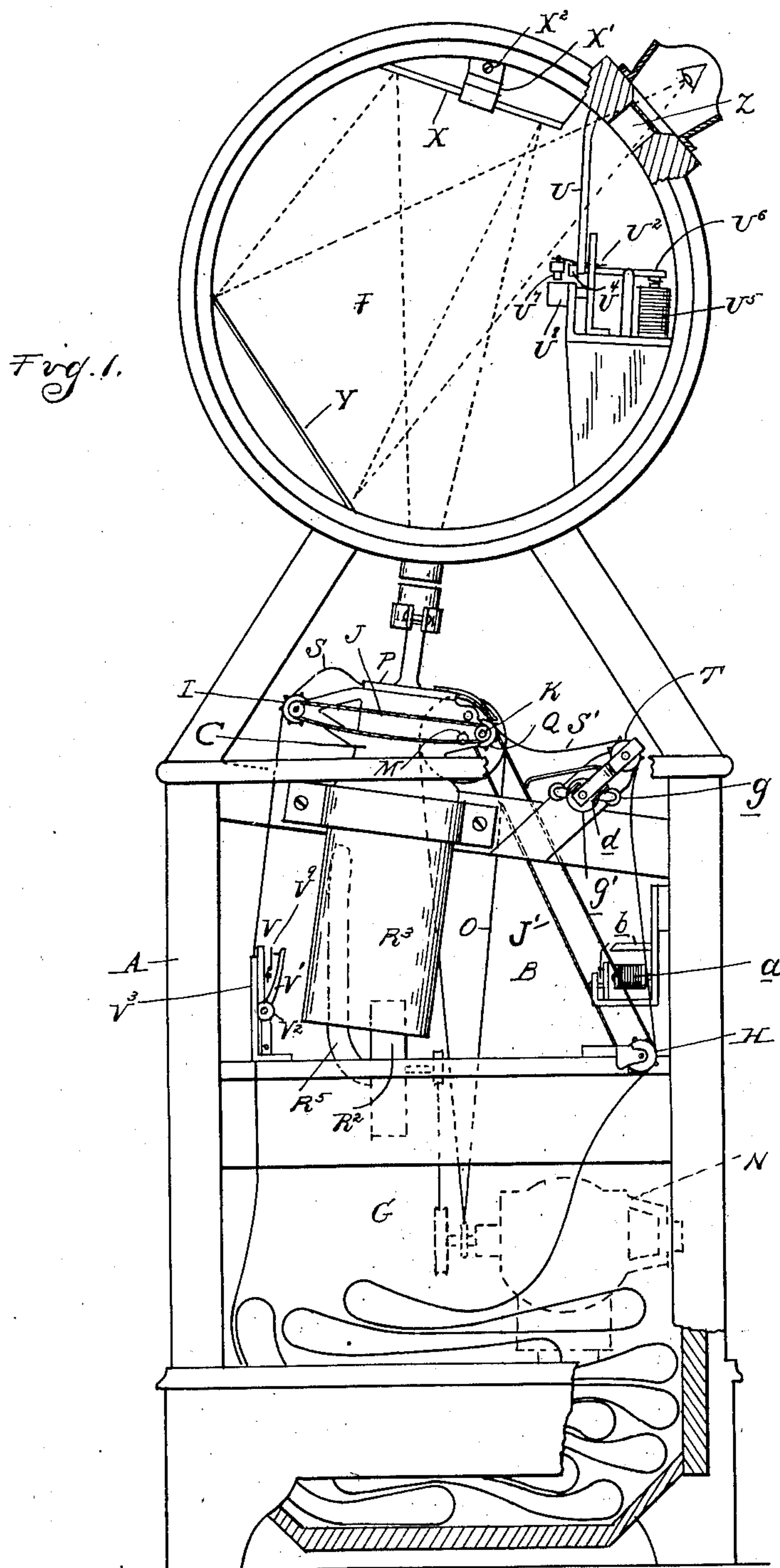


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 APPARATUS FOR EXHIBITING MOVING PICTURES.  
 APPLICATION FILED JUNE 28, 1905.

929,678.

Patented Aug. 3, 1909.

