J. T. WELLS.

MACHINE FOR TAKING, PRINTING, AND PROJECTING MOTION PICTURES.

APPLICATION FILED OCT. 5, 1914.

1,165,146.

Patented Dec. 21, 1915.

5 SHEETS—SHEET 1.

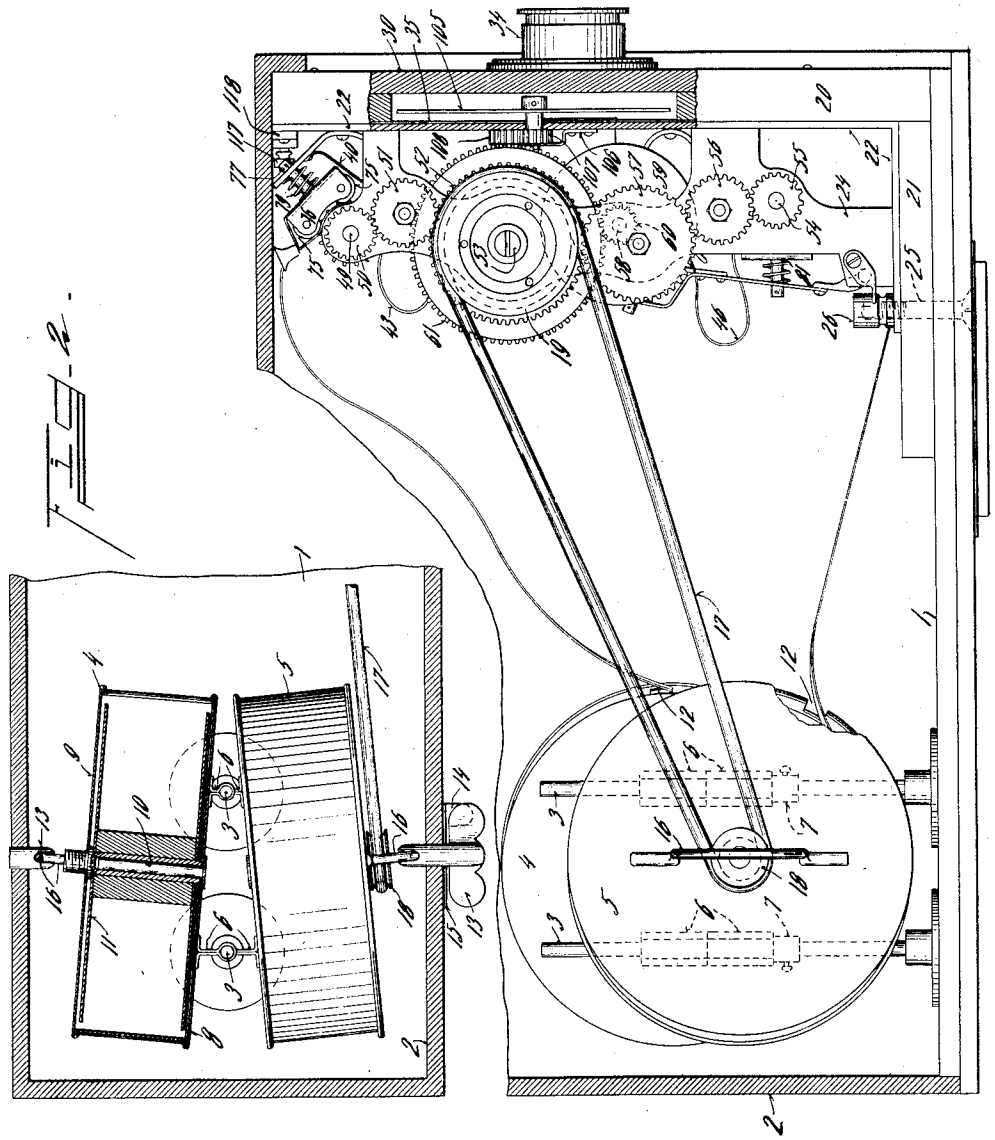


Fig. 2.

Fig. 1.

