

No. 615,315.

Patented Dec. 6, 1898.

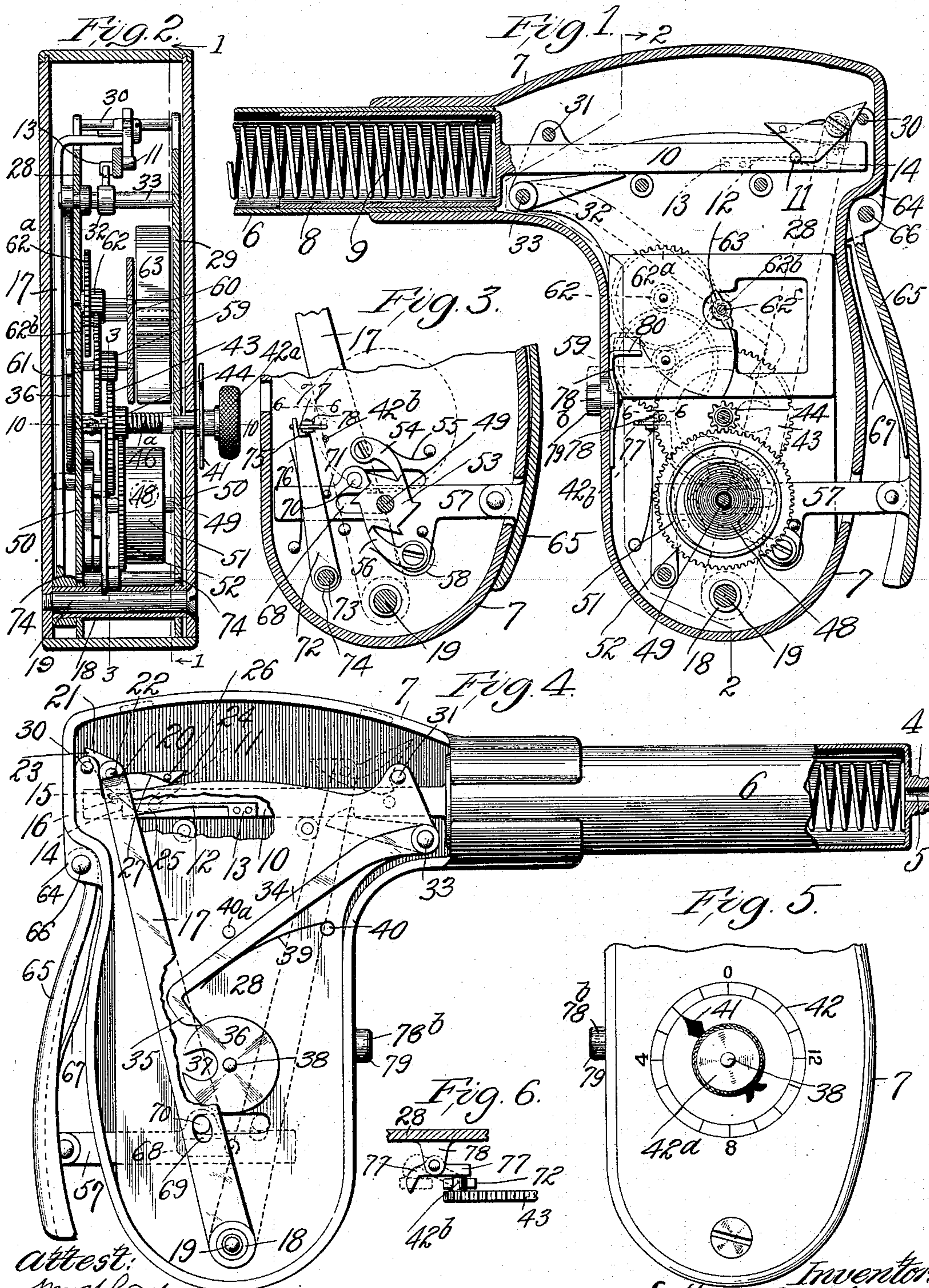
S. H. SMITH & H. HOLBORN.

DEVICE FOR PNEUMATICALLY OPERATING PHOTOGRAPHIC SHUTTERS.

(Application filed Nov. 10, 1897.)

(No Model.)

