

J. E. THORNTON.

PNEUMATIC APPARATUS FOR CONTROLLING DURATION OF EXPOSURE
IN PHOTOGRAPHIC SHUTTERS.

APPLICATION FILED OCT. 16, 1899.

NO MODEL.

2 SHEETS—SHEET 1.

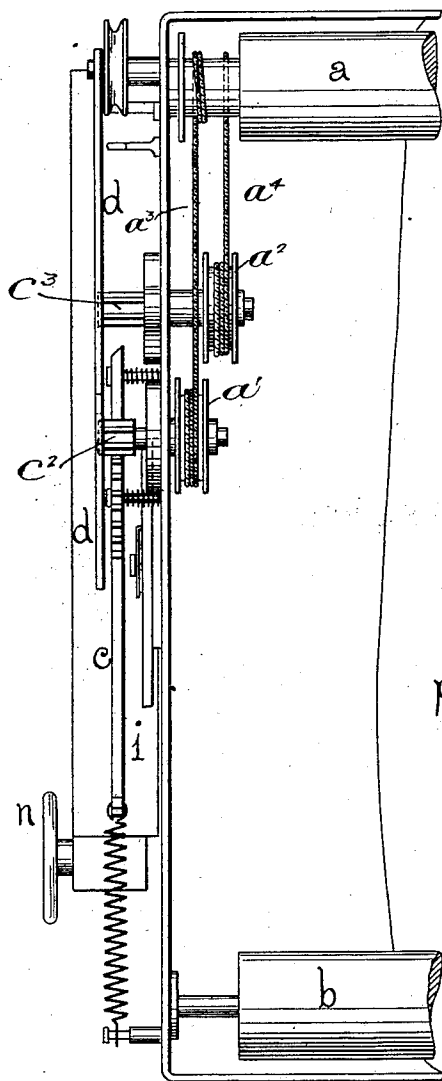


FIG. 2.

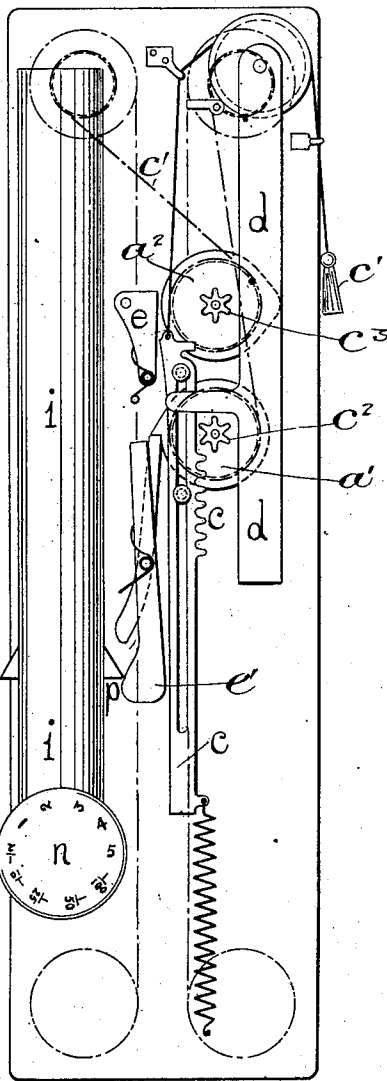


FIG. 1.

WITNESSES.

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INVENTOR

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att'y.