Witnesses

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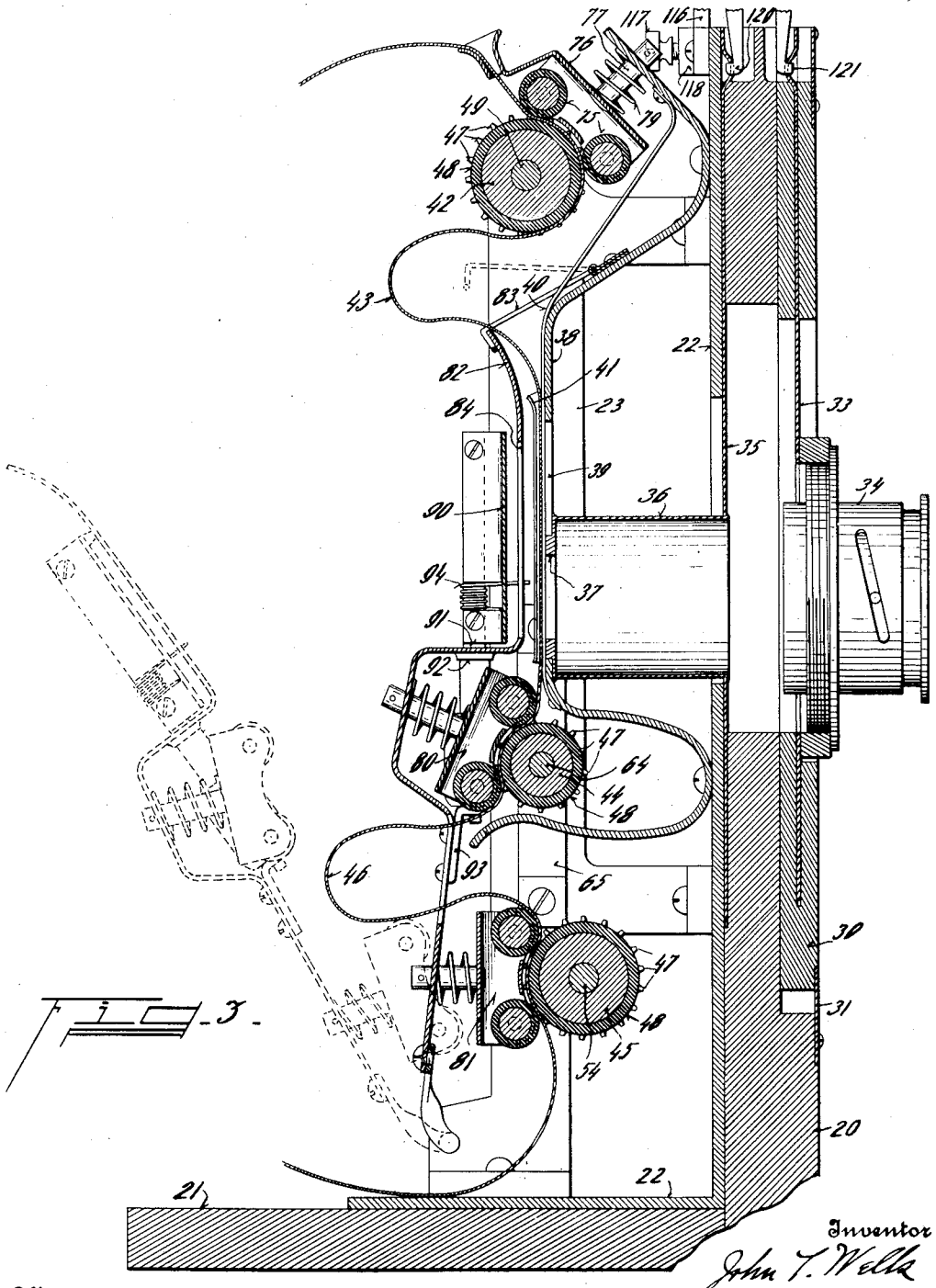


Fig. 3.

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5 SHEETS—SHEET 3.

FIG. 4.

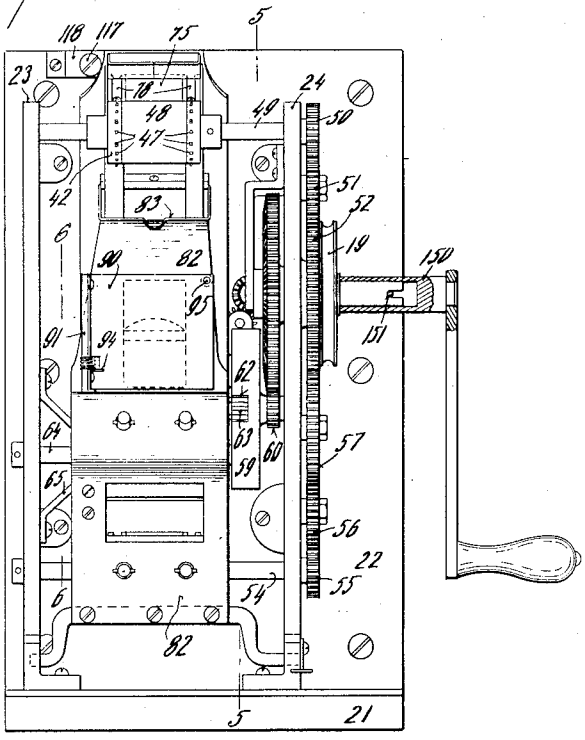
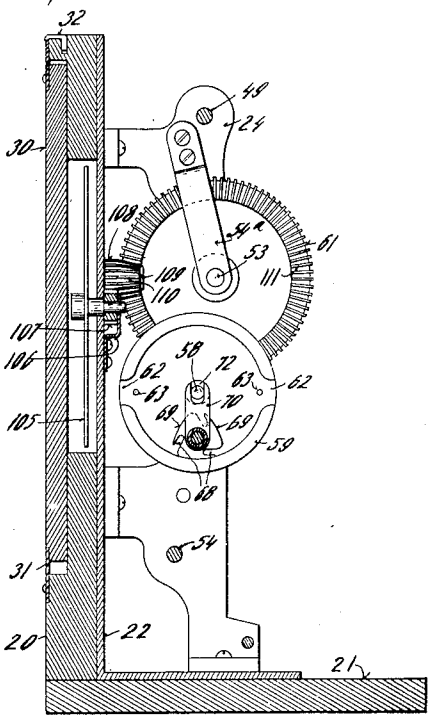


FIG. 5.



