

(No Model.)

J. R. FROOME.

CAMERA SHUTTER.

No. 343,367.

Patented June 8, 1886.

Fig. 1.

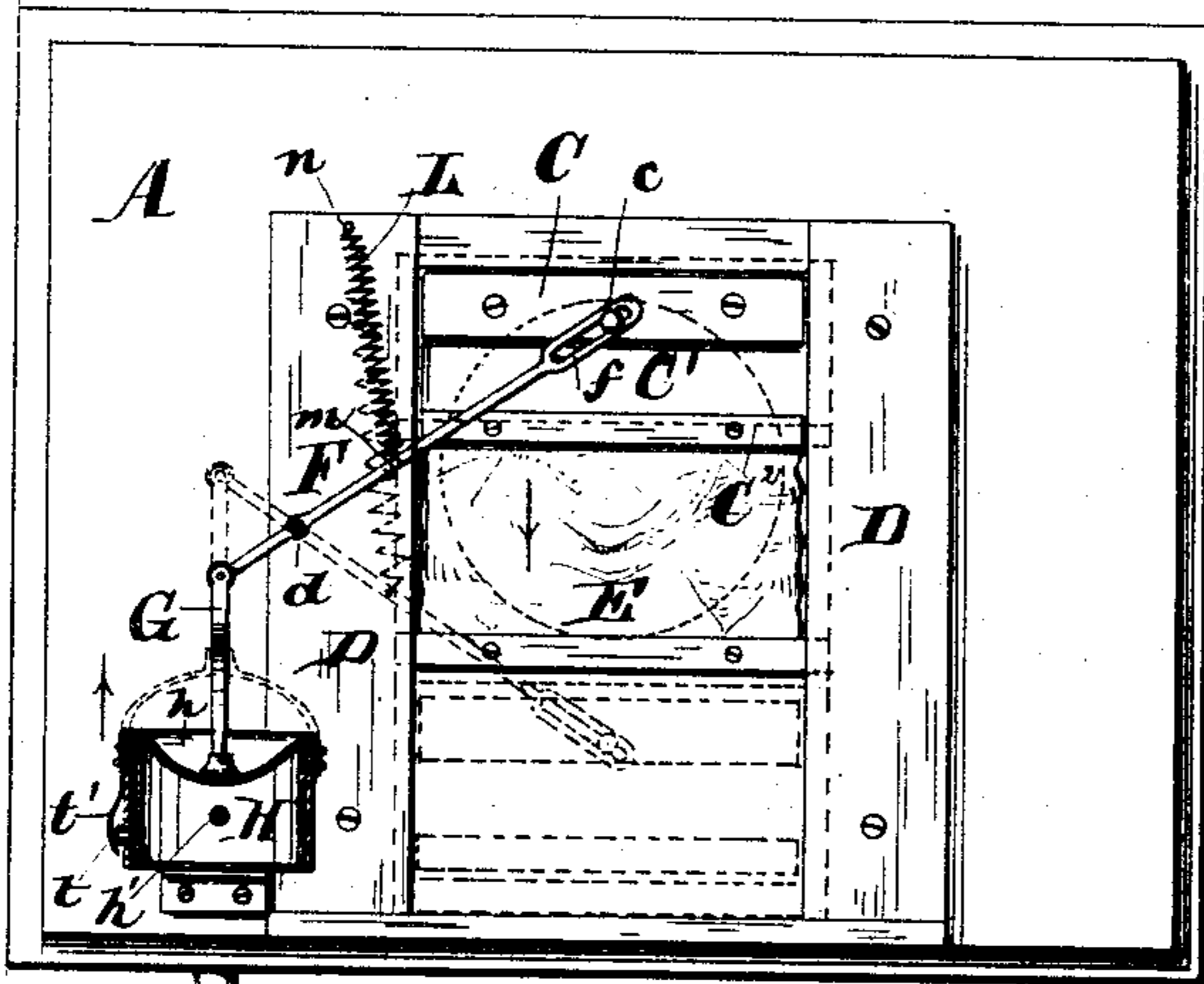


Fig. 2.

