

No. 670,117.

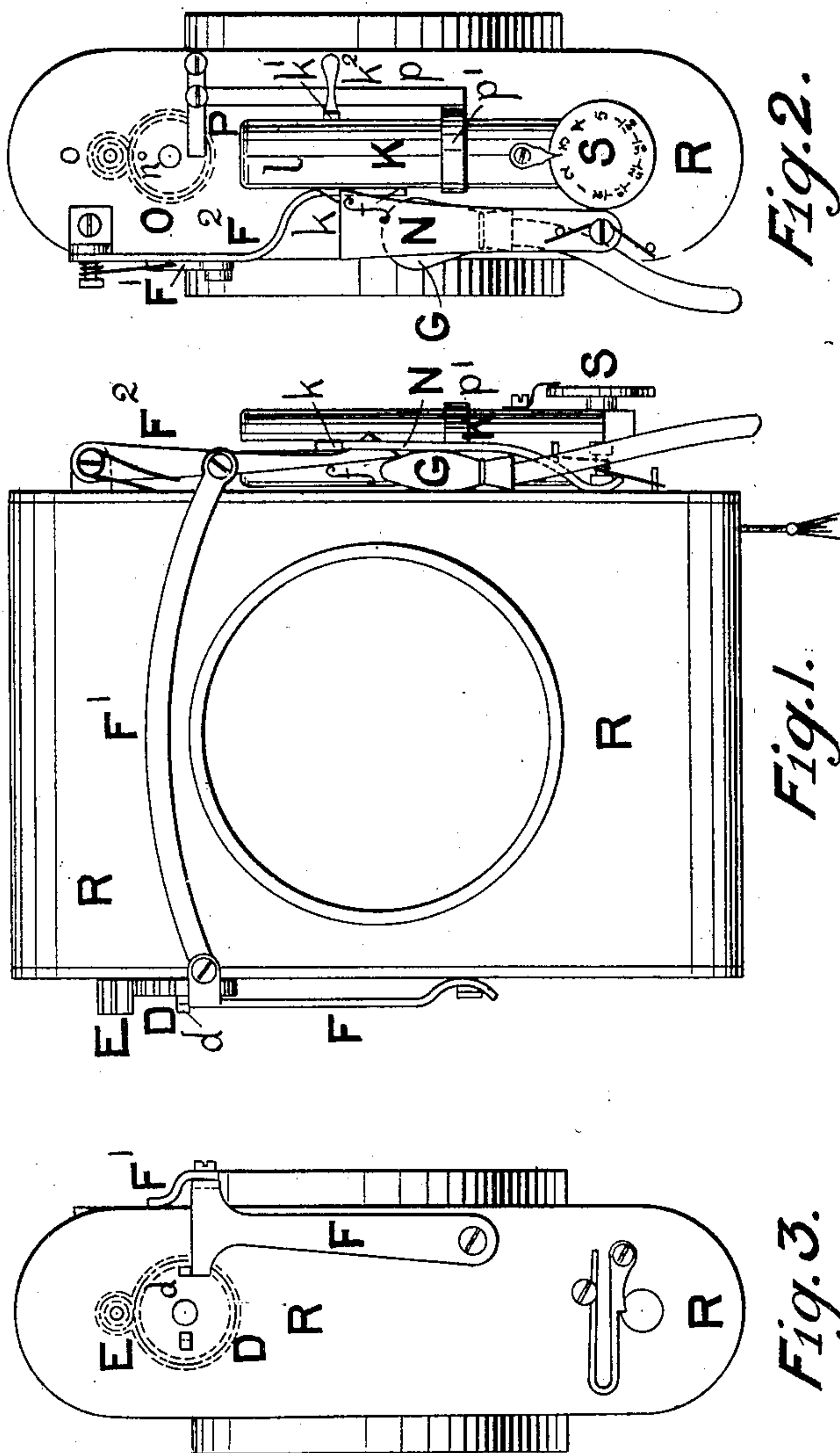
Patented Mar. 19, 1901.

J. E. THORNTON.
PHOTOGRAPHIC SHUTTER.

(Application filed Dec. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES.

