RECORD OF ANOTHER 19TH CENTURY TELESCOPE

The Sheffield 4.5-inch Parkes & Son - Wray Telescope

A. D. ANDREWS

enquiries@wheelers-warehouse.co.uk

ABSTRACT. The 'Sheffield' 4.5-inch telescope by Parkes & Son with an achromatic object glass by Wray of London, belonging to the Sheffield Astronomical Society, has been examined. Measurements have been taken to record this fine instrument for future historical research. A large number of illustrations accompany the text.

1. INTRODUCTION

In 1859 James Parkes & Son produced an 'improved equipoise stand' which according to them was 'made on such mechanical principles as should insure *perfect steadiness, with smooth and uniform action'*. The firm's 1859 list of astronomical telescopes, object glasses, pocket telescopes etc. was published from 5 St Mary's Row, Birmingham and published by J. Wilson & Co., A100 New Street. According to their 1859 catalogue, James Parkes & Son (Patentees) were instrument makers to the Board of Trade, and Government Schools of Design. In the 1867 catalogue we find further credentials..... a Jury Award Class 13, International Exhibition, 1862, for economy combined with quality in the manufacture of microscopes and mathematical instruments.

2. PARKES & SON'S IMPROVED EQUIPOISE STAND

The *improved equipoise stand* had ..... 'the peculiar feature' that *all the working parts are perfectly central*, so that there is no *side strain* on any of the pivots, whatever may be the position of the Telescope body. The italics, punctuation marks and inverted commas are theirs. The description continues..... The axis of the tube is also central;- working like a scale beam;- so that only slight friction is required to keep it fixed at any inclination. The side uprights A, A, are kept in position by two milled head screws B, B, these when unscrewed allow the head of the stand to bend forward towards the observer ;- enabling him to place the telescope tube in a perfectly *vertical* position when it is thus required. The legs of the stand are of polished Oak, or Birch, clamped midway by a jointed metal tripod C, - and carrying a long central axle D, thus preventing vibration. The mechanical parts of the stand are made of Bronzed Iron and Brass; sufficiently heavy to insure steadiness; but not so as to be too unwieldy for moving about when necessary. The Telescope tube is covered with dark green patent waterproof cloth (resembling morocco leather) which is more pleasant to handle, and will better bear exposure to damp than polished brass. The entire instrument, when mounted, presents a very elegant and substantial appearance (unquote).

There is little mention of the object glass and eyepiece manufacturer in Parkes & Son's trade catalogues of 1859 or 1867. They do state that..... With regard to the quality of the Object Glasses, J.P. & Son can speak *most confidently*, each one is carefully examined and tested by a practical judge before being sent out, and the accurate performance of each is warranted. They also state in their 1867 catalogue that ..... Skilled London workmen are also employed by us on certain parts of Instruments used for Optical and Mathematical purposes.

The maker's description of their larger telescopes (f/14.8, 4 1/4 inch; f/15.2, 3.75 inch; f/17.5, 3 1/4 inch; f/15, 3 inch) specify achromatic objectives with various focal ratios, mostly near f/15. They supplied one terrestrial eyepiece, two or three celestial eyepieces with sun glasses, achromatic object finder, handsome polished oak (or mahogany) case with brass handle, lock and key. The telescopes were mounted on either the improved equipoise stand (with vertical rack movement) or equatorially (with slow motion by rack movement, setting circles accurately divided and engraved). The more expensive equatorials had a second 'strong deal case' for the stand. In 1859 the price of the 4 1/4 inch equipoise altazimuth was £40 and the 4 1/4 inch equatorial was £115. Parkes & Son also offered a 5 1/4 inch equatorial for £170. The writer would point out that in the 1859 models the equipoise stand possessed a steadying/ altitude rod which reached from the lower telescope tube to *above* the jointed metal tripod C. In 1867 Parkes & Son offered equipoise stands as a separate item (at £8 for the large model), and they also supplied separate vertical and horizontal racks, handles and Hook's joints. We note also that the 1867 equipoise model (their No.5415) was slightly modified, and seemed to possess a rod secured *below* the tripod C. Their

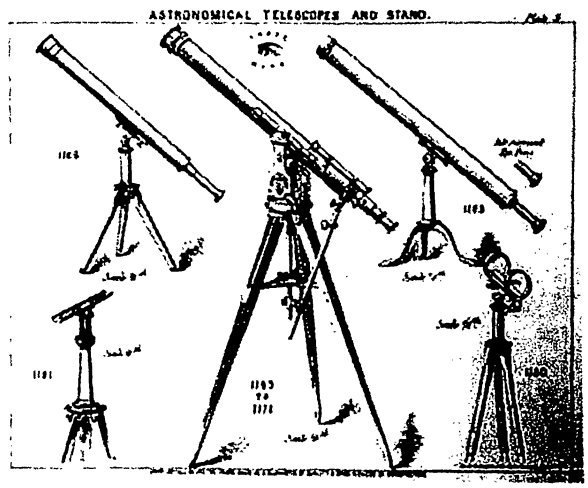

Fig. 1. Telescopes offered by Parkes & Son in 1867.

