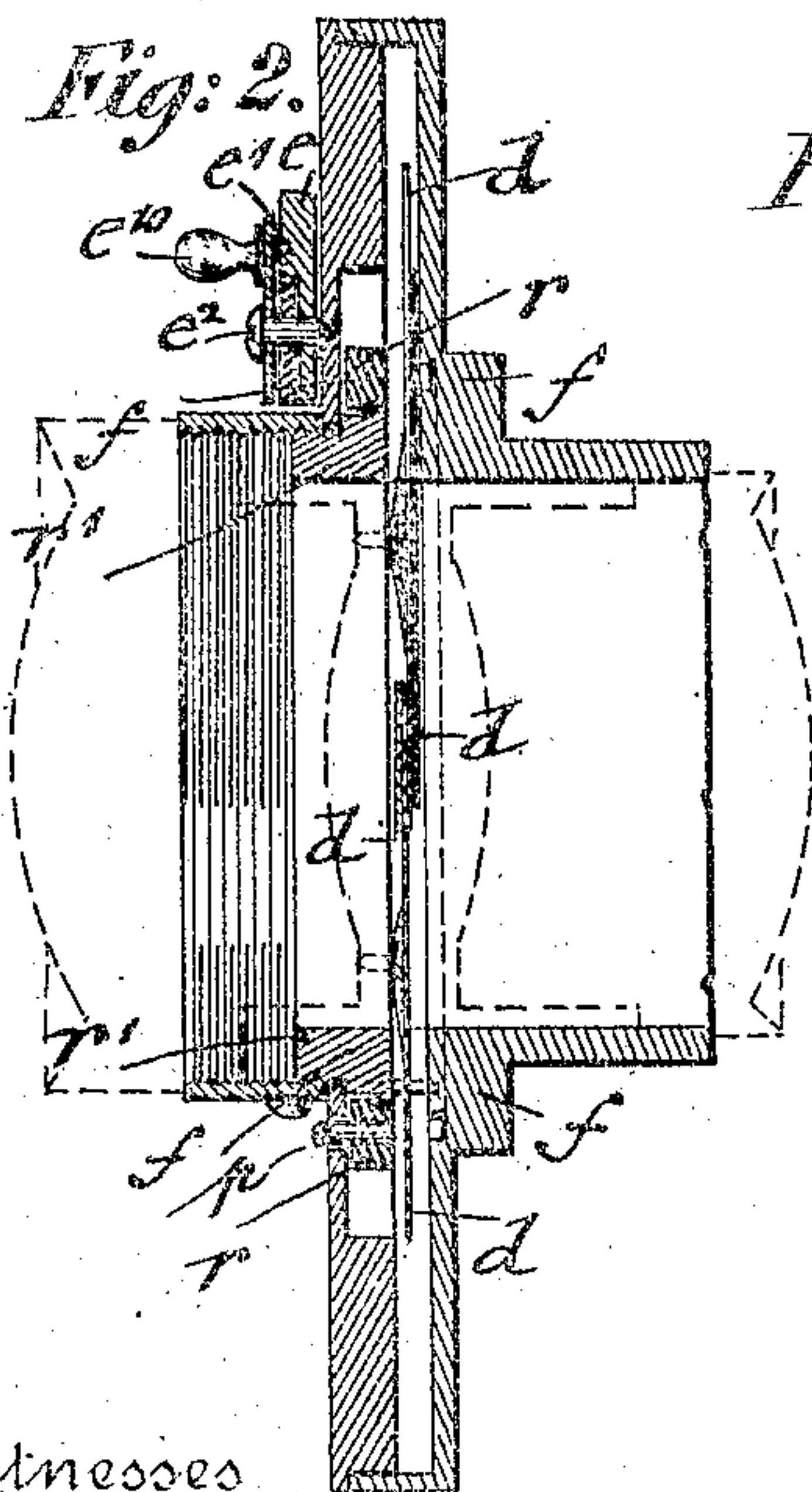
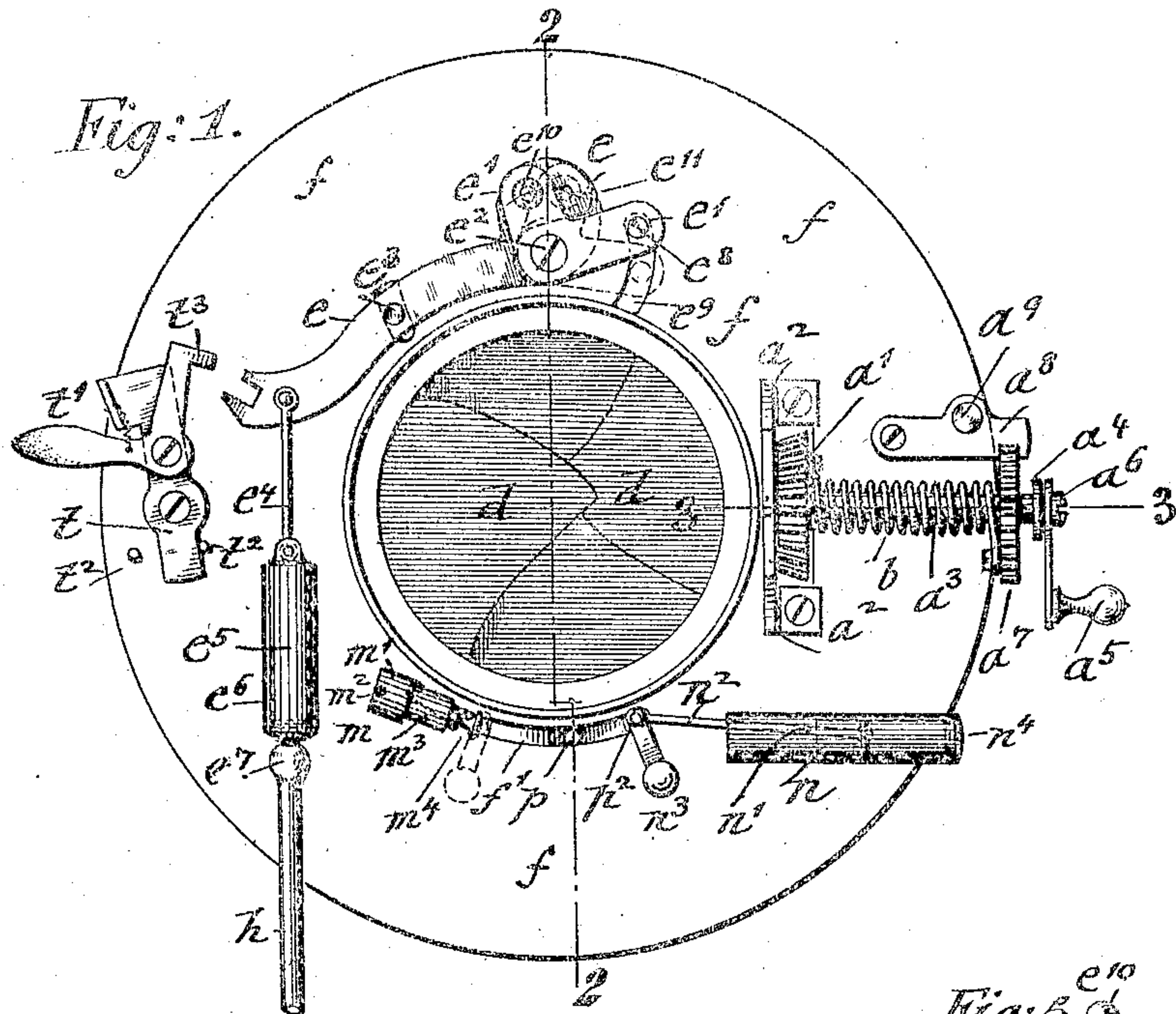


