No. 734,501. PATENTED JULY 28, 1903.

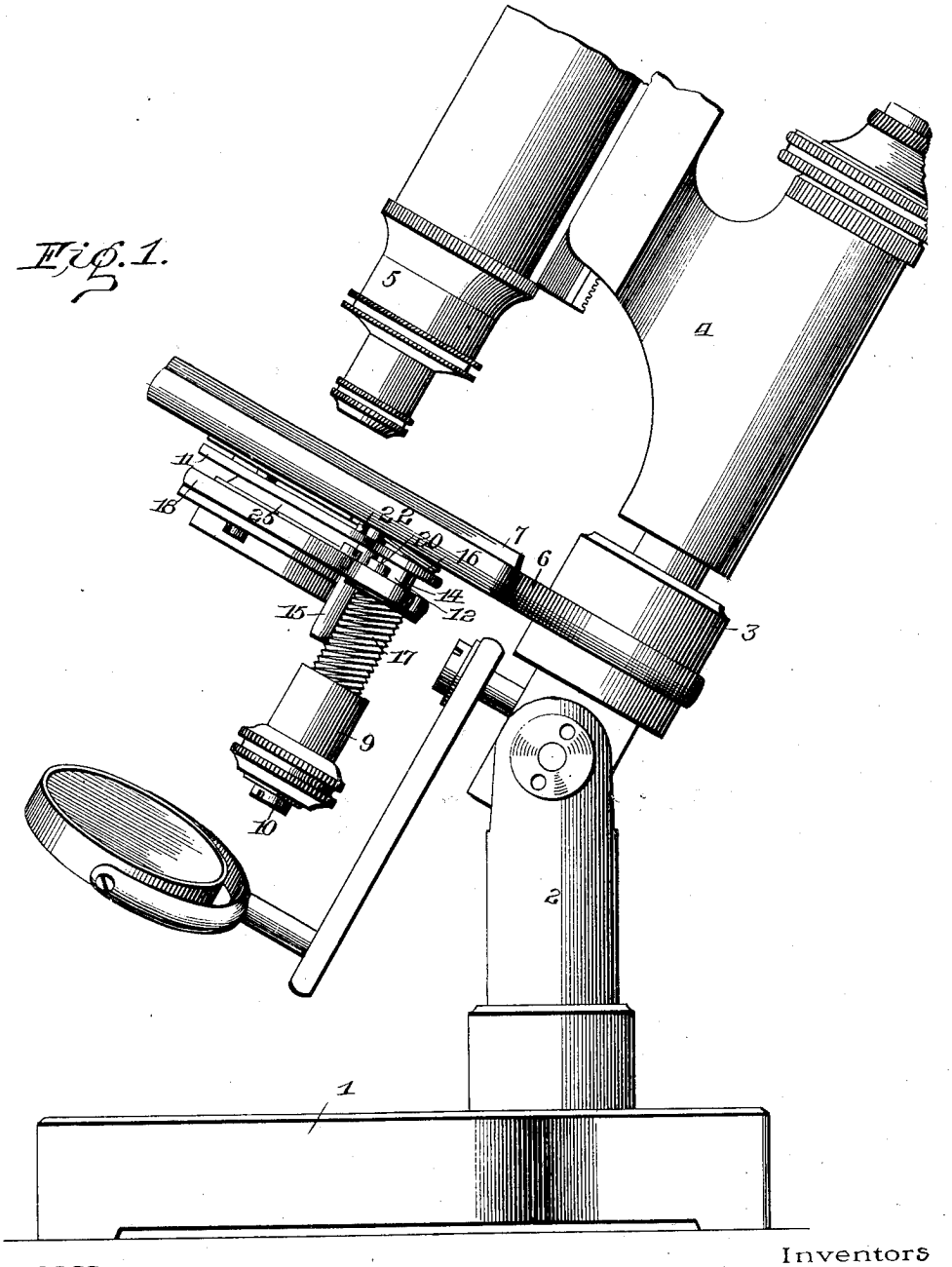
E. BAUSCH & G. HOMMEL.

MICROSCOPE.

APPLICATION FILED DEC. 3, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

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NO MODEL. 2 SHEETS—SHEET 2.

