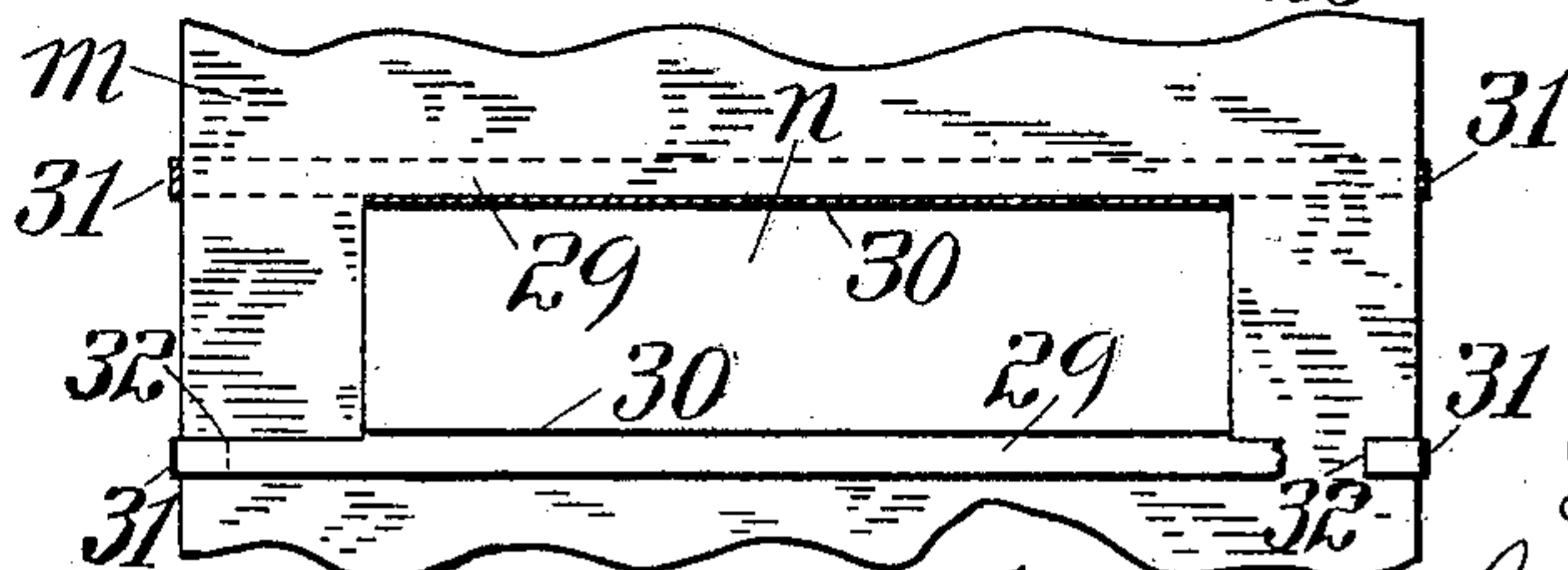
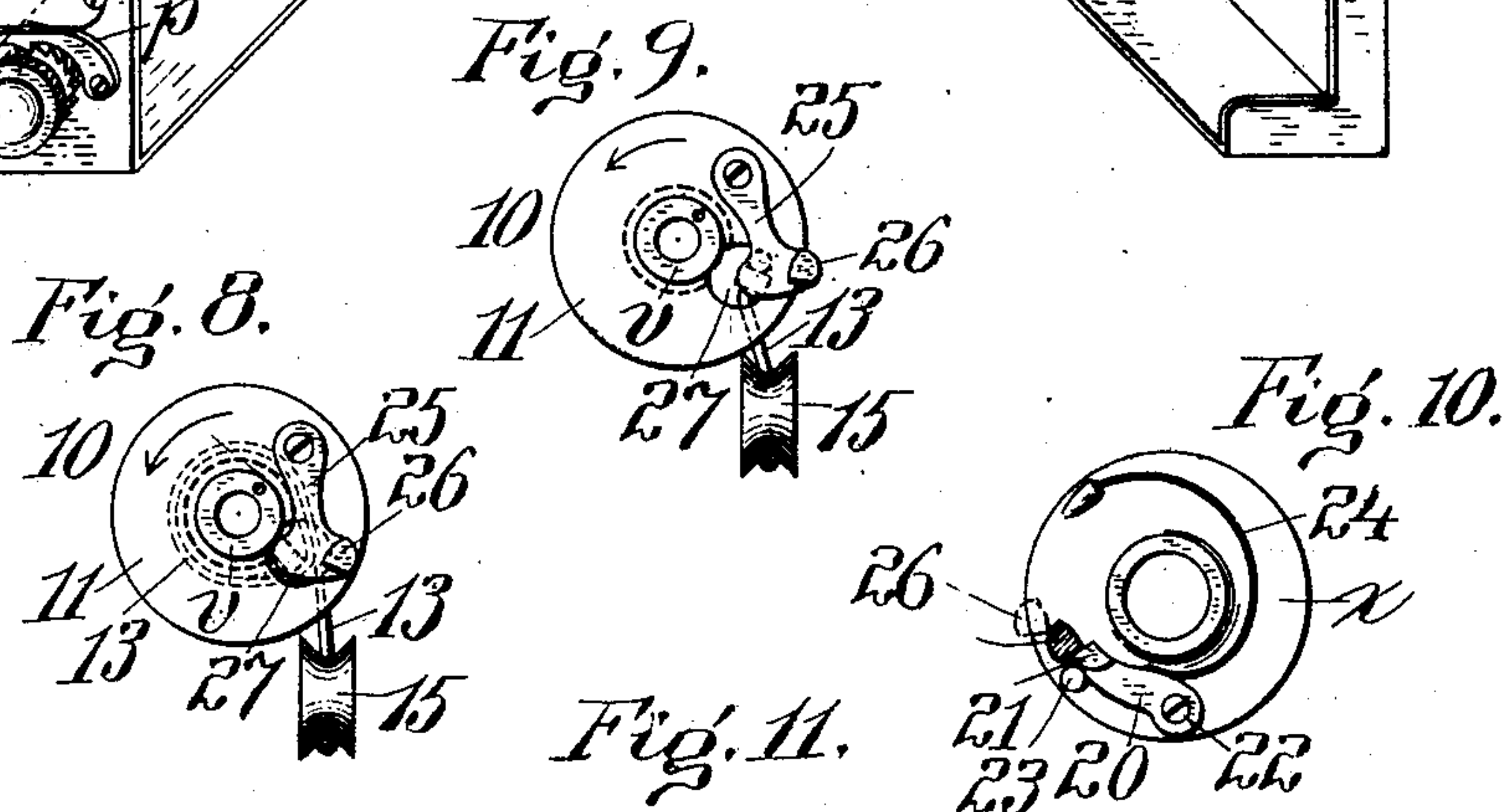
