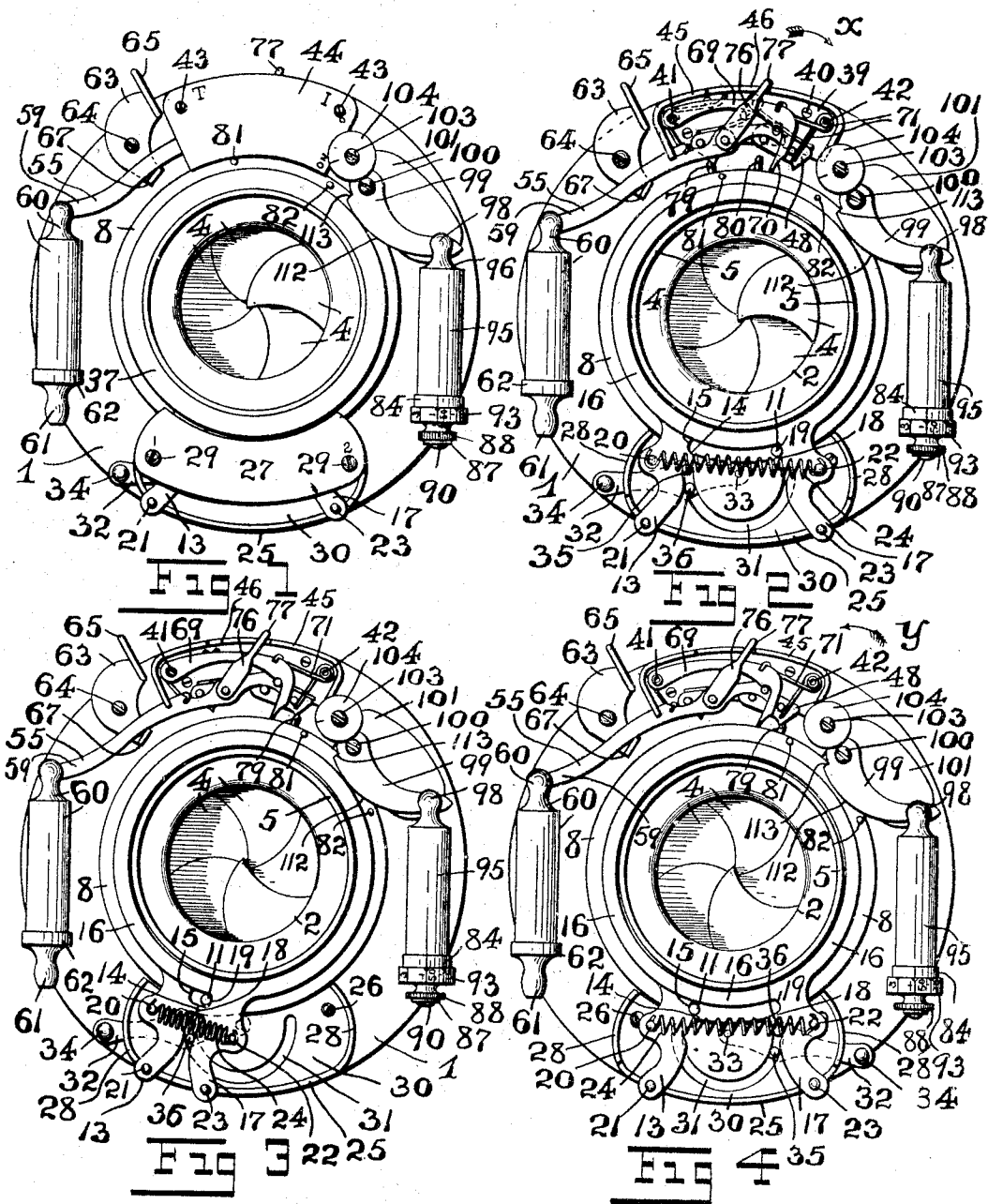


G. L. COURSEN.
 PHOTOGRAPHIC SHUTTER.
 APPLICATION FILED APR. 17, 1906.

946,657.

Patented Jan. 18, 1910.

4 SHEETS—SHEET 1.



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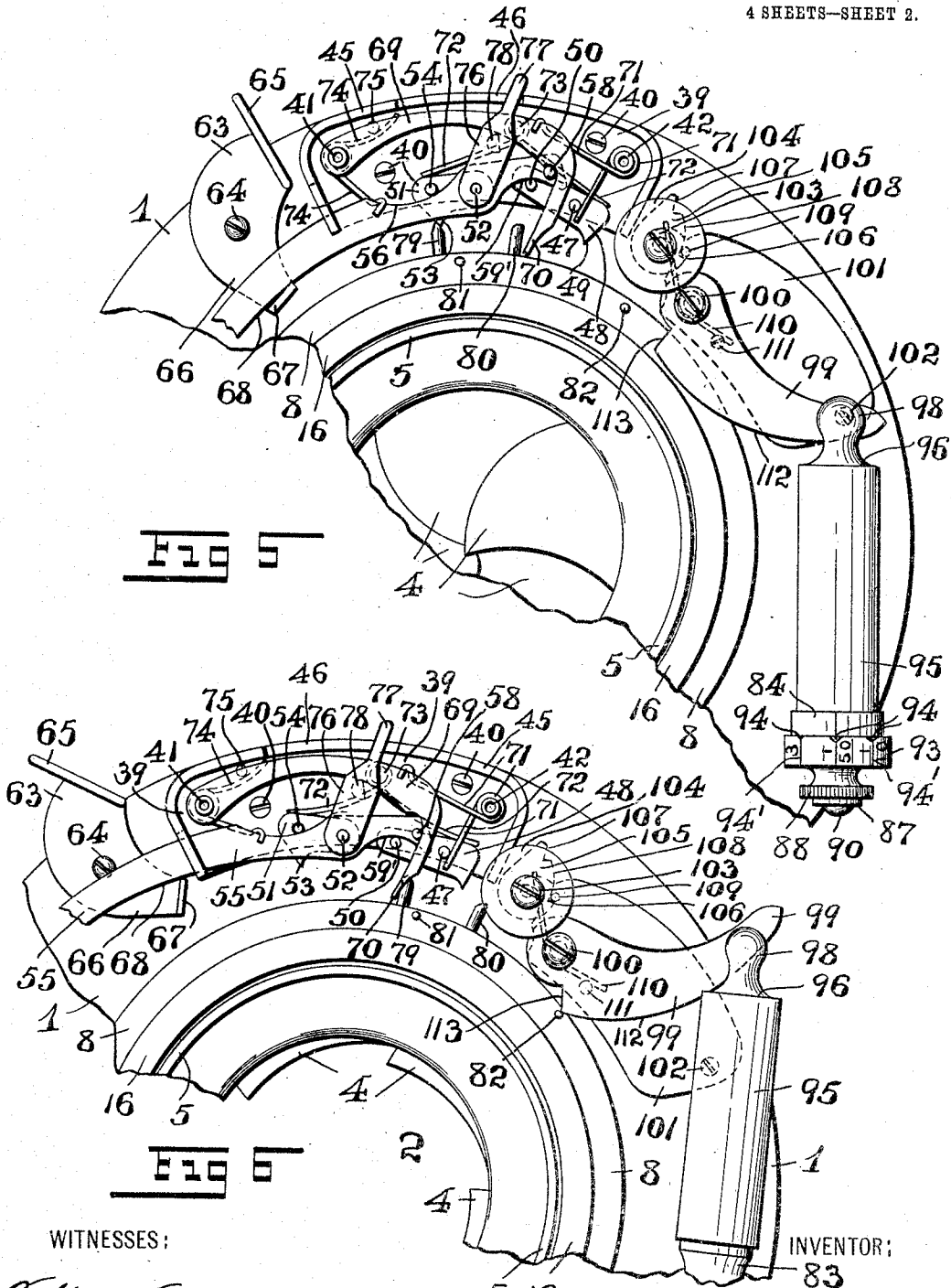
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4 SHEETS—SHEET 2.