No. 827,513.

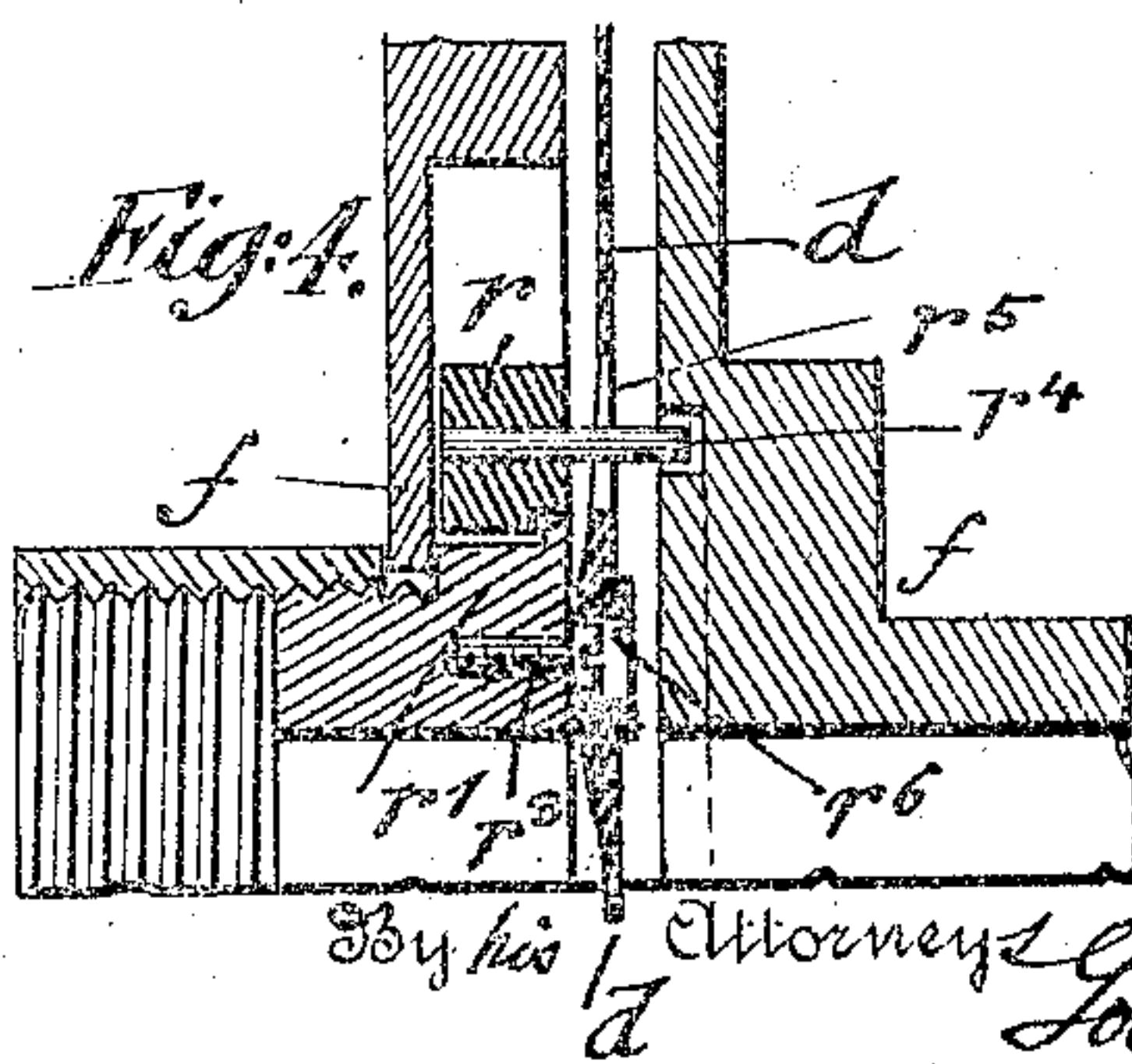
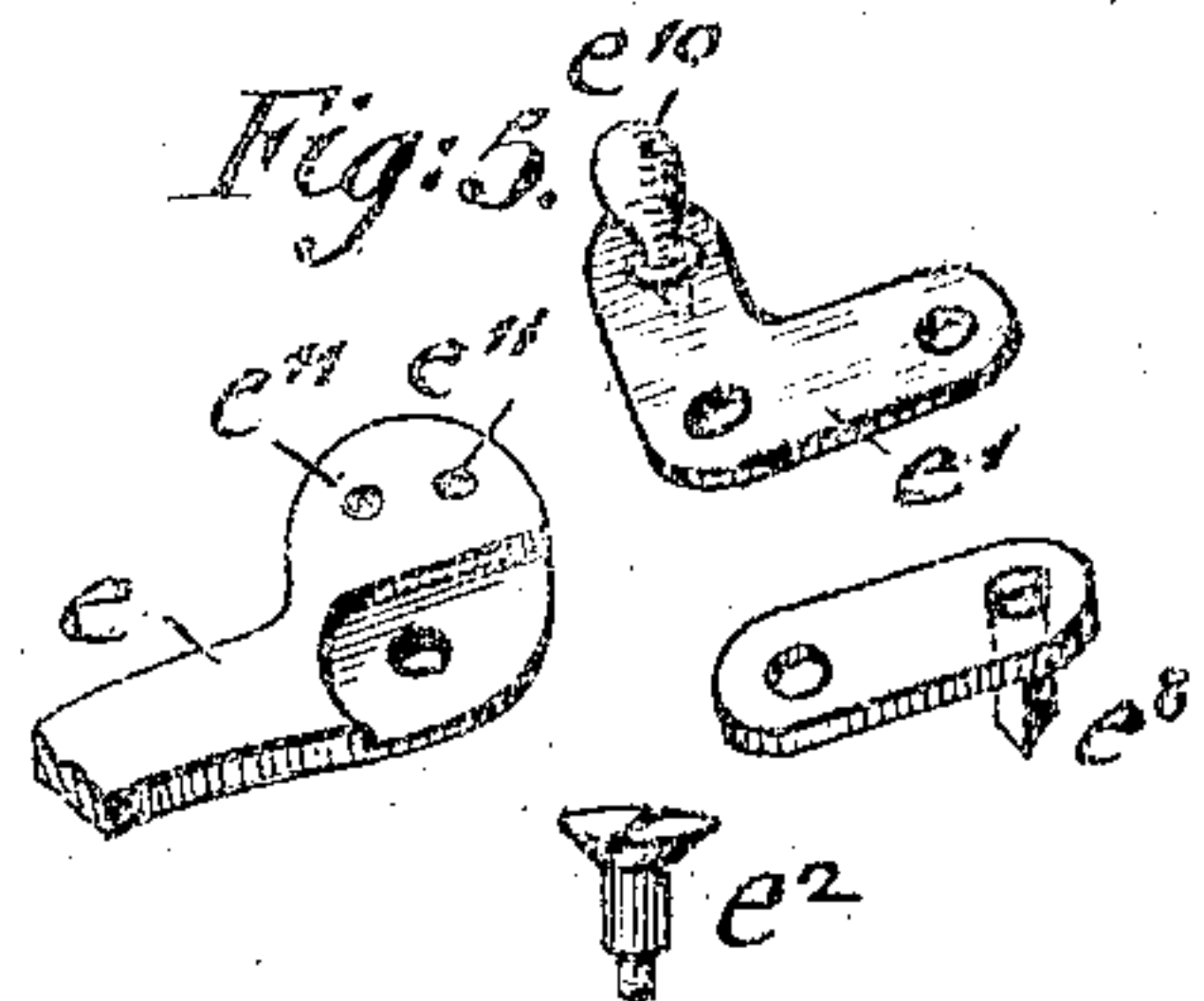