3 SHEETS—SHEET 1.



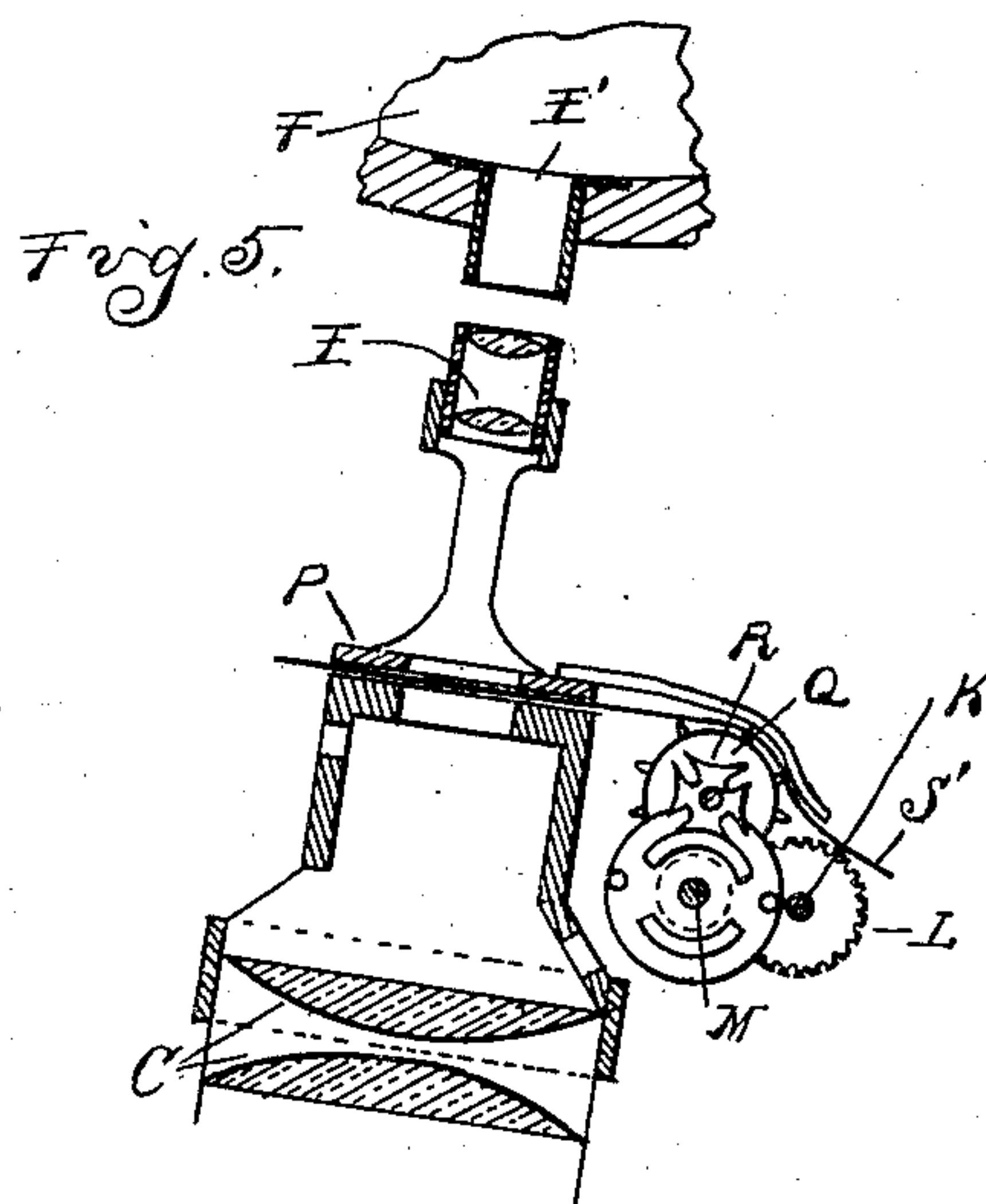
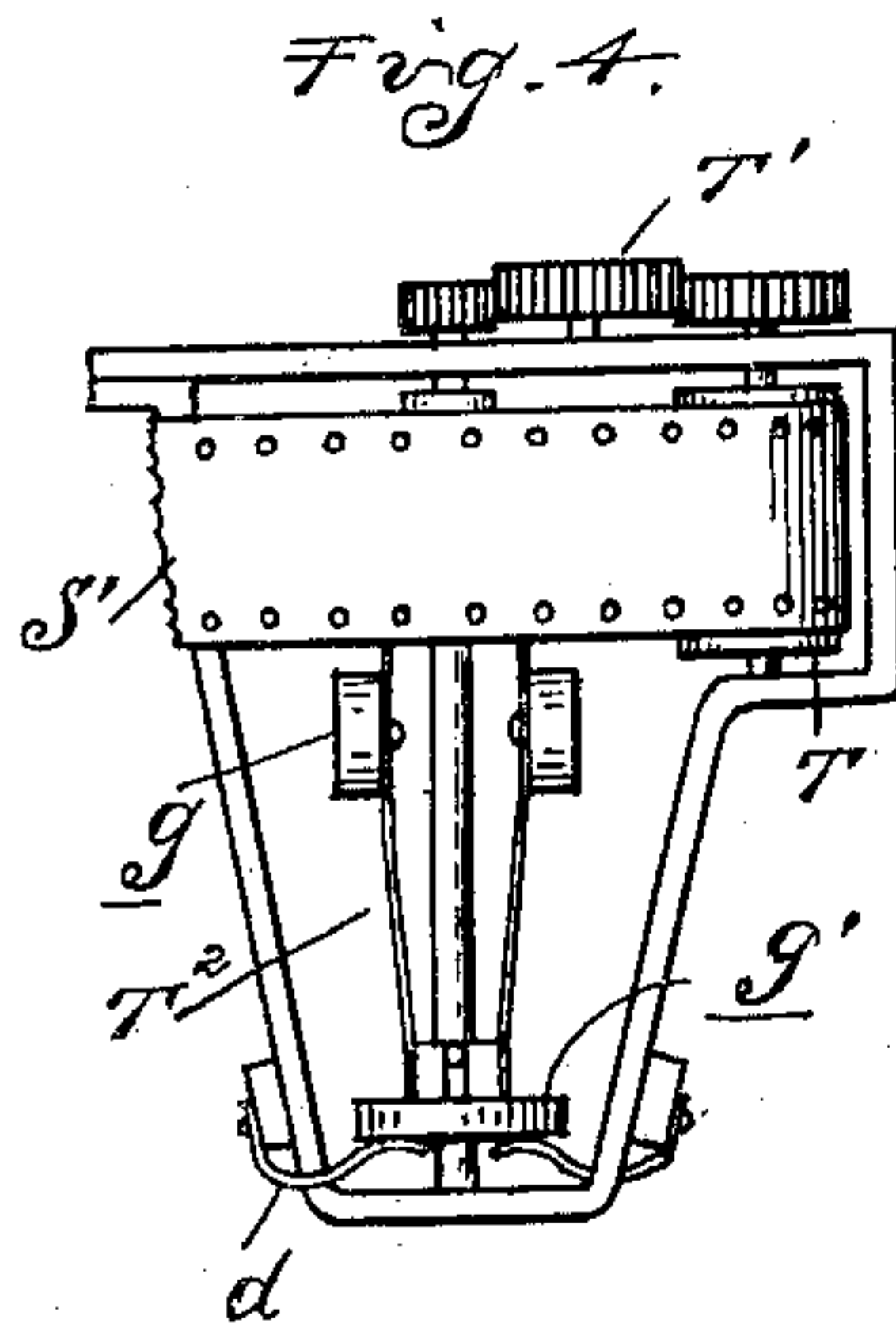
