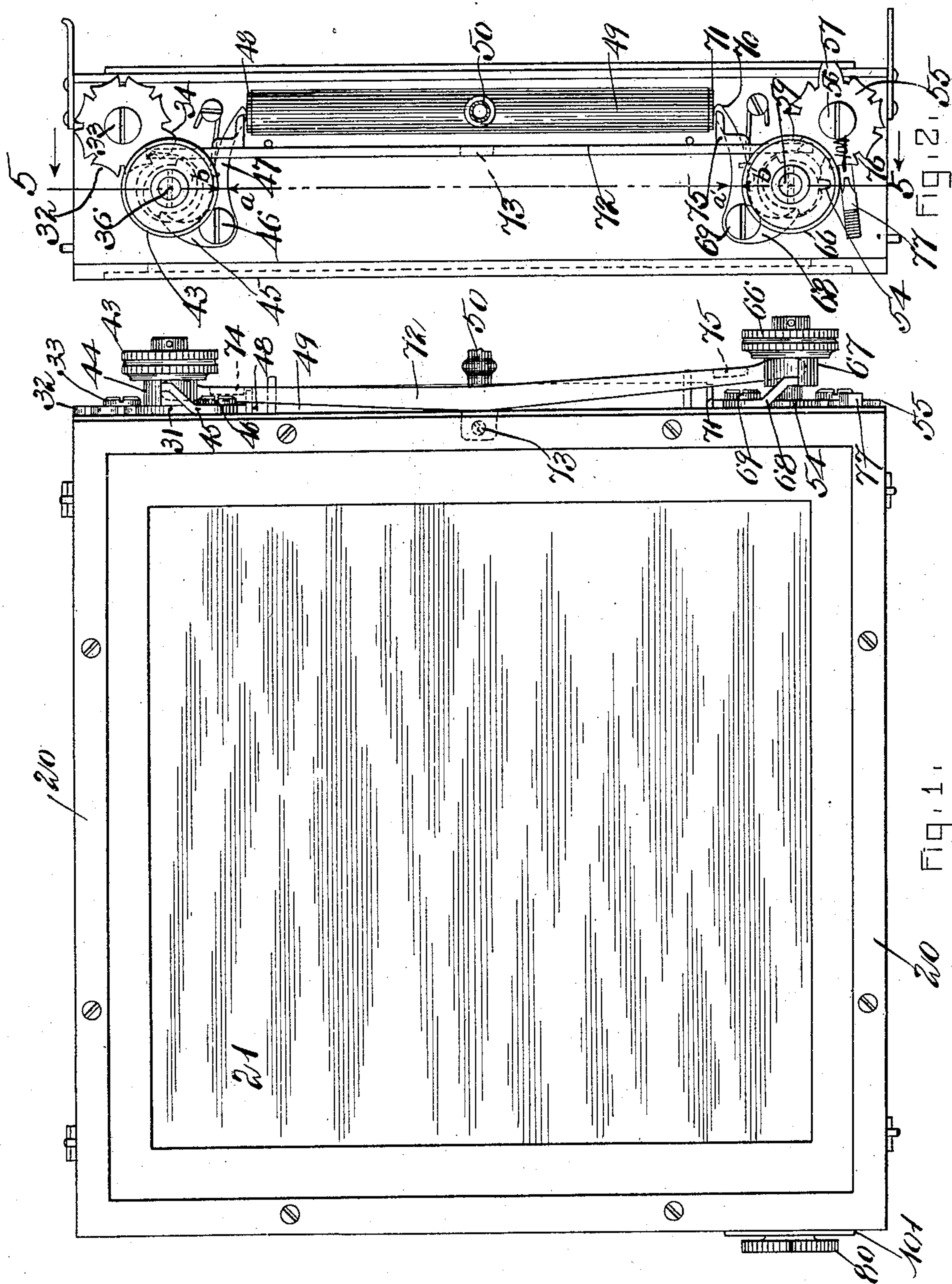


J. S. WRIGHT.
 PHOTOGRAPHIC SHUTTER.
 APPLICATION FILED JULY 9, 1902.

NO MODEL.

5 SHEETS—SHEET 1.



WITNESSES:

Sydney C. Taft.
 Franklin O. Low.