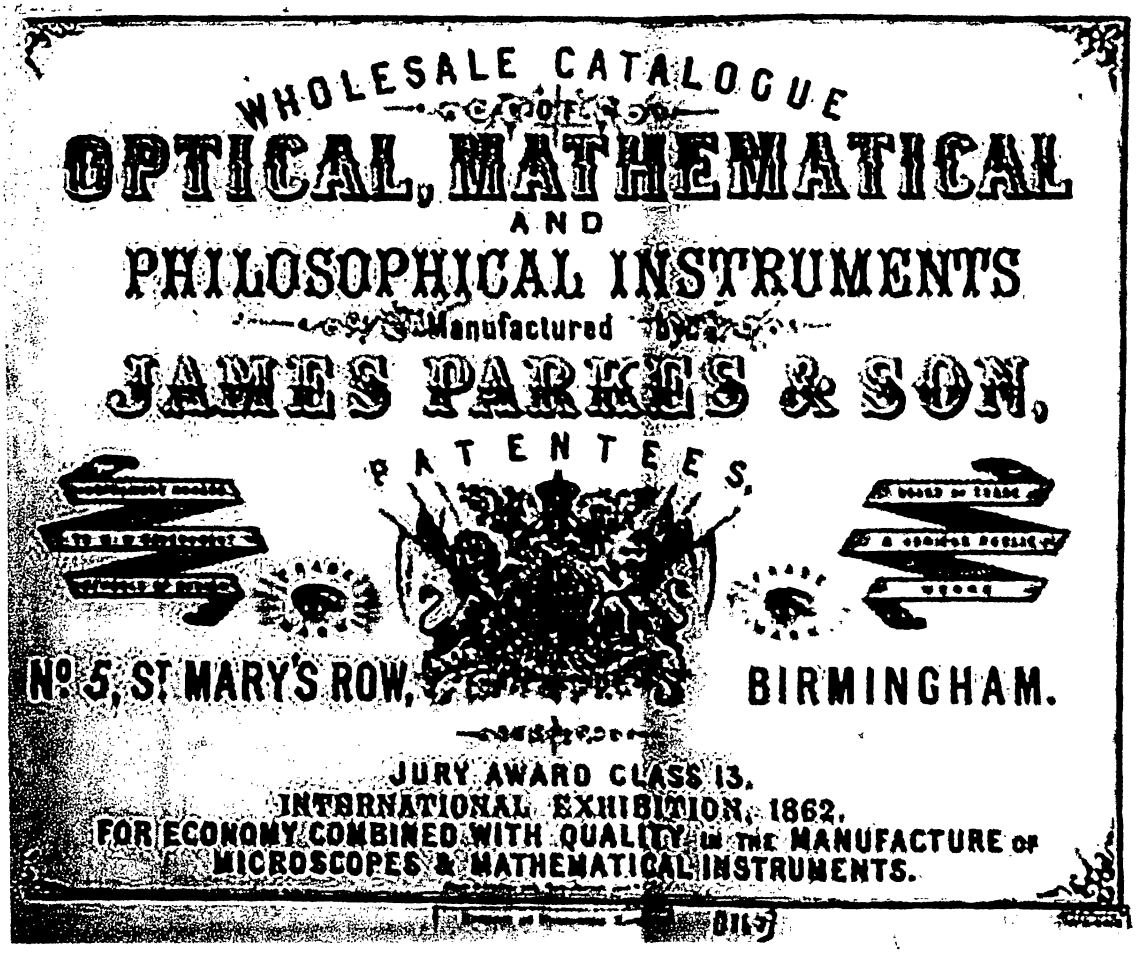

Fig. 2. Title page of Parkes & Son's 1867 Catalogue. Note the 'Eye' trademark which can be seen on the Sheffield Astronomical Society's instrument.

PLATE XIII.

ASTRONOMICAL TELESCOPE ON EQUIPOISE STAND.

