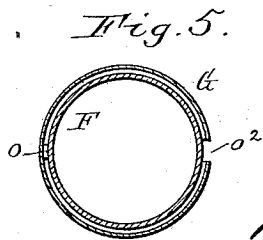
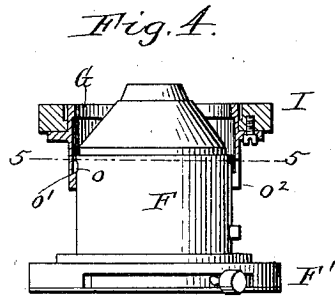
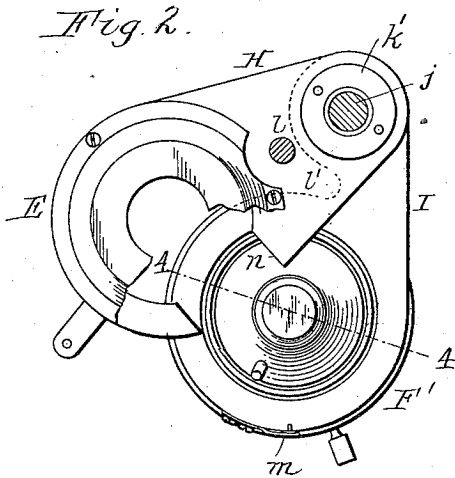
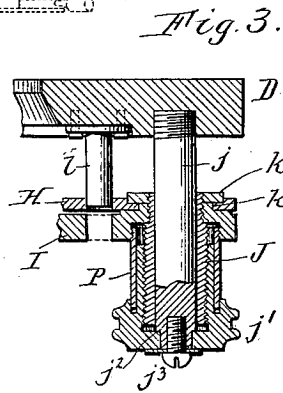
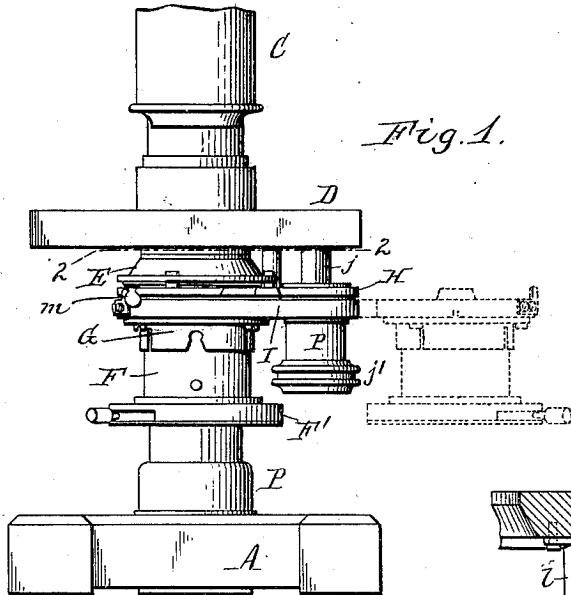


H. ZIRNGIBL.  
MICROSCOPE.

(Application filed June 14, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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H. ZIRNGIBL.  
MICROSCOPE.

(Application filed June 14, 1900.)

(No Model.)

