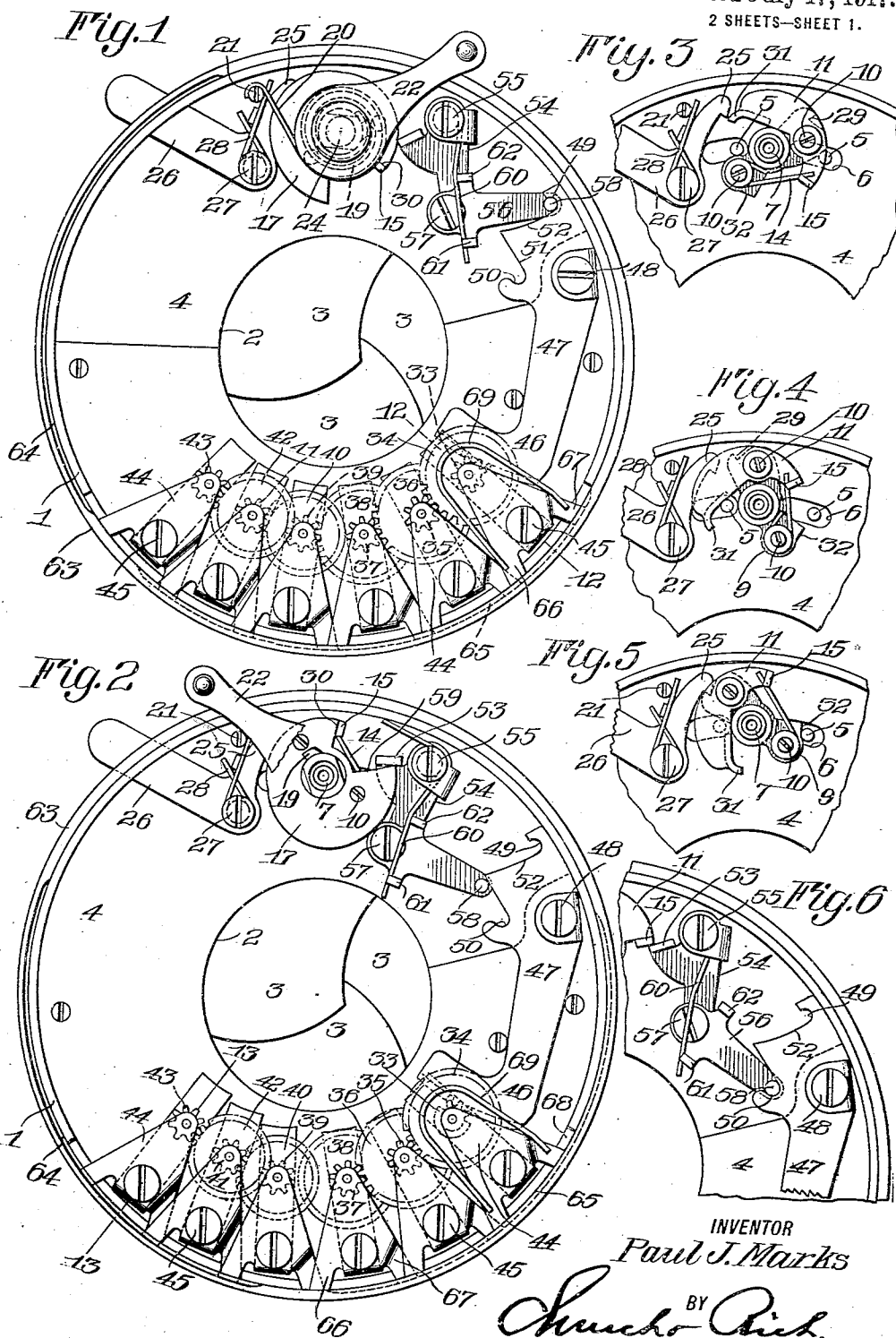


1,234,061.

P. J. MARKS.
PHOTOGRAPHIC SHUTTER.
APPLICATION FILED SEPT. 25, 1915.

Patented July 17, 1917.

