A. WOLLENSAK.

PHOTOGRAPHIC SHUTTER.

APPLICATION FILED APR. 27, 1915.

1,170,207. Patented Feb. 1, 1916.

Fig. 1.

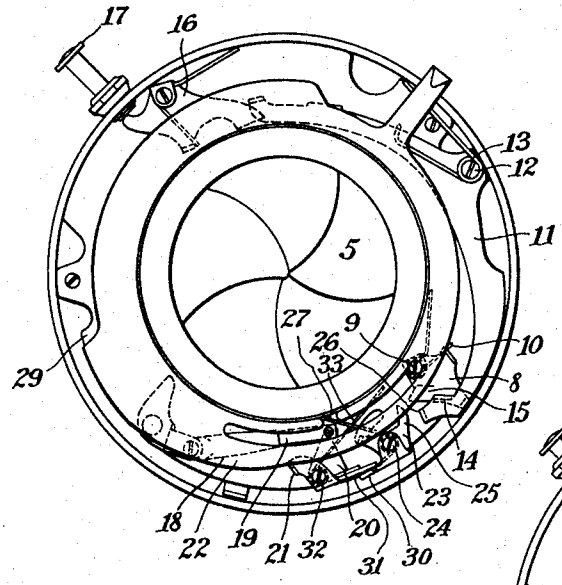


Fig. 2.

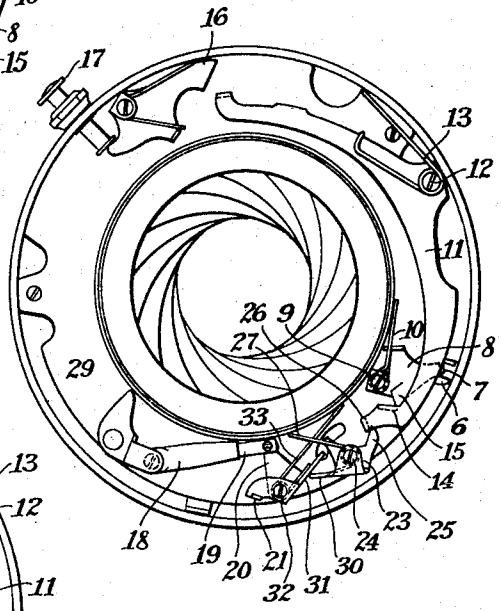


Fig. 3.

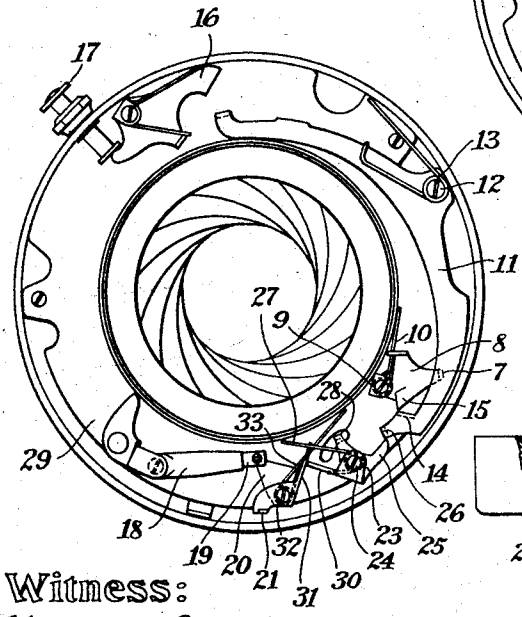
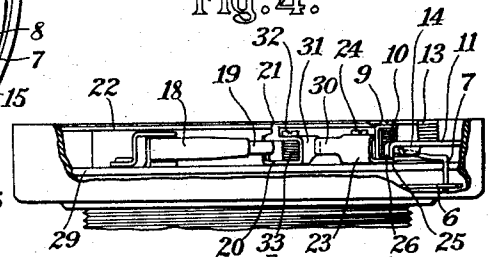


Fig. 4.



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PHOTOGRAPHIC SHUTTER.

1,170,207. Specification of Letters Patent. Patented Feb. 1, 1916.

Application filed April 27, 1915. Serial No. 24,367.

To all whom it may concern:

Be it known that I, ANDREW WOLLENSAK, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Photographic Shutters, of which the following is a specification.

This invention relates to photographic shutters of the type in which exposures of measured duration are obtained automatically by the use of a retarding-device, usually pneumatic in its operation.

The object of the invention is to produce a shutter, of the kind in question, in which a high degree of accuracy may be attained in regulating the lengths of the exposures, particularly the exposures occupying only a fraction of a second.

In shutters of the type in question it is common to regulate the length of the exposure by varying the length of the movement imparted to the retarder by the actuating-mechanism of the shutter. In the shorter exposures, however, the inertia of the mechanism of the retarder plays a large, and perhaps the chief part, in the retarding function, while the stroke or movement which is imparted to the retarder is so short that in the case of a pneumatic retarder the slight increase in air-pressure resulting from it has comparatively little effect. Under these conditions any slight distortion of the parts of the mechanism, or any increase in play or lost motion due to wear, has a pronounced effect on the timing of the mechanism, and such distortion and wear are likely to occur in consequence of the fact that the coöperative engagement between the actuating-mechanism and the retarder is usually in the nature of a blow, which is most accentuated in the case of the shorter exposures.