2 Sheets—Sheet 1



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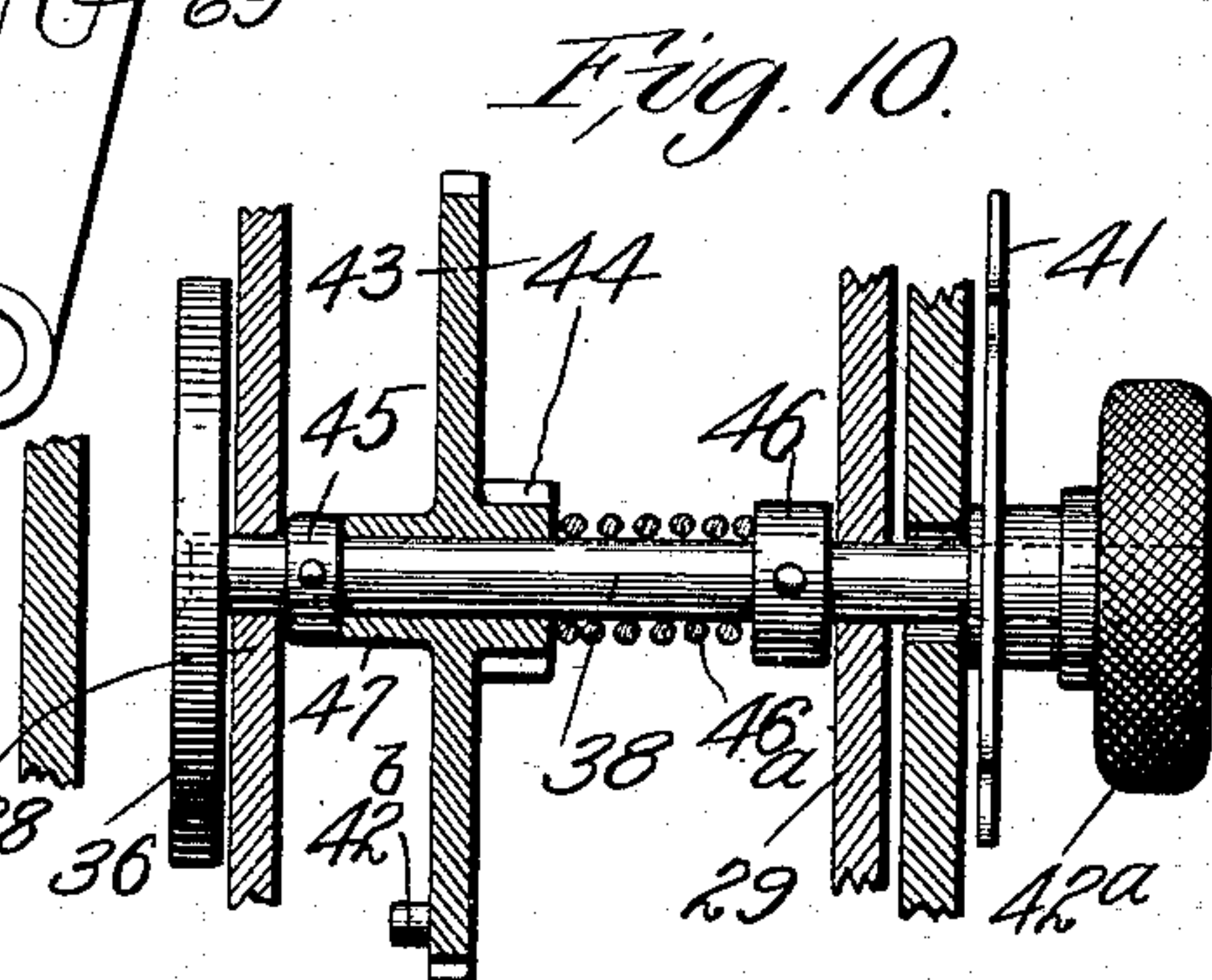