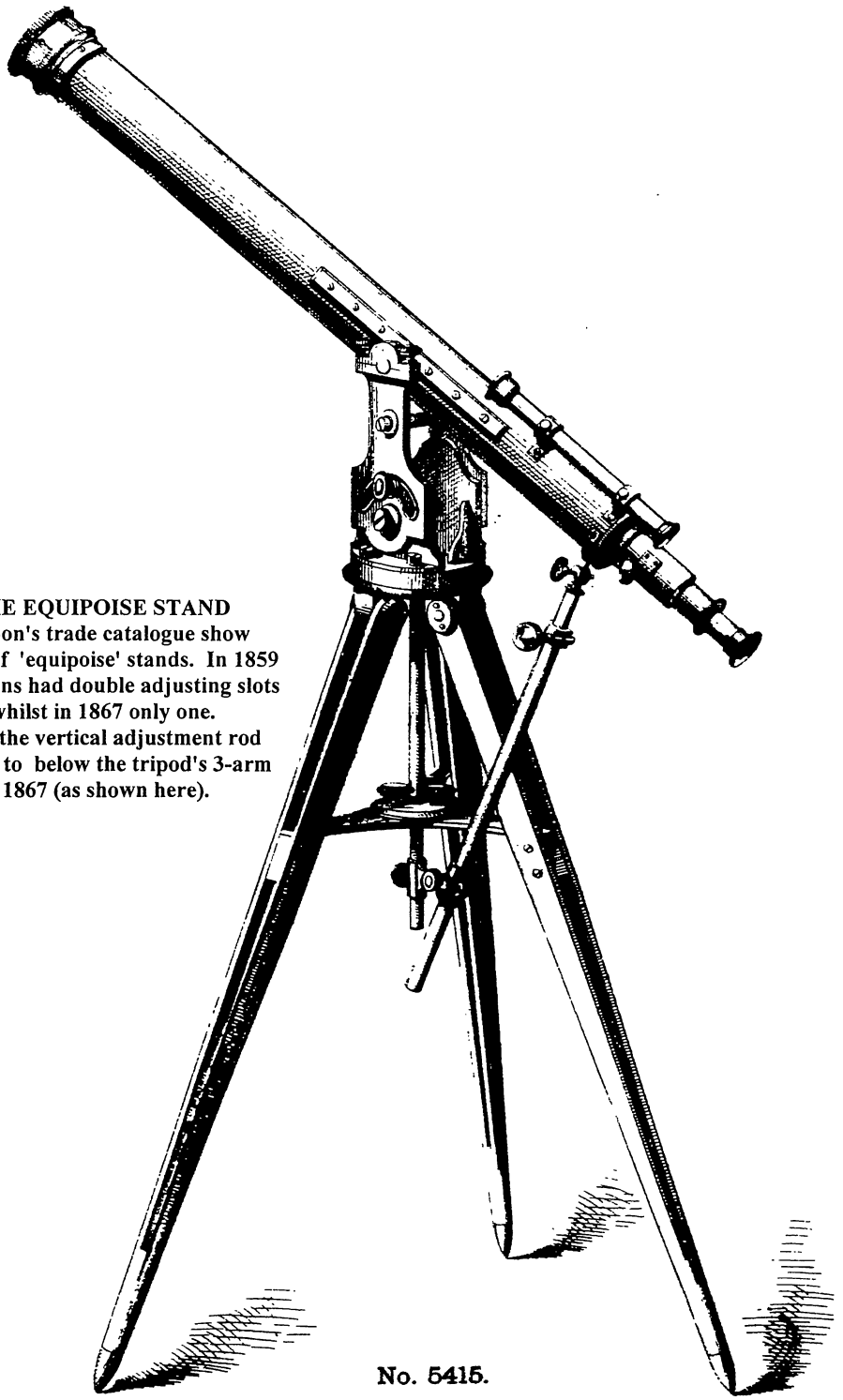

Fig. 3. THE EQUIPOISE STAND
Parkes & Son's trade catalogue show two types of 'equipoise' stands. In 1859 the trunnions had double adjusting slots (see Fig.4) whilst in 1867 only one. Moreover, the vertical adjustment rod had moved to below the tripod's 3-arm support by 1867 (as shown here).

