H. N. OTT.

SUBSTAGE FOR MICROSCOPES.

APPLICATION FILED JAN. 4, 1917.

1,234,795.

Patented July 31, 1917.

2 SHEETS—SHEET 1.

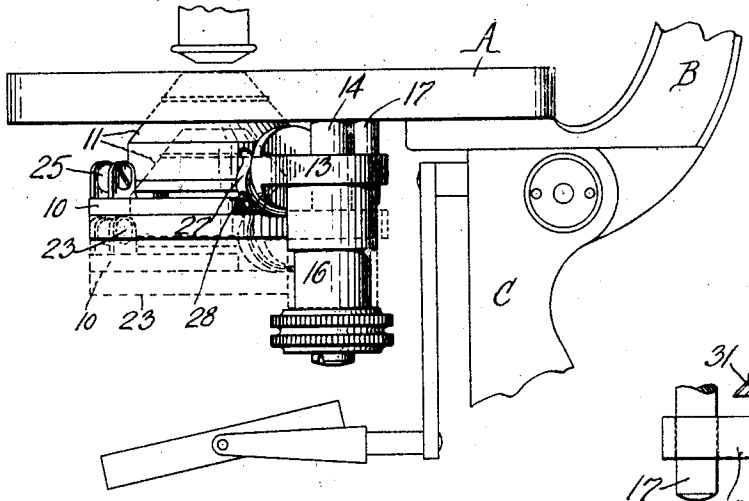
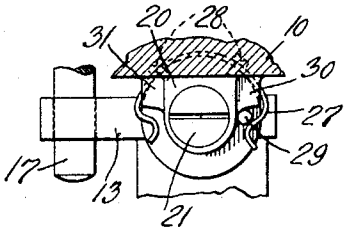


Fig. 1.

Fig. 4.



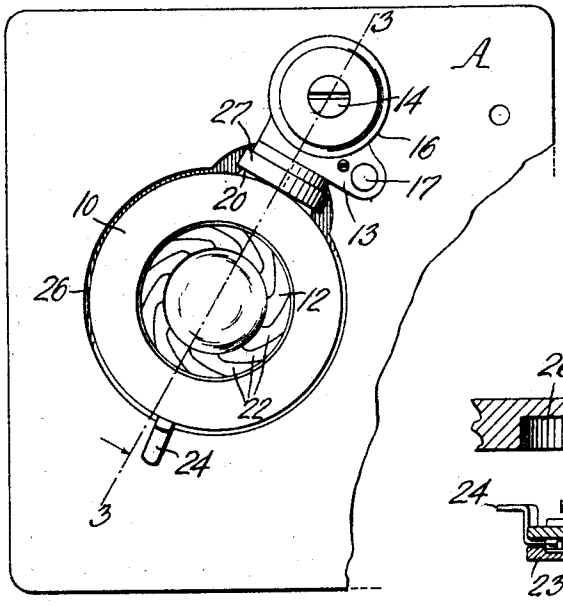
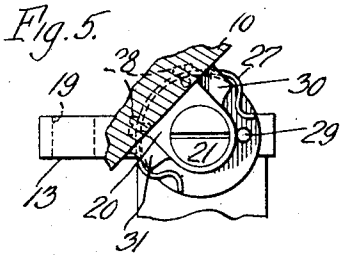


Fig. 2.

Fig. 5.



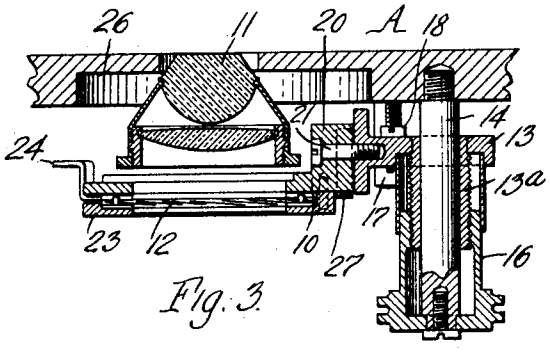


Fig. 3.

Inventor.

Harvey N. Ott,

By Wilhelm & Parker

Attorneys.

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2 SHEETS—SHEET 2.

Fig. 6.