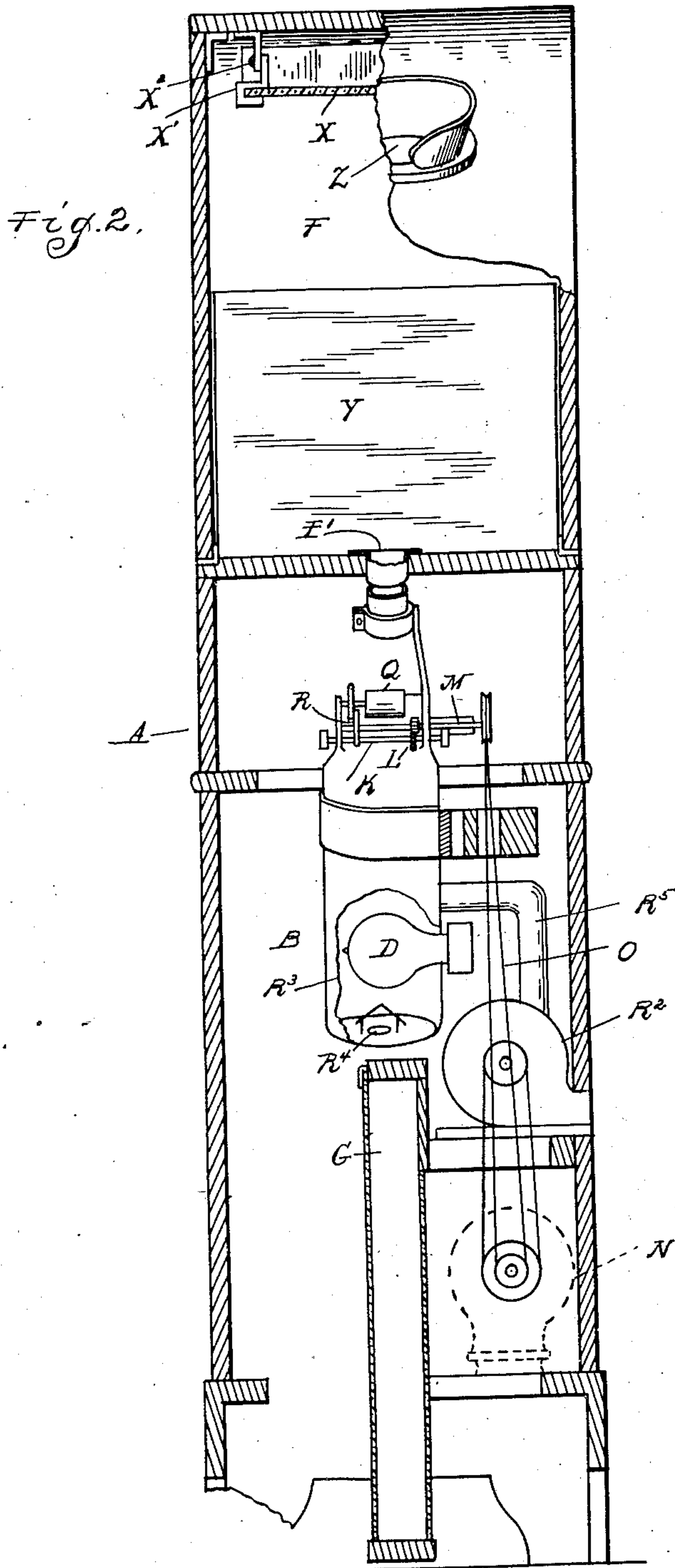
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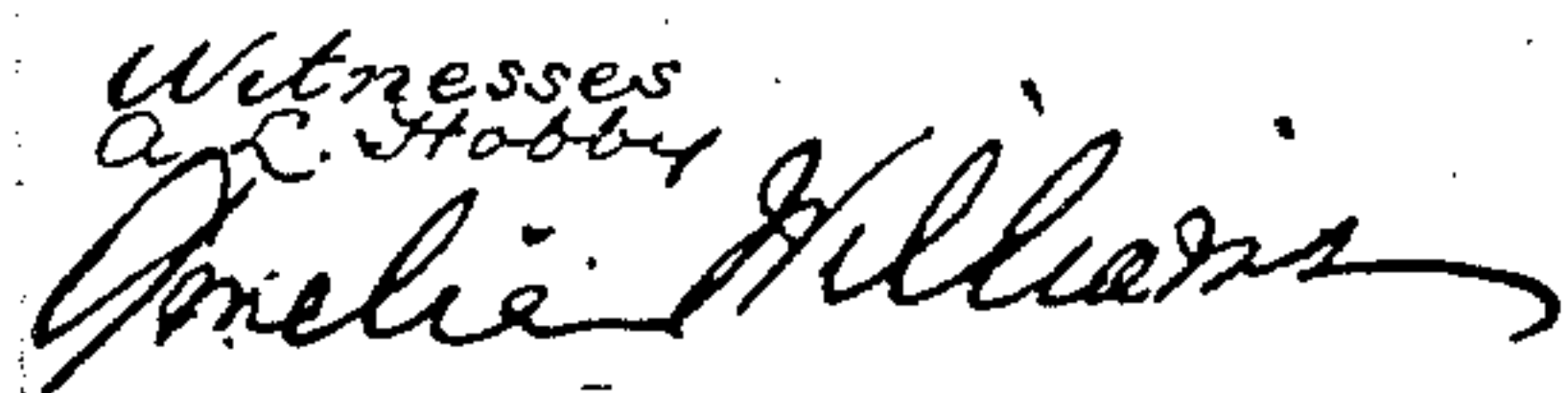


