnetic service of the Argentine Republic.

In January a vertical force magnetograph of the Watson pattern was tested for India. Two others of the same pattern have also been under trial, but the test has not yet been concluded. In June some experiments were made with a vertical force instrument for Lord Kelvin.

At the request of Dr. Bauer special magnetic observations were made on August 30, during the eclipse of the sun. Quick run magnetograms were taken, and the measurements of the curves during the time of the eclipse and at corresponding hours for some days before and after were sent to the Carnegie Institute.

The measurement of the Antarctic magnetic curves has been in progress, that of the declination being nearly completed. It has also been arranged to undertake the reduction of the magnetic observations obtained by Mr. R. C. Mossman in the South Orkneys for the Scottish Antarctic Expedition.

The Superintendent has been appointed a member of the Executive Bureau of the International Committee in Terrestrial Magnetism and Atmospheric Electricity.

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

*Bright Sunshine.*—For the last four years Table III, Appendix II, has contained figures for the monthly and annual percentages got out according to both the "old" and the "new" methods described in the Report for 1901. Sufficient data for comparison of the methods having now been published, future Reports will give results from the new method only.

*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, re-charged, &c., in July, but there has been no serious stoppage.

The portable Electrometer, "White No. 53," which is regularly used for taking eye observations at the fixed station on the Observatory lawn, was compared with a battery of standard Clark cells in May and December, and its scale value was found to have remained constant.

Determinations of the scale value of the Electrograph were made on January 9, April 19, July 14 and 26, November 24 and 29, and December 29.

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, Fleetwood, Armagh, Dublin, Valencia, Falmouth and Scilly Isles, by Mr. Baker; and Radcliffe Observatory (Oxford), Aberdeen, Deerness (Orkney), Glasgow, North Shields, and Yarmouth, 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 April 4, July 9, and July 23, when the maximum amplitude exceeded 14 mm.

A detailed list of the movements recorded from January 1 to December 31, 1905, has been made and sent to Professor Milne, and will be found in the 'Report' of the British Association for 1905, "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.

*Effects of Pressure on Watch Rates.*—The experiments on the effect of changes of barometric pressure on the rates of watches, referred to in last year's Report, were continued. The results obtained have been discussed in a paper which it is hoped will soon appear in the Horological Journal.

*Temperature Observations.*—At the request of Lord Kelvin, observations were made under a variety of conditions with thermometers covered with black and white cloths respectively. The earlier results have been described by Lord Kelvin in a paper communicated to the British Association Meeting in South Africa (Philosophical Magazine, September 1905, p. 285).

## 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 1905, compared with a corresponding return for 1904:—

| | Number tested in the year ending December 31. | |
|---|---|---|
| | 1904. | 1905. |
| Air-meters | 9 | 7 |
| Anemometers | 6 | 7 |
| Aneroids | 170 | 143 |
| Artificial horizons | 27 | 45 |
| Barometers, Marine | 116 | 114 |
| ,, Standard | 108 | 94 |
| ,, Station | 43 | 36 |
| Binoculars | 1,027 | 554 |
| Compasses | 29 | 16 |
| Hydrometers | 706 | 530 |
| Inclinometers | 9 | 9 |
| Levels | 5 | 15 |
| Magnetographs | 1 | 1 |
| Magnets | 5 | 18 |
| Milk-test apparatus | 202 | 137 |
| Rain Gauges | 12 | 35 |
| Rain-measuring Glasses | 32 | 54 |
| Sextants | 957 | 1,044 |

| | | |
|---|---|---|
| Sunshine Recorders | — | 3 |
| Telescopes | 2,943 | 3,627 |
| Theodolites | 13 | 65 |
| Thermometers, Clinical | 15,903 | 16,089 |
| ,, Deep sea | 41 | 56 |
| ,, High Range | 42 | 50 |
| ,, Hypsometric | 15 | 39 |
| ,, Low Range | 53 | 30 |
| ,, Meteorological | 3,157 | 3,626 |
| ,, Solar radiation | 71 | 44 |
| ,, Standard | 75 | 109 |
| ,, Other Forms | 2 | 12 |
| Unifilars | 4 | 6 |
| Miscellaneous | 14 | 43 |
| Total | 25,797 | 26,658 |

Duplicate copies of corrections have been supplied in 68 cases.

The number of instruments rejected in 1904 and 1905 on account of excessive error, or for other reasons, was as follows :—

| | 1904. | 1905. |
|---|---|---|
| Thermometers, clinical | 83 | 72 |
| ,, ordinary meteorological | 98 | 50 |
| Sextants | 127 | 128 |
| Telescopes | 145 | 93 |
| Binoculars | 10 | 21 |
| Various | 128 | 99 |

There were at the end of the year at the Observatory, undergoing verification, 18 Barometers, 1 Aneroid, 353 Thermometers, 57 Hydrometers, 26 Sextants, 397 Telescopes, 16 Binoculars, 1 Unifilar Magnetometer, 1 Inclinometer, 4 various.

## VI. Rating of Watches and Chronometers.

The number of watches sent for trial this year was 456, as compared with 429 in 1904.

The "especially good" class A certificate was obtained by 163 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. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage "especially good" | 16·6 | 30·5 | 28·0 | 22·1 | 26·6 | 35·4 | 35·5 | 31·6 | 42·4 | 50·2 | 44·7. |

The 456 watches received were entered for trial as below :—

For Class A, 427; class B, 5; and for the subsidiary trial, 24. Of these, 365 were awarded class A certificates, 5 obtained class B certificates, 21 passed the subsidiary test, and 65 failed from various causes to gain any 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 Karrusel watches, Nos. 6,473 and 6,472, sent by Victor Kullberg, London. These watches obtained 92·7 and 92·4 marks, respectively.

10 watches obtained 90 marks and upwards, and even the lowest on the list is credited with 85 marks.

*Marine Chronometers.*—During the year, 41 chronometers were entered for the Kew A trials and 1 for the B trials; of these, 29 gained A certificates, 1 gained a B certificate and 12 failed.

The examination of chronometers under the class B conditions has been abolished.

One photometer clock, to be used in the testing of the illuminating power of coal-gas, has been examined.

## VII. Miscellaneous.

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

For the Observatory, Palermo, 1 Unifilar Magnetometer.

For the India Office, 2 Dip Needles.

For the Survey Department, Cairo, 10 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 and Sunshine Sheets* have been sent to Hong Kong.

*Falmouth Magnetic Observations.*—A paper by the Superintendent dealing with the Falmouth "quiet" day results for the 12 years, 1891 to 1902, has been published in the Philosophical Transactions (A, vol. 204, p. 373, 1905).

*Pendulum Observations.*—Further observations with the pendulums employed in the British Antarctic Expedition have been made by Mr. Constable, both at Bushy House and Kew, and a re-determination has been made of the pressure co-efficient.

*Telescopes.*—Arrangements having been made with the War Office to test the optical qualities of telescopes supplied to the Army, a variety of new test objects have been erected in the Observatory grounds. One of the upper west rooms, added to the main building in 1892, is being fitted up to carry out the optical tests, and several new pieces of apparatus have been obtained for the purpose.

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

16 Scientific Societies and Institutions of Great Britain and Ireland,

115 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, F.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, 1905, KEW OBSERVATORY.

Latitude 51° 28′ 6″ N., and Longitude 0 $1^m$ $15^s.1$ 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 1905 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, 9, **13**, 23, **30**. |
| February | 11, 18, 19, 26, 28. |
| March | 11, 13, 18, 22, 28. |
| April | 9, 11, 17, 18, **24**. |
| May | 6, 11, 16, 20, 21. |
| June | 13, 16, 18, 19, 25. |
| July | 2, 4, 16, 21, 31. |
| August | 9, 10, 15, 17, 18. |
| September | 6, 13, 14, 15, 24. |
| October | 2, 3, 15, 29, 31. |
| November | 2, 3, 11, 25, 29. |
| December | 8, 10, 11, 22, 23. |

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

| Hours | Preceding noon. | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (16° + West.) | | | | | Winter. | | | | | | | |
| 1905. Months. | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| Jan. ... | 37·9 | 36·4 | 36·2 | 36·6 | 36·5 | 36·6 | 36·7 | 36·3 | 36·0 | 35·8 | 35·5 | 36·2 | 36·7 |
| Feb. ... | 36·7 | 32·4 | 32·1 | 32·2 | 32·6 | 32·7 | 32·8 | 32·7 | 32·5 | 31·7 | 31·4 | 32·2 | 33·9 |
| Mar. ... | 38·1 | 32·1 | 32·1 | 32·0 | 32·1 | 32·4 | 32·3 | 31·7 | 30·9 | 29·4 | 29·0 | 30·9 | 34·8 |
| Oct. ... | 36·7 | 31·1 | 30·9 | 30·9 | 30·9 | 30·9 | 31·0 | 30·8 | 30·3 | 29·5 | 29·3 | 30·9 | 34·0 |
| Nov. ... | 33·8 | 30·5 | 30·4 | 30·6 | 30·8 | 31·2 | 31·3 | 30·8 | 30·3 | 29·5 | 29·0 | 30·0 | 32·4 |
| Dec. ... | 32·4 | 30·3 | 30·1 | 30·4 | 30·3 | 30·3 | 30·4 | 30·3 | 30·2 | 29·9 | 29·8 | 30·7 | 31·8 |
| Means | 35·9 | 32·1 | 32·0 | 32·1 | 32·2 | 32·4 | 32·4 | 32·1 | 31·7 | 31·0 | 30·6 | 31·8 | 33·9 |
| | | | | | | Summer. | | | | | | | |
| | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| April ... | 37·4 | 33·1 | 32·5 | 32·4 | 32·5 | 32·3 | 32·2 | 32·0 | 31·0 | 29·3 | 29·0 | 30·6 | 33·2 |
| May ... | 39·0 | 33·4 | 32·9 | 32·9 | 32·8 | 32·3 | 31·6 | 30·5 | 29·6 | 29·2 | 30·0 | 33·3 | 36·6 |
| June ... | 37·3 | 32·9 | 32·7 | 32·2 | 31·5 | 31·3 | 30·4 | 29·1 | 28·3 | 29·0 | 30·2 | 32·7 | 35·8 |
| July ... | 36·0 | 31·0 | 30·5 | 30·2 | 30·6 | 29·9 | 28·8 | 27·8 | 27·0 | 26·4 | 27·4 | 29·6 | 33·4 |
| Aug. ... | 38·5 | 30·4 | 30·0 | 30·1 | 30·0 | 29·7 | 29·3 | 28·1 | 27·1 | 27·1 | 28·3 | 32·0 | 36·0 |
| Sept. ... | 37·3 | 31·0 | 31·2 | 31·0 | 30·8 | 30·7 | 30·6 | 30·2 | 29·4 | 29·3 | 30·1 | 32·2 | 35·5 |
| Means | 37·6 | 32·0 | 31·6 | 31·5 | 31·4 | 31·0 | 30·5 | 29·6 | 28·7 | 28·4 | 29·2 | 31·7 | 35·1 |

Table II.—Diurnal Inequality of the

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

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

Quiet Days in 1905. Mean for the Year = 16° 32′·9 West.

