

*Report of the Kew Committee for the Year ending
October 31, 1878.*

The Kew Committee has had its strength increased during the past year by the accession of two new members, Professor W. G. Adams and Professor G. C. Foster, and is now constituted as follows:—

General Sir E. Sabine, K.C.B., *Chairman.*

Mr. De La Rue, *Vice-Chairman.*

Prof. W. G. Adams.

Capt. Evans, C.B.

Prof. G. C. Foster.

Mr. F. Galton.

Vice-Adm. Sir G. H. Richards,
K.C.B.

The Earl of Rosse.

Mr. R. H. Scott.

Lieut.-General W. J. Smythe.

Lieut.-General R. Strachey,
C.S.I.

Mr. E. Walker.

Magnetic Work.—The Magnetographs have been in constant operation throughout the year, but only few magnetic disturbances have been registered, the period being one of almost continued magnetic calm. The most notable perturbation was that of May 15th.

The scale values of all the instruments were re-determined in January, in accordance with the usual practice.

A slight alteration has been made in the cases enclosing the horizontal and vertical force magnets; zinc cylinders with glass covers being substituted for the glass shades lined with gold-leaf previously employed, which were found to be very expensive to replace in case of breakage.

The tabulation of the magnetic curves has not been continued during the year, the time of the department being very fully occupied with the verification of magnetic instruments.

The Committee have referred the whole subject of the reduction of the accumulated magnetograph records to a Sub-Committee, with a view of considering what steps shall be taken to utilize them to the best advantage.

The monthly observations with the absolute instruments have been

made as usual by Mr. Figg, and the results are given in Tables appended to this Report.

The catalogue of the documents and papers in the late Magnetic Office, directed by Sir E. Sabine, having been completed, a selection was made of all those relating to marine observations, and at the request of the Hydrographer, these were transferred to the Hydrographic Department of the Admiralty.

The magnetic instruments have been examined and knowledge of their manipulation obtained by Lieutenants Speelman and van Hasselt, of the Dutch Navy; Professor Greene, of the United States Navy; M. Hooerman, of the Brussels Observatory; and Dr. T. E. Thorpe, F.R.S.

The latter gentleman made a series of base observations at Kew before and after an extended tour, for the purpose of a magnetic survey along the fortieth parallel of latitude in the United States.

A large magnet and a journeyman clock, the property of the Royal Observatory, Greenwich, which have been for many years at Kew, have been returned to the former establishment at the request of the Astronomer Royal.

Information on matters relating to terrestrial magnetism and various data have been supplied to the Hydrographic Office, Mr. Adie, Mr. Archbutt, Mr. Gordon, and Mr. Frost.

Meteorological Work.—The several self-recording instruments for the continuous registration respectively of pressure, temperature, humidity, wind (direction and velocity), and rain have been maintained in regular operation under the care of Mr. T. W. Baker, assisted by J. Hillier.

The daily standard eye observations, for the control of the automatic records have been made regularly, as well as daily observations in connexion with the Washington synchronous system.

The tabulation of the meteorological traces has been regularly carried on by Mr. Hawkesworth, and copies have been transmitted weekly to the Meteorological Office.

In compliance with a request made by the Meteorological Council to the Kew Committee, the Observatories at Aberdeen, Armagh, Falmouth, Glasgow, Stonyhurst, and Valencia have been visited and their instruments inspected by Mr. Whipple, who has also inspected the telegraph-reporting and climatological stations throughout Ireland, an allowance has been made by the Meteorological Office to Kew, for the time occupied by Mr. Whipple on this duty.

With the sanction of the Meteorological Council, weekly abstracts of the meteorological results have been regularly forwarded to and published by "the Times," "Illustrated London News," and "Mid-Surrey Times"; and meteorological data have been supplied amongst others to Mr. G. J. Symons, F.R.S., Dr. Rowland, Mr. Mawley, and the Institute of Mining Engineers.

Electrograph.—This instrument has been in almost continuous action through the year under the care of Mr. Harrison. Certain improvements in minor details, suggested by Sir W. Thomson, have been introduced from time to time.