2 SHEETS—SHEET 1.



INVENTOR

Paul J. Marks

BY

Shuchor Rich.

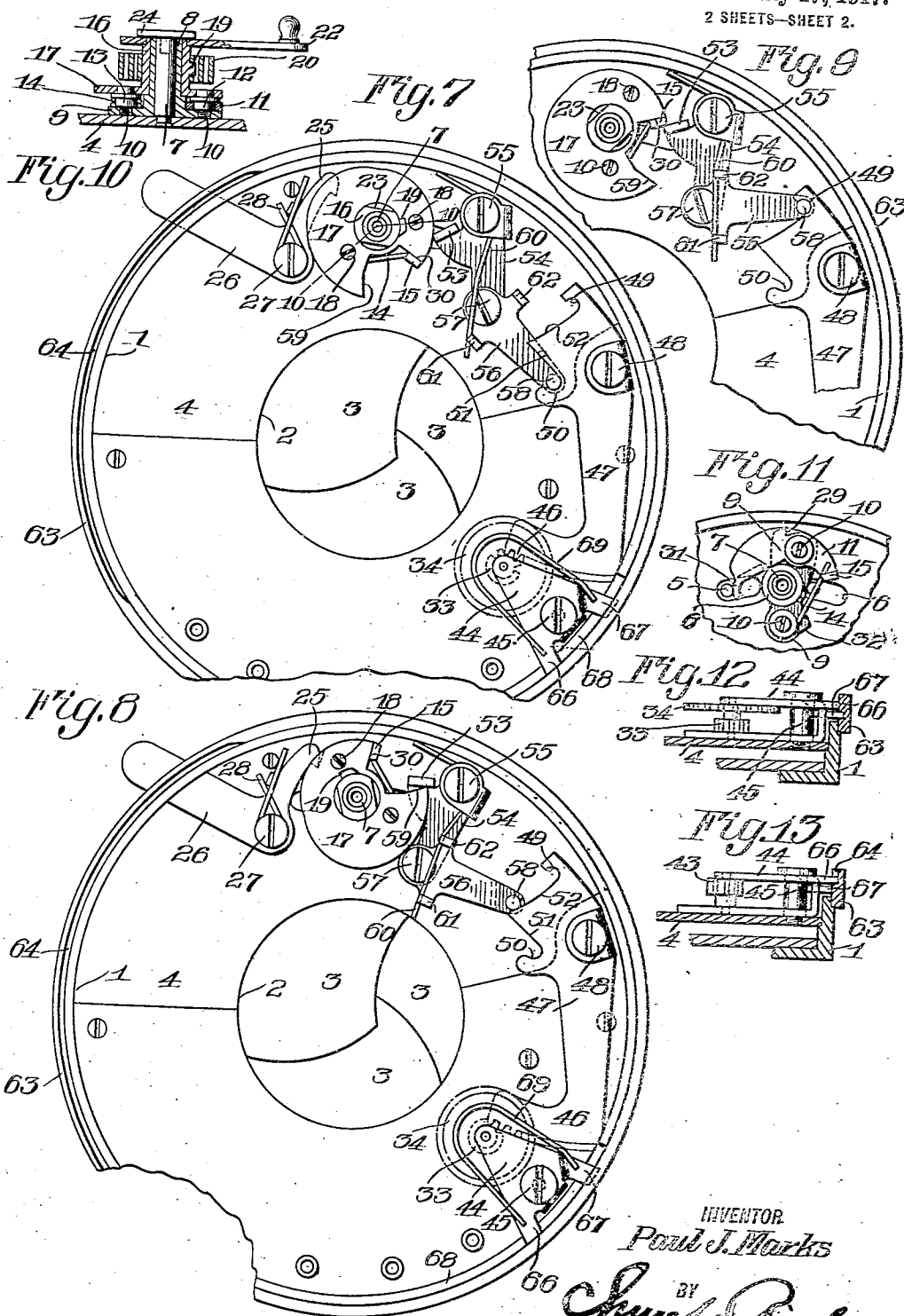
his ATTORNEYS

1,234,061.