| Noon. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. | Succeeding noon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter. | | | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 37·3 | 37·6 | 37·2 | 36·2 | 35·3 | 34·9 | 35·1 | 35·2 | 35·2 | 35·5 | 35·7 | 35·6 | 35·5 | 37·4 |
| 36·1 | 37·3 | 38·0 | 37·3 | 35·4 | 34·9 | 34·0 | 33·8 | 33·4 | 33·5 | 33·5 | 33·5 | 33·6 | 37·8 |
| 38·1 | 39·8 | 39·5 | 38·0 | 35·6 | 34·1 | 33·9 | 33·8 | 33·1 | 32·6 | 32·1 | 31·6 | 31·6 | 38·2 |
| 35·9 | 36·6 | 35·7 | 34·2 | 32·6 | 32·0 | 32·0 | 31·7 | 31·5 | 31·5 | 31·5 | 31·6 | 31·5 | 36·2 |
| 34·0 | 34·6 | 34·4 | 33·4 | 32·3 | 31·9 | 31·7 | 31·3 | 31·1 | 30·9 | 30·7 | 30·8 | 30·7 | 34·5 |
| 32·8 | 33·3 | 33·2 | 32·5 | 31·9 | 31·7 | 31·2 | 31·2 | 31·0 | 30·8 | 30·7 | 30·9 | 30·9 | 32·9 |
| 35·7 | 36·5 | 36·3 | 35·3 | 33·9 | 33·3 | 33·0 | 32·8 | 32·6 | 32·5 | 32·4 | 32·4 | 32·3 | 36·2 |
| Summer. | | | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 36·8 | 39·0 | 38·4 | 36·8 | 35·8 | 35·0 | 34·5 | 34·3 | 34·0 | 33·9 | 33·3 | 33·1 | 33·2 | 38·1 |
| 39·4 | 40·5 | 39·9 | 38·1 | 36·2 | 34·5 | 33·6 | 33·7 | 33·7 | 33·8 | 33·5 | 33·5 | 33·3 | 37·4 |
| 37·7 | 38·4 | 38·4 | 36·9 | 35·4 | 34·0 | 33·4 | 33·3 | 33·6 | 33·6 | 33·5 | 33·4 | 32·9 | 37·8 |
| 36·7 | 39·0 | 39·3 | 38·0 | 36·2 | 34·2 | 32·7 | 31·9 | 31·7 | 31·7 | 31·8 | 31·7 | 31·4 | 35·8 |
| 38·8 | 39·5 | 38·1 | 35·8 | 33·9 | 31·9 | 30·6 | 30·5 | 31·0 | 31·3 | 31·5 | 31·6 | 31·3 | 39·8 |
| 36·5 | 37·3 | 36·6 | 34·5 | 32·5 | 31·3 | 30·8 | 31·3 | 31·3 | 31·2 | 31·3 | 31·3 | 31·4 | 36·2 |
| 37·6 | 38·9 | 38·5 | 36·7 | 35·0 | 33·5 | 32·6 | 32·5 | 32·6 | 32·6 | 32·5 | 32·4 | 32·2 | 37·5 |

Kew Declination as derived from Table I.

| Noon. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer Means. | | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| +4·9 | +6·2 | +5·7 | +3·9 | +2·2 | +0·7 | −0·2 | −0·2 | −0·2 | −0·2 | −0·3 | −0·3 | −0·5 |
| Winter Means. | | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| +2·7 | +3·6 | +3·4 | +2·3 | +0·9 | +0·3 | 0·0 | −0·2 | −0·4 | −0·5 | −0·6 | −0·6 | −0·7 |
| Annual Means. | | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| +3·8 | +4·9 | +4.5 | +3·1 | +1·6 | +0·5 | −0·1 | −0·2 | −0·3 | −0·3 | −0·4 | −0·5 | −0·6 |

points to the West of its mean position.

,, ,, East ,, ,,

Table III.—Hourly Means of the Horizontal Force in C.G.S. Units in 1905. (Mean for the

| Hours | Preceding Noon. | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0·18000 + | | | | | | Winter. | | | | | | | |
| 1905. Months. | | | | | | | | | | | | | |
| Jan. ..... | 495 | 510 | 509 | 508 | 509 | 510 | 513 | 516 | 516 | 516 | 512 | 507 | 503 |
| Feb. ..... | 482 | 506 | 505 | 503 | 502 | 503 | 506 | 507 | 510 | 510 | 501 | 495 | 490 |
| March ... | 494 | 513 | 510 | 509 | 508 | 507 | 508 | 511 | 510 | 505 | 495 | 488 | 486 |
| Oct. ..... | 485 | 513 | 511 | 508 | 511 | 509 | 509 | 509 | 504 | 493 | 480 | 474 | 477 |
| Nov. ..... | 483 | 514 | 514 | 511 | 513 | 514 | 515 | 515 | 513 | 507 | 497 | 488 | 485 |
| Dec. ..... | 498 | 513 | 510 | 509 | 510 | 508 | 510 | 513 | 513 | 512 | 507 | 501 | 499 |
| Means ... | 490 | 512 | 510 | 508 | 509 | 509 | 510 | 512 | 511 | 507 | 499 | 492 | 490 |
| | | | | | | Summer. | | | | | | | |
| April ..... | 493 | 514 | 511 | 507 | 509 | 508 | 509 | 508 | 507 | 503 | 494 | 487 | 486 |
| May ..... | 514 | 529 | 526 | 523 | 523 | 522 | 522 | 519 | 513 | 506 | 498 | 495 | 500 |
| June ..... | 496 | 518 | 515 | 511 | 512 | 512 | 511 | 505 | 497 | 491 | 486 | 485 | 489 |
| July ..... | 507 | 525 | 521 | 519 | 522 | 520 | 519 | 516 | 508 | 501 | 496 | 491 | 489 |
| Aug. ..... | 488 | 515 | 512 | 508 | 511 | 508 | 509 | 506 | 498 | 487 | 479 | 480 | 484 |
| Sept. ..... | 491 | 515 | 514 | 512 | 511 | 509 | 508 | 503 | 497 | 488 | 482 | 479 | 481 |
| Means ... | 498 | 519 | 517 | 513 | 515 | 513 | 513 | 510 | 503 | 496 | 489 | 486 | 488 |

Table IV.—Diurnal Inequality of the Kew

| Hours. | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Summer Means. | | | | | | | |
| | +·00007 | +·00004 | +·00001 | +·00003 | +·00001 | +·00001 | −·00003 | −·00009 | −·00016 | −·00023 | −·00026 | −·00024 |
| | | | | | Winter Means. | | | | | | | |
| | +·00003 | +·00002 | ·00000 | ·00000 | ·00000 | +·00002 | +·00004 | +·00003 | −·00001 | −·00009 | −·00016 | −·00018 |
| | | | | | Annual Means. | | | | | | | |
| | +·00005 | +·00003 | ·00000 | +·00001 | +·00001 | +·00001 | ·00000 | −·00003 | −·00009 | −·00016 | −·00021 | −·00021 |

NOTE.—When the sign is + the

(Corrected for Temperature) as determined from the Selected Quiet Days Year = ·18510).

| Noon. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. | Succeeding Noon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter. | | | | | | | | | | | | | |
| 505 | 510 | 515 | 514 | 514 | 517 | 519 | 518 | 519 | 520 | 517 | 517 | 514 | 499 |
| 491 | 494 | 498 | 501 | 501 | 504 | 505 | 508 | 510 | 510 | 510 | 512 | 510 | 494 |
| 492 | 500 | 506 | 510 | 513 | 516 | 517 | 521 | 521 | 522 | 519 | 514 | 512 | 488 |
| 487 | 498 | 504 | 511 | 513 | 517 | 519 | 521 | 521 | 520 | 519 | 519 | 518 | 492 |
| 489 | 496 | 500 | 506 | 510 | 514 | 514 | 515 | 516 | 515 | 514 | 515 | 515 | 492 |
| 498 | 504 | 508 | 510 | 513 | 517 | 516 | 516 | 515 | 514 | 514 | 514 | 514 | 509 |
| 494 | 500 | 505 | 509 | 511 | 514 | 515 | 517 | 517 | 517 | 516 | 515 | 514 | 496 |
| Summer. | | | | | | | | | | | | | |
| 493 | 501 | 504 | 511 | 513 | 515 | 518 | 517 | 516 | 517 | 516 | 516 | 516 | 494 |
| 507 | 515 | 523 | 528 | 532 | 537 | 540 | 539 | 538 | 535 | 535 | 532 | 531 | 507 |
| 497 | 506 | 513 | 520 | 522 | 524 | 525 | 527 | 529 | 525 | 523 | 521 | 521 | 499 |
| 500 | 509 | 520 | 528 | 533 | 532 | 533 | 533 | 532 | 532 | 529 | 529 | 527 | 505 |
| 495 | 509 | 510 | 515 | 513 | 515 | 517 | 521 | 524 | 525 | 522 | 519 | 518 | 499 |
| 491 | 498 | 504 | 507 | 514 | 514 | 518 | 523 | 523 | 520 | 520 | 518 | 517 | 496 |
| 497 | 506 | 512 | 518 | 521 | 523 | 525 | 527 | 527 | 526 | 524 | 523 | 522 | 500 |

Horizontal Force as deduced ftom Table III.

| Noon. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer Means. | | | | | | | | | | | | |
| −·00015 | −·00006 | ·00000 | +·00006 | +·00009 | +·00010 | +·00013 | +·00014 | +·00015 | +·00013 | +·00012 | +·00010 | +·00010 |
| Winter Means. | | | | | | | | | | | | |
| −·00015 | −·00008 | −·00003 | ·00000 | +·00002 | +·00006 | +·00007 | +·00008 | +·00009 | +·00009 | +·00007 | +·00007 | +·00006 |
| Annual Means. | | | | | | | | | | | | |
| −·00015 | −·00007 | −·00001 | +·00003 | +·00006 | +·00008 | +·00010 | +·00011 | +·00012 | +·00011 | +·00010 | +·00009 | +·00008 |

reading is above the mean.

Table V.—Mean Monthly Values of Inclination and Vertical Force during the Year 1905.

| 1905. | 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 ..... | 3 1 | 67 4·2 | 67 4·0 | ·43756 |
| February ..... | 3 24 | 67 4·5 | 67 4·3 | ·43744 |
| March ..... | 3 25 | 67 4·4 | 67 4·3 | ·43756 |
| April ..... | 3 5 | 67 4·3 | 67 4·3 | ·43753 |
| May ..... | 3 33 | 67 2·8 | 67 3·1 | ·43745 |
| June ..... | 3 27 | 67 2·8 | 67 3·1 | ·43719 |
| July ..... | 3 28 | 67 2·8 | 67 3·2 | ·43739 |
| August ..... | 3 45 | 67 3·6 | 67 3·8 | ·43735 |
| September ..... | 3 48 | 67 3·9 | 67 4·0 | ·43739 |
| October ..... | 3 29 | 67 3·3 | 67 3·2 | ·43710 |
| November ..... | 3 2 | 67 4·7 | 67 4·5 | ·43762 |
| December ..... | 2 54 | 67 4·2 | 67 4·0 | ·43749 |
| Mean for year | ... | ... | ° ′<br>67 3·8 | ·43742 |