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# UNITED STATES PATENT OFFICE.

JOSEPH E. LOCKWOOD, OF DETROIT, MICHIGAN.

## APPARATUS FOR EXHIBITING MOVING PICTURES.

No. 929,678.

Specification of Letters Patent.

Patented Aug. 3, 1909.

Application filed June 28, 1905. Serial No. 287,429.

*To all whom it may concern:*

Be it known that I, JOSEPH E. LOCKWOOD, residing at Detroit, in the county of Wayne and State of Michigan, a citizen of the United States, have invented certain new and useful Improvements in Apparatus for Exhibiting Moving Pictures, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to apparatus for exhibiting moving pictures, and has for its object the obtaining of a compact arrangement of mechanism adapted to be placed in a relatively small cabinet, and at the same time to exhibit a relatively large picture; further to effectually guard against ignition of the photographic film by the heat of the lamp; and further in the peculiar construction, arrangement and combination of parts as hereinafter set forth.

In the drawings, Figure 1 is a side elevation of the cabinet with the panels removed to show the mechanism therein; Fig. 2 is a vertical section through the cabinet, taken in a plane at right angles to Fig. 1; Fig. 3 is a diagram of the electrical circuits, illustrating in perspective the coin-controlled starting mechanism, the film-controlled stopping mechanism, and the governing mechanism for controlling the illumination of the film; Fig. 4 is a plan of the lamp-circuit-controlling governor; Fig. 5 is a section through the light-condensing and picture-projecting lenses.