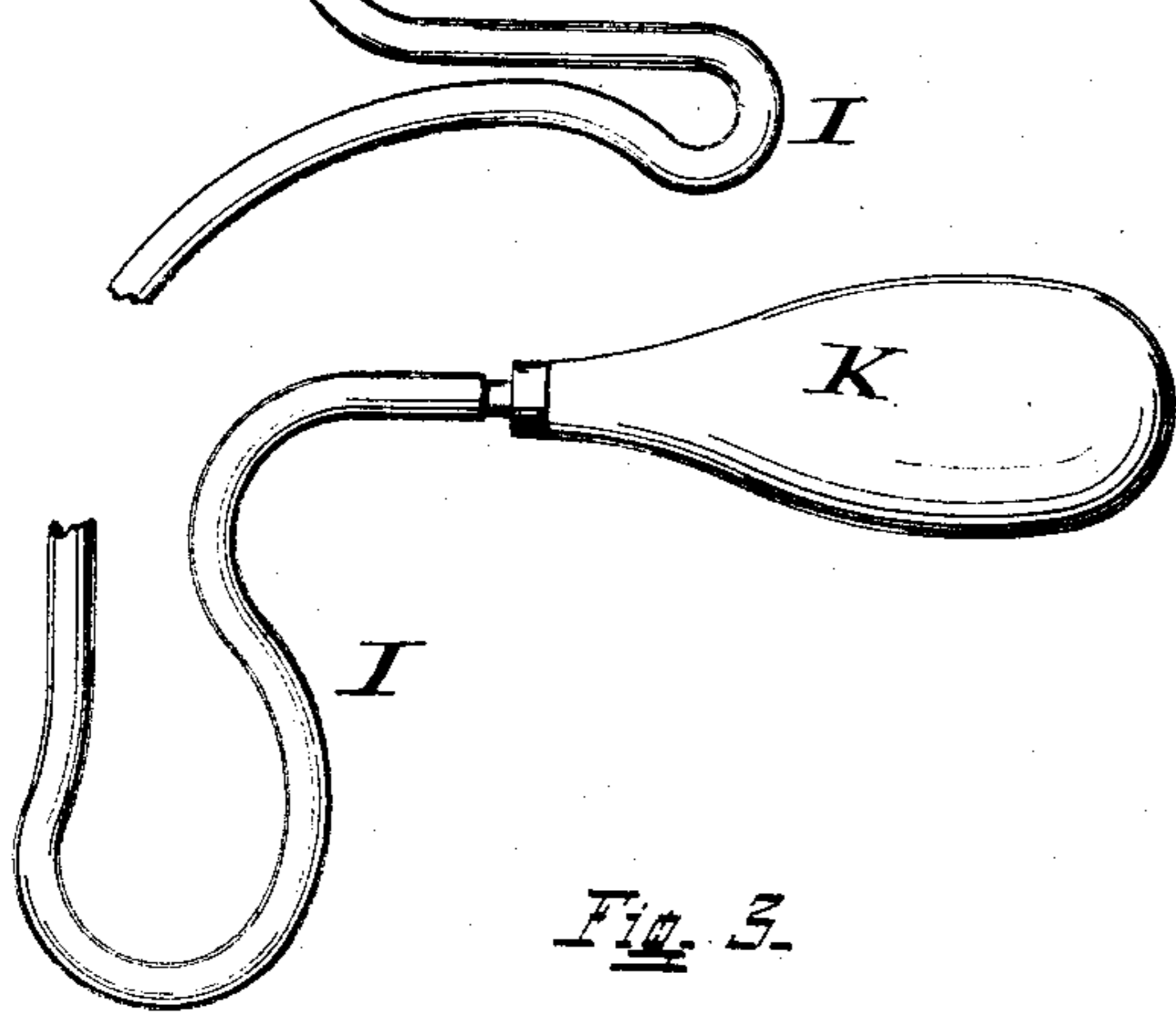