## 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. | 1902 | 29 51·2 E. | 74 48·1 N. | ·15432 | ·56806 |
| | | | 1903 | 29 54·3 E. | 74 46·0 N. | ·15446 | ·56720 |
| | | | 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 |
| Kasan | 55 47 N. | 49 8 E. | 1897 | 7 54·8 E. | 68 34·8 N. | ·18616 | ·47454 |
| 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. | 1904 | 17 58·2 W. | 68 48·2 N. | ·17392 | ·44845 |
| | | | 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. | 1903 | 12 16·8 W. | 67 36·9 N. | ·18144 | ·44053 |
| Potsdam | 52 23 N. | 13 4 E. | 1904 | 9 39·4 W. | 66 19·6 N. | ·18880 | ·43065 |
| | | | 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. | 1903 | 13 37·2 W. | 66 51·2 N. | ·18575 | ·43453 |
| Valencia (Ireland) | 51 56 N. | 10 15 W. | 1905 | 21 10·4 W. | 68 19·2 N. | ·17848 | ·44893 |
| Kew | 51 28 N. | 0 19 W. | 1905 | 16 32·9 W. | 67 3·8 N. | ·18510 | ·43742 |
| Greenwich | 51 28 N. | 0 0 | 1904 | 16 15·0 W. | 66 57·2 N. | ·18520 | ·43531 |
| Uccle (Brussels) | 50 48 N. | 4 21 E. | 1901 | 14 8·3 W. | 66 7·8 N. | ·18956 | ·42838 |
| Falmouth | 50 9 N. | 5 5 W. | 1905 | 18 8·4 W. | 66 36·1 N. | ·18749 | ·43328 |
| Prague | 50 5 N. | 14 25 E. | 1904 | 8 48·7 W. | — | ·20023 | — |
| St. Helier (Jersey) | 49 12 N. | 2 5 W. | 1905 | 16 39·3 W. | 65 36·1 N. | — | — |
| Val Joyeux (near Paris) | 48 49 N. | 2 1 E. | 1902 | 15 8·6 W. | 64 56·6 N. | ·19700 | ·42139 |
| | | | 1903 | 15 4·4 W. | 64 54·7 N. | ·19711 | ·42102 |
| | | | 1904 | 15 0·0 W. | 64 52·4 N. | ·19721 | ·42048 |
| Vienna | 48 15 N. | 16 21 E. | 1898 | 8 24·1 W. | — | — | — |
| Munich | 48 9 N. | 11 37 E. | 1900 | 10 27·9 W. | 63 18·5 N. | ·20610 | ·40993 |
| 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. | 1904 | 9 6·0 W. | 60 7·9 N. | ·22231 | ·38709 |
| Agincourt (Toronto) | 43 47 N. | 79 16 W. | 1904 | 5 38·4 W. | 74 33·2 N. | ·16444 | ·59507 |
| | | | 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 |
| Tiflis ..... | 41 43 N. | 44 48 E. | 1898 | 2 5·5 E. | 55 50·6 N. | ·25635 | ·37784 |
| Capodimonte (Naples) ..... | 40 52 N. | 14 15 E. | 1903 | 8 56·5 W. | 56 17·6 N. | — | — |
| | | | 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. | 1904 | 17 5·4 W. | 59 9·4 N. | ·22885 | ·38322 |
| Baldwin (Kansas) ..... | 38 47 N. | 95 10 W. | 1902 | 8 23·2 E. | 68 38·1 N. | ·21950 | ·56112 |
| | | | 1903 | 8 24·8 E. | 68 39·5 N. | ·21904 | ·56062 |
| | | | 1904 | 8 26·4 E. | 68 40·9 N. | ·21866 | ·56029 |
| Cheltenham (Maryland) ... | 38 44 N. | 76 50 W. | 1902 | 5 6·8 W. | 70 22·5 N. | ·20188 | ·56616 |
| | | | 1903 | 5 9·9 W. | 70 24·1 N. | ·20145 | ·56579 |
| | | | 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. | 1904 | 15 44·6 W. | 54 59·9 N. | ·24741 | ·35331 |
| Tokio ..... | 35 41 N. | 139 45 E. | 1900 | 4 33·7 W. | 49 0·7 N. | ·29909 | ·34421 |
| | | | 1901 | 4 36·1 W. | 49 0·0 N. | ·29954 | ·34459 |
| Zi-ka-wei ..... | 31 12 N. | 121 26 E. | 1902 | 2 25·1 W. | 45 40·0 N. | ·32939 | ·33715 |
| | | | 1903 | 2 27·3 W. | 45 38·8 N. | ·32957 | ·33708 |
| Dehra Dun ..... | 30 19 N. | 78 3 E. | 1903 | 2 41·6 E. | 43 14 N. | ·33430 | ·31429 |
| | | | 1904 | 2 40·8 E. | 43 18 N. | ·33405 | ·31479 |
| Helwan..... | 29 52 N. | 31 21 E. | 1903 | 3 21·4 W. | 40 31·2 N. | ·30209 | ·25819 |
| 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. | 1904 | 1 22·4 E. | 30 20 N. | ·37224 | ·21781 |
| Hong Kong ..... | 22 18 N. | 114 10 E. | 1904 | 0 10·5 E. | 31 9·8 N. | ·36953 | ·22347 |
| | | | 1905 | 0 8·9 E. | 31 6·6 N. | ·36975 | ·22317 |
| Honolulu (Hawaii)..... | 21 19 N. | 158 4 W. | 1902 | 9 18·0 E. | 40 14·5 N. | ·29236 | ·24743 |
| | | | 1903 | 9 18·7 E. | 40 13·2 N. | ·29200 | ·24693 |
| | | | 1904 | 9 20·0 E. | 40 10·0 N. | ·29179 | ·24628 |
| Colaba (Bombay) | 18 54 N. | 72 49 E. | 1904 | 0 15·5 E. | 21 49·8 N. | ·37391 | ·14978 |
| Vieques (Porto Rico) ..... | 18 9 N. | 65 26 W. | 1904 | 1 18·7 W. | — | ·29025 | — |
| Manila ..... | 14 35 N. | 120 59 E. | 1903 | 0 50·9 E. | 16 2·4 N. | ·38186 | ·10979 |
| Kodai-Kanal ... | 10 14 N. | 77 28 E. | 1903 | 0 23·4 W. | 3 5 N. | ·37367 | ·02013 |
| | | | 1904 | 0 27·2 W. | 3 11 N. | ·37381 | ·02079 |
| Batavia..... | 6 11 S. | 106 49 E. | 1903 | 0 59·7 E. | 30 23·7 S. | ·36696 | ·21526 |
| Dar-es-Salaam | 6 49 S. | 39 18 E. | 1903 | 7 35·2 W. | — | — | — |
| Mauritius ..... | 20 6 S. | 57 33 E. | 1904 | 9 14·9 W. | 53 54·5 S. | ·23631 | ·32416 |
| Rio de Janeiro... | 22 55 S. | 43 11 W. | 1904 | 8 37·5 W. | 13 42·9 S. | ·24793 | ·06054 |
| Santiago (Chile) | 33 27 S. | 70 42 W. | 1903 | 14 36·9 E. | 30 41·6 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.

### 1905.

| Months. | Thermometer. | | | | | | | | Barometer.* | | | | | Mean vapour tension. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean. | Means of— | | | Absolute Extremes. | | | | Mean. | Absolute Extremes. | | | | |
| | | Max. | Min. | Max. and Min. | Max. | Date. | Min. | Date. | | Max. | Date. | Min. | Date. | |
| | ° | ° | ° | ° | ° | | ° | | ins. | ins. | | ins. | | in. |
| January ... | 38·4 | 43·8 | 33·2 | 38·5 | 54·6 | 6th 4 P.M. | 23·4 | 19th 7 P.M. | 30·289 | 30·977 | 28th 11 P.M.) 29th 1 A.M.) | 29·062 | 17th 2 A.M. | ·191 |
| February ... | 42·7 | 46·9 | 38·4 | 42·7 | 53·0 | 5th 1 ,, | 31·6 | 20th 8 A.M. | 30·179 | 30·588 | 15th 3 ,, | 29·172 | 26th 4 P.M. | ·220 |
| March ..... | 45·2 | 51·5 | 38·9 | 45·2 | 60·9 | 22nd 1 ,, | 28·8 | 4th 7 ,, | 29·746 | 30·342 | 4th 6 ,, | 28·940 | 15th Noon | ·245 |
| April ..... | 46·9 | 53·9 | 41·0 | 47·5 | 63·1 | 13th 1 ,, | 32·8 | 9th 4 ,, | 29·857 | 30·321 | 1st 10 ,, | 29·255 | 10th 9 P.M. | ·248 |
| May ..... | 53·2 | 62·0 | 44·2 | 53·1 | 79·0 | 29th 5 ,, | 34·7 | 23rd 4 ,, | 30·125 | 30·447 | 9th 10 and 11 A.M. | 29·387 | 2nd 9 A.M. | ·265 |
| June ..... | 60·1 | 67·7 | 53·1 | 60·4 | 77·5 | 27th 4 ,, | 46·1 | 7th 1 ,, | 29·947 | 30·407 | 23rd 5 ,, | 29·694 | 29th 5 P.M. | ·386 |
| July ..... | 66·0 | 74·8 | 57·9 | 66·4 | 81·5 | 8th 3 ,, | 50·1 | 7th 4 ,, | 30·055 | 30·290 | 19th 11 ,, | 29·784 | 1st 4 A.M. | ·449 |
| August ..... | 60·6 | 68·5 | 53·3 | 60·9 | 74·1 | 14th 2 ,, | 45·2 | 24th 5 ,, | 29·896 | 30·334 | 31st 11 P.M. | 29·295 | 28th 10 P.M. | ·385 |
| September | 56·3 | 62·5 | 50·0 | 56·3 | 72·2 | 3rd 3 ,, | 41·0 | 15th 6 ,, | 29·971 | 30·370 | 17th 9 A.M. | 29·569 | 7th 4 ,, | ·354 |
| October ... | 45·4 | 51·9 | 38·6 | 45·3 | 58·8 | 9th 3 ,, | 27·9 | 26th 8 ,, | 30·035 | 30·488 | 11th 9 ,, | 29·153 | 31st 1 A.M. | ·245 |
| November... | 41·5 | 46·9 | 35·7 | 41·3 | 54·5 | 26th 11 A.M. | 22·4 | 22nd 3 ,, | 29·699 | 30·251 | 17th 11 P.M.) 18th 1 A.M.) | 28·864 | 13th 4 ,, | ·230 |
| December... | 40·9 | 44·7 | 36·7 | 40·7 | 56·9 | 7th 2 P.M. | 28·1 | 10th 11 P.M. | 30·248 | 30·898 | 12th 10 ,, | 29·225 | 29th 5 ,, | ·228 |
| Means | 49·8 | 56·3 | 43·4 | 49·9 | ... | ... | ... | ... | 30·004 | ... | ... | ... | ... | ·287 |

* 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 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.‖ |
| 1905. | | ins. | ins. | | | | | | | | | | | | | | | | | |
| January | 5·9 | 1·080 | 0·670 | 16 | 5 | 1 | 0 | 0 | 7 | 11 | 0 | 0 | 3 | 3 | 2 | 1 | 6 | 12 | 4 | 4 |
| February | 7·7 | 0·675 | 0·220 | 26 | 12 | 3 | 1 | 0 | 0 | 16 | 1 | 4 | 2 | 1 | 0 | 1 | 10 | 7 | 3 | 2 |
| March | 7·8 | 3·180 | 0·565 | 15 | 22 | 0 | 5 | 2 | 0 | 21 | 3 | 3 | 1 | 2 | 1 | 7 | 10 | 6 | 1 | 1 |
| April | 8·7 | 1·555 | 0·440 | 9 | 19 | 1 | 1 | 1 | 0 | 25 | 1 | 5 | 3 | 2 | 1 | 5 | 6 | 4 | 4 | 0 |
| May | 6·1 | 0·730 | 0·190 | 1 | 8 | 0 | 0 | 1 | 3 | 12 | 1 | 11 | 8 | 0 | 0 | 2 | 4 | 4 | 2 | 1 |
| June | 7·9 | 4·985 | 1·090 | 5 | 16 | 0 | 0 | 2 | 1 | 20 | 0 | 9 | 5 | 4 | 1 | 1 | 7 | 2 | 1 | 1 |
| July | 6·5 | 0·775 | 0·320 | 9 & 22 | 8 | 0 | 0 | 1 | 2 | 11 | 0 | 3 | 2 | 2 | 0 | 1 | 7 | 11 | 5 | 3 |
| August | 7·5 | 2·820 | 0·775 | 28 | 17 | 0 | 0 | 3 | 0 | 16 | 0 | 2 | 2 | 3 | 2 | 3 | 9 | 8 | 2 | 2 |
| September | 7·3 | 1·745 | 0·420 | 9 | 13 | 0 | 0 | 0 | 1 | 13 | 0 | 8 | 5 | 2 | 0 | 1 | 7 | 5 | 2 | 4 |
| October | 6·3 | 1·325 | 0·640 | 29 | 11 | 0 | 0 | 0 | 4 | 14 | 0 | 10 | 3 | 0 | 0 | 2 | 4 | 5 | 7 | 6 |
| November | 7·2 | 2·995 | 0·425 | 2 | 16 | 0 | 0 | 0 | 4 | 18 | 1 | 6 | 4 | 2 | 2 | 4 | 8 | 2 | 2 | 6 |
| December | 8·1 | 0·745 | 0·230 | 7 | 7 | 0 | 0 | 0 | 2 | 20 | 0 | 1 | 0 | 2 | 4 | 7 | 10 | 4 | 3 | 9 |
| Totals and Means | 7·3 | 22·610 | | | 154 | 5 | 7 | 10 | 24 | 197 | 7 | 62 | 38 | 23 | 13 | 35 | 88 | 70 | 36 | 39 |

* 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 35 miles an hour in at least one hour of the twenty-four.

‖ In a "calm" the mean wind velocity for the twenty-four hours has not exceeded 5 miles an hour.