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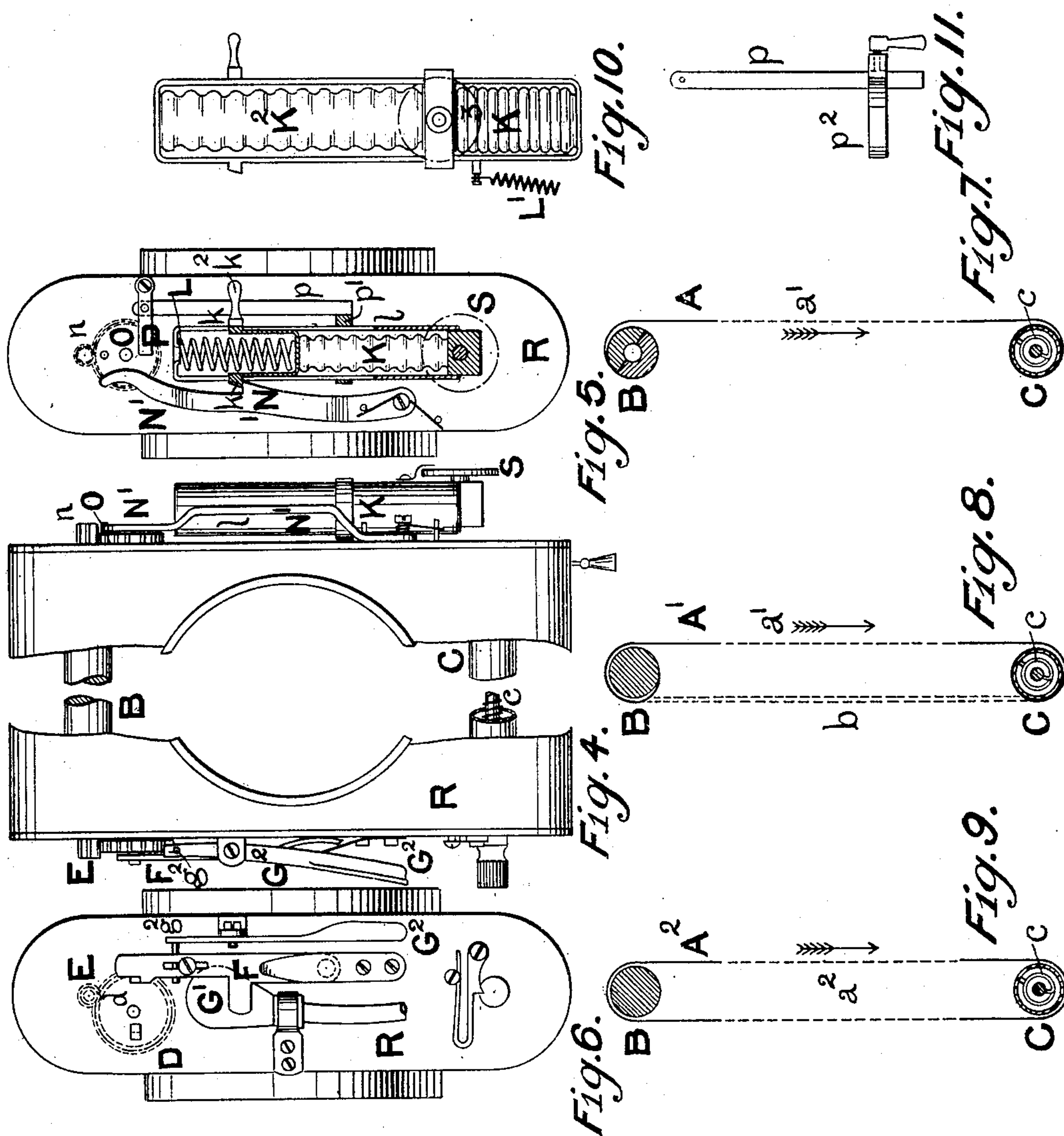
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UNITED STATES PATENT OFFICE.

JOHN EDWARD THORNTON, OF MANCHESTER, ENGLAND.

PHOTOGRAPHIC SHUTTER.

SPECIFICATION forming part of Letters Patent No. 670,117, dated March 19, 1901.

Application filed December 18, 1899. Serial No. 740,832. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD THORNTON, manufacturer, a subject of the Queen of Great Britain, and a resident of Manchester, in the county of Lancaster, England, 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 single-roller-blind description and the control of the period of exposure in such shutters.

The invention consists, essentially, in the combination, with a single spring-blind that always moves in the same forward direction for the exposure movement, of a regulatable timing device for interrupting the exposure movement of such blind and for detaining it for the desired period of time—say, for example, one one-hundredth of a second or five seconds or longer—which timing device forms a part of the shutter itself (not part of a ball-and-tube-releasing device) and the said timing device consisting of one or more reservoirs—such as a bellows, cylinder, or other suitable arrangement—containing air, water, glycerin, or other convenient fluid, such as described in the specification of my earlier application, Serial No. 733,789.