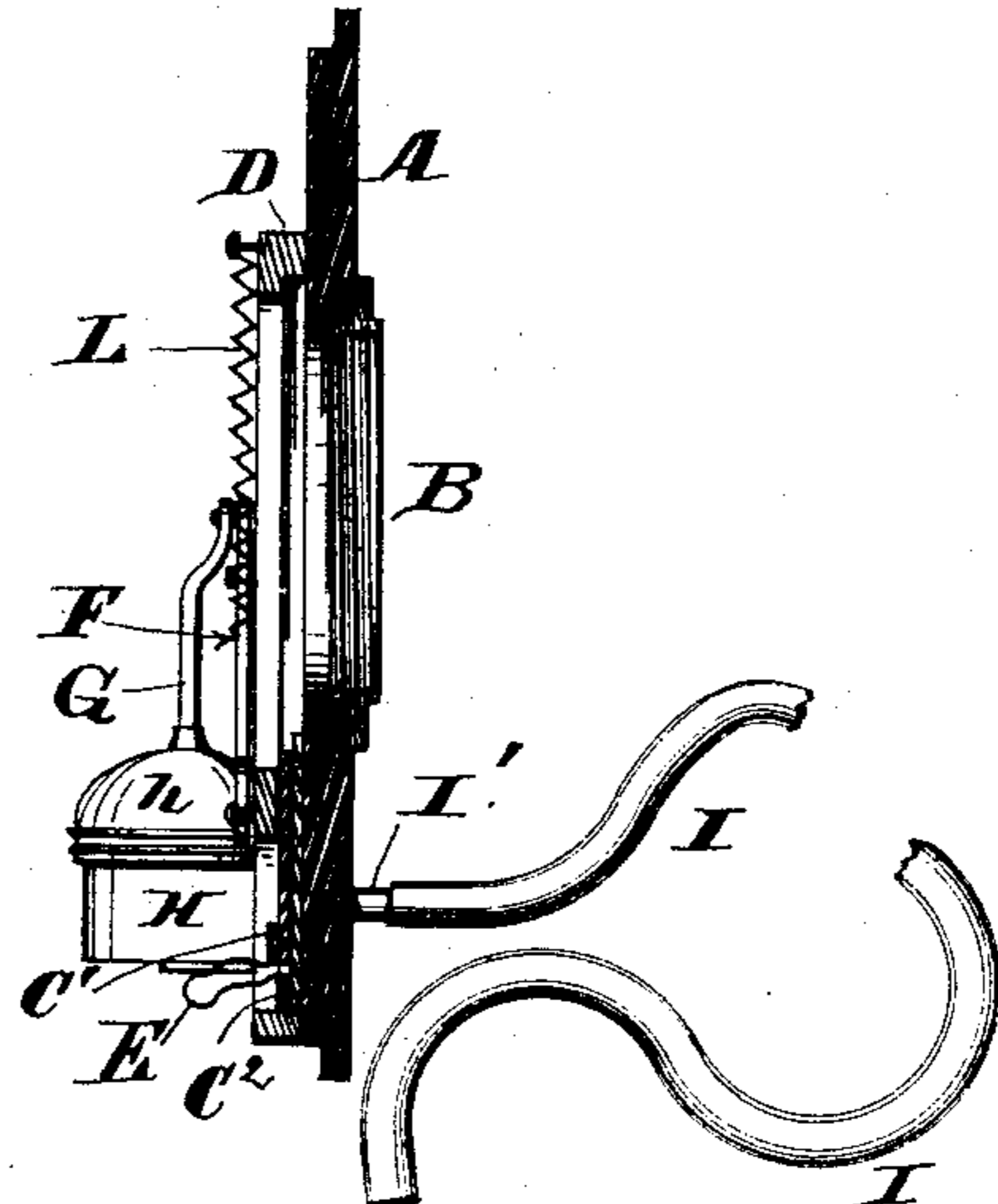