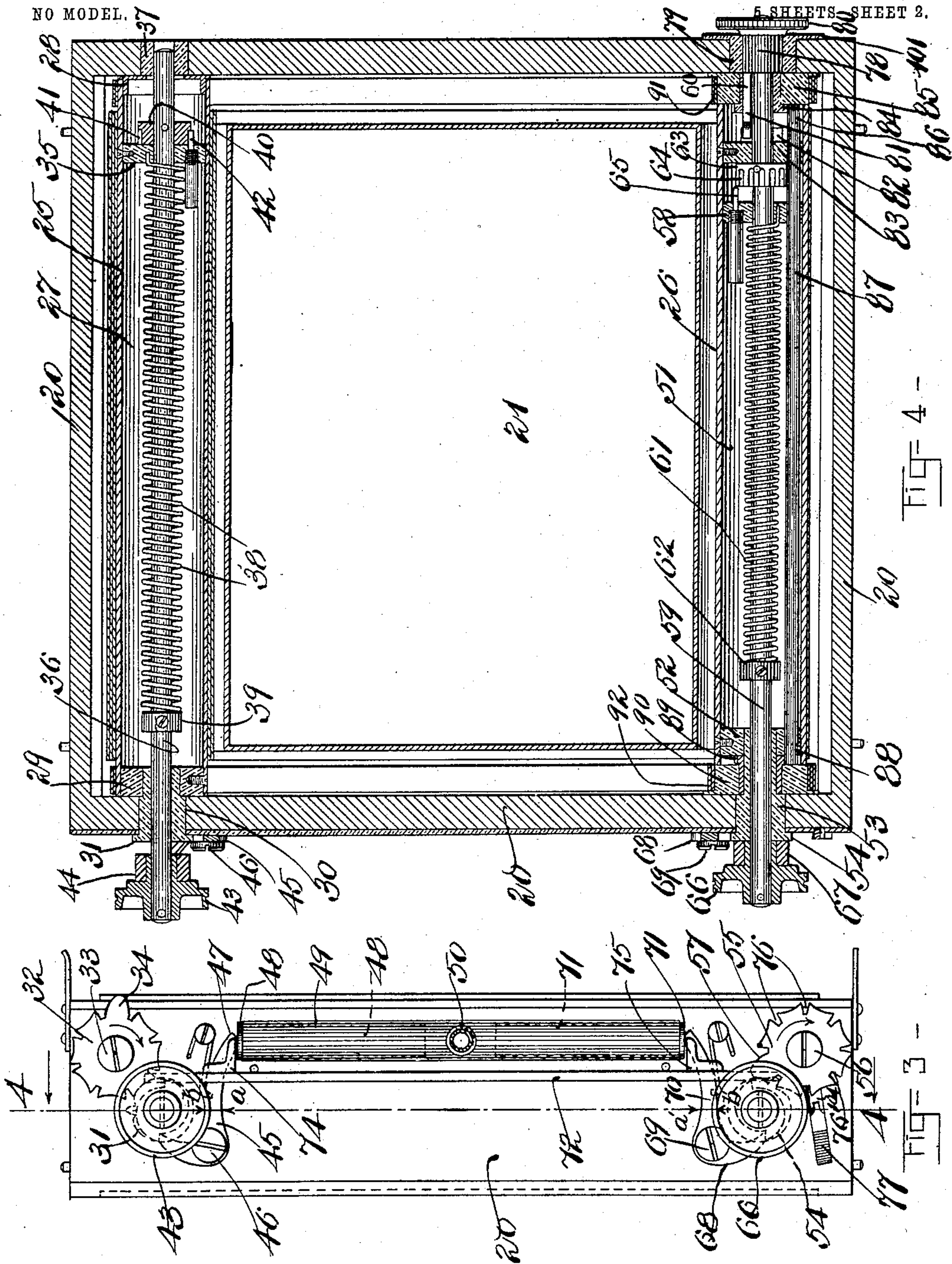
INVENTOR:

John S. Wright,
 by his Attorney,
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NO MODEL.

5 SHEETS SHEET 2.



WITNESSES:

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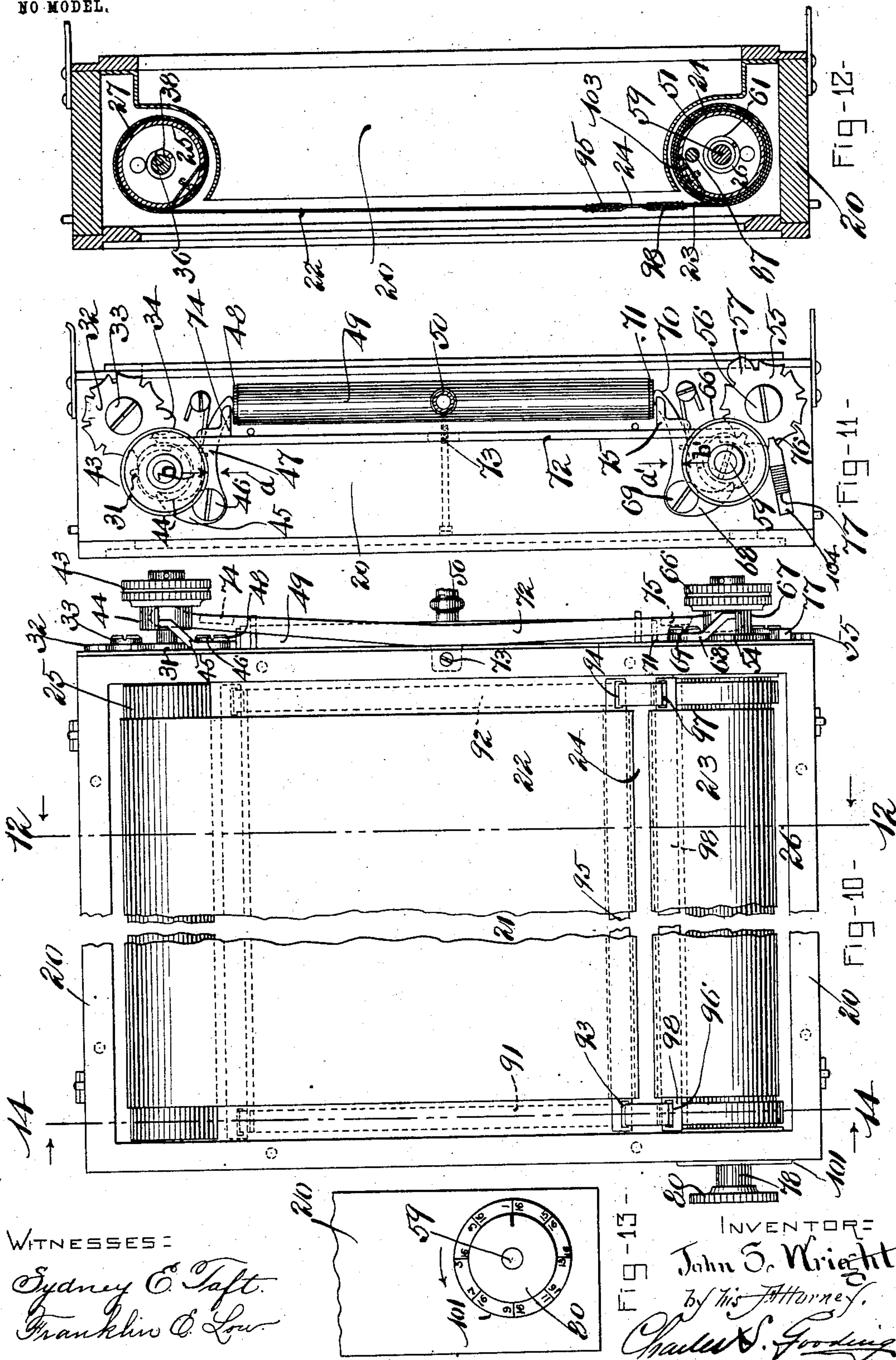
INVENTOR:

