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REPORT OF THE KEW COMMITTEE

FOR THE YEAR ENDING

*October 31, 1873.*

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THE only change of consequence affecting the management of the Observatory during the year has been caused by the resignation by Mr. Spottiswoode of his seat on the Committee. The vacancy thus occasioned has been filled up by the appointment of Major-Gen. Strachey, while the Earl of Rosse has been nominated as an additional member of the Committee.

*Magnetic Work.*—The series of automatic records of the several Magnetographs, viz. Declinometer, Horizontal-Force, and Vertical-Force instruments, have been continued, and the independent absolute determinations have been, as usual, made monthly. This latter duty has been, as heretofore, performed by Mr. G. M. Whipple, B.Sc., First Assistant, who also takes charge of the General Magnetic Work, in which he has the assistance of Mr. Cullum. The salaries of these two gentlemen, whose time is chiefly devoted to magnetic work, amounted during the period under consideration to £249 12s. 6d., leaving a balance of about £350 out of the sum of £608 0s. 7d. received from the Royal Society to meet the general expenses (£1979 10s. 7d.) of the Observatory. £673 4s. 5d. of this amount has been defrayed by the Meteorological Office; and £613 0s. 1d. has been obtained from other sources, such as fees for verification of instruments, and payments for new instruments for foreign observatories, leaving a balance in hand of £522 3s. 1d. on the 31st of October.

On the 2nd of December the suspension-thread of the Declinometer gave way and was replaced by a new one.

Arrangements have been made to dismount the Magnetograph instruments in the course of the ensuing year, on the occasion of painting the basement story, in order to have them thoroughly examined and readjusted—a step which has become necessary, as their continuous action has not been interrupted for 15 years.

As regards the Magnetic Reductions, the Tabulations of Declination have been continued to the end of 1872; and copies of the results have been intrusted, for discussion, to the two Sergeants of the Royal Artillery who are located at Kew, as explained in the last Report. Magnetic data have been supplied to Prof. Balfour Stewart, F.R.S., Owens Coll., Manchester, Prof. Atkinson, R. Mil. Coll., Sandhurst, Mr. W. Gee, Cheetham Hill, Manchester, Mr. H. Proctor, N. Shields, Mr. Reid, and to Dr. Stein of Frankfort.

The stock of forms having become exhausted, care has been taken in ordering a fresh supply to procure a quantity sufficient to meet possible requisitions from other observatories.

A Unifilar and Dip-circle, formerly in store at the Observatory, have been repaired and set to rights, preparatory to their being lent to the Rev. S. J. Perry for use on the expedition to observe the Transit of Venus.

*Meteorological Work.*—The several self-recording instruments, registering respectively the Pressure, Temperature, Vapour-tension, Rainfall, and Wind, have been maintained in constant action under the superintendence of Mr. T. W. Baker, Second Assistant, aided by Mr. Figg; and the daily standard eye-observations for control of the photographic records have been made regularly.

The instrumental traces with hourly tabulated values are sent monthly to the Meteorological Office as in former years. The Barograms and Thermograms are printed off in duplicate, and one copy is preserved at Kew. As regards the Anemograms and Rain-records, the copy has been obtained by the method of tracing.

In addition to the regular work of Kew as a Magnetical and Meteorological Observatory, the duty of examining and checking the work of all the seven Self-recording Observatories in connexion with the Meteorological Office has been carried on, in accordance with the method described in the Report of the British Association for 1869. This portion of the work has been performed by Messrs. Rigby and Foster.

A series of experiments are being carried on at the expense of the Meteorological Committee, at the Pagoda in Kew Gardens, to test the influence of height above the ground on temperature. The thermometers are placed at three different levels, viz. 22 feet 6 inches, 69 feet, and 128 feet 10 inches above the ground.

Copies of Meteorological data have been supplied to Mr. G. J. Symons and the Secretary of the Institute of Mining Engineers.