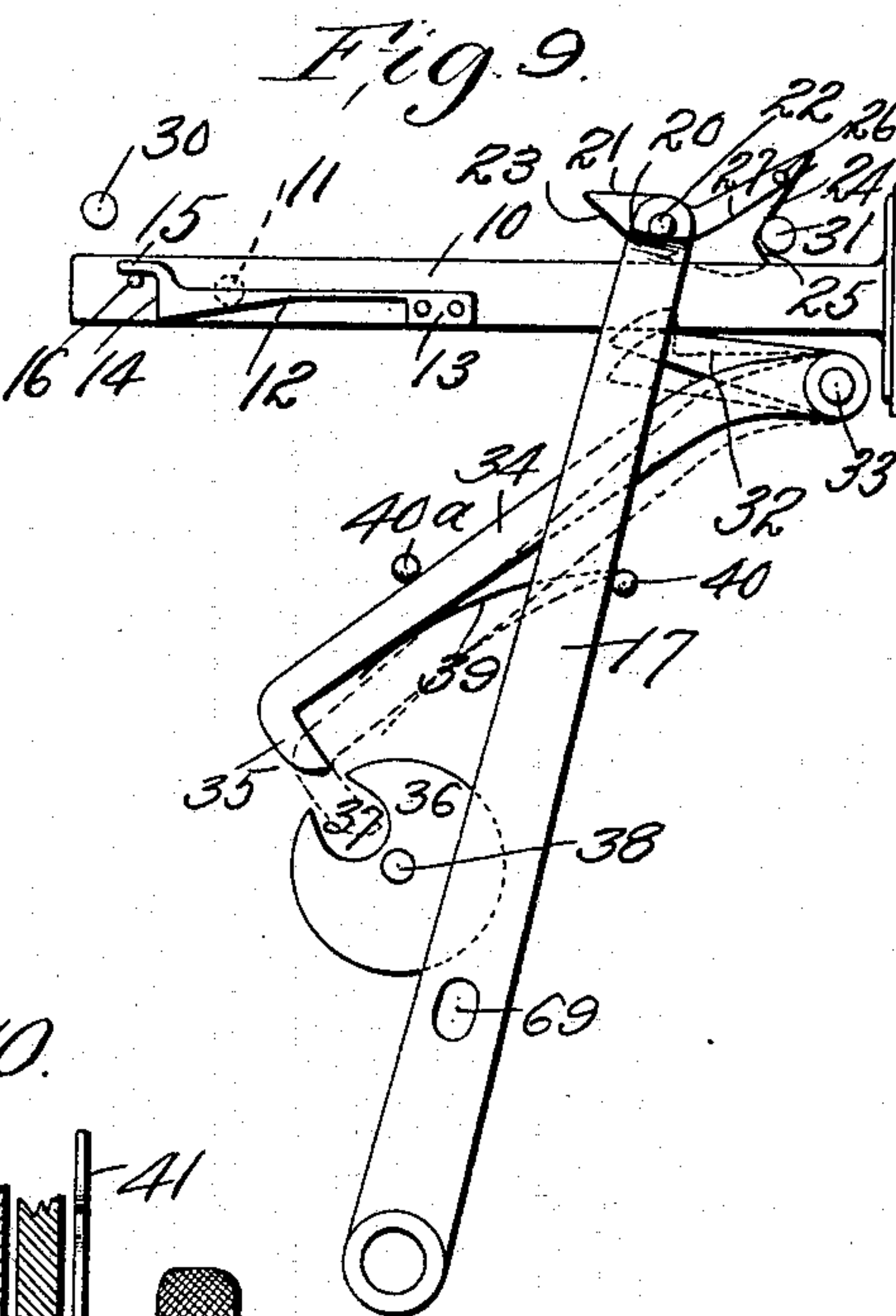
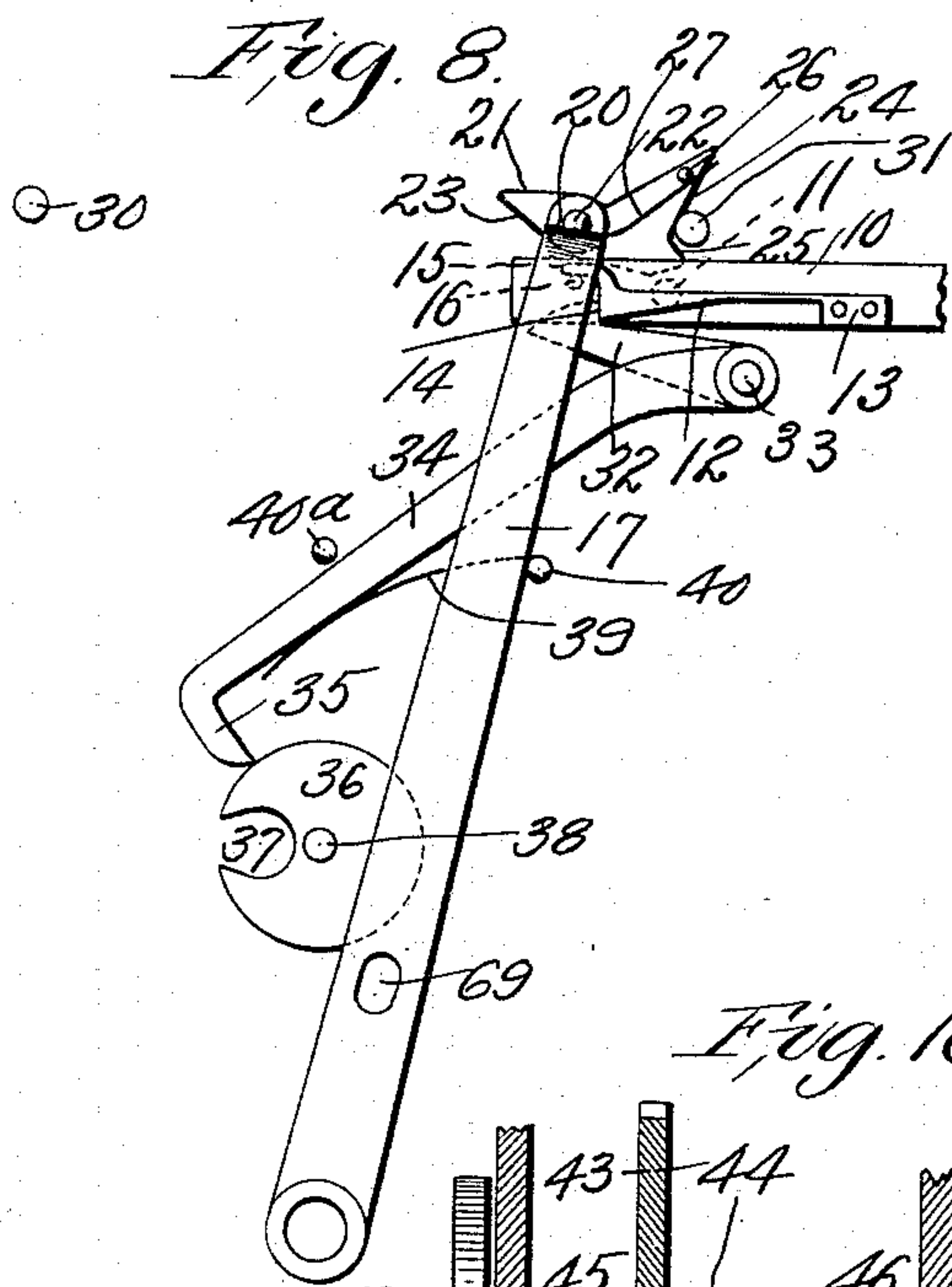
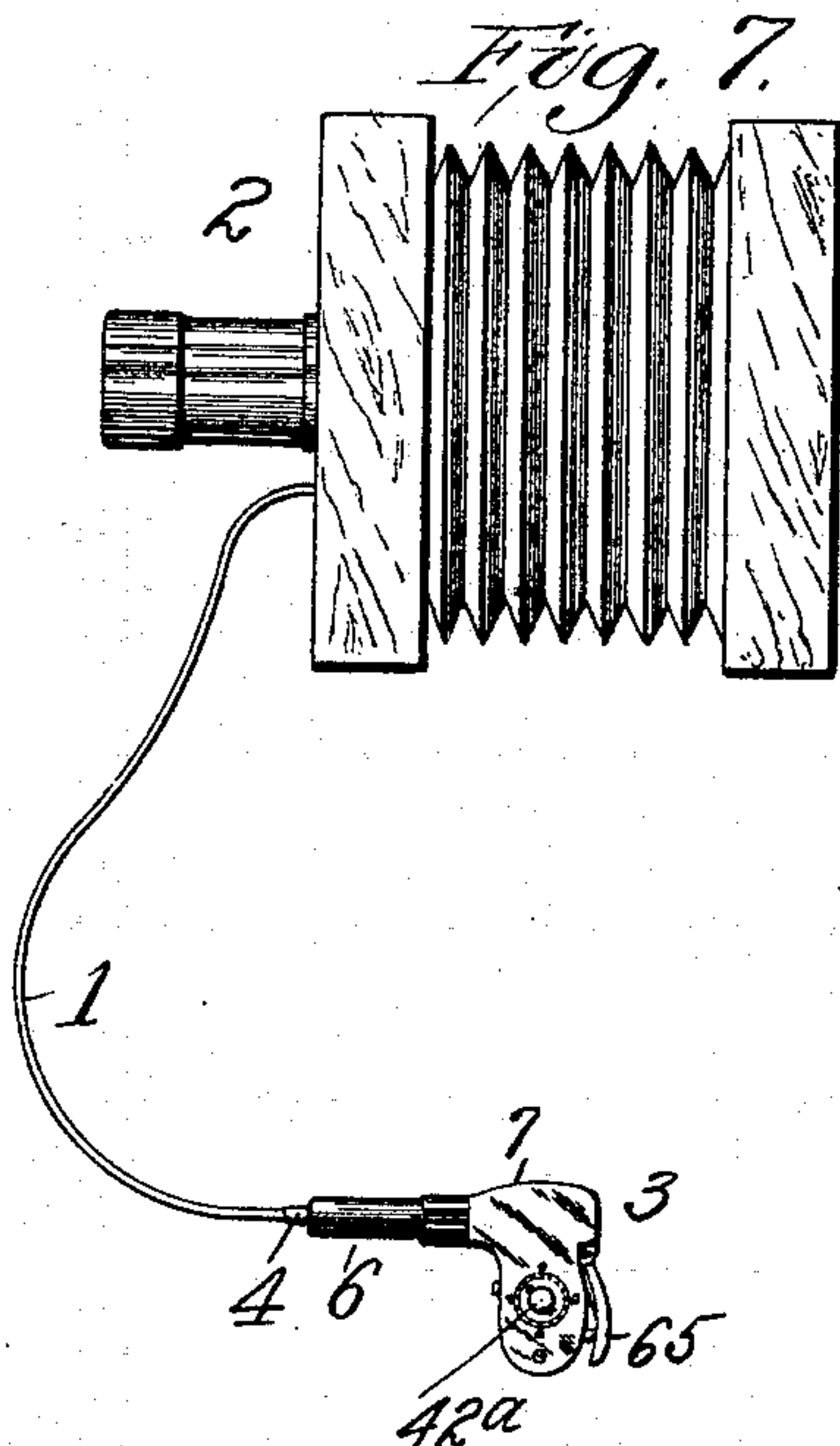
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2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