It has been thought desirable to make a determination of the scale value of the instrument throughout the whole extent of its range. The Committee not possessing a sufficiently powerful battery for the purpose, the Electrometer was conveyed at Mr. De La Rue's suggestion to his Laboratory, where a complete determination of its scale value was made over the range of tension afforded by 1,200 chloride of silver cells. A detailed account of the experiment was afterwards laid before the Royal Society, and printed in the "Proceedings," vol. xxvii, p. 356.*

At the request of Professor Mascart, a typical set of curves, illustrating the action of the Electrograph during different kinds of weather, was reduced and engraved by the Pantagraph at the Meteorological Office, and forwarded for his use in illustration of the lectures he delivered before the Société Météorologique de France.

These engravings have since been reproduced, together with notes respecting the instrument, in a Report on Atmospheric Electricity, drawn up by Professor Everett, for the Permanent Committee of the Vienna Congress, which is about to be published by the authority of the Meteorological Council.

The late Captain R. G. Scott, R.E., and since his decease, Captain R. Y. Armstrong, R.E., visited the Observatory and inspected the working of the instrument with the view of possibly utilizing the Electrometer in the study of atmospheric electricity at the various torpedo stations round the coast.

Two Electrographs, similar in construction to the instrument at Kew, have been constructed by Mr. White, of Glasgow, and after examination at the Observatory, forwarded, the one to the Brussels Observatory, the other to Zi-ka-Wei, China.

Photoheliograph.—The re-examination of the measurements of the Kew sun-pictures, as noticed in former Reports, has been steadily carried on throughout the year by Mr. Whipple, assisted by Mr. M'Laughlin, who has been temporarily engaged for this purpose.

During the year upwards of 400 pictures have been measured, and it is hoped that the end of the series will be reached in the early months of 1879.

* With the view of rendering the indications of the instrument better adapted for treatment with the Harmonic Analyser, it is in contemplation to somewhat alter the existing bifilar suspension of the needle, and at the same time to adopt the new insulating stand devised by Professor Mascart ("Nature," vol. xviii, p. 44) will be substituted for the present supports of the water reservoir. These changes may cause a short discontinuity in the observations.

Mr. Marth is still engaged on the reduction to heliocentric elements of the pictures for 1864 to 1868 inclusive.

All of these operations have been conducted under the direction and at the expense of Mr. De La Rue.

The eye-observations of the sun, after the method of Hofrath Schwabe, have been made daily, when possible, as described in the Report for 1872, in order for the present to maintain the continuity of the Kew record of sun-spots.

Extra Observations.—The Solar-radiation Thermometers are still observed daily, and a new form of the instrument designed by Professor G. C. Foster, is at present undergoing trial.

The question of observing Solar Radiation having been referred by the Meteorological Council to the Kew Committee, a sub-committee has been appointed to take the whole subject into consideration.

The Campbell Sundial described in the 1875 Report, continues in action, and the improved form of the instrument, giving a separate record for every day, of the duration of sunshine, has been regularly worked throughout the year and its curves tabulated.

A paper comparing the relative amount of sunshine recorded by this instrument during the year 1877, with the amount registered at the Royal Observatory, Greenwich, by a similar apparatus, has been read by the Superintendent before the Meteorological Society, and published in their Quarterly Report, vol. iv, No. 28. It shows that the difference in the total duration of sunshine observed at the two stations, which amounted to 171 hours in the year, was in great measure due to the preponderance of westerly winds, which carry the smoke of the metropolis over the Royal Observatory.

A copy of the Kew instrument, constructed by Mr. Browning for the Brussels Observatory, has been compared at the Observatory; and another instrument, with a new form of mounting, designed by Mr. R. J. Lecky, F.R.A.S., is at present being tried.

Wind Component Integrator.—This instrument, at the time of the last Report, was working temporarily, attached to the Kew Anemograph. This arrangement was found, however, to interfere with the regular action of the latter instrument, and accordingly its own cups and vane, sent over by Professor von Oettingen, have been fitted to it by Mr. R. W. Munro; and with the exception of a small period, during which it was under repair (one of the cups having been carried away by a high wind), it has been in good action. A comparison of its indications with those of the ordinary instrument will shortly be made.

Photo-nephoscope.—This instrument, designed by Professor Stokes and Mr. F. Galton for the purpose of photographing clouds at the time of their passage across the zenith, has been the subject of experiment for some time, with a view of its adoption as a means of trigo-

In addition, 134 Thermometers have been tested at the melting-point of mercury.