2 Sheets—Sheet 2.

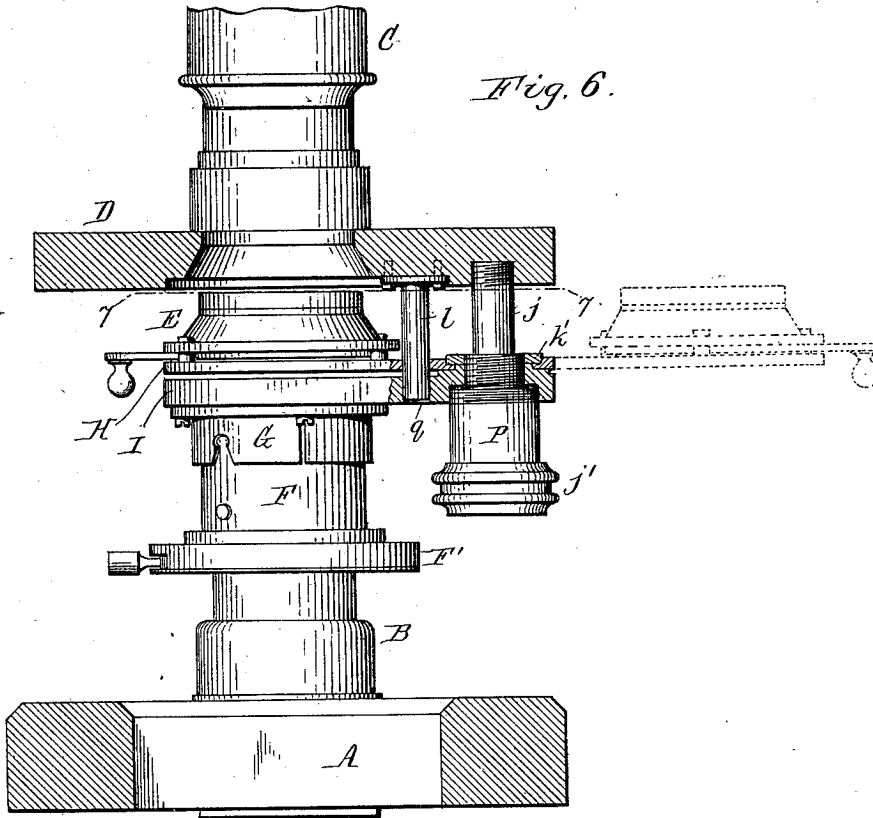
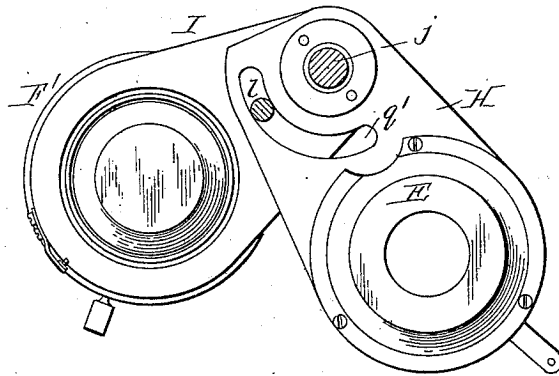


Fig. 6.

Fig. 7.



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# UNITED STATES PATENT OFFICE.

HERMANN ZIRNGIBL, OF BUFFALO, NEW YORK, ASSIGNOR TO THE SPENCER LENS COMPANY, OF SAME PLACE.

## MICROSCOPE.

SPECIFICATION forming part of Letters Patent No. 663,650, dated December 11, 1900.

Application filed June 14, 1900. Serial No. 20,231. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN ZIRNGIBL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Microscopes, of which the following is a specification.

This invention relates to the substage of microscopes, and more particularly to microscopes in which the upper iris-diaphragm is adjusted with reference to the main stage by a quick-shifting screw as distinguished from a rack-and-pinion adjustment.

One of the objects of my invention is to support the substage accessories by simple means and in such a manner that one or the other of the same can be swung aside or out of the optical axis of the instrument when not required or in case they interfere with the use of other accessories.

The invention has the further objects to provide simple means for excluding dust and grit from the quick-shifting screw of the substage and to improve the instrument in other respects.

In the accompanying drawings, consisting of two sheets, Figure 1 is a fragmentary front view of a microscope provided with my improvements. Fig. 2 is a horizontal section in line 2 2, Fig. 1, on an enlarged scale, showing the condenser partly swung aside. Fig. 3 is a vertical section, on an enlarged scale, of the quick-screw adjustment of the substage. Fig. 4 is a vertical section in line 4 4, Fig. 2, showing the condenser in elevation. Fig. 5 is a horizontal section in line 5 5, Fig. 4. Fig. 6 is a sectional front elevation of the instrument, on an enlarged scale, showing a modified construction of the substage. Fig. 7 is a horizontal section in line 7 7, Fig. 6, showing the upper iris-diaphragm swung aside.

