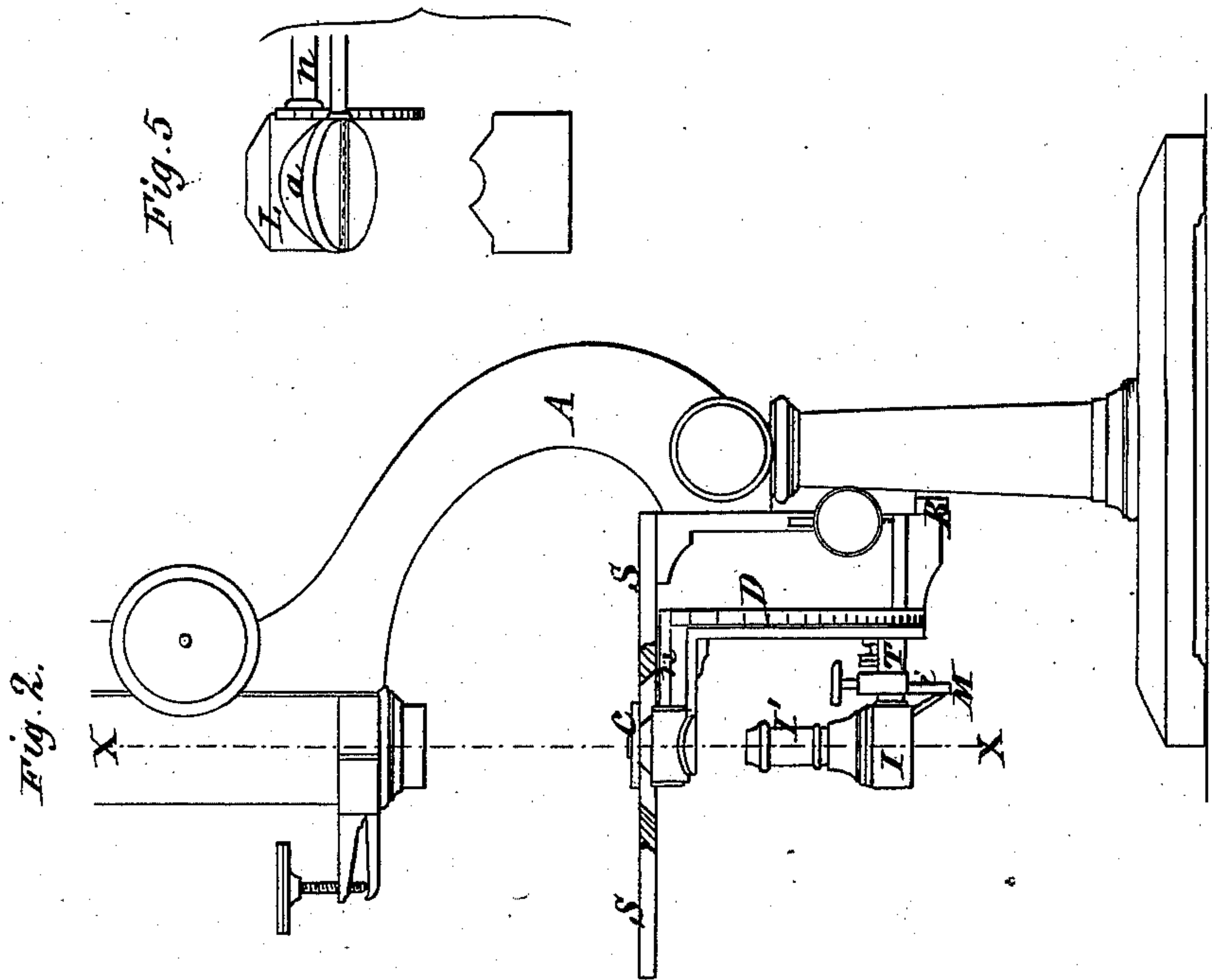


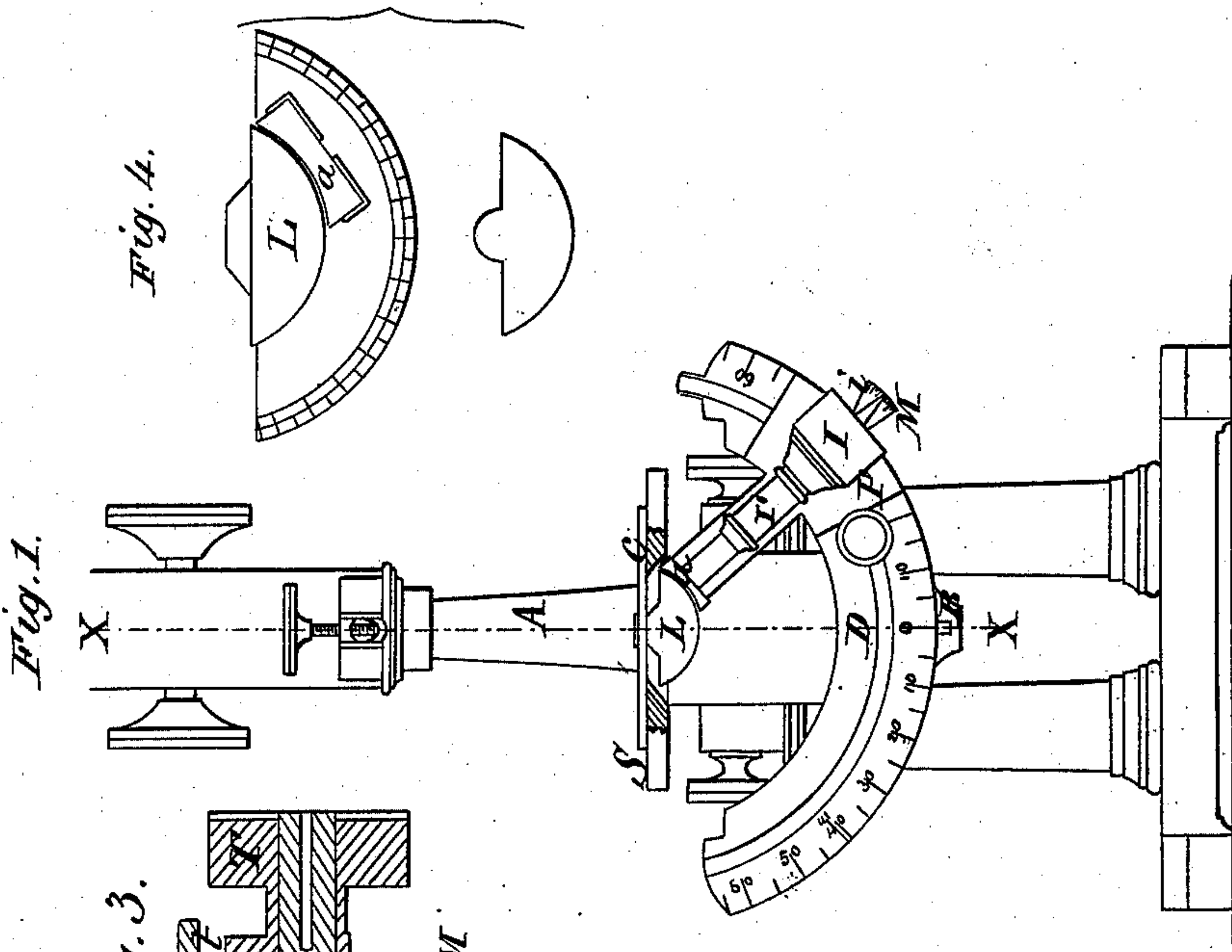