The apparatus is of that type in which a series of pictures successively exhibited are formed on the endless film which in the operation of the device is intermittently actuated to register with the objective lens.

It is a primary object of the invention to obtain as large a picture as possible and at the same time to restrict the dimensions of the cabinet containing the apparatus so as to occupy a comparatively small floor and wall space; furthermore it is particularly desirable to limit the width of the cabinet, as machines of this character are usually arranged side by side and consequently the narrower the cabinet, the greater the number of machines that can be placed in an exhibition room. These objects I have attained in the present construction, first, by

an arrangement in which the picture rays projected from the film are caused to practically double upon their course before reaching the screen; second by an arrangement of the observation opening so that the picture upon the screen is viewed across the path of the rays passing from the projector to the screen; third by the arrangement of a dark chamber in which the screen is located above that portion of the cabinet containing the film actuating mechanism and the projector, so as to utilize the height of the cabinet in place of increasing the width to obtain the necessary length of path for the rays; finally, by an arrangement in which the endless film, the projector and the path of the projected rays are all arranged in symmetrical relation to a common central vertical plane. The width of the cabinet may be considerably reduced over the dimension of depth, which, as has been above stated, is a desired object.

The film upon which the pictures are printed is usually formed of celluloid which is highly inflammable and in order to obtain a good picture, a highly concentrated light is focused upon this film. Thus the heat rays, which are concentrated as well as the light would quickly ignite the film if any one portion of it were permitted to remain in the path of the light. This danger I have guarded against by providing means for automatically controlling the light so as to prevent it from illuminating, excepting when the speed of the film is above a predetermined safe limit.

Another feature of my invention is the construction by which the endless film is relieved from strain due to intermittent feeding. This comprises a storage box having parallel side walls but slightly farther apart than the width of the film, together with feed rolls for continuously feeding the film into and out from opposite ends of said box and at a perfectly uniform speed. The interval of rest for the exhibition of each picture is provided intermittently by feeding a small portion of the film intermediate the two constant feed mechanisms, while expansion loops on opposite sides of this intermittently fed portion give and take from the constant feed.

In detailed construction, A is the cabinet,



within which is arranged the chamber B containing the light condenser C, lamp D and object lens E. Above this chamber B is a dark chamber F, which is preferably of substantially cylindrical shape, the light orifice being formed in the lower wall thereof and in registration with the object lens.

G is the storage box for the endless film which is arranged below the chamber B within the cabinet. The film passes downward into this box from the right hand side of Fig. 1 and is fed out and upward at the left hand side thereof.

H is a feed roll or sprocket which is located adjacent to the box G and feeds the film therinto, and I is a similar sprocket for drawing the film out from the box, the latter wheel being arranged adjacent to the casing of the condenser C. These two wheels H and I are, during the operation of the apparatus, driven at a constant and uniform speed through the medium of sprocket chains J, J', connecting them to a common shaft K. This shaft in turn is driven through the medium of gear wheels L from a shaft M which is connected to a motor N by a suitable drive connection O. Between the feed wheels I and H the film passes across the path of the light through guides P.

Q is a feed wheel which is intermittently actuated from the shaft M by suitable mechanism such as the star wheel or "Geneva movement" R. Thus whenever the motor is running, the film will be constantly fed into and out from the box G and the small portion of the film between the light and projector lens will be intermittently operated to successively arrest the pictures in registration with the lens.

S is a loop in the film between the feed wheel I and guide P, and S' is a similar loop between the guide P and the portion of the film leading to the feed wheel H. These loops are of sufficient size to compensate for the change from the uniform to the intermittent feed.

Between the loop S' and the feed wheel H, the film is passed over a feed wheel T which is connected with a gear train T' operating a centrifugal governor T<sup>2</sup>. This governor controls, as will be hereinafter described, an electric switch by means of which the current for the electric lamp D is supplied or cut out. Inasmuch as the wheel T is driven solely through the medium of the film, it is obvious that any breakage in the film or stoppage due to any cause will arrest said wheel and thereby arrest movement of the governor. The arrangement is such that when the governor is not running or is running at too low a speed, the electric lamp will be cut out of circuit, so as to prevent heating of the film across the path of its rays.

The machine is preferably coin-controlled and to this end is provided with starting and

stopping mechanism of the following construction:—

U is a coin chute, U' is a pivotal latch having an arm thereof extending in the path of the coin chute and adapted to be rocked by the impact of the coin.