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PHOTOGRAPHIC SHUTTER.
APPLICATION FILED JULY 9, 1902.

5 SHEETS—SHEET 4.

NO MODEL.



WITNESSES:

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Franklin C. Low.

INVENTOR:

John S. Wright,

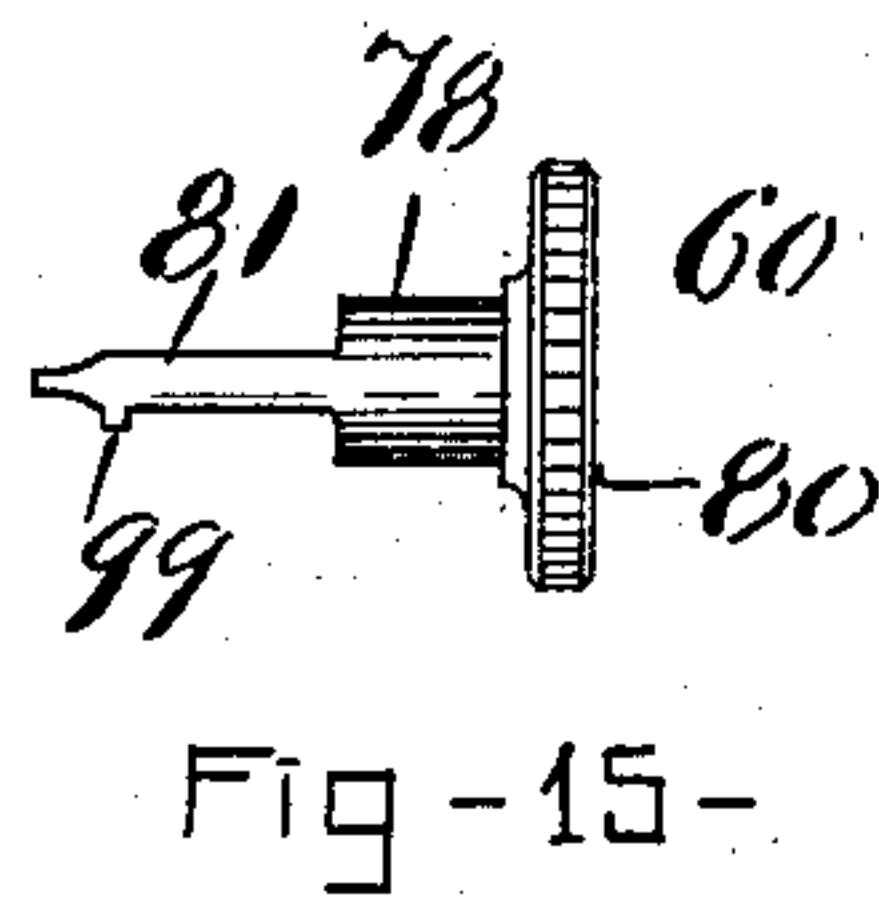
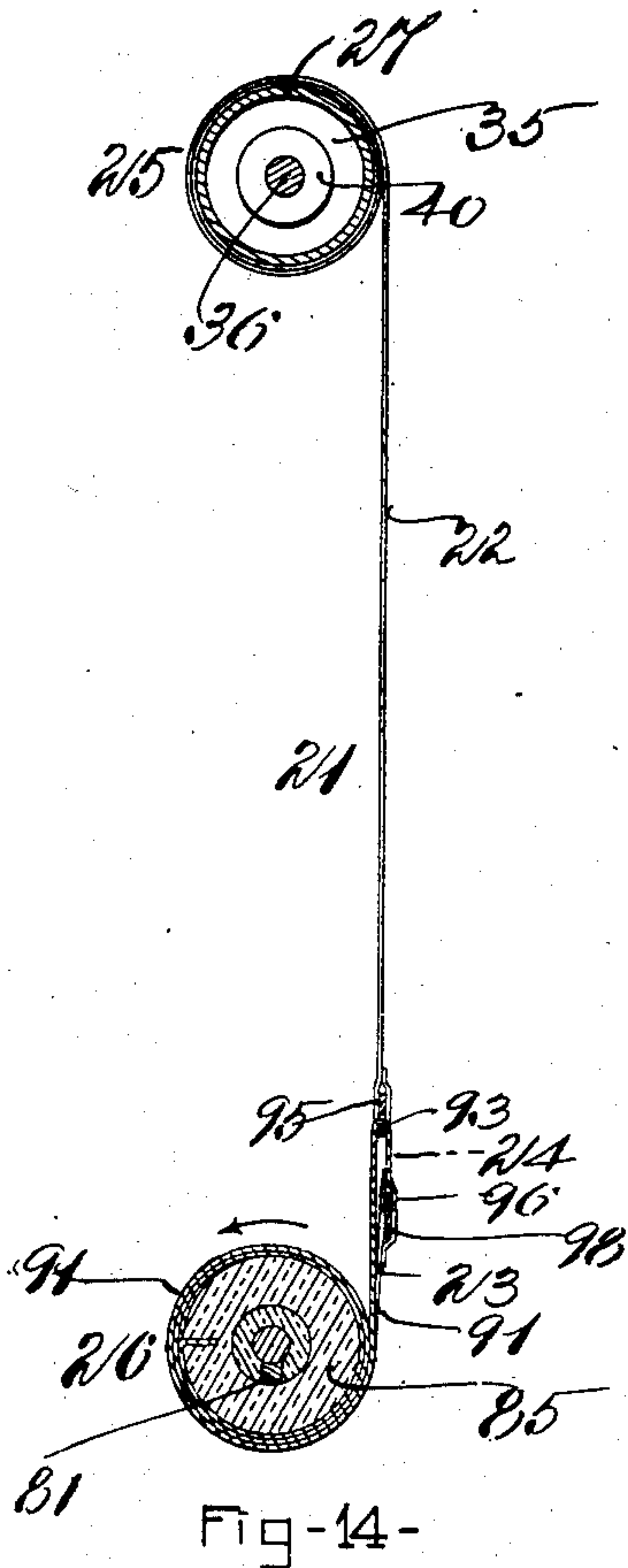
by his Attorney,