14 Standard Thermometers have been calibrated and divided.

The following miscellaneous instruments have also been verified :—

Hydrometers.....	356
Anemometer.....	1

A Barograph and Thermograph have been examined, and their scale values determined, for the Brussels Observatory; also a similar pair of instruments for the Zi-ka-Wei Observatory, and a Thermograph for the Japanese Government.

There are at present in the Observatory undergoing verification, 19 Barometers, 182 Thermometers, 4 Anemometers, and 1 Rain-gauge.

A number of Aneroid Barometers, of a new pattern, have been received from MM. Hottinger and Co., of Zürich, for comparison.

The "Hall Mark," figured in last report, has been etched, at the desire of the makers, upon a number of the Thermometers compared at the Observatory.

A *Hydraulic Press* especially constructed for the purpose of subjecting Deep sea Thermometers to pressures similar to those they experience when sunk to great depths, has been erected in the workshop, by Messrs. Hopkinson and Cope. It is capable of exerting a strain equal to 4 tons on the square inch. Several protected Thermometers have been found to stand this test successfully.

Air Thermometer.—The Committee are taking steps to obtain a standard air thermometer.

The old "Royal Society" Standard Barometer, with the flint and crown-glass tubes refilled by Negretti and Zambra, has been compared with the Kew standard daily for several months. Its scale has also been measured and its error determined.

Comparison of Standard Barometers.—The account of the comparison of the Standard Barometers at Greenwich and Kew, which resulted in proving a close agreement between the standards of the two Observatories, was published in the "Royal Society Proceedings," vol. xxvii, p. 76.

With a view to determine the source of small variations in the correction to the working standard of the Observatory (Newman 34) and the large Welsh's standards, numerous comparisons have been made between the instruments, from time to time, but as yet without success.

Professor B. Stewart has had similar series of readings made between the Owens College ordinary Standard Barometer and one after the Kew model, also filled by Welsh's system. The results tend to show a most close agreement between the two forms of instru-

ment. For a complete account of these experiments, see "Manchester Philosophical Society's Proceedings," vol. xvii, No. 10.

Freezing Point of Water.—In consequence of a communication from Dr. Guthrie as to the presence of cryohydrates in water lowering its freezing point, a series of experiments was made for determining the melting point of distilled-water ice, rainwater ice, clean pond ice, and the commercial ice used at the Observatory. It was found to be practically identical in all the specimens examined, the differences observed only amounting to a few hundredths of a degree Fahrenheit.

Waxed Paper, &c., supplied.—Waxed paper has been supplied to the following Observatories:—

Bombay.	Montsouris.
Brussels.	Radcliffe.
Coimbra.	Zi-Ka-Wei.

A supply of chemical and photographic material has also been procured for the Coimbra Observatory.

A set of lamps, for use with Magnetographs, has been supplied to the Mauritius Observatory.

Loan Exhibition.—The old instruments (with the exception of a Magnet, the property of the Royal Observatory, Greenwich, and a Unifilar Magnetometer) lent to the Science and Art Department, enumerated in the Report for 1876, remain for the present deposited in the galleries at South Kensington.

A Dip-circle, the property of Mr. Dover, has been withdrawn from the collection.

Workshop.—The several pieces of Mechanical Apparatus, such as the Whitworth Lathe and the Planing Machine, procured by Grants from either the Government Grant Fund or the Donation Fund, for the use of the Kew Observatory, have been kept in thorough order, and many of them are in constant, and others in occasional use at the Observatory, but the funds of the Committee do not at present allow of the employment of a mechanical assistant, although one is much needed.

Library.—During the year the Library has received, as presents, the publications of

- 11 English Scientific Societies and Institutions,
- 43 Foreign and Colonial Scientific Societies and Institutions.

Ventilation Experiments.—The Sanitary Institute of Great Britain having applied to the Committee for permission to use the experimental house (which was unoccupied at the time) for a series of experiments on the ventilating powers of cowls of different form, the Committee granted it, and a large number of observations were made by them, extending over several weeks. A second set, with other appliances, is now about to be instituted.

Observatory and Grounds.—The buildings and grounds have been kept in repair, and application has been made to Her Majesty's Commissioners of Woods and Forests for a repainting of the interior, six years having elapsed since it was last done.