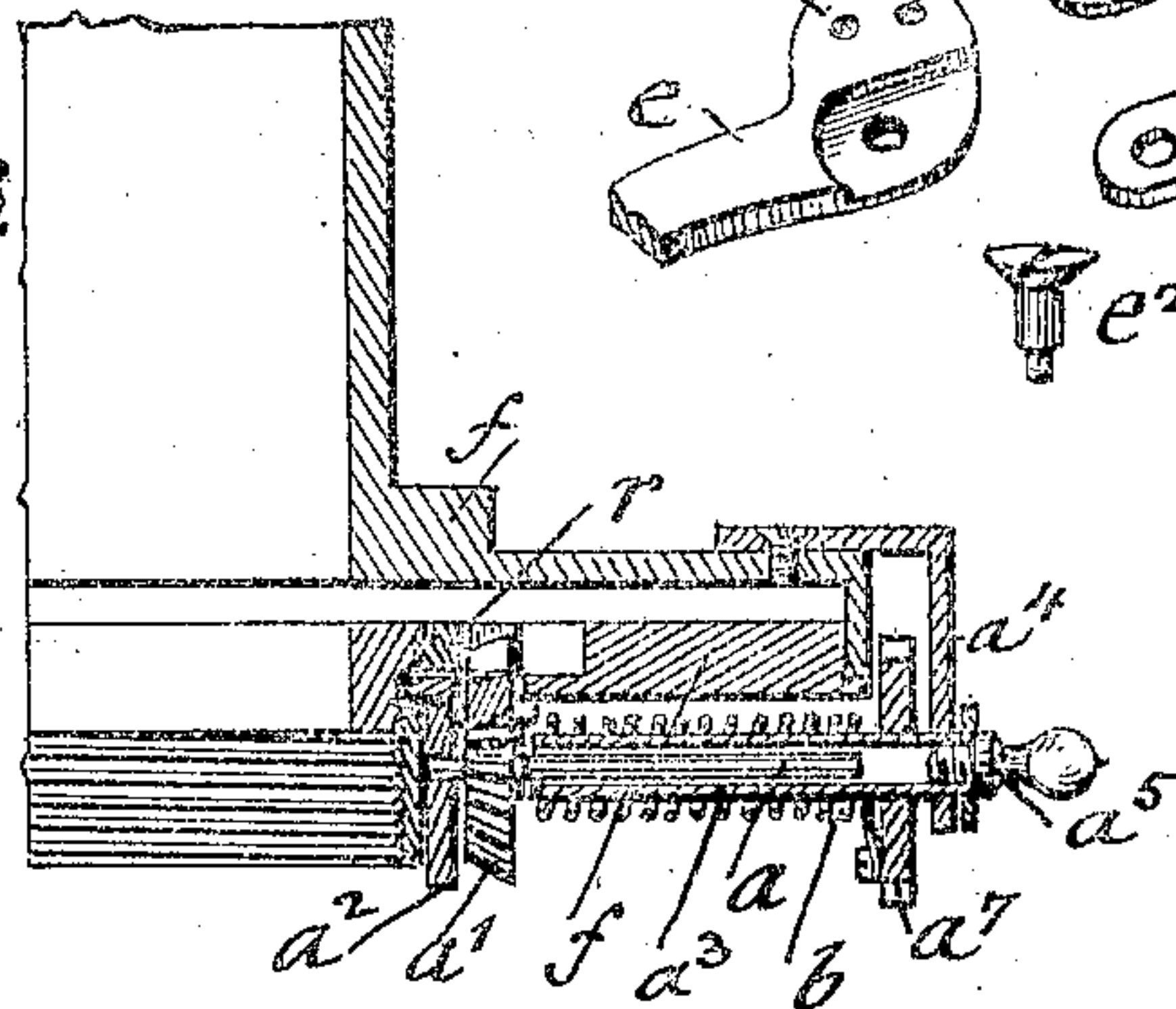
PATENTED JULY 31, 1906.