Charles S. Gooding.

J. S. WRIGHT.
PHOTOGRAPHIC SHUTTER.
APPLICATION FILED JULY 9, 1902.

NO MODEL.

6 SHEETS—SHEET 5.



WITNESSES:

Sydney C. Taft.
Franklin C. Low.

INVENTOR:

John S. Wright.
By his Attorney, Charles S. Gooding.

UNITED STATES PATENT OFFICE.

JOHN S. WRIGHT, OF DUXBURY, MASSACHUSETTS.

PHOTOGRAPHIC SHUTTER.

SPECIFICATION forming part of Letters Patent No. 726,608, dated April 28, 1903.

Application filed July 9, 1902. Serial No. 114,895. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. WRIGHT, a citizen of the United States, residing at Duxbury, in the county of Plymouth and State of Massachusetts, have invented new and useful Improvements in Photographic Shutters, of which the following is a specification.

This invention relates to photographic shutters for cameras, and may be located either in front of the lens, between the glasses of a double lens, at the rear of the lens, or in the focal plane of the lens of the camera. In the present case I have illustrated my invention as adapted to be placed at the rear of the camera and in the focal plane of the lens of the camera.

The object of the invention is to provide a photographic shutter for cameras which may be used for instantaneous or time exposures and which may be used to take an instantaneous picture when the curtain is moving in either direction, up or down.

The object of the invention is, further, to provide means whereby the width of the slot in the curtain may be varied from the outside of the shutter-casing.

The invention consists in a photographic shutter having a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation.

The invention again consists in a slotted curtain, a pair of rotary rolls attached to said curtain, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, and means to alternately lock and unlock each of said spindles to and from, respectively, its respective roll, and means to lock said spindles against rotation.

The invention again consists in a pair of rotary rolls, a slotted curtain attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said

rolls by moving said spindles longitudinally thereof in the opposite direction.

The invention again consists in the instrumentalities hereinbefore set forth in combination with means to simultaneously move said spindles in opposite directions.

The invention finally consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings, Figure 1 is a rear elevation of my improved shutter, showing the parts in their relative positions when the curtain is wound upon the lower roll. Fig. 2 is a side elevation of the same as viewed from the right of Fig. 1. Fig. 3 is a side elevation similar to Fig. 2 with the curtain wound upon the upper roll. Fig. 4 is a sectional elevation taken on line 4 4 of Fig. 3 looking toward the left in said figure or from the front of the shutter, the curtain being shown wound upon the upper roll. Fig. 5 is a section, partly in elevation, taken on line 5 5 of Fig. 2 viewed from the right-hand side of said figure or from the front of the shutter with a portion of the frame removed for the purpose of more clearly illustrating the construction of the shutter. Fig. 6 is a detail plan view, partly in section, of the right-hand end of the lower roll shown in Fig. 5, the clutch being shown in connection with the disk. Fig. 7 is a view similar to Fig. 6, the clutch being shown withdrawn from the disk. Fig. 8 is a right-hand end elevation of the lower roll with the clutch-disk therein and the curtain wound thereon. Fig. 9 is an end elevation of the tape-reel shown at the right-hand end of the lower roll in Fig. 5, together with the gear fast thereto and the pinion which meshes into said gear, the pinion-shaft being shown in section. Fig. 10 is a rear elevation of the shutter, broken away to save space in the drawings and illustrating the mechanism for widening the slot in the curtain. Fig. 11 is a side elevation of the shutter as viewed from the right of Fig. 6. Fig. 12 is a transverse vertical section taken on line 12 12 of Fig. 6. Fig. 13 is a detail side elevation of the slot-registering dial as viewed from the left of Fig. 10. Fig. 14 is a detail section illustrating the manner of connecting the tape to the curtain, taken on line

14 14 of Fig. 10. Fig. 15 is a detail plan view of the clutch-slide.

Like characters refer to like parts throughout the several views of the drawings.

