

PRICE ONE SHILLING.

FIFTH EDITION

OF

HINTS

ON

SILVERED-GLASS REFLECTING

PRIZE



TELESCOPES,

MEDAL.

ILLUSTRATED,



MANUFACTURED BY

MR. G. CALVER, F.R.A.S.

WITH DIRECTIONS FOR SILVERING, ADJUSTING, ETC.,

INCLUDING

Prices and a large number of Testimonials.

1893.

GEORGE CALVER,

HILL HOUSE, WIDFORD,

CHELMSFORD.

Description of Equatorial Reflectors exhibited by G. CALVER, at the International Exhibition, London, 1884, and which were awarded highest award (Silver Medal) for "excellence and improvements."

Equatorial Newtonian Reflecting Telescope,

No. 2 STAND,

WITH CLOCK WORK. TEN INCH SPECULUM.

This is a newly-designed instrument. Its superior arrangements and construction make it the handiest and most complete ever offered to Astronomers or Amateurs. Among its new and special features may be mentioned :—

1st.—It is so contrived that a driving clock can be applied conveniently to the upright column or pedestal stand.

2nd.—The Right Ascension, Declination, and Clock Motions are under complete control from the eye end, are *fixed* and *follow* the movements of Telescope, keeping in a line with or parallel with it; they are ready to give every movement without clamping or unclamping.

3rd.—The Telescope can be retarded or accelerated while the clock is driving it, without the trouble of unclamping or clamping. The hand-motion screw is always in gear and ready to drive either way.

4th.—The clock will drive the hour circle independently of or without driving the Telescope if needed, and thus, with one setting, keep the correct sidereal time.

5th.—The diagonal plane is mounted in a new and superior manner, with rack and pinion for adjustment, and the plane can be removed without altering adjustments.

6th.—The cradle in which the Telescope tube revolves is solid and fitted in a superior manner.

7th.—The Declination Hand-motion is brought to the hand on same side of the stand as the Telescope, as is also the R.A. motion.

8th.—The clock is fitted with pendulum regulator.

(Sold to Lord McLAREN, F.R.A.S. See his letter, page 9.)

PRICE LIST.

The New Form of No. 2, or Column Stand.

The equatorial arrangements of this stand are exactly the same as No. 1 stand, and up to 12 to 14 inch is quite as efficient. The arrangements for ease and pleasure in working are perfect. Nothing is omitted that is necessary to give the observer the most complete control when observing, and that with the least possible trouble.

The clock once set to sidereal time, and started, and the Telescope directed to the object to be observed, there is nothing then to attend to, the clock does all the rest, and making notes, sketching, etc., is made easy, as the hands are free. Though lacking nothing in the completeness of No. 1, this stand can be made at less cost. As 10 and 12 $\frac{1}{2}$ inch are favourite and standard sizes, the size of all the equatorial parts and movements, the circles, clock and readings of circles, are exactly the same for 10 and 12 $\frac{1}{2}$ inch, hour circle 13 inch, reading to single seconds.

It is now universally seen that a good mirror is worthy of as good a mounting as a good object glass, and the demand is now for the best of mounting as well as for the best mirrors, and 10 and 12 $\frac{1}{2}$ inch is the size now most approved of for general work. The amateur often begins with a small aperture, from 3 to 4 inch O.G., and generally in about a year more light is desired. Coming from a 3 to 4 inch to a 10 or 12 $\frac{1}{2}$ inch, celestial objects are quite different pictures, and the amateur seems to begin Astronomy anew, and with greatly increased interest.

The new form of No. 2 stand has a long polar axis, works exceedingly smooth and steady, complete as above described (see Lord McLAREN's and Mr. WESTLAKE's letters) with clock and 5 powers, 13 inch circles, reading to single seconds.

| | | | | | | £ | s. | d. |
|-------------------------|----|----|----|----|----|-----|----|----|
| 10 inch .. | .. | .. | .. | .. | .. | 215 | 0 | 0 |
| 12 $\frac{1}{2}$ inch.. | .. | .. | .. | .. | .. | 240 | 0 | 0 |

TELESCOPE. No. 1 Stand.