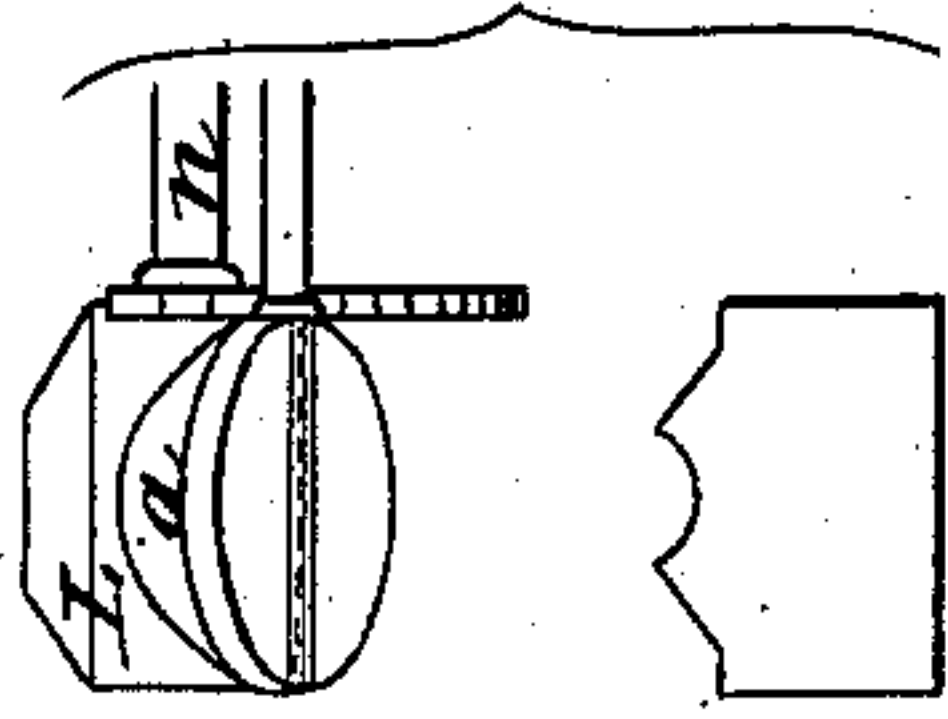
R. B. TOLLES.  
Microscope.