5 In the drawings, 20 is a rectangular casing or frame, 21 is a curtain in two parts, the upper part 22 and a lower part 23, said parts being separated from each other at their adjacent ends by a slot 24. The part 22 is fastened to a rotary roll 25, and the part 23 is
10 fastened to a rotary roll 26. The roll 25, Figs. 4 and 5, consists of a tube 27, having an annular ring 28 fast at the right-hand end thereof and forming a head therefor, and at
15 the left-hand end said tube has a disk 29 fastened thereto, said disk in turn being fastened to a sleeve 30, which extends through one side of the casing 20 and has an intermittent pinion-gear 31 formed upon its outer
20 end. The intermittent pinion-gear 31 meshes into an intermittent stop-gear 32, journaled to rotate upon a screw 33, fast to the casing 20. The intermittent stop-gear 32 is provided with a stop-tooth 34, which serves to stop the
25 rotation of the roll 25 when the parts have rotated, as hereinbefore described, to the position shown in Fig. 2.

Within the interior of the tube 27, near the right-hand thereof, is fastened a disk 35,
30 said disk being journaled to rotate upon a spindle 36, said spindle in turn being journaled to rotate in the sleeve 30 at the left-hand end thereof, Fig. 4, and in a sleeve 37, extending through the right-hand side of the
35 casing in said figure.

A torsional spiral spring 38 encircles the spindle 36 and is fast at one end to a collar 39, fast to the spindle 36, the other end of said spring being fastened to the disk 35. A clutch-disk
40 40, fast to the spindle 36, is provided with recesses 41, adapted to engage a spring-pin 42 upon the disk 35, and thereby lock the spindle 36 to the disk 35 and tube 27 when the spindle is drawn toward the left, as shown in
45 Fig. 4. The spindle 36 has fastened to the left-hand end thereof, outside the casing 20, a thumb-disk 43, and said thumb-disk has fastened thereto a ratchet 44. A pawl-lever
50 45, pivoted at 46 to the casing 20, engages the ratchet 44. The spring 38 is wound up by turning the thumb-disk 43 toward the right, Fig. 3, the ratchet and pawl locking the spindle against unwinding of the spring when in the position shown in Fig. 3. The arm 47 of
55 the pawl-lever 45 extends across one end of a pneumatic piston 48. Said pneumatic piston is arranged to be reciprocated lengthwise of the cylinder 49 by air forced through a rubber tube 50, attached to an air-bulb in a
60 manner well known to those skilled in the art. When the piston 48 is forced upwardly by the pressure of the air, Fig. 3, the arm 47 of the pawl-lever 45 is raised, disconnecting the other arm of said pawl-lever from the
65 teeth of the ratchet 44 and allowing the spring 38 to unwind, rotating the upper roll

25, and winding the curtain thereon, as hereinafter more fully described.

The lower roll 26, Figs. 4 and 5, consists of a tube 51, and at the left-hand end said
70 tube has a disk 52 fastened thereto, said disk in turn being fastened to a sleeve 53, which extends through one side of the casing 20 and has an intermittent pinion-gear 54 formed upon
75 its outer end. The intermittent pinion-gear 54 meshes into an intermittent stop-gear 55, journaled to rotate upon a screw 56, fast to the casing 20. The intermittent stop-gear 55 is provided with a stop-tooth 57, which
80 serves to stop the rotation of the roll 26 when the parts are in the position shown in Fig. 3. Within the interior of the tube 51 is fastened, near the right-hand end thereof, a disk 58,
85 said disk being journaled to rotate upon a spindle 59, said spindle in turn being journaled to rotate in the sleeve 53 at the left-hand end thereof, Fig. 4, and in a cylindrical clutch-slide 60.

A torsional spiral spring 61 encircles the spindle 59 and is fast at one end to a collar 62, fast
90 to the spindle 59, the other end of said spring being fastened to the disk 58. A clutch-disk 63, fast to the spindle 59, is provided with recesses 64, adapted to engage a spring-pin 65 upon the disk 58, and thereby lock the spindle
95 59 to the disk 58 and tube 51 when the spindle is drawn toward the left, as shown in Fig. 5. The spindle 59 has fastened to the left-hand end thereof outside the casing 20 a thumb-disk 66, and said thumb-disk has fastened thereto
100 a ratchet 67. A pawl-lever 68, pivoted at 69 to the casing 20, engages the ratchet 67. The spring 61 is wound up by turning the thumb-disk 66 toward the left, Fig. 3, the ratchet and pawl locking the spindle against unwinding
105 of the spring when in the position shown in said Fig. 3. The arm 70 of the pawl-lever 68 extends across one end of a pneumatic piston 71. Said pneumatic piston is arranged to be reciprocated lengthwise of the cylinder 49,
110 fast to the casing 20, by air forced through a rubber tube 50, as hereinbefore described. When the piston 71 is forced downwardly by the pressure of the air, Fig. 3, the arm 70 of the pawl-lever 68 is lowered, disconnecting
115 the other arm of said pawl-lever from the teeth of the ratchet 67 and allowing the spring 61 to unwind, rotating the lower roll 26 and winding the curtain thereon, as hereinafter more fully described.
120

The spindles 36 and 59 are each movable longitudinally thereof for the purpose of bringing the clutch-disks 40 and 63, respectively, into and out of connection with the spring-pins 42 and 65, and thus connecting the
125 spindle 36 to the tube 27, or disconnecting the same therefrom and connecting the spindle 59 to the tube 51, or disconnecting said spindle from said tube. When the spindle 36 is locked to the tube 27, it is necessary in
130 the operation of the shutter that the spindle 59 should be disconnected from the tube 51,

and vice versa, and to insure this result a lever 72 is provided, pivoted at 73 to the casing 20. One end of said lever bears against the thumb-disk 43, and the other end of said lever bears against the thumb-disk 66, so that when the thumb-disk 43 is moved toward the right, Fig. 4, the thumb-disk 66 will be moved toward the left in said figure by the lever 72. Near the upper end of the lever 72 is provided a stop 74, and near the lower end of said lever another stop 75 is provided, said stops alternately being thrown into and out of line with the pneumatic pistons 48 and 71 as the lever 72 is rocked from the position shown in Fig. 10 to that shown in Fig. 5. When the lever is in the position shown in Fig. 5, if the bulb is compressed the pneumatic piston 71 will move downwardly and disconnect the pawl-lever 68 from the ratchet 67. When the lever is in the position shown in Fig. 10, the stop 75 will be in line with the pneumatic piston 71 and the stop 74 will be out of line with the pneumatic piston 48, and therefore upon compression of the bulb said pneumatic piston 48 will move upwardly, disconnect the pawl-lever 45 from the ratchet 44, and release the upper spindle 36.