U<sup>2</sup> is a switch arm which is normally locked by the latch U' but when released closes with a contact U<sup>4</sup>, thereby closing an electric circuit. This circuit leads from the switch U<sup>2</sup> to the motor N and also includes in series therewith the electro-magnet *a* which controls a switch *b*.

*c* is a shunt about the coils of the magnet *a* which includes a switch *d* controlled by the governor T<sup>2</sup>, this switch being normally closed when the governor is stationary or running below the required speed. The switch *b* controls a branch electric circuit *e* which includes the lamp D, and the arrangement is such that when the shunt *c* is closed and the switch *b* consequently opened, no current is supplied to the lamp D when the motor circuit is established. As soon, however, as the shunt *c* is opened by the action of the governor, the magnet *a* will be energized, closing the switch *b* and sending current through the branch *e* so as to illuminate the lamp D.

With the construction as just described, it will be understood that the motor is started and consequently the film is driven whenever a coin is inserted in the chute U and actuates the latch U' as has been described.

To stop the film after it has completed its circuit, mechanism is provided of the following construction:—

V is an electric switch, the movable member V' of which carries an anti-friction roll V<sup>2</sup>.

V<sup>3</sup> is a guide through which the picture film passes and which is cut away at V<sup>4</sup> to permit the roll V<sup>2</sup> to bear against the film. The distance between the movable and stationary contacts of the switch V is such that a movement of the roll V<sup>2</sup> equal to the thickness of the film will cause the closing of the switch and this is accomplished at the completion of the circuit of the film by slotting the latter as at V<sup>5</sup>. Thus when the slot V<sup>5</sup> passes the roll V<sup>2</sup>, the contact V' is permitted to close with the stationary contact of the switch and thereby close an electric circuit. This electric circuit is a branch of the main circuit including the coils of an electro-magnet U<sup>5</sup> which when energized actuates an armature U<sup>6</sup> upon the contact arm U<sup>2</sup> and restores the latter to its open position where it is locked by the reengagement of the latch U'. The branch circuit *f* for the magnet U<sup>5</sup> includes, in addition to the switch V, a suitable resistance such as *f*'.

In order to facilitate the engagement of the film with the guide V<sup>3</sup>, the latter is preferably formed in two hinged sections, which are normally held together by a spring latch V<sup>6</sup>.



The contact arm  $V'$  is actuated by a suitable spring such as  $V^7$  and the distance between the contacts may be accurately adjusted by suitable means such as the adjusting screw  $V^8$  engaging the stationary contact member  $V^9$ .

As has been stated, the light from the object lens passes through an orifice in the bottom of the chamber  $F$ . At the top of this chamber and directly in the path of the light is arranged a mirror  $X$ , which is secured to a bracket  $X'$ , preferably by the screw  $X^2$  which permits of a slight rotary adjustment. The angle at which this mirror is set is such as to reflect the light downward against a screen  $Y$  which is arranged within the dark chamber  $F$  on one side thereof, preferably adjacent to the light orifice  $E'$ . Diametrically opposite this screen  $Y$  is an observation opening  $Z$  through which the picture thrown on the screen may be viewed. As shown, the arrangement is such that the light entering through the orifice  $E'$  first passes completely across the dark chamber  $F$  and is then reflected back to the screen  $Y$  by the mirror  $X$  so that the length of the rays and consequently the size of the picture is considerably increased. It will be further observed that reflected light from the screen, in passing to the observation opening  $Z$ , crosses the path of the light passing from the orifice  $E'$  to the mirror  $X$ . Thus the comparatively small space within the dark chamber  $F$  is utilized to its fullest extent in obtaining a large picture and proper viewing distance therefor.

In the complete operation of the machine, the coin is first inserted in the chute  $U$  which trips the latch  $U'$ , causing the switch  $U^2$  to close the circuit. This closes the electric circuit through the motor  $N$ , which immediately starts and communicates motion through the connection  $O$  to the shaft  $M$  and from the latter to the shaft  $K$  and sprocket chains  $J, J'$ , which drive the feed wheels  $H$  and  $I$  at constant and uniform speed. At the same time, the star wheel  $R$  communicates intermittent movement to the feed wheel  $Q$  which feeds the portion of the film between the loops  $S, S'$ , by a step by step movement. The portion of the film which is drawn by the feed wheel  $H$  communicates movement to the wheel  $T$ , gear train  $T'$  and governor  $T^2$  and as soon as the motor has attained its normal speed, the operation of this governor in throwing outward the weights  $g$  will withdraw the contact disk  $g'$  from the contacts  $d$  and will break the shunt  $c$ . This will energize the magnet  $a$  which will close the switch  $b$  and cause the illumination of the lamp  $D$ . To provide time for the operation of this mechanism and the throwing on of the light, a blank portion is arranged in the film intermediate the opposite ends of the picture portion, and before this blank portion

is passed the light will be thrown thereon. In the following operation the individual pictures will be successively registered with the light opening until the entire series has passed.