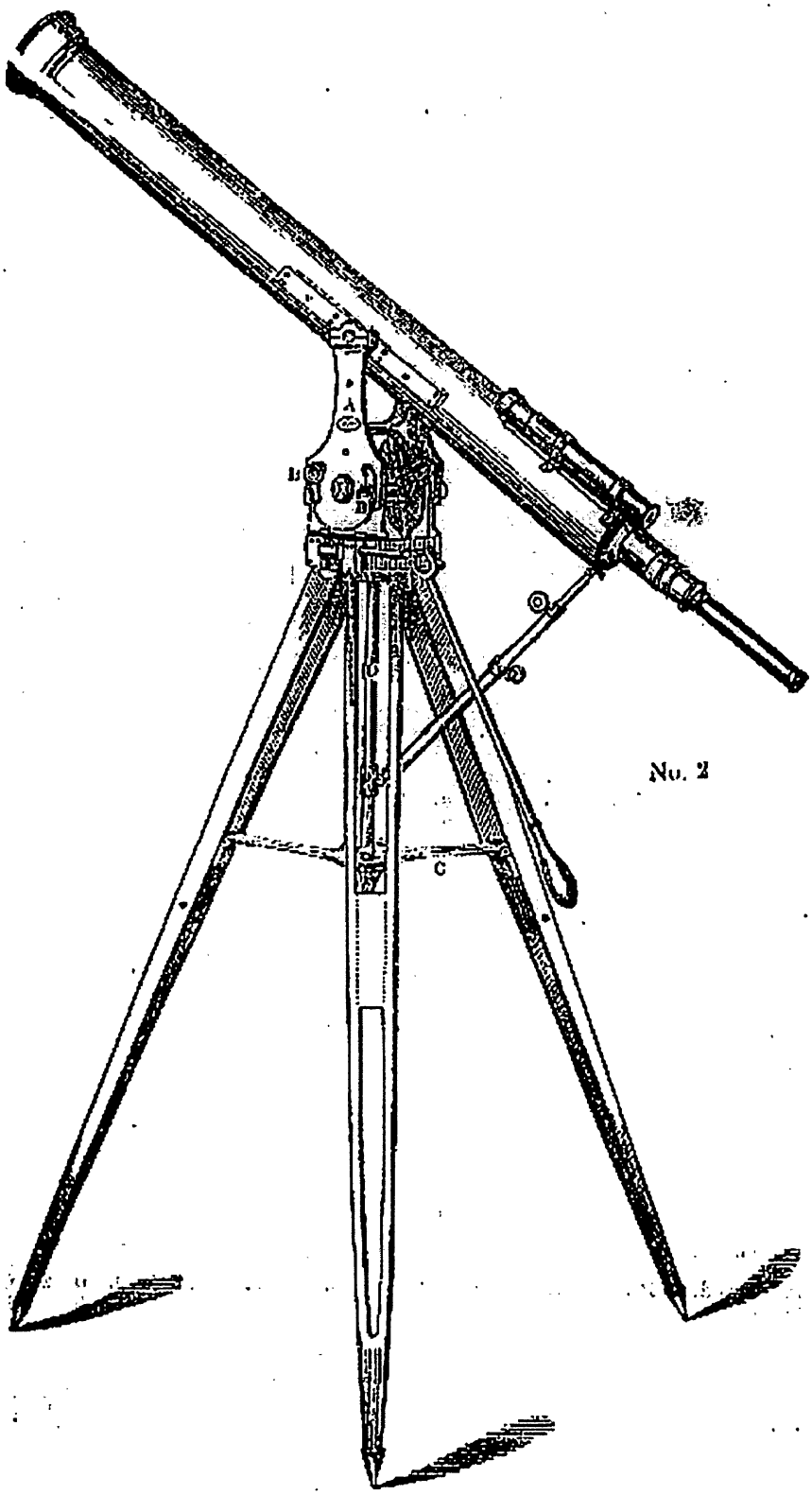

Fig. 4. THE EARLY VERSION ? Some models had two slow motions as seen here. It is probable that Parkes & Son's earlier models had double slots in the trunnions, and a vertical adjustment rod above the 3-arm support, as depicted here.

trunnion mount then, however, had a single securing screw on each side, unlike the 1859 model which had two, but these may have been modifications to add strength and rigidity to the largest instruments only.

3. THE SHEFFIELD 4.5-INCH PARKES & SON - WRAY TELESCOPE

A very fine 4 1/2-inch telescope with an achromatic object glass by the famous 19th century optician, Wray LONDON (inscribed on OG cell), and mounted by James Parkes & Son of Birmingham, has recently been brought to the author's attention in Sheffield UK. This astronomical refractor is mounted on Parkes & Son's *Improved Equipoise Stand* (with two inscriptions). It resembles telescopes listed in Parkes & Son's trade catalogues from 1859 and 1867. Several details concerning the Sheffield telescope are given in the Appendix.

The two inscriptions are *Improved* EQUIPOISE STAND and JA.s PARKES & SON (with eye trademark below), 5 & 6 St Mary's Row BIRMINGHAM (as shown in illustrations). The exact date of the Sheffield instrument has not been determined. It is known that James Parkes & Son was recorded in local street directories in 1839, and they appear at No.5 St Mary's Row from 1848 until at least 1867. The firm initially offered mathematical instruments, measuring tapes, miner's and mariner's compasses, watch keys, seals etc. In 1859 they offered also optical and philosophical instruments. They are found at Nos.5 & 6 St Mary's Row in 1882. Price lists and trade catalogues are known up until 1903 according to the comprehensive Handlist of Anderson et al. NMS 1990. Illustrations from their trade catalogues mentioned in our introduction suggest that the type of telescope and mounting stems from about 1859 or 1867 but could have been manufactured 25 years later. The mount is similar to the 1859 model but the vertical adjustment rod is similar to the 1867 model. As regards the object glass we are not certain which Wray was responsible for the fine optics.

William Wray, maker of the 21-inch Buckingham (Walworth Common) lens, showed his great achromat at the 1862 International Exhibition in London. The Wray inscription should easily sort this out, and an illustration is given for the Sheffield instrument. It seems that if the Sheffield object glass had been made by one so famous as William Wray (his 21-inch object glass was only surpassed by Thomas Cooke's 25-inch for the Newall telescope) then Parkes & Son would have mentioned the name. One explanation is that the Wray objective was specially mounted by Parkes & Son, but it is strange then that the mounting was not more sophisticated, say, an equatorial or an altazimuth with two rack slow motions.

4. COMMENTS

The large tripod of the Sheffield telescope (with tapered legs 1722mm long) together with its altazimuth mount is extremely rigid. The weight of the telescope (with cap removed) is 9.5kg. The original central three-armed tripod support was made of cast iron, one of which was broken. The three arms have been replaced with copies in hard wood. The originals with their hinges are with the instrument. The Sheffield tripod was painted pale green when the writer first saw it, as was also the cast bronze-iron mount and all the brass on the mount! It was discovered that under this paint was a bright red base. A temporary water-based black paint was applied to the tripod to improve its appearance. Other comments are made in the Appendix. The original brass lower component to the altitude rod, fitting *below* the central three-armed support, is with the instrument but the rod itself is missing. However, from the arrangement of the telescope parts within the carrying case, it is clear that this missing rod was 1 metre long. The arrangement for this adjusting rod can easily be seen in the illustrations from the original catalogues, some of which are given here.

It is difficult to understand the balancing of the Sheffield telescope. The only advantage of having the centre of gravity well forward (10cm beyond the pivot point towards the object glass) is that, when the trunnions are adjusted towards the observer to allow reaching near the zenith, the weight is almost directed down the centre of the tripod and the central rod. This would alleviate differences in pressure across the two horizontal brass plates and the rollers, and also reduce wear on the pivots. Movement in azimuth would be smoother. As we summarize in the Appendix, the weight required to balance the tube at the pivots is as much as 3.5kg at a distance of 27cm from the pivot. Friction in the sliding vertical rod to the telescope's lower end could not compensate this. With weight added to the lower telescope tube and a temporary rod replacement, the telescope is very manoeuvrable. One further oddity is in the fact that in certain positions the rod fouls one or other of the tripod legs. The focal ratio of f/15 seems normal for the telescopes of Parkes & Son so the tube assembly was almost certainly designed for a 4 1/2-inch object glass. It would be interesting to trace the complete history of the Sheffield telescope to perhaps clarify these points.

Acknowledgements

We wish to thank the Sheffield Astronomical Society for the loan of the instrument which allowed a close inspection and measurement, and also R. Gasser for useful comments on the engineering of this exceptional 19th century mounting. Also, we are happy to acknowledge the assistance given us in tracing Parkes & Son by Maria Twist, Local Studies and History, Department of Leisure and Community Services, Birmingham Central Library, UK.