The operation of the mechanism hereinbefore specifically described is as follows: Assuming the spiral springs 38 and 61, surrounding the spindles 36 and 59, respectively, to be wound up, with the curtain 21 wound upon the upper roll, as shown in Fig. 4, the spindle 36 being moved toward the left and the clutch-disk 40 locking said spindle to the tube 27, while the spindle 59 is thrown toward the right, with the clutch-disk 63 disconnected from the tube 51 and the pawl-levers 45 and 68 in engagement with the ratchets 44 and 67, respectively. Now upon pressing the bulb the air will be forced through the tube 50, and as the thumb-disk 43 is drawn toward the left the lever 72 will be also thrown to the left at its upper end and the stop 74 will be out of line with the pneumatic piston 48, while the stop 75 will be in line with the pneumatic piston 71, and therefore the pneumatic piston 48 will be forced upwardly, rocking the pawl-lever 45 upon its pivot and releasing the ratchet 44, whereupon the spring 61 upon the lower spindle 59 will unwind, rotating the tube 51, winding the curtain upon said tube 51, and unwinding it from the tube 27, said tube 27 rotating, together with the spindle to which it is locked by the clutch-disk 40, until the stop-tooth 34 comes in contact with the intermittent pinion-gear 31, as shown in Fig. 2. The curtain is now wound upon the lower roll. The next operation is to press the upper spindle 36 toward the right, Fig. 4, which throws the lower spindle 59 to the left by means of the lever 72, the two spindles thus assuming the position shown in Fig. 5, with the clutch upon the lower spindle thrown into engagement with the spring-pin 65 and fast by said pin to the tube 51 and the clutch upon the upper spindle being thrown out of en-

gagement with the spring-pin 42 and with the tube 27. The lever 72 now being in the position shown in Fig. 5, the stop 75 will be out of line with the pneumatic piston 71. The stop 74 will be in line with the pneumatic piston 48. Now upon pressing the bulb a second time the lower piston 71 will be moved downwardly, the upper piston being locked against movement by the stop 74, and as said piston 71 moves downwardly it engages the pawl-lever 68, disengaging said pawl-lever from the ratchet 67, and thus freeing the spindle 59, together with the tube 51 fast thereto, whereupon the spring 38 will unwind, rotating the tube 27, winding the curtain upon the upper roll, unwinding said curtain from the lower roll, and rotating said lower roll until the stop-tooth 57 comes in contact with the intermittent pinion-gear 54, as shown in Fig. 3.

The operations hereinbefore described are repeated, alternately pushing in one of the spindles and then the other, and subsequently pressing the bulb. After each pressure of the bulb and movement of a spindle toward the right the spring on the spindle which is so moved is subsequently wound up.

The speed of the curtain is regulated by winding the springs 38 and 61 to a greater or less extent. It will thus be seen and understood that by means of my mechanism the curtain of a photographic shutter may be actuated in opposite directions, each time making an exposure by means of the slot therein. The manner of adjusting the width of the slot 24 to different distances is illustrated in Figs. 6 to 13, inclusive. The curtain 21 is first wound up on the lower roll 26 in the manner hereinbefore set forth. The springs upon both of the spindles 36 and 59 are wound up and all of the parts are in the relative positions shown in Fig. 10, the upper spindle 36 being drawn outwardly or toward the right in said figure. Thus by reference to Fig. 4 it will be seen that the clutch 40 is in connection with the spring-pin 42. Now upon rotating the upper thumb-disk 43 the curtain 21 will be partly wound from the lower roll onto the upper roll and into the position shown in Fig. 10, bringing the slot 24 away from the lower roll 26, as shown in full lines, and rotating the intermittent stop-gear 55 into a position in which one of the spaces 76 is brought in line with the locking-slide 77, as shown in Fig. 11. The locking-slide 77 is then moved toward the right, Fig. 11, and into engagement with one of said spaces 76. The locking-slide 77 is arranged to slide in a groove 104, formed in the casing 20. It will thus be seen that the lower roll 26 is locked in position against rotation by means of the locking-slide 77, intermittent stop-gear 55, and intermittent pinion-gear 54, it being understood that the intermittent pinion-gear 54 is fast to or integral with the sleeve 53, the sleeve 53 being fast to the disk 52 and the disk 52 being fastened by a screw to the tube 51, as shown in Fig. 4. It will now