G. DIETZ.  
PHOTOGRAPHIC SHUTTER.  
APPLICATION FILED DEC. 22, 1905.

3 SHEETS—SHEET 1.



*Fig: 3.*

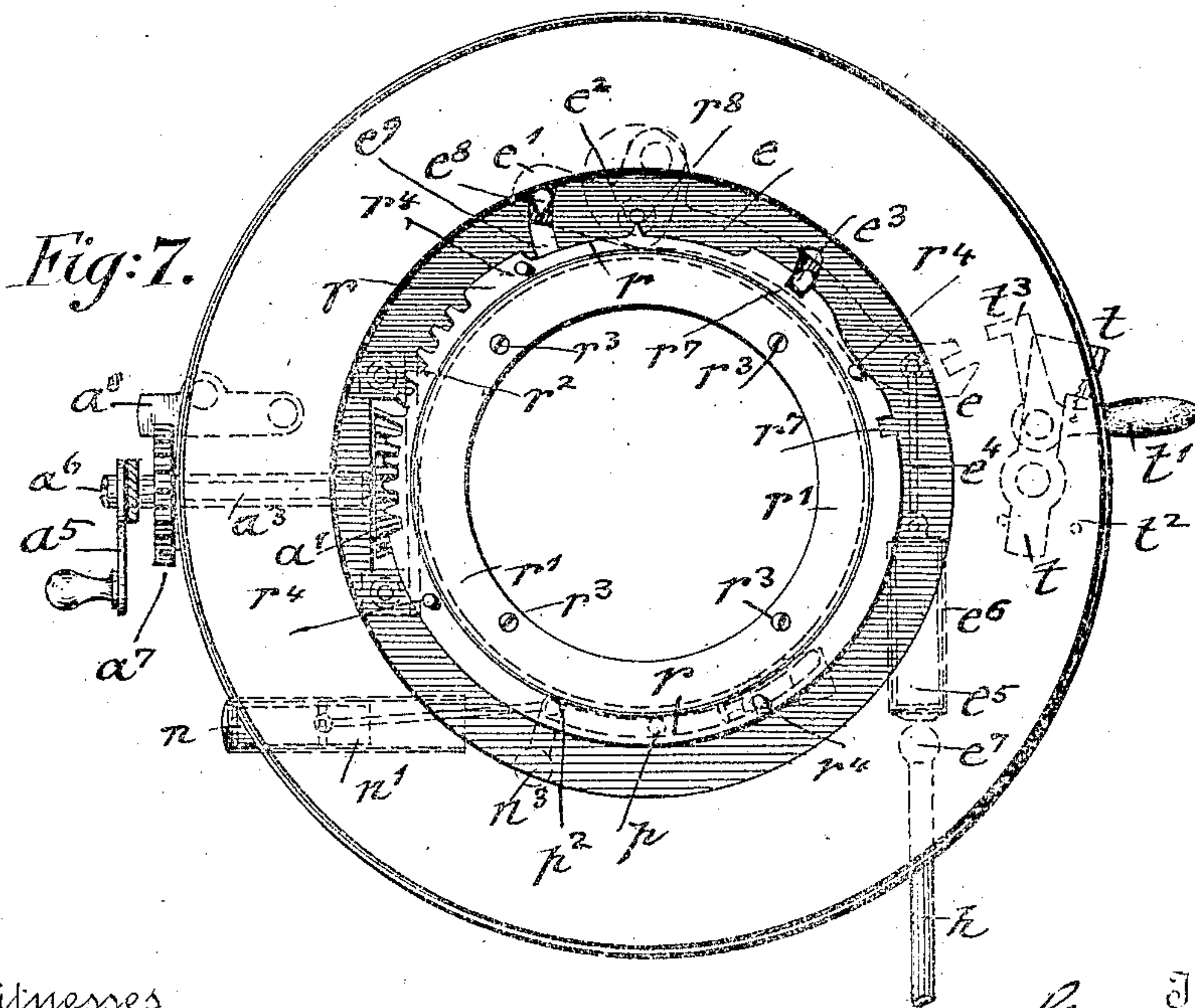
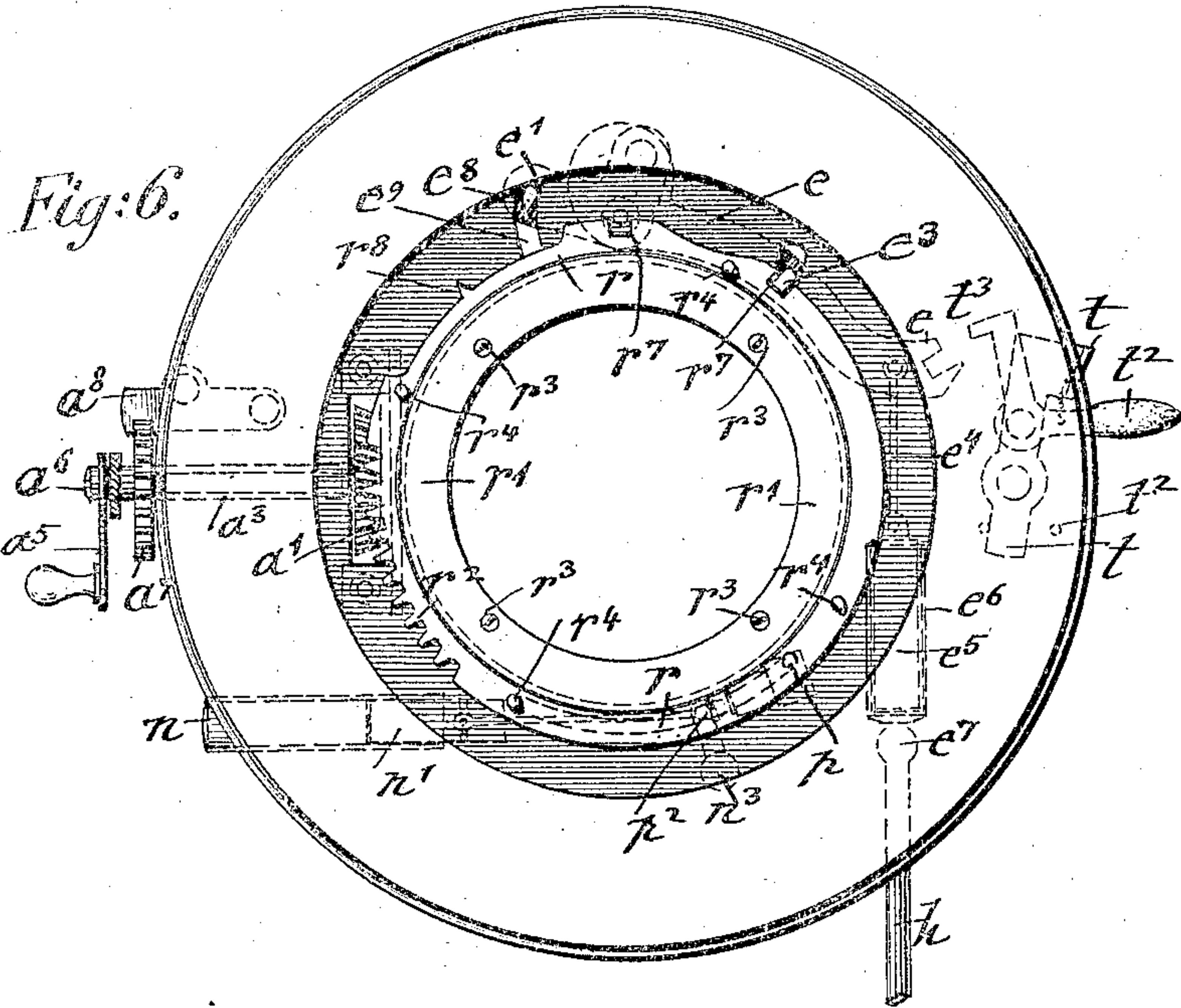