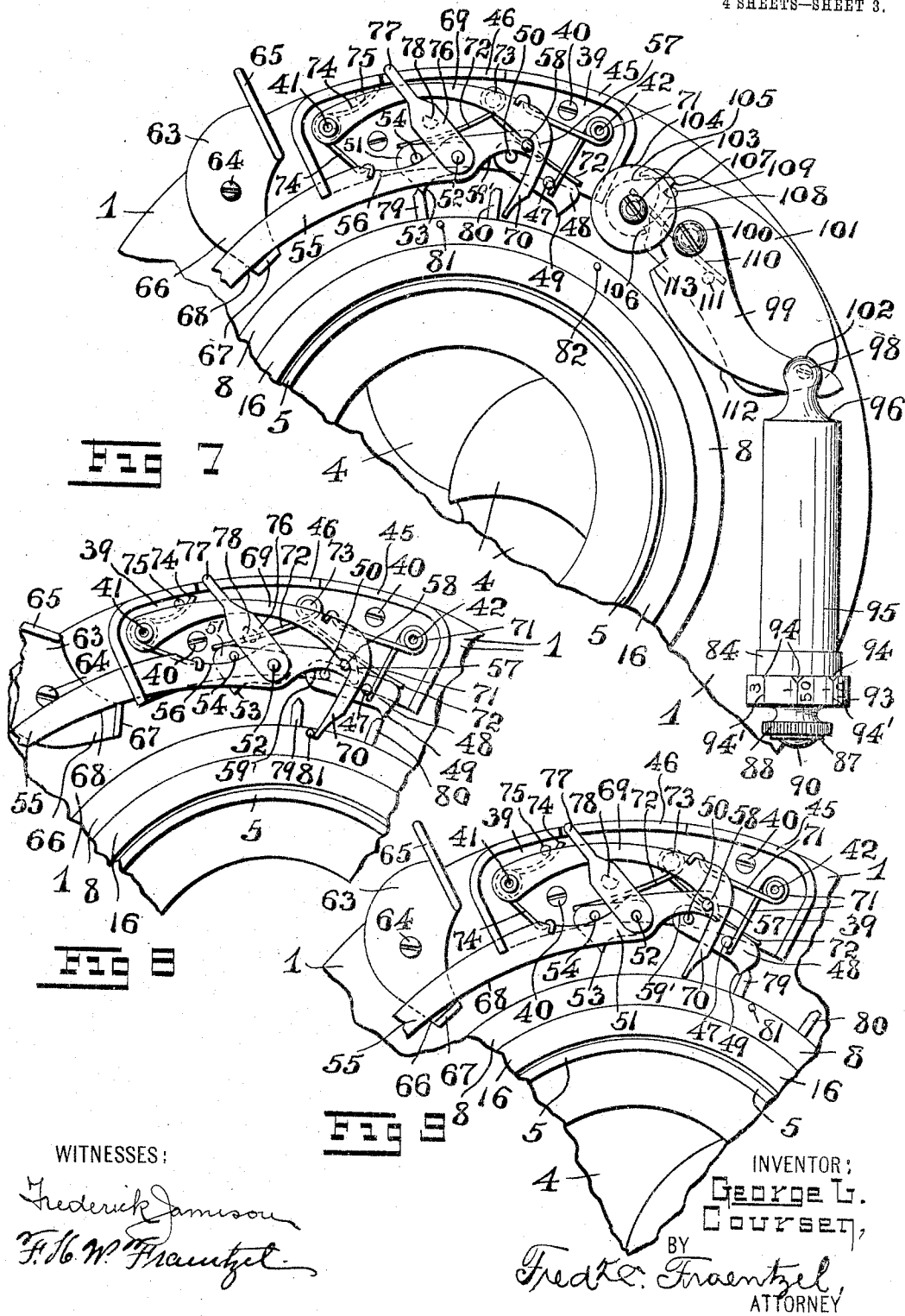
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946,657.