Fig. 5.

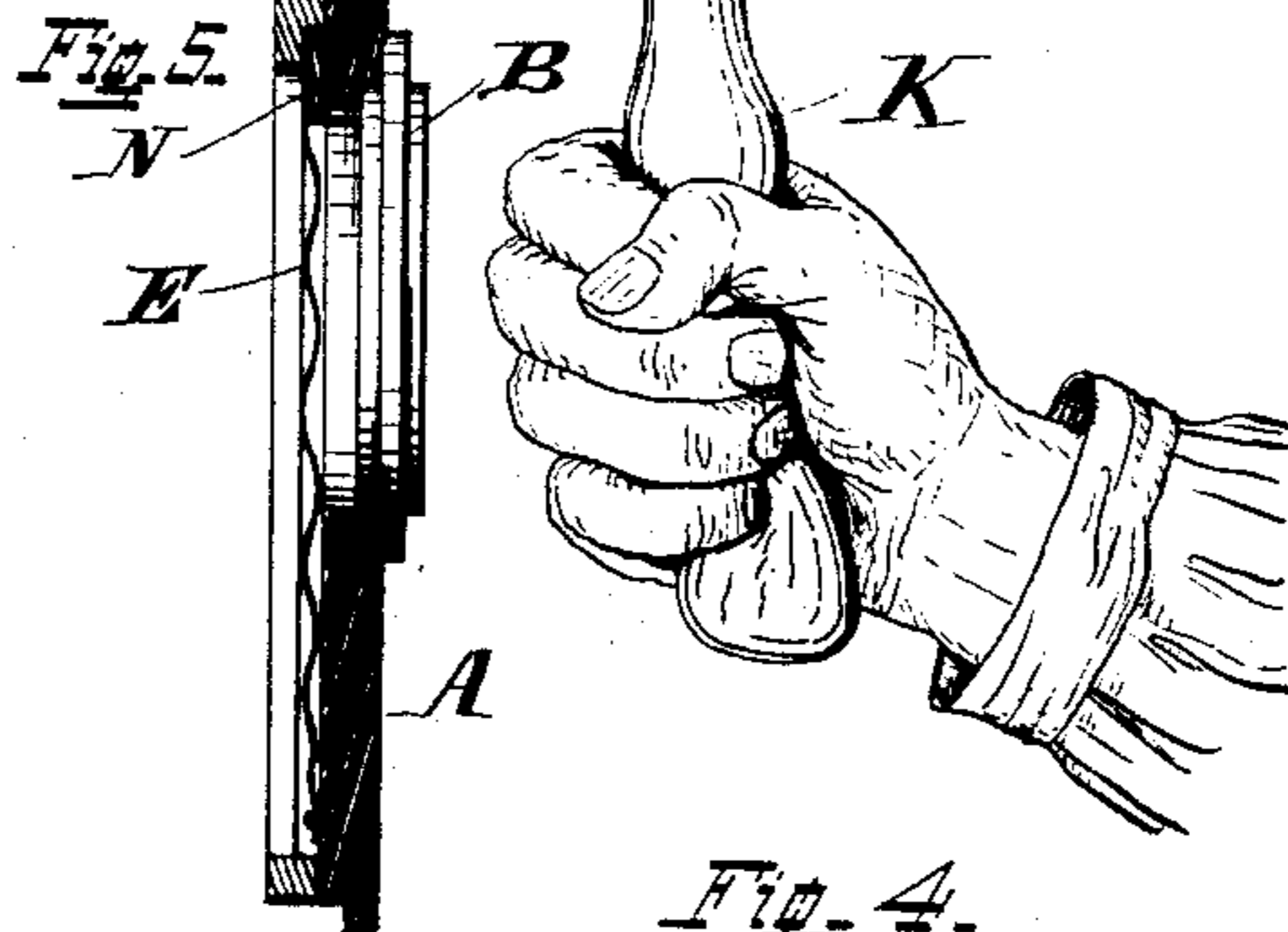