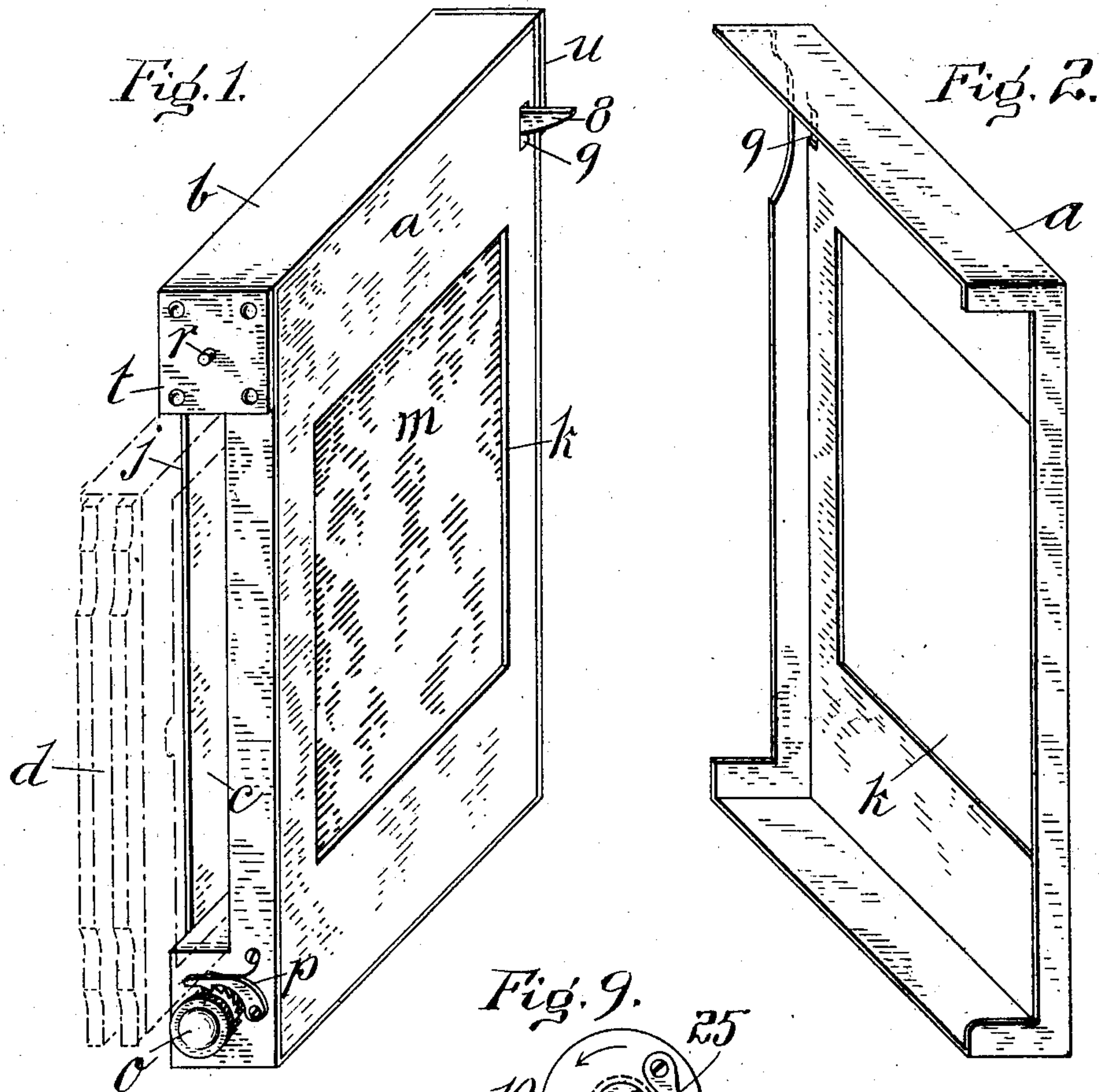