Patented Jan. 18, 1910.
 4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

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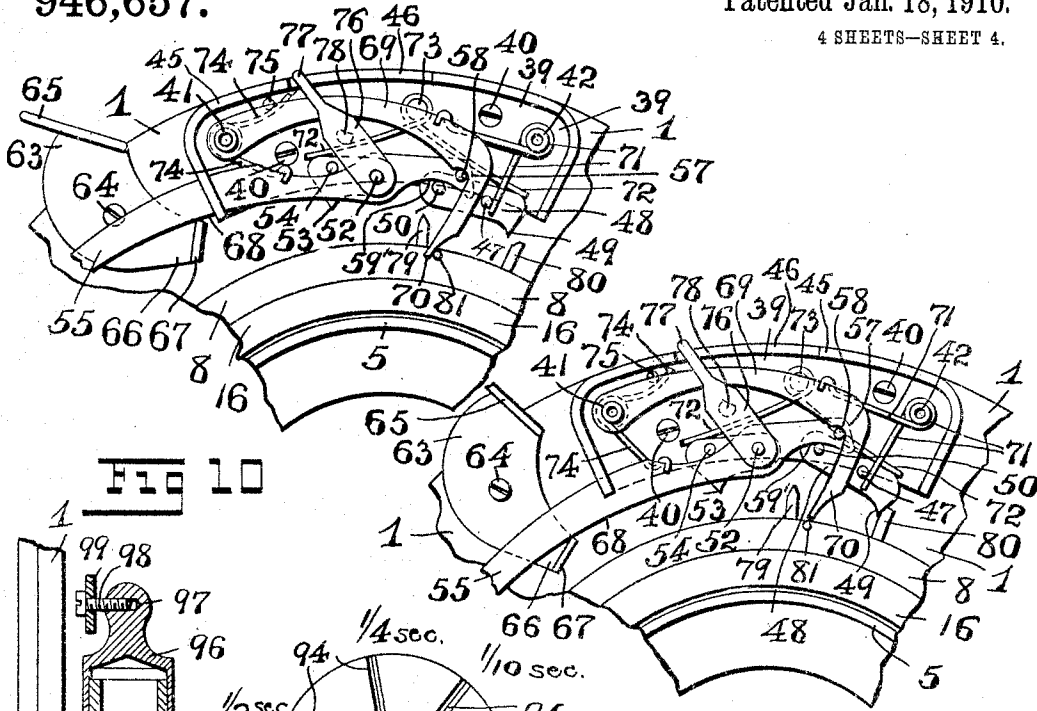


FIG 10

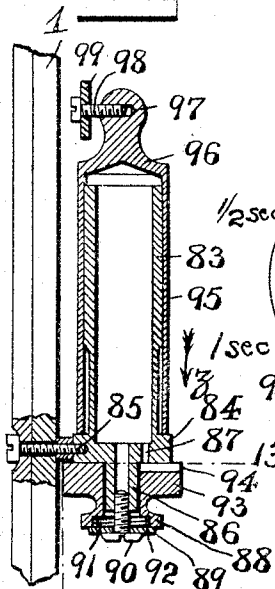


FIG 12

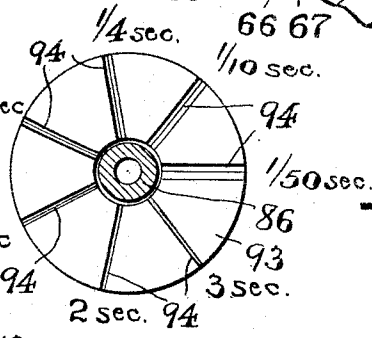


FIG 13

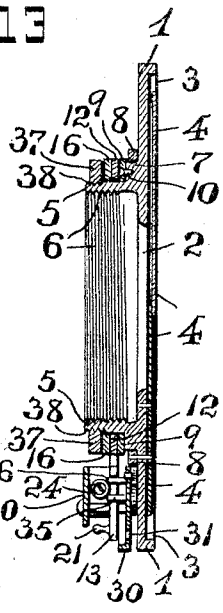


FIG 14

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UNITED STATES PATENT OFFICE.

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TO WOLLENSAK OPTICAL COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION
OF NEW YORK.

PHOTOGRAPHIC SHUTTER.

946,657.

Specification of Letters Patent.

Patented Jan. 18, 1910.

Application filed April 17, 1906. Serial No. 312,101.

To all whom it may concern:

Be it known that I, GEORGE L. COURSEN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, 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 invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to numerals of reference marked thereon, which form a part of this specification.

This invention relates, generally, to improvements in photographic shutters; and the same has reference, more particularly, to improvements in that class of photographic shutters illustrated in Letters-Patent No. 718,983, issued to me on the 27th. day of January, 1903.

My present invention has for its principal objects to provide a novel and simply constructed and efficient mechanism which may be employed for either time or instantaneous exposures, the time exposure being governed by the operator; but, which may also be set so that an automatic time-exposure, controlled by the mechanism itself, may be had.

This invention has for its further object to provide an improved photographic shutter of the general character set forth in my former patent No. 718,983.

Other objects of the present invention not at this time more particularly mentioned, will be clearly understood from the following detailed description of the same.

The invention consists primarily in the novel construction of shutter hereinafter more fully set forth; and, furthermore, this invention consists in the various novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, all of which will be more fully described in the following specification, and then finally embodied in the clauses of the claim which are appended to and which form an essential part of this specification.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a front face view of a photographic shutter embodying the principles of this invention, the lens and lens-holding means having been omitted, and Fig. 2 is a

similar view of the photographic shutter, certain cover-plates, which are shown in said Fig. 1, being removed from this figure, to illustrate the general arrangements of the parts of the setting and the actuating mechanisms for opening and closing the shutter leaves, the said various parts being indicated in their normal initial positions, and set for an automatic time-exposure. Fig. 3 is a view similar to that shown in said Fig. 2, but illustrating the relative positions of the parts, after operation, the shutter leaves having been opened and closed, while the time of opening or closing, or rather the time of exposure, has been regulated automatically. Fig. 4 is a view similar to that represented in said Fig. 2, but illustrating the parts set for an instantaneous exposure. Fig. 5 is a detail face view of the shutter-leaf actuating mechanism, on an enlarged scale, illustrating the parts set in their normal positions ready for instantaneous exposure; Fig. 6 is a similar view of the same parts, showing the shutter-leaves nearly open, and the movement of the leaves being retarded by means of the automatic timing device. Fig. 7 is a similar view of the same parts, set for time exposure only, the time-regulator being thrown off; and Fig. 8 is a similar view of the same parts, showing the shutter-leaves in their open relation. Fig. 9 is a view of the same parts set for time exposure, when the parts move in the reverse direction, and when the shutter-leaves are held open and then released manually; Fig. 10 is a similar view showing the said parts operated manually for exposure, the shutter-leaves being held open by a depressed finger-lever; and Fig. 11 is another view of the same parts, showing said finger-lever released, but the shutter-leaves still held open for a very long exposure, by contact of a pawl with a post of the leaf-actuating ring, until the parts are again released manually. Fig. 12 is a detail vertical sectional representation of an air-receiving cylinder and plunger, provided with a regulatable air-supplying means for controlling the supply of air into the cylinder and producing a predetermined time-controlled movement of the plunger, and of the releasing mechanism which is operatively connected therewith; and Fig. 13 is a horizontal section, taken on line 13—13 in said Fig. 12, looking in the direction of the arrow Z, said section being