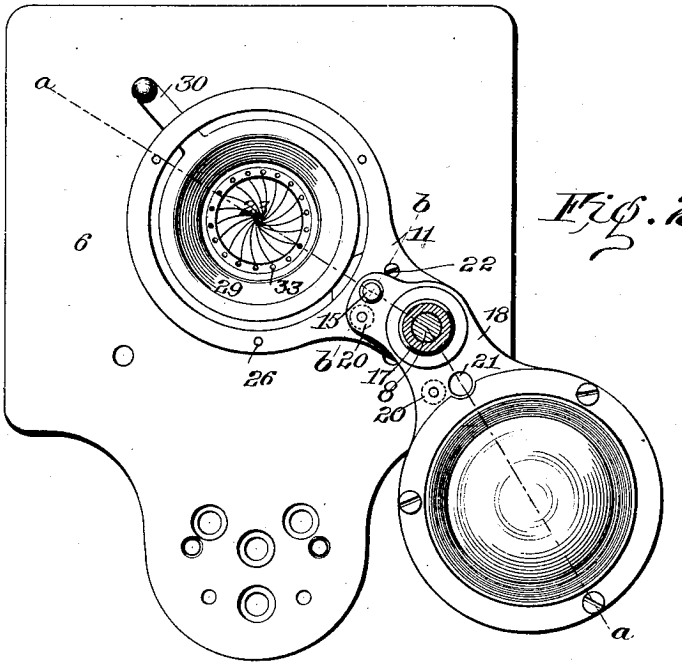


Fig. 2.

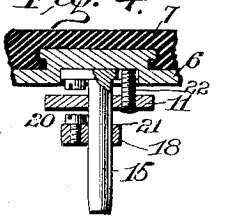


Fig. 4.

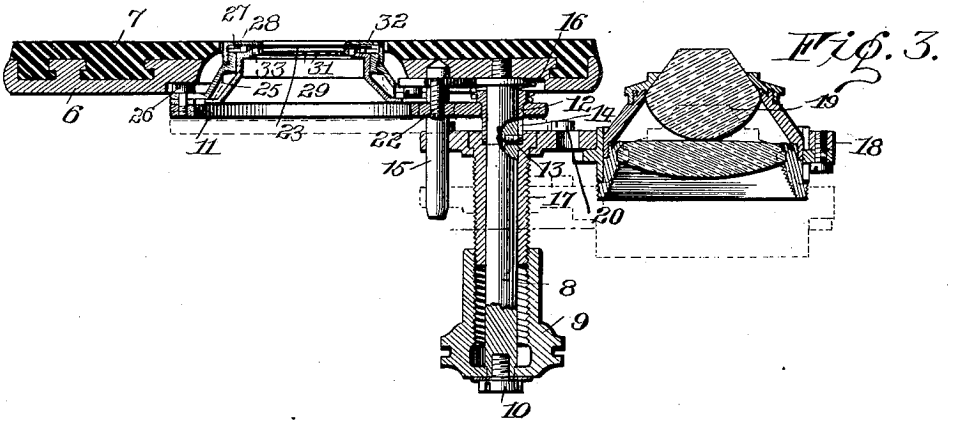


Fig. 3.

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No. 734,501. Patented July 28, 1903.

# UNITED STATES PATENT OFFICE.

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## MICROSCOPE.

SPECIFICATION forming part of Letters Patent No. 734,501, dated July 28, 1903.

Application filed December 3, 1900. Serial No. 38,415. (No model.)

*To all whom it may concern:*

Be it known that we, EDWARD BAUSCH and GEORGE HOMMEL, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Microscopes; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

Our present invention relates to improvements in microscopes, and particularly to the substage attachments thereof, and has for its object to provide a simple and effective means for adjusting said attachments, such as the diaphragm and the condenser, whereby the diaphragm may be adjusted separately from the condenser when desired and by the same operating means; and it further consists in certain improvements and combination of parts, all as will be hereinafter fully described, and the novel features pointed out in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a side elevation of the base of a microscope, showing our invention applied thereto. Fig. 2 is a bottom plan view of the condenser and diaphragm, the adjusting devices being shown in section. Fig. 3 is a sectional view on the line *a a* of Fig. 2. Fig. 4 is a sectional view on the line *b b* of Fig. 2.

Similar reference-numerals in the several figures indicate similar parts.

1 indicates the base of a microscope to which our improvement is shown attached, having the standard 2, to which the main arm 3 is pivoted.

4 is the adjustable arm, 5 the tube, and 6 the stage or table attached to the arm 2 and which may be of any suitable construction, but is preferably such a one as is shown in Patent No. 577,344, being provided with a hard-rubber covering 7, secured by suitable anchors or studs upon its upper surface.

