

(No Model.)

3 Sheets—Sheet 1.

A. RUDALL.
TELESCOPE.

No. 471,708.

Patented Mar. 29, 1892.

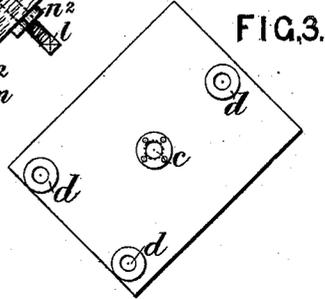
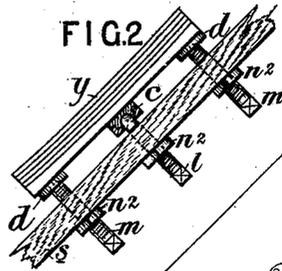
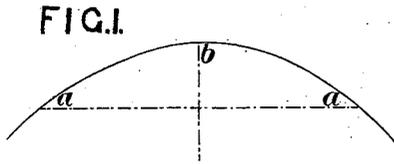
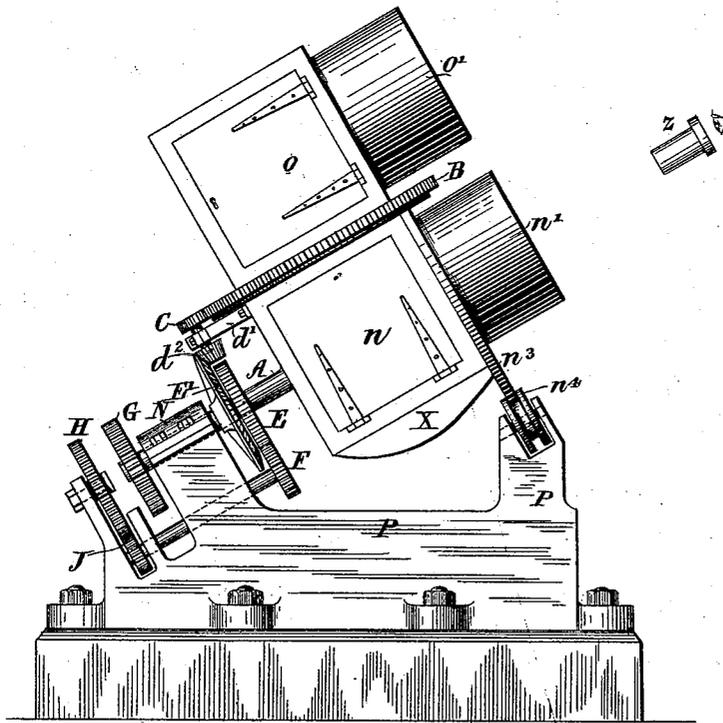


FIG. 4.



Witnesses:
H. B. Kingsbury
C. S. Northrup

Inventor:
Alfred Rudall,
by William E. Souther,
his atty

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FIG. 6.

