

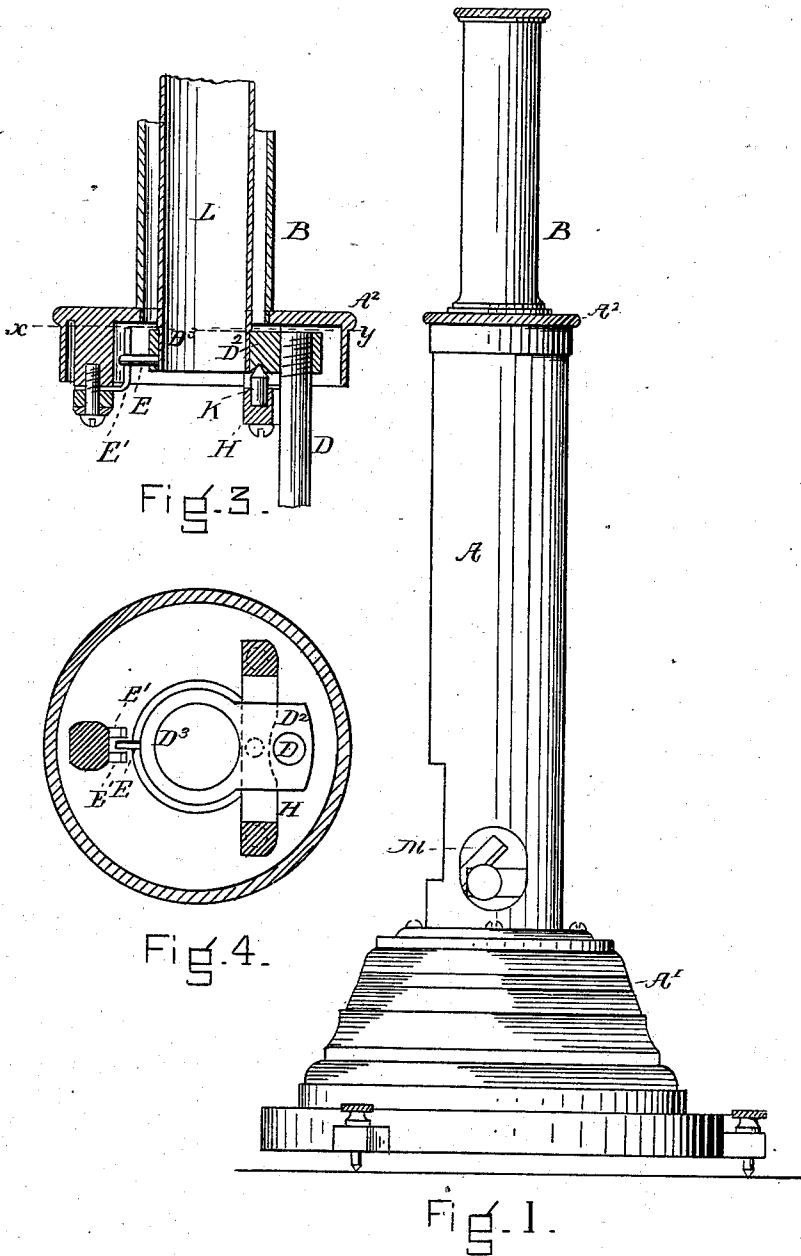
(No Model.)

2 Sheets—Sheet 1.

S. C. CHANDLER, Jr.
Altitude Instrument.

No. 239,315.

Patented March 29, 1881.



WITNESSES.
Helen M. Fagan
Wm S. Sampson.

INVENTOR
Seth C. Chandler, Jr.

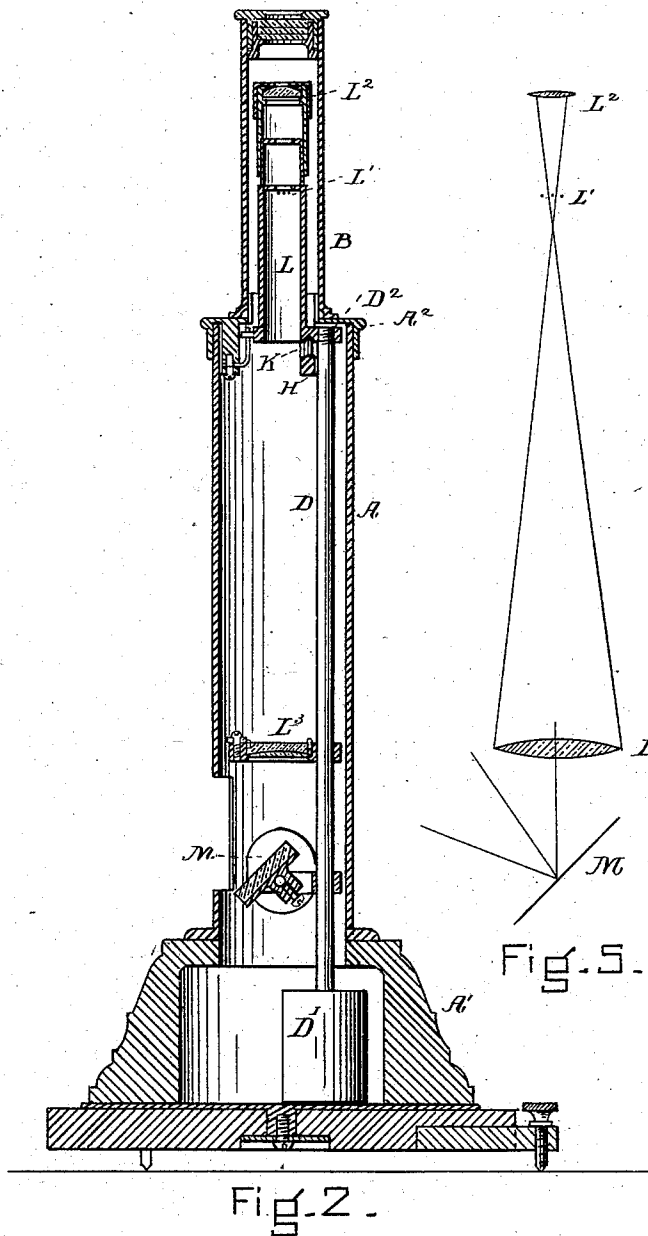
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UNITED STATES PATENT OFFICE.