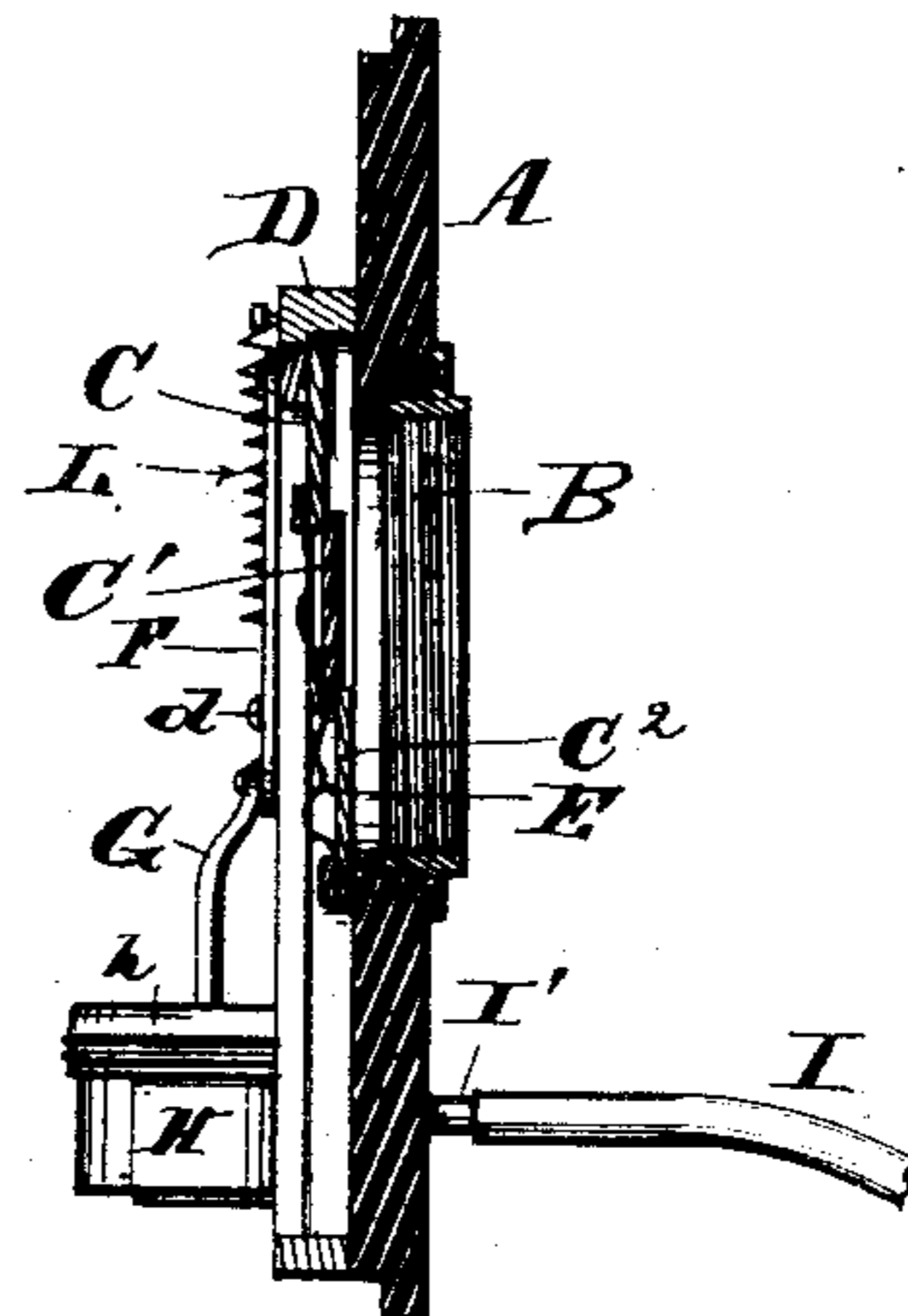
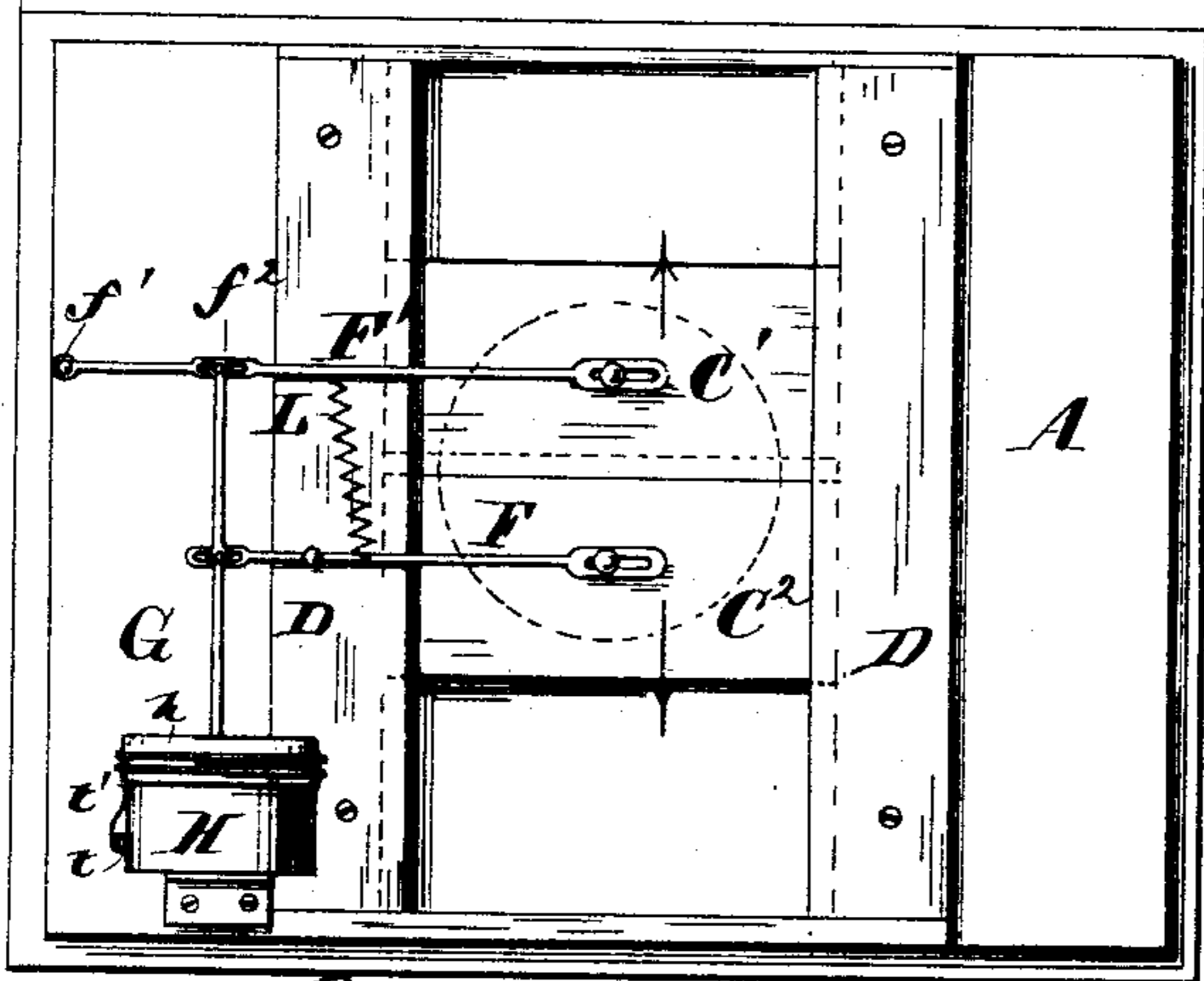


