



REPORT

OF THE

THIRTY-FIFTH MEETING

OF THE



BRITISH ASSOCIATION

FOR THE

ADVANCEMENT OF SCIENCE;

HELD AT

BIRMINGHAM IN SEPTEMBER 1865.

LONDON:

JOHN MURRAY, ALBEMARLE STREET.

1866.

quired in every large town, especially in Birmingham itself, the population of which is increasing at the rate of about 5000 yearly, a distinct record of the new cases of disease, the nature of the localities in which they have occurred, and the conditions of atmosphere under which they have been formed. The principal local results obtained are—Mean atmospheric pressure (reduced to sea-level), 29.958 inches; mean temperature, $47^{\circ}6$; the highest temperature, $89^{\circ}2$; the lowest mean, $-2^{\circ}5$; mean yearly rainfall, 27.991 inches; greatest fall, 35.16; least, 21.21; mean number of days on which rain fell, 176.

Description of the Magnetic Storm of the Beginning of August 1865, as recorded by the Self-recording Magnetographs at the Kew and Lisbon Observatories. By J. B. CAPELLO and B. STEWART, F.R.S.

The great magnetic storm which broke out about the beginning of August last will be remembered as occurring at the time when anxiety began to be felt respecting the fate of the Atlantic cable. The following are the general characteristics of that storm, and apply both to Kew and Lisbon, since these two places were similarly affected by the storm. It first commenced about 5.40 p.m. (G. M. T.) of the 2nd of August; but it broke out with great violence, and with those rapid motions which form the mark of a large disturbance, about 5 a.m. of the 3rd of August, and this outbreak lasted until midnight of that day or early morning of the 4th of August. The disturbance then ceased for about twenty-four hours, recommencing a little before midnight of the 4th of August, and lasting till about 4 p.m. of the next day. There remained, however, traces of the disturbance for a considerable time after this date. There were thus two great outbreaks forming this storm, the first commencing on the 2nd of August at 5.40 p.m., or more notably on the 3rd of August, at 5 a.m., and lasting till early morning of the 4th of August, the second commencing about 11 p.m. of the 4th of August and lasting till 4 p.m. of the 5th of August. With regard to the first of these two outbreaks, from about 5 a.m. until 11 a.m. on the 3rd of August the horizontal and vertical components of the magnetic force were both considerably decreased by it, while in the afternoon of the same day they were both, but especially the vertical-force component, considerably increased. The westerly declination, on the other hand, was, on an average, increased during the greater part of this outbreak, although towards the end it was probably diminished. Broadly viewed, this disturbance may be said to have begun with a tendency to diminish both components of the force and to increase the westerly declination, and to have ended with a tendency to increase both components, but especially the vertical force. On the whole, the effect of the disturbance was, probably, to diminish both components of the force, and to increase the declination. With regard to the second of the two outbreaks which together constituted this storm, it began by diminishing both components of the force, if we except a comparatively small increase of horizontal force at the very commencement, and ended by slightly increasing both components at Kew. With respect to the westerly declination, this element was at first somewhat diminished, but it was ultimately increased by this disturbance. Broadly viewed, the characteristics of this second outbreak were similar to those of the first, exhibiting a tendency to diminish both components of force, and slightly to increase the declination. In comparing the storm with the greater one of August–September 1859, as registered at Kew, we find the following points of resemblance:—1. Both storms consisted of two separate outbreaks, and both the outbreaks of both the storms began during the hours of night or early morning. Thus we have—

| Storm of Aug.–Sept. 1859. | | Storm of August 1865. | |
|---------------------------|------------------|-----------------------|----------------|
| 1st Outbreak | 28 Aug. 10½ p.m. | 1st Outbreak | 3 Aug. 5 a.m. |
| 2nd do. | 2 Sept. 5 a.m. | 2nd do. | 4 Aug. 11 p.m. |

—2. Both outbreaks of both storms tended at first to diminish both components of the force, and to increase the westerly declination, but changed in the afternoon of next day into forces tending rather to increase both components. This is a very good instance of the influence (proved to exist by Gen. Sabine) of the hour of the day upon the character of the disturbance. Thus we see that in all these cases we have, in the early morning hours, a diminution of both components of the

force, while in the afternoon hours we have an increase of those components. 3. Both outbreaks of both storms tended, on the whole, to diminish both components of the force, and to increase the westerly declination,—a somewhat uncommon type of disturbance. 4. Both these storms were accompanied by phenomena on the surface of the sun which are worthy of notice. At the time of the occurrence of the great disturbance of August–September 1859, a very large spot might have been observed on the disk of our luminary, and several of a size somewhat smaller. Considerable changes were taking place in the appearance of these spots, and, moreover, a luminous body was observed, by Carrington and Hodgson independently, to move across the large spot at the very moment when the magnetic disturbance broke out at Kew. On the 29th of July, 1865, there was no spot or almost none on the sun's disc; but on the 3rd of August there was a very considerable spot on the right limb, nearly going off. The only pictures obtained at Kew were on these days, and it is clear from these that this spot must have rapidly formed between July 29 and August 3, on the right half of the solar disk. It would, of course, be premature to conclude that certain changes going on in the sun cause, or even invariably accompany, terrestrial magnetic storms; but there can be no impropriety in stating facts which may possibly serve to establish some future generalization.

An Improved Standard Barometer. By W. SYMONS.

At the Newcastle Meeting of the Association, the author exhibited a Standard Barometer combining the advantages of Fortin's and Gay-Lussac's instruments. The objection that the contraction and bending of the tube necessary in the arrangement for making that instrument portable impaired its sensitiveness, has been entirely removed in this improved one. The facility of reading is also increased.

HYDROSTATICS.

On the Hydrometer and its Adaptation to the present requirements of the Board of Inland Revenue. By L. OERTLING.

In this paper the means adopted for levying the duty upon spirits in the Revenue departments were considered, and attention called to the shortcomings of the present method. The instrument now used is Sikes's hydrometer, accompanied by Sikes's tables. It was distinctly pointed out that the instrument and the tables had been constructed upon different formulæ, and were not in harmony, and that, further, there were defects in the actual form of that hydrometer, causing considerable amounts of error in the estimation of the strength of the spirits tested by it.

INSTRUMENTS.

On a Self-recording Anemometer. By S. B. HOWLETT.

On the Topograph, a new Surveying Instrument By Captain LENDY.

The topograph may be used—

1. As a prismatic compass alone;
2. As a plane table alone with its sight ruler;
3. As a plane table and a compass, combined to facilitate the finding of stations.

It possesses the great advantage that it may be employed without any alteration, *simultaneously* or *successively*, as a plane table or a compass, when in the same survey we pass from undulating ground to open country, and *vice versa*. In all cases, we need no scales, no pair of compasses, and no protractor, the machine itself protracting the angles and laying down distances at the scale.