WITH TWENTY AND A HALF INCH SPECULUM.

This form of Stand I have found especially suited for large and heavy instruments, of any dimensions. For mechanical detail it is as complete as No. 2 form. It has a large and powerful Driving Clock, with governor regulator and friction brake, and also a seconds bell.

The Axes are fitted with Friction Rollers, and, though very heavy, the instrument moves with ease.

For bringing the eye tube to the most convenient position for observing, the Telescope tube is rotated by worm and wheel.

(Sold to S. OKELL, Esq., F.R.A.S.) Photographs of these two forms of mounting can be sent for inspection.

*14 inch Speculum mounted as (Fig. 1), with rotating hour circle reading to 5 seconds and declination to 1 minute (the diameter of the circles never less than that of the Speculum, and often larger)

| | £ | s. | d. |
|---|------|-----|-----|
| 8 powers, from 50 to 700, with first-rate and very powerful Driving Clock, and complete | from | 350 | 0 0 |
| 17, 18 to 20 inch | from | 500 | 0 0 |
| 22 to 24 inch | from | 700 | 0 0 |
| 30 inch | | | |
| 36 to 60 inch | | | |

Prices will be forwarded for special arrangements in any of these large sizes.

These clocks are fitted with governor, regulator, and self-adjusting break. They are made of gun metal and steel, and every wheel is cut. They drive with most excellent regularity, and are, when desired, made to beat seconds on a bell. The whole is enclosed in a mahogany frame, with glass panels.

SILVERED-GLASS EQUATORIAL TELESCOPES, very substantially and well fitted, as (Fig. 2). All these equatorials have revolving body. Axes, $2\frac{1}{2}$ inch diameter.

| | £ | s. | d. |
|---|-----|----|----|
| $5\frac{1}{4}$ inch Speculum, from 4 to 6 feet focus, with 7 inch hour circles, reading to 5 seconds of time, and declination circle reading to 1 minute, 2 powers | 40 | 0 | 0 |
| $6\frac{1}{2}$ inch Speculum, of from 5 to $6\frac{1}{2}$ feet focus, 10 inch rotating hour circle, reading to 5 seconds of time, and declination circle to 1 minute of arc, with 3 powers—100 to 500 | 60 | 0 | 0 |
| $8\frac{1}{2}$ inch Speculum, as above, with 10 inch circles, 4 powers | 76 | 0 | 0 |
| 10 " " " 5 " " from | 135 | 0 | 0 |
| $12\frac{1}{2}$ " " " 5 " " from | 165 | 0 | 0 |

The EDUCATIONAL REFLECTOR is a plain and very steady and satisfactory instrument, mounted on (Fig. 2) stand, without circles, has revolving body, and made so as to be portable.

| | £ | s. | d. |
|--|----|----|----|
| $8\frac{1}{2}$ inch Speculum as above, with 3 powers | 50 | 0 | 0 |

The POPULAR REFLECTOR (Fig. 3), with Angle-Block stand, with endless screw-motion to follow the stars with equatorial motion.

| | £ | s. | d. |
|--|----|----|----|
| $5\frac{1}{4}$ inch Speculum, of from 4 to 6 feet focus, with 2 powers | 26 | 0 | 0 |

These are also made with rotating body.

Reflecting Telescopes on Alt-azimuth Stand, fitted with silvered-glass Speculum, and provided with two eye-pieces.

| | | | | | | £ | s. | d. |
|--------------------------------|---------------------------|----|----|----|----|----|----|----|
| 5 $\frac{1}{2}$ inch Speculum, | 4 to 6 feet focus | .. | .. | .. | .. | 26 | 0 | 0 |
| 6 $\frac{1}{2}$ " " " | 5 " 6 $\frac{1}{2}$ " " " | .. | .. | .. | .. | 30 | 0 | 0 |
| 8 $\frac{1}{2}$ " " " | 6 $\frac{1}{2}$ " " " | .. | .. | .. | .. | 40 | 0 | 0 |
| 10 " " " | 7 " " " | .. | .. | .. | .. | 56 | 0 | 0 |
| 12 $\frac{1}{2}$ " " " | 8 " " " | .. | .. | .. | .. | 70 | 10 | 0 |

Silvered-Glass Specula (unmounted).