The Committee have received, as a donation, from Commander Sebastian Gassiot, R.N., busts of his father, the late J. P. Gassiot, Esq., and General Sir E. Sabine.

The Experimental House and Magnetic Observatory have been painted externally.

Staff.—The Staff employed at Kew is as follows:—Mr. G. M. Whipple, B.Sc., Superintendent; T. W. Baker, First Assistant; J. Foster, J. W. Hawkesworth, H. M'Laughlin, F. G. Figg, R. W. F. Harrison, E. G. Constable, T. Gunter, J. Hillier, and J. Dawson.

Mr. C. Robinson resigned his appointment in March, and was succeeded by Mr. Hillier.

Visitors.—The Observatory has been honoured by the presence, amongst others, of:—

Mr. Blanford.

Mr. Chambers.

The Chinese Educational Mission.

Captain De La Haye.

Professor Everett.

Mons. Houzeau.

The Hydrographer of the Japanese Navy.

Lieutenant-General Sir J. H. Lefroy.

Professor E. Mascart, Directeur du Bureau Central Météorologique, Paris.

Captain von Obermayer.

Dr. Wijkander.

(Signed)

WARREN DE LA RUE,

Vice-Chairman.

APPENDIX I.

Magnetic Observations made at the Kew Observatory, Lat. 51° 28' 6" N., Long. 0^h 1^m 15^s.1 W., for the year October 1877 to September 1878.

The observations of Deflection and Vibration given in the annexed Tables were all made with the Collimator Magnet marked K C 1, and the Kew 9-inch Unifilar Magnetometer by Jones.

The Declination observations have also been made with the same Magnetometer, Collimator Magnet N E being employed for the purpose.

The Dip observations were made with Dip-circle No. 33, the needles 1 and 2 only being used; these are 3½ inches in length.

The results of the observations of Deflection and Vibration give the values of the Horizontal Force, which, being combined with the Dip observations, furnish the Vertical and Total Forces.

These are expressed in both English and metrical scales—the unit in the first being one foot, one second of mean solar time, and one grain; and in the other one millimetre, one second of time, and one milligramme, the factor for reducing the English to metric values being 0·46108.

By request, the corresponding values in C.G.S. measure are also given.

The value of $\log \pi^2 K$ employed in the reduction is 1·64365 at temperature 60° F.

The induction-coefficient μ is 0·000194.

The correction of the magnetic power for temperature t_0 to an adopted standard temperature of 35° F. is

$$0\cdot0001194(t_0 - 35) + 0\cdot000,000,213(t_0 - 35)^2.$$

The true distances between the centres of the deflecting and deflected magnets, when the former is placed at the divisions of the deflection-bar marked 1·0 foot and 1·3 feet, are 1·000075 feet and 1·300097 feet respectively.

The times of vibration given in the Table are each derived from the mean of 12 or 14 observations of the time occupied by the magnet in making 100 vibrations, corrections being applied for the torsion-force of the suspension-thread subsequently.

No corrections have been made for rate of chronometer or arc of vibration, these being always very small.

The value of the constant P, employed in the formula of reduction

$$\frac{m}{X} = \frac{m'}{X'} \left(1 - \frac{P}{r_0^2} \right), \text{ is } -0\cdot00179.$$

In each observation of absolute Declination the instrumental readings have been referred to marks made upon the stone obelisk erected about a quarter of a mile north of the Observatory as a meridian mark, the orientation of which, with respect to the Magnetometer, was determined by the late Mr. Welsh, and has since been carefully verified.

The observations have all been made and reduced by Mr. F. G. Figg.

Observations of Deflection for Absolute Measure of Horizontal Force.

