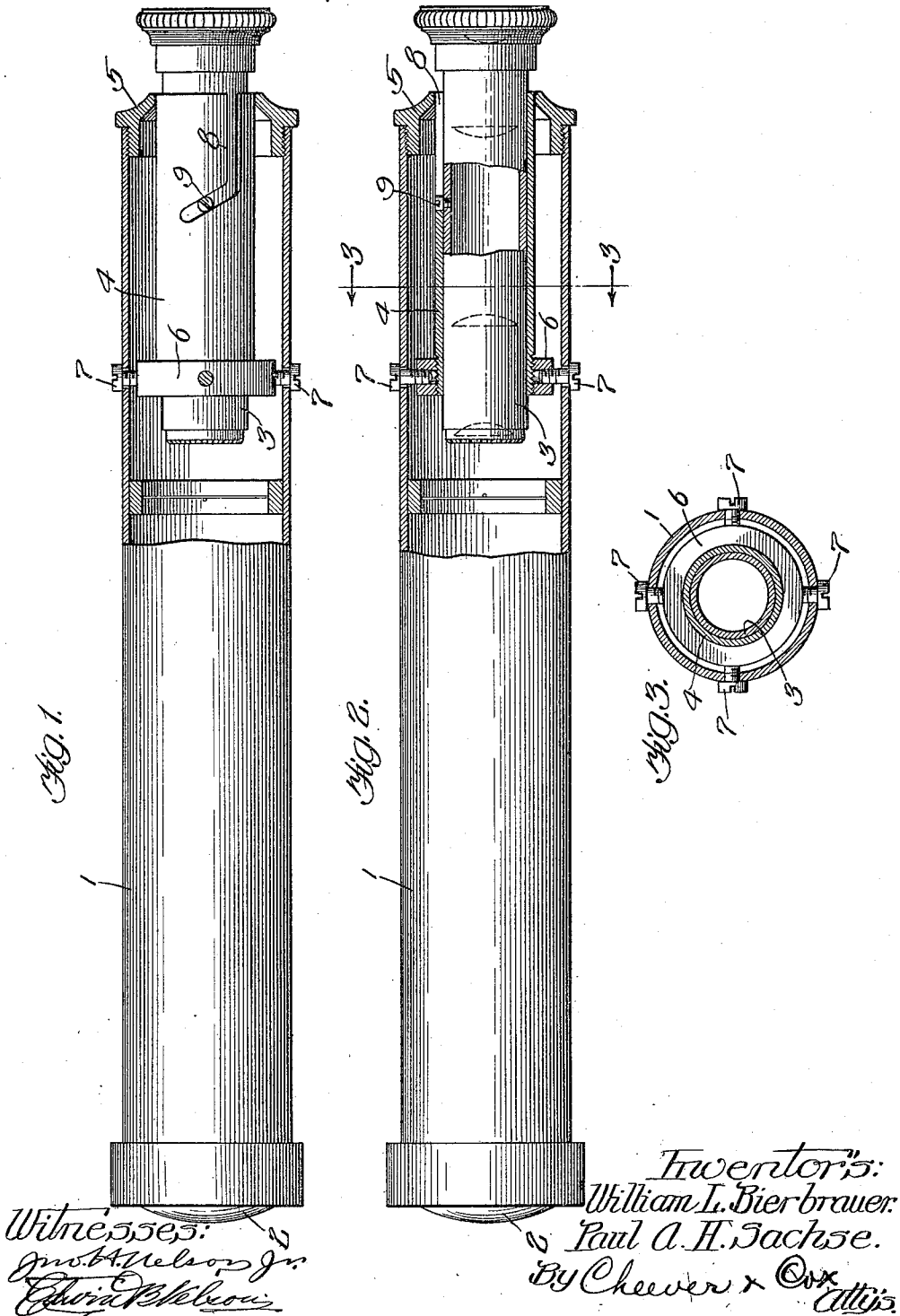


W. L. BIERBRAUER & P. A. H. SACHSE.
EYEPiece ADJUSTMENT FOR SURVEYOR'S TELESCOPES.
APPLICATION FILED MAY 20, 1914.

1,130,468.