FINEST QUALITY GUARANTEED.

| FIRST QUALITY CONCENTRATORS. | | | | £ | s. | d. |
|------------------------------|----------------|---|-----------------|-----|----|----|
| 5½ | inch diameter, | 4 | to 6 feet focus | 6 | 0 | 0 |
| 6½ | " | 4 | " 6½ " | 7 | 10 | 0 |
| 8½ | " | " | " 6½ " | 14 | 10 | 0 |
| 10 | " | " | " 7 " | 25 | 0 | 0 |
| 12½ | " | " | " 8 " | 38 | 10 | 0 |
| 14 | " | " | " 8 " | 55 | 0 | 0 |
| 16 | " | " | " 10 " | 75 | 0 | 0 |
| 18 | " | " | " 12 " | 100 | 0 | 0 |
| 20 | " | " | " 12 " | 130 | 0 | 0 |
| 22 | " | " | " 15 " | 165 | 0 | 0 |
| 24 | " | " | " 18 " | 200 | 0 | 0 |
| 26 | " | " | " " | 250 | 0 | 0 |
| 30 | " | " | " " | 300 | 0 | 0 |
| 36 | " | " | " " | 400 | 0 | 0 |

Silvered-Glass Diagonal Mirrors (*unmounted*)

FINEST QUALITY GUARANTEED.

| | | | £ | s. | d. |
|----|--|----|----|----|----|
| 1 | inch in the minor axis, or narrowest diameter of the ellipse | .. | 1 | 10 | 0 |
| 1½ | " | " | 2 | 15 | 0 |
| 2 | " | " | 3 | 10 | 0 |
| 2½ | " | " | 4 | 15 | 0 |
| 3 | " | " | 6 | 10 | 0 |
| 3½ | " | " | 8 | 10 | 0 |
| 4 | " | " | 15 | 5 | 0 |
| 5 | " | " | 25 | 0 | 0 |

Silvering and Polishing Specula.

| | £ | s. | d. | | £ | s. | d. |
|----------------|---|----|----|--------------------------|---|----|----|
| 5 inch | 0 | 7 | 6 | 10 inch | 0 | 18 | 6 |
| 6½ „ | 0 | 10 | 6 | 12½ „ | 1 | 10 | 0 |
| 8½ „ | 0 | 12 | 6 | Diagonal Planes.. 3s. to | 0 | 5 | 0 |

Astronomical Eye-Pieces.

OF BEST QUALITY.

Huyghenian Construction of the following magnifying powers on a 6 feet focus object-glass:—

| | | | |
|-----------------------------------|----|--------|--------|
| | £ | s. | d. |
| 35, 60, 90, 130, 180, 200 | .. | each | 0 15 0 |
| 320, 450 | £1 | 1s. to | 1 10 0 |
| 610 | .. | .. | 1 17 6 |

Improved Achromatic, Ramsden's Construction.

| | | £ | s. | d. |
|------------------|----------------|---|----|----|
| 90, 130 | each | 1 | 5 | 0 |
| 189, 250 | | 1 | 10 | 0 |
| 320, 450 | £1 12s. 6d. to | 2 | 0 | 0 |
| 610, 750 | | 2 | 12 | 0 |
| 850 | | 2 | 12 | 0 |

Kellner's Construction.

| | | £ | s. | d. |
|------------------------|------|---|----|----|
| 30, 58, and 80 | each | 1 | 5 | 0 |

Solar Eye-Pieces.

| | | £ | s. | d. |
|---|-----------|----|----|----|
| Solar Diagonal, with true plane | | 1 | 12 | 6 |
| Barlow's Lens | | 1 | 1 | 0 |
| Day Erecting Eye-piece | £1 5s. to | 1 | 10 | 0 |
| Coloured Eye-piece Cap for observing the Moon | | 0 | 4 | 0 |
| Transit Eye-pieces, for use with Equatorials | £1 1s. to | 2 | 2 | 0 |
| Adjusting Piece | | 0 | 2 | 6 |
| Micrometers, position, 4", circle on silver, 3 powers, etc., in case .. | | 15 | 15 | 0 |
| Neutral Tint Wedge | | 1 | 1 | 0 |

Good Instruments will be taken in exchange, and liberally allowed for.

