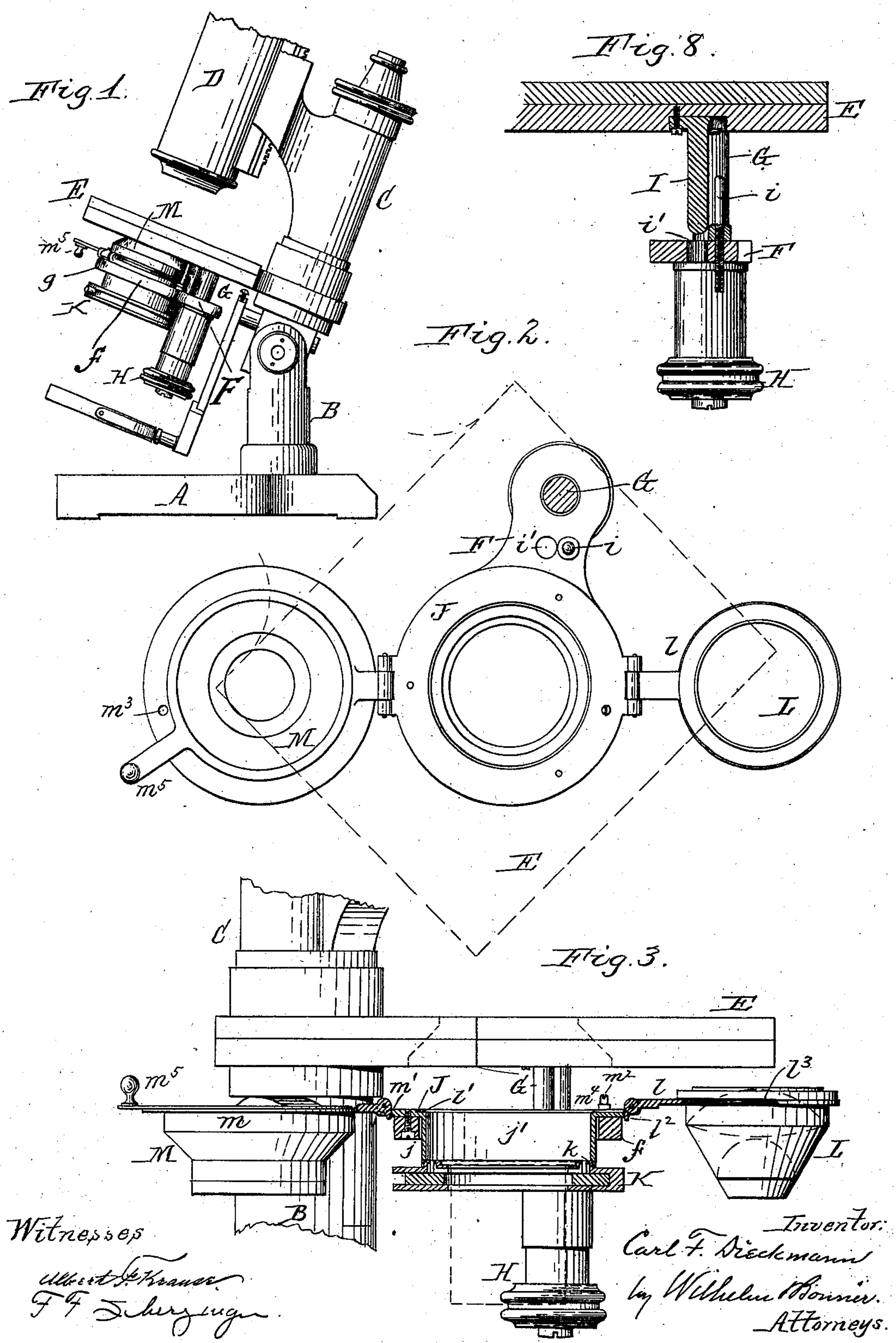
No. 700,409. Patented May 20, 1902.

C. F. DIECKMANN.

MICROSCOPE.

(Application filed Sept. 6, 1901.)

(No Model.) 2 Sheets—Sheet I.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 4.