SAMUEL HENRY SMITH, OF PERRYVILLE, AND HENRY HOLBORN, OF ST. LOUIS, MISSOURI.

DEVICE FOR PNEUMATICALLY OPERATING PHOTOGRAPHIC SHUTTERS.

SPECIFICATION forming part of Letters Patent No. 615,315, dated December 6, 1898.

Application filed November 10, 1897. Serial No. 658,011. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL HENRY SMITH, a citizen of the United States, residing at Perryville, in the county of Perry, and HENRY HOLBORN, a subject of the Queen of Great Britain, residing at St. Louis, State of Missouri, have invented a new and useful Attachment for Pneumatic Shutter-Openers, of which the following is a specification.

As is well known, most photographic cameras are provided with shutters so connected with a piston reciprocating in a cylinder attached to the camera that when air is forced into the cylinder the piston is forced outward and opens the shutters, and when air previously forced into the cylinder is withdrawn and a partial vacuum created the piston is forced inward by atmospheric pressure and the camera-shutters are closed.

The device ordinarily used heretofore for forcing air into and withdrawing it from the cylinders of pneumatic shutter-openers of the kind described is a compressible rubber bulb of common form, which is held in the hand of the operator and is connected with the cylinder of the shutter-opener above mentioned by means of a rubber tube. Such a bulb has several inherent defects. Among them are a lack of durability and a tendency to remain in a collapsed condition when compressed. It is, moreover, very difficult for an operator to time an exposure correctly by means of the device described when doing portrait-work, for he is not ordinarily able to keep his eyes upon a timepiece, as the sitter usually requires his attention.

Our invention relates to means for operating pneumatic shutter-openers; and the chief objects of our improvements are, first, to provide a substitute for the common hand-bulb above mentioned which will be free from the defects of such a bulb, and, second, to provide an automatic timing attachment which can be set so as to give an exposure of any desired length and close the shutters of a photographic camera automatically at the proper instant. We attain these objects by mechanism whose preferred form is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section on line 1 1, Fig.

2. Fig. 2 is a vertical section on line 2 2, Fig. 1, looking toward the rear. Fig. 3 is a vertical section on line 3 3, Fig. 2. Fig. 4 is a side elevation of our device on the side opposite the one shown in Fig. 1 with the side of the casing removed. Fig. 5 is a detailed side elevation of a portion of the handle, showing the dial and indicator of the timing mechanism and the thumb-piece used in setting it. Fig. 6 is a horizontal section on line 6 6, Figs. 1 and 3, looking downward. Fig. 7 is a side elevation of a photographic camera with an instrument attached thereto. Fig. 8 is a diagrammatic view showing the parts represented in one position. Fig. 9 is a similar view of the same parts in another position; and Fig. 10 is a detailed view of a horizontal section on line 10 10, Fig. 2.

Similar numerals refer to similar parts throughout the several views.

The shutters and the pneumatic shutter-opener in connection with which our device is designed to be used being old and well known are not illustrated in our drawings.

The connection between the shutter-opener and our attachment may be made by means of a rubber tube 1, Fig. 7, just as the connection is ordinarily made between shutter-openers and the common rubber bulbs now in use, as indicated in Fig. 7, in which 2 represents a photographic camera of common form, and 3 our improvement. The outer end of the tube 1 is preferably connected with our device by means of a nipple 4, Fig. 4, over which it preferably fits, and which is provided with an air-passage 5, which connects said tube with the interior of a cylinder 6, Figs. 1, 4, 5, and 7, attached to the casing 7 of our device, and preferably, but not necessarily, projecting forward from said casing somewhat after the manner of the barrel of a pistol from its handle, as shown in Figs. 1, 4, and 7.

Within the cylinder 6 a piston 8, Figs. 1, 4, and 9, reciprocates. It is preferably, but not necessarily, in the form of a tube, open at its inner end and closed at its outer end and telescoping into the cylinder 6, as shown in Fig. 1. Between the piston 8 and the outer end of the cylinder a coiled spring 9 is preferably arranged within the cylinder, as shown

in Figs. 1 and 4. This spring is compressed when the piston 8 is forced inward, and when the piston is released said spring tends to force it back to the position in which it is shown in Fig. 1.

To the outer side or end of the piston 8 a piston-rod 10, Figs. 1, 2, 4, 8, and 9, is shown attached and projecting rearward. This rod is shown provided near its outer end with a laterally-projecting pin 11 on one side, Figs. 1 and 2, and on the other side with a spring-latch 12, whose inner end 13 is secured to the piston-rod and whose outer end is provided with a shoulder 14 and a rearwardly-projecting tip 15, which last preferably normally rests upon a pin 16, projecting from the side of the piston-rod and limiting the downward movement of the rear end of the latch, Figs. 1, 2, 4, 8, and 9. The forward or inward movement of the piston 8 is effected by means of a sweep 17, whose lower end is attached to a sleeve 18, through which a pivot 19 passes, Figs. 1, 2, 3, 4, 8, 9, and 10. The upper end 20 of the sweep is preferably bent inward and then upward, as shown in Figs. 2, 4, 8, and 9. To the upwardly-projecting tip of this sweep a dog 21 is attached by means of a laterally-projecting pivot 22, Figs. 1, 2, 4, 8, and 9. The dog 21 is shown provided with a rear incline 23, extending upward and outward and terminating in a tip beyond the pivotal point of the dog, a front incline 24, extending forward and upward, a shoulder 25, and a laterally-extending pin 26. The pin 26 rests upon a spring 27, whose inner end is attached to the sweep 17 and which tends to keep the front end of the dog 21 in the elevated position in which it is shown in Figs. 8 and 9.