## APPENDIX II.—Table III.

### Kew Observatory.

| Months. | Bright Sunshine (by Campbell-Stokes Recorder). | | | | | 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. |
| | | Old method. | New method. | | | | | | | | | | | |
| 1905. | h. m. | | | h. m. | | ° | ° | | ° | ° | | | | |
| January | 74 12 | 28 | 29 | 6 48 | 29 | 65 | 88 | 31 | 25 | 10 | 2 | 10·5 | 30 | 9, 15 |
| February | 76 6 | 27 | 28 | 7 0 | 22 | 81 | 96 | 17 | 32 | 20 | 12 | 12·9 | 35 | 26 |
| March | 108 18 | 29 | 30 | 10 6 | 26 | 97 | 114 | 31 | 32 | 15 | 4 | 13·3 | 43 | 15 |
| April | 103 24 | 25 | 25 | 11 48 | 15 | 103 | 120 | 12 | 35 | 22 | 9 | 12·5 | 35 | 30 |
| May | 253 42 | 53 | 53 | 14 24 | 17 | 120 | 132 | 29 | 36 | 21 | 23 | 10·6 | 42 | 1 |
| June | 155 6 | 31 | 31 | 14 12 | 23 | 117 | 136 | 3, 16 | 48 | 42 | 22 | 11·0 | 30 | 8 |
| July | 240 54 | 48 | 48 | 14 36 | 7 | 131 | 141 | 30 | 51 | 40 | 7, 19 | 7·5 | 24 | 29 |
| August | 166 42 | 37 | 37 | 11 36 | 19 | 123 | 137 | 8 | 47 | 34 | 24 | 10·1 | 33 | 4 |
| September | 112 24 | 30 | 30 | 10 42 | 8 | 106 | 127 | 7 | 43 | 29 | 15 | 10·3 | 32 | 8 |
| October | 104 6 | 32 | 32 | 9 24 | 16 | 90 | 107 | 3 | 31 | 15 | 17 | 8·7 | 25 | 4 |
| November | 57 54 | 22 | 22 | 6 48 | 27 | 72 | 98 | 12 | 29 | 12 | 21 | 10·3 | 38 | 22 |
| December | 21 0 | 9 | 9 | 4 54 | 6, 19 | 58 | 89 | 7 | 32 | 19 | 10, 20 | 7·8 | 24 | 7 |
| Totals and Means | 1473 48 | 31 | 33 | | | | | | | | | 10·5 | | |

* As indicated by a Robinson anemograph, 70 feet above the general surface of the ground, the original factor 3 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. | Mid. | 1 h. | 2 h. | 3 h. | 4 h. | 5 h. | 6 h. | 7 h. | 8 h. | 9 h. | 10 h. | 11 h. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| January ..... | 173 | 153 | 133 | 120 | 122 | 128 | 142 | 164 | 185 | 199 | 215 | 205 |
| February ..... | 181 | 169 | 154 | 134 | 130 | 137 | 146 | 164 | 191 | 211 | 237 | 228 |
| March ..... | 196 | 191 | 170 | 156 | 147 | 151 | 170 | 196 | 214 | 213 | 193 | 169 |
| April ..... | 174 | 152 | 139 | 119 | 108 | 121 | 137 | 166 | 194 | 208 | 198 | 184 |
| May ..... | 170 | 148 | 132 | 124 | 123 | 130 | 145 | 171 | 191 | 193 | 188 | 171 |
| June ..... | 184 | 163 | 143 | 129 | 119 | 122 | 131 | 148 | 174 | 187 | 177 | 142 |
| July ..... | 120 | 120 | 106 | 105 | 118 | 120 | 151 | 182 | 198 | 209 | 195 | 163 |
| August ..... | 166 | 159 | 151 | 147 | 143 | 155 | 184 | 212 | 226 | 220 | 201 | 174 |
| September ... | 185 | 174 | 167 | 163 | 166 | 177 | 204 | 232 | 250 | 244 | 229 | 209 |
| October..... | 152 | 147 | 131 | 125 | 127 | 139 | 154 | 188 | 217 | 231 | 236 | 202 |
| November ... | 211 | 212 | 209 | 205 | 207 | 211 | 227 | 253 | 280 | 302 | 306 | 298 |
| December..... | 177 | 160 | 145 | 137 | 137 | 142 | 166 | 194 | 222 | 233 | 228 | 221 |

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 ..... | −55 | −77 | **−90** | −89 | −80 | −63 | −37 | −12 | + 6 | +24 | +14 | +12 | +16 |
| February ..... | −19 | −33 | −50 | **−54** | −48 | −40 | −24 | − 1 | +17 | **+40** | +32 | +28 | +20 |
| March ..... | + 8 | −11 | −23 | −32 | −29 | −13 | +10 | +25 | +24 | + 6 | −16 | −33 | −34 |
| April ..... | −14 | −27 | −46 | **−57** | −46 | −31 | − 5 | +20 | +32 | +23 | + 9 | + 3 | − 4 |
| May ..... | −12 | −24 | −31 | **−32** | −26 | −14 | + 7 | +22 | +24 | +20 | + 7 | − 4 | −23 |
| June ..... | +10 | − 6 | −18 | −26 | −23 | −16 | − 2 | +19 | +28 | +20 | − 8 | −23 | −25 |
| July ..... | −25 | −38 | **−39** | −27 | −25 | + 2 | +30 | +44 | **+54** | +40 | +12 | − 9 | − 6 |
| August ..... | −18 | −25 | −29 | −32 | −22 | + 3 | +26 | +38 | +33 | +17 | − 6 | − 8 | −21 |
| September ... | −26 | −30 | **−36** | −33 | −26 | − 4 | +18 | **+31** | +27 | +15 | − 2 | − 7 | −15 |
| October..... | −26 | −41 | **−47** | −45 | −34 | −20 | +13 | +40 | +53 | **+57** | +26 | − 2 | −28 |
| November ... | −44 | −46 | **−50** | −47 | −43 | −27 | − 2 | +25 | +46 | **+51** | +43 | +26 | +18 |
| December..... | −35 | −49 | −57 | **−57** | −52 | −31 | − 6 | +18 | +28 | +23 | +16 | + 8 | + 1 |
| Winter ..... | −38 | −51 | −61 | **−62** | −56 | −40 | −17 | + 7 | +24 | +34 | +26 | +18 | +14 |
| Equinox ..... | −14 | −27 | −38 | **−42** | −34 | −17 | + 9 | +29 | +34 | +25 | + 4 | −10 | −20 |
| Summer ..... | −11 | −23 | **−29** | **−29** | −24 | − 6 | +15 | +31 | +35 | +24 | + 1 | −11 | −19 |
| Year ..... | −21 | −34 | −43 | **−44** | −38 | −21 | + 2 | +22 | **+31** | +28 | +10 | − 1 | − 8 |

*Principal maxima and

(in volts) from the Self-recording Kelvin Water-dropping Electrograph at "Quiet" Days (10 each month).
05.

| Noon. | 1 h. | 2 h. | 3 h. | 4 h. | 5 h. | 6 h. | 7 h. | 8 h. | 9 h. | 10 h. | 11 h. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 203 | 205 | 219 | 232 | 245 | 254 | 245 | 236 | 230 | 223 | 205 | 181 | 153 |
| 224 | 215 | 196 | 198 | 205 | 203 | 212 | 226 | 213 | 212 | 208 | 202 | 184 |
| 150 | 149 | 149 | 152 | 156 | 167 | 193 | 231 | 246 | 252 | 251 | 233 | 209 |
| 179 | 172 | 163 | 170 | 166 | 166 | 180 | 209 | 231 | 233 | 215 | 204 | 192 |
| 158 | 134 | 128 | 131 | 133 | 141 | 161 | 188 | 207 | 223 | 221 | 202 | 171 |
| 124 | 121 | 116 | 113 | 113 | 133 | 152 | 177 | 191 | 197 | 200 | 187 | 187 |
| 140 | 143 | 151 | 145 | 134 | 136 | 144 | 159 | 169 | 178 | 172 | 146 | 125 |
| 172 | 156 | 143 | 136 | 151 | 167 | 198 | 219 | 220 | 233 | 224 | 197 | 166 |
| 202 | 193 | 194 | 197 | 205 | 233 | 249 | 249 | 250 | 248 | 239 | 209 | 193 |
| 172 | 147 | 142 | 165 | 182 | 191 | 194 | 201 | 203 | 186 | 175 | 168 | 150 |
| 279 | 270 | 268 | 272 | 283 | 291 | 281 | 262 | 243 | 236 | 230 | 211 | 198 |
| 211 | 203 | 202 | 210 | 223 | 230 | 237 | 242 | 248 | 247 | 233 | 198 | 181 |

Gradient at Kew Observatory near the Ground in volts per metre of height.*
05.

| 2 h. | 3 h. | 4 h. | 5 h. | 6 h. | 7 h. | 8 h. | 9 h. | 10 h. | 11 h. | Mid. | Range of inequality. | Monthly and seasonal mean absolute values. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| +33 | +48 | +64 | **+75** | +66 | +57 | +52 | +43 | +24 | − 2 | −33 | 165 | 219 |
| + 3 | + 5 | +11 | + 9 | +17 | +29 | +18 | +17 | +13 | + 8 | − 8 | 94 | 169 |
| **−35** | −33 | −29 | −21 | + 2 | +35 | +48 | **+52** | +51 | +35 | +23 | 87 | 165 |
| −13 | − 7 | −11 | −12 | 0 | +27 | +46 | **+47** | +30 | +19 | + 7 | 104 | 163 |
| −28 | −25 | −24 | −17 | − 1 | +20 | +36 | **+48** | +47 | +32 | + 7 | 80 | 130 |
| −29 | −31 | **−32** | −16 | − 1 | +20 | +31 | +36 | **+38** | +28 | +28 | 70 | 123 |
| + 1 | − 5 | −15 | −14 | − 6 | + 6 | +15 | +23 | +18 | − 5 | −24 | 93 | 135 |
| −32 | **−38** | −25 | −12 | +14 | +32 | +33 | **+44** | +36 | +13 | −13 | 82 | 152 |
| −15 | −12 | − 6 | +16 | +28 | +28 | +28 | +27 | +19 | − 5 | −18 | 67 | 167 |
| −30 | − 8 | + 7 | +18 | +19 | +26 | +28 | +12 | + 2 | − 5 | −22 | 104 | 162 |
| +16 | +21 | +32 | +40 | +31 | +13 | − 5 | −11 | −16 | −34 | −46 | 101 | 242 |
| 0 | + 6 | +17 | +24 | +30 | +34 | **+39** | +38 | +25 | − 5 | −20 | 96 | 178 |
| +13 | +20 | +31 | **+37** | +36 | +33 | +26 | +22 | +11 | − 8 | −27 | ... | 202 |
| −23 | −15 | −10 | − 0 | +12 | +29 | **+37** | +34 | +25 | +11 | − 3 | ... | 164 |
| −22 | −25 | −24 | −15 | + 1 | +19 | +29 | **+38** | +35 | +17 | 0 | ... | 135 |
| −11 | − 7 | − 1 | + 7 | +16 | +27 | **+31** | **+31** | +24 | + 7 | −10 | ... | 167 |

**minima are in heavy type.**

## APPENDIX III.—Table I.

Register of principal Seismograph Disturbances at Kew Observatory. 1905.

| No. in Kew register. | Date. | Commencement. | Time of Max. | Max. Amplitude. | Duration. | Remarks. |
|---|---|---|---|---|---|---|
| | | hrs. min. | hr. min. | mm. | hr. min. | |
| 590 | Jan. 22 | 3 8·9 | 3 59·3 | 1·5 | 1 32 | |
| 594 | Feb. 14 | 9 10·5 | 9 40·6 | 7·3 | 1 56 | |
| 595 | ,, 17 | 12 11·7 | 12 30·2 | 2·0 | 55 | |
| 600 | Mar. 19 | 0 21·1 | 1 35·2 | 1·5 | 2 28 | "Repetition" of max. at 1hr. 59·7m. |
| 602 | ,, 22 | 3 59·2 | 4 34·3 | 1·6 | 2 36 | Movement after 5hrs., very small. |
| 603 | April 4 | 1 0·2 | 1 29·2 | 15·3 | 3 48 | Indian earthquake. |
| 616 | May 31 | 19 15·4 | 19 20·5 | 1·0 | 19 | |
| 617 | June 1 | 4 51·9 | 4 53·7 | 1·1 | 23 | |
| 618 | ,, 2 | 6 2·2 | 6 30·3 | 1·3 | 1 0 | Preliminary tremors very small. |
| 622 | ,, 14 | 12 13·8 | 13 6·2 | 1·0 | 1 43 | |
| 623 | ,, 30 | 18 4·0 | 19 8·4 | 1.4 | 1 38 | |
| 624 | ,, 30 | 20 47·4 | 20 54·0 | 1·0 | 27 | |
| 626 | July 6 | 16 37·3 | 17 17·2 | 5·0 | 1 38 | |
| 627 | ,, 9 | 9 50·9 | 10 17·0? | >17·0 | 4 5 | >17mm. from 10hr. 13m. to 10hr. 21m. |
| 628 | ,, 11 | 8 46·0 | 9 15·2 | 2·0 | 1 9 | |
| 632 | ,, 14 | 22 33·7 | 22 36·5 | 1·0 | 33 | "Repetition" of max. at 22h. 41m. |
| 635 | ,, 23 | 2 56·0 | 3 20·0 | >14·0 | ? | Times and amplitude approximate. |
| 637 | Aug. 4 | 5 18·4 | 5 21·5 | 2·2 | 13 | |
| 640 | Sept. 15 | 6 23·3 | 6 53·3 | 4·5 | 2 31 | |
| 641 | ,, 17 | 1 58·3 | 2 6·4 | 1·1 | 38 | |
| 643 | Oct. 8 | 7 35·3 | 7 40·0 | 1·2 | 19 | |
| 645 | ,, 21 | 11 14·4 | 11 28·5 | 1·1 | 54 | |
| 647 | ,, 24 | 18 21·8 | 18 31·5 | 1·0 | 32 | |
| 652 | Nov. 8 | 22 9·7 | 22 17·6 | 12·1 | 1 43 | "Repetition" of max. at 22h. 18·5m. |
| 653 | ,, 21 | 23 24·8 | 23 57·2 | 1·0 | 44 | |
| 656 | Dec. 4 | 7 16·7 | | 1·5 | 40 | |
| 657 | ,, 10 | 13 1·4 | | 1·3 | 53 | Film damaged. |
| 658 | ,, 10 | 19 2·5 | | 1·0 | 43 | |
| 659 | ,, 17 | 6 7·3 | 6 18·5 | 2·0 | 45 | |
| 660 | ,, 17 | 10 16·8 | 10 26·4 | 1·0 | 44 | |

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 throughout.