Like letters of reference refer to like parts in the several figures.

A is the base of the instrument, B the stand, and C the lens-tube.

D is the main stage, and E, F, and F' are the members of the substage, E denoting the ring or casing of the upper iris-diaphragm and F the condenser and F' the casing of the lower iris-diaphragm.

G is the ring or holder in which the condenser is seated.

H is an arm carrying the upper iris-diaphragm and its casing and having an opening which coincides with the bore of said casing, and I is a similar arm arranged below the arm H and carrying the condenser-holder. These arms are both mounted on the vertically-movable screw-sleeve J of the quick-screw adjustment, whereby the substage is moved toward and from the main stage.

j is the usual stationary pin, which extends downwardly from the main stage and on which the screw-sleeve J is guided, and j' the rotary adjusting-nut or hollow screw engaging with said sleeve by a quick thread and held against vertical movement on the guide-pin j by the customary shoulder j<sup>2</sup> and screw j<sup>3</sup>.

In the construction shown in Figs. 1 to 5 the lower arm I, which carries the condenser-holder, is rigidly secured to the reduced upper portion of the screw-sleeve J, preferably by a screw-thread, as shown, and is adapted to swing on the guide-pin j as a pivot, so that the said arm and the condenser-holder and condenser mounted therein can be moved aside or out of the optical axis of the instrument when the condenser is not required.

As shown in Fig. 3, the lower arm I is provided around the screw-sleeve J with an upwardly-projecting cylindrical stud k, which fits in a corresponding opening formed in the inner end of the upper arm H, and said arm is confined on this stud by a screw-nut k', applied to the upper end of the screw-sleeve J and bearing against the upper side of the upper arm or the bottom of a recess which receives said nut. The stud k is free to turn in the opening of the upper arm H, but the latter is held against turning on said stud by a steadying or stop pin l, depending from the main stage and passing through an opening formed in the upper arm, as shown in Fig. 3. To permit the lower arm to clear the steadying-pin l, said arm is provided in its edge with a notch or recess l', as shown by dotted lines in Fig. 2. As the screw-sleeve J is held against turning by the upper arm, but is free to slide on the guide-pin j, and the adjusting-

nut  $j'$  is capable of turning, but held against vertical movement, the rotation of the nut causes the substage to move toward or from the main stage in an obvious manner. By this improved construction the upper iris-diaphragm remains at all times in the optical axis of the instrument, while the condenser-holder, with the condenser therein, can be readily swung under said diaphragm or moved aside without the necessity of removing the condenser from its holder.

The condenser-holder is provided with a suitable spring-catch  $m$ , which interlocks with a notch or opening in the edge of the diaphragm-casing and which holds the condenser-holder against accidental displacement.

Before the supporting-arm of the condenser can be swung aside the condenser must first be withdrawn from its holder sufficiently to clear the upper iris-diaphragm and its casing. In order to avoid the necessity of withdrawing the condenser to such an extent that its upper end clears the supporting-arm of said diaphragm, this arm is cut away or recessed on its front side, as shown at  $n$  in Fig. 2. If this arm were not recessed in this manner, the condenser would have to be lowered so far as to bring the lower diaphragm-casing  $F'$  too closely to the usual reflecting-mirror.

The entire withdrawal of the condenser from its holder is prevented by a stop-pin  $o$ , which projects laterally from the upper portion of the condenser and which is adapted to interlock with an annular flange or shoulder  $o'$ , arranged within the lower portion of the condenser-holder, as shown in Figs. 4 and 5. This flange is provided with a vertical notch  $o^2$  with which the stop-pin of the condenser is adapted to register in inserting and removing the same. After inserting the condenser in its holder it is turned sufficiently to move its pin out of register with the notch of the shoulder  $o'$ , thereby locking the condenser in the holder, but permitting the same to be slipped upwardly into place or withdrawn sufficiently to allow it to be swung aside.