The piston-rod 10 reciprocates in the form of our device shown between two side plates 28 and 29, forming parts of a frame by means of which the movement hereinafter described is supported. Two rods or bars 30 and 31 connect the plates 28 and 29 and are designed to engage the dog 21, as shown most clearly in Figs. 1, 2, 4, 8, and 9. When the sweep 17 is drawn back into its rearmost position, the rear incline 24 of the dog 21 comes in contact with the bar 30, which forces the shoulder 25 of said dog down into position to engage the pin 11, projecting from the piston-rod, as shown in Figs. 1 and 4. When the sweep 17 is thrown forward, its dog 21 carries the piston-rod 10 forward with it until the dog 21 reaches the bar 31, when it rides up on said bar, as shown in Fig. 4 in dotted lines and in Figs. 8 and 9 in full lines, and releases the pin 11. When disengaged in this manner from the pin 11, the dog is prevented from dropping back into position to reengage said pin by the spring 27, hereinbefore mentioned, even if the sweep is allowed to move back far enough to disengage the dog 21 from the bar 31.

In moving forward the piston-rod 10 carries the shoulder 14 of its spring-latch 12 over

the head of a rearwardly-projecting catch 32, Figs. 1, 2, 4, 8, and 9, arranged in its path and which it is enabled to pass by rising above said catch, and as long as it retains its normal position prevents the backward movement of the piston 8 and its rod 10. Therefore when the piston-rod 10 is released by the dog 21 it is prevented by said catch from being forced backward by the spring 9 as long as the catch retains its position.

The catch 32 is rigidly attached to a shaft 33, journaled in the plates 28 and 29 and having depending therefrom and attached thereto a detent 34, having a toe 35, which normally rests upon the periphery of a disk 36, provided with a notch 37 and preferably attached to and rotating with a shaft 38, Figs. 1, 2, 4, 5, 8, 9, and 10. As long as the toe 35 rests upon the periphery of said disk the catch 32 is held rigidly in its upper position, and if in engagement with the latch 12 prevents the recession of the piston 8; but when in the course of a revolution of the disk 36 the notch 37 is carried under the toe 35 while the catch 32 engages the shoulder 12 the catch 32 is forced down out of engagement with said shoulder by the backward thrust of the spring 9 and the toe 35 is forced down into the notch 37 and the piston returns to the position in which it is shown in Figs. 1 and 4. A spring 39, whose inner end is shown attached to a pin 40, projecting from the outer side of the plate 28, is arranged beneath the detent 34, so as to be compressed when the toe 35 of said detent is forced into said notch 37 in the disk 36, and as soon as the catch 32 is disengaged from said latch 12 said spring at once lifts the toe out of the notch and causes the catch to rise into position to reengage said latch. The movement of the toe 35 into and out of said notch occupies but an instant and does not interfere with the revolution of the disk. The upward movement of the detent is preferably limited by a stop 40^a.

The post 33, to which the disk 36 is attached, is journaled in bearings 39 in the plates 28 and 29, Figs. 2 and 10, and carries at its outer end a hand 41, which moves over the face of a dial 42, Figs. 5 and 7, shown divided into 16 spaces each representing a second. Said post also carries a thumb-piece 42^a at its outer end, by means of which it and the hand 40 and disk 36, attached thereto, may be turned so as to cause the hand 40 to point to any desired portion of the dial and the notch 37 of the disk 36 to assume any desired relation to a pin 42^b, extending laterally from the face of a spur-wheel 43, carried by the shaft 38. The wheel 43 is not attached rigidly to said shaft, but is preferably, together with a pinion 44, which may be made integral therewith or otherwise connected with said wheel, secured to said shaft 38 by means of an inner collar 45 and an outer collar 46, attached to said shaft, and a coiled spring 46^a, surrounding the shaft between the collar 46 and said pinion and forcing the hub 47 of said spur-wheel firmly

against the collar 45, Figs. 5 and 10. Motion is communicated to said wheel 43 and through it to said disk 36 from a mainspring 48, Figs. 1 and 2, surrounding a winding-post 49, journaled in bearings 50 in the plates 28 and 29, and having one end attached to said winding-post and the other to a revoluble housing 51, attached to a spur-wheel 52, turning on said winding-post, and which meshes in with the pinion 44. Said winding-post 49 carries at its inner end a ratchet-wheel 53, which is engaged by a pawl 54, pivotally attached to the plate 28 and preferably held in engagement by a spring 55, as well as the force of gravity, and a pawl 56 is pivotally attached to a reciprocating bar 57 and preferably pressed into engagement by means of a spring 58, whose inner end is attached to the same bar. When the movement is wound up, the spring 48 is condensed, and through the medium of said housing operates to rotate the wheel 53, the pinion 44, with which said wheel gears, and through said pinion the spur-wheel 43 and the shaft 38, which carries the disk 36. Motion is also transmitted through said wheel 43 to the pinion 59, with which it gears and which, together with a spur-wheel 60, is carried by a shaft 61. From the wheel 60 motion is transmitted to a pinion 62, Fig. 1, attached to a shaft carrying a spur-wheel 62^a, which gears with a pinion 62^b on a shaft 62^c, carrying a fly 63, by means of which the speed of the movement is preferably governed.