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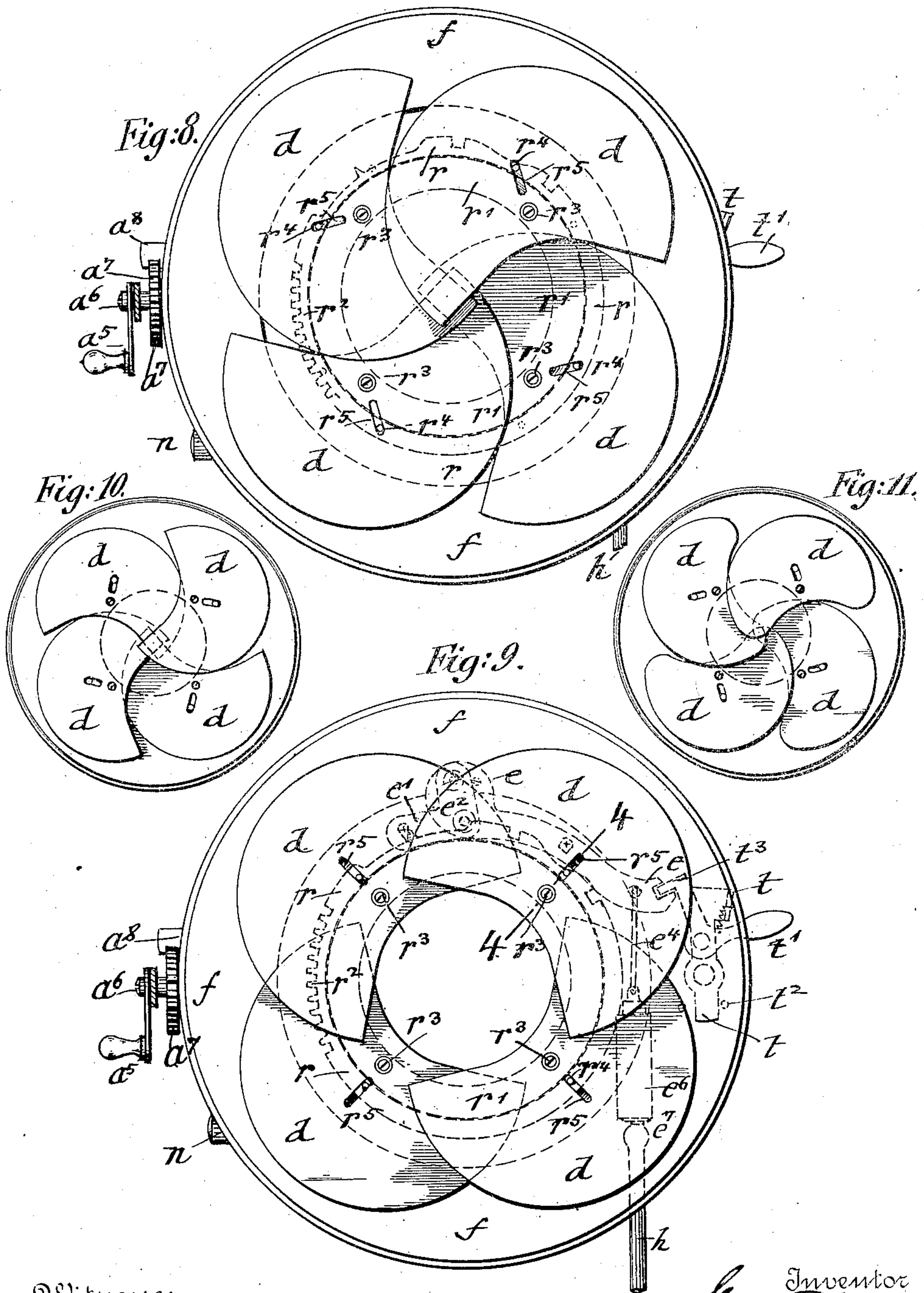


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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

GUSTAV DIETZ, OF YONKERS, NEW YORK.

## PHOTOGRAPHIC SHUTTER.

No. 827,513.

Specification of Letters Patent.

Patented July 31, 1903.

Application filed December 22, 1905. Serial No. 292,989.

*To all whom it may concern:*

Be it known that I, GUSTAV DIETZ, a citizen of the United States, residing in Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Photographic Shutters, of which the following is a specification.