## APPENDIX IV.—Table I.

RESULTS OF WATCH TRIALS. Performance of the 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. | |
| | | | | | | | | | | | 0—40 | 0—40 | 0—20 | 0—100. |
| | | | secs. | secs. | secs. | secs. | secs. | | | secs. | | | | |
| Victor Kullberg, London | 6473 | S.r., g.b., s.o., "Karrusel" | +0·2 | +0·0 | +0·0 | +1·1 | −1·0 | 17 | 31 | 3·0 | 36·6 | 38·1 | 18·0 | 92·7 |
| ,, ,, ,, | 6472 | S.r., g.b., s.o., "Karrusel" | +0·9 | +0·9 | +0·9 | +0·7 | −0·8 | 21 | 21 | 2·7 | 35·9 | 37·9 | 18·6 | 92·4 |
| Patek Philippe & Co., Geneva | 116491 | D.r., g.b., s.o., "Bar lever" | +3·0 | +2·8 | +3·4 | +1·5 | +4·4 | 24 | 17 | 4·5 | 35·2 | 37·1 | 18·9 | 91·2 |
| Joseph White & Son, Coventry | 37758 | D.r., g.b., d.o., "Tourbillon lever" | +4·4 | +4·2 | +4·5 | +5·6 | +5·4 | 29 | 21 | 3·0 | 34·2 | 37·8 | 18·6 | 90·6 |
| Patek Philippe & Co., Geneva | 114396 | D.r., g.b., d.o., "Bar lever" | +1·9 | +2·0 | +1·7 | +1·2 | +3·6 | 27 | 24 | 4·7 | 34·6 | 37·6 | 18·4 | 90·6 |
| S. Smith & Son, London | 302--3 | D.r., fusee, s.o., "Tourbillon lever" | +0·5 | +0·1 | −0·5 | +1·0 | +1·1 | 26 | 35 | 3·0 | 34·8 | 38·0 | 17·7 | 90·5 |
| B. Bonniksen, Coventry | 57410 | S.r., g.b., s.o., "Karrusel" | +1·7 | +0·6 | +0·4 | +0·8 | +1·6 | 33 | 10 | 3·5 | 33·3 | 37·9 | 19·3 | 90·5 |
| ,, ,, | 57415 | S.r., g.b., s.o., "Karrusel" | +2·0 | +1·5 | +2·1 | +1·6 | +1·7 | 39 | 15 | 2·8 | 32·2 | 39·1 | 19·0 | 90·3 |
| Chas. Frodsham & Co., London | 08991 | D.r., fusee, d.o., "Tourbillon lever" | +0·2 | +0·1 | +0·3 | +0·0 | −0·3 | 20 | 77 | 3·7 | 35·9 | 39·3 | 14·9 | 90·1 |
| Patek Philippe & Co., Geneva | 128387 | D.r., g.b., s.o., "Bar lever" | −2·3 | −2·1 | −2·2 | −1·5 | −1·3 | 28 | 41 | 3·0 | 34·4 | 38·5 | 17·2 | 90·1 |
| ,, ,, ,, | 121949 | D.r., g.b., s.o., "Bar lever" | +0·9 | +1·1 | +0·5 | +0·8 | +2·5 | 27 | 44 | 4·2 | 34·6 | 37·9 | 17·1 | 89·6 |
| ,, ,, ,, | 119152 | D.r., g.b., s.o., "Bar lever" | +2·0 | +1·8 | +1·8 | +1·6 | +1·9 | 30 | 63 | 5·0 | 34·0 | 39·6 | 15·9 | 89·5 |
| ,, ,, ,, | 121968 | D.r., g.b., s.o., "Bar lever" | −1·6 | −0·2 | −1·6 | −1·3 | −1·5 | 29 | 46 | 3·7 | 34·3 | 38·3 | 16·9 | 89·5 |
| John Hewitt, Coventry | 59728 | D.r., g.b., Phillips' end coils, "Tourbillon lever" | +1·5 | +1·2 | +1·2 | +1·0 | +4·9 | 24 | 21 | 5·0 | 35·3 | 35·3 | 18·6 | 89·2 |
| Longines Watch Factory, Switzerland | 1111327 | D.r., g.b., s.o. | +0·5 | +1·1 | +1·2 | −0·9 | +0·9 | 31 | 33 | 4·0 | 33·8 | 37·6 | 17·8 | 89·2 |
| Carley & Clemence, London | 51605 | D.r., g.b., d.o., "Annular Tourbillon" | +0·9 | −0·3 | +0·8 | +0·2 | −0·6 | 25 | 60 | 4·5 | 35·1 | 37·9 | 16·0 | 89·0 |
| Longines Watch Factory, Switzerland | 1111526 | D.r., g.b., s.o. | +0·9 | −2·9 | −0·8 | +1·6 | +1·5 | 20 | 14 | 6·0 | 35·9 | 33·9 | 19·1 | 88·9 |
| Vacheron & Constantin, Geneva | 332612 | D.r., g.b., s.o., "Bar lever" | +2·0 | +0·8 | +2·2 | +0·3 | +0·8 | 35 | 22 | 3·3 | 33·1 | 37·2 | 18·5 | 88·8 |
| Newsome & Co., Coventry | 148641 | S.r., g.b., s.o., "Karrusel" | +0·7 | +0·1 | +0·3 | −1·4 | +1·6 | 35 | 25 | 5·7 | 33·0 | 37·1 | 18·3 | 88·4 |
| C. J. H. Marlow, Coventry | 22125 | S.r., g.b., s.o., "Karrusel" | −0·1 | −0·3 | −0·4 | +0·8 | −2·2 | 25 | 56 | 4·0 | 35·0 | 37·0 | 16·3 | 88·3 |
| Stauffer, Son & Co., London | 203021 | D.r., g.b., s.o., min. and split seconds, chronograph | −3·7 | −5·5 | −7·4 | −6·2 | −4·5 | 33 | 15 | 5·7 | 33·4 | 35·6 | 19·0 | 88·0 |
| Chas. Frodsham & Co., London | 08356 | D.r., g.b., s.o., "Nickel steel balance" | −1·9 | −0·3 | −0·8 | +1·4 | +1·3 | 34 | 11 | 7·2 | 33·2 | 35·5 | 19·2 | 87·9 |
| Carley & Clemence, London | 51608 | D.r., g.b., s.o., "Annular tourbillon" | −0·4 | −0·1 | −0·9 | +0·5 | −3·5 | 29 | 37 | 5·2 | 34·3 | 35·8 | 17·5 | 87·6 |
| ,, ,, | 51610 | D.r., g.b., d.o., "Annular tourbillon" | +0·5 | −0·2 | +1·0 | +3·6 | −0·5 | 29 | 32 | 5·2 | 34·2 | 35·4 | 17·8 | 87·4 |
| Newsome & Co., Coventry | 148332 | S.r., g.b., s.o., "Karrusel" | +1·1 | +1·4 | +1·5 | +1·7 | +0·7 | 31 | 76 | 4·0 | 33·7 | 38·8 | 14·9 | 87·4 |
| Waltham Watch Co., U.S.A. | 11076824 | D.r., g.b., s.o. | −0·7 | +0·1 | −1·9 | −1·2 | −2·4 | 35 | 41 | 4·5 | 33·1 | 37·0 | 17·3 | 87·4 |
| Longines Watch Factory, Switzerland | 1111328 | D.r., g.b., s.o. | −1·0 | −3·9 | +0·3 | −0·3 | −1·4 | 29 | 39 | 6·0 | 34·2 | 35·6 | 17·4 | 87·2 |
| Robert Milne, Manchester | 1400 | S.r., g.b., s.o., "Karrusel" | +0·0 | +1·3 | +1·3 | +0·4 | +3·8 | 38 | 19 | 5·7 | 32·4 | 36·1 | 18·7 | 87·2 |
| Newsome & Co., Coventry | 152243 | S.r., g.b., s.o., "Karrusel" | +0·2 | −0·7 | +0·4 | −0·2 | −0·3 | 48 | 29 | 3·5 | 30·5 | 38·6 | 18·1 | 87·2 |

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. | | | | |
| Longines Watch Factory Switzerland | 1111323 | D.r., g.b., s.o. | −0·7 | −1·5 | −0·3 | +2·2 | −0·7 | 25 | 60 | 6·2 | 35·0 | 36·1 | 16·0 | 87·1 |
| Robert Milne, Manchester | 55171 | S.r., g.b., s.o., "Karrusel" | −1·4 | −1·2 | −0·7 | −1·9 | +0·6 | 35 | 47 | 3·7 | 33·0 | 37·2 | 16·9 | 87·1 |
| S. Smith & Son, London | 302--5<br>11909 | D.r., fusee, d.o., "Tourbillon" lever | −1·5 | −2·3 | −1·7 | +0·5 | −0·6 | 38 | 30 | 3·7 | 32·5 | 36·6 | 18·0 | 87·1 |
| Chas. Frodsham & Co., London | 190119<br>09128 | D.r., fusee, d.o., repeater, calendar, "Tourbillon" | +2·2 | +1·0 | +1·9 | +1·4 | +3·1 | 33 | 60 | 6·0 | 33·4 | 37·8 | 15·8 | 87·0 |
| C. J. H. Marlow, Coventry | 22837 | S.r., g.b., s.o. | +1·2 | −3·5 | −1·3 | +1·4 | +0·7 | 27 | 15 | 6·5 | 34·5 | 33·3 | 19·0 | 86·8 |
| B. Bonniksen, Coventry | 57508 | S.r., g.b., s.o., "Karrusel" | +3·3 | +3·6 | +3·3 | +3·8 | +4·1 | 40 | 64 | 4·8 | 32·1 | 38·9 | 15·7 | 86·7 |
| Longines Watch Factory, Switzerland | 1344475 | D.r., g.b., s.o. | +2·1 | −0·9 | +0·1 | +3·5 | +2·0 | 29 | 28 | 6·2 | 34·2 | 34·3 | 18·1 | 86·6 |
| " " " " | 1344476 | D.r., g.b., s.o. | −0·6 | −3·0 | −1·0 | +1·2 | +2·9 | 21 | 36 | 6·5 | 35·8 | 33·1 | 17·6 | 86·5 |
| B. Bonniksen, Coventry | 57432 | S.r., g.b., s.o., "Karrusel" | +2·5 | +4·0 | +3·7 | +2·0 | +3·6 | 31 | 68 | 4·5 | 33·8 | 37·1 | 15·5 | 86·4 |
| Waltham Watch Co., U.S.A. | 11076761 | D.r., g.b., s.o. | +3·3 | +1·5 | +1·3 | −0·6 | +1·8 | 37 | 40 | 7·5 | 32·6 | 36·4 | 17·3 | 86·3 |
| B. Bonniksen, Coventry | 57510 | S.r., g.b., s.o., "Karrusel" | +3·3 | +4·1 | +3·0 | +0·9 | +2·6 | 44 | 26 | 6·0 | 31·2 | 36·8 | 18·2 | 86·2 |
| Patek Philippe & Co., Geneva | 119109 | D.r., g.b., s.o., "Bar lever" | +1·4 | +2·7 | +2·1 | +3·9 | +4·0 | 34 | 52 | 6·0 | 33·3 | 36·3 | 16·5 | 86·1 |
| A. E. Fridlander, Coventry | 25642 | S.r., g.b., s.o., "Non-magnetic" "Karrusel" | +2·3 | +2·4 | +2·6 | +6·1 | +4·9 | 33 | 24 | 6·5 | 33·5 | 34·1 | 18·4 | 86·0 |
| Andrew Taylor, London | 1092 | S.r., g.b., s.o. | −0·0 | −4·3 | −0·9 | −1·9 | −2·9 | 39 | 16 | 6·0 | 32·2 | 34·8 | 19·0 | 86·0 |
| Vacheron & Constantin, Geneva | 327858 | D.r., g.b., s.o., "Bar lever" | −1·4 | −1·8 | −3·1 | −2·6 | −2·7 | 44 | 47 | 4·0 | 31·3 | 37·7 | 16·8 | 85·8 |
| Wright & Craighead, London | 8330 | S.r., g.b., s.o., "Karrusel" | +1·1 | +1·2 | +1·4 | +3·9 | +1·5 | 25 | 95 | 5·0 | 35·1 | 36·7 | 13·7 | 85·5 |
| Robert Milne, Manchester | 1387 | S.r., g.b., s.o., "Karrusel, Invar balance" | +6·0 | +4·4 | +5·1 | +2·4 | +6·9 | 34 | 43 | 5·7 | 33·3 | 35·0 | 17·1 | 85·4 |
| Carley & Clemence, London | 51606 | D.r., g.b., d.o., "Annular Tourbillon lever | +1·2 | +1·2 | +0·2 | +0·1 | −0·5 | 34 | 80 | 5·2 | 33·2 | 37·5 | 14·7 | 85·4 |
| Waltham Watch Co., U.S.A. | 12072517 | D.r., g.b., s.o. | −1·6 | −1·6 | −3·3 | −1·2 | −0·4 | 42 | 55 | 4·7 | 31·7 | 37·4 | 16·3 | 85·4 |
| Vacheron & Constantin, Geneva | 332118 | D.r., g.b., s.o., "Bar lever" | −3·4 | −2·9 | −3·6 | −2·8 | −1·7 | 52 | 35 | 3.8 | 29·6 | 38·0 | 17·7 | 85·3 |
| Robert Milne, Manchester | 1391 | S.r., g.b., s.o., "Karrusel, Invar balance" | +1·9 | +1·3 | −0·2 | +3·4 | 0·0 | 30 | 68 | 5·5 | 34·0 | 35·5 | 15·5 | 85·0 |
| B. Bonniksen, Coventry | 57509 | S.r., g.b., s.o., "Karrusel" | +1·1 | +1·8 | +1·5 | +3·2 | +3·8 | 36 | 59 | 5·7 | 32·8 | 36·1 | 16·1 | 85·0 |
| Waltham Watch Co., U.S.A. | 11500167 | D.r., g.b., s.o. | +1·5 | −2·0 | +0·5 | +2·7 | −0·6 | 39 | 26 | 7·2 | 32·2 | 34·5 | 18·3 | 85·0 |