Fig. 3.

Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## CAMERA-SHUTTER.

SPECIFICATION forming part of Letters Patent No. 343,367, dated June 8, 1886.

Application filed July 28, 1884. Serial No. 138,979. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN R. FROOME, a resident of the town of Winton Place, in Hamilton county, and State of Ohio, have invented certain new and useful Improvements in Camera-Shutters, of which the following is a specification.

The several features of my invention and the various advantages resulting from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings, Figure 1 represents an elevation of the rear side of the front of a camera, and showing a door closed and apparatus for operating the latter, illustrating my invention. Fig. 2 represents a vertical central transverse section of the camera-front and the door shown in Fig. 1, the door being at the left-hand side of said Fig. 2, and being shown as open, the air bulb and tube for operating the door being shown in elevation, the air-bulb being compressed. Fig. 3 represents an elevation of the rear of said camera-front, showing a modified form of door and one of the suitable descriptions of mechanism for operating said doors. Fig. 4 represents a vertical central transverse section of a camera-front, and shows another modification of the form of the door shown in Figs. 1 and 2, the door in this Fig. 4 being at the left-hand side of the figure. Fig. 5 shows another modification of one feature of my invention.

The box or frame-work of the camera may be of any desired size and construction.

A indicates a supporting board or frame-work located in the front portion of the camera.

B indicates the lens or lenses, of any construction and single or in duplicate—as, for example, in the stereoscopic camera.

At or in the near vicinity of the frame A, and suitably secured thereto is a sliding door, C. This door can be interposed at will between the lens and the sensitized plate within the camera, which is to receive the picture thrown by the lens. Thus the door will regulate, as desired, the passage of the rays of light from the lens to the said photographic plate.

In the taking of daguerreotype or photographic pictures on the sensitized plate the high lights take more rapidly than the low lights. Ordinarily the earth and the fields

and trees, &c., are, comparatively speaking, of a dark color, and are low lights. On the other hand the sky is ordinarily of a light color, and is therefore usually a high light. So are also those portions of the view which are most distant from the lens. The high lights form a good proportion of every landscape view and usually occupies a large proportion of the said view. It therefore becomes desirable to provide a mode of so applying the light from the lens to the sensitized plate as that the high lights and the low lights shall be relatively allowed to impinge upon the plate such a length of time, respectively, as will enable the plate to duly receive the said high and low lights, and that the time of the action upon the plate of the high lights and low lights shall be such that the plate shall receive and faithfully reproduce the picture transmitted to it by the lens.

In a camera the picture is thrown from the lens upon the screen and upon the sensitized plate in an inverted position, and the high lights usually fall upon the lower portion of the sensitized plate and the low lights upon the upper portion of said plate. I have arranged the door so that in uncovering the lens, or in other words, uncovering the plate to the action of the rays of light from the lens, the door shall first submit the sensitized plate to the action of the low lights or foreground at the upper portion of the sensitized plate and afterward to the action of the high lights at the lower portion of the plate, and in cutting off from the plate the rays of light cast thereon by the lens shall first obscure the high lights at the lower portion of the plate, and afterward obscure the low lights at the upper portion of the plate. Thus the sensitized plate is submitted to the action of the low lights for a longer time than it is submitted to the action of the high lights, and as the low lights, as before mentioned, require a longer time to accomplish their desired action on the plate than the high lights my process provides for this necessity, and enables better and more perfect pictures to be taken. Ordinarily, when a plate has been exposed to the rays of light from the lens long enough to enable the low lights to complete their desired effect upon the plate, the high lights have completed their desired action on the plate

sometime before the low lights have completed theirs, and said high lights after completing their desired action have continued to act, and that in an undesired and injurious manner, and have burned or otherwise acted upon that portion of the plate which receives and is subject to the action of the rays. My improved aforesaid mode of submitting the plate to the action of the low lights and high lights prevents this injurious action of the high lights, and enables very accurate and perfect pictures to be taken. By this mode of application of the rays of light from the lens to the sensitized plate the upper portion of the plate is first submitted to the action of rays of light from the lens, then the middle portion of the plate is submitted to rays of light from said lens, and lastly the lower portion of the plate is submitted to rays of light from said lens, and in closing the lens the lower portion of the sensitized plate is first obscured from the action of rays of light from the lens, and then the middle portion is obscured from the action of rays of light from the lens, and lastly the upper portion of the plate is obscured from the action of rays of light from the lens.

Besides introducing this new and very desirable feature into the process of photography the preferred mechanism by which it is accomplished constitutes a very desirable means of operating any door or movable partition, which is employed to admit, regulate, and cut off the rays of light passing through the lens to the sensitized plate.

I will now continue the description of the device. The door or shutter C preferably consists of two halves or portions, C' and C<sup>2</sup>, (see Figs. 1 and 2,) sliding in guides or grooves in the side pieces, D, one of which is placed on one side of the opening in front and the other on the other side of said opening of the lens. The halves C' C<sup>2</sup> do not run in the same grooves, but each has its own set of grooves running parallel to each other, so that the two halves may pass each other. When preferred, the edges of the ends of the halves C' C<sup>2</sup> may have grooves, and the sides of the opening have tongues, the latter respectively fitting said grooves and operating as guides for the halves C' C<sup>2</sup>, as aforesaid. The two shutters or halves C' C<sup>2</sup> are connected by a flexible connection, E, of any suitable material. This connection may be a cord or cords, but preferably is a sheet form, as shown, and made of black silk, cloth, muslin, or other flexible material. Such a sheet not only forms a flexible connection between said halves C' C<sup>2</sup>, but also aids in preventing any rays of light that may perchance leak through the joint between the said halves or between the halves and the frame from reaching the sensitized plate.