SETH C. CHANDLER, JR., OF BOSTON, MASSACHUSETTS.

ALTITUDE-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 239,315, dated March 29, 1881.

Application filed April 23, 1880. (No model.)

To all whom it may concern:

Be it known that I, SETH C. CHANDLER, Jr., of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Instrument for Measuring Equal Altitudes, of which the following is a specification.

The nature of my invention consists in attaching to a swinging bar a small telescope and an adjustable reflector, the telescope being provided with a spider-line diaphragm, which is placed, as usual, in the focus of the eye-piece.

My invention also consists in combining with the swinging telescope and reflector certain devices and modifications, which may be best understood by reference to the drawings and specification.

In the drawings, Figure 1 is an elevation of my invention. Fig. 2 is a vertical section of the same. Fig. 3 is an enlarged section, showing the method of suspending the swinging rod. Fig. 4 is a plan of the device for suspending the swinging rod, the cap being represented as cut off at the line *xy*, Fig. 3. Fig. 5 is a diagram to show the principle of action of my invention.

The outer case of my instrument is indicated by the letters *A' A B*, Figs. 1 and 2. At the upper end of the tube *A*, I affix a cap, *A²*. (See Fig. 3.) On the under side of the cap *A²*, I attach a cross-bar, *H*. (See Figs. 3 and 4.) This cross-bar *H* has a pointed pin or stud, *K*, projecting upward from its center. Upon the point of the stud *K*, I suspend a piece of metal, *D² D³*, the shape of which is shown in Figs. 3 and 4, the part *D³* being annular, and serves to support the eye-piece tube *L*. The other part, *D²*, has upon its underside an indentation, in which the point of the stud *K* works; and to this part *D²*, I fasten the rod *D*.

The part designated by *D² D³*, which I will hereinafter call the "supporting-ring," is free to swing in all directions; but it cannot turn on its vertical axis, it being checked by the small projecting pin *E*, which plays between the two guides *E' E'*, Figs. 3 and 4.

The rod *D* has attached to its lower end a weight, *D'*, (see Fig. 2,) which serves to main-

tain it in a constant position in relation to the vertical. To this rod *D*, I attach the object-glass *L²* and the adjustable reflector *M*.

All of the parts of the instrument that are depended upon for detecting equal altitudes—namely, the eye piece *L²*, the spider-line diaphragm *L'*, the object-lens *L³*, and the reflector *M*—are connected to and governed by the weighted rod *D*, (see Figs. 2 and 5,) and are thus free to adjust themselves into a constant position in relation to the vertical.

The tubes *A* and *B* serve simply as a support and covering for the other parts. In the upper part of the tube *B* colored or darkened glasses may be placed to shield the eye from the sun when solar observations are taken.

To use this instrument for obtaining true time by the sun, the instrument is adjusted to show the passage of the image of the sun on the reflector *M*, the exact chronometer time of the passage across the spider-lines being observed, the reflector being firmly fixed in its adjusted position in relation to the rod *D*. This constitutes the first observation, and is to be taken before meridian passage of the body observed. The second observation is to be taken after meridian passage. This is to be recorded in the exact chronometer time. The mean time of the two observations will give exact time (by chronometer) of the passage of the body across the meridian, and by an ordinary calculation, with the aid of an ephemeris, the exact error of the chronometer may be ascertained.

If desirable, the device may be inverted and the image thrown onto a screen, the screen being attached to the same swinging bar that the other parts are.

Having thus described my invention, what I desire to secure by Letters Patent is—

In an altitude-instrument, the combination of a pendulum having upon it a light-directing device with an eye-piece and defining line or lines, substantially as described, and for the purpose set forth.

SETH C. CHANDLER, JR.

Witnesses:

HELEN M. FEEGAN,
WM. S. SAMPSON.