8 indicates a post secured to the lower side of the stage and having upon its lower end a thumb-nut 9 and secured in position by a screw 10 or otherwise, so as to turn freely on the post, but prevented from longitudinal movement thereon, although any other suitable swiveling connection between the nut and the post could be provided, if desired.

11 indicates a ring-plate or diaphragm-support having a perforated arm at one side, to which is rigidly secured a sleeve 12, fitting the post 8 and arranged to slide vertically thereon, being prevented from turning on the post, and also having its downward movement limited by a screw or pin 13, secured in the latter and operating in a slot 14. This diaphragm-support is further prevented from rotating on the post by a guide-pin 15, secured to the stage 6 and passing vertically through an aperture formed in said support. The downward movement of the diaphragm-support 11 is caused by a spring 16 encircling the post 8 and arranged between the stage 6 and the upper side of the support. The movement permitted the plate is sufficient to move the diaphragm downward from the top of the stage a comparatively short distance, so as to leave the top of the stage perfectly free and permit a slight vertical adjustment of the diaphragm, the upward movement being caused by the engagement of the lower side of the support with a sleeve 17, sliding upon the post 8 and having an exterior threaded portion engaged by the nut 9. This sleeve 17 is secured rigidly to or forms part of a condenser support or plate 18, carrying a substage condenser 19, of any approved type, at its outer portion. The plate or support 18 is provided upon its upper side with stops or projections 20, (shown in dotted lines in Fig. 2,) arranged at the sides of apertures 21, through one or the other of which the pin 15 is adapted to project when the support is moved vertically. The upward movement of the diaphragm-support is limited and is capable of regulation, if desired, by a small screw 22, passing through the plate and adapted to engage the under side of the stage 6, as shown particularly in Fig. 4. The diaphragm, which is mounted upon the support 11, projects up through the aperture in the stage, and the leaves or plates 23 thereof are capable of

movement as nearly as possible in the plane of the top of the stage, said plates and their operating devices being of any suitable construction.

From the above construction it will be seen that when it is desired to use the condenser either with or without the diaphragm, the latter being fully opened if not in use, the support 18 is swung around to the position shown in Fig. 1 with the aperture 21 nearest the condenser in line with the pin 15, the condenser at this time being below the lower end of said pin having been drawn down by the operation of the thumb-nut 9 or equivalent adjusting device. Then by operating the thumb-nut to the left the condenser is carried upwardly on the post 8 and may be adjusted vertically by the manipulation of the nut, the diaphragm being carried upwardly by the engagement of its sleeve 12 with the sleeve 17, connected to or carried with condenser-support and being moved downwardly by the spring 16. Of course if it is desired to use the condenser alone the diaphragm is held wide open, but the latter may be used in connection with the condenser in the usual manner. If it is desired to use the diaphragm alone without the condenser, the support 18 for the latter may be drawn down by the thumb-nut and then swung around to the position shown in Figs. 2 and 3, the other aperture 21 registered with the pin 15, and the condenser-support moved vertically again by the manipulation of the adjusting device, the upper portion of the sleeve 17 or the condenser-support then engaging with the under side of the diaphragm-support 11, or, preferably, with the sleeve 12 thereon, and thus the same adjusting device is employed for causing the vertical adjustment of the diaphragm. The spring causes the downward movement of the diaphragm-support in the manner described and within certain limits determined by the location of the pin or stop 13. This feature of providing a single adjusting member—in the present instance the thumb-nut 9—is particularly advantageous, as it simplifies the construction and is less confusing to the operator than where separate adjustments are provided for accomplishing the result desired, and it will be understood that instead of employing a thumb-nut, as shown, any other single adjusting member its equivalent can be employed without departing from our invention.

The iris-diaphragm may be of any suitable construction, but preferably embodies an outer ring-plate 25, secured to the support 11, as by screws 26, and having an apertured cover-plate 28. Operating within the ring is another ring 29, having a handle 30, and the ends of the leaves 23 are pivotally connected to said ring-plate 25 and the ring 29, so that as the latter is rotated the leaves will be moved and the size of the aperture varied as desired.

It will be understood that other substage appliances which require adjustment and are capable of conjoint and separate use could be employed on the two supports instead of the diaphragm and condenser, but as these are the ones usually employed we illustrate them.

We claim as our invention—

1. In a microscope the combination with the stage, of two independent supports arranged beneath the stage and movable relatively thereto, and a single adjusting device coöperating with the stage for moving said supports relatively to each other and to the stage.

2. In a microscope the combination with the stage, of two independent substage attachments capable of combined or separate use, and a support for each, of a single adjusting device coöperating with the stage for operating both of said attachments relatively to each other and to the stage.