L. BORSUM.  
FOCAL PLANE SHUTTER.  
APPLICATION FILED DEC. 26, 1902.

NO MODEL.

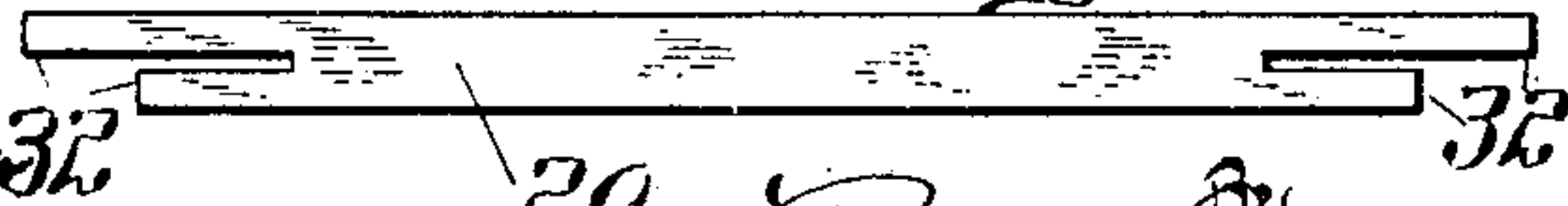
2 SHEETS—SHEET 1.



Witnesses:

Otto Greenberg  
William A. Stahl

Inventor  
Louis Borsum

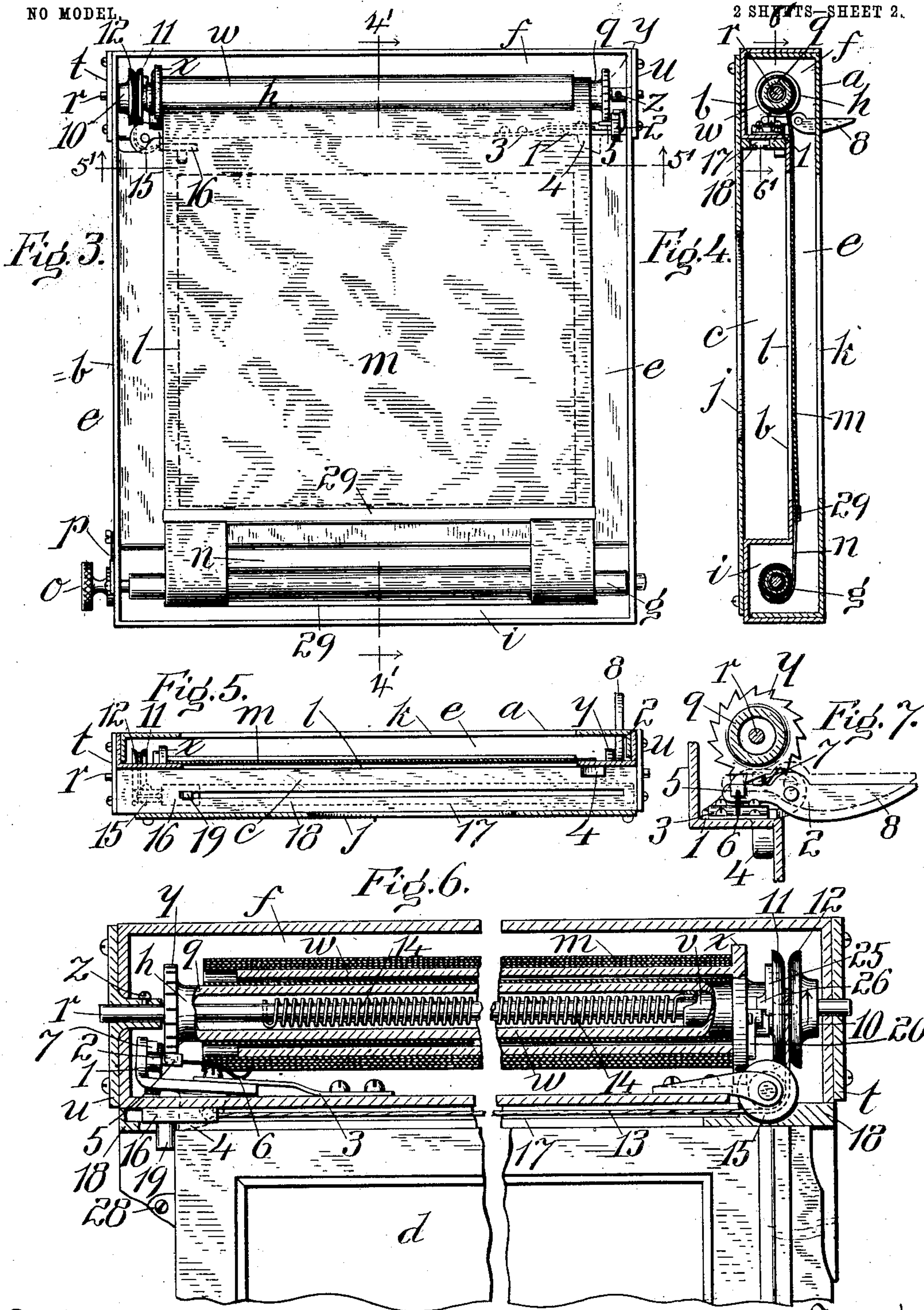


Baldwin & Davidson, Attorneys

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2 SHEETS-SHEET 2.



Witnesses:  
Otto Greenberg  
William A. Stahl

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# UNITED STATES PATENT OFFICE.

LOUIS BORSUM, OF PLAINFIELD, NEW JERSEY.

## FOCAL-PLANE SHUTTER.

SPECIFICATION forming part of Letters Patent No. 741,103, dated October 13, 1903.

Application filed December 26, 1902. Serial No. 136,562. (No model.)

*To all whom it may concern:*

Be it known that I, LOUIS BORSUM, a citizen of the United States, residing at Plainfield, county of Union, State of New Jersey, have  
5 invented certain new and useful Improvements in Focal-Plane Shutters, of which the following is a specification.

The object of this invention is to provide a focal-plane shutter that is automatically  
10 wound by insertion of the plate. This, so far as is known, is broadly new.

The accompanying drawings show one embodiment of the invention that experience has shown to be practical and efficient.