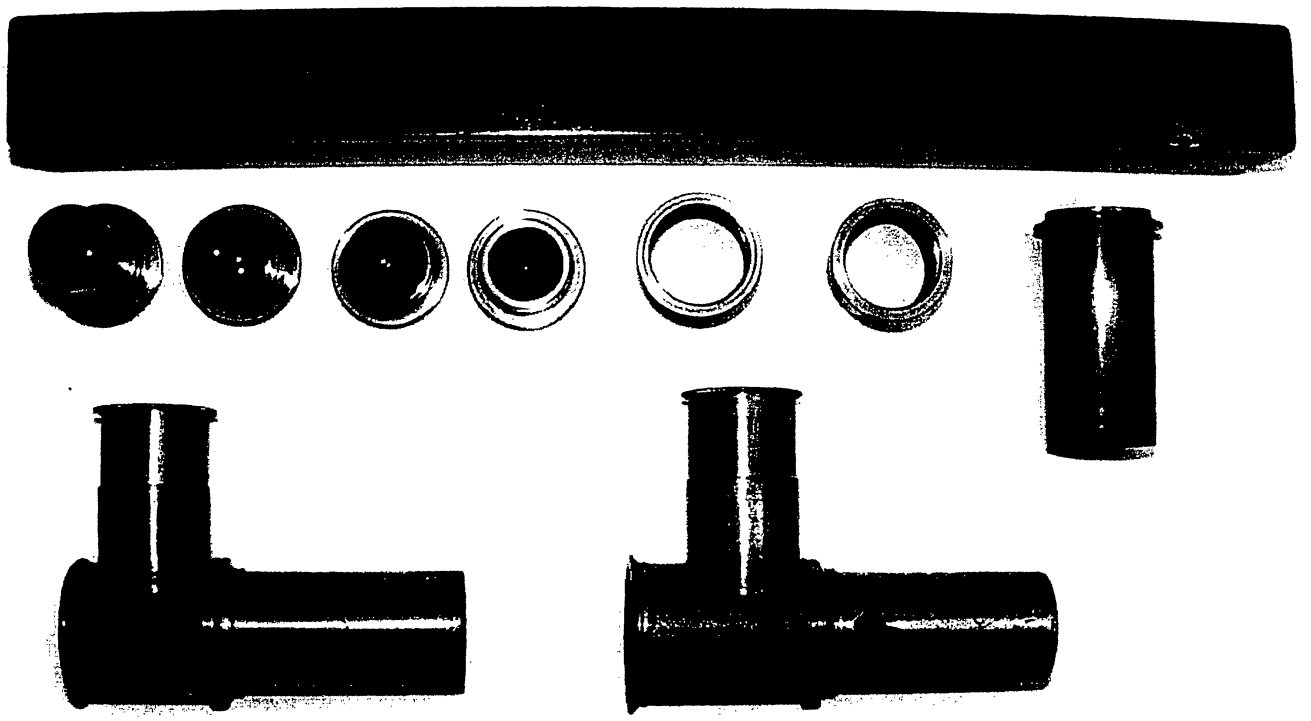

Fig. 5. The Sheffield instrument possesses 4 eyepieces marked x75, x130, x264, x462. Other accessories include a star diagonal and a sun diagonal (see Appendix).

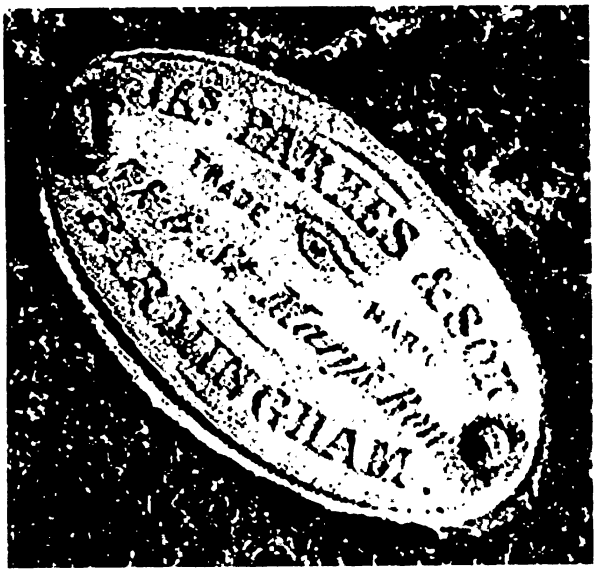

Fig. 6. Inscription JAs PARKES & SON
5 & 6 St Mary's Row BIRMINGHAM
Note the 'Eye' trade mark.