3. In a microscope the combination with the stage of two independent substage attachments capable of combined or separate use, one of them being movable out of coöperative relation with the stage, and a single adjusting device coöperating with the stage for simultaneously operating said attachments in the same direction relatively to each other and to the stage.

4. In a microscope the combination with the stage, of a substage attachment embodying two movable supports, one of which is capable of being moved out of vertical alinement with the other, and a single adjusting device operating one support toward and from the stage independently of the other and adapted to coöperate with the second support and actuate the latter during part of its movement only.

5. In a microscope the combination with the stage, of two substage attachments capable of conjoint use when in alinement and movable relatively out of alinement, and a single adjusting device moving both said attachments toward and from the stage and operating one of them independently of the other.

6. In a microscope the combination with the stage, of a substage attachment having a limited movement toward and from the stage, a second substage attachment capable of conjoint use with the former and movable laterally out of alinement therewith, and a single adjusting device coöperating with the last-mentioned attachment to move it toward and from the stage and also coöperating with the first-mentioned attachment to adjust it when the second attachment is either in or out of alinement.

7. In a microscope the combination with the stage, and a support beneath the stage having a limited movement toward and from it, of a second support beneath the stage, a substage attachment thereon, movable into and out of alinement with the first-mentioned support, guides for the second support, and

a single adjusting device coöperating with the second support for moving it toward and from the stage and operating upon the first support to move it through its limited movement.

8. In a microscope the combination with the stage, the support movable beneath it, and a stop for limiting the vertical movement of the support, of a second support pivoted beneath the stage and capable of a swinging movement in a plane parallel with that of the stage, and a single adjusting device for operating the second support vertically and engaging the first-mentioned support to operate it vertically through its limited movement.

9. In a microscope the combination with the stage, the support and the diaphragm thereon arranged beneath the stage, a spring for operating the support downwardly, and stops for limiting the movement, of an adjusting device for moving the support vertically against the spring.

10. In a microscope the combination with the stage, the support, and the diaphragm thereon arranged beneath the stage, a spring for operating the support downwardly, and stops for limiting its movement, of a support movable toward and from the stage and swinging laterally thereof and adapted to engage the diaphragm-support, a condenser on the support, and an adjusting device for the support.

11. In a microscope the combination with the stage, the support, the diaphragm thereon, and the spring for moving the diaphragm-support, of the condenser-support beneath the diaphragm-support, the condenser thereon and means for moving the condenser-support vertically.

12. In a microscope the combination with the stage, the post thereon, the support movable toward and from the stage, and the spring for operating it in one direction, of a second support movable upon and capable of swinging around the post, and means for adjusting the support vertically and causing it to engage the upper support.

13. In a microscope the combination with the stage, the post thereon, the vertically-movable diaphragm-support, the diaphragm thereon and the spring for moving the support in one direction, of the condenser-support movable longitudinally upon the post and the condenser thereon, said support being capable of swinging around the post and of engaging the diaphragm-support when moved vertically, guides for the condenser-support, and means for adjusting it vertically upon the post.

14. In a microscope the combination with the stage, the post thereon, the diaphragm-support sliding on the post, and the diaphragm thereon, of a condenser-support adapted to slide upon said post and to swing laterally thereon and guides therefor, a condenser on the support and adjusting devices for adjusting the support toward and from the stage.

15. In a microscope the combination with the stage, the post thereon, the condenser-support having the threaded sleeve movable upon the post toward and from the stage and capable of swinging thereon, the operating-nut swiveled on the post engaging the sleeve, guides for the condenser-support, a diaphragm-support movable toward and from the stage and arranged between the latter and the condenser-support and adapted to be moved by the latter.

16. In a microscope the combination with the stage, having the post, the support movable longitudinally of the post and a spring for operating it away from the stage, of a second support movable longitudinally of the post and swinging thereon, and adapted to contact with and operate the first-mentioned support in one direction, and adjusting devices for operating the swinging support toward and from the stage.

17. In a microscope the combination with the stage, having the post thereon, of the diaphragm-support sliding on the post, the diaphragm thereon, the spring for operating the diaphragm-support away from the stage, stops for limiting its movement, and means for operating the support toward the stage and against the spring.

18. In a microscope the combination with the apertured stage having the post, the diaphragm-support sliding thereon, the spring between the support and stage, and stops for limiting the movement of the diaphragm-support, of the diaphragm mounted on the support having its leaves projecting close to the plane of the top of the stage, and means for adjusting the diaphragm-support toward and from the stage.

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