*Photoheliograph.*—As soon as the experiments with this instrument mentioned in last Report were completed it was taken down, and, on application from the Astronomer Royal, intrusted to him for use at Greenwich, in taking sun-pictures pending the return of the new instruments to be used in observing the Transit of Venus. The scale of equal parts, erected on the Pagoda in Kew Gardens, in order to test the optical distortion (if any) of the Kew Photoheliograph, has been taken down by the direction of Mr. De La Rue, and any slight damage done to the building has been made good at the expense of that gentleman, and to the satisfaction of the Clerk of the Works at Kew. The scale itself has been made over to the Astronomer Royal by Mr. De La Rue.

The thanks of the Committee have been conveyed to H.M.'s Office of Works for the facilities kindly afforded for the above experiments.

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

An additional series of positives, from the Kew negative pictures, is now being printed by a photographer, at the expense of Mr. De La Rue.

A statement, embodying the usual data respecting the spots &c. on the sun's disk, has been, as usual, published in the 'Monthly Notices of the Royal Astronomical Society.'

Prof. Spoerer, of Anclam, has applied for the measurements of sun-spots for the months of January and February 1872, during the period of his own illness; and Mr. De La Rue has kindly promised to furnish them as soon as their reduction has been effected.

*Electrometer.*—This instrument, the property of the Meteorological Committee, which was returned for readjustment to the maker, Mr. White, of Glasgow, in September 1872 (Report, 1872), is still in his hands. The instrument, a self-recording one, has never yet been in working order.

*Verifications.*—This department of the Observatory has been in full activity; and the work has increased largely as regards barometers and clinical thermometers, so that almost the entire time of Mr. Baker and a junior assistant is occupied therewith.

The following magnetic instruments have been verified and constants determined :—

- A Unifilar for the Observatory at Manila.
- „ „ Prof. Clifton, F.R.S., Oxford.
- „ „ Dr. E. van Rijckevorsel, of Rotterdam.

And in addition :—

- A Dip-circle for the Observatory at Manila.
- „ „ Dr. E. van Rijckevorsel.

- 3 Dip-circles for Mr. L. P. Casella, London.
- 2 Dipping-needles for H.M.S. 'Challenger.'
- An Azimuth Compass for Mr. Ney Elias, F.R.G.S.

Determinations of the Moments of Inertia have been made of two magnets used by Capt. F. J. Evans, C.B., F.R.S., when swinging iron ships.

Several instruments are on hand awaiting verification. Among them may be mentioned a Unifilar and Dip-circle received from Prof. Stewart, for use abroad, and a set of Magnets, for determination of their constants, destined for the observatory of Don Luiz at Lisbon.

At the request of the Rev. S. J. Perry, a complete set of Magnetographs have been ordered for transmission to Zi-ka-wei, near Shanghai, to the Rev. A. M. Colombel, who received instruction at Kew in the year 1868.

The meteorological instruments which have been verified are as follows:—

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|-------------------------------------------------|------|
| Barometers, Standards . . . . .                 | 49   |
| "    Marine and Station . . . . .               | 110  |
|                                                 | 159  |
| Aneroids . . . . .                              | 20   |
| Thermometers, ordinary Meteorological . . . . . | 782  |
| "    Boiling-point Standards . . . . .          | 29   |
| "    Mountain . . . . .                         | 52   |
| "    Clinical . . . . .                         | 1233 |
|                                                 | 2096 |

In addition, nine Kew Standard Thermometers have been calibrated and divided at Kew, and two glass tubes have been graduated to millimetres.

The following miscellaneous instruments have also been verified:—

- Rain-gauge, 1, with graduated glass.
- Robinson's Dial-anemometer, 1.

Allusion was made in the last Report to the difficulty of testing anemometers, owing to the limitation of space at disposal for the purpose. In the course of the year a grant was obtained from the Government-Grant Committee for the purpose of carrying on a series of such experiments; and a piece of ground in the Park has been rented. Several anemometers, of various constructions, have been erected therein, and experiments are still in progress.

A Pressure-plate Anemometer, by Mr. Oxley, of Manchester, has been tested, but not with satisfactory results.

Experiments were made with a spare Barograph belonging to the Meteorological Committee, in order to ascertain the amount of optical distortion, if any, produced by the lenses.

Waxed paper for photographic purposes has been supplied to the Meteorological Office (3 reams), to the India Office (1 ream), and to the Radcliffe Observatory ( $\frac{1}{2}$  ream).