A shutter made according to this invention comprises the following elements: first, a single flexible blind having one or more perforations therein for the passage of light, one, two, or more rollers around which the blind may be passed or to which, if desired, it may be attached, a driving-spring for operating one or more of the rollers in such a manner as to control the movement of the blind, and means for winding up the driving-spring and for adjusting the tension thereof; second, a fluid or air operated timing device for regulating the time of exposure by interrupting the spring-driven blind during its exposure travel in such a manner that the perforation or perforations in the blind are detained coincident with the openings in the shutter-frame for a predetermined period of time, which can be altered by the operator setting the timing device accordingly; third, a release for setting in action the shutter-blind or else the timing device for both, such as a

pneumatic ball and tube, a cord, a trigger, or other convenient arrangement, and, fourth, a suitable frame or case to carry the whole working parts in correct position in relation to each other.

The invention will be fully described with reference to the accompanying drawings.

Figure 1 is a front elevation of shutter with a single blind. Fig. 2 is an elevation of one side of same, showing the timing device attached thereto. Fig. 3 is an elevation of the other side, showing the releasing mechanism for setting in action the shutter. Fig. 4 is a front elevation of the shutter, showing a modified arrangement of the parts. Fig. 5 is an elevation of one side of same, Fig. 4, showing the timing device. Fig. 6 is an elevation of the other side of same, Fig. 4, showing the blind-releasing mechanism. Fig. 7 is a side elevation of one form of single blind. Fig. 8 is a side elevation of another form of single blind. Fig. 9 is a side elevation of another form of single endless blind; Fig. 10, a sectional detail of liquid timing device; Fig. 11, a modification of stop-rod P and ring P².

The blind A of the shutter is of one of the common or ordinary forms employed in single-blind shutters passing over or around a top roller B and a bottom roller C, actuated by a spring.

The blind A² may be endless, as in Fig. 9, always rotating in one direction, as indicated by the arrows, the exposure taking place at each movement, in which case the lens is not uncovered to reset the shutter, or the setting of the blind for another exposure may be effected by winding it back in the reverse direction, in which case the lens would be uncovered during the operation. In either of these modifications the blind has two apertures a², which pass each other in opposite directions opposite the lens during the travel of the blind.

The blind A', as shown in Fig. 8, instead of being endless may roll off the roller B onto the roller C and from the roller C back to the roller B, the two rollers being also connected together by a cord, chain, or flexible band b, (shown in dotted lines,) so that all operate in unison. The blind A' is provided with one aperture a' and always moves in the direc-

tion of the arrow across the lens for exposure and back in the reverse direction for resetting.

The blind A (shown in Fig. 7) is of the most ordinary or commonly-used description, being attached by the ends to both rollers B and C and wound up upon the plain roller B to be set and drawn from that onto the roller C by the action of the spring *c* for exposure. It is rewound onto the plain roller B to set it for each exposure.

Whichever form or modification of blind is adopted the act of setting the blind for exposure is effected by the operator, the blind is held in the set position against the action of a spring by the releasing mechanism placed at one side of the shutter, (see Figs. 3 and 6,) and the duration of exposure is controlled by the timing mechanism, (see Figs. 2 and 5,) which can be set or adjusted by the operator as required. The releasing mechanism comprises a disk or wheel D, gearing with a wheel E on the end of the blind-roller and provided with a stop *d* to engage with a lever F to hold the blind when set and by which it is released when desired. The lever F is raised to release the blind for exposure out of contact with the stop *d* on the disk D. The releasing mechanism may be actuated, as in Figs. 1 to 3, by means of a connecting-rod F', extending from the timing device placed at the other side of the shutter-case, or it may be actuated direct by a pneumatic bulb G', placed beneath the lever F, or by a pivoted lever G², with a finger *g*² extending beneath it.

The pneumatic timing device which I prefer to adopt comprises a closed bellows K, charged with air or other fluid, with a small port through which the air passes in or out. The pneumatic timing device is moved in one direction to expel the air from the interior by a spiral or other spring L, inclosed in the casing *l*. This movement is utilized to control the period during which the moving blind shall be detained at a position of rest during the exposure. The timing device K is attached to one side of the shutter and is provided with projections *k* *k'*, one of which serves to hold the device in its expanded position against the action of the spring L and the other serves to release the blind after the desired length of exposure. In the arrangement shown in Figs. 1 to 3 the projection *k*, when in its expanded position, engages the catch-lever N, by which it is held until released by the lifting of the catch-lever N out of its path. This is done by the pneumatic bulb G, placed beneath it. Above the catch-lever N is a second pivoted lever F², the end *f* of which is in the path of the projection *k*, and as it travels down it engages the end *f*, moving it about its center. This movement is communicated by the connecting-rod F' to the blind-releasing lever F, which is thereby raised out of contact with the stop *d* on the disk D to release the blind.