The preferred means for moving the door or shutter is as follows: A lever, F, is fulcrumed at the point *d* to the side D. Its long arm terminates in the loop *f*, and in this loop is the pin *e* in the upper half of the door C, as

shown in Fig. 1. When desired, the loop *f* may be transferred to the door C, and the adjacent end of the lever carry the pin *e*. The short arm of the lever is connected to the rod G, which is in turn attached to the flexible top *h* of cylinder H. The cylinder H is made of wood or metal, or other rigid material, and is closed at the bottom by a permanent or rather a stiff and unyielding cover. Its top, however, is covered by a diaphragm of rubber or other flexible material, which is sufficiently loose to play up and down a certain distance. The approximate amount of this play is shown in Fig. 1, where the heavy line shows the position of the diaphragm when down, while the dotted lines show its position when elevated. A tube, I, preferably of rubber or other flexible material, opens into the cylinder H at any convenient point, as *h'* in Fig. 1. This tube I terminates in the semi-stiff rubber hand bulb or ball K. It will be seen that the cylinder H, tube I, and hand-bulb K form a closed cavity or chamber, from which the contained air cannot escape, and into which the outside air cannot enter. The amount of air in this cavity is considerably less than its full capacity—consequently not entirely balancing the external pressure of the atmosphere. The walls of this cavity being mostly flexible, it follows that this external pressure will compress them at some point or other, which will necessarily be the point of less resistance. The hand-bulb K and the tube I being made of stiff rubber, the compression falls on the flexible top *h* and forces it into the cylinder H, as shown in Fig. 1. In this position of the top *h* the door C is raised and covers the opening in front of the lens. If, now, the hand-bulb K be compressed by the hand of the operator, the air within it and the tube I is forced along said tube, enters the cylinder H, and raises the top *h* to the position shown in dotted lines. This raises the rod G, operates the lever F, lowers the door C to the position shown in dotted lines, and thus uncovers the lens, and submits the sensitized plate to the action of the rays of the lens.

In taking a photograph the operator, after first focusing the camera, permits the door C to cover the lens, and then puts the sensitized plate in position. When all is ready, he compresses the hand-bulb K and lowers the door C, and exposes the plate. Since the door drops from above downward, it exposes the plate to the low lights first and the high lights afterward, securing the advantages already described. By relaxing the pressure of the hand upon the bulb the door is elevated thereby, first obscuring the high lights and afterward obscuring the low lights, thereby again securing the advantages already described. Another feature of advantage is in the varying rapidity with which the door C may be lowered and elevated. If there are no high lights, or if they form only a comparatively small portion of the picture, it would not be desirable to have one part of the plate exposed

longer than the other, and this difficulty is met by very sudden compression of the hand-ball K, which then throws down the door C with a motion that is almost instantaneous. When, however, the opposite condition obtains, a gradual pressure upon the hand-ball K will lower the door C more slowly, and gradual relaxation permit it to return slowly, thus securing the advantages of difference in time of exposure of different parts of the plate. It may be desirable to insure against any chances of leakage of the tube I and hand ball or bulb K, and of diaphragmic top *h* and their connections. I provide a spring to operate on the lever F, so as to keep that end of the lever which is connected to the door at all times uplifted when the lever is not operated upon by compressing the bulb K. A preferred mode of applying such a spring is shown in Figs. 1, 2, and 3, and consists in connecting one end of the spring to the lever F at a suitable point, as *m*, thereon, between fulcrum-pivot *d* and loop *f*, and securing the other end of the spring to a point, as *n*, on the camera-frame above the point *m*, the spring being strained between said points *m* and *n*.

Among the various means other than the lever F and its immediate connections for operating the door may be mentioned pulleys, and cord, or rack and pinion, &c.

There are various modifications of my device which fall within the scope of my invention and some of which I will now describe. The least advantageous of these modifications and the one which prevents the use of the principle of difference in time of exposure to high or low lights is shown in Fig. 3. In this modification the lever F is attached to the lower half, C<sup>2</sup>, of door C, and a second lever, F', is attached to the upper door, C'. This lever F' being fulcrumed at the point *f'*, and attached to the rod G at the point *f*<sup>2</sup>, is a lever of the third class. The curtain E is preferably present here as in the previous form of shutter or door. Now, when the rod G rises, the two doors C' C<sup>2</sup> are separated, moving in the direction of the arrows and exposing the plate. When the rod *f* is moved down, the doors C' and C<sup>2</sup> are brought together. The spring L, when present, as shown, will aid in quickly drawing the doors together when the rod G is moved upward or allowed to move upward.