This invention relates to an improved photographic shutter which is intended for all-around use on high-class lenses with small separation, said shutter being adapted to permit the making of fast and slow instantaneous exposures and bulb and time exposures, all the operating mechanism being located on the outside of the shutter, so as to be readily accessible for setting them for the different exposures and permit their convenient control and adjustment; and for this purpose the invention consists of a photographic shutter which comprises a driving mechanism which is set to tension by a hand-crank, an escapement mechanism for the shutter, an air-check for use in making fast exposures, a suction-piston and means for making slow instantaneous exposures, and means for locking the escapement-lever for long-time exposures.

The invention consists, further, in certain details of construction of the different mechanisms referred to, which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a front elevation of my improved photographic shutter. Fig. 2 is a vertical transverse section taken on line 2 2, Fig. 1. Fig. 3 is a detail horizontal section on line 3 3, Fig. 1. Fig. 4 is a detail vertical transverse section through the shutter-operating ring on line 4 4, Fig. 9. Fig. 5 shows in perspective the individual parts for making long-time bulb exposures. Figs. 6 and 7 are rear elevations of the driving mechanism of the shutter, shown, respectively, before and after actuation. Figs. 8, 9, and 10 are also rear views showing the flies, respectively, in primary closed position, in their open position for long-time exposures, and in their secondary closed position; and Fig. 11 shows a modified form of flies.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

Referring to the drawings, *f* represents the ring-shaped case of a so-called "between-

lens shutter." On a stationary ring-frame *r'* of the case is guided a driving-ring *r*. This ring is driven by a driving mechanism which is arranged at one side of the case *f* and which consists of an interior steel axle *a*, which carries at its inner end a bevel gear-wheel *a'*, the projecting end of the axle *a* turning in journal-bearings of a bracket *a<sup>2</sup>*, attached to the ring-shaped case *f*. The steel axle *a* is supported in a brass tube *a<sup>3</sup>*, which is open at the inner end and which is supported at its opposite end in journal-bearings of a bracket *a<sup>4</sup>*. To the outer end of the brass tube *a<sup>3</sup>* a hand-crank *a<sup>5</sup>* is firmly attached by a screw *a<sup>6</sup>*. The brass tube carries adjacent to the bracket *a<sup>4</sup>* an ordinary gear-wheel *a<sup>7</sup>*, which is engaged by a pawl *a<sup>8</sup>*, pivoted to the ring-shaped case of the shutter, so as to act in the nature of a ratchet-wheel, said pawl *a<sup>8</sup>* carrying a handle *a<sup>9</sup>* for permitting the lifting of the pawl out of the teeth of the ratchet-wheel or lowering it into engagement with the same. The hand-crank *a<sup>5</sup>*, and the ratchet-wheel *a<sup>7</sup>* can be turned in either direction. Around the brass tube *a<sup>3</sup>* is arranged a helical spring *b*, which is attached at one end to the bevel gear-wheel *a'* and at its opposite end to the ratchet-wheel *a<sup>7</sup>*, so that when the hand-crank *a<sup>5</sup>* is turned in either direction the helical spring *b* is set to tension or, in other words, power is stored up in the same, which power is used as the driving force for the movement of the shutter-driving ring. As soon as the spring *b* is set to torsional tension the pawl *a<sup>8</sup>* is dropped into the teeth of the ratchet-wheel *a<sup>7</sup>*, so that thereby the pawl-and-ratchet mechanism and the brass tube *a<sup>3</sup>* are locked in position and the full tension of the spring exerted on the bevel gear-wheel and the parts driven thereby as soon as this action is required. The bevel gear-wheel *a'* is placed in mesh with the driving-ring *r*, which is guided around the stationary ring-frame *r'*, to which the lenses are applied. The movable driving-ring *r* is provided for a certain distance of its circumference with teeth *r<sup>2</sup>*, that are in mesh with the bevel gear-wheel *a'*, as shown in Figs. 6 and 7, the toothed portion being of sufficient length so as to permit the required shifting motion to be imparted to the driving-ring *r* in either direction for properly working the shutter. The stationary ring-frame *r'* is provided with four steel pivots *r<sup>3</sup>*, to which the flies *d* of the shutter, of which four are arranged, are ap-



plied, so that they turn on the same. The driving-ring  $r$  has four steel pins  $r^4$ , which engage slots  $r^5$ , arranged in the flies so as to operate the same. The steel pivots are  
 5 evenly spaced around the opening in the shutter-case, so that the flies can turn thereon in either direction for the opening and closing movement.

The flies  $d$  are preferably made of thin  
 10 plates of celluloid, which are increased in thickness at the parts around the pivots  $r^3$  and slots  $r^5$  and cemented to brass bushings  $r^6$  for turning around their pivots  $r^3$ , as shown clearly in Figs. 4, 8, and 9, said thickened or  
 15 reinforced parts giving the flies the required strength for resisting the strain to which they are subjected in starting and stopping.

*The escapement mechanism.*—The driving-ring  $r$  is engaged or released by means of an  
 20 escapement mechanism, which consists of two elbow-levers  $e$   $e'$ , which are both pivoted to a fulcrum-pin  $e^2$  on the upper part of the ring-shaped case  $f$ , the elbow-lever  $e$  being of greater length than the elbow-lever  $e'$ . The  
 25 longer arm of the elbow-lever  $e$  is connected by a pivot-link  $e^4$  with the end of a piston  $e^5$ , that is guided in a stationary cylinder  $e^6$ , which is attached to the ring-shaped case  $f$ . The lower end of the cylinder  $e^6$  is  
 30 provided with a nipple  $e^7$ , to which a rubber hose  $h$  is applied, the opposite end of the rubber hose being connected to the usual air-bulb, by which the piston  $e^5$  is moved in up-  
 35 ward or downward direction, according as the bulb is compressed or relaxed. The elbow-lever  $e$  is provided approximately mid-way of its length with a pin  $e^3$ , which extends through a slot in the ring-shaped case  $f$  and engages one of two recesses  $r^7$  in the driving-  
 40 ring  $r$ . As soon as the bulb is compressed the action of the air moves the piston and elbow-lever  $e$  in upward direction, so that the pin  $e^3$  is moved clear of the recess  $r^7$ , permitting thereby under the influence of the driv-  
 45 ing mechanism the driving-ring  $r$  to move around the stationary guide-frame  $r'$  of the case  $f$  and produce the movement of the flies connected therewith. As soon as the movement of the flies is completed the pin  $e^3$  by  
 50 the weight of the elbow-lever  $e$  and the suction on the piston  $e^5$  drops into the second recess  $r^7$  of the driving-ring  $r$ , so as to lock the same for permitting the setting of the driving mechanism to tension for the next exposure.  
 55 The smaller elbow-lever  $e'$  is provided with a pin  $e^8$  at the end of one arm, said pin moving in a guide-slot  $e^9$  of the ring-shaped shutter-case  $f$ . The upper arm of the elbow-lever  $e'$  is provided with a projecting handle  $e^{10}$ . The  
 60 shorter arm of the elbow-lever  $e$  is located back of the shorter arm of the elbow-lever  $e'$  and provided with two depressions  $e^{11}$ , which are engaged by a tapering point of the handle  $e^{10}$ , so as to permit the setting of the elbow-le-  
 65 ver  $e'$  into raised position, as shown in full