To a pair of lugs 64, projecting from the end of the case 7, the upper end of a lever 65 is shown connected by means of a pivot 66, and between said lever and the case a spring 67 is shown arranged so as to tend to keep said lever in the position in which it is shown in Figs. 1 and 4. The lever 65 is shown pivotally connected to the outer end of the reciprocating bar 57, by which the pawl 56 is carried. A horizontal slot 68 in said bar permits the passage of the winding-post 49. Said sweep preferably contains an inclined slot 69, through which a pin 70, attached to the bar 57, projects.

A pin 71 preferably projects from the side of the bar 57 and engages a lever 72, Figs. 1, 2, and 3, whose lower end is attached to a shaft 73, journaled in bearings 74 in said side plates 28 and 29, and whose upper end preferably contains a notch 75, extending inward from its rear edge. A spring 76, whose lower end is shown attached to the plate 28 and which is arranged in front of said lever, tends to push the upper end of the lever 72 into the position in which it is shown in Fig. 1. A horizontal bell-crank lever 77 is shown pivoted between a pair of lugs 78 in position to be moved by said lever 72. When said lever 72 stands in the position in which it is shown in Fig. 1, its upper end is in the path of the pin 42^b, extending out from the face of the spur-wheel 43, and when said pin in the course of the revolution of said wheel is carried against said lever the revolution of the wheel

is stopped. When the lever 72 is forced forward into the position in which it is shown in Fig. 3, the pin 42^b is released, but said lever 72 strikes the outer arm of the lever 77 and forces its inner arm in above the pin 42^b in its path, but, as shown in dotted lines in Fig. 6, so that the wheel 43 can in any case only make a single revolution before having its motion arrested either by the lever 72 or the lever 77.

In focusing with a photographic camera it is often desirable to keep the shutters open much longer than they are ever kept open in exposing a sensitized plate, and we have therefore provided a sliding stop 78^b, Fig. 1, adapted to be moved up and down by means of a button 79, projecting through a slot in the case. When slid up into the position in which it is represented in dotted lines in Fig. 1, the head 80 of said slide is in the path of the vanes of the fly 63, and when struck by one of said vanes it arrests its course, stops the movement of the connecting mechanism, and prevents the shutters from being closed. By sliding the stop 78^b down into the position in which it is shown in full lines in Fig. 1 it is withdrawn from the path of the fly-vanes, and the mechanism is then free to drive the wheel 43 on around until said wheel has completed a full revolution.

In using our attachment the operator should first set the timing attachment so as to secure an exposure of the desired length. When the hand 41 points to "0," the toe 35 of the detent 34 is preferably in the position in which it is shown in Fig. 9, and in setting the timing portion of the device said hand is turned back by means of the thumb-piece 42^a one space for each second of exposure desired. In Fig. 5 it is shown two spaces from zero, and the instrument when so set will give an exposure of two seconds. In turning the hand 41 back the disk 36, which, like the hand 41, is attached to the shaft 38, is also revolved and assumes, when set for a two-seconds' exposure, the position or about the position in which it is shown in Figs. 4 and 8. The instrument being thus set, the operator preferably grasps its handle so that the cylinder 6 will point forward and presses the lower end of the lever 65 inward from the position in which it is shown in Figs. 1 and 4 to the position in which it is represented in Fig. 3. In doing this he forces the bar 57 inward, and by means of the pawl 56, carried by said bar, forces the ratchet-wheel 53 to make a partial revolution, and thus winds up the spring 48, already preferably partially wound, and compresses said spring enough to enable it to force the spur-wheel 43 to make one revolution. At the same time said bar 57 forces the sweep forward from the position in which it is shown in full lines in Fig. 4 and in dotted lines in Fig. 1 into the position in which it is shown in dotted lines in Fig. 4 and in full lines in Figs. 8 and 9 and by doing so forces the piston 8 inward, compresses the spring 9, and

by expelling the air from the cylinder 6 and forcing it through the tube 1 into the pneumatic shutter-opener (not shown) opens the shutter of the camera or other instrument.