In accordance with the present invention the disadvantages above set forth are avoided by a construction and organization of the parts such that the coöperative engagement between the actuating-mechanism and the retarding-mechanism is comparatively long, even in the production of the shorter exposures, the necessary variations in the retarding effect being secured by an arrangement through which the actuating-mechanism operates on the retarding-mechanism with a mechanical advantage which increases rapidly toward the end of the operative movement of the parts. In this manner it is possible to secure a less sudden and more prolonged engagement, for the shorter exposures, and thus to largely eliminate the hammering action characteristic of the usual constructions, and also to reduce the proportionate effect of inertia, since the retarding-mechanism is thrown into movement less suddenly, the length of the coöperative movement of the parts being greater in all cases, except that of the longest exposures. In the preferred form of the invention the change in mechanical advantage just referred to is secured by the use of coöperating levers so formed and arranged as to act upon each other with varying effective lever-arms.

In the accompanying drawings:—Figures 1, 2 and 3 are front-elevations of a shutter embodying the present invention, with the front cover-plate and certain parts of the mechanism removed, and showing the mechanism in different positions; and Fig. 4 is a bottom-view of the shutter, with a part of the casing broken away to show the mechanism.

The illustrated shutter, in its general organization and mode of operation is substantially the same as that disclosed in Letters Patent of the United States No. 1,035,762, granted Aug. 13, 1912, to the present inventor, and only so much of the mechanism of the shutter is illustrated as is necessary for an understanding of the improvement disclosed.

The illustrated shutter has the usual oscillating shutter-blades 5 connected, in any ordinary or suitable manner, with a blade-ring 6 which has a forked projection engaged by a lug 7 depending from an exposure-lever 8. The exposure-lever 8 is mounted on a pivot 9, and is moved in one direction by a spring 10. It is moved in the opposite direction by means of a master-lever 11, which is mounted on a pivot 12 and moved in one direction by a spring 13. A beveled lug 14, near the lower end of the master-lever, coöperates with a beveled lug 15 on the exposure-lever, so as to rock the latter from the position of Fig. 1, in which the shutter-blades are closed, to the position of Fig. 2, in which the blades are open, and then to release the exposure-lever and permit it to close the blades again, after the master-lever has

moved just beyond the position shown in Fig. 3.

The master-lever is actuated by coöperation with an actuating-lever 16, which may be moved by a finger-button 17, or in any other convenient or usual manner. The parts so far described are all substantially the same in construction and operation as in the shutter of the said patent.

The retarder is illustrated as comprising an air-cylinder 18, in which a piston 19 moves, the cylinder being pivotally mounted at its rear end. The outer end of the piston is pivoted to a retarder-lever 20 mounted on a pivot 32, and this retarder-lever has a lug 21 which engages the cam-like edge of the controller-ring 22, which is turned in the usual manner to vary the length of exposure. By the action of this ring the initial position of the retarder-lever 20 is varied, so as to vary the length of stroke remaining to be performed by the retarder-piston. A spring 33, associated with the retarder-lever, tends to swing it in a direction to pull the piston outwardly, and to press the lug 21 against the controller-ring.

The master-lever is operatively connected with the retarder-lever by an intermediate lever 23, which is mounted on a pivot 24 and controlled by a spring 27. The intermediate lever has a beveled lug 25 which coöperates with a lug 26 on the master-lever. The lug 26 rides freely over the lug 25 when the master-lever is swung in a clockwise direction, but upon its return-stroke, under the influence of the spring 13, the square faces of the lugs are engaged, and the intermediate lever is therefore rocked in a clockwise direction until, by reason of this movement, the end of the lug 25 is drawn clear of the lug 26, whereupon the intermediate lever is returned to its normal position by the spring 27. This position is determined by a stop-lug 28 projecting from the lever 23 into a slot in the base-plate 29 of the mechanism.

The intermediate lever and the retarder-lever coöperate through arms 30 and 31, respectively. In the normal position of the parts, when the shutter is set for the longest exposure, these arms lie substantially parallel with each other, as shown in Fig. 1. In the exposure-movement, however, as the intermediate lever swings toward the position of Fig. 3, which represents its final operative position, the angle between the arms 30 and 31 changes in such a manner that the intermediate lever has a mechanical advantage over the retarder-lever which increases rapidly toward the end of the movement, becoming, in fact, infinite at the completion of the operative movement. Owing to this same arrangement, when the retarder is set for a shorter exposure the intermediate lever and the retarder-lever have a position such that, although the retarder-lever is held, by the controller, away from the intermediate lever in the initial position of the parts, so that the intermediate lever and the master-lever have a preliminary free movement, nevertheless the engagement between the intermediate lever and the retarder-lever is not in the nature of a severe blow, by which the parts of the retarder are suddenly thrown into rapid movement, but is rather in the nature of a wiping action, such as to throw the parts into movement gradually. The increased mechanical advantage of the intermediate lever over the retarder-lever, near the last part of the operative movement, also permits, and in fact requires, a formation of the controller such as to secure a longer operative connection between the retarder and the actuating-mechanism for the shorter exposures than would otherwise be the case, thus further reducing the sudden and violent engagement of the parts and the preponderant effect of inertia in the retarding action.

I claim:—

1. A photographic shutter having, in combination, a retarder; actuating-mechanism; and connections between said mechanism and the retarder, for actuating the latter, constructed and arranged to give the acuating-mechanism a mechanical advantage over the retarder which increases substantially toward the last part of the operative movement.

2. A photographic shutter having, in combination, a retarder; actuating-mechanism; and connections between said mechanism and the retarder, for actuating the latter, comprising levers having effective arms which vary in such sense as to give the actuating-mechanism a mechanical advantage over the retarder which increases substantially toward the last part of the operative movement.

3. A photographic shutter having, in combination, a retarder; a controller to vary the length of the operative movement of the retarder; a master-lever; a retarder-lever connected with the retarder; and an intermediate lever coöperating with the retarder-lever and the master-lever; the retarder-lever and the intermediate lever coöperating with effective lever-arms which vary in such sense as to give the intermediate lever a mechanical advantage over the retarder-lever which increases substantially toward the last part of the operative movement.

ANDREW WOLLENSAK.