REFRACTORS AND REFLECTORS FREQUENTLY
FOR SALE.

GEORGE CALVER, F.R.A.S., F.B.A.A.,

Hill House, Widford,

Chelmsford, Essex.

LETTERS FROM THE FOLLOWING GENTLEMEN.

Mr. CALVER has carried the equatorial reflector to such a high degree of perfection that it may interest your readers to have a description of it.

Some time since he made me a $12\frac{1}{2}$ inch mirror, which he mounted on an alt-azimuth stand, with massive iron column, steel friction rollers, large axis, etc., which was all that could be desired. The mirror turned out to be such a fine one that I decided to have it mounted equatorially in Mr. Calver's best style. He has executed this to my highest satisfaction; indeed, it seems to me marvellously perfect.

It is on the principle known as his No. 1 stand which has long massive polar axis, and also very large Declination axis, both solid iron. The sides and base-plate are also very massive.

The weight in motion, including the telescope, is about 12 cwt., yet moving with the greatest possible ease, both in R.A. and Declination, and, of course, balanced perfectly in both.

The tube, which rotates as usual, is so perfectly true, that when the mirror is adjusted on the spot and pinhole method (of which many of your readers know the exquisite nicety), say with the telescope on the east side of the stand, and the tube is then rotated and moved over to the west side, the adjustment still retains its perfection absolutely.

The telescope is driven by a powerful clock which goes exactly the same speed, whether it is driving the telescope or not. This clock is so arranged that when in motion it always drives the tangent and hour circles, whether the telescope is clamped or otherwise.

When the telescope is clamped in R.A. it drives the tangent, and hour circles, and the telescope, leaving, however, the hour circle quite free to move backward or forward if required. The telescope can also be moved in R.A. and Declination by hand either way, when all is clamped and the clock is driving everything forward.

The facility which this gives to the observer is very great, the *modus operandi* being thus—

1st. Start the clock, and set the hour circle to the correct sidereal time by the sidereal vernier, which will then keep the time all the evening.

2nd. Set the Dec. circle to the declination of the object as given in catalogue, and clamp it in Dec. Then move the telescope in R.A. till the R.A. vernier points to the R.A. of object in the catalogue, and it is then in the field.

So true are the motions and readings of the circles that the object will generally be very nearly in the centre of the field, without the slightest trouble or difficulty; indeed, the pleasure of finding, particularly in the day time, objects invisible to the naked eye, is very great.

For a sidereal clock I have a simple Venetian timepiece, with wood pendulum, which is made to gain the 3 min. 57 sec. per day on solar time, and which keeps very correct. It is set quite right, however, by the first star observed, thus:

With all in motion, bring the star to the centre of the field, with a transit eyepiece. Set the hour circle to the exact R.A. by catalogue of the star, and the sidereal vernier will point to the exact sidereal time, with which correct the sidereal clock if necessary.

The precision of the clock and the arrangements of the stand are extraordinary.

These I tested as follows: At 3.30 p.m., April 24th, in brilliant sunshine, I put the telescope by the circles on α Orionis, found it immediately near the centre of the field, got it into the centre by hand motions, and left it with all clamped and the clock running for thirty or forty minutes. When I returned the star was still in the centre of the field, and I could not see that it had moved at all from where it was when I left it. Eyepiece, Kellner, power 84.

To test the positions and readings of the two sides of the stand, I proceed as follows:—Putting α Orionis on the central cross-wire of transit eyepiece, with the telescope on the east side of the stand, and the hour circle to the exact R.A. by *Nautical Almanac*, I set my sidereal clock to the exact time shown by the sidereal vernier. I then moved the telescope over to the west side of the stand, and did the same with Arcturus, when the sidereal clocks and sidereal vernier were exactly alike. This is a degree of precision hardly looked for, and reflects the highest credit on the maker.