made upon an enlarged scale. Fig. 14 is a transverse vertical section of the shutter, the releasing or actuating mechanism being omitted from said view.

5 Similar characters of reference are employed in all of said above described views, to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference character 1 indicates one of the frame sections of the photographic attachment or device, the same being provided as will be seen from an inspection of Fig. 14 of the drawings, with a central opening 2 and a depression or receiving chamber 3, in which the shutter leaves 4 are arranged, in the manner of my former patent No. 718,983, or in any other suitable manner, and are movable over said opening 2 so as to open and close the same, substantially as will be hereinafter more fully set forth. The said frame-section 1 is provided with an outwardly extending annular flange 5, which is provided with an internally disposed screw-thread 6 for the reception of the usual lens-holder, not shown here. Contiguous to the said annular flange 5 is an annular shoulder 7, which is encircled by a ring 8 which is capable of an oscillatory motion about said shoulder for actuating and sliding the shutter-leaves 4, across the said opening 2. A ring 9 is suitably secured by means of screws 10, or otherwise, upon the upper face of said shoulder 7 and partially over the face of the ring 8, whereby said ring is retained in its operative position, against displacement, upon the outer face of the main plate or frame-section 1. The said ring 8, as will be seen from an inspection of Figs. 2, 3 and 4 of the drawings, is provided with an outwardly extending post or lug 11, and movably arranged upon the face of said ring 9 is a ring 12 which is provided with an extension 13 and a small lug 14 providing a recess 15, said extension 13 and the small lug 14 and the recess 15 all being located upon the left of said post or lug 11 of the ring 8. A similarly formed ring 16 is movably arranged upon the ring 12, said ring 16 being provided with an extension 17 and a small lug 18 and recess 19 all being located upon the right of the said post or lug 11 of the ring 8, all of which will be clearly seen from an inspection of said Figs. 2, 3 and 4 of the drawings, and the purpose of which will be presently more fully described. The said extension 13 is provided with a suitable post 20 and a fingerpiece 21; and, in a like manner, the said extension 17 is provided with a post 22 and a fingerpiece 23, a spiral spring 24 being arranged between the said posts 20 and 22, substantially as shown. Suitably secured to the outer face and the lower part of the said plate or frame-section 1, by means of screws 26, or

other fastening means, is a shell or casing 25 having a top-plate or cover 27 arranged upon its end-walls 28 and secured in place by means of screws 29. The said extensions 13 and 17 extend into and are movably arranged within the interior of said shell or casing 25, their free end-portions and fingerpieces 21 and 23 projecting from an open space 30, substantially as illustrated in Fig. 1 of the drawings. In the base of said shell or casing 25 is a semi-circular slot or opening 31, and movably arranged beneath the said base is a swinging lever or arm 32, said lever or arm 32 being pivoted at its inner end upon a pin 33, and being provided at its forward end with a fingerpiece 34. Said lever or arm 32 is also provided with two suitably disposed posts 35 and 36, both of which extend into and through the said slot or opening 31, and move therein, said post 35 at certain times being adapted for engagement with the marginal edge of the extension 13, and the said post 36 at other times being adapted for engagement with the marginal edge of the extension 17. The said rings 12 and 16 are retained in their operative positions against accidental displacement from the said annular flange 5, about which they are movably disposed, by an internally screw-threaded retaining ring 37, which is screwed upon the externally screw-threaded part 38 of the said flange 5, as illustrated in Fig. 14 of the drawings.

Coming now to the releasing or actuating mechanism for producing the various movements of the shutter-leaves 4, by the setting-mechanism herein-above described, either for the ordinary, instantaneous, or automatic time-exposure, it will be necessary for a clear understanding of the operations of the parts of said setting-mechanism to refer more particularly to Figs. 7 to 11 inclusive of the drawings. A plate 39 is secured by screws 40 upon the outer surface of the upper portion of the said plate or section 1, said plate 39 being provided with a pair of posts or lugs 41 and 42, each post being formed with a screw-receiving socket for the reception of the threaded portions of screws 43 by means of which a face-plate or cover 44, see Fig. 1, is secured in position, and at the same time retains a yoke-shaped frame 45, which surrounds the said plate 39 on three of its marginal edges, in position to provide a suitable casing. The said yoke-shaped frame 45 is provided with a slotted or open portion 46 for the purpose herein-after more fully described. Pivotaly arranged upon a pin 47 is a pawl 48 having a holding point or nosing 49 and provided with an upwardly projecting post or lug 50. A second pawl 51 is pivoted upon a post 52, said pawl 51 being provided with a holding point or nosing 53 and an upwardly extending post or lug 54. A long releasing lever 130