P. J. MARKS.
PHOTOGRAPHIC SHUTTER.
APPLICATION FILED SEPT. 25, 1915.

Patented July 17, 1917.

2 SHEETS—SHEET 2.



INVENTOR

Paul J. Marks

BY

Chas. E. Rich.
His ATTORNEYS

UNITED STATES PATENT OFFICE.

PAUL J. MARKS, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY,
OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

PHOTOGRAPHIC SHUTTER.

1,234,061.

Specification of Letters Patent.

Patented July 17, 1917.

Application filed September 25, 1915. Serial No. 52,571.

To all whom it may concern:

Be it known that I, PAUL J. MARKS, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Photographic Shutters; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

My present invention relates to photography and more particularly to photographic shutters and it has for its object to provide a simple, cheap and convenient form of retarding device for automatically timing the exposures made by the shutter. In its preferred form, my invention contemplates the use of a gear train, the inertia and frictional resistance of which furnishes the retarding action and the elements of which may be progressively thrown in or out of gear to vary this action. Further objects of the invention are to provide a retarding device that does not require resetting but which will act effectively in both directions being actuated in first one direction and then the other with successive closing movements of the shutter. To these and other ends the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a front elevation of a shutter casing with the cover plate removed to reveal actuating and retarding mechanism constructed in accordance with and illustrating one embodiment of my invention; the parts being in normal position;

Fig. 2 is a similar view showing the parts in set position;

Figs. 3, 4 and 5 are detail views showing different successive positions of the blade actuating mechanism;

Fig. 6 is a detail view showing a different position of the intermediate parts connecting the driving mechanism with the retarding mechanism;

Fig. 7 is a view similar to Fig. 1 but with certain parts removed, the retarding device

on the last movement of the shutter having been actuated in an opposite direction from that of Fig. 1;

Fig. 8 is a view similar to Fig. 2 with certain parts removed, except that the retarding device is to be actuated in the opposite direction;

Fig. 9 is another detail view of the connections between the driving and retarding mechanisms;

Fig. 10 is a detail section taken substantially on the line 10—10 of Fig. 7;

Fig. 11 is another detail view of the blade actuating parts;

Fig. 12 is a detail section taken substantially on the line 12—12 of Fig. 1, and

Fig. 13 is a detail section taken substantially on the line 13—13 of Fig. 2.

Similar reference numerals throughout the several figures indicate the same parts.

The shutter in connection with which I have illustrated my invention in its present embodiment is of the diaphragm or pivoted blade type and comprises an annular casing 1 having a central exposure opening 2 normally closed by the pivoted blades 3. The blades are confined between a partition wall 4 and the rear wall of the casing and may have the usual actuating ring, the rotation of which causes the blades to open and close in unison but these parts are so well known that it has not been considered necessary to show them, it being sufficient to explain that pins 5 (Figs. 3, 4, 5, 8 and 11) projecting through slots 6 in the partition member 4 are connected to the ring or to the blades in such manner that they open the latter when moved to the left in the figures and close them when moved to the right. They are normally maintained in the last mentioned position by the usual spring that closes the blades and holds them closed, these arrangements being well known in the art. The actuating and retarding mechanisms are housed within the annular space between the central exposure opening 2 and the peripheral wall of the casing 1 and are protected by a cover plate seated upon said last mentioned wall but which is removed in the figures to reveal the interior parts.

Referring first to the driving mechanism

for operating the shutter, at the top of the casing is a fixed stud 7 (Figs. 7 and 10) upon which is journaled a hub 8 having lateral extensions 9 at its base. On these extensions 9 are fixed two diametrically opposite studs 10 on one of which is pivoted an arm 11 beneath a shouldered washer 12 while about a similar shouldered washer 13 on the other is coiled a spring 14 which engages a lip 15 on the arm 11 to normally actuate the latter in one direction, (Fig. 11). Surrounding the hub 8 is a drum 16 having a lateral flange 17 at its base provided with apertures 18 that engage over the heads of the studs 10 and lock the drum and the hub 8 together for joint movement. The drum 16 has a lateral projection 19 with which engages the inner end of a flat spiral or clock spring 20, the outer end of which is hooked over an abutment 21 fixed on the partition 4 as best shown in Fig. 1. Both the hub 8 and the drum 16 are thus adapted to be rotated in one direction by the spring 20 and they may be rotated in the other direction to place the spring under tension by an operating arm 22 engaging over squared faces 23 on the outer end of the drum. The arm is held in place and at the same time both the hub and drum are held down upon the stud 7 by a headed screw 24 threaded into the end of the latter.