I need hardly say that the instrument is absolutely steady, no tremor or motion of any kind, although all is in motion, can be detected; the object appears perfectly still.

Should any of your readers be in this neighbourhood, and wish to see the telescope, it will give me much pleasure to show it, as I consider such care and skill exercised by Mr. Calver demand, on my part, the greatest publicity.

T. WESTLAKE.

Fordingbridge, April 28th.

From LORD McLAREN, LL.D., F.R.A.S., F.R.S.E., &c.

46, MORAY PLACE, EDINBURGH.

DEAR MR. CALVER,—I have pleasure in testifying to the excellence of your 10 inch reflector, and of the micrometer which you have made to be used with it. I need say nothing regarding the optical qualities of the telescope, because the perfection of your mirrors is too well known to need any recommendation from me. But I must add a few lines regarding the mounting of your instruments:

(1.) I think you have successfully overcome the difficulty connected with hand motion while the clock is driving; and it is indeed a very great convenience to the observer to be able to range over a considerable field without the necessity of touching the clock or disturbing the reading of the hour circle.

(2.) The driving-clock is very steady, and is easily regulated. I have repeatedly watched a small star on one of the wires for several minutes without detecting the smallest tremor or sensible change of position.

(3.) The micrometer, I think, contains all the improvements of Ropsold, except that connected with illumination, and is a very complete work of art. The new mode of central illumination has been well carried out: it is admirably suited for use with the incandescent lamp, because the illuminating apparatus is entirely out of the way of the observer's eye.

If I were ambitious of possessing a telescope of greater power, I do not think that I should desire anything more perfect in mechanism, or more convenient in arrangement, than your 10 inch reflector.

I am,

Yours faithfully,

(Signed.)

I think it may interest some of your readers to know what fine instruments Mr. Calver is now supplying his clients with. I have lately purchased a 12 $\frac{1}{2}$ inch reflecting telescope from him. It is equatorially mounted, and complete with clockwork, perfect steadiness while clock is driving telescope, and every contrivance complete for handiness and ease in working. The stand is known as his No. 1 type, and all the hand movements are brought to eye end of telescope, and follow the hand in all positions. In beginning a night's work, the clock is started; the hour circle, which revolves freely, is set to sidereal time. The clock is now driving the circle only, and if properly regulated, keeping sidereal time. To find an object, it is only necessary to set the telescope in R.A., clamp clock, then set in Declination and clamp.

The clock is now driving the telescope and keeping the object in the field of view. If the object is not exactly in centre of field of view, the hand motions will bring it to centre while clock is driving telescope. I do not think anything could be more perfect in all its movements and ease of working than the instrument I now have. With regard to the mirror, Mr. Calver's work is too well known and appreciated to need any words of mine; but I consider I have as good a mirror as can possibly be turned out, and for the instrument to show its full powers all that is wanted is a good night.

I should be very pleased to show my instrument to anyone desirous of seeing it.

BERNARD E. CAMMELL, F.R.A.S.

Folly Court, Wokingham.

Mr. Cammell's letter (35518) in the "E. M." for November 3rd, describing the steadiness and handiness of his reflecting telescope by Mr. Calver, induces me to say a few words about my own $12\frac{1}{2}$ inch telescope, which Mr. Calver has just completed for me. It is equatorially mounted on his No. 2 type of stand with driving clock. It is a much less expensive mount than the No. 1 type; but I do not think any stand could be steadier or work smoother. The circles have the same simple arrangement for setting as Mr. Cammell's; but in mine the handles to the slow motions and clamps are in duplicate, there being one set within easy reach of the circles, and the other brought up to the eye-tube. The optical part, it is needless to say, is up to Mr. Calver's usual standard, and I think he is to be congratulated on having thought out so many additions and mechanical conveniences, which go to form in the whole an instrument of high excellence, and as complete as could be desired.

LOUIS H. WALTER.

Victoria Street, Westminster.