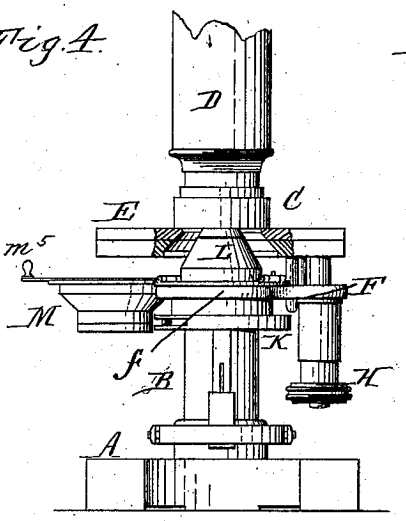


Fig. 5.

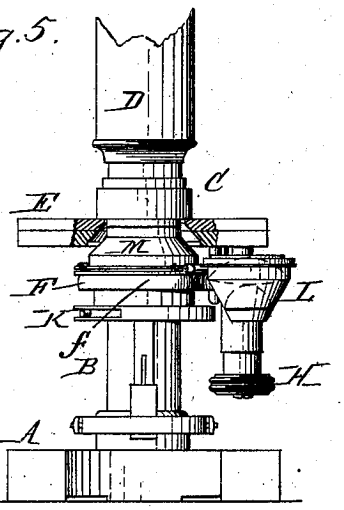


Fig. 7.

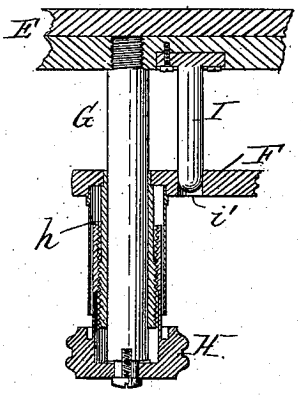
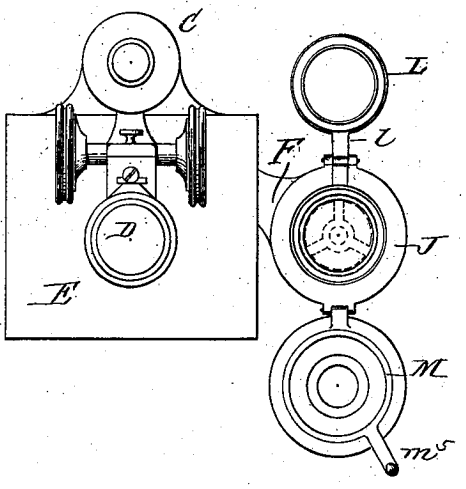


Fig. 6.



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UNITED STATES PATENT OFFICE.

CARL F. DIECKMANN, OF BUFFALO, NEW YORK, ASSIGNOR TO SPENCER LENS COMPANY, OF BUFFALO, NEW YORK.

MICROSCOPE.

SPECIFICATION forming part of Letters Patent No. 700,409, dated May 20, 1902.

Application filed September 6, 1901. Serial No. 74,535. (No model.)

To all whom it may concern:

Be it known that I, CARL F. DIECKMANN, a citizen of the United States, and a resident of 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 more particularly to microscopes of that character in which the upper and lower iris-diaphragms and condenser are carried by a substage below the stage and are movable without detachment from the substage into and out of the optical axis and toward and from the stage, either singly or in any desired combination. In microscopes prior to my invention of which I am aware one or more of these parts has or have been made detachable from the microscope and the operator has been obliged to attach or detach the same, as required, in the use of the instrument, or the said parts have been attached to the substage by separate arms or carriers, thus increasing the number of parts and the necessary adjustments to carry the diaphragms and condenser into and out of operative position. Microscopes of the former type are objectionable, in that the detachable parts are apt to be misplaced or harmed and more or less time is required to attach and detach the same, and the latter type of instruments are also objectionable, owing to the complication of parts and adjustments.

The object of the present invention is to avoid these inconveniences and simplify the construction of microscopes and at the same time permit the usual adjustments of the illuminating apparatus, including iris-diaphragms and the condenser, also to so construct and arrange the parts that the same can be readily and easily applied to the ordinary modern microscopes. To this end I secure to a substage-arm, which can be swung into and out of a position concentric with the optical axis and moved toward and from the stage, a frame or ring which carries the two diaphragms and the condenser, the upper diaphragm and condenser being pivoted to the frame, and either or both capable of being swung over in a plane substantially at right angles to the plane of the arm into position concentric with the lower diaphragm.