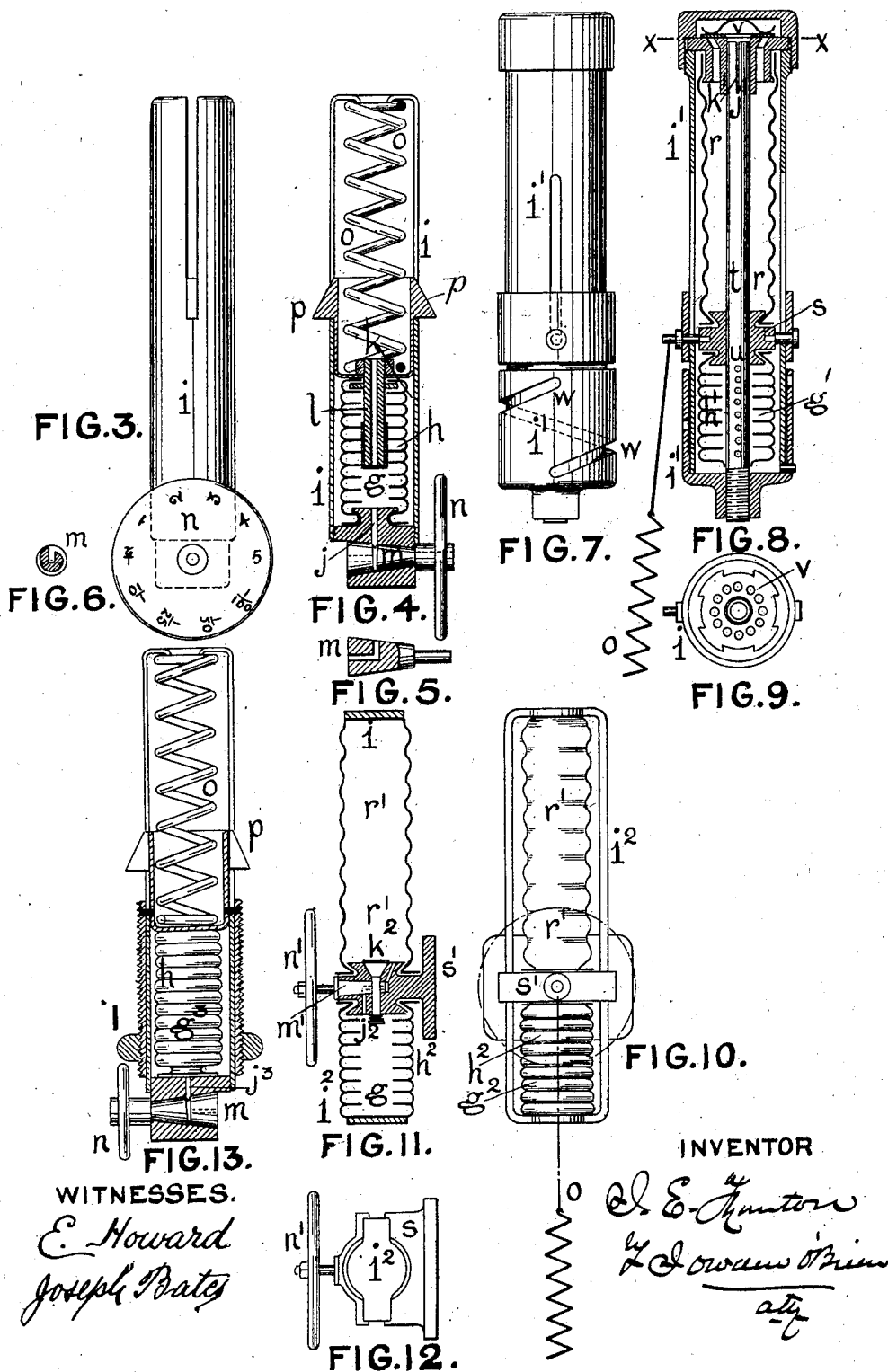
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UNITED STATES PATENT OFFICE.

JOHN EDWARD THORNTON, OF MANCHESTER, ENGLAND.

PNEUMATIC APPARATUS FOR CONTROLLING DURATION OF EXPOSURE IN PHOTOGRAPHIC SHUTTERS.

SPECIFICATION forming part of Letters Patent No. 729,014, dated May 26, 1903.

Application filed October 16, 1899. Serial No. 733,789. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD THORNTON, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancashire, England, (whose postal address is Worsley Mills, Hulme, Manchester, aforesaid,) have invented certain new and useful Improvements in Pneumatic Apparatus for Controlling Duration of Exposure in Photographic Shutters, of which the following is a specification.

This invention relates to pneumatic apparatus for controlling the length of exposure in photographic shutters. Pneumatic apparatus as hitherto constructed for this purpose has usually consisted of a cylinder and piston or plunger, the latter being drawn out before exposure and allowed to return upon release of the shutter, and the length of time occupied in its return (which indirectly controls the length of exposure) is determined by the admission of air to or from the cylinder. The objection to devices of this class is that it is difficult to get a good and accurate fit between cylinder and piston and sufficient freedom of action, and consequently there is either considerable leakage of air or else jamming of the piston in action. This invention is designed to overcome these objections and produce a certain and simple pneumatic time-controller.

It consists, essentially, of a flexible reservoir or its equivalent with sides of bellows shape, made of rubber or other flexible material, incased in a suitable frame or cover.

It will be fully described with reference to the accompanying drawings.

Figure 1 is a side elevation of shutter with the invention attached thereto; Fig. 2, a front elevation of part of shutter, partly in section; Fig. 3, an elevation of pneumatic timing apparatus detached from shutter; Fig. 4, a longitudinal section of Fig. 3; Fig. 5, a sectional detail of regulating exhaust-tap *m*; Fig. 6, a transverse section of tap *m*; Fig. 7, a side elevation of modified arrangement of pneumatic timing apparatus; Fig. 8, a longitudinal section of same, Fig. 9, a transverse section of same on line *xx*, Fig. 8; Fig. 10, a side elevation of another modification; Fig. 11, a longitudinal section of same, Fig. 10; Fig. 12,

a plan of same, Fig. 11; Fig. 13, a longitudinal section of another modification.