55 is also fulcrumed upon said post 52, said lever 55 having an edge-portion 56 in engagement with the post or lug 54 of said pawl 51. Said lever 55 is also provided with a nosing or engaging portion 57, upon which is an upwardly extending post or lug 58. The lever 55 has an edge portion 59 resting upon and in engagement with said post or lug 58, and the end portion 59 of said lever 55 is preferably connected at its lower free end to the usual plunger 60 which is adapted to be forced in an upward direction when air is forced into the inlet-portion 61 of a cylinder 62, through a flexible tubing, attached to said inlet-portion, by means of the usual compressible bulb. Said tubing and bulb both being old and well-known, are not shown in the drawings. Said lever 55 may also be actuated by means of a plate 63 which is fulcrumed upon a post or pin 64, said plate 63 having a suitable finger-piece 65, and being formed with a member 66 which projects beneath the said lever 55, as shown, and has an angular engaging shoulder or portion 67 which can be brought in active engagement with the lower edge-portion 68 of said lever 55 for actuating said lever, as will presently appear. An oscillatory dog 69 is provided on the post 41, and by the action of a spring is forced toward the ring 8. This dog has a member or finger 70 which is adapted to engage the pin or post 81 upon the ring 8, for purposes to be described. The said dog also bears against the post or stud 58 on the lever 55, whereby the upward or downward movements of said lever 55 will produce corresponding movements of the dog 69, and the member 70 may be placed in or removed from the path of the pin or post 81. A suitable spring 71 arranged upon the post 42 has its respective arms in engagement with the upper edge of said dog 69 and with the post or lug 47, a similar spring 72 arranged upon a post 73 having its respective arms in active engagement with the upper edges of the pawls 48 and 51; and a third spring 74 is arranged upon the post 41, said spring 74 having its respective arms in engagement with a post 75 and with the upper edge of the lever 55, all substantially as illustrated in the several figures of the drawings, and for the purpose of retaining the several parts in their relatively operative position to each other. Upon the said post 52 is also fulcrumed a setting-lever or arm 76 having a finger-piece 77 which extends into and is movably disposed in the open portion 46 of the yoke-shaped frame 45, the said arm or lever 76 being also provided upon its under face with a lug or projection 78. The said shutter-actuating ring 8 is also provided with fingers or extensions 79 and 80 which radiate from the circumferential edge of said ring 8, two other pins or posts 81 and 82 being

also made to extend at right angles from the flat faces of said ring 8, substantially as shown and for the purposes to be described.

The means of automatically regulating the time exposure of the shutter-leaves 4 is clearly illustrated in Figs. 1 to 7 inclusive, and in Figs. 12 and 13 of the drawings. The said means, consists, essentially, of an air-receiving cylinder 83 having a base 84 which is suitably secured upon the face of the plate or frame-section 1 by means of a screw 85, substantially in the manner shown in said Fig. 12. The said base 84 is provided with a tubular extension 86 and an air-duct 87, and rotatively arranged upon the said tubular extension 86 is a button 88 which is operatively held in place by means of a washer 89 and a screw 90, a spring 91 being arranged in a socketed-portion 92 of said button 88, and directly beneath the said washer 89, substantially as shown. The said button 86 is provided in the upper flat surface of its enlarged part 93 with radially disposed grooves or channels 94 which vary in size substantially as illustrated in Fig. 13 of the drawings. On its outer cylindrical surface, the said button is provided with scale-indications or marks 94', the same designating seconds, usually:—1/50, 1/10, 1/4, 1/2, 1, 2 and 3 seconds. Each line or mark 94' is in alinement with the proper groove or channel 94.

By rotating the proper groove or channel 94, beneath the air-duct or inlet 87 in the base 84, according to the time-exposure which may be desired, it will be clearly evident, that more or less air can be admitted by suction into the air-cylinder 83. Slidably arranged upon said cylinder 83 is a cylinder-sucker 95 which has a closed top 96 and a head 97 with which is operatively connected, by means of a pin or screw 98, a cam-shaped arm 99. This arm 99 oscillates upon a pin or screw 100, which extends upwardly from an oscillatory plate 101, which in turn is pivoted upon a pin or post 102 upon the face of the said plate or frame-section 1, as shown. Upon a pin or post 103 is a sleeve which is provided with a finger-piece 104, and a cam 105 having a cam-surface 108 and a pair of off-sets 106 and 107, which form stops, against which a short pin or lug 109 can be brought in engagement, in the manner indicated in Figs. 5, 6 and 7, and for the purposes to be presently more fully described. Encircling the said pin or post 100 is a spring 110 having its arms respectively in engagement with the side of the sleeve which is connected with the finger-piece 104 and with a lug or projection 111 upon said plate 101, the purpose of the said spring 110 being to retain the said parts, just described, in their normal initial positions indicated in Figs. 1 to 5 inclusive, and to return the said parts to said positions

after they have been operated. Referring now again to the said cam-shaped arm 99, the said arm is made with a curved edge 112 and an off-set 113 lying normally in the path of movement of the post or pin 82 of the ring 8, but by slightly turning the finger-piece 104 from the position indicated in Fig. 5 to that shown in Fig. 7, the curved edge-portion 108 of said cam 105 rides against the pin or lug 109, until the pin or lug 109 drops into the off-set 107, thereby moving both the plates 101 and the arm 99 into the position shown in Fig. 7 of the drawings, and out of the path of the pin 82.

The operations of the setting and actuating and releasing mechanism for producing the opening and closing movements of the shutter-leaves for automatic time-exposure briefly are as follows:—The various parts having been set in the relative positions shown in Figs. 2 and 5 of the drawings, the lever 55 is raised, either by pushing the fulcrumed plate 63 from right to left, or by means of the air-pressure from the air-cylinder 62, as will be clearly understood, whereby the holding point or nosing 53 is withdrawn from the holding engagement with the post or lug 79, thus permitting the shutter-actuating ring 8 to move in the direction of the arrow X shown in said Fig. 2. During this movement of the said ring to the position shown in Fig. 3 of the drawings, the shutter-leaves have moved from their closed into an opened and again closed position, with the various parts of the mechanism now in the positions represented in said Fig. 3. During the movement of the said ring 8, the opening and closing movements of the shutter-leaves have been automatically timed by the bringing in sliding contact of the pin or post 82 against the off-set 113 of the oscillating arm 99, whereby the cylindrical sucker 95 is raised, and according to the quantity of air sucked in through the previously set groove or channel 94, may be made to move upwardly at any desired degree of movement, in seconds, thus controlling the movement of the ring 8, and in consequence thereof the opening and closing movements of the shutter-leaves can be automatically timed, at the will of the operator. To reset the parts, the lever or arm 32 is moved from the position indicated in said Fig. 3 to that shown in Fig. 4 of the drawings, thus again putting the spring 24 in tension for moving the ring 8 in the reverse direction from that above stated. By again pushing the said plate 63 from right to left, to raise the lever 55, the nosing 49 of the pawl 48 is moved away from its holding engagement with the post or lug 79 of the said ring 8 thus permitting the ring 8 to be moved by the spring 24 in the direction of the arrow Y in Fig. 4 of the drawings. Now, having again opened and

closed the shutter-leaves and having brought the parts at the top of the device again into their normal initial positions indicated in said Fig. 1 of the drawings, the lever or arm 32 is again moved from right to left whereby the spring 24 is again distended with all the parts again in their relative positions ready to be operated for an automatic time exposure in the manner hereinabove described.