As soon as the blank portion of the film is again reached, the slot  $V^5$  will come into registration with the roller contact  $V^2$ , permitting the movement of the contact arm  $V'$  to close the switch  $V$  which, as already described, energizes the magnet  $U^5$ , restoring the contact arm  $U^2$  to its initial position where the motor circuit is opened, while the reengagement of the latch  $U'$  with said contact arm will hold the circuit open. The slot  $V^5$  is made very short and as the motor is not stopped instantaneously the film is rotated far enough by the inertia of the motor to move the slot out of engagement with the roller  $V^2$ , thereby raising the contact arm  $V'$  and opening the switch. To avoid burning of the metallic contacts on the switch arm  $U^2$  and contact  $U^4$ , a pair of auxiliary carbon contacts  $U^7, U^8$ , are provided which remain in contact until after the separation of the metallic members, thus avoiding arcing between the latter.

From the operation of the governor  $T^2$  as described, it will be understood that the light  $D$  is not turned on until the film has attained its normal operating speed, and the velocity at which the film travels is such that the concentrated heat and light rays cannot produce any material heating of the film. If, however, a break in the film should cause the stoppage of that portion opposite the light orifice, this will simultaneously stop the governor, closing the shunt  $c$  and re-energizing the magnet  $a$  so that the switch  $b$  will be opened and the current cut out from the lamp  $D$ . To further guard against the possibility of igniting the inflammable film, I have provided a ventilating apparatus by means of which the air heated by the lamp and in the projector is withdrawn and discharged from the cabinet. As shown, this comprises a rotary fan  $R^2$  driven by the motor and which is connected to the casing  $R^3$  surrounding the lamp and containing the light condenser. The lower portion of this casing is provided with a light-trapped air inlet orifice  $R^4$  and the fan is connected with a conduit  $R^5$  for discharging the hot air out of the cabinet. Thus the temperature within the chamber  $B$  is prevented from rising to the danger point.

It is to be observed that the arrangement of the parts of the apparatus is such that practically all of the mechanism is within the intermediate chamber  $B$ , being arranged above the film storage chamber and beneath the dark chamber. Space is economized in this arrangement by reason of the fact that the lamp and light condenser are contained within the loop of the endless film



extending from the points of feeding in and out of the storage chamber. It is further to be observed that by projecting the picture rays upward to the reflector, returning them downward to the screen at one side of the projector, and then observing them from the opposite side, the height and depth of the cabinet is utilized, while the width may be diminished to the width of the screen.

10 What I claim as my invention is:—

1. In an apparatus for exhibiting pictures, the combination with means for projecting divergent picture light rays, of a dark chamber across which the path of said rays extends, a reflector for returning the rays across said dark chamber, and a screen opposite said reflector upon which the picture is thrown, said dark chamber having an observation opening on the opposite side thereof from said screen.

2. In an apparatus for exhibiting pictures, the combination with means for projecting divergent picture light rays, of a dark chamber across which the path of said rays extends, a reflector for returning the said rays across said dark chamber and a screen opposite to said reflector and adjacent to the starting point of said rays upon which the picture is thrown, said chamber having an observation opening upon the opposite side thereof, through which the picture may be viewed across the path of the unreflected rays.

3. In an apparatus for exhibiting pictures, the combination with means for projecting divergent picture light rays, of a dark chamber having an orifice therein through which said light rays are projected, a reflector diametrically opposite said orifice for returning the light rays across said chamber and a screen opposite said reflector and at one side of said light orifice, upon which the picture is thrown, said dark chamber having an observation opening diametrically opposite said screen and on the opposite side of the light orifice for the entering rays, whereby the picture is viewed across the path of the unreflected rays.

4. In an apparatus for exhibiting moving pictures, the combination with a source of light and a condenser therefor, of means for moving a picture film across the path of the concentrated light, and speed controlled means in the path of the film and actuated thereby for controlling the source of light.

55 5. In an apparatus for exhibiting moving pictures, the combination with a source of light, of means for moving a picture film across the path of the light and speed controlled means in the path of the film and actuated thereby for controlling the source of light.

6. In an apparatus for exhibiting moving pictures, the combination with a source of light, of means for moving a picture film

across the path of the light, and means actuated by said film for automatically cutting in said light upon the movement of the film at a predetermined velocity and for cutting out the light upon the dropping of the velocity below the limit predetermined.

7. In an apparatus for exhibiting moving pictures, the combination with a source of light, of means for moving a picture film across the path of the light, means actuated by the movement of the film for controlling the movement of said film, and a governor controlling said electric circuit actuated by the movement of said film.