$P$  is a dust cap or sleeve which incloses the upper portion of the screw-sleeve  $J$  and the adjusting-nut  $j'$ , so as to exclude dust and grit from the screw-threads. This cap depends from the under side of the main stage and is preferably secured thereto by a screw-thread, as shown in Fig. 3.

If desired, the supporting-arm of the upper iris-diaphragm may be constructed to swing laterally and the supporting-arm of the condenser-holder permanently held in the optical axis of the instrument, so that the diaphragm can be swung aside instead of the condenser. Such a construction is shown in Figs. 6 and 7 and is desirable in using an accessory which will not fit the upper iris-diaphragm—such, for instance, as a condenser with a large aperture. In this modified ar-

range the arms  $H$  and  $I$  are mounted on the quick-shifting screw, as in the construction previously described; but the steadying-pin  $l$ , instead of interlocking with the upper arm, enters an opening  $q$ , formed in the lower arm for holding the same against turning, while the upper arm is provided with a curved slot  $q'$  for the passage of said pin, which slot is concentric with the stud, so that the upper arm of the iris-diaphragm carried by the same can be swung aside without restraint, as shown by dotted lines in Fig. 6. After moving the diaphragm aside a condenser with a large aperture can be inserted in its holder.

It will be observed that in both of the constructions shown in Figs. 1 and 6 the supporting-arms of the upper iris-diaphragm and the condenser are carried by the quick-adjusting screws  $J$  and  $j'$  and that in each case one of the arms is held against lateral movement while the other can be swung aside.

I claim as my invention—

1. The combination with the main stage, an iris-diaphragm arranged below the same, a condenser arranged below said diaphragm, an adjusting-screw for said diaphragm and condenser arranged below said main stage on one side of said diaphragm and condenser, and a support for said adjusting-screw depending from the main stage, of separate supporting-arms for said diaphragm and condenser, both mounted one below the other on said adjusting-screw, and a guide device depending from said main stage on one side of said adjusting-screw and engaging one of said arms, holding the same against lateral movement, while the other arm is free to swing laterally out of the optical axis of the instrument, substantially as set forth.

2. The combination with the main stage, of a substage having an upper iris-diaphragm and a condenser, an adjusting-screw for the parts of the substage arranged below said main stage on one side of said diaphragm and condenser, an upper supporting-arm carrying said iris-diaphragm mounted on said adjusting-screw, a guide or steadying pin secured to the main stage and engaging with said arm, a lower arm also carried by said adjusting-screw and capable of swinging laterally out of the optical axis of the instrument, and a condenser-holder mounted on said lower arm, substantially as set forth.

3. The combination with the main stage, of a substage having an upper iris-diaphragm and a condenser, an adjusting-screw for the parts of the substage arranged below said main stage on one side of said diaphragm and condenser, an upper supporting-arm carrying said iris-diaphragm and mounted on said adjusting-screw and provided at one side with a recess which communicates with the aperture of the arm, a laterally-swinging lower arm also carried by said adjusting-screw and carrying a condenser-holder, and a condenser arranged in said holder and adapted to pass

laterally through the recess of said upper arm  
in swinging the lower arm aside, substantially  
as set forth.

4. The combination with the main stage  
5 and a vertical support depending therefrom,  
of an adjusting screw-nut rotatably supported  
at the lower end of said support, a screw-  
sleeve arranged between said nut and sup-  
port and capable of vertical movement on  
10 said support, a substage attached to the up-  
per end of said screw-sleeve, and a sleeve de-

pending from said substage and inclosing the  
upper portion of said screw-nut, forming  
therewith a dust-guard, substantially as set  
forth.

Witness my hand this 24th day of May, 15  
1900.

HERMANN ZIRNGIBL.

Witnesses:

CARL F. GEYER,  
CYESTA HORNBECK.