Month.	G. M. T.	Distances of Centres of Magnets.	Tempe- rature.	Observed Deflection.	Log $\frac{m}{X}$. Mean.	Observer.
1877.	d h m	foot.				
October.....	26 12 34 P.M.	1.0	55.5	15 38 6		F.
		1.3	....	7 3 8	9.13146	"
	2 38 "	1.0	58.8	15 37 3		"
		1.3	....	7 2 42		"
November.....	27 12 31 P.M.	1.0	54.6	15 37 46		F.
		1.3	....	7 3 5	9.13131	"
	2 18 "	1.0	55.3	15 37 26		"
		1.3	....	7 2 45		"
December.....	21 12 35 P.M.	1.0	43.6	15 38 37		F.
		1.3	....	7 3 18	9.13093	"
	2 30 "	1.0	45.4	15 38 4		"
		1.3	....	7 3 8		"
1878.						
January.....	28 12 41 P.M.	1.0	45.3	15 39 26		F.
		1.3	....	7 3 41	9.13139	"
	2 34 "	1.0	43.6	15 39 23		"
		1.3	....	7 3 37		"
February.....	26 12 16 P.M.	1.0	50.9	15 37 26		F.
		1.3	....	7 2 47	9.13092	"
	2 13 "	1.0	52.7	15 37 14		"
		1.3	....	7 2 37		"
March.....	27 12 18 P.M.	1.0	46.6	15 39 24		F.
		1.3	....	7 3 45	9.13139	"
	2 26 "	1.0	52.2	15 37 55		"
		1.3	....	7 2 54		"
April.....	27 12 39 P.M.	1.0	63.1	15 33 32		F.
		1.3	....	7 2 12	9.13080	"
	2 25 "	1.0	62.7	15 35 42		"
		1.3	....	7 2 6		"
May.....	27 12 40 P.M.	1.0	66.8	15 34 23		F.
		1.3	....	7 1 32	9.13068	"
	2 35 "	1.0	68.2	15 34 12		"
		1.3	....	7 1 21		"
June.....	26 12 42 P.M.	1.0	87.4	15 31 55		F.
		1.3	....	7 0 16	9.13086	"
	2 39 "	1.0	89.7	15 31 2		"
		1.3	....	6 59 52		"
July.....	29 12 42 P.M.	1.0	72.8	15 34 7		F.
		1.3	....	7 1 22	9.13083	"
	2 37 "	1.0	72.5	15 33 26		"
		1.3	....	7 1 8		"
August.....	28 12 27 P.M.	1.0	71.3	15 33 52		F.
		1.3	....	7 1 10	9.13058	"
	2 39 "	1.0	70.6	15 33 16		"
		1.3	....	7 1 2		"
September.....	24 12 33 P.M.	1.0	57.5	15 36 1		F.
		1.3	....	7 2 16	9.13060	"
	2 37 "	1.0	60.1	15 34 47		"
		1.3	....	7 1 42		"

Vibration Observations for Absolute Measure of Horizontal Force.

Month.	G. M. T.	Temperature.	Time of one Vibration.	Log mX . Mean.	Value of m .	Observer.
1877.	d. h. m.		secs.			
October.....	26 11 52 A.M.	54 ^o ·2	4·6353			F.
	3 14 P.M.	61·1	4·6356	0·31152	0·52661	„
November.....	27 11 45 A.M.	53·5	4·6328			F.
	2 58 P.M.	54·9	4·6331	0·31187	0·52673	„
December.....	21 11 54 A.M.	42·0	4·6266			F.
	3 5 P.M.	46·0	4·6286	0·31224	0·52672	„
1878.						
January.....	28 12 0 noon.	44·5	4·6290			F.
	3 9 P.M.	44·0	4·6308	0·31182	0·52674	„
February.....	26 11 37 A.M.	49·7	4·6305			F.
	2 49 P.M.	52·4	4·6316	0·31200	0·52657	„
March.....	27 11 31 A.M.	44·3	4·6331			F.
	3 4 P.M.	54·7	4·6338	0·31133	0·52645	„
April.....	27 11 21 A.M.	60·7	4·6365			F.
	3 2 P.M.	65·4	4·6366	0·31166	0·52630	„
May.....	27 11 53 A.M.	65·4	4·6383			F.
	3 13 P.M.	70·1	4·6381	0·31188	0·52636	„
June.....	26 11 56 A.M.	88·1	4·6454			F.
	3 15 P.M.	90·2	4·6454	0·31195	0·52650	„
July.....	29 11 57 A.M.	73·6	4·6418			F.
	3 17 P.M.	73·0	4·6398	0·31175	0·52637	„
August.....	28 11 45 A.M.	71·3	4·6407			F.
	3 15 P.M.	71·0	4·6385	0·31184	0·52627	„
September.....	24 11 52 A.M.	56·2	4·6361			F.
	3 11 P.M.	61·4	4·6340	0·31188	0·52631	„

Dip Observations.

