II. "Description of an Apparatus employed at the Kew Observatory, Richmond, for the Examination of the Dark Glasses and Mirrors of Sextants." By G. M. WHIPPLE, B.Sc., Superintendent. Communicated by WARREN DE LA RUE, Esq., Vice-Chairman of the Kew Committee. Received February 6, 1883.

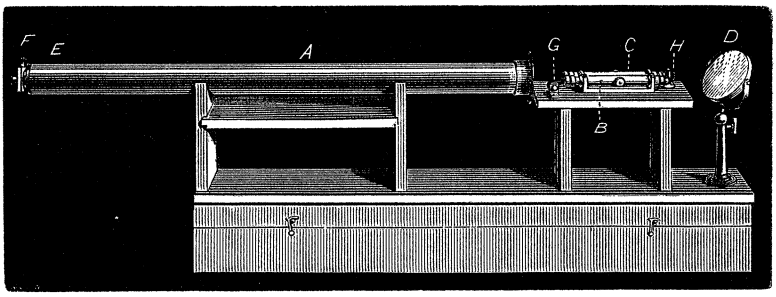
In the "Proc. Roy. Soc.," vol. 16, p, 2, Professor Balfour Stewart described an apparatus designed and constructed by Mr. T. Cooke for the determination of the errors of graduation of sextants. This instrument has from that date been constantly in use at the Kew Observatory, and since the introduction of certain unimportant improvements, has been found to work very well.

No provision was made, however, for its employment in the determination of the errors of the dark shades used to screen the observer's eyes when the sextant is directed to the sun or moon, and it has been found that errors may exist in the shape of want of parallelism in these glasses, sufficiently large to seriously affect an observation, accurate in other respects.

It has also been found that sextant makers are desirous of having the shades examined before proceeding to fit them into their metal mountings, and also to have the surfaces of the mirrors tested for distortion before making the instruments up. With a view to the accomplishment of these ends, for some time past the Kew Committee have undertaken to examine both dark glasses and mirrors, and to mark them with a hall-mark, when they are found to answer the requirements necessary for exactitude.

For these purposes the apparatus now described has been devised by the author, and brought into use at the Observatory.

It is represented in the annexed cut.



A telescope, A, of $3\frac{1}{4}$ inches aperture and 48 inches focal length, a pair of collimators, B and C, of $1\frac{1}{4}$ inch aperture and 10 inches focal length, and a heliostat, D, are firmly fixed to a stout plank, so

that their axes may be in the same horizontal plane. The eye-piece of the telescope, E, carries a parallel wire micrometer, F. G is the dark glass to be examined, and H is another glass of the same tint.

In order to adjust the instrument, the telescope, A, is directed to the sun, a shade being fitted to the eye-piece, and then placed in its Y's focussed for parallel rays. The collimators, B and C, are then fixed on their table with their object-glasses opposed to that of the telescope, A, the eye-pieces and wires having first been removed, and a metal plate with a sharply cut hole in its centre, fitted to their diaphragms.

Light is next reflected down the collimator by the mirror D, and the aperture in the diaphragm, being viewed through the telescope A, is carefully focussed by moving the object-glass of the collimator to and fro, by means of its rack and pinion.

The diaphragm aperture is next collimated by rotating the collimator in its bearings.

Both collimators being thus adjusted they are placed side by side, so that their illuminated sights can be viewed simultaneously in the telescope, appearing as superimposed bright disks 12′ in diameter. They are next separated so that the disks remain merely in contact at the extremity of their horizontal diameters.

The instrument is now ready for use, and the examination of the shades is performed in the following manner.

The glass to be tested is fixed in a holder, in front of the object-glass of collimator B, a corresponding shade being placed between the héliostat and diaphragm of collimator C. The sun is directed on to the diaphragms. The coloured disks are viewed through the telescope, when if the sides of the shade G are perfectly parallel the relative position of the disks is unchanged, if, however, the shade is not ground true, the disks will appear either separated or to overlap. In the first case, the amount of separation is measured by the micrometer, F, and serves to indicate the quality of the glass. In the case of overlapping images the shade is rotated through 180°, and separation produced which can be measured. A second examination is then made, the shade having been turned through 90°.

If in no position a separation of images is found to exist to the extent of 20″, the glass is etched K.O. 1; if more than 20″ but less than 40″, the mark is K.O. 2, with greater distortion than this, the shade is rejected and not marked.

To examine the quality of the mirrors, a small table, on levelling screws, is put in front of the object-glass of the telescope. The mirror to be tested is placed on its edge on this table, and turned until a distant well-defined object is reflected down the tube of the telescope. The object-glass of the telescope having previously been

stopped down to an aperture corresponding to the size of the mirror, the reflected image is contrasted with that seen directly, and if the definition is unchanged, the mirror is marked K.O., with a writing diamond, and returned to the maker; if the object appears distorted, its unfitness for use is similarly notified. A small fee is charged for the examination.