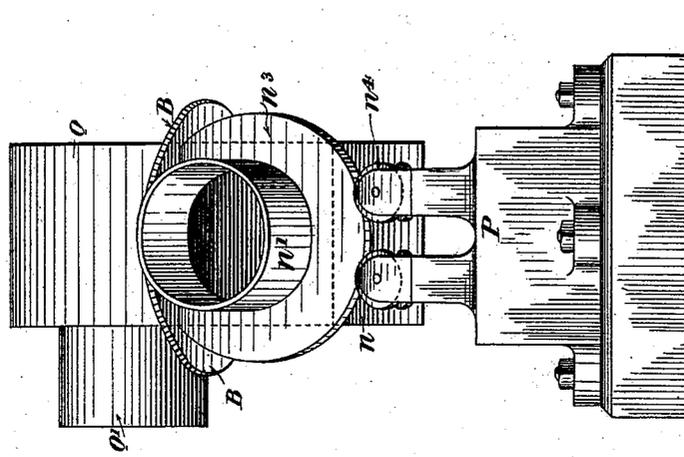
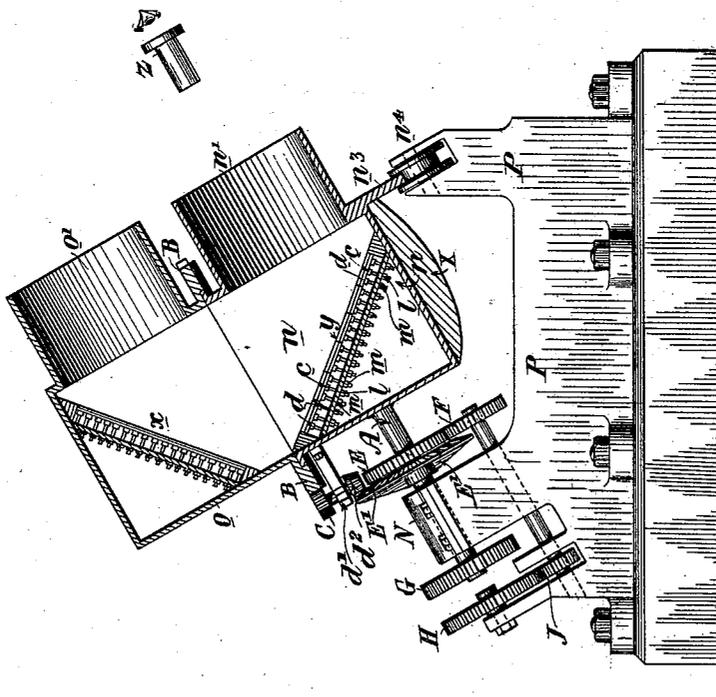


FIG. 5.



Witnesses:
H. B. Dingsberg
C. S. Northrup.

Inventor:
Alfred Rudall,
by William E. Foulter,
his atty.

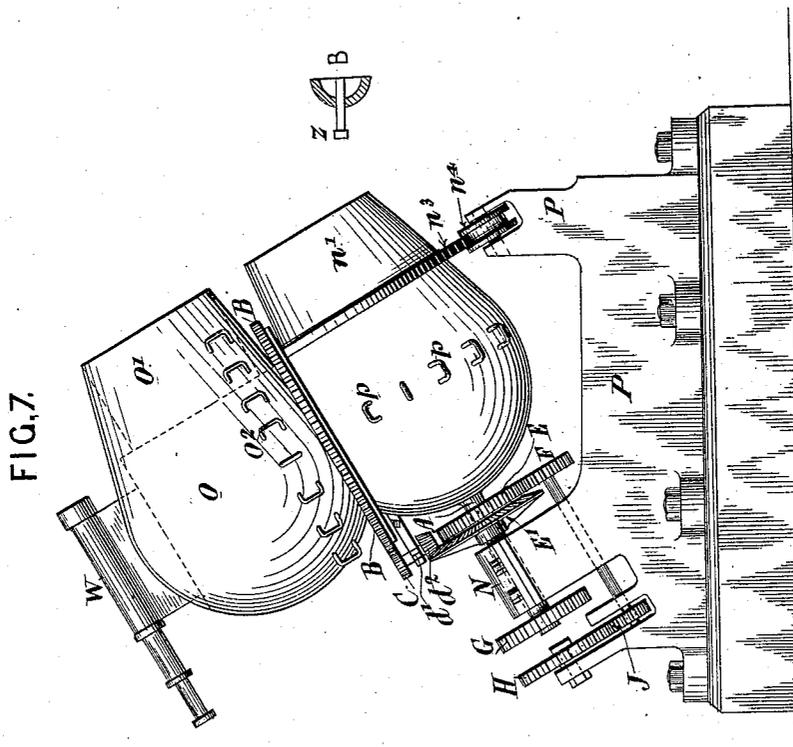
(No Model.)

3 Sheets—Sheet 3.

A. RUDALL.
TELESCOPE.

No. 471,708.

Patented Mar. 29, 1892.



Witnesses:
H. B. Kingsbury
C. C. Northrup

Inventor:
Alfred Rudall,
by William E. Doolittle
his atty.

UNITED STATES PATENT OFFICE.

ALFRED RUDALL, OF ST. AGNES, ENGLAND.

TELESCOPE.

SPECIFICATION forming part of Letters Patent No. 471,708, dated March 29, 1892.