s.r. = single roller ; d.r. = double roller. + for gaining rate.
s.o. = " overcoil ; d.o. = " overcoil. − " losing rate.

## APPENDIX IV.—TABLE II.

Highest Marks obtained by Complicated Watches during the year. 1905.

| Description of watch. | Number. | Deposited by | Marks awarded for | | | Total Marks. |
|---|---|---|---|---|---|---|
| | | | Variation. | Position. | Temperature. | |
| | | | 0—40 | 0—40 | 0—20 | 0—100 |
| Minute repeater, perpetual calendar, phases of moon, Tourbillon | 190119<br>09128 | Chas. Frodsham & Co., London | 33·4 | 37·8 | 15·8 | 87·0 |
| Minute and seconds chronograph and minute repeater | 6982 | Audemars Piguet & Co., London | 29·1 | 32·2 | 10·7 | 72·0 |
| | 2541 | J. W. Benson, London | 29·6 | 28·4 | 12·5 | 70·5 |
| Minute and split seconds chronograph | 203021 | Stauffer, Son & Co., London | 33·4 | 35·6 | 19·0 | 88·0 |
| | 200344 | ,, ,, ,, | 31·2 | 35·1 | 16·1 | 82·4 |
| | 187883 | ,, ,, ,, | 34·2 | 31·5 | 16·6 | 82·3 |
| | 1901–20<br>306 | S. Smith & Son, London | 31·4 | 35·7 | 14·9 | 82·0 |
| Minute and seconds chronograph | 57382 | B. Bonniksen, Coventry | 32·8 | 35·3 | 16·1 | 84·2 |
| | 2930 | Audemars Piguet & Co., London | 28·7 | 37·2 | 15·9 | 81·8 |
| | 178066 | Stauffer, Son & Co., London | 30·7 | 35·2 | 14·8 | 80·7 |
| Minute repeater | 2465 | H. Golay, London | 29·2 | 32·2 | 14·6 | 76·0 |
| | 2305 | A. Smythson, London | 28·5 | 31·7 | 13·8 | 74·0 |
| "Non-magnetic" | 25642 | A. E. Fridlander, Coventry | 33·5 | 34·1 | 18·4 | 86·0 |
| | 190–259 | S. Smith & Son, London | 29·0 | 36·1 | 16·1 | 81·2 |

## APPENDIX V.

### MAGNETIC OBSERVATIONS, 1905, FALMOUTH OBSERVATORY.

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

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### 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 6th January, 1905. The following values of the ordinates of the photographic curves were then found :—

Declination, 1 cm. = 0° 11′·7.
Bifilar, 1 cm. $\delta$ H. = 0·00052 C.G.S. unit.
Balance, 1 cm. $\delta$ V. = 0·00049 C.G.S. unit.

On 31st January, 1905, the position of the Vertical Force trace was altered, and a second series of deflections of the Vertical Force Magnet was made, the result being

Balance, 1 cm. $\delta$ V. = 0·00052 C.G.S. unit.

Deflections of the Horizontal and Vertical Force Magnets were again made on December 30th, when the scale values were found to be

Bifilar, 1 cm. $\delta$ H. = 0·00053 C.G.S. unit.
Balance, 1 cm. $\delta$ V. = 0·00073 C.G.S. unit.

The principal variations of the Magnetic Curves that were recorded took place on the following dates:—January 5; February 3; March 2; April 1; November 12, 15, 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, 50.
,, Inclination, 47.
,, Declination, 47.

The mean values of the Magnetic Elements for the year 1905 are as follows :—

Declination, 18° 8′·4 W.; Horizontal Force, 0·18749 C.G.S.; Vertical Force, 0·43328 C.G.S.; Inclination, 66° 36′·1 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.*

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* The 10 a.m. Vertical Force data in Table V for 1904 require correction as follows :—
February, for 411 read 421; Winter mean, for 404 read 406; Mean Winter Diurnal Inequality, for − ·00005 read − ·00003; Mean Annual Diurnal Inequality, for − ·00006 read − ·00005.

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.*

Mr. Baker inspected the Magnetographs and absolute instruments in October, 1905. He reports that the H.F. Curves were satisfactory. On the Declination Curves disturbances due in part to heavy traffic on the road are noticeable; the Vertical Force Curves show a distinct improvement on those of previous years. The absolute instruments were found to be in good order, but it seemed desirable to fit a new suspension to the H.F. mirror magnet, as the results showed some slight irregularities which were traced to varying torsion. Mr. Baker's own observations agreed with those of Mr. Kitto.

R. T. G.

Table I.—Hourly Means of Declination at Falmouth on Five selected Quiet Days

| Hours ..... | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (18° + West.) | | | | Winter. | | | | | | | | |
| 1905. | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| January ..... | 7·3 | 7·6 | 8·0 | 8·0 | 8·0 | 8·2 | 7·7 | 7·5 | 7·4 | 6·9 | 7·3 | 8·5 | 8·7 |
| February ..... | 6·9 | 6·3 | 6·6 | 7·1 | 7·2 | 7·0 | 6·8 | 6·6 | 6·1 | 5·4 | 5·7 | 7·1 | 9·1 |
| March ..... | 6·5 | 6·3 | 6·4 | 6·6 | 6·4 | 6·3 | 5·7 | 5·3 | 3·6 | 2·7 | 4·1 | 7·5 | 11·0 |
| October..... | 8·0 | 8·3 | 8·0 | 7·9 | 8·0 | 7·8 | 7·4 | 6·5 | 5·4 | 4·9 | 6·5 | 9·6 | 12·6 |
| November..... | 6·0 | 6·1 | 6·0 | 6·4 | 6·3 | 6·2 | 5·7 | 5·4 | 4·5 | 3·7 | 4·3 | 6·4 | 9·0 |
| December..... | 7·3 | 7·3 | 7·5 | 7·6 | 7·5 | 7·3 | 7·2 | 7·1 | 6·8 | 6·5 | 7·4 | 8·5 | 9·6 |
| Means ..... | 7·0 | 7·0 | 7·1 | 7·3 | 7·2 | 7·1 | 6·8 | 6·4 | 5·6 | 5·0 | 5·9 | 7·9 | 10·0 |
| | | | | | Summer. | | | | | | | | |
| 1905. | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| April ..... | 6·8 | 6·2 | 6·1 | 6·4 | 6·1 | 5·9 | 5·7 | 4·7 | 2·9 | 2·2 | 3·3 | 5·6 | 9·1 |
| May ..... | 9·9 | 9·4 | 9·5 | 9·2 | 9·1 | 8·1 | 7·1 | 5·9 | 4·9 | 5·4 | 7·7 | 10·9 | 14·2 |
| June ..... | 8·2 | 8·4 | 7·9 | 7·4 | 7·3 | 6·1 | 4·8 | 3·8 | 3·7 | 4·3 | 6·6 | 9·3 | 11·6 |
| July ..... | 9·3 | 9·2 | 8·8 | 9·3 | 8·7 | 7·6 | 6·3 | 5·2 | 4·5 | 5·0 | 7·0 | 10·0 | 13·8 |
| August .. ..... | 8·8 | 8·5 | 8·6 | 8·5 | 8·0 | 7·3 | 6·0 | 5·0 | 4·8 | 5·6 | 8·8 | 11·9 | 15·3 |
| September ... | 7·6 | 7·7 | 7·3 | 7·1 | 7·1 | 6·8 | 6·3 | 5·2 | 4·7 | 6·0 | 8·7 | 11·7 | 13·9 |
| Means ..... | 8·4 | 8·2 | 8·0 | 8·0 | 7·7 | 7·0 | 6·0 | 5·0 | 4·3 | 4·8 | 7·0 | 9·9 | 13·0 |

Table II.—Diurnal Inequality of the Falmouth

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

Observatory, determined from the Magnetograph Curves in each Month, 1905.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Winter. | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 11·0 | 11·3 | 10·4 | 9·7 | 8·6 | 8·4 | 8·3 | 8·1 | 7·6 | 7·6 | 7·3 | 7·2 |
| 10·4 | 11·6 | 11·2 | 9·9 | 9·3 | 8·3 | 8·1 | 7·8 | 7·5 | 7·8 | 7·5 | 7·9 |
| 13·4 | 14·3 | 13·0 | 10·6 | 8·9 | 8·2 | 7·9 | 7·4 | 7·1 | 6·4 | 5·5 | 5·7 |
| 13·8 | 13·5 | 12·0 | 10·2 | 9·2 | 9·1 | 8·5 | 8·3 | 7·8 | 7·7 | 7·7 | 7·7 |
| 10·3 | 10·6 | 9·4 | 8·2 | 7·7 | 7·4 | 6·4 | 6·2 | 5·8 | 5·6 | 5·4 | 5·5 |
| 10·4 | 10·4 | 9·6 | 9·2 | 8·5 | 7·9 | 7·7 | 7·7 | 7·5 | 7·6 | 7·5 | 7·6 |
| 11·6 | 12·0 | 10·9 | 9·6 | 8·7 | 8·2 | 7·8 | 7·6 | 7·2 | 7·1 | 6·8 | 6·9 |
| | | | | | Summer. | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 11·5 | 12·2 | 11·9 | 9·4 | 8·4 | 7·7 | 7·2 | 7·2 | 6·9 | 6·5 | 6·2 | 6·4 |
| 15·7 | 15·8 | 14·6 | 13·0 | 11·3 | 10·2 | 9·8 | 9·8 | 9·9 | 9·6 | 9·6 | 9·9 |
| 12·8 | 13·2 | 12·1 | 10·8 | 9·5 | 8·6 | 8·5 | 8·8 | 8·6 | 8·4 | 8·4 | 8·3 |
| 16·2 | 17·0 | 16·1 | 14·7 | 12·6 | 11·1 | 10·1 | 9·6 | 9·7 | 9·7 | 9·5 | 9·7 |
| 16·7 | 15·7 | 13·9 | 11·8 | 10·0 | 8·6 | 8·3 | 8·7 | 8·8 | 8·8 | 8·6 | 8·6 |
| 15·4 | 15·5 | 13·3 | 11·0 | 9·2 | 8·6 | 9·1 | 8·7 | 8·5 | 8·5 | 8·1 | 8·4 |
| 14·7 | 14·9 | 13·7 | 11·8 | 10·2 | 9·1 | 8·8 | 8·8 | 8·7 | 8·6 | 8·4 | 8·6 |

Declination as deduced from Table I.