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UNITED STATES PATENT OFFICE.

WILLIAM L. BIERBRAUER AND PAUL A. H. SACHSE, OF CHICAGO, ILLINOIS, ASSIGNORS
TO EUGENE DIETZGEN COMPANY, FACTORY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

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To all whom it may concern:

Be it known that we, WILLIAM L. BIERBRAUER and PAUL A. H. SACHSE, both residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Eyepiece Adjustments for Surveyors' Telescopes, of which the following is a specification.

It is well known by those skilled in the art of making and using surveyors' transits, levels or other telescopes that it is necessary to provide means for adjusting the inner end of the eye-piece in a direction transverse to the axis of the main tube or case. Usually the body of the eye-piece is formed of comparatively thin tubing and the adjustment at the inner end thereof is accomplished by three or more set screws passing radially through the main tube on the outside thereof and engaging a ring which encircles the eye-piece near the inner end thereof. It has been found that adjustments constructed along such plan have certain disadvantages: In the first place, the ring, when moved appreciably from central position, frequently distorts the body of the eye-piece—a result which is both injurious to the instrument and renders it inaccurate; second, the set screws and ring are apt to bind especially if the ring be adjusted any appreciable distance from central position and this renders the operation of adjusting both difficult and somewhat unpleasant to those accustomed to manipulating delicate instruments.

It is an object of our invention to provide a construction by which these objectionable characteristics are avoided.

Another object of our invention is to provide a construction such that the distortion of the eye-piece will be avoided and at the same time, the eye-piece may be readily removed for cleaning the lenses or other purposes and replaced without disturbing the adjustment.

We accomplish these objects by the construction illustrated in the accompanying drawings in which—

Figure 1 is a side view of a telescope em-

bodiment of our invention, part of the main tube or casing being broken away to reveal the internal parts. Fig. 2 is similar to Fig. 1 except that the sleeve which supports the eye-piece is shown in section and a portion of the eye-piece itself is broken away to better illustrate the construction. Fig. 3 is a transverse section taken on the line 3—3, Fig. 2.

Similar numerals refer to similar parts throughout the several views.

The main tube or casing which is of ordinary construction is provided with an object glass 2. At the opposite end of the tube is an eye-piece 3 of such construction, the body being tubular and containing suitable lenses. Inclosing the eye-piece for the major portion of its length is a sleeve 4 made of tubular material of substantial thickness and supported at the rear or outer end in a bushing 5 screwed onto or otherwise fastened to the rear end of the main tube. At the point where the bushing contacts the eye-piece, the surface is rounded with the result that the outer end of the eye-piece will be held fixed while the inner end is free to be adjusted.

At the inner end of sleeve 4 is a ring 6 rigidly fastened thereto. Said ring may be integral with the sleeve or soldered thereto but by preference screws onto the sleeve in the manner shown in Fig. 2. The ring and sleeve are adjusted transversely to the axis by set screws 7. These screws in the present instance being four in number and penetrating the main tube 1. Ring 6 is tapped and threaded to take the inner end of said screws.

It will be seen from the foregoing and from the drawings that the eye-piece is inclosed by a tubular element which bears at one end in a bushing at the rear end of the main tube and at the inner end bears upon adjusting set screws. The result is that the stresses and strains are borne by said tubular element, and this relieves the eye-piece and prevents distortion thereof. It will be noted, also, that this effect is obtained without the multiplication of elements, for the

ring and the sleeve may be regarded as a single piece, since they operate as a single piece and may be integral if desired.

A slot 8 is formed in the side of sleeve 4 which receives the head of a screw pin 9, the threaded shank of said pin screwing into the side of the eye-piece as shown in Fig. 2. Slot 8 is open at the rear or outer end and hence permits the eye-piece to be withdrawn without disturbing the adjustment of the sleeve. Consequently the eye-piece may be replaced by simply inserting it into the sleeve and the user may be assured that it will be brought to the same position as before. In order to provide for longitudinal adjustment of the eye-piece relatively to the main tube, slot 8 preferably has two portions, one of which is oblique and the other parallel to the axis of the eye-piece. The result is that when the pin 9 is in the inner, oblique portion of the slot, the eye-piece may be adjusted longitudinally without disturbing its axial position by merely rotating the eye-piece, and furthermore the eye-piece cannot be withdrawn, ordinarily, by merely a straight outward pull. This lessens the danger of accidental dislodgment.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a telescope, the combination of a main tube, an eye-piece having a cylindrical body, a sleeve surrounding the body of the eye-piece for supporting the same, the outer end of said sleeve being held against transverse movement in said tube and the inner end of said sleeve being adjustable transversely to the axis of said tube for thereby adjusting the eye-piece.