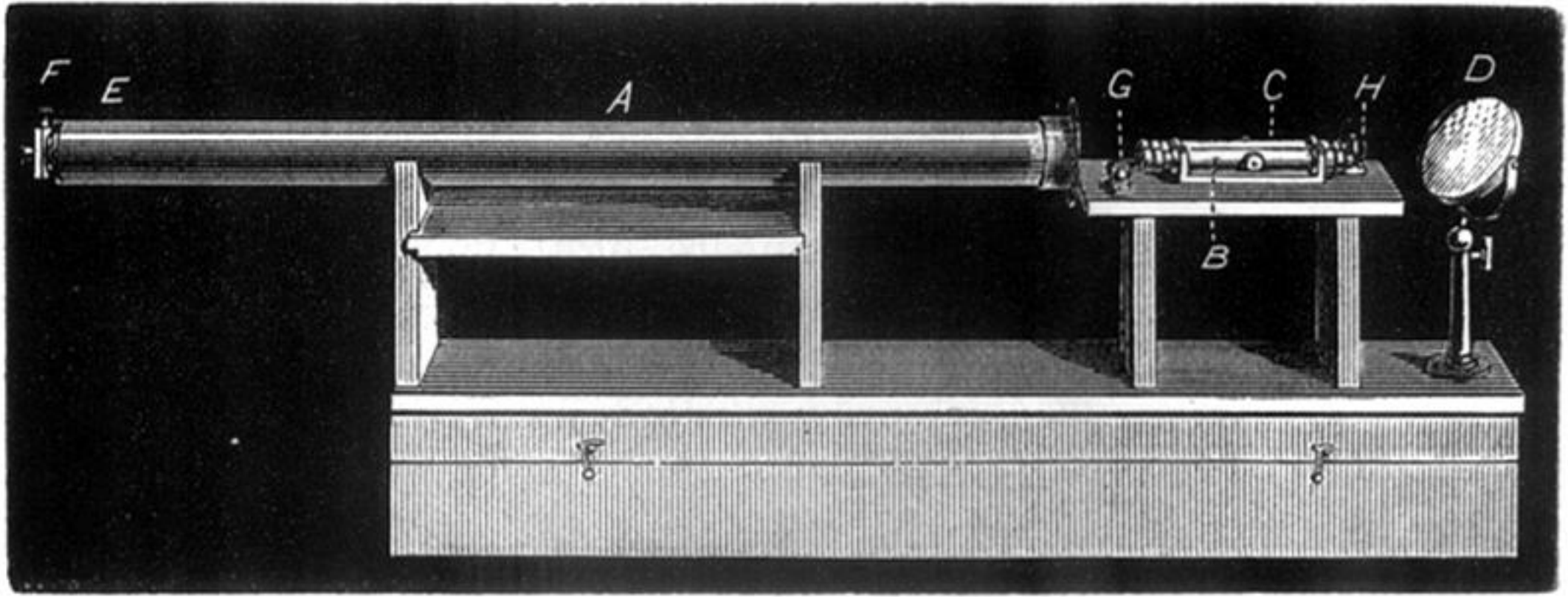
III. "On the Atomic Weight of Manganese." By James Dewar, M.A., F.R.S., Jacksonian Professor, Cambridge, and Alexander Scott, M.A. Received February 9, 1883.

Our attention has been directed for some time to a new determination of the atomic weight of manganese. This communication gives a succinct account of the results of the preliminary stages of such an inquiry, and although the further progress of the investigation may reveal some errors, still we feel convinced the final numbers can in no way differ materially from the present values, and therefore further delay in publication is unnecessary.

The atomic weight of manganese has been determined by many chemists,* but the resulting values vary considerably according to the special method selected. The results of the different investigators may be divided into two classes—those giving approximately 55 as the number, and those making it about 54. To the former class belong Turner, Berzelius, and Dumas, all of whom use the same method, viz., the determination of the silver chloride yielded by a weighed amount of chloride of manganese. Turner also made determinations from the analysis of the carbonate, and from the conversion of the monoxide into sulphate. Von Hauer used the same method as that employed by him in the determination of the atomic weight of cadmium, viz., the reduction of manganous sulphate to sulphide by ignition in a current of sulphuretted hydrogen. It is probable that this method is not very trustworthy, as, according to Schneider, the sulphide may be contaminated by oxysulphide. Schneider and Rawack belong to the second class of observers, the former employing the oxalate, and from its analysis calculating the atomic weight by deducting the weight of water and carbon dioxide obtained. Rawack, whose experiments were conducted in Schneider's laboratory, weighed the water obtained by reducing manganoso-manganic oxide to manganous oxide.

One objection to the analysis of the chloride is that it may contain besides manganous chloride varying proportions of manganic salt.

* Berzelius, "Lehrbuch," 5 Ed., 3, 1224. Dumas, "Ann. Chem. Pharm.," 113, 25, 1860. Hauer, "Wien. Acad.," xxv, 124. Rawack and Schneider, "Pogg Ann.," 107, 603.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