When the arm 22 is moved to the left in the figures to place the spring 20 under tension and set the shutter, the spring is held in this wound position by a detent 25 on one arm of a bell crank shutter releasing lever 26 pivoted at 27 and having a spring 28 arranged to move the detent 25 into engagement with a shoulder 29 on one of the lateral extensions 9 of the hub 8 (Fig. 11). The other arm of the bell crank 26 projects to the exterior of the casing to constitute a releasing member by means of which the detent may be disengaged and the spring released.

Referring now more particularly to Figs. 3, 4, 5 and 11, when the shutter is in the normal or run-down position of Fig. 1, the parts are in the position shown in Fig. 3 and the spring 14 is holding the pivoted arm 11 so that the lip 15 thereon, previously described, is against a shoulder 30 on the flange 17 of the drum 16. As the arm 22 is moved to the left, the hub 8 and drum 16 are rotated with it and the inner face of a cam 31 on the pivoted arm 11 rides over one of the blade actuating pins 5 by contact with the outer side of the latter, as shown in Fig. 4, the arm 11 being thereby rocked against the tension of its spring 14. When the spring is fully wound and the detent 25 has engaged the shoulder 29, as in Fig. 5, the cam 31 will have passed beyond the pin 5, as shown in that figure, and the lip 15 will have returned to its position against the

shoulder 30. When, therefore, the shutter 65 is released through the lever 26, the return movement of the parts under the influence of the main spring 20 carries the cam 31 on the inside of the blade actuating pin 5, as shown in Fig. 11 and the cam is so shaped 70 that it displaces the pin to the left and opens the shutter blade against the tension of the closing spring. The cam 31 does not yield when passing on this side of the pin because it is supported by the engagement of 75 the lip 15 with the shoulder 30. As soon as the cam 31 has passed the pin 5, the latter returns under the control of the shutter closing spring and also by the engagement of one of the extensions 9 with the other 80 blade actuating pin 5, as shown in Fig. 3. It will be observed that this extension remains in contact with the said pin to lock the blades closed so that they cannot be jarred open, while when the shutter is set, 85 as in Fig. 5, a shoulder 32 on the other extension 9 similarly locks the blades closed by engagement with the same pin 5.

For automatically timed exposures, the spring 20 is caused to act against the variable resistance of retarding mechanism which regulates the speed of rotation of the mechanism turning about the stud 7 and the length of time during which the cam 31 holds the blades open by remaining in engagement with the blade actuating pin 5. 95 This mechanism comprises, in the present instance, a train of gears 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 arranged in a semi-circle at the lower part of the casing. With the reception of the last unit, there is a pair of 100 gears on each center or shaft and each pair or, rather, each shaft is journaled between the arms of a yoke 44 pivoted at 45 to studs fixed to the partition 4. Meshing with the 105 first gear 33 is a toothed segment 46 on an arm 47 of a lever pivoted at 48. On the other arm of the lever are two abutments 49 and 50 arranged on opposite sides of the pivotal center of the lever between which 110 abutments is a switch cam having the surfaces 51 and 52 adjacent to each.