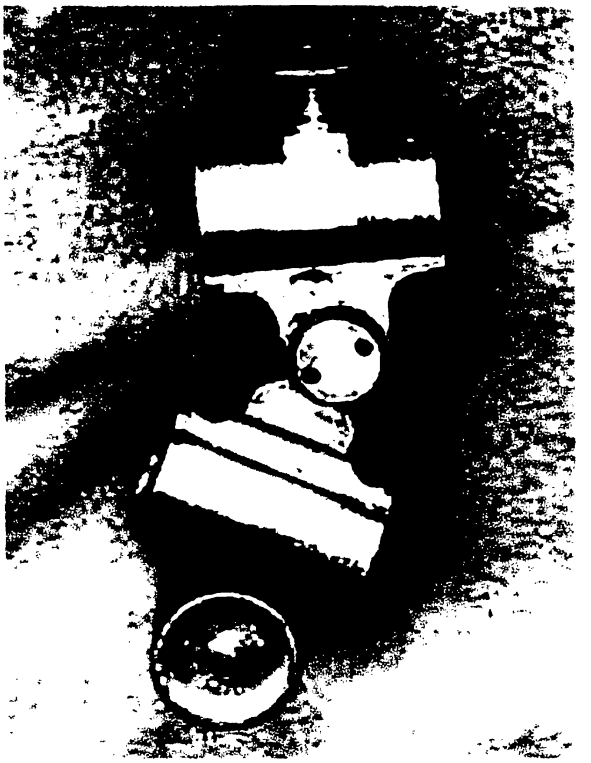

Fig. 7. Vertical 'friction' adjustment was achieved on this simple device, fitted to the tripod vertical rod (see Fig. 3).

Fig. 8. The Sheffield 4.5-inch (114mm) telescope (with temporary adjustment rod).

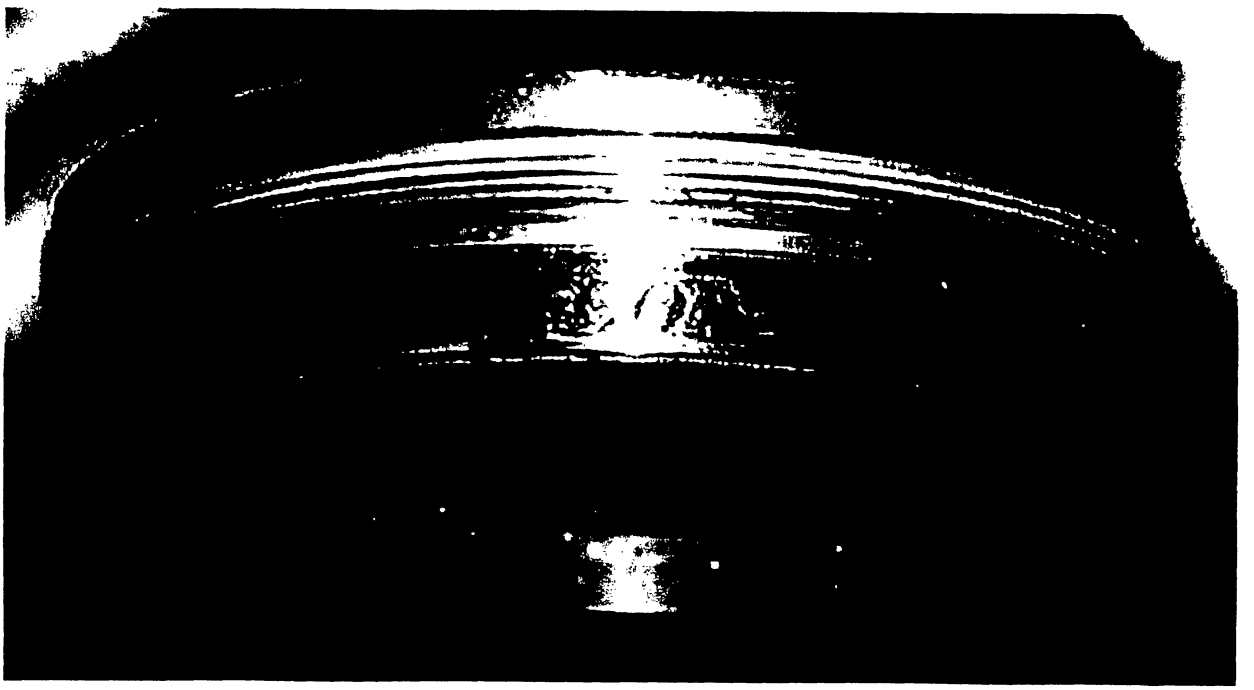

Fig. 9. The Achromatic Object Glass by WRAY LONDON (inscribed on cell).