Application filed March 31, 1890, Serial No. 345,932. (No model.)

To all whom it may concern:

Be it known that I, ALFRED RUDALL, clerk in holy orders, a subject of the Queen of Great Britain, residing at St. Agnes Vicarage, Scorrier, in the Duchy of Cornwall, England, have invented certain new and useful Improvements in and Connected with Astronomical and other Telescopes, of which the following is a specification, reference being had to the accompanying drawings.

According to my invention I make the reflectors of astronomical and other telescopes of a concave-curved surface formed by the revolution round the axis of a parabola (with the semi-parameter as its radius) of that part of the parabola which lies at or near the extremity of the parameter; and my invention also consists in improvements in the construction of instruments suitable for such reflectors; and in order that my invention may be more readily understood I will describe the same with reference to the accompanying drawings, of which—

Figure 1 is a diagram representing a parabola. Fig. 2 is a side elevation showing a convenient mode of mounting a reflector, and Fig. 3 is a back view of reflector. Fig. 4 is a side elevation of a telescope. Fig. 5 is the same, partly in section. Fig. 6 is an end view of telescope with upper reflector-box turned round a quarter of a turn. Fig. 7 is a side elevation of a telescope with a finder shaped and covered so as not to offer too much resistance to the wind.

Referring to Fig. 1, which is a diagram representing a parabola, I would have it understood that I utilize that part (designated by a) which lies at or near the extremity of the parameter instead of the part at or near the apex and designated by b , which has been the practice hitherto. The reflectors are preferably made of plaster-of-paris or of some other material easily molded into shape, and in the case of large reflectors they may be built up in sections on some suitable backing or framework; or the same effect may practically be obtained by building the curve of a parabola of a series of very small planes or sections of a sphere.

A convenient method of making the reflector or sections thereof is as follows: A convex reflector-form or matrix made of iron or other suitable material has a coating of silver de-

posited or laid thereon, and a good backing of copper is then deposited on the silver. The copper is then coated with a layer of glue or some adhesive, preferably cold, a coating of very fine plaster-of-paris, and, lastly, a thick coat of rougher plaster. Furthermore, a backing of wood or other suitable material may, if required, be added. When set, the whole is removed from the iron form or matrix and the silver surface is polished.

A convenient mode of mounting and adjusting the reflector or reflector-sections is shown by Figs. 2 and 3, in which y represents the reflector or a section thereof mounted on a beam s , of wood or other suitable material, by means of a screw l , having a universal joint c or its equivalent at the end fixed to the back of the reflector y . The reflector or reflector-section is eventually adjusted and fixed in its proper position and at the proper angle by means of the set-screws m and check-nuts n^2 . The back view, Fig. 3, shows back of reflector only, and d are bearing-plates for the set-screws m .

In constructing an equatorial telescope, as shown in Figs. 4, 5, and 6, the paraboloidal reflector y is inclosed in a box n of cubical or other convenient shape and forms, approximately, the diagonal plane therein. This box n revolves on its axis in bearings N , or any other suitable and stable construction may be designed for that purpose. The box n is provided with two circular openings at adjacent sides, one of them being at the top and the other in the direction of the axis of rotation. On it is mounted another similar box or frame or frame-work o , containing a plane reflector x , set at right angles to the reflector y in such manner that rays from the object to be examined pass through a circular opening in the side of the box o onto the plane reflector x , whence they are reflected through a circular opening in the bottom of the said box o and the upper opening on the lower box n , with which it coincides onto the paraboloidal reflector y , which focuses them into the eye-piece z , said eye-piece being suitably mounted at the proper distance from and angle to the paraboloidal reflector y . Owing to want of space on the drawings, the eye-piece is, however, shown in all cases much too close to the reflector y . The upper box o is mounted on the lower one n in such manner as to