When the flange or disk 17 on the drum 16 rotates during the opening of the blades, the shoulder 30 thereon through the medium of 115 the interposed lip 15 comes in contact with a lip 53 on a member 54 pivoted at 55. This member 54 carries a link 56 pivoted at 57 and having an abutment 58 at its free end adapted to travel on switch cam surfaces 51 120 and 52 and to alternately engage the abutments 49 and 50. In this way, the impact of the driving mechanism is taken by the lip 53 on the member 54 which turns slowly on its pivot and, through the medium of the 125 link 56, transmits this impact against one or the other of the abutments 49-50 so that the pivoted lever 47 is rocked in one direc-

tion or the other as the case may be. In Fig. 2 the parts are shown in the set position, the abutment 58 being ready to travel the cam surface 51. In Fig. 6, the lips 15 and 53 are in contact and the abutment 58 being against the abutment 50, is about to rock the arm 47. As the arm is rocked, it drives the gear train, the segment 46 being in mesh with the first gear 33, and during the travel of the disk or flange 17, the driving of the gears acts as a drag which slows up the movement of the parts under the influence of the main spring 20 and delays the closing of the blades.

When the shutter is set again by re-winding the spring through the movement of the lever 22 to the left, another shoulder 59 on the flange or disk 17 engages the lip 53 from the other direction as shown in Fig. 8, and oscillates the member 54 withdrawing the link 56 and carrying the abutment 58 away from the abutment 50. A spring 60 encircling the pivot 55 of the member 54 and having an arm acting against abutments 61 and 62 on opposite sides of the pivot of the link switches the latter over until the abutment 58 rests on the cam surface 52, as shown in Fig. 8, so that upon the next actuation of the shutter, the lever 47 will be swung in the opposite direction and the train of gears will perform their retarding function while returning to the position of Fig. 1. This last mentioned figure shows that the lip 15 has slipped off of the lip 53 which it does by the time the arm 47 has made its complete swing and given the full degree of rotation to the gear train.

It is obvious that the smaller the number of gears that are in operation in the train, the less the retarding action will be and the greater the number employed, the greater will be the retarding effect. I therefore provide means for progressively throwing the gears in or out so as to selectively change the combination that is in action. To this end, the journal member or yoke 44 at each gear shaft is pivoted at 45 as previously explained. On the outside of the casing is a revoluble ring 63 having cam tracks 64 and 65 therein arranged one beyond the other but not in alinement, that is, they are on different circumferences. Each journal member or yoke is provided with two arms 66 and 67 which are relatively offset. They project through a cutaway portion 68 in the peripheral wall of the casing 1 so that those on one side of each pivot 45 occupy one cam track in the ring and those on the other side the other cam track. Thus, when the ring is rotated in one direction, one cam surface acts upon the journals to rock them about their pivots 45 in one direction, picking them up successively and when the ring is rotated in the other direction, the other cam track co-

operates with the other arm to swing the journals back again. When one of the journals is so rocked, it throws a gear carried thereby into or out of mesh with the gear next adjacent thereto and thus all of the gears may be kept in mesh as in Fig. 1, or some of them thrown to an idle position as shown in Fig. 2, in which figure the break has been made between the gear 38 and the gear 39, so that only the gears carried on the three journals at the right of the figure will take part in the retarding action. For the highest speed, all of the gears are thrown out and the segment arm 47 is alone left to furnish the retarding action, together with the transmitting mechanism between it and the driving spring.

To increase the retarding action of any one or all of the gears, a friction spring 69 may be carried on the journal member 44 to bear against one face of the gear carried thereby.

I claim as my invention:

1. In a photographic shutter, the combination with a shutter mechanism, of a retarding device operatively connected therewith having a retarding movement in two directions.
2. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith operable in two directions and having an equal retarding action in each of said directions.
3. In a photographic shutter, the combination with a shutter mechanism, of a retarding device having a retarding movement in two directions and a connecting member for actuating the retarding device movable in one direction with one actuation of the shutter mechanism and returned in the other direction by the next actuation of the shutter mechanism.
4. In a photographic shutter, the combination with a shutter mechanism, of a retarding device having a retarding movement in two directions, said retarding device being actuated in one direction with one actuation of the shutter mechanism and in the other direction with a subsequent actuation of the shutter mechanism.
5. In a photographic shutter, the combination with a shutter mechanism, of a retarding device comprising a gear train and a connecting member arranged to revolve the gear train in one direction with one actuation of the shutter mechanism and in the other direction on the next actuation of the shutter mechanism.
6. In a photographic shutter, the combination with a shutter mechanism, of a retarding device comprising a gear train and a segment lever in constant mesh with the gear train and connected with the shutter

mechanism to revolve the train in one direction with one actuation of the shutter mechanism and in the other direction on the next actuation of the shutter mechanism.