2. In a telescope, the combination of a main tube, a sleeve within said tube, means at the outer end of said tube for supporting the outer end of said sleeve and preventing transverse movement thereof, means at the inner end of said sleeve for adjusting it transversely to the axis of said tube, and an eye-piece fitting into and completely supported by said sleeve.

3. In a telescope, the combination of a main tube, a bushing at the outer end of said tube, an eye-piece having a cylindrical body, a sleeve surrounding the body of the eye-piece for supporting the same, and means for adjusting the inner end of the sleeve transversely to the axis of the main tube to thereby accomplish the adjustment of the eye-piece.

4. In a telescope, the combination of a main tube, an eye-piece having a cylindrical body, a sleeve surrounding the body of the eye-piece for supporting the same, means at the outer end of said sleeve for prevent-

ing transverse movement thereof with respect to the tube, and adjusting means at the inner end of said sleeve for adjusting said sleeve and the inner end of the eye-piece transversely to the axis of the tube, said adjusting means including set screws operable from the outside of said tube.

5. In a telescope, the combination of a main tube, an eye-piece located chiefly within said tube, said eye-piece having a cylindrical body, a sleeve into which the body of the eye-piece slidably fits, means at the outer end of said tube for supporting the outer end of said sleeve and holding it against transverse movement, means at the inner end of said tube adjacent to the inner end of the eye-piece for reinforcing said sleeve, and means for adjusting the inner end of the sleeve transversely to the main tube.

6. In a telescope, the combination of a main tube, a sleeve located chiefly within said tube, an eye-piece fitting slidably in said sleeve, and a pin projecting from the side of said eye-piece, said sleeve having an open ended slot for receiving and guiding said pin, and permitting the eye-piece to be removed from the sleeve without removing the sleeve from the main tube.

7. In a telescope, the combination of a main tube, a sleeve located chiefly within said tube, and being held against transverse movement relatively to the axis of said tube, means at the inner end of said sleeve for adjusting it transversely to the axis of the tube, and an eye-piece fitting slidably within said sleeve, said eye-piece being withdrawable from said sleeve, whereby the eye-piece may be separated from the rest of the device without disturbing the adjustment of the sleeve in the tube.

8. In a telescope, the combination of a main tube, a sleeve located within said tube, the outer end of the sleeve being held concentric with the tube and the inner end being adjustable transversely to the axis of the tube, an eye-piece supported solely by said sleeve and having a cylindrical body fitting slidably thereinto, and a slot and pin connection between the eye-piece and the sleeve, the slot being open at the end for the purpose described.

9. In a device of the class described, the combination of a main tube, an eye-piece, a sleeve within said tube forming the sole support for said eye-piece, and means for adjusting said sleeve within said tube transversely to said tube.

10. In a telescope, the combination of a main tube forming the outer casing for the telescope, an eye-piece the body whereof is tubular, a sleeve within which the tubular portion of the eye-piece fits, and means for

adjusting said sleeve within the tube transversely to the axis thereof.

11. In a telescope, the combination of a main tube forming the outer casing for the telescope, an eye-piece having a tubular body, a sleeve approximately coextensive in length with the body of the eye-piece and forming the sole support therefor, and means for adjusting said sleeve transversely to the axis of the device, said eye-piece be-

ing longitudinally adjustable within said sleeve.

In witness whereof we have hereunto subscribed our names in the presence of two witnesses.

WILLIAM L. BIERBRAUER.
PAUL A. H. SACHSE.

Witnesses:

ESTHER W. OSTROM,
P. L. LOEST.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."