In the accompanying drawings, Figure 1 is a side elevation of a portion of a microscope, illustrating my invention. Fig. 2 is a horizontal sectional view enlarged, parts being shown in plan. Fig. 3 is an enlarged fragmentary vertical sectional elevation. Fig. 4 is a fragmentary front elevation showing the condenser and lower diaphragm in operative position. Fig. 5 is a similar view showing the upper and lower diaphragms in operative position. Fig. 6 is a plan view showing the substage-arm and illuminating apparatus thrown out to one side of the stage. Figs. 7 and 8 are detail sectional views of the arm-operating device.

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

A indicates the base; B, the standard; C, the main arm pivoted to the standard and carrying the tube D and also the stage E, which is located below the tube.

F indicates the swinging substage-arm for the illuminating apparatus. The arm is mounted on a stud-shaft G, depending from the under side of the stage, so as to be capable of swinging in under the stage to place its outer ring-shaped end *f* concentric with the optical axis, as shown in Figs. 2 and 3, and of swinging out to the side of the stage, as shown in Fig. 6. The arm is also slidable up and down on the shaft G toward and from the stage.

H indicates a thumb-nut rotatably secured on the shaft G and having a screw-threaded connection with a sleeve *h*, secured to the arm F and sleeved on the shaft, the construction being such that when the nut is turned in one direction the substage-arm is first swung around beneath the stage and is then upon continuing the turning of the nut in the same direction raised up toward the stage, and that when the nut is turned in the opposite direction the arm is first moved down until the sleeve *h* contacts with the head of the nut when the arm is swung out beneath the stage. The arm F is provided with an upwardly-projecting stop-pin *i*, which engages with a downwardly-extending coöperating stop and centering pin I, fixed to the stage, when the arm is thrown in beneath the stage, and the former is thus stopped in such

a position that a hole i' therein is directly below the pin I, which enters the hole i' when the arm is moved up, the pin I acting to accurately hold the same from lateral movement.

The parts thus far described are old in microscopes, and a more detailed description thereof is not believed to be necessary. Any other suitable construction may be employed.

J indicates an open frame or ring secured to the ring-shaped end of the substage-arm, preferably detachably by means of screws j in order that the frame J may be readily applied to the arm of the modern microscope. This frame has secured thereto or is adapted to support the various illuminating devices, as will be now described. The frame J is shown as provided with an inner depending flange j', which extends down through the circular opening in the substage-arm, and the lower iris-diaphragm casing, which is shown at K, is secured thereto. The diaphragm-casing is preferably detachably connected to the lower end of the flange j' by means of an upwardly-projecting circular rib k on the diaphragm-casing, which fits tightly in a rabbet in the lower end of the flange j'. Any other desired connection may be employed.

L indicates the condenser, which is carried by the outer ring-shaped end of an arm l, which is hinged at its inner end in any preferred manner to the frame J, so as to swing up over the same to a position concentric therewith, as indicated in Fig. 4, or down into the position indicated in Fig. 3. In order to accurately center the condenser when thrown in and hold the upper face of the ring-shaped arm l flush with the top of the frame J, the latter is preferably provided at its inner upper edge with an annular rabbet or groove l', which forms a seat for the ring-shaped part of the condenser-arm. The hinge end of the condenser-arm is preferably provided with a stop l^2, adapted to engage the outer edge of the frame J to hold the condenser in the horizontal outer position indicated in Fig. 3. The condenser is shown as being detachably secured to its arm l by means of a screw-threaded connection l^3 in order that different condensers may be employed.