5 7. In a photographic shutter, the combination with a shutter mechanism and a pivoted retarding element having a retarding action in both directions of movement and provided with two abutments on opposite
10 sides of its pivotal center, of a driving member for operating the shutter mechanism and means for exerting the power of the latter against first one abutment and then the other.

15 8. In a photographic shutter, the combination with a shutter mechanism and a pivoted retarding element having a retarding action in both directions of movement, and provided with two abutments on opposite
20 sides of its pivotal center and with a switch cam between said abutments, of a driving member for operating the shutter mechanism and a shifting transmission element also operated thereby to traverse the switch
25 cam and thrust against first one abutment and then the other with successive actuations of the driving member.

9. In a photographic shutter, the combination with a shutter mechanism and a pivoted retarding element having retarding action in both directions of movement, of a driving element for operating the shutter mechanism and means for exerting the power of the latter against first one side and
30 then the other of the pivotal center of the retarding device.

10. In a photographic shutter, the combination with a shutter mechanism and a pivoted retarding element having a retarding action in both directions of movement and provided with two abutments on opposite
40 sides of its pivotal center, and with a switch cam between said abutments, of a driving member for operating the shutter mechanism, a pivoted member arranged to receive the impact thereof, and a link pivoted to the pivoted member and adapted to traverse the switch cam and to thrust against first one abutment and then the other with successive actuations of the driving member.
50

11. In a photographic shutter, the combination with a shutter mechanism comprising blades and a reciprocatory actuating pin therefor, of a rotary driving element, and a yielding pivoted cam adapted to ride over the actuating pin and against one side thereof when the driving member is being set and to displace the pin to open the blades by engaging the pin on the other side when the driving member is released.
60

12. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith

comprising a train of gears and means for driving the gears in first one direction and
65 then the other with successive complete actuations of the shutter mechanism.

13. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith
70 comprising a plurality of gears, different combinations of which are adapted to be used to furnish the retarding action.

14. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith comprising a train of gears adapted to be successively thrown into or out of cooperative relation with each other to furnish as many degrees of retarding action as there
75 are gears in the train.

15. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith comprising a train of gears of progressively graduated sizes adapted to be successively thrown into or out of cooperative relation with each other to furnish as many degrees of retarding action as there are gears in the train.
85

16. In a photographic shutter, the combination with a shutter mechanism, of a retarding device connected to move therewith comprising a train of gears and pivoted journals therefor, by means of which the gears may be successively thrown into or out of cooperative relation with each other to furnish as many degrees of retarding action as there are gears in the train.
90

17. In a photographic shutter, the combination with an annular shutter casing and shutter mechanism therein, of a retarding device connected to move with the shutter mechanism comprising a train of gears housed in the casing, a pivoted journal for one of said gears adapting it to be rocked into or out of cooperation with the adjacent gear to vary the retarding action, and a revoluble controlling ring mounted on the casing for turning the journal on its pivot.
100 105 110

18. In a photographic shutter, the combination with an annular shutter casing having a peripheral opening and shutter mechanism in the casing, of a retarding device connected to move with the shutter mechanism comprising a train of gears housed in the casing, a pivoted journal for each gear adapting it to be rocked into and out of cooperation with the adjacent gear to vary the retarding action, said journals having portions projecting through the said opening in the casing, and a revoluble controlling ring mounted on the casing and provided with a cam track with which the journals cooperate and by which they are rocked in two
115 120 125 directions, selectively.

19. In a photographic shutter, the combination with a shutter mechanism and a retarding element having a retarding action in two directions, of a driving member for
5 actuating the shutter mechanism, an oscillatory member adapted to receive the impact of the driving member and means for com-

municating said impact to the retarding element in first one direction and then the other.

PAUL J. MARKS.

Witnesses:

RUSSELL B. GRIFFITH,
AGNES NESBITT BISSELL.