No. 198,782.

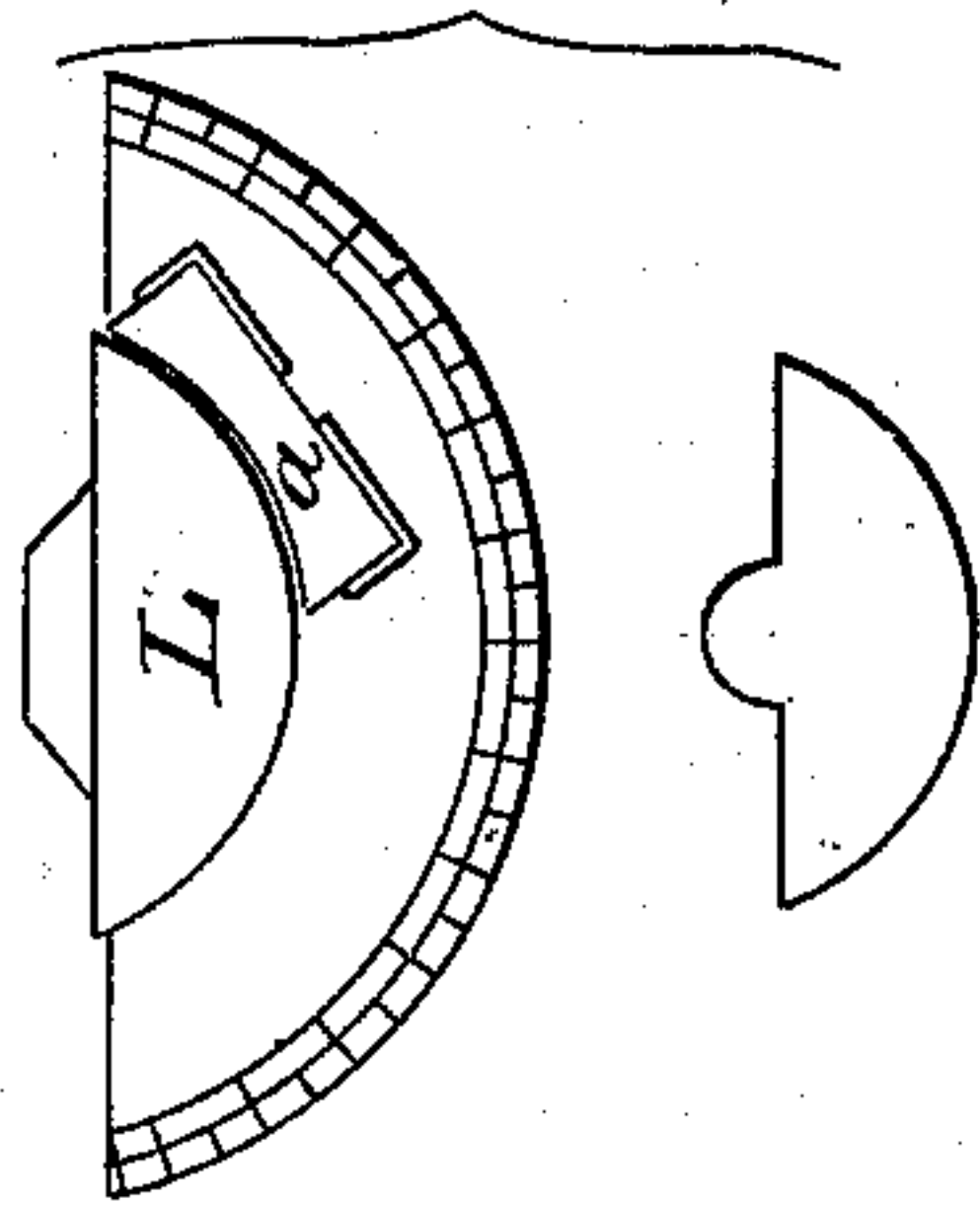
Patented Jan. 1, 1878.