Month.	G. M. T.	Needle.	Dip.	Observer.	Month.	G. M. T.	Needle.	Dip.	Observer.
1877. Oct.	d h m	No.	North.		1878. Apl.	d h m	No.	North.	
	29 3 8 P.M.	1	67 45'97	F.		29 3 4 P.M.	1	67 44'68	F.
	3 10 "	2	45'19	"		3 1 "	2	44'12	"
						30 3 29 "	1	44'62	"
					3 27 "	2	43'00	"	
	Mean..	....	67 45'58			Mean..	....	67 44'10	
Nov.	28 2 56 P.M.	1	67 44'31	F.	May	29 3 7 P.M.	1	67 43'81	F.
	2 57 "	2	44'16	"		3 7 "	2	44'06	"
	30 2 49 "	1	44'75	"		30 3 9 "	1	44'68	"
	2 48 "	2	44'09	"		3 12 "	2	44'12	"
	Mean..	....	67 44'33			Mean..	....	67 44'17	
Dec.	20 2 55 P.M.	1	67 44'87	F.	June	27 3 19 P.M.	1	67 42'12	F.
	2 54 "	2	44'06	"		3 17 "	2	41'37	"
	24 2 50 "	1	44'87	"		28 3 7 "	1	43'81	"
	2 51 "	2	44'06	"		3 8 "	2	41'81	"
	Mean..	....	67 44'46			Mean..	....	67 42'28	
1878. Jan.	29 2 55 P.M.	1	67 45'12	F.	July	30 3 6 P.M.	1	67 43'06	F.
	2 55 "	2	44'19	"		3 5 "	2	41'32	"
	30 2 53 "	1	44'81	"		31 3 4 "	1	44'00	"
	2 54 "	2	44'50	"		3 5 "	2	43'00	"
	Mean..	....	67 44'65			Mean..	....	67 42'84	
Feb.	27 2 50 P.M.	1	67 44'75	F.	Aug.	29 3 15 P.M.	1	67 43'68	F.
	2 48 "	2	43'50	"		3 15 "	2	43'00	"
	28 3 0 "	1	45'12	"		30 3 15 "	1	43'31	"
	3 0 "	2	44'31	"		3 15 "	2	43'18	"
	Mean..	...	67 44'42			Mean..	....	67 43'29	
Mar.	28 2 54 P.M.	1	67 44'69	F.	Sept.	25 3 2 P.M.	1	67 43'53	F.
	2 53 "	2	43'94	"		3 1 "	2	43'43	"
	29 2 57 "	1	44'68	"		26 3 0 "	1	43'75	"
	2 57 "	2	43'81	"		3 1 "	2	43'81	"
	Mean..	....	67 44'28			Mean..	....	67 43'63	

Declination Observations.

Month.	G. M. T.	Uncorrected.		Corrected for Torsion.		Observer.
		Observation.	Monthly Mean.	Observation.	Monthly Mean.	
1877.	d h m	West.	West.	West.	West.	
October	29 12 34 P.M.	19° 18' 56"		19° 18' 56"		F.
	30 12 33 "	19 20 28	19° 19' 42"	19 20 28	19° 19' 42"	"
November . .	28 12 27 "	19 15 52		19 17 53		F.
	29 12 34 "	19 16 48	19 16 20	19 16 48	19 17 20	"
December . .	22 12 35 "	19 15 21		19 16 32		F.
	24 12 29 "	19 16 50	19 16 5	19 16 50	19 16 41	"
1878.						
January	29 12 22 "	19 16 40		19 16 40		F.
	30 12 31 "	19 13 25	19 15 2	19 14 45	19 15 42	"
February. . .	27 12 28 "	19 21 20		19 18 50		F.
	28 12 40 "	19 17 23	19 19 21	19 16 33	19 17 41	"
March	28 12 30 "	19 11 33		19 13 29		F.
	29 12 29 "	19 17 36	19 14 34	19 15 39	19 14 34	"
April	29 12 29 "	19 13 47		19 10 59		F.
	30 12 36 "	19 14 25	19 14 6	19 17 12	19 14 5	"
May	29 12 30 "	19 12 9		19 13 36		F.
	30 12 42 "	19 17 46	19 14 57	19 17 46	19 15 41	"
June	27 12 30 "	19 15 10		19 17 51		F.
	28 12 35 "	19 19 6	19 17 8	19 20 53	19 19 22	"
July	30 12 19 "	19 12 52		19 12 18		F.
	31 12 30 "	19 13 32	19 13 12	19 12 35	19 12 27	"
August	29 12 33 "	19 17 44		19 15 59		F.
	31 12 40 "	19 12 9	19 14 56	19 13 53	19 14 56	"
September . .	25 12 27 "	19 9 50		19 12 10		F.
	26 12 23 "	19 13 33	19 11 41	19 13 33	19 12 51	"