M indicates the upper iris-diaphragm, which is of common construction. It is carried by a casing m, which is pivoted or hinged to the frame J, preferably at a point diametrically opposite the condenser-hinge, so as to enable the diaphragm-casing to be swung up over the frame J into a position concentric with the latter, as indicated in Figs. 1 and 5, or down into the position indicated in Figs. 2, 3, 4, and 6, in which position it is held by a shoulder m' on its hinge-lug engaging with the outer edge of the frame J. The upper diaphragm M is centered and held in its operative position by any suitable means, such as a lock-stud m^2, arranged on the frame J, to enter a hole m^3 in the diaphragm-casing. The stud is preferably provided with a shoulder m^4, which prevents the upper-diaphragm casing from contacting with the frame J, and thus provides a space between the two for the diaphragm-operating handle, (shown at m^5.) If desired, the upper end of the stud m^2 may be split, as shown, to afford a spring retainer or lock for the diaphragm-casing. The upper-diaphragm casing is of suitable size and shape to permit it to be thrown over and inclose the condenser. When the casing is moved up, the condenser and upper diaphragm project into the usual hole in the stage to a position substantially flush with the top of the latter.

With the parts constructed as above described it will be observed that the substage-arm F can be lowered from the position shown in Fig. 1 and swung out from beneath the stage to the position indicated in Fig. 6. In this position of the arm the upper diaphragm and condenser can be thrown out on their hinge connections, as indicated, and the arm swung back under the stage and moved up into operative position, with only the lower diaphragm in the optical axis, or either the condenser or upper diaphragm, or both, can be thrown up over the arm and lower diaphragm and then swung with the same into the optical axis. The arm can thus be swung in under the stage and moved up with either diaphragm or the condenser or with all three in the optical axis, as shown in Fig. 1.

Other illuminating diaphragms and devices which are sometimes used with the microscope can be placed within the frame J and supported by the lower-diaphragm casing, which forms a horizontal ledge projecting inwardly from the lower end of the flange j' of the frame J and is well adapted as a support for such illuminating devices. By dotted lines in Fig. 3 I have shown a polarizer so supported, and in Fig. 6 a dark illumination-diaphragm is represented.

I claim as my invention—

1. In a microscope, the combination with a substage-arm movable toward and from the optical axis of the instrument, of illuminating devices pivotally connected with said substage-arm so as to swing in a plane substantially at right angles to that of the arm, substantially as set forth.

2. In a microscope, the combination with a substage-arm movable toward and from the optical axis of the instrument, of a diaphragm pivotally connected to said arm, and a condenser pivotally connected to said arm so as to swing in a plane substantially at right angles to that of the arm, substantially as set forth.

3. In a microscope, the combination with a stage, and a substage-arm movable toward and from the optical axis of the instrument and toward and from said stage, of illuminating devices pivotally connected to said arm so as to swing in a plane substantially at right angles to that of the arm, substantially as set forth.

4. In a microscope, the combination with a substage-arm movable toward and from the optical axis of the instrument, of a diaphragm carried by said arm, and an illuminating device pivotally connected to said arm so as to swing in a plane substantially at right angles to that of the arm, substantially as set forth.

5. In a microscope, the combination with a substage-arm movable in a horizontal plane toward and from the optical axis of the instrument, of a separate frame secured to said arm, and an illuminating device pivotally connected to said frame, substantially as set forth.

6. In a microscope, the combination with a substage-arm movable toward and from the optical axis of the instrument, of a separate frame secured to said arm, a diaphragm pivotally connected to said frame, and a condenser pivotally connected to said frame, substantially as set forth.

7. In a microscope, the combination with a substage-arm having a ring-shaped part, of a frame supported on said part and having a flange extending down through the opening thereof, a diaphragm secured to said flange, a diaphragm pivotally connected to said frame, and a condenser pivotally connected to said frame, substantially as set forth.

8. In a microscope, the combination with a substage-arm movable toward and from the optical axis of the instrument, of a condenser pivotally connected thereto, and a diaphragm pivotally connected to said arm and adapted to be swung over said condenser concentric therewith, substantially as set forth.

9. In a microscope, the combination of a stage, a substage-arm connected with the stage by a vertical pivot to swing laterally toward and from the optical axis of the instrument, a condenser, and a diaphragm connected to opposite sides of said arm by horizontal pivots to swing in a vertical plane over the arm toward and from a position concentric with the optical axis, substantially as set forth.

Witness my hand this 28th day of August, 1901.

CARL F. DIECKMANN.

Witnesses:
CHAS. W. PARKER,
C. B. HORNBECK.