8. In an apparatus for exhibiting moving pictures, the combination with a light, of mechanism actuated by the movement of a picture film, a circuit closer controlled by the speed of said mechanism, and an electric circuit controlled by said circuit closer and controlling the cutting in and the cutting out of said light.

9. In an apparatus for exhibiting moving pictures, the combination with a source of light, of mechanism for feeding a portion of a picture film at normally constant speed, mechanism actuated by the constantly moving portion of said film, an electric circuit controlling the cutting in and the cutting out of said light, and a circuit closer for said circuit controlled by the speed of said mechanism actuated by said film.

10. In an apparatus for exhibiting moving pictures, the combination with an electric light, of an electric motor for feeding a picture film, circuits for said motor and lamp in multiple, a circuit closer for said lamp circuit, an electro-magnet for closing said lamp circuit closer in series with said motor circuit, a shunt around said magnet, and means operated by said film for opening said shunt when said film is traveling at a predetermined velocity and for closing the shunt when said velocity is not maintained.

11. In an apparatus for exhibiting moving pictures, the combination with an electric lamp, of an electric motor for actuating a picture film, electric circuits for said lamp and motor in multiple, a circuit closer common to both the motor and lamp circuit, a circuit closer for said lamp circuit, an electro-magnet in the main circuit for operating said lamp circuit closer, and timing mechanism actuated by said motor adapted in its operation to open said circuit closer for the main circuit.

12. In an apparatus for exhibiting moving pictures, the combination with an electric lamp, of an electric motor for feeding a picture film across the path of the light, electric circuits for said lamp and motor in multiple, a circuit closer common to said motor and lamp circuits, a latch for holding said circuit closer normally open, means for tripping said



latch to permit of the automatic closing of said circuit closer, a circuit closer for the lamp circuit, an electro-magnet in the main circuit for operating said lamp circuit closer, and timing mechanism actuated by said motor adapted during its operation to reopen said circuit closer and reengage the same with said latch.

13. In an apparatus for exhibiting moving pictures the combination with a cabinet, of a chamber therein in which the unused portion of a film is stacked, a superposed chamber having a loop of the film therein from a point of entrance to the point of leaving the storage chamber, film actuating mechanism within the superposed chamber, a lamp and light condenser arranged within said loop, and a projector for directing the picture rays upward, a superposed dark chamber into which the projected rays pass, a reflector for returning the rays, and a screen upon which the picture is cast within said dark chamber.

14. In an apparatus for exhibiting moving pictures, the combination with a cabinet containing the picture film and its actuating mechanism, of a lamp and condenser within said cabinet, an inclosing casing, and mechanically-driven means for ventilating said cabinet.

15. In an apparatus for exhibiting moving pictures, the combination with a cabinet having a picture film therein, of a lamp and condenser within said cabinet, an inclosing casing for said lamp and condenser, and means for ejecting the heated air within said casing to without the cabinet.

16. In an apparatus for exhibiting moving pictures, the combination with a cabinet having a picture film therein, of a light and a light condenser therein, an inclosing casing for said lamp and condenser, and a rotary fan for withdrawing the heated air from said casing and discharging it without said cabinet.

17. In an apparatus for exhibiting pictures, the combination with means for projecting divergent picture light rays, of a dark chamber across which the path of the rays extends, a reflector for returning the rays across the chamber, and a screen on an oppo-

site side of said chamber from said reflector and upon which the picture is thrown.

18. In an apparatus for exhibiting moving pictures, a cabinet having a compartment containing the film-actuating and light-projecting apparatus, and a superposed dark chamber into which the picture rays are projected and containing the picture screen.

19. In an apparatus for exhibiting moving pictures, a cabinet containing a chamber for the mechanism and a superposed dark chamber, a light and condenser and a projector arranged within the lower chamber and adapted to project the picture rays upwardly into the dark chamber, a reflector for returning the rays within the dark chamber, and a screen upon which the picture is cast, said dark chamber having an observation opening on the opposite side thereof from said screen.

20. The combination of a projector, a speed controlled governor connected therewith, a contact connected with said governor and opened and closed by variations in the speed thereof, and an electric lamp in communication with said contact and controllable thereby for illuminating said projector.

21. The combination of a lamp, a picture projector provided with a movable film and with means for actuating said film, and a mechanism including a speed governor connected with said means and controllable by movements thereof for extinguishing said lamp.

22. The combination of a picture projector provided with means for supporting a movable film, a governor connected with said projector and having a speed related to that of said film, a lamp for illuminating said film, and means controllable by the speed of said governor for extinguishing said lamp whenever the speed of said film drops below a predetermined limit.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH E. LOCKWOOD.

Witnesses:

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JAMES P. BARRY.