Magnetic Intensity.

Month.	English Units.			Metric Units.			C. G. S. Measure.		
	X, or Horizontal Force.	Y, or Vertical Force.	Total Force.	X, or Horizontal Force.	Y, or Vertical Force.	Total Force.	X, or Horizontal Force.	Y, or Vertical Force.	Total Force.
1877.									
October ..	3·8907	9·5148	10·2795	1·7939	4·3871	4·7397	0·1794	0·4387	0·4740
November	3·8930	9·5104	10·2764	1·7950	4·3851	4·7383	0·1795	0·4385	0·4738
December	3·8963	9·5196	10·2861	1·7965	4·3893	4·7427	0·1796	0·4389	0·4743
1878.									
January ..	3·8923	9·5113	10·2771	1·7947	4·3855	4·7386	0·1795	0·4385	0·4739
February .	3·8953	9·5168	10·2830	1·7961	4·3880	4·7413	0·1796	0·4388	0·4741
March ...	3·8902	9·5032	10·2686	1·7937	4·3818	4·7347	0·1794	0·4382	0·4735
April	3·8943	9·5117	10·2783	1·7956	4·3857	4·7391	0·1796	0·4386	0·4739
May	3·8958	9·5161	10·2828	1·7963	4·3877	4·7412	0·1796	0·4388	0·4741
June	3·8953	9·4999	10·2676	1·7961	4·3803	4·7342	0·1796	0·4380	0·4734
July	3·8946	9·5025	10·2698	1·7957	4·3815	4·7352	0·1796	0·4381	0·4735
August. ...	3·8961	9·5098	10·2768	1·7964	4·3848	4·7385	0·1796	0·4385	0·4738
September	3·8962	9·5128	10·2797	1·7965	4·3862	4·7398	0·1796	0·4386	0·4740

APPENDIX II.

Meteorological Observations.—Table I.

Kew Observatory.

Longitude 0^h 1^m 15^s.1 W. Latitude 51° 28' 6" N. Height above sea-level = 34 feet.
 Mean Monthly results from the continuous Records for the Twelve Months ending September 30th, 1878.

Months.	Thermometer.*				Barometer.†				Pressure.	
	Means.		Extreme minimum.		Extreme maximum.		Extreme minimum.		Means.	
	Date.	Ther.	Date.	Ther.	Date.	Bar.	Date.	Bar.	Vapour-tension.	Dry air.
1877. October . . .	48·5	65·0	14 1 P.M.	29·0	d. h.	inches.	d. h.	inches.	inches.	inches.
November . . .	45·5	58·0	16 11 A.M.	29·0	8 A.M.	30·680	25 2 P.M.	29·212	·279	29·748
December . . .	41·0	53·3	6 2 P.M.	27·9	4 "	30·474	11 11 "	28·718	·262	29·427
1878. January . . .	40·8	54·7	21 3 "	26·4	23 7 "	30·044	1 2 A.M.	29·138	·223	29·821
February . . .	42·5	57·5	22 2 "	25·9	11 10 P.M.	30·167	25 9 "	29·376	·217	29·950
March	42·8	57·1	17 2 "	27·5	8 9 A.M.	30·285	27 8 P.M.	29·659	·288	30·047
April	48·4	64·6	7 4 "	29·0	26 7 "	30·075	29 5 A.M.	29·178	·204	29·871
May	55·0	71·2	30 1 "	39·1	1 6 "	29·888	1 5 "	29·139	·266	29·572
June	60·3	85·6	10 3 "	44·0	21 4 "	29·794	24 { 2 P.M.	29·292	·347	29·447
July	63·1	81·8	26 2 "	51·9	2 3 "	29·943	11 4 "	29·485	·394	29·549
August	62·2	77·1	19 2 "	37·0	4 4 "	30·036	31 0 midt.	29·654	·428	29·608
September . . .	56·3	71·9	5 3 "	..	26 4 "	29·759	1 1 A.M.	29·154	·447	29·312
	50·5	..	7 4 "	..	24 6 "	29·935	2 0 noon	29·463	·374	29·621
	..	..	..	..	..	29·971	..	..	·307	29·664