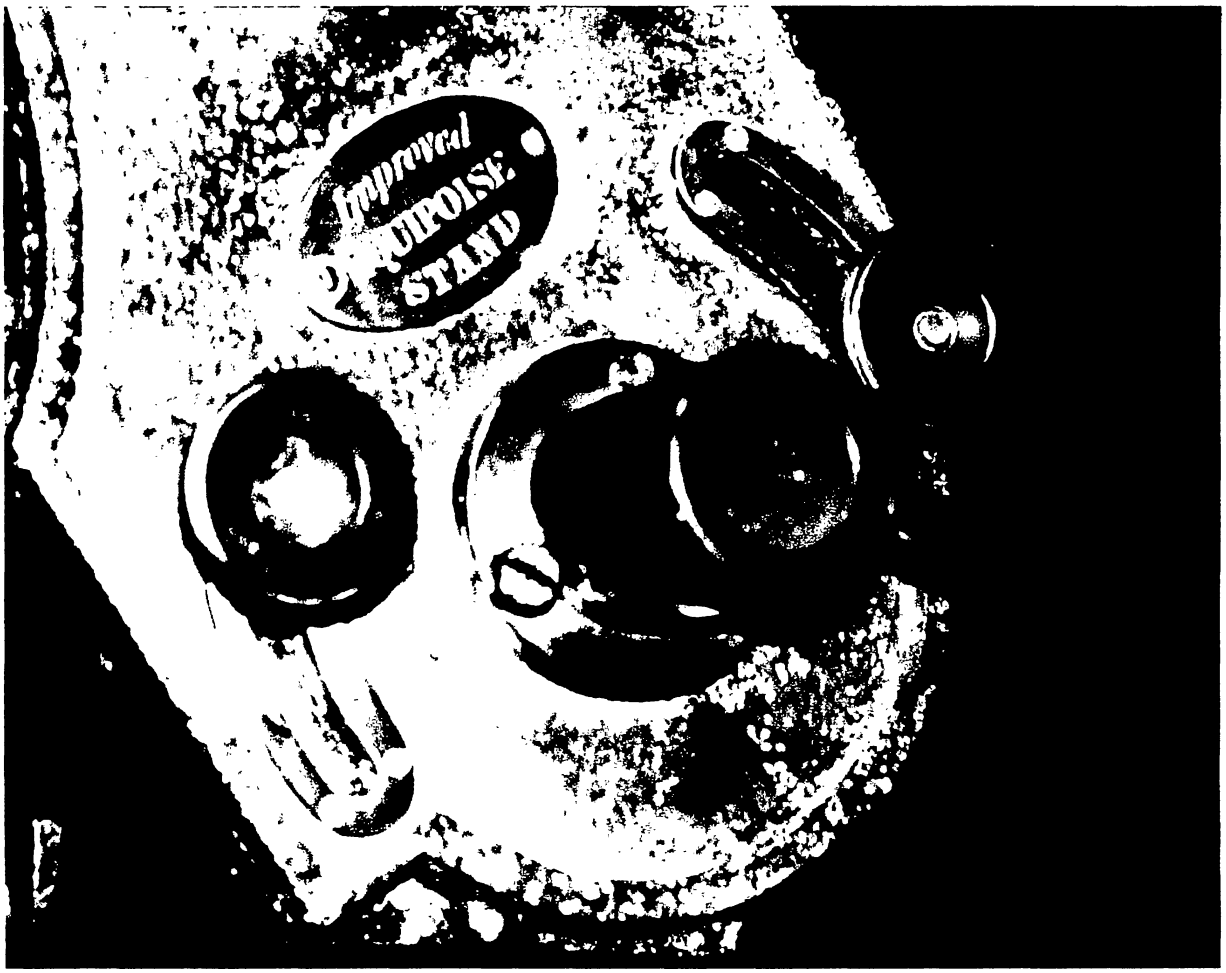

Fig. 10. Detail of the Sheffield instrument's trunnion with double slots. The inscription reads Improved EQUIPOISE STAND. On the other trunnion PARKES & SON placed their trade mark and name and address (see Fig. 6).

APPENDIX

Details of the Sheffield Instrument

1. OPTICS

Object glass clear aperture = 114mm (4.5in)
Focal length of OG = 1726mm (68in)
Focal ratio of OG = f/15.0
Outer diameter of OG cell = 135mm
OG cell fixed to main tube with four screws (no adjustment)
3 Huygenian eyepieces (negative), f.l. marked 1",1/2", 1/4" (under screw cap)
1 high power e/p (positive, marking unclear)
Eyepieces also marked x75, x130, x264, x462 (on cap)
Magnifying powers expected, x68, x136, x272 (h.p e/p f.l. unknown)
Field of view of e/ps = 32', 14', others very small
Focal lengths of e/ps (estimated from Ramsden disk measures) = 39mm, 12mm, 7.5mm
Highest power not measurable from RD

2. ACCESSORIES

Solar diagonal (unsilvered optical flat)
Star diagonal (prism)
Finder telescope, cell diam = 30mm
Finder OG cell finished in black enamel
Clear aperture 27mm, focal length 260mm
Length of finder = 316mm (with e/p)
Outer diameter finder tube = 33mm
Ditto cap = 33mm
Finder e/p component lens loose in Sheffield instrument
Ring & pedestal-type attachment to main tube for finder, with ring adjusting screws
Base plates of pedestal (with two screws into tube) length = 60mm
Wooden carrying case (oak or mahogany) for telescope & accessories

3. TUBE

Weight of telescope tube + cap + rod = 10kg
Weight of cap to object glass = 570g
Carrying case (without contents) = 10kg

Three extension tubes
1. length 159mm, outer diam 72mm (fixed to main tube, holding focusing nob, diam 45mm)
2. length about 100mm, diam 58.5mm
3. length 245mm, diam 51.7mm (with fixed inner section length 64.5mm with 30mm stop at interior end, with slide fit, i.e. not threaded)

Extension brass tubes, thickness 0.4mm
With main tube off pivots (OG cap removed) centre of gravity of tube 86cm from OG (equivalent to 10cm from pivots)
Length of main tube (less extensions, but incl. OG cell) = 1446mm
There is no dew cap extension for OG with the Sheffield instrument, only the dust cap

4. TUBE BALANCE & MOUNTING

Pivot plates on main tube, length = 321mm, width = 29.3mm
With six screws to tube and pivot axle mounted centrally
Pivot axle diameter = 13mm (26.5mm at pivot plate)
Off pivots, cap on, centre of gravity of tube 861mm from OG
(important from point of view of closing OG after observations)
Distance of vertical support rod joint from pivot = 478mm
Distance of centre of gravity of telescope tube (cap removed) from pivot point = 10cm
Distance of vertical support rod joint to pivot = 45cm
Vertical support rod (missing) probably 1m long (judging from storage position in carrying case)
3.5kg weight required, 27cm from pivot, to counter balance telescope tube
when vertical support rod is unconnected.