15 Figure 1 is a front isometric view showing in broken lines a partly-inserted plate-holder; Fig. 2, a view of the front wall or section of the casing or shutter-frame; Fig. 3, a front elevation with the front wall removed; Fig.  
20 4, a vertical section on the line 4' 4' of Fig. 3; Fig. 5, a horizontal section viewed from below on the line 5' 5' of Fig. 3; Fig. 6, an enlarged vertical section viewed from the rear on the line 6' 6' of Fig. 4; Fig. 7, an enlarged  
25 detail of the shutter-tripping mechanism. Figs. 8, 9, and 10 are detail views showing the clutch mechanism for winding the shutter; Fig. 11, a detail view, partly in section, showing the shutter-slit and reinforcing-strips  
30 therefor; and Fig. 12, a face view of a blank of one of said strips.

The shutter-frame or casing consists of two sheet-metal members *a b*, one fitting within the other. The main member *b* is struck up  
35 to form a plate-holder space *c* at the rear for the reception of a plate-holder *d*, a shutter-space *e* at the front, and horizontal compartments *f* and *g* at the top and bottom for the winding-roll *h* and spring-roll *i*, respectively.  
40 A sheet-metal plate *j*, secured by screws to the main member *b*, incloses the plate-holder space *c* at its rear. Openings *k* and *l* in the front and rear members *a* and *b* form the exposure-opening.

45 The shutter *m* is attached at its upper edge to the winding-roll *h* and at its lower edge to the spring-roll *i*, provided with the usual milled thumb-wheel *o* and ratchet and pawl *p*.

The winding-roll *h* consists of three main  
50 parts—a hollow cylinder *q*, to which the shutter *m* is attached, a shaft *r*, supported at its ends in plates *u f* and secured against rota-

tion by a set-screw *z*, fitted in a hub projecting from plate *u*, and a shutter-winding mechanism. The rotatable hollow cylinder *q* has  
55 a bearing at one end on the shaft *r* and at the other on a hub *v* of the winding mechanism, through which the shaft passes. The shutter *m* is secured to the cylinder *q* by a loop passing around the cylinder and within  
60 a slotted tube *w*, fixed at one end to a flange *x* near one end of the cylinder, at the other end of which is a ratchet *y*, that coöperates with a tripping mechanism. The tripping mechanism consists of a pawl *2*, pivotally  
65 mounted on the upturned end of a carrier *1*, movably secured to the frame *b* beneath the ratchet-wheel *y* by a plate-spring *3*, acting normally to hold the carrier down, so that the tooth *5* of the pawl will not engage  
70 the ratchet-wheel. On the carrier is a cam-lug *4*, projecting through a slot in the casing into the plate-holder chamber and which when moved upwardly by the edge of the plate-holder *d* when the latter is inserted carries the  
75 tooth *5* of the pawl into engagement with the ratchet-wheel. A hair-spring *6*, applied to the pawl-tooth *5*, presses the pawl against a stop *7* on the upturned portion of the carrier. The end *8* of the pawl projects through a slot *9* in  
80 the front wall *a* and may be thrown upwardly in any appropriate way to trip the pawl. On the other end of shaft *r* is a reel *10*, rotatable in either direction and having the elongated  
85 hub *v* and guide flanges or checks *11* and *12*, between which a cord *13* is wound. Within the hollow cylinder *q* and secured at one end to the shaft *r* and at the other to the hub *v* is a coiled spring *14*, permanently under tension, tending to revolve the reel in the direc-  
90 tion indicated by the arrow, Fig. 8. The free end of the cord *13* after passing over a pulley *15* is secured to a slide *16*, movable in a guide *17*, formed by the wall of the frame *b* and a metal strip *18*. A lug *19* on the slide  
95 projects downwardly through a slot in the strip *18* into the path of the plate-holder, by which it is pushed to the other end of the slot, unwinding the cord from the reel and rotating it against the tension of spring *14*.  
100

The flange *x* of the cylinder *q* and the guide-check *11* are provided with clutch mechanism. (Shown in detail in Figs. 6, 8, 9, and 10.) A dog *20*, pivoted at *22* on the



side of flange  $\alpha$ , has lateral lug 21 at its end, that is held against a stop 23 on the flange by a spring 24. Another dog 25 is pivoted on the adjacent face of the cheek-piece 11 and is provided with a lateral lug 26.