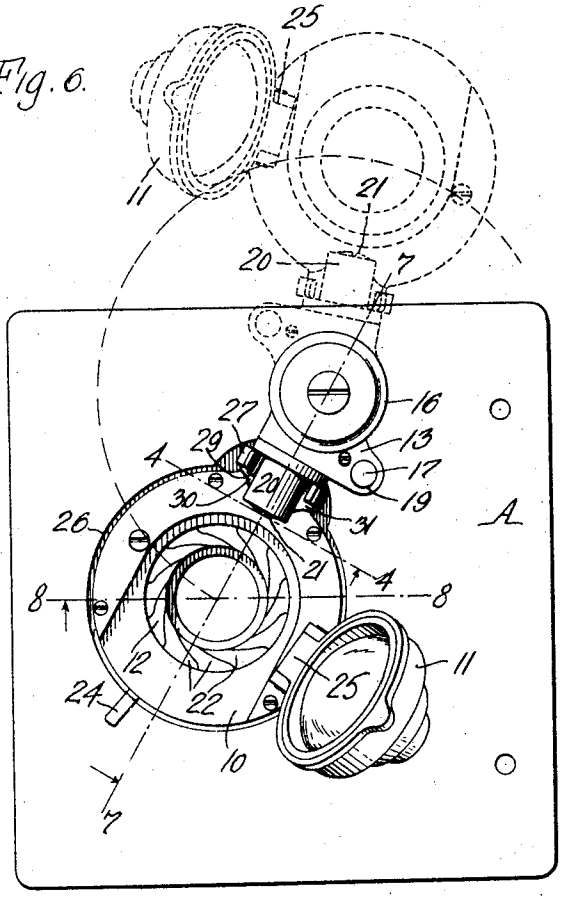
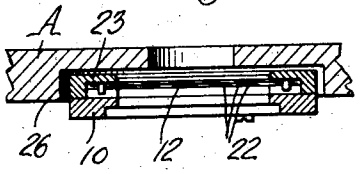


Fig. 8.



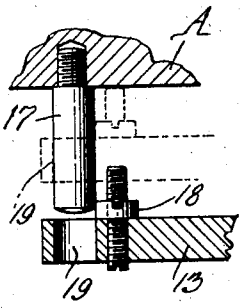
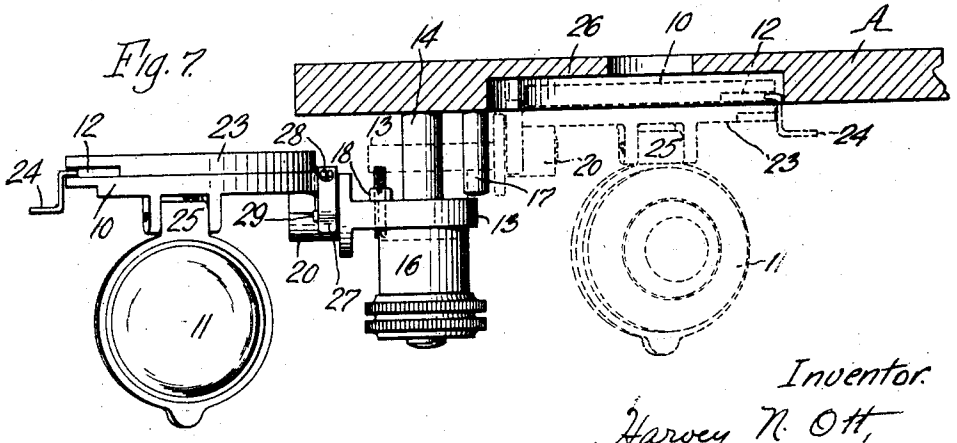


Fig. 9.

Fig. 7.



Inventor.

Harvey N. Ott,

By Wilhelm & Parker.

Attorneys

UNITED STATES PATENT OFFICE.

HARVEY N. OTT, OF BUFFALO, NEW YORK, ASSIGNOR TO SPENCER LENS CO., OF BUFFALO, NEW YORK.

SUBSTAGE FOR MICROSCOPES.

1,234,795. Specification of Letters Patent. Patented July 31, 1917.

Application filed January 4, 1917. Serial No. 140,633.

To all whom it may concern:

Be it known that I, HARVEY N. OTT, 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 Substages for Microscopes, of which the following is a specification.

This invention relates to substages for microscopes.

It is common in microscopes in which the substage is equipped with a condenser to provide two iris diaphragms, a small one above the condenser and a larger one below the condenser. The lower diaphragm is used in conjunction with the condenser for regulating the light to the same but the condenser and upper diaphragm are not used together, and when it is desired to use the upper diaphragm the condenser and lower diaphragm are moved out of the way from beneath the upper diaphragm.

The object of this invention is to provide a substage having a single diaphragm which is adapted to serve the purposes of the two diaphragms heretofore employed, said diaphragm being arranged so that by a simple adjustment it can be located either below the condenser for use therewith, or for use at the stage, with the condenser moved out of the optical axis beneath the diaphragm. Another object of the invention is to provide a substage of this sort in which the single diaphragm and the condenser are mounted to swing laterally beneath the stage to and from operative position in the optical axis and to move toward and from the stage as usual and, which in addition, are adapted to be inverted for the purpose of locating the diaphragm beneath the condenser for use therewith or for locating the diaphragm uppermost in position for use alone at the stage.