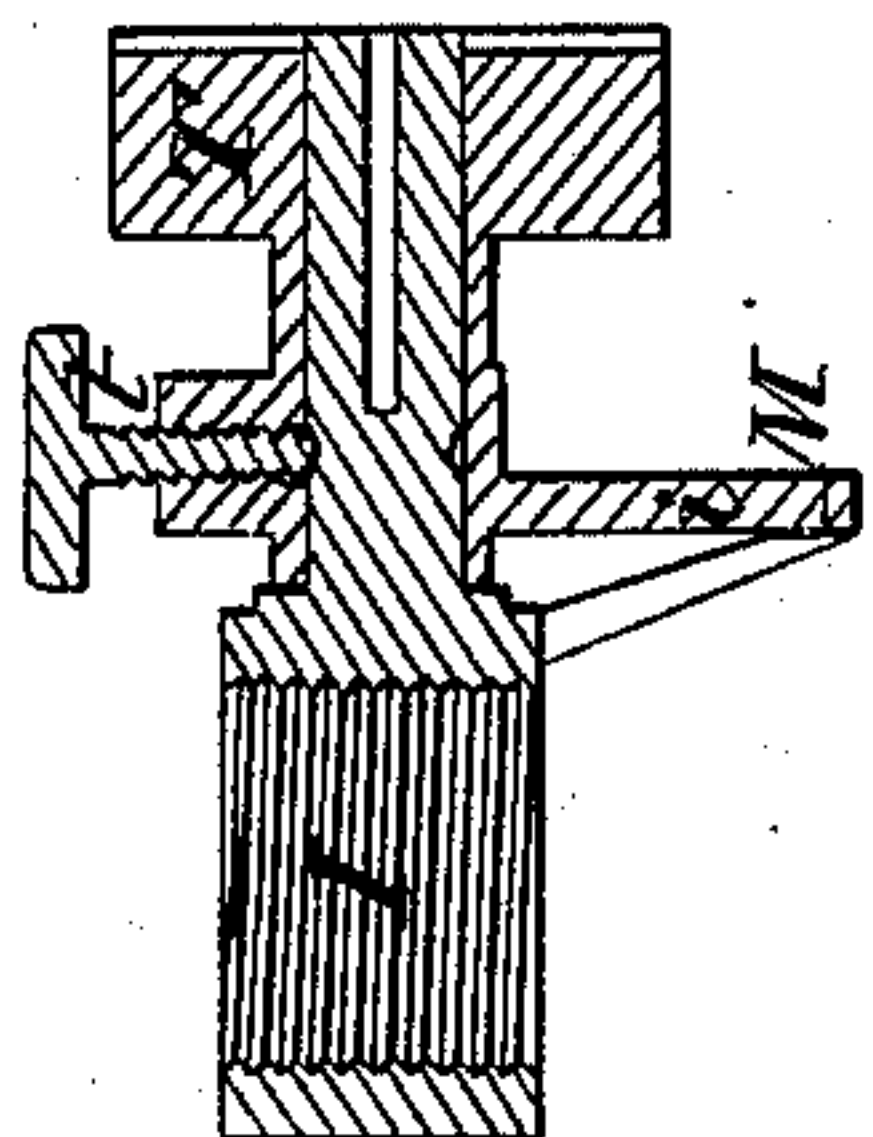
*Fig. 5.*



*Fig. 4.*



*Fig. 3.*



Attest:  
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att'y



# UNITED STATES PATENT OFFICE.

ROBERT B. TOLLES, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN MICROSCOPES.

Specification forming part of Letters Patent No. **198,782**, dated January 1, 1878; application filed July 27, 1877.

*To all whom it may concern:*

Be it known that I, ROBERT B. TOLLES, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Microscopes, of which the following is a specification, reference being had to the accompanying drawings, making a part of the same, in which—

Figure 1 represents a front elevation of a portion of a microscope-stand with my improvements applied thereto. Fig. 2 represents a side elevation of the same. Fig. 3 represents in section a portion of the sub-stage detached. Fig. 4 represents in side elevation a portion of the sub-stage illumination apparatus detached and drawn upon an enlarged scale, and modified by connecting with it a graduated arc; and Fig. 5 represents in end elevation the parts shown in Fig. 4.