*Instruction* in the use of magnetical or meteorological instruments has been given to the following gentlemen:—

Dr. E. van Rijkevorsel in magnetical work.

Nav. Lieut. Dixon, R.N., H.M.S. 'Nassau,' in magnetical work.

Staff Comr. Creak, R.N., made observations with a Fox's Circle for H.M.S. 'Challenger,' and with a Fox's Circle for H.M.S. 'Nassau.'

Capt. Evans, C.B., F.R.S., made some observations with a magnetometer constructed after his own design.

Photographs of the portable magnetic instruments, of the most approved patterns, have been taken for the use of persons seeking information.

In the month of May a request was received from Col. J. T. Walker, F.R.S., Superintendent of the Great Trigonometrical Survey of India, through the Chairman of the Committee, for provision to be made at the Observatory for vibrating pendulums.

In the year 1865 two pendulums lent by the Royal Society for use in India had been vibrated at Kew by the late Capt. Basevi; and it was necessary that these pendulums should be vibrated again on their return, and that at the same time two pendulums obtained from the Imperial Academy of Sciences at St. Petersburg should also be vibrated.

The Committee at once complied with the request; and at the expense of the Indian Government preparation was made for the experiments in the south hall on the basement story, by removing for a time the apparatus for testing sextants, and building up from the foundation-arches two solid isolated supports for the Russian clock and pendulum.

Capt. Heaviside, R.E., the officer charged with the duty of making the pendulum experiments, arrived in England in July, and, finding all the arrangements satisfactory, at once commenced his experiments, which are still in progress.

Endeavours were made, in connexion with the arrangements just mentioned, to obtain an electrical time communication between Kew and the Royal Observatory at Greenwich; but the proposal failed of success.

*Instruments.*—The Kew Standard Barometer, Newman 34, has been cleaned by Messrs. Negretti and Zambra.

In January a new Minimum Thermometer by Casella was obtained to replace the old instrument, which had been accidentally broken.

The several pieces of Mechanical Apparatus, such as the Whitworth Lathe and Planing Machine, procured by Grants from either the Govern-

ment Grant Fund or the Donation Fund, have been kept in thorough order; and many of them are in constant use at the Observatory.

A supply of filled thermometer-tubes, of various ranges, has been procured for ultimate graduation as required.

The Committee have, through their Hon. Secretary Mr. Scott, who was present at the Meteorological Congress at Vienna in the month of September, as one of the Delegates from this country, professed their readiness to graduate standard thermometers for any of the Continental observatories which may require them, on condition that the tubes supplied for graduation are sufficiently old.

*Library.*—The usual Donations of English and Foreign Scientific Publications have been received, and a few standard works purchased.

*Staff.*—The Staff employed at Kew is as follows:—Mr. Samuel Jeffery, Superintendent; G. M. Whipple, B.Sc., First Assistant; T. W. Baker, Second Assistant; A. J. Rigby, J. E. Cullum, J. Foster, F. Figg, E. Constable.

*Note.*—Mr. F. J. Page resigned his appointment in January, and B. Bensted was appointed as Junior Assistant. This gentleman has also left, and his place has been filled by E. Constable.

In accordance with a precedent established by the Kew Committee of the British Association, by a Resolution passed in October 1867, Mr. B. Loewy was employed to give instruction to the Assistants. The present Committee, in March last, resolved to resume this practice, and Mr. G. M. Whipple was appointed to give a course of instruction in Mathematics; and he commenced his Lectures in April.

Mr. Robert H. Scott, F.R.S., continues to act as Honorary Secretary to the Committee.

*Visitors.*—The Observatory has been honoured during the year by the presence of several scientific men of eminence. Among these may be mentioned:—

Prof. R. B. Clifton, F.R.S., Oxford.

B. F. Craig, M.D., Army Medical Museum, Washington.

Prof. Felix Klein.

Dr. Radcliffe.

R. Bowie Walcott, M.D., Inspector of Hospitals, Barbados.

Baron von Wrangel, Hydrographic Department for the Black-Sea Imperial Russian Navy.