lines in Fig. 1, or into lowered position, as shown in dotted lines in Fig. 1, so as to engage a single tooth  $r^8$  on the driving-ring  $r$  when the flies have made half a movement and arrest the same for holding the flies open  
 70 until the elbow-lever  $e'$  is released from the stop-tooth on the driving-ring and permits the flies to make the remaining movement when time exposure is required. When the elbow-lever  $e'$  is retained in its upper position, it is  
 75 out of operation and permits the flies to be moved for instantaneous exposures. Adjacent to the lower end of the elbow-lever  $e$  is arranged a lever  $t$ , which is fulcrumed to the ring-shaped shutter-case  $f$  and which is lim-  
 80 ited in its movement by two fixed pins  $t^2$  on the case  $f$ . To the lever  $t$  an elbow-lever  $t'$  is fulcrumed above the fulcrum of the elbow-lever  $t$ . One arm of the elbow-lever  $t'$  serves  
 85 as a handle for placing the other arm of the elbow-lever  $t'$  by means of a lug  $t^3$  into engagement with the recessed end of the longer arm of the elbow-lever  $e$ , so as to positively lock  
 90 the same in the position shown in Fig. 9 whenever a long-time exposure is to be made. This is accomplished by moving the lever  $t$  from its position in contact with one stop-pin  
 95  $t^2$  into contact with the other stop-pin  $t^2$ , whereby the lug  $t^3$  is made to engage the recessed end of the lever  $e$ . By a slight pressure on the outer end of the handle of the elbow-lever  $t'$  the lug-shaped end  $t^3$  of the same  
 100 is withdrawn from the recess in the elbow-lever  $e$  when the time exposure is to be terminated, the elbow-levers  $e$   $e'$  being then released and permitted to return by gravity to  
 105 their normal position, (shown in Fig. 1,) while the flies complete their closing movement.

*The air-check.*—The driving-ring  $r$  is pro-  
 105 vided at its lower part with a pin  $p$ , which projects forward through an arc-shaped slot  $f'$  in the shutter-case  $f$  and which serves, in connection with a pneumatic check  $m$ , that is  
 110 arranged on the case, to permit the gradual stopping of the driving-ring  $r$  when high-speed instantaneous exposures are made, so as to diminish the force of the concussions of  
 115 the parts due to sudden stops. The pneumatic check  $m$  is made in any well-known construction and consists, for instance, of a stationary cylinder  $m'$ , provided with a small  
 120 air-escape hole  $m^2$ , a piston  $m^3$  in said cylinder, and a head  $m^4$  at the outer end of the piston, against which the pin  $p$  strikes. The sudden compression of the air in the cylinder,  
 125 which is due to the slow escape of the same through the small hole in the cylinder, produces an air-cushion for the gradual stopping of the pin  $p$  and ring  $r$ . The pin  $p$  is made  
 130 long enough so as to be used as a handle for resetting the shutter after having made an experimental exposure and winding up thereby the motor-spring without turning the hand-  
 135 crank and without changing the tension of



the spring. For very slow instantaneous exposures a stationary cylinder  $n$  is arranged in horizontal position on the shutter-case  $f$ . In this cylinder is guided a piston  $n'$ , which is applied by a perforation in the outer end of its piston-rod  $n^2$  to a second pin  $p^2$  on the driving-ring  $r$ , so as to permit the retardation of the ring speed. The piston-rod  $n^2$  may be detached by its handle  $n^3$  from the pin  $p^2$  when the action of the piston is not required. By the horizontal cylinder  $n$  the motion of the piston is retarded by suction, while in the opposite direction it is retarded by the compression of the air and slow escape of the same through a small air-hole  $n^4$  in the end of the cylinder  $n$ .

In Fig. 11 is shown a slightly-modified construction of the flies, which is used to advantage when speeds of not more than one four-hundredth of a second are desired, as in this case the rounding off of the corners of the flies admits one-third more light during the time of exposure.

It may be desired to cover up some of the operating parts, so as to protect them against dust. In this case they may be placed at the rear of the ring-shaped frame instead of at the front of the same, or a dust-proof cover may be used for the operating parts.

The operation of my improved photographic shutter is as follows: For instantaneous exposures the motor-spring is first set to tension by turning the hand-crank in either direction, after which the pawl is dropped into the ratchet-wheel, so as to hold the motor-spring in a position of tension. When an exposure is to be made, the bulb is compressed and the elbow-lever  $e$  lifted, so that its pin is released from the driving-ring  $r$ , and the motor-spring permitted to act on the same and move it around the guide-ring of the case  $f$ . The power of the motor-spring is transferred by the bevel gear-wheel and teeth of the driving-ring onto the latter, so that the flies are thereby moved from their primary closed position through an instantaneously-open one into their secondary closed position, the exposure being made in the extremely short interval of time for which the flies are open. The ordinary instantaneous exposures are from one seventy-fifth to one five-hundredth of a second, according to the tension which is imparted to the motor-spring. Still quicker exposures may be obtained by increasing the tension of the motor-spring by giving a few additional turns to the hand-crank of the driving mechanism. For slow instantaneous exposures the suction-piston is connected to the pin  $p^2$  and called into action on the release of the elbow-lever  $e$  by the action of the bulb. By the retarding action of the suction mechanism on the driving-ring  $r$  slow instantaneous exposure can be made. When bulb exposures are to be made, the elbow-lever  $e'$  is moved in downward direc-