When instantaneous exposures are desired the cam-shaped arm 99, its projection 113, and surface-edge 112 are moved out of the path of the pin or post 82 of the ring 8, by turning the finger-piece 104 in such a manner, that the lug or projection 109 is brought into retained engagement with the off-set or recess 107, whereby the said oscillatory plate 101 and said arm 99 are held in their inoperative positions, indicated in Fig. 7 of the drawings, and there will be no resultant movement of the air-sucker 95, when the parts for actuating the shutter-leaves are operated in precisely the same manner as above described. By again turning the finger-piece 104 in the opposite direction, the parts are again ready for automatic time-exposure, as previously described.

In Figs. 8, 9, 10 and 11, I have shown the several operations of the parts for ordinary time-exposure. Thus, by moving the lever 76 from the position indicated in said Figs. 2, 3 and 4, to that shown in said Figs. 7 to 11 inclusive, the spring-controlled dog 69 is slightly lowered, whereby its member 70 is lowered down sufficiently, so as to be directly in the path of the movement of the pin or post 81 of the shutter-controlling and moving ring 8.

When the lever 55 is raised by the plate 63 in the manner hereinabove stated, the parts will move in the direction of the arrow X (Fig. 2), until the pin 81 moves against the member 70, thus arresting the movements of the parts and holding open the leaves of the shutter, until the operator removes his finger from the plate 63 which again lowers the lever 55 and raises the dog 69. This action removes the member 70 from its holding engagement with the pin or post 81, and the shutter-leaves are again closed. The same results take place when the parts are set by means of the arm or lever 32, so that the ring 8 will move in the direction of the arrow Y.

From an inspection of Figs. 10 and 11 it will be seen that when a long or slow time-exposure is desired, by pressing down upon the fingerpiece 65 the inner end-portion of the lever 55 is raised in a direction away from the pin 50 of the pawl 48, thereby allowing the spring 72 to act upon the pawl 48 and bringing its nosing or end-portion 49 directly in the path of the post 80, and retaining the shutter-leaves in their open rela-

tion, until the operator removes the pressure from the finger piece 65, whereby the lever 55 and the pawl are again brought in their former positions, thus once more removing the end-portion 49 of the pawl from its holding engagement with the post 80, and the various parts again assuming their relative positions indicated in Fig. 7, with the shutter leaves closed.

From the foregoing description of my present invention it will be clearly seen, that I have produced a simple and efficiently operating photographic shutter which can be readily manipulated for various automatic time-exposures, according to the exact time in seconds, as may be desired, and which may be set also for instantaneous, and for the usual slow-time exposures controlled directly by the operator.

I claim:—

1. In a photographic shutter, the combination, with a frame provided with a circular opening, of a shutter-actuating means, mechanism for moving said shutter-actuating means, an air-receiving cylinder mounted upon said frame and provided with a series of air inlets of different sizes, and a reciprocatory cylinder-sucker arranged upon said receiving cylinder, and controlled from said mechanism which moves the shutter-actuating means, substantially as and for the purposes set forth.

2. In a photographic shutter, the combination, with a frame provided with a circular opening, of a shutter-actuating means, mechanism for moving said shutter-actuating means, an air-receiving cylinder provided with a series of air inlets of different sizes, and a means of oscillatory connection between said air-receiving cylinder and the frame-section, a reciprocatory cylinder-sucker arranged upon said receiving cylinder, and controlled from said mechanism which moves the shutter-actuating means, substantially as and for the purposes set forth.

3. In a photographic shutter, the combination, with a frame provided with a circular opening, of a shutter-actuating means, mechanism for moving said shutter-actuating means, an air-receiving cylinder mounted upon said frame-section, a reciprocatory cylinder-sucker arranged upon said receiving cylinder, an element also connected with said receiving-cylinder, said element being provided with a series of variously sized air-receiving ducts, and an adjustable means for establishing communication with any one of the said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating means for the purpose of time-exposure, substantially as and for the purposes set forth.

4. In a photographic shutter, the combination, with a frame provided with a circular

opening, and an annular shoulder surrounding said opening, of a shutter-actuating ring encircling said shoulder, mechanism for moving said ring, an air-receiving cylinder mounted upon said frame-section, and an air-sucking cylinder slidably arranged upon said air-receiving cylinder and adapted to be actuated from said ring, said receiving cylinder being provided with a series of variously sized air-receiving ducts, and an adjustable means for establishing communication with any one of the said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, substantially as and for the purposes set forth.

5. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, means for actuating said ring, an air-receiving cylinder mounted upon said frame-section, and an air-sucking cylinder slidably arranged upon said receiving cylinder, said receiving cylinder being provided with a series of variously sized air-receiving ducts, a lug or post on said ring, a pivoted cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, said air-sucking cylinder being actuated from cam-shaped arm, and an adjustable means for establishing communication with any one of the said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, substantially as and for the purposes set forth.

6. In a photographic shutter, the combination with a frame having an exposure opening, of a movable shutter, a ring for actuating the same, a lug or post on said ring, a movable arm adapted to be actuated by said lug or post, means actuated through said arm for automatically varying the movements of the shutter actuating ring, and manually movable setting means for moving and holding said arm out of the path of said post or lug.

7. In a photographic shutter, the combination with a frame having an exposure opening, of a movable shutter, a ring for actuating the same, a lug or post on said ring, a movable arm adapted to be actuated by said lug or post, means actuated through said arm for automatically varying the movements of said shutter actuating ring, and a manually movable cam pivoted on said arm for engaging said arm and moving and holding the same out of the path of movement of said post or lug.

8. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, means for actuating said ring, an air-

cylinder mounted upon said frame and a cylinder slidably arranged upon said first cylinder, and provided with a series of different sized air passages, a lug or post on said ring, a pivoted cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and one of said cylinders being actuated from said cam shaped arm; an element connected with the other cylinder, one of the two cylinders having a series of differently sized air passages and an adjustable means for establishing communication with any one of the said air-receiving passages, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, and means for forcing said cam-shaped arm out of the path of movement of the post or lug on said shutter-actuating ring, substantially as and for the purposes set forth.

9. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, means for actuating said ring, an air cylinder mounted upon said frame and a cylinder slidably arranged upon said first cylinder, and provided with a series of different sized air passages, a lug or post on said ring, a pivoted cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and one of said cylinders being actuated from said cam shaped arm; an element connected with the other cylinder, one of the two cylinders having a series of differently sized air passages, and an adjustable means for establishing communication with any one of said air-receiving passages all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, and means for forcing said cam-shaped arm out of the path of movement of the post or lug on said shutter-actuating ring, consisting of an oscillatory plate which carries said cam-shaped arm, a lug 109 on said plate 101, and a cam adapted to be brought in engagement with said lug 109 for producing an upward movement of said plate 101 and the cam-shaped arm carried by said plate, substantially as and for the purposes set forth.

10. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, and means for simultaneously actuating said pawls,

substantially as and for the purposes set forth.

11. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever in engagement with both of said lugs, and means connected with said lever for raising said lever and thereby simultaneously actuating both pawls, substantially as and for the purposes set forth.

12. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever in engagement with both of said lugs, and an oscillatory plate provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, substantially as and for the purposes set forth.

13. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time-exposure, substantially as and for the purposes set forth.

14. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring,

a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and a pneumatic means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time-exposure, substantially as and for the purposes set forth.

15. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, an air-receiving cylinder mounted upon said frame-section, and an air-sucking cylinder slidably arranged upon said receiving cylinder, said receiving cylinder being provided with a series of variously sized air-receiving ducts, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and an air-sucking plunger actuated from said cam-shaped arm, and an adjustable means for establishing communication with any one of the said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, substantially as and for the purposes set forth.

16. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and means connected with said lever for raising said lever and thereby simultaneously actuating both pawls, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time exposure, substantially as and for the purposes set forth.

17. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-

actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and means connected with said lever for raising said lever and thereby simultaneously actuating both pawls, a pneumatic means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time exposure, substantially as and for the purposes set forth.

18. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and means connected with said lever for raising said lever and thereby simultaneously actuating both pawls, an air-receiving cylinder mounted upon said frame-section, and an air-sucking cylinder slidably arranged upon said receiving cylinder, said receiving cylinder being provided with a series of variously sized air-receiving ducts, a lug or post on said ring, a pivoted and cam-shaped arm provided with an offset with which said lug or post is brought in engagement for lifting said arm, said air-sucking cylinder being actuated from said cam-shaped arm, and an adjustable means for establishing communication with any one of said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, substantially as and for the purposes set forth.

19. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and an oscillatory plate 63 provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought

in engagement for lifting said arm, and means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time exposure, substantially as and for the purposes set forth.

20. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and an oscillatory plate 63 provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, and a pneumatic means actuated from said cam-shaped arm for automatically controlling and regulating the movement of said shutter-actuating ring for a time-exposure, substantially as and for the purposes set forth.

21. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of pivoted and spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and an oscillatory plate 63 provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, an air-receiving cylinder mounted upon said frame-section, and an air-sucking cylinder slidably arranged upon said receiving cylinder, said receiving cylinder being provided with a series of variously sized air-receiving ducts, a lug or post on said ring, a pivoted and cam-shaped arm provided with an off-set with which said lug or post is brought in engagement for lifting said arm, said air-sucking cylinder being actuated from cam-shaped arm, and an adjustable means for establishing communication with any one of the said air-receiving ducts, all arranged for automatically controlling and regulating the movement of said shutter-actuating ring for the purpose of a time-exposure, substantially as and for the purposes set forth.

22. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a projection 81 on said ring, a spring-controlled dog pivoted to said frame-section, a member 70 on said dog, and a pivoted lever provided with means for engagement with said dog for lifting said member 70 out of the path of movement of said projection 81, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, and means for simultaneously actuating said pawls, substantially as and for the purposes set forth.

23. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a projection 81 on said ring, a spring-controlled dog pivoted to said frame-section, a member 70 on said dog, and a pivoted lever provided with means for engagement with said dog for lifting said member 70 out of the path of movement of said projection 81, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and means connected with said lever for raising said lever and thereby simultaneously actuating both pawls, substantially as and for the purposes set forth.

24. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a projection 81 on said ring, a spring-controlled dog pivoted to said frame-section, a member 70 on said dog, and a pivoted lever provided with means for engagement with said dog for lifting said member 70 out of the path of movement of said projection 81, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and an oscillatory plate 63 provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, substantially as and for the purposes set forth.

25. In a photographic shutter, the combination, with a frame provided with a circular opening, of a movable shutter-actuating ring, a projection 81 on said ring, a spring-controlled dog pivoted to said frame-section, a member 70 on said dog, and a pivoted lever provided with means for engagement with said dog for lifting said member 70 out of the path of movement of said projection 81, a pair of extensions extending radially from the outer peripheral edge of said ring, a pair of spring-actuated pawls carried by said frame-section, said pawls being alternately in retaining engagement with the respective extensions of said shutter-actuating ring, each pawl being provided with a lug, a pivoted lever 55 in engagement with both of said lugs, and an oscillatory plate 63 provided with a finger-piece and an angular shoulder in engagement with said lever for raising said lever and thereby simultaneously actuating both pawls, substantially as and for the purposes set forth.

nation, with a frame provided with a circular opening, and an annular shoulder surrounding said opening, of a shutter-actuating ring encircling said opening, a casing 25 secured upon said frame-section, said casing being provided with a semi-circular slot, a lever 32 pivoted to said frame-section and movably arranged between said frame-section and the bottom of said casing 25, two upwardly extending posts on said lever 32, said posts projecting through and being movably arranged in said semi-circular slot, a pair of rings 12 and 16 movably arranged above the annular shoulder of said frame-section, extensions 13 and 17 respectively connected with said rings 12 and 16, a connecting spring between said extensions 13 and 17, adapted to be distended when the posts on said lever 32 are in active engagement with either of said extensions 13 and 16, and means on said shutter-actuating ring with which either of said extensions 13 and 17 can be brought in active engagement, substantially as and for the purposes set forth.