The above Table is extracted from the Quarterly Weather Report of the Meteorological Office, by permission of the Meteorological Council.

* The thermometer-bulbs are 10 feet above the ground.

† Readings reduced to sea-level.

Meteorological Observations.—Table II.

Kew Observatory.

Months.	Mean amount of cloud (0=clear, 10=overcast).	Rainfall*.		Weather †. Number of days of						Wind ‡. Number of days on which it blew							
		Total.	Maxi-mum.	Rain.	Snow.	Hail.	Thun-der-storms.	Clear sky.	Over-cast.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
1877.		in.	in.														
October...	6.1	1.985	0.310	15	..	..	3	10	4	3	2	..	4	12	4	2	2
November	6.3	3.490	1.020	21	..	..	..	9	..	..	..	1	11	11	..	2	2
December	7.0	1.300	0.468	13	1	..	3	14	3	..	1	1	4	8	7	7	7
1878.																	
January...	7.6	1.185	0.230	13	1	..	2	16	4	3	2	1	3	7	6	5	5
February...	8.3	1.235	0.370	10	..	..	..	17	2	1	3	2	5	8	5	2	2
March...	7.7	1.030	0.580	5	3	..	..	15	6	3	2	..	1	4	7	2	8
April.....	6.7	3.990	1.190	17	..	2	1	12	3	3	9	1	5	6	2	1	1
May.....	7.8	4.005	1.100	20	..	4	..	15	2	2	4	1	4	12	5	2	1
June.....	6.6	2.745	0.780	15	..	6	2	10	2	4	4	3	2	12	2	2	1
July.....	7.0	2.345	1.165	9	..	3	2	13	5	6	5	..	1	3	6	5	5
August...	7.4	6.500	1.400	22	..	6	1	16	..	3	6	1	5	11	4	1	6
September	6.3	0.970	0.250	14	..	..	2	6	2	1	1	..	1	10	9	9	6
Total..		30.780		174	5	4	16	153	33	30	39	11	46	104	59	43	43

* Measured daily at 10 A.M. by gauge 1.75 feet above surface of ground. † Derived from observations made at 10 A.M., noon, 2, 4, and 10 P.M.

‡ As registered by the anemograph.

Meteorological Observations.—Table III.

Kew Observatory.

Months.	Sunshine.*		Maximum temperature in Sun's rays.†			Horizontal movement of the Air.‡		
	Total number of hours.	Number of hours sun was above the horizon.	Mean.	Highest.	Date.	Average daily Velocity.	Greatest Movement in a day.	Date.
1877.						miles	miles	
October	h. m.	h. m.	100.2	110.0	1	242	579	15
November	120 12	328 26	88.9	104.8	5	284	686	11
December	81 18	264 8	68.7	88.0	9	217	436	24
1878.								
January	51 12	259 7	70.7	94.2	16	245	631	21
February	44 42	277 46	75.5	103.9	18	180	399	27
March	107 24	366 49	98.6	108.2	15	284	695	29
April	155 24	414 33	112.4	128.0	29	284	694	8
May	180 36	426 4	120.7	133.1	9	275	544	19
June	149 6	494 22	128.1	146.8	26	193	469	11
July	185 24	497 17	130.0	140.5	14	169	339	20 and 21
August	178 30	449 31	127.0	142.3	18	238	436	2
September	149 36	377 40	115.2	136.4	4	165	463	15

* Registered by Campbell's sun-dial.

† Derived from the means of the indications of four black-bulb thermometers in vacuo, read daily at 10 A.M.

‡ As indicated by Robinson's anemograph, 70 feet above the general surface of ground.

Erratum in Report for 1877, p. 16, note, for "unreduced" read "reduced."