tion by setting the pin of its handle into engagement with the left-hand depression on the elbow-lever  $e$ , as shown in dotted lines in Fig. 1. The elbow-lever  $e'$  engages then, by its pin  $e^8$ , the single tooth  $r^8$  on the circumference of the driving-ring  $r$  and arrests the flies and holds them in open position for exposure until the bulb is released and the elbow-levers  $e$   $e'$  returned to normal position by the withdrawal of the pin  $e^8$  from the tooth  $r^8$ , so that the driving-ring can complete its movement for closing the flies. For long-time exposures the lever  $t$ , with the elbow-lever  $t'$ , is pushed over into the path of the recessed end of the elbow-lever  $e$ . The bulb is then compressed and the elbow-lever  $e$  lifted by the action of the bulb and intermediate piston, so that the flies are moved into open position. The elbow-lever  $t'$  interlocks then with the recessed end of the elbow-lever, so that the pin  $e^8$  holds the driving-ring  $r$  by engagement with the tooth  $r^8$  on the same. This holds the shutter in open position, so as to permit long-time exposure. When it is desired to terminate the long-time exposure, the handle of the lever  $t'$  is depressed and the latter withdrawn from the end of the elbow-lever  $e$ , so that the driving-ring, with its flies, completes the closing movement.

The advantages of my improved photographic shutter are, first, that the quickest instantaneous exposures can be made down to slow-time exposures, the exposures ranging from one six-hundredth part of a second down to slow-time exposures of one seventy-fifth of a second; secondly, that all exposures are made by a continuous motion of the flies in one direction—that is to say, by the movement of the flies from one closed position into the other—the exposure being made during the instantaneous opening made by the flies as they pass from one closed position to the other; thirdly, that all the operating parts are arranged in front of the shutter-case and readily accessible for operation and inspection, and, fourthly, that the strong and accurate construction of the shutter permits the reliable functioning of all the parts for a considerable length of time without requiring repairs.

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

1. In a photographic shutter, the combination of a plurality of flies, and a driving mechanism, comprising a driving-ring and a motor-spring connected thereto, and adapted to be energized to torsional tension in either direction.

2. In a photographic shutter, the combination of a plurality of flies and a driving mechanism for the same comprising a driving-ring and a helical motor-spring connected thereto, and adapted to be energized to torsional tension in either direction.



3. In a photographic shutter, the combination of a plurality of flies and a driving mechanism for the same comprising a driving-ring and a helical motor-spring connected thereto, and means for imparting variable torsional tension to said spring in either direction.

4. In a photographic shutter, the combination of a plurality of flies and a driving mechanism for the same, comprising a driving-ring and a helical motor-spring, means for imparting torsional tension to the same in either direction, means for holding the motor-spring under torsional tension, and means for transmitting the power, stored in the spring, to the driving-ring.

5. In a photographic shutter, the combination with a stationary guide-ring, a driving-ring and flies, of a driving mechanism for the driving-ring, consisting of a motor-spring, a pawl-and-ratchet mechanism for holding it under tension, and a bevel gear-wheel meshing with a toothed portion of the driving-ring and connected with the motor-spring for imparting rotary movement to the driving-ring.

6. In a photographic shutter, the combination, with a stationary guide-ring, a driving-ring provided with recesses at its circumference, flies pivoted to the guide-ring and connected with the driving-ring, and a driving mechanism, of an escapement mechanism provided with a locking-pin for the driving-ring, said locking-pin being adapted to engage with the recesses on the driving-ring and permit the movement of the flies through a full movement in either direction.

7. In a photographic shutter, the combination, with a stationary guide-ring, a driving-ring guided thereon, flies pivoted to the guide-ring and connected with the driving-ring, and a driving mechanism for the driving-ring, of an escapement mechanism consisting of two elbow-levers fulcrumed to the same pivot, both provided with pins for engaging the driving-ring and means for adjusting the elbow-levers one on the other for permitting instantaneous or bulb exposures.

8. In a photographic shutter, the combination of a driving-ring, provided with recesses and a single tooth at its circumference, and its driving mechanism, of an escapement mechanism composed of two elbow-levers pivoted to the same fulcrum-pin, each elbow-lever being provided with a pin, one for engaging the recesses on the driving-ring and the other for engaging the stop-tooth on the same, and means for setting the smaller elbow-lever on the larger elbow-lever so as to clear or engage the stop-tooth and permit instantaneous or bulb exposures.

9. In a photographic shutter, the combi-

nation, with a driving-ring, its driving mechanism and the flies operated thereby, of an escapement mechanism composed of two elbow-levers pivoted to the same fulcrum-pin, means for adjusting one of the elbow-levers on the other for setting it for time exposures, and means for locking the other elbow-lever for long-time exposures.

10. In a photographic shutter, the combination, with a guide-ring, a driving-ring, its driving mechanism and flies operated by the same, said driving-ring being provided with a projecting pin, of an escapement mechanism for releasing the driving-ring, and a pneumatic check for arresting the driving-ring and neutralizing the concussions of the parts when making instantaneous exposures.

11. In a photographic shutter, the combination of a case provided with an arc-shaped guide-slot, a driving-ring guided on the same, flies operated by the driving-ring, a driving mechanism for the driving-ring, a pin on the driving-ring projecting through the slot in the case, and a pneumatic check for arresting said pin and neutralizing the concussions of the operating parts when making instantaneous exposures.

12. In a photographic shutter, the combination, with a driving-ring, a driving mechanism and flies operated thereby, of an escapement mechanism, and a pneumatic retarding-check connected with the driving-ring and adapted for making slow instantaneous exposures.

13. In a photographic shutter, the combination, with a driving-ring, its driving mechanism and flies operated thereby, of a pneumatic retarding device, and means for connecting the retarding device with the driving-ring or disconnecting it therefrom.

14. In a photographic shutter, the combination of a guide-ring, a driving-ring and driving mechanism for the same, of flies pivoted to the guide-ring and connected with the driving-ring, said flies being reinforced at their pivoted and slotted portions for resisting the strain on the same.

15. In a photographic shutter, the combination of a stationary guide-ring provided with pivots, a driving-ring provided with pins, and flies applied to the pivots of the guide-ring and provided with slots for engagement with the pins on the driving-ring, said flies being reinforced at their slotted portions for resisting the strain on the same.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GUSTAV DIETZ.

Witnesses:

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