26. In a photographic shutter, the combination, with a chambered frame-section provided with a circular opening, and an annular shoulder surrounding said opening, of a shutter-actuating ring encircling said opening, a casing 25 secured upon said frame-section, said casing being provided with a semi-circular slot, a lever 32 pivoted to said frame-section and movably arranged between said frame-section and the bottom of said casing 25, two upwardly extending posts on said lever 32, said posts projecting and being movably arranged in said semi-circular slot, a pair of rings 12 and 16 movably arranged above the annular shoulder of said frame-section, extensions 13 and 17 respectively connected with said rings 12 and 16, a connecting spring between said extensions 13 and 17, adapted to be distended when the posts on said lever 32 are in active engagement with either of said extensions 13 and 17, said extension 13 being provided with a recess 15, and said extension 17 being provided with a recess 19, and a post or lug 11 on said shutter-actuating ring adapted to enter either of said recesses 15 and 19 and adapted to become actively engaged by either of said extensions 13 and 17, substantially as and for the purposes set forth.

27. In a photographic shutter, the combination, with a frame provided with a circular opening, and a shutter-actuating ring, means for actuating said ring, and a pneumatic device for controlling and regulating the movement of said ring, consisting of an air-receiving cylinder open at the top and closed at the bottom, said cylinder being secured to said frame-section, the closed bottom of said cylinder being provided with an air-duct 87, an air-sucking cylinder arranged

over said receiving cylinder, an extension on said closed bottom of said cylinder, an enlarged part 93 rotatably arranged upon said extension, said enlarged part being provided with radially disposed and variously sized grooves, and means connected with said enlargement to bring any of said grooves in communication with said air-duct 87, substantially as and for the purposes set forth.

28. In a photographic shutter, the combination of a frame, shutter leaves carried thereby, a shutter actuating member for actuating said leaves in opposite directions and provided with a projection, a pair of independently oscillating arms each adapted to engage said projection, a spring connecting the two arms, means for engaging and holding the ring against movement in each direction, and means for moving either arm away from the other arm and locking it when the spring is under tension.

29. In a photographic shutter, the combination of a frame, shutter leaves pivoted thereto, a shutter actuating ring for actuating said leaves in opposite directions and provided with a projection, a pair of independently oscillating arms each adapted to engage said projection, a driving spring connecting the two arms, means for engaging and holding the shutter ring against movement in each direction, and a lever for engaging either arm and moving it away from the other arm and locking it when the spring is under tension.

30. In a photographic shutter, the combination of a frame having an exposure opening and an annular flange, shutter leaves pivoted to the frame, a shutter actuating ring around said flange for actuating said leaves in opposite directions and provided with a projection, a pair of rings around said flange each having an arm adapted to engage said projection, a driving spring connecting the two arms, means for engaging and holding the shutter actuating ring against movement in each direction, and means for moving either arm away from the other arm and locking it when the spring is under tension.

31. In a photographic shutter, the combination of a frame, shutter leaves carried thereby, a shutter actuating member for actuating said leaves in opposite directions and provided with a projection, a pair of independently oscillating arms each adapted to engage said projection, a spring connecting the two arms, means for engaging and holding the ring against movement in each direction, and means for moving either arm away from the other arm and locking it when the spring is under tension, and automatic variable means for retarding the speed of movement of said ring.

32. In a photographic shutter, the combination of a frame, shutter leaves pivoted

thereto, a shutter actuating ring for actuating said leaves in opposite directions and provided with a projection, a pair of independently oscillating arms each adapted to
5 engage said projection, a driving spring connecting the two arms, means for engaging and holding the shutter ring against movement in each direction, a lever for engaging either arm and moving it away from
10 the other arm and locking it when the spring is under tension, and automatic variable means for retarding the speed of movement of said ring.

33. In a photographic shutter, the combination of a frame having an exposure opening and an annular flange, shutter leaves pivoted to the frame, a shutter actuating ring around said flange for actuating said
15 leaves in opposite directions and provided with a projection, a pair of rings around said flange each having an arm adapted to engage said projection, a driving spring connecting the two arms, means for engaging
20 and holding the shutter actuating ring against movement in each direction, means for moving either arm away from the other arm and locking it when the spring is under tension, and automatic variable means for
25 retarding the speed of movement of said ring.
30 ring.

34. In a photographic shutter, the combination of a frame, shutter leaves carried thereby, a shutter actuating member for actuating said leaves in opposite directions
35 and provided with a projection, a pair of independently oscillating arms each adapted to engage said projection, a spring connecting the two arms, means for engaging and holding the ring against movement in
40 each direction, means for moving either arm away from the other arm and locking it when the spring is under tension, and means for automatically stopping the shutter leaves

in the open position and for releasing the leaves to permit them to close. 45

35. In a photographic shutter, the combination of a frame, shutter leaves pivoted thereto, a shutter actuating ring for actuating said leaves in opposite directions and provided with a projection, a pair of independently oscillating arms each adapted to
50 engage said projection, a driving spring connecting the two arms, means for engaging and holding the shutter ring against movement in each direction, a lever for engaging either arm and moving it away from
55 the other arm and locking it when the spring is under tension, and means for automatically stopping the shutter leaves in the open position, and for releasing the leaves to permit them to close. 60

36. In a photographic shutter, the combination of a frame having an exposure opening and an annular flange, shutter leaves pivoted to the frame, a shutter actuating
65 ring around said flange for actuating said leaves in opposite directions and provided with a projection, a pair of rings around said flange each having an arm adapted to engage said projection, a driving spring
70 connecting the two arms, means for engaging and holding the shutter actuating ring against movement in each direction, means for moving either arm away from the other arm and locking it when the spring is under
75 tension, and means for automatically stopping the shutter leaves in the open position and for releasing the leaves to permit them to close.

In testimony, that I claim the invention set forth above I have hereunto set my hand
80 this 13th day of April, 1906.

GEORGE L. COURSEN.

Witnesses:

FREDK. C. FRAENTZEL,
GEO. D. RICHARDS.