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

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

| Hours ..... | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0·18000 + (C.G.S. units). | | | | | | Winter. | | | | | | | |
| 1905. | | | | | | | | | | | | | |
| January ..... | 727 | 729 | 729 | 729 | 731 | 733 | 733 | 733 | 732 | 729 | 723 | 720 | 720 |
| February ..... | 728 | 727 | 727 | 727 | 729 | 730 | 729 | 732 | 732 | 724 | 718 | 714 | 713 |
| March ..... | 733 | 733 | 731 | 731 | 732 | 731 | 732 | 733 | 727 | 717 | 710 | 707 | 709 |
| October ..... | 753 | 752 | 751 | 751 | 751 | 752 | 751 | 748 | 739 | 725 | 718 | 716 | 726 |
| November ... | 772 | 772 | 772 | 772 | 773 | 774 | 774 | 772 | 767 | 758 | 749 | 745 | 746 |
| December ... | 755 | 754 | 754 | 754 | 755 | 756 | 758 | 757 | 756 | 750 | 744 | 741 | 741 |
| Means ..... | 745 | 745 | 744 | 744 | 745 | 746 | 746 | 746 | 742 | 734 | 727 | 724 | 726 |
| | | | | | | Summer. | | | | | | | |
| 1905. | | | | | | | | | | | | | |
| April ..... | 739 | 739 | 735 | 736 | 736 | 736 | 736 | 736 | 733 | 725 | 715 | 713 | 719 |
| May ..... | 762 | 761 | 761 | 760 | 760 | 759 | 756 | 750 | 743 | 734 | 731 | 734 | 736 |
| June ..... | 766 | 764 | 761 | 761 | 761 | 760 | 756 | 747 | 740 | 735 | 735 | 738 | 745 |
| July ..... | 772 | 769 | 769 | 769 | 769 | 769 | 765 | 758 | 751 | 747 | 740 | 738 | 746 |
| August ..... | 769 | 764 | 763 | 763 | 763 | 763 | 759 | 752 | 742 | 732 | 731 | 735 | 744 |
| September ... | 768 | 768 | 767 | 765 | 765 | 764 | 760 | 754 | 745 | 739 | 735 | 737 | 745 |
| Means ..... | 763 | 761 | 759 | 759 | 759 | 759 | 755 | 750 | 742 | 735 | 731 | 733 | 739 |

Table IV.—Diurnal Inequality of the Falmouth

| Hrs. | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Summer Means. | | | | | | | |
| | + ·00007 | + ·00005 | + ·00003 | + ·00003 | + ·00003 | + ·00003 | − ·00001 | − ·00006 | − ·00014 | − ·00021 | − ·00025 | − ·00023 | − ·00017 |
| | | | | | | Winter Means. | | | | | | | |
| | + ·00003 | + ·00003 | + ·00002 | + ·00002 | + ·00003 | + ·00004 | + ·00004 | + ·00004 | ·00000 | − ·00008 | − ·00015 | − ·00018 | − ·00016 |
| | | | | | | Annual Means. | | | | | | | |
| | + ·00005 | + ·00004 | + ·00003 | + ·00003 | + ·00003 | + ·00004 | + ·00002 | − ·00001 | − ·00007 | − ·00015 | − ·00020 | − ·00021 | − ·00017 |

Observatory determined from the Magnetograph Curves on each Month, 1905.

| 1. | 2. | 3. | 4. | 5 | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter. | | | | | | | | | | | |
| 723 | 728 | 727 | 728 | 729 | 731 | 733 | 734 | 734 | 733 | 731 | 730 |
| 718 | 720 | 722 | 720 | 722 | 725 | 730 | 731 | 731 | 731 | 731 | 731 |
| 716 | 726 | 727 | 732 | 734 | 735 | 741 | 740 | 742 | 739 | 734 | 733 |
| 736 | 744 | 749 | 752 | 755 | 758 | 760 | 760 | 759 | 758 | 759 | 758 |
| 752 | 757 | 763 | 767 | 771 | 772 | 773 | 775 | 775 | 774 | 774 | 773 |
| 747 | 751 | 752 | 753 | 757 | 758 | 758 | 757 | 756 | 756 | 756 | 756 |
| 732 | 738 | 740 | 742 | 745 | 747 | 749 | 750 | 750 | 749 | 748 | 747 |
| Summer. | | | | | | | | | | | |
| 726 | 729 | 735 | 737 | 738 | 742 | 742 | 741 | 740 | 740 | 738 | 741 |
| 747 | 754 | 761 | 764 | 769 | 772 | 772 | 770 | 769 | 769 | 765 | 764 |
| 750 | 758 | 765 | 768 | 770 | 772 | 774 | 776 | 772 | 771 | 769 | 769 |
| 753 | 763 | 772 | 778 | 778 | 780 | 780 | 780 | 778 | 776 | 775 | 774 |
| 757 | 759 | 763 | 763 | 766 | 768 | 771 | 774 | 774 | 772 | 770 | 768 |
| 753 | 759 | 759 | 764 | 765 | 769 | 773 | 774 | 770 | 770 | 771 | 769 |
| 744 | 754 | 759 | 762 | 764 | 767 | 769 | 769 | 767 | 766 | 765 | 764 |

Horizontal Force as deduced from Table III.

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

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

| Hours ..... | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0·43000 + (C.G.S. units). | | | | | | Winter. | | | | | | | |
| 1905. | | | | | | | | | | | | | |
| January ..... | 373 | 372 | 373 | 373 | 373 | 372 | 373 | 373 | 373 | 373 | 369 | 367 | 368 |
| February ..... | 351 | 350 | 349 | 349 | 349 | 349 | 348 | 347 | 348 | 347 | 346 | 339 | 337 |
| March ..... | 335 | 336 | 335 | 336 | 337 | 337 | 337 | 339 | 340 | 338 | 332 | 324 | 318 |
| October..... | 287 | 288 | 290 | 291 | 291 | 291 | 291 | 292 | 292 | 291 | 285 | 276 | 275 |
| November ... | 319 | 319 | 319 | 319 | 318 | 318 | 318 | 318 | 318 | 318 | 314 | 308 | 309 |
| December..... | 313 | 313 | 312 | 311 | 310 | 309 | 308 | 308 | 309 | 310 | 309 | 308 | 309 |
| Means ..... | 330 | 330 | 330 | 330 | 330 | 329 | 329 | 330 | 330 | 330 | 326 | 320 | 319 |
| | | | | | | Summer. | | | | | | | |
| 1905. | | | | | | | | | | | | | |
| April ..... | 354 | 355 | 355 | 355 | 356 | 355 | 355 | 356 | 357 | 352 | 347 | 339 | 333 |
| May ..... | 321 | 322 | 323 | 324 | 325 | 325 | 325 | 323 | 320 | 314 | 305 | 295 | 294 |
| June ..... | 330 | 329 | 330 | 331 | 330 | 333 | 333 | 333 | 330 | 325 | 320 | 314 | 314 |
| July ..... | 336 | 336 | 337 | 337 | 338 | 339 | 339 | 338 | 336 | 332 | 328 | 324 | 322 |
| August ..... | 324 | 325 | 325 | 326 | 327 | 327 | 329 | 330 | 329 | 325 | 320 | 312 | 309 |
| September ... | 317 | 317 | 317 | 317 | 317 | 317 | 317 | 318 | 316 | 310 | 306 | 301 | 302 |
| Means ..... | 330 | 331 | 331 | 332 | 332 | 333 | 333 | 333 | 331 | 326 | 321 | 314 | 312 |

Table VI.—Diurnal Inequality of the Falmouth

| Hours | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer Means. | | | | | | | | | | | | | |
| | + ·00001 | + ·00002 | + ·00002 | + ·00003 | + ·00003 | + ·00004 | + ·00004 | + ·00004 | + ·00002 | − ·00003 | − ·00008 | − ·00015 | − ·00017 |
| Winter Means. | | | | | | | | | | | | | |
| | + ·00002 | + ·00002 | + ·00002 | + ·00002 | + ·00002 | + ·00001 | + ·00001 | + ·00001 | + ·00002 | + ·00001 | − ·00002 | − ·00008 | − ·00009 |
| Annual Means. | | | | | | | | | | | | | |
| | + ·00002 | + ·00002 | + ·00002 | + ·00002 | + ·00002 | + ·00003 | + ·00003 | + ·00003 | + ·00002 | − ·00001 | − ·00005 | − ·00011 | − ·00013 |

Observatory, determined from the Magnetograph Curves on during 1905. (Mean for the Year = 0·43328).

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter. | | | | | | | | | | | |
| 368 | 371 | 374 | 375 | 375 | 373 | 371 | 371 | 370 | 370 | 370 | 370 |
| 338 | 339 | 342 | 346 | 348 | 348 | 347 | 345 | 344 | 343 | 342 | 341 |
| 321 | 327 | 335 | 340 | 342 | 340 | 340 | 338 | 337 | 336 | 337 | 337 |
| 278 | 284 | 292 | 296 | 295 | 294 | 294 | 292 | 291 | 290 | 289 | 288 |
| 312 | 317 | 321 | 323 | 324 | 322 | 321 | 320 | 319 | 318 | 317 | 317 |
| 310 | 313 | 314 | 313 | 312 | 310 | 309 | 308 | 307 | 307 | 308 | 308 |
| 321 | 325 | 330 | 332 | 333 | 331 | 330 | 329 | 328 | 327 | 327 | 327 |
| Summer. | | | | | | | | | | | |
| 334 | 341 | 350 | 354 | 357 | 358 | 359 | 359 | 358 | 357 | 356 | 356 |
| 297 | 305 | 315 | 321 | 325 | 325 | 323 | 322 | 320 | 320 | 318 | 319 |
| 318 | 324 | 330 | 335 | 337 | 337 | 337 | 336 | 335 | 333 | 333 | 334 |
| 322 | 327 | 335 | 340 | 344 | 345 | 346 | 344 | 342 | 341 | 341 | 341 |
| 311 | 316 | 324 | 328 | 330 | 332 | 331 | 329 | 328 | 326 | 327 | 326 |
| 305 | 312 | 318 | 322 | 320 | 318 | 315 | 314 | 313 | 312 | 311 | 311 |
| 315 | 321 | 329 | 333 | 336 | 336 | 335 | 334 | 333 | 332 | 331 | 331 |

Vertical Force as deduced from Table V.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Summer Means. | | | | | | | | | | | |
| − ·00014 | − ·00008 | ·00000 | + ·00004 | + ·00007 | + ·00007 | + ·00006 | + ·00005 | + ·00004 | + ·00003 | + ·00002 | + ·00002 |
| Winter Means. | | | | | | | | | | | |
| − ·00007 | − ·00003 | + ·00002 | + ·00004 | + ·00005 | + ·00003 | + ·00002 | + ·00001 | ·00000 | − ·00001 | − ·00001 | − ·00001 |
| Annual Means. | | | | | | | | | | | |
| − ·00011 | − ·00005 | + ·00001 | + ·00004 | + ·00006 | + ·00005 | + ·00004 | + ·00003 | + ·00002 | + ·00001 | + ·00001 | + ·00001 |