On the side of the shutter above the pneu-

matic timing device K is pivoted a disk O, provided with a stop-pin *n*, the disk being rotated with the blind-roller by a pinion *o* on the end of the blind-roller. The stop-pin *n* when it has completed part of its travel comes into contact with the stop P and is arrested thereby.

In the arrangement shown in Figs. 4, 5, and 6 the catch-lever N' is elongated to reach to the disk O and to engage with the stop-pin *n* thereon. As the disk O is rotated after the release of the blind by the lifting of the lever F by the pneumatic bulb G', the stop-pin *n* engages the lever N' and moves it out of contact with the projection *k*, thereby releasing the pneumatic timing device K. The stop-pin *n* comes into contact with the stop P and the travel of the blind A is arrested thereby. The stop P is also pivoted to the shutter and to it is connected a rod *p*, carrying at its lower end a ring or the like *p'*, with which the second projection *k'* on the pneumatic timing device K as it travels slowly downward comes in contact and draws down the stop P out of the path of the stop-pin *n*, thereby releasing the blind a second time and permitting it to continue its travel and complete the exposure.

The time with which the stop-pin *n* remains in contact with the stop P, and thereby determines the duration of exposure, is consequent upon the length of time the projection *k'* takes to travel to engage the end piece *p'* of the stop P. This may be controlled by altering the speed of the pneumatic timing device K or by bringing the end piece *p'* nearer to the projection *k'*, and thereby reducing the time of travel, as shown in Fig. 11.

The pneumatic timing device is raised or set by a knob *k*² or other suitable device.

A timing device with two bellows-shaped chambers K² K³ may be employed, in which fluid or liquid is forced backward and forward from one chamber to the other and operated by a spring L'.

The parts of the shutter are so arranged that as soon as the releasing-lever F is raised and the blind released the timing-lever N' is disengaged from and releases the pneumatic timing device K, thus commencing the exposure. The travel of the blind is arrested by the stop-pin *n* against the stop P as soon as the opening therein is coincident with the opening in the shutter frame or case R. When the predetermined time of exposure has elapsed, the stop P is withdrawn by the pneumatic timing device K and the blind allowed to proceed and determine its exposure. In this way the shutter may be constructed to give a wide range of exposures with accuracy—say, for instance, from one one-hundredth of a second to twenty or thirty seconds. An indicating device—such as dial S and pointers, for instance—serves to show the time of exposure for which the shutter has been set. The timing device on the shutter is set in motion by any suitable means such as are well known—

for instance, a pneumatic ball G and tube or by a cord or a trigger.

The case R may be of any suitable construction, as is well understood—say of metal, wood, or other material.

What I claim as my invention, and desire to protect by Letters Patent, is—

1. The combination with a single blind traveling in one direction for exposure, of an automatic pneumatic timing device to arrest the travel of the blind in order to commence the exposure and to allow it to restart in order to terminate the period of exposure, such timing device being adjustable to a predetermined time in order that after the timing device has been set in action it shall operate the shutter-blind automatically without attention from the operator.

2. The combination with a single blind capable of traveling in one direction only for exposure, of a releasing device by which the blind is held when set and subsequently released and a pneumatic timing device by which the travel of the blind is arrested and restarted when the exposure is complete substantially as described.

3. The combination with a single blind capable of traveling in one direction only for exposure, the roller on which it is wound, the wheel E on the end of the blind-roller, the wheel D gearing therewith provided with a stop, and the lever F which engages therewith, of the wheel o on the other end of the blind-roller, the disk O gearing therewith provided with stop-pin n, the catch-lever N which engages the pneumatic device K, the stop P to engage the stop-pin n, stop-lever p, and

the pneumatic timing device K which is held and released by the catch-lever N and releases the stop P at the termination of a predetermined period substantially as described.

4. The combination with a single blind capable of traveling in one direction only for exposure, the roller on which it is wound, the wheel E on the end of the blind-roller, the wheel D gearing therewith provided with a stop d, and the lever F which engages therewith, of the wheel o on the end of the blind-roller, the wheel O gearing therewith provided with stop-pin n, the pneumatic bellows device K provided with projections k k', the catch-lever N by which the pneumatic device is held until released, the stop P to engage the stop-pin, and the stop-levers p to engage the projection k', by which the stop P is withdrawn substantially as described.

5. The combination with a single blind traveling in one direction for exposure, of an automatic timing device, a device for setting the timing device in motion, a device connected thereto to release and set in motion the blind, a stop to arrest the travel of the blind, and a device on the timer to engage the stop and restart the blind-forming mechanism whereby the single blind is started into action arrested in its travel to commence the exposure and restarted to complete the exposure.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN EDWARD THORNTON.

Witnesses:

J. OWDEN O'BRIEN,
E. HOWARD.