5 When thus forced inward, the piston-rod 10 is at the end of its stroke released from the sweep 17, but the compressed spring 9 is prevented from forcing the piston back by the catch 32, as hereinbefore explained. Another
10 thing accomplished by forcing the bar 57 inward is the release of the wheel 43 and the movement of which it forms a part. When the lever 65 is in the normal position, in which it is shown in Figs. 1, 4, and 6, the pin 42^b of the
15 wheel 43 rests upon the top of the lever 72; but when said bar 57 is forced inward its pin 71, which rests against the front of the lever 72, forces said lever outward into the position in which it is shown in full lines in Fig. 3 and
20 in dotted lines in Fig. 6 and disengages it from the pin 42^b, thus leaving the wheel 43 and connecting mechanism free to revolve, but in moving out said lever 72 strikes the outer arm of the bell-crank lever 77 and throws its in-
25 ner arm into the path of the pin 42 in position to stop said pin when the wheel 43 has substantially completed a full revolution. After forcing the bar 57 inward in the manner above described the lever 65 may either
30 be held in the inner disengaged position in which it is shown in Fig. 3 or released. In any case it will be forced back into its original position by the spring 67 as soon as the release takes place and will carry the bar 57
35 and the sweep 17 back with it and cause the dog 21 to assume the position in which it is shown in Figs. 1, 4, 8, and 9. Where the device is set for a two-seconds exposure, the disk 36 will be carried into the position in
40 which it is shown in Fig. 9 in two seconds after the shutter is opened, and the toe 35 of the detent 34 being no longer supported by the periphery of the disk 36 the catch 32 will be forced down out of engagement by the ac-
45 tion of the spring 9 and the piston 8 will be forced back into its original position. In moving back the piston 8 will draw air into the cylinder 6 from the cylinder of the pneumatic shutter-opener, and thus cause the
50 shutter to be instantly closed.

We have described the preferred form of our device, but do not wish to be confined thereto, as the details of the mechanism can all be changed without departing from the
55 underlying ideas therein embodied.

We claim—

1. The combination in a timing apparatus, of a cylinder having a port for the admission and escape of air; a reciprocating piston for
60 drawing air into and forcing it out of the cylinder; mechanism for forcing the piston into the cylinder and holding said piston in its inner position; and a spring which is compressed by the inward movement of the piston and automatically forces the piston out-
65 ward when the latter is released.

2. The combination of an air-chamber; a

cylinder, means connecting the chamber and the inside of the cylinder; a piston for the cylinder; means for forcing said piston into
70 said cylinder and forcing air from the cylinder into said chamber and a spring which is compressed by the inward movement of the piston and tends to force the piston outward and cause it to draw air from said chamber
75 into said cylinder.

3. The combination of a cylinder 6 having an air-port 5; a piston 8 in the cylinder; a piston-rod attached to the piston; means for
80 forcing said piston inward and driving air out of the cylinder; a catch for locking the piston in place at the end of its forward stroke; means for automatically forcing the piston back after a forward stroke, upon the disen-
85 gagement of said catch; and timing mechanism for withdrawing the support from said catch at a predetermined interval after the termination of the forward stroke.

4. The combination of the cylinder 6, a piston in the cylinder; a piston-rod; a pivoted
90 sweep carrying at its upper end a pivoted dog for engaging said rod; a lever 65, a spring 67 for forcing the lever 65 outward; a bar connecting the lever 65 and the sweep 17; and means for disengaging the dog from the
95 piston-rod at the end of a forward stroke substantially as described.

5. The combination of the sweep 17; the dog 21 pivoted to the sweep and having the
100 inclines 23 and 24 and the shoulder 25; the spring 27 elevating the front tip of the dog; a piston-rod engaged by the dog; means for setting the dog in position to engage the piston at the end of its back stroke and means
105 for disengaging the dog from the piston at the end of its forward stroke, substantially as described.

6. The combination of the cylinder 6 having a port for the admission and discharge of
110 air; a piston in said cylinder, having a piston-rod; a sweep for drawing the piston inward and forcing air from the cylinder, a dog carried by the sweep, by which it engages the piston-rod; means for disengaging the dog at
115 the end of the instroke of the piston; a catch which engages the piston-rod; means for forcing the piston backward; a revoluble notched disk 36; a detent connected with said catch and having a toe normally resting upon the
120 periphery of said disk, substantially as and for the purposes described.

7. The combination of the disk 36 having a notch 37; the shaft 38; a dial; a hand 41 at-
125 tached to the shaft 38 and moving over the dial; a gear-wheel through which the shaft 38 passes; means holding said gear in position on said shaft; a spring; means transmitting motion from the spring to said wheel and through it to said shaft; means regulat-
130 ing the speed of said wheel; the catch 32 and the detent 34 substantially as described.

8. The combination of a movement having a wheel 43 with a pin 42; a lever 72; a bell-
crank lever 77; a lever 65 and means by which

the lever 72 is thrown out of the path of the pin 42 and the lever 77 into said path.

8. The combination of the herein-described timing movement having a fly and a stop
5 movable by hand and independent of the timing mechanism, for engaging a vane of the fly in one position, substantially as and for the purposes described.

10. The combination of the piston-rod 10;
10 the latch 12 and the catch 32 substantially as described.

11. The combination of the spring 48, the winding-post 49; the ratchet-wheel 53 attached to the winding-post, the reciprocating

bar 57 and the pawl 56 pivoted to said bar 15 and engaging said wheel substantially as described.

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