In the accompanying drawings:

Figure 1 is a fragmentary side elevation of a microscope stand provided with a substage embodying the invention.

Fig. 2 is a bottom plan view of the stage and substage.

Fig. 3 is a sectional elevation thereof on line 3—3, Fig. 2.

Figs. 4 and 5 are sections on line 4—4, Fig. 6, showing different positions of the substage ring and the device for holding the ring in its different operative positions.

Fig. 6 is a bottom plan view of the stage and substage showing the diaphragm in position for use at the stage and the condenser swung down out of the way, and also indicating by dotted lines the position of the parts when the substage is swung out from beneath the stage.

Fig. 7 is a sectional elevation on line 7—7, Fig. 6, showing the substage with the diaphragm uppermost and the condenser swung down out of the way.

Fig. 8 is a sectional elevation on line 8—8, Fig. 6, showing the diaphragm in position for use at the stage.

Fig. 9 is a sectional elevation, enlarged, showing the guide pin and stop for the substage.

A represents the stage, B the tube-supporting arm and C a portion of the stationary stand or supporting base of a microscope. These parts may be of any usual or suitable construction.

10 represents a frame or ring which is mounted beneath the stage A and supports the condenser, shown at 11, and an iris diaphragm, shown at 12. The supporting frame 10 is pivotally connected to a substage arm 13 which is preferably actuated by the usual quick acting screw by which the arm with the parts carried thereby can be swung laterally beneath the stage and also raised and lowered toward and from the stage. For this purpose the arm 13 shown is provided with a bearing sleeve 13^a mounted in a well known manner to slide and turn on a stationary pivot post 14 which depends from the stage A. The bearing sleeve 13^a has an external screw thread which is engaged by the internal thread of a hollow operating screw, sleeve or barrel 16 which is rotatably secured on the lower end of the pivot post 14. When this operating screw is turned in one direction the substage arm and parts carried thereby are moved downwardly on the pivot post, and when the arm reaches the limit of its downward movement the continued rotation of the screw will swing the arm and parts carried thereby laterally away from the optical axis. When the screw is turned in the opposite direction it acts first to swing the parts around beneath the stage into the optical axis, and when the arm is arrested in this position the continued rotation of the screw will elevate the parts toward the stage. 17 indicates the usual stop and guide

pin which depends from the stage and is adapted to strike a stop nut or projection 18 on the substage arm and to enter a hole 19 in the arm. When the operating screw 16 is turned in the direction last mentioned, the substage arm will swing with the operative screw until arrested by the projection 18 striking the stop pin 17, at which time the pin will register with the hole 19. Then the continued turning of the screw elevates the arm and the pin 17 enters the hole 19, thereby accurately centering the substage with reference to the optical axis and retaining it in this position during its movement toward and from the stage. The means described for thus moving the substage to and from a position concentric with the optical axis and raising and lowering it are common in microscopes and are not herein claimed. Any other suitable means for the purpose can be employed.

The supporting frame or ring 10 can be pivotally connected to the substage arm 13 in any suitable way adapting the supporting ring, which carries the condenser 11 and the iris diaphragm 12 on opposite sides thereof, to be inverted to locate either the condenser or the diaphragm uppermost. As shown, the supporting ring 10 has a hinge lug 20 arranged to turn on a pivot screw 21 secured to the substage arm. The condenser and diaphragm may both be of the usual or any other suitable construction. An iris diaphragm of well known construction is shown, having adjustable pivoted leaves 22 inclosed between one side of the supporting ring 10 and a casing ring 23 which is secured by screws to the supporting ring. 24 indicates the usual projecting handle for operating the leaves of the diaphragm to vary the diaphragm opening. The condenser 11 is mounted on the side of the supporting ring 10 opposite to that on which the diaphragm is located in any suitable manner adapting the condenser to be swung, or moved to and from a position in which its axis is coincident with the axis of the supporting ring and diaphragm. As shown, the condenser is hinged to the supporting ring 10 by a hinge joint 25 affording sufficient friction to prevent the condenser from swinging relative to the supporting ring except when purposely swung. Since the condenser and diaphragm are mounted on opposite sides of the supporting ring 10 which is pivoted to the substage arm, either the condenser can be placed uppermost as shown in Figs. 1 to 3, or the diaphragm can be placed uppermost as shown in Figs. 6, 7 and 8 by inverting the supporting ring. The supporting ring can be thus turned on the substage arm when the arm and ring are swung out to one side of the stage as indicated by dotted lines in Fig. 6. After the supporting ring has been turned to place either the diaphragm or the condenser uppermost, depending upon which is to be used, the substage can be swung around into position concentric with the optical axis and raised by the usual operation of the screw 16 to place the condenser or diaphragm in operative position at the stage, as indicated in Fig. 1 or Figs. 6 to 8. When the condenser has been in position for use and it is desired to use the diaphragm, the substage is lowered and swung out from beneath the stage by means of the screw 16, and the supporting ring 10 is turned to place the diaphragm uppermost. The condenser is then swung down on its hinge 25, as shown in Figs. 6 and 7. The screw is then operated to swing the diaphragm around beneath the stage and raise it into operative position in the recess 26 in the bottom of the stage, as indicated in Fig. 8 and by dotted lines in Fig. 7.