The cord 13 is secured to a projection on the dog 25, which plays in an aperture 27 in the cheek-piece 11 and acts as a stop to the motion of the dog, which is controlled by the cord, which holds it in either of two positions. When the cord is wound around the reel, the dog is forced toward the hub  $v$ , when the lug 21 of dog 20 is in its path, Figs. 8 and 10, and when the cord has been unwound its strain upon the dog throws it, with its lug 26, into the outer position. (Indicated in Figs. 9 and 10.) It is obvious from the construction of the dog 20 and its lug 21 that the latter will yield and permit lug 26 to pass when the reel is turned in the direction for winding, as indicated by the arrow.

The parts of the apparatus are normally in the positions shown in Fig. 3. The curtain is down, the cord wound upon the reel by reaction of spring 14, the slide 16 19 is at the entrance side of the plate-holder chamber, and the tripping mechanism disengaged from the ratchet  $\gamma$ . On inserting the plate-holder its upper corner engages the slide-lug 19, and as the plate-holder is advanced the cord 13 is unwound from and revolves the reel in the direction opposite to that indicated by the arrow, Fig. 8. The lugs 26 21 of the clutch-dogs will engage, and the roll  $h$  will be revolved to wind the shutter. The cord is of such length that when the plate-holder  $d$  reaches its fully-inserted position against a stop 28 the reel will be entirely unwound, and the strain of the cord will pull the dog 25 outward, Fig. 9, so that it will pass lug 21 without engaging it. Just previous to this movement of dog 25, however, and when the plate-holder is not yet in its fully-inserted position the frame of the plate-holder will reach the lug 4 and raise the carrier 1, so that the detent-pawl 2 will engage the ratchet  $\gamma$ , and roll  $h$  will be prevented from revolving to permit unwinding of the shutter. When the plate-holder is fully inserted and a plate ready for exposure, the pawl 2 may be actuated by any suitable means acting upon its projecting end 8 to trip the shutter. When the plate-holder is withdrawn, the reaction of spring 14 returns all parts to normal position. (Shown in Fig. 3.) Expulsion of the plate-holder by reaction of spring 14 may be prevented by any suitable latch or means. The drawings show the entrance edge of the plate-holder chamber bent inward at 33 to impose such friction upon the holder as to retain it in place. The frictional grip of the cam-lug 4, however, has been found quite sufficient to retain the plate-holder in position.

The shutter-slit is formed by cutting an

aperture in the continuous shutter  $m$  and reinforcing the upper and lower edges by applying thereto metal strips 29, (shown in Fig. 12), formed at the ends with tongues 32 of unequal length. The strip is folded at the middle 30 and bent and clamped at the ends 31 over and against the body of the shutter, so that the ends of tongues 32 will meet on the same side of the shutter, where they may be soldered, if desired. This affords a flat shutter not liable to wrinkles or other distortion.

I claim as my invention—

1. A focal-plane shutter combined with means whereby it is automatically wound on insertion of the plate-holder.

2. The combination with a focal-plane shutter and its winding and spring rolls, of a reel mounted at one end of the winding-roll, a cord wound upon the reel, a spring interposed between the reel and roll, clutch devices also interposed between the reel and roll and operated by the cord, a slide to which the free end of the cord is attached and which is adapted to be moved by the plate-holder longitudinally of the roll to wind the shutter thereon, roll detent devices actuated to engage the roll when the plate-holder has been inserted, and means for tripping the detent devices.

3. A focal-plane shutter combined with means for automatically winding it on insertion of the plate-holder, which means comprise a cord attached at one end to a slide adapted to be moved by the plate-holder when inserted, a reel on which the cord is, a clutch-dog mounted on the reel and to which the other end of the cord is attached, a cooperating clutch-dog mounted on the shutter-winding roll and a spring interposed between the reel and roll, the operation being substantially as set forth.

4. A focal-plane shutter combined with means for automatically winding it on the insertion of the plate-holder, in combination with the detent-ratchet of the roll, its detent-pawl, a movable support on which the pawl is mounted adapted to be moved when the plate-holder is inserted and to thereby carry the pawl into engagement with the ratchet, and means for at will tripping the pawl to release the shutter.

5. A focal-plane shutter combined with means for automatically winding the shutter on insertion of the plate-holder, and detent devices for holding the shutter-winding roll when the shutter is wound thereon and tripping it when an exposure is to be made.

In testimony whereof I have hereunto subscribed my name.

LOUIS BORSUM.

Witnesses:

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WILLIAM A. STAHLIN.