The invention is applied to a shutter of any ordinary construction, such as shown, 55 constructed with a roller *a* at top, a spring-roller *b*, a winding-up rack *c*, drawn up by a cord *c'* and engaging with pinions *c² c³* on the winding-drums *a' a²*. The winding-drums are connected to the top rollers by the cords *a³ a⁴*, which wind up upon their axles. 60

The pneumatic apparatus comprises an air reservoir or receptacle *g*, formed with flexible sides *h*, of rubber or other suitable airtight material, the sides *h* being of bellows 65 or concertina formation. The air-receptacle is placed in a metallic or other tube *i*, with an outlet-orifice *j* at the lower end and an inlet-orifice *k* at the upper end, the ends being attached to plates or blocks of metal or other suitable material. The inlet-orifice *k* is formed in a tube *l*, covered by a non-return valve of elastic or other form, and the outlet-orifice *j* is formed in a valve *m* and is capable of being adjusted in area by moving the valve. 75 The outlet-orifice is preferably of the shape shown in Figs. 4, 5, and 6 in the form of a spiral or scroll around the plug of the valve, and the valve-spindle is fitted with a knob or wheel *n*, with index-numbers near the periphery. 80

Above the flexible sides of the air-receptacles *g* is placed a strong spring *o*, which presses against the end of the air-receptacle and is inclosed in a tube or frame *i*. It acts 85 upon a block or slide *p*, with projections at side which engage with the catch *e* on the shutter.

In operation the spring *o* is compressed to operate the apparatus, the flexible sides of 90 the air-receptacle *g* being at the same time expanded and filled with air. When released, the spring *o* acts against the pressure of the air in the flexible air-receptacle *g*, compressing it and driving it out of the orifice *j*, the 95 size of this orifice determining the duration of time for the movement of the spring. When the block or slide *p* reaches the bottom of its travel, it pushes back the catch *e'*.

In a modified arrangement the spring *o* 100 may be replaced by a second flexible air-receptacle *r*, the air being caused to pass from

one receptacle to the other. The two flexible air-receptacles g' and r are attached to a central block s , with guide-pins at each side which slide up and down in a slot in the exterior casing. The block s is moved upward to set the apparatus. The air is expelled from the receptacle r and enters the receptacle g' through perforations u in a tube t , as shown in Fig. 8. A cap is secured upon the outer case or tube i' , forming a chamber in which is a flat disk valve v , held down by a spring forming a non-return valve. The tube t is fitted at its upper end with a slit or slot inside a sleeve and at its lower end with the perforations u , the end of the tube being plugged and screwed into the casing. The block s slides upon the tube, and the tube can be rotated by turning the lower part of the case or tube i' , which is fitted with a spiral groove w , engaging a pin to cause it to move longitudinally. In operation the flexible receptacles g' and r are filled with air or liquid, preferably air. The block s is raised, forcing the fluid in the receptacle r into the receptacle g' through the outlet-orifices j' and non-return valve v . The block s is held in this position by the stop-catch on the shutter, and when it is released is drawn down by the spring o , the fluid being forced from the receptacle g' through the perforations u into the tube t and through the longitudinal slot or orifice k' at the upper end. The time occupied by the fall or traverse of the block s is varied by adjusting the slot k to extend more or less through the sleeve in which it is placed.

In another arrangement (shown in Figs. 10, 11, and 12) the central block s' , to which the two flexible air-receptacles g^2 and r' are attached, is affixed to the body of the shutter, and the frame or case i^2 is attached to the ends of the flexible receptacles g^2 and r' and moves up and down with them. An orifice k^2 is placed in the block s' , closed by a non-return valve on top, and an orifice j^2 is controlled by a tap or valve m . The valve m' is similar to that shown in Figs. 5 and 6 and is provided with an index wheel or knob n' . The frame or case i^2 slides in guides attached to the shutter.

In another modification the variation of exposure may be regulated by a device independent of the orifice j^3 , as shown in Fig. 13. The casing inclosing the air-receptacle g^3 may be fitted with an adjustable stop I , arranged with a screw-thread to adjust its position, so that it may act on a roller-releasing lever at any desired time after the apparatus itself is first released, the casing always falling a given distance in the same time.

The apparatus is held in the position shown by a stop or catch on the shutter and when released is drawn down by the spring o , compressing the receptacle r and forcing the air out of it through the orifice j and valve m into the receptacle g . The time occupied is varied by turning the tap or valve m , as previously described.

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

1. In a timing device for photographic shutters, the combination with a guide-tube i , a block sliding therein, and an operating-spring, of a flexible receptacle of bellows formation for an elastic fluid, provided with an orifice at one end for the admission of air, a block provided with an adjustable orifice open to the air attached to the other end of the bellows, a valve to adjust the passage therein and an index-wheel attached thereto, substantially as described.

2. In a timing device for photographic shutters the combination with a flexible receptacle of bellows formation for an elastic fluid, a spring to operate the same, and a tubular casing in which the bellows slides, of a metal block provided with an inlet-orifice, attached to the free end of the bellows, and sliding with it, a metal block attached to the other end of the bellows and fixed to the casing, a plug-valve with a scroll-shaped passage therein, and an index-wheel attached to the valve substantially as described.

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

JOHN EDWARD THORNTON.

Witnesses:

J. OWDEN O'BRIEN,
JOSEPH BATES.