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

| Hours ..... | Mid. | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Noon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (66° + | | ) | | | Winter. | | | | | | | |
| 1905. | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| January ..... | 38·8 | 38·7 | 38·7 | 38·7 | 38·5 | 38·4 | 38·4 | 38·4 | 38·5 | 38·7 | 39·0 | 39·1 | 39·1 |
| February ..... | 38·1 | 38·2 | 38·1 | 38·1 | 38·0 | 37·9 | 38·0 | 37·7 | 37·8 | 38·3 | 38·6 | 38·7 | 38·7 |
| March ..... | 37·3 | 37·3 | 37·5 | 37·5 | 37·4 | 37·5 | 37·4 | 37·4 | 37·9 | 38·5 | 38·8 | 38·7 | 38·4 |
| October ..... | 34·6 | 34·7 | 34·8 | 34·8 | 34·8 | 34·8 | 34·8 | 35·1 | 35·7 | 36·6 | 36·9 | 36·7 | 36·1 |
| November ... | 34·2 | 34·2 | 34·2 | 34·2 | 34·2 | 34·1 | 34·1 | 34·2 | 34·6 | 35·2 | 35·6 | 35·7 | 35·7 |
| December..... | 35·2 | 35·3 | 35·2 | 35·2 | 35·1 | 35·0 | 34·9 | 34·9 | 35·0 | 35·5 | 35·8 | 36·0 | 36·0 |
| Means..... | 36·4 | 36·4 | 36·4 | 36·4 | 36·3 | 36·3 | 36·3 | 36·3 | 36·6 | 37·1 | 37·4 | 37·5 | 37·3 |
| | | | | | | Summer. | | | | | | | |
| 1905. | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| April ..... | 37·5 | 37·5 | 37·8 | 37·7 | 37·7 | 37·7 | 37·7 | 37·7 | 38·0 | 38·3 | 38·9 | 38·8 | 38·2 |
| May ..... | 35·0 | 35·1 | 35·1 | 35·2 | 35·2 | 35·3 | 35·5 | 35·8 | 36·2 | 36·7 | 36·6 | 36·1 | 35·9 |
| June ..... | 35·0 | 35·1 | 35·3 | 35·3 | 35·3 | 35·5 | 35·7 | 36·3 | 36·7 | 36·9 | 36·7 | 36·4 | 35·9 |
| July ..... | 34·7 | 34·9 | 35·0 | 35·0 | 35·0 | 35·0 | 35·3 | 35·7 | 36·1 | 36·3 | 36·6 | 36·7 | 36·1 |
| August ..... | 34·6 | 35·0 | 35·0 | 35·1 | 35·1 | 35·1 | 35·4 | 35·9 | 36·5 | 37·1 | 37·0 | 36·5 | 35·8 |
| September ... | 34·5 | 34·5 | 34·5 | 34·7 | 34·7 | 34·7 | 35·0 | 35·4 | 36·0 | 36·2 | 36·3 | 36·1 | 35·6 |
| Means..... | 35·2 | 35·3 | 35·4 | 35·5 | 35·5 | 35·5 | 35·8 | 36·1 | 36·6 | 36·9 | 37·0 | 36·8 | 36·2 |

Table VIII.—Diurnal Inequality of the Falmouth

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

Observatory, calculated from Tables III. and V.
Year = 66°·36′·1).

| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | Mid. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter. | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 38·9 | 38·7 | 38·8 | 38·8 | 38·7 | 38·5 | 38·4 | 38·3 | 38·3 | 38·3 | 38·5 | 38·5 |
| 38·4 | 38·3 | 38·3 | 38·5 | 38·4 | 38·2 | 37·9 | 37·7 | 37·7 | 37·7 | 37·7 | 37·6 |
| 38·0 | 37·6 | 37·7 | 37·5 | 37·5 | 37·3 | 36·9 | 36·9 | 36·8 | 36·9 | 37·3 | 37·4 |
| 35·5 | 35·1 | 35·0 | 34·9 | 34·7 | 34·5 | 34·3 | 34·3 | 34·3 | 34·3 | 34·2 | 34·3 |
| 35·4 | 35·2 | 34·9 | 34·7 | 34·5 | 34·3 | 34·2 | 34·1 | 34·0 | 34·1 | 34·1 | 34·1 |
| 35·7 | 35·5 | 35·4 | 35·3 | 35·1 | 34·9 | 34·9 | 34·9 | 35·0 | 35·0 | 35·0 | 35·0 |
| 37·0 | 36·7 | 36·7 | 36·6 | 36·5 | 36·3 | 36·1 | 36·0 | 36·0 | 36·0 | 36·1 | 36·1 |
| Summer. | | | | | | | | | | | |
| ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ |
| 37·8 | 37·8 | 37·6 | 37·6 | 37·6 | 37·4 | 37·4 | 37·5 | 37·5 | 37·5 | 37·6 | 37·4 |
| 35·3 | 35·1 | 34·9 | 34·8 | 34·6 | 34·4 | 34·4 | 34·5 | 34·5 | 34·5 | 34·7 | 34·8 |
| 35·7 | 35·3 | 35·0 | 35·0 | 34·9 | 34·8 | 34·6 | 34·5 | 34·7 | 34·7 | 34·9 | 34·9 |
| 35·6 | 35·1 | 34·7 | 34·5 | 34·6 | 34·5 | 34·5 | 34·4 | 34·5 | 34·6 | 34·7 | 34·8 |
| 35·0 | 35·0 | 35·0 | 35·1 | 35·0 | 34·9 | 34·7 | 34·4 | 34·4 | 34·5 | 34·6 | 34·7 |
| 35·1 | 34·9 | 35·1 | 34·9 | 34·7 | 34·4 | 34·1 | 34·0 | 34·2 | 34·2 | 34·1 | 34·2 |
| 35·7 | 35·5 | 35·4 | 35·3 | 35·2 | 35·1 | 34·9 | 34·9 | 35·0 | 35·0 | 35·1 | 35·1 |

Inclination as deduced from Table VII.

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

## APPENDIX VI.

## MAGNETIC OBSERVATIONS MADE AT THE VALENCIA OBSERVATORY, CAHIRCIVEEN, 1905.

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

The absolute observations of Declination, Inclination, and Horizontal Force, have been made without interruption during the year. Complete sets, at about two weeks interval, were made each month, and their means are taken as the monthly value.

The Antarctic observations being concluded and there being no occasion to keep the term days, the dates from March are so arranged as to bring the mean date as near as possible to the middle of the month.

At the request of Dr. Bauer, and with the approval of Lord Rosse and the Director of the Meteorological Office, scale readings of the Declination magnet were made every minute from 10 a.m. to 4 p.m. G.M.T. on August 30th, during the Solar Eclipse, the observations being sent to Washington and duly acknowledged.

On October 1st, Mr. T. W. Baker, of the National Physical Laboratory, inspected the work and made an independent set of observations, which being in close accord with my own are included in the tables.

The mean times of observing are as in previous years—Declination, 10 a.m.; Horizontal Force, noon; and Inclination, 1 p.m.

The secular change is, Declination $-4'{\cdot}8$; Inclination $-1'{\cdot}7$; Horizontal Force $+{\cdot}00008$; Vertical Force $-{\cdot}00046$; Total Force $-{\cdot}00040$.

J. E. CULLUM,
*Observer and Superintendent.*

The instruments were inspected by Mr. Baker in October, 1905, and appeared in good order. Observations made by Mr. Baker on October 1st, for Horizontal Force, Declination and Inclination were in accordance with Mr. Cullum's results.

R. T. G.

Table I.—Declination at Valencia Observatory, 1905.
(Dover Unifilar 139.)

| Date. | Declination, West. | Monthly Mean. | Remarks. |
|---|---|---|---|
| | ° ′ | ° ′ | |
| January 2 ... | 21 12·3 | — | |
| ,, 14 ... | 21 12·1 | 21 12·2 | |
| February 1 ... | 21 11·2 | — | |
| ,, 15 ... | 21 12·5 | 21 11·9 | |
| March 7 ... | 21 10·5 | — | |
| ,, 8 ... | 21 14·4 | — | |
| ,, 21 ... | 21 12·8 | 21 12·6 | |
| April 6 ... | 21 8·9 | — | |
| ,, 24 ... | 21 8·9 | 21 8·9 | |
| May 8 ... | 21 10·2 | — | |
| ,, 22 ... | 21 7·3 | 21 8·8 | |
| June 7 ... | 21 9·7 | — | |
| ,, 22 ... | 21 9·7 | 21 9·7 | |
| July 6 ... | 21 5·5 | — | |
| ,, 25 ... | 21 7·3 | 21 6·4 | |
| August 7 ... | 21 12·2 | — | |
| ,, 21 ... | 21 11·1 | 21 11·7 | |
| September 7 ... | 21 8·3 | — | |
| ,, 21 ... | 21 13·4 | 21 10·9 | |
| October 1 ... | 21 15·3 | — | Inspection observation |
| ,, 9 ... | 21 9·6 | — | |
| ,, 23 ... | 21 6·8 | 21 10·6 | |
| November 6 ... | 21 10·1 | — | |
| ,, 27 ... | 21 9·5 | 21 9·8 | |
| December 8 ... | 21 10·0 | — | |
| ,, 20 ... | 21 12·3 | 21 11·2 | |
| Mean ... | at 10 a.m., G.M.T. | 21 10·4 | |

Table II.—Inclination at Valencia Observatory, 1905.
(Dover Circle 118.)

| Date. | Mean of two needles. | Monthly Mean. | Remarks. |
|---|---|---|---|
| | ° ′ | ° ′ | |
| January 2 ... | 68 17·6 | — | |
| ,, 14 ... | 68 19·3 | 68 18·5 | |
| February 1 ... | 68 20·9 | — | |
| ,, 15 ... | 68 17·8 | 68 19·3 | |
| March 7 ... | 68 24·1 | — | |
| ,, 8 ... | 68 20·9 | — | |
| ,, 21 ... | 68 17·8 | 68 20·9 | |
| April 6 ... | 68 19·9 | — | |
| ,, 24 ... | 68 19·2 | 68 19·6 | |
| May 8 ... | 68 18·6 | — | |
| ,, 22 ... | 68 19·9 | 68 19·2 | |
| June 7 ... | 68 17·3 | — | |
| ,, 22 ... | 68 17·7 | 68 17·5 | |
| July 6 ... | 68 18·9 | — | |
| ,, 25 ... | 68 19·1 | 68 19·0 | |
| August 7 ... | 68 20·5 | — | |
| ,, 21 ... | 68 18·0 | 68 19·2 | |
| September 7 ... | 68 17·7 | — | |
| ,, 21 ... | 68 20·3 | 68 19·0 | |
| October 1 ... | 68 19·2 | — | Inspection observation |
| ,, 9 ... | 68 18·5 | — | |
| ,, 23 ... | 68 19·7 | 68 19·1 | |
| November 6 ... | 68 18·9 | — | |
| ,, 27 ... | 68 19·9 | 68 19·4 | |
| December 8 ... | 68 19·4 | — | |
| ,, 20 ... | 68 18·8 | 68 19·1 | |
| Mean ... | at 1 p.m., G.M.T. | 68 19·2 | |

Table III.—Magnetic Force (C.G.S.) at Valencia Observatory, 1905.
(Dover Unifilar 139, and Circle 118.)

| Date. | H.F. | Mean. | V.F. H.F. × Tan Dip. | T.F. H.F. × Sec. Dip. |
|---|---|---|---|---|
| January 2 ... ... | 0·17863 | — | — | — |
| ,, 14 ... ... | 0·17840 | 0·17852 | 0·44879 | 0·48299 |
| February 1 ... ... | 0·17838 | — | — | — |
| ,, 15 ... ... | 0·17845 | 0·17841 | 0·44882 | 0·48298 |
| March 7 ... ... | 0·17796 | — | — | — |
| ,, 8 ... ... | 0·17821 | — | — | — |
| ,, 21 ... ... | 0·17841 | 0·17819 | 0·44887 | 0·48295 |
| April 6 ... ... | 0·17827 | — | — | — |
| ,, 24 ... ... | 0·17863 | 0·17845 | 0·44903 | 0·48320 |
| May 8 ... ... | 0·17854 | — | — | — |
| ,, 22 ... ... | 0·17871 | 0·17863 | 0·44933 | 0·48354 |
| June 7 ... ... | 0·17878 | — | — | — |
| ,, 22 ... ... | 0·17865 | 0·17871 | 0·44889 | 0·48315 |
| July 6 ... ... | 0·17864 | — | — | — |
| ,, 25 ... ... | 0·17848 | 0·17856 | 0·44908 | 0·48328 |
| August 7 ... ... | 0·17819 | — | — | — |
| ,, 21 ... ... | 0·17839 | 0·17829 | 0·44848 | 0·48262 |
| September 7 ... ... | 0·17826 | — | — | — |
| ,, 21 ... ... | 0·17829 | 0·17828 | 0·44838 | 0·48252 |
| October 1 ... ... | 0·17834 | — | — | — |
| ,, 9 ... ... | 0·17863 | — | — | — |
| ,, 23 ... ... | 0·17856 | 0·17851 | 0·44899 | 0·48318 |
| November 6 ... ... | 0·17850 | — | — | — |
| ,, 27 ... ... | 0·17866 | 0·17858 | 0·44928 | 0·48347 |
| December 8 ... ... | 0·17871 | — | — | — |
| ,, 20 ... ... | 0·17849 | 0·17860 | 0·44922 | 0·48335 |
| Mean ... ... | at Noon, G.M.T. | 0·17848 | 0·44893 | 0·48310 |