be understood that the lower roll 26 is locked to the casing 20 and that the lower part 23 of the curtain 21 is fastened to said lower roll. To increase the width of the slot between the lower part 23 and the upper part 22 of the curtain 21, I provide means whereby the upper part 22 of the curtain is drawn away from said lower part 23, and also in order to decrease the width of the slot said means operate to draw the upper part 22 of the curtain toward the lower part 23. Said means for varying the width of the slot 24 consists of the cylindrical clutch-slide 60, hereinbefore referred to. (Illustrated in detail in Fig. 15 and in section in Fig. 5 and also in Figs. 6 and 7 in connection with the lower roll.) Said clutch-slide consists of a cylindrical sleeve portion 78, which is arranged to slide in a sleeve 79, extending through the casing 20, Fig. 5. Outside the casing said cylindrical clutch-slide is provided with a thumb-disk 80 and at the inside of the casing with a finger 81, Fig. 15, arranged to engage spaces or depressions 82, formed in the clutch-disk 83, as seen in Fig. 5. The clutch-disk 83 is fastened by screws to the tube 51. The finger 81 projects through a spur-gear 84, Figs. 5 and 9, said spur-gear in turn projecting through and being fastened to a tape-reel 85 at the right-hand end of the lower roll, Fig. 5, the finger 81 thus constituting a spline by which the spur-gear 84 and the tape-reel 85 are rotated upon rotation of the thumb-disk 80 and clutch-slide 60, as seen in Figs. 5 and 9. The spur-gear 84 meshes into a pinion-gear 86, formed upon the right-hand end of the pinion-gear shaft 87, said pinion-gear shaft being arranged to rotate in bearings formed in the clutch-disk 83, the disk 58, and the disk 52 and having another pinion-gear 88 formed upon the left-hand end thereof, Figs. 4 and 5. The pinion-gear 88 meshes into a spur-gear 89, said spur-gear 89 being arranged to rotate upon the sleeve 53 at the left of Figs. 4 and 5 and having fastened thereto another tape-reel 90.

During the operations hereinbefore described, in which the curtain was wound first upon one roll and then upon the other, the cylindrical clutch-slide 60 was in connection with the clutch-disk 83, as shown in Figs. 4, 5, and 6; but in adjusting the width of the slot 24 to different distances the clutch-slide 60 is drawn toward the right from the position shown in Figs. 4, 5, and 6 to that shown in Fig. 7, thus disconnecting the finger 81 from the clutch-disk 83. Now upon rotation of the thumb-disk 80 the tape-reel 85 will be rotated, and through the spur-gear 84, pinion-gears 86 and 88, and spur-gear 89 the tape-reel 90 will also be rotated. Said tape-reels 85 and 90 are each provided with a tape 91 and 92, respectively, one end of each of said pieces of tape being fastened to its respective tape-reel, the other end being fastened to one side of the lower part 23 of the curtain 21, and intermediate of the two ends of each

tape said pieces of tape pass through eyes 93 and 94, formed in a flat strip of metal 95, fast to the lower end of the upper part 22 of the curtain 21. As seen in Figs. 10 and 14, the tapes 91 and 92 pass from the lower roll upwardly through the eyes 93 and 94, respectively, and then passing downwardly are fastened to eyes 96 and 97, formed in a metal strip 98, fast to the free end of the lower portion 23 of the curtain 21. As the thumb-disk 80 is turned in the direction of the arrow, Fig. 13, the tape-reels 85 and 90 will be turned in the same direction, Fig. 14, and the tapes 91 and 92 will be paid off from said tape-reels, allowing the upper curtain-roll to rotate and draw the upper portion of the curtain upwardly, increasing the width of the slot. By turning the thumb-disk 80 in the opposite direction the width of the slot will be narrowed, the tapes 91 and 92 being wound up on the tape-reels.

In Fig. 10 the upper portion of the curtain is indicated by dotted lines in a position in which the slot 24 is of sufficient width to allow of a time exposure of the whole extent of the plate. To prevent the clutch-slide from being drawn too far toward the right, as hereinbefore described in relation to Fig. 5, a stop 99 is provided upon the finger 81, which enters a recess 100, formed in the spur-gear 84, Fig. 9, and abuts against said spur-gear, preventing said slide from being drawn beyond the position shown in Fig. 7.

The sleeve 79 is provided with a flange 101, Figs. 5 and 13, said flange being graduated to different distances—three-sixteenths, five-sixteenths, seven-sixteenths, &c.—indicating the width of the slot in the curtain when the indicator 102 upon the thumb-disk 80 is brought in line with said graduations. After the slot in the curtain has been adjusted to the desired width the thumb-disk 80 is pushed inwardly from the position shown in Fig. 7 to that shown in Figs. 5 and 6, and the shutter is then in condition to be operated for instantaneous or time exposures, as desired.

In Fig. 8 I have illustrated a practical means of attaching the curtain to the roll, in which a section 103 of the tube 51 is removed therefrom throughout the entire length of the tube and one end of the curtain passed between said section and tube, the section finally being fastened by screws to the disks 83 and 52.

In order to indicate to the operator the extent to which he has wound the springs 38 and 61, and therefore the comparative speed of travel of the curtain 21 when either of said springs is released, I engrave upon the thumb-disk 43 an arrow *b* and upon the casing adjacent to said thumb-disk an arrow *a* and also upon the thumb-disk 66 an arrow *b'* and upon the casing adjacent thereto an arrow *a'*. It will be seen that when either thumb-disk is turned to rotate the spindles to which they are attached, and thus wind up the springs 38 and 61, the arrows *b* and *b'* will be turned

out of line with the arrows a' and a , respectively, and thus the operator can judge to what extent he has wound up said springs.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation.

2. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to alternately lock and unlock each of said spindles to and from, respectively, its respective roll, and means to lock said spindles against rotation.

3. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to alternately lock and unlock each of said spindles to and from, respectively, its respective roll, and means to alternately lock said spindles against rotation and to unlock said spindles to allow them to rotate for the purpose specified.

4. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, a clutch to lock each of said spindles to its respective roll, and means to operate said clutches.

5. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction.

6. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction, and means to simultaneously move said spindles in opposite directions.

7. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said

spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction, and a lever connected to said spindles and operating to simultaneously move them in opposite directions.

8. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to alternately lock each of said spindles to its respective roll and to alternately unlock said spindles from said rolls and allow said rolls to rotate, and means to lock said spindles against rotation.

9. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction, a lever connected to said spindles and operating to simultaneously move them in opposite directions, a ratchet fast to each of said spindles, a pair of stop-pawls, each engaging its respective ratchet, and means to alternately disengage said pawls from said ratchets.

10. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, means to lock each of said spindles against rotation, a pneumatic piston, and means to reciprocate said pneumatic piston, unlock one of said spindles, and allow it to rotate.

11. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, means to lock each of said spindles against rotation, a pair of pneumatic pistons, and means to alternately reciprocate said pneumatic pistons and alternately unlock said spindles and allow them to rotate.

12. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction, a lever connected to said spindles and operating to simultaneously move them in opposite directions, a ratchet fast to each of said spindles, a pair of

stop-pawls each engaging its respective ratchet, a pair of pneumatic pistons, and means to alternately reciprocate said pneumatic pistons and alternately disengage said pawls from said ratchets.

13. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, said spindles movable longitudinally thereof, a clutch upon each of said spindles, said clutches operating to lock said spindles to said rolls by moving said spindles longitudinally thereof in one direction and to unlock said spindles from said rolls by moving said spindles longitudinally thereof in the opposite direction, a lever connected to said spindles and operating to simultaneously move them in opposite directions, a ratchet fast to each of said spindles, a pair of stop-pawls each engaging its respective ratchet, a pair of pneumatic pistons, means to reciprocate said pistons and disengage said pawls from said ratchets, and a pair of stops upon said lever arranged to alternately cross the line of motion of said pistons for the purpose specified.

14. In a photographic shutter, a slotted curtain, a pair of rotary rolls attached thereto, a pair of rotary spindles upon which said rolls are mounted, a pair of torsional springs, one end of each of said springs attached to its respective spindle and the other end to its respective roll, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation.

15. In a photographic shutter, a rotary roll, a curtain fast thereto, a spindle upon which said roll is mounted, said spindle movable longitudinally thereof, a spiral torsional spring one end fast to said spindle the other end to said roll, means to lock said spindle against rotation, and a clutch operating to lock said spindle to said roll by moving said spindle longitudinally thereof in one direction and to unlock said spindle from said roll by moving said spindle longitudinally thereof in the opposite direction.

16. In a photographic shutter, a slotted curtain, a roll attached thereto, a spindle upon which said roll is mounted, a disk, provided with recesses, fast to said spindle, and a spring locking-pin attached to said roll and arranged to engage one of said recesses when said spindle is moved longitudinally thereof for the purpose specified.

17. In a photographic shutter, a rotary roll, a curtain fast thereto, a spindle upon which said roll is mounted, said spindle movable longitudinally thereof, a spiral torsional spring one end fast to said spindle the other end to said roll, means to lock said spindle against rotation, a clutch operating to lock said spindle to said roll by moving said spindle longitudinally thereof in one direction and to unlock said spindle from said roll by moving said spindle longitudinally thereof in the opposite direction, an intermittent pinion-

gear fast to said spindle, and an intermittent stop-gear meshing into said intermittent pinion-gear.

18. In a photographic shutter, a casing, a pair of rotary rolls, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation; in combination with a curtain in two parts, provided with a slot between said parts, each of said parts fast to its respective roll, and means to vary the width of said slot from the outside of said casing.

19. In a photographic shutter, a casing, a pair of rotary rolls, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll and means to lock each of said spindles against rotation; in combination with a curtain in two parts, provided with a slot between said parts, each of said parts fast to its respective roll, and means to rotate one of said rolls from the outside of said casing and vary the width of said slot.

20. In a photographic shutter, a casing, a pair of rotary rolls, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation; in combination with a curtain in two parts, provided with a slot between said parts, each of said parts fast to its respective roll, a tape-reel journaled upon one of said spindles at the end of one of said rolls, and means to lock said tape-reel to said roll and unlock said tape-reel from said roll.

21. In a photographic shutter, a casing, a pair of rotary rolls, a pair of rotary spindles upon which said rolls are mounted, means to rotate said rolls, means to lock each of said spindles to its respective roll, and means to lock each of said spindles against rotation; in combination with a curtain in two parts, provided with a slot between said parts, each of said parts fast to its respective roll, a tape-reel journaled upon one of said spindles at one end of one of said rolls, and a clutch movable longitudinally of said spindle to lock said tape-reel to said roll, said clutch extending through said casing for the purpose specified.

22. In a photographic shutter, a casing, a rotary curtain-roll, a slotted curtain, one end of said curtain fast to said roll, means to lock said roll against rotation, a spindle upon which said roll is journaled, a tape-reel journaled upon said spindle at one end of said roll, a disk fast to said roll and provided with depressions, a clutch movable longitudinally of said spindle to engage said depressions and lock said tape-reel to said roll and to unlock said tape-reel from said roll when withdrawn from said depressions, said clutch extending through said casing, and a graduated disk

upon the exterior of said casing for the purpose specified.

23. In a photographic shutter, a casing, a rotary curtain-roll, a slotted curtain, one end of said curtain fast to said roll, means to lock
5 said roll against rotation, a spindle upon which said roll is journaled, a pair of tape-reels journaled upon said spindle, one at each end of said roll, a gear fast to each of said
10 tape-reels, a pinion-shaft journaled within said roll, a pinion at each end of said pinion-

shaft intermeshing said gears, and a clutch movable lengthwise of said shaft splined to one of said tape-reels and extending through said casing for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN S. WRIGHT.

Witnesses:

CHARLES S. GOODING,
SYDNEY E. TAFT.

15