5. TRUNNIONS

Cast bronze-iron main trunnion component
Maximum width at base = 143mm (over 75mm vertical section)
Narrowest width (upper section) 47mm
Width at pivot position = 75mm
Thickness of trunnions about 10mm (with edge rim)
Sheffield instrument, one trunnion repaired by weld
Distance between two trunnions (outer measure) = 172mm
Thickness of upper cross strut between trunnions about 11mm
Similar lower cross strut between trunnions
Additional lower cross plates (in brass) possibly for optional fittings
Total height of trunnions about 320mm
Height of pivot above (fixed) brass base plate = 336mm
Trunnion component inner plate (vertical, brass?) attached to brass base plate
Central lower adjusting bolt hole on trunnion, 70mm above brass base plate
Two brass plates (circular, 10.5mm thick) on tripod
Top brass plate fixed to trunnions, lower plate to tripod, separated by rollers
Metal tube attached to lower brass base plate, reaching down to three-armed tripod support
Metal tube length about 80cm, reaching through small central plate on support, 652mm down

6. TRIPOD

Legs probably constructed from 50x25mm timber
Leg length = 1722mm (6ft 7in)
Tripod legs outer width at top 84mm (held by 1/4-inch tightening bolt, & 38mm disk nuts)
Tripod separator blocks, middle 180mm long, bottom 270mm long
Hinges (44x51mm) on these three centre blocks 665mm from top of tripod
Metal protecting caps at base of tripod legs (64mm long)

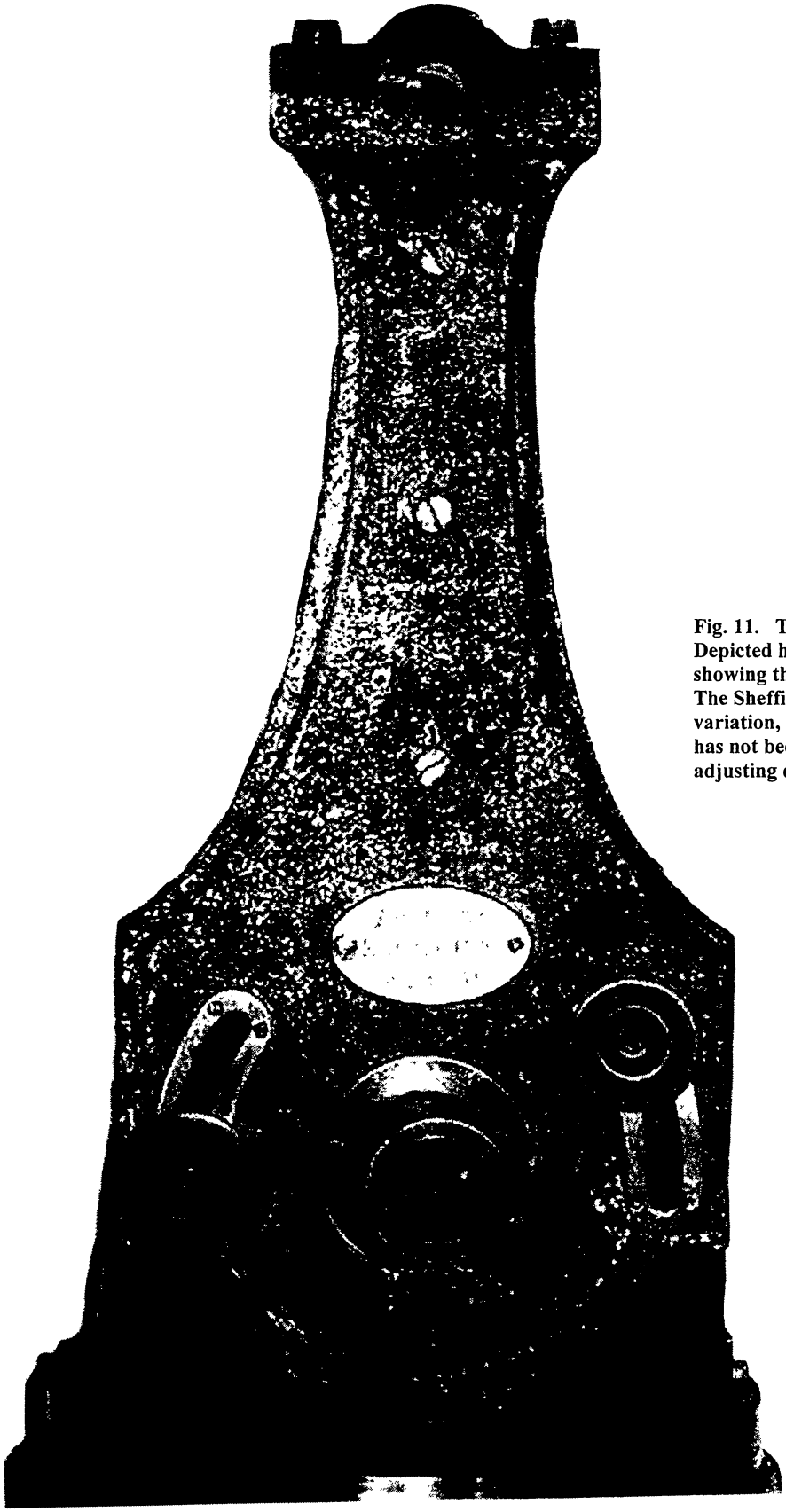

Fig. 11. THE TRUNNION
Depicted here is the complete trunnion showing the simple pivot hole at top. The Sheffield instrument has another variation, the purpose of which, as yet, has not been ascertained. See central adjusting device.