Suitable means are provided for arresting and releasably holding the supporting ring when either the diaphragm or the condenser is uppermost. For this purpose a curved spring 27 is shown which is secured between its ends by screws 28 to the pivot lug 20 of the supporting ring. The free ends of this spring straddle the pivot lug adjacent to the end face of the substage arm 13 and are adapted to spring into engagement with a stop and holding pin 29 which projects from the end of the substage arm. When the supporting ring is in one position, one end of the spring 27 will engage the pin 29, as shown in Fig. 4, the pin being held between the bent end of the spring and a stop shoulder 30 on the hinge lug 20 of the supporting ring. When the supporting ring is inverted this end of the spring will be disengaged from the stop and holding pin, as shown in Fig. 5, and the ring can be turned until arrested by the engagement of the pin 29 with another stop face 31 and the opposite end of the spring. The supporting ring 10 will then be releasably held stationary in the inverted position. The spring is adapted to be sprung into and out of engagement with the stop and holding pin by applying a slight turning force to the supporting ring. It is not necessary to independently actuate the spring to release or secure the ring. While a single bent spring is shown, its ends operate as independent springs, and obviously separate springs could be used and would operate in the same way. Other suitable stop and releasable catch means could be employed in lieu of those shown.

I claim as my invention:

1. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage.

2. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support which carries said condenser and diaphragm and is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage.

3. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, said condenser being also movable from beneath the diaphragm when the latter is uppermost.

4. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, said condenser being hinged to swing from beneath the diaphragm when the latter is uppermost.

5. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support on the opposite sides of which said condenser and diaphragm are mounted and which is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage.

6. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support on the opposite sides of which said condenser and diaphragm are mounted and which is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, said condenser being hinged to said support to swing from beneath the diaphragm when the latter is uppermost.

7. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, and means for adjusting the invertible condenser and diaphragm relative to the stage.

8. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, said invertible condenser and diaphragm being also movable laterally beneath and toward and from the stage, and means for so moving the condenser and diaphragm.

9. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support which carries said condenser and diaphragm and is rotatably mounted and adapted to be inverted for placing either the condensed or the diaphragm uppermost beneath the stage, and means for moving said support laterally beneath the stage and adjusting it toward and from the stage.

10. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support which carries said condenser and diaphragm and is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, said condenser being hinged to said support to swing from beneath the diaphragm when the latter is uppermost, and means for moving said support laterally beneath the stage and adjusting it toward and from the stage.

11. In a microscope, the combination of a substage arm, means for adjusting said arm relative to the optical axis, a ring having a pivotal connection with said arm adapting the ring to be inverted, a diaphragm mounted on one side of said ring, and a condenser hinged on the opposite side of the ring and adapted to swing from beneath the diaphragm when the latter is uppermost.

12. In a microscope, the combination with the stage, of a condenser and a diaphragm rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, and a catch for limiting the rotation of the condenser and diaphragm and releasably holding either of them uppermost.

13. In a microscope, the combination with the stage, of a condenser and a diaphragm, a support which carries said condenser and diaphragm and is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, a stop which limits the rotation of said support in opposite directions, and a catch which coöperates with said stop for releasably holding said support in its two operative positions.

14. In a microscope, the combination with a stage, of a condenser and a diaphragm, a support which carries said condenser and diaphragm and is rotatably mounted and adapted to be inverted for placing either the condenser or the diaphragm uppermost beneath the stage, a stop arranged to engage parts on said support for limiting the rotation of the support in opposite directions, and a catch which engages said stop for releasably holding said support in its two operative positions.

Witness my hand this 30th day of December, 1916.

HARVEY N. OTT.

Witnesses:
ROBERT W. WEITH,
LOUIS M. POTTER.

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