My invention relates to the combination of a circular track in a plane parallel with the optical axis of the instrument and concentric with the object to be examined, with a sub-stage carriage, upon which said track is mounted and carried on guides.

It also relates to the said circular track, provided with graduations, in combination with a carriage running thereon, and carrying a condensing-lens and other accessories, either singly or combined.

It also relates to a holder to carry an achromatic illuminator or other accessory, in combination with a graduated arc and clamping device, to fix the holder at any angle to the radius that may be desired, or in the radius of the circular track.

It also relates to a convex lens, either plano-spherical or plano-cylindrical, in combination with a plano-concave lens, that can be caused to traverse the surface of the plano-convex lens, and an illumination-tube to direct a beam of light through the plano-concave lens.

It also relates to the convex lens and its support in the radius of the circular track, in combination with an illuminating device.

It also relates to a graduated circular track to support an illumination-tube and accessories, with the stage, to support the object-slide, as will be more fully described herein-after.

In the drawings, the base or stand has jointed to it a curved arm, A, upon which the body of the instrument is mounted. It also carries the stage S, upon which is placed the object-slide C. D represents a circular track mounted upon a sub-stage carriage B, connected to the arm A. This circular track is mounted and carried on or within guides in a plane parallel to the optical axis X X of the instrument and concentric with the object to be examined, mounted in the slide C, so that whether the slide be above or below the stage, the object it holds shall always be in the axis of said circular track D. This track has graduation-marks placed upon it, by which the position of the carriage P, that it carries, can be set and recorded. It may also be used without graduations. Upon this carriage is mounted the sub-stage T, carrying the holder I, to which is screwed the illumination-tube I', or other accessories.

The spindle of the holder I can turn in its socket, and be clamped to it by the screw *t* in any position in which it may be placed, to carry an achromatic illuminator or other accessory, either in the radius of the track D, or at any degree of obliquity thereto; and to facilitate this adjustment, it is provided with an index, M, resting against a graduated arc, *i*, attached to the sub-stage.

The apparatus is provided with a convex lens, L, either plano-spherical or plano-cylindrical, (the plane surface of either being modified to concave or convex, if either of these forms should for special purposes be deemed preferable to a plane,) and a plano-concave lens, *a*, the curvature of whose concave surface is the counterpart of the convex surface of the lens L, the lens *a* being caused to traverse the surface of the lens L by the movements of its carriage—in this instance an arm of the carriage P, which latter also carries an illumination-tube, I', or a condenser arranged to direct a beam or pencil of light upon the plane face of the lens *a*. The convex lens L is mounted upon the axial end of an arm, *n*, which arm is in the radius of the circular track D, and is also carried by the sub-stage.

Having now fully described my invention, I claim—

1. The combination of a circular track, D,



in a plane parallel to the optical axis  $XX$  of the instrument and coincident with the object to be examined, with a sub-stage carriage,  $B$ , upon which said track is mounted in a plane parallel to the optical axis, substantially as shown and described.

2. The combination of a graduated circular track,  $D$ , with a carriage,  $P$ , running therein, and carrying a condensing-lens and other accessories, either singly or combined, substantially as shown and described.

3. A turning-holder,  $I$ , carrying an index,  $M$ , in combination with a graduated arc,  $i$ , and a clamping device, to secure the holder either in the radius of the track  $D$  or at any degree of obliquity in which it may be placed, to carry an achromatic illuminator or other accessory, substantially as shown and described.

4. The combination of a convex lens,  $L$ , of plano-spherical or suitable form, with a plano-concave lens,  $a$ , of counterpart curvature, and

a carriage,  $P$ , carrying said concave lens, and also an illumination-tube, substantially as shown and described.

5. The combination of a convex lens,  $L$ , and an arm,  $n$ , on the axial end of which said lens is mounted, with a circular track,  $D$ , and carriage  $P$ , carrying a suitable illumination device, substantially as shown and described.

6. The combination of a graduated circular track,  $D$ , and carriage  $P$ , for guiding and supporting an illumination device and other accessories, with a stage,  $S$ , for supporting the object-slide, substantially as shown and described.

In witness whereof I have hereunto subscribed my name.

ROBERT B. TOLLES.

In presence of—

P. S. YENDELL,  
ARTHUR McNALLY.