be capable of rotating thereon on its vertical axis relatively to the lower box, the axis of rotation of the two boxes being, therefore, at right angles to each other, and thus commanding the whole of the celestial hemisphere. Each of the two exterior openings are provided with tubes o' and n' of sufficient length to exclude oblique rays. The lower box n is provided with a weight X to counterbalance the weight of the upper box o . A telescope of this construction may be actuated in very much the same manner as those at present in use—for instance, by applying motion with suitable releasing and reversing gear to tooth-wheels G and H . The wheel G is mounted on the trunnion or pivot A of the lower box n , while the movement of the upper box on the lower box is provided for by the wheel H and wheel J , mounted on a counter-shaft, which at its other end has another wheel F gearing with the spur-wheel E and beveled wheel E' , which run loose on the shaft A . The wheels E and E' may be connected in any convenient manner by clutches or the like, and the wheel E' thus, when desired, actuates bevel-pinion d^2 , mounted on a short shaft running in bearings d' and having at its other end a spur-pinion c , which latter gears with a circular tooth-rim B on the outside of the lower part of the upper box o . It is, however, evident that any convenient arrangement of mechanism may be employed for actuating the several moving parts of the instrument. In order to still further steady the apparatus, I provide the lower box n with a roller guide or guides n^3 , which moves or move on pulleys n^4 , mounted in bearings on the bed-plate P . The boxes o and n have hinged or sliding doors at their sides to facilitate easy access to their interiors for the adjustment and cleaning of the reflectors, as shown in Fig. 4.

Fig. 7 represents a telescope with a finder W , the upper and lower boxes being covered or fashioned in such manner that they offer the least possible resistance to the wind. o^2 are handles on the upper box o , and p are handles on the lower box n , so as to facilitate turning the said boxes around by hand, if desired.

The eye-piece z is always stationary, being fixed at the proper distance, according to the focus of the parabola, and is entirely independent of and unconnected with the reflector-chambers.

Although the telescopes have only been shown mounted in one position, it is evident that such may be varied according to the necessities of each case, which would be apparent to an astronomer.

The instruments which have just been described may also be used as transit-instruments. They may also be used as ordinary telescopes without apparatus of any kind for moving the several parts, except the handles o^2 and p or their equivalents:

Having fully described my invention, what

I desire to claim and secure by Letters Patent is—

1. A reflector for telescopes and the like, having a curve coinciding with the curve of that part of the parabola which lies at or near the extremity of the parameter, substantially as set forth.

2. A reflector for telescopes and the like, consisting, essentially, of a backing of plaster-of-paris or the like, a deposit or coating of copper secured upon said backing, and a coating of silver upon said copper, the whole having the shape described.

3. In a telescope or the like, the combination, with the reflector, of means for supporting and adjusting the same, consisting of a support, as s , and screws adjustably mounted in said support and upon which screws said reflector is supported and adapted to be revolved, as and for the purpose specified.

4. In a telescope or the like, the combination, with a paraboloidal reflector mounted so as to adapt the same to have the revoluble movement described, of a plane reflector arranged in proximity to the paraboloidal reflector and at right angles to the latter, said plane reflector being also mounted so as to permit it to have a revoluble movement independently of the paraboloidal reflector, as and for the purpose specified.

5. In a telescope, the combination, with the stationary eye-piece, of a lower reflector-box mounted and adapted to be rotated upon its central axis, an opening in the upper side of said reflector-box and a paraboloidal reflector mounted in said reflector-box, an upper reflector-box mounted and adapted to revolve upon the lower one, an opening in the lower side of the upper reflector-box and coinciding with the opening in the lower reflector-box, and a plane reflector mounted in the upper reflector-box and occupying a position at right angles to the paraboloidal reflector, as and for the purpose set forth.

6. In a telescope, the combination, with the stationary eye-piece, of a lower reflector-box mounted and adapted to be rotated upon its central axis, said reflector-box having a nearly ovoid shape, as described, an opening in the upper side of said reflector-box and a paraboloidal reflector mounted therein, an upper reflector-box mounted and adapted to revolve upon the lower reflector-box, said upper reflector-box having a shape corresponding with that of the lower one, an opening in the lower side of the upper reflector-box and coinciding with the opening in the lower one, and a plane reflector mounted in the upper reflector-box and occupying a position at right angles to the paraboloidal reflector, as and for the purpose set forth.

ALFRED RUDALL.

Witnesses:

THOMAS HUNKIN,
JOSEPH MOSS,

Both of Truro.