In Fig. 4 the door C is shown made in three sections connected by a flexible back, in other respects the construction being the same as in Fig. 1. The advantage of this form is that it requires less depth of box below the aperture of the lens to accommodate the closed door. It illustrates the fact that the number of sections used may be varied, and that I do not confine myself to the construction of a door having any given number of sections.

In Fig. 5 a very important modification is shown—one, indeed, which possesses some very considerable advantages even over the form first described. In this form both doors, C'

C<sup>2</sup>, are dispensed with, and in place of the upper door a narrow strip, N, is substituted, which serves for the attachment of the lever F and the upper end of the curtain E. Below the curtain E it is attached to the lower side of the opening. By this arrangement the curtain E forms the sole covering of the lens, and raising and lowering the strip N raises and lowers the curtain. In certain instances the supporting-frame A and its door and connection will be placed upon the outer side of the camera, but (of course) behind the lens. One solid portion, as C', may be used instead of two or more such portions, and it will be desirable to use but one such door portion when the lense is small. In case of leakage the bulb K will gradually fill with air; so, also, when the semi-flexible tube I is applied to the rigid tube I', connecting the tube I to the chamber H, the air in bulb K may, through inadvertence or otherwise, not be exhausted.

To enable the operator to exhaust the air in bulb K without removing tube I from tube I', I provide a suitable valve, preferably connected to chamber H. One form of such valve—viz., *t*—is shown in Fig. 1 connected to the exterior of chamber H, and covering an aperture in said chamber. Said valve opens outward, and is pressed upon its seat by means of a suitable spring, as *t'*.

An advantage in making the semi-flexible tube I detachable from the rigid tube I' consists in the fact that when focusing, or in case I do not wish to use the door, I can immediately remove the semi-flexible tube I', and the door will, when arranged to open downward, remain open till such time as I choose to reunite the semi-flexible to the rigid tube I'.

While the various features of my invention are preferably employed together, one or more of said features may be employed without the remainder. One or more of said features of invention may, in so far as applicable, be employed in connection with other styles of doors of cameras, and may be employed with optical instruments other than that specifically herein described.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. In an optical instrument, a door consisting of two or more solid sections sliding in the frame and interposed between the lens and plate, said sections connected together by flexible connections, substantially as and for the purposes specified.

2. The door interposed between the lens and the plate, and consisting of two or more solid pieces or sections connected together by flexible connections and arranged to close upward, substantially as and for the purposes specified.

3. The door interposed between the lens and the plate, and consisting of two or more solid sections and curtains connected thereto, substantially as and for the purposes specified.

4. The chamber H, flexible diaphragm *h*, flexible tube I, and semi-elastic bulb K, and

lever F, connected to the diaphragm, and connected to the upper portion of the upwardly-sliding door through the agency of the pin *c* and the loop *f*, substantially as and for the purposes specified.

5 5. The chamber H, flexible diaphragm *h*, flexible tube I, and semi-elastic bulb K, and lever F, connected to the diaphragm, and connected to the upper portion of the upwardly-sliding door through the agency of the pin *c* and the loop *f*, and the spring L, substantially as and for the purposes specified.

15 6. The upwardly-sliding door, consisting of a rigid cross-piece and curtain connected thereto, and chamber H, flexible diaphragm *h*, flexible tube I, and semi-elastic bulb K, and lever F, connected to the diaphragm by a rod, G, and connected to the upper portion of the upwardly-sliding door through the agency of the pin *c* and the loop *f*, substantially as and for the purposes specified.

20 7. The upwardly-sliding door, consisting of two or more rigid and flexible connections, and chamber H, flexible diaphragm *h*, flexible tube I, and semi-elastic bulb K, and lever F, connected to the diaphragm by a rod, G, and connected to the upper portion of the upwardly-sliding door through the agency of the pin *c* and the loop *f*, substantially as and for the purposes specified.

8. The upwardly-sliding door, consisting of two or more rigid and flexible connections, and chamber H, flexible diaphragm *h*, flexible tube I, and semi-elastic bulb K, and lever F, connected to the diaphragm by a rod, G, and connected to the upper portion of the upwardly-sliding door through the agency of the pin *c* and the loop *f*, and the spring L, connected at one end to that end portion of the lever which is between fulcrum *d* and the door, and connected at its other end to the frame above the door, and strained between its two points of connection, substantially as and for the purposes specified.

9. In an optical instrument, the combination of a downwardly-opening door, an air-chamber provided with diaphragm *h*, rigid tube I', flexible tube I, and semi-elastic bulb K, the semi-flexible tube I being detachable from the rigid tube I', and mechanism for transmitting the movement of the diaphragm to positively operate the door, substantially as and for the purposes specified.

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Attest:

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