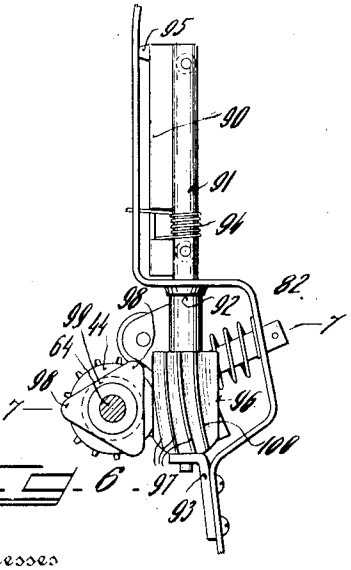


FIG. 6.

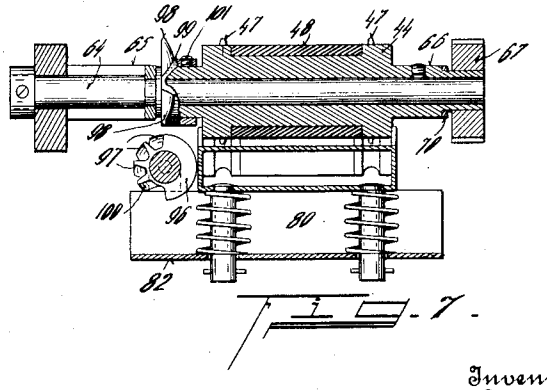


FIG. 7.

Witnesses

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5 SHEETS—SHEET 4.

Fig. 8.

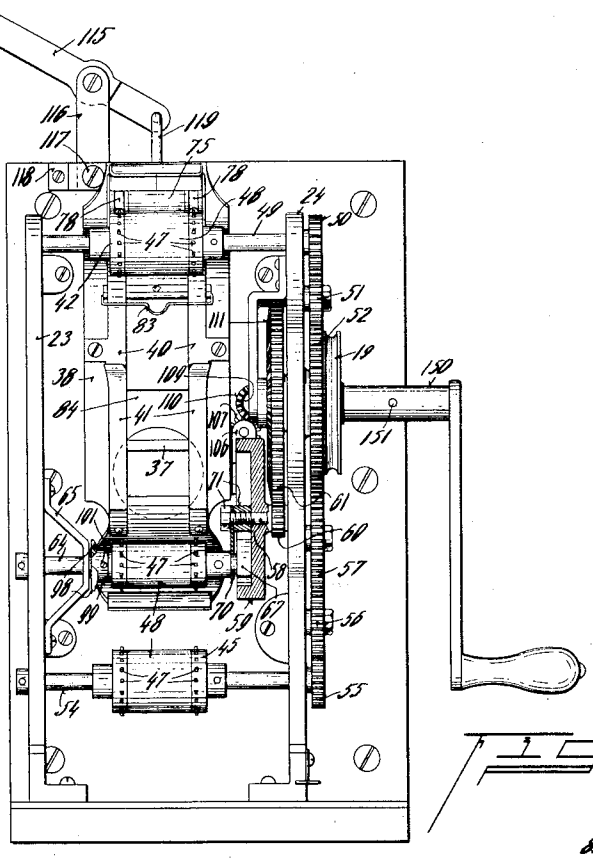


Fig. 9.

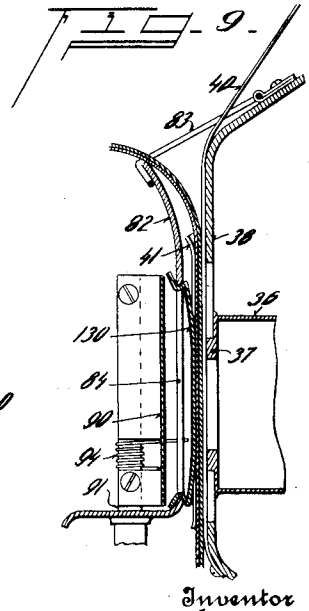


Fig. 11.

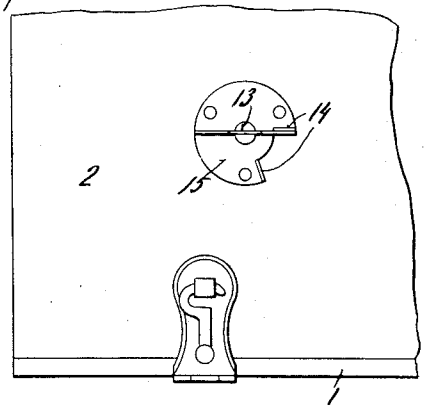
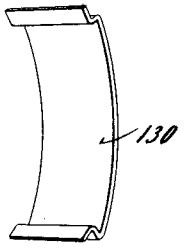


Fig. 10.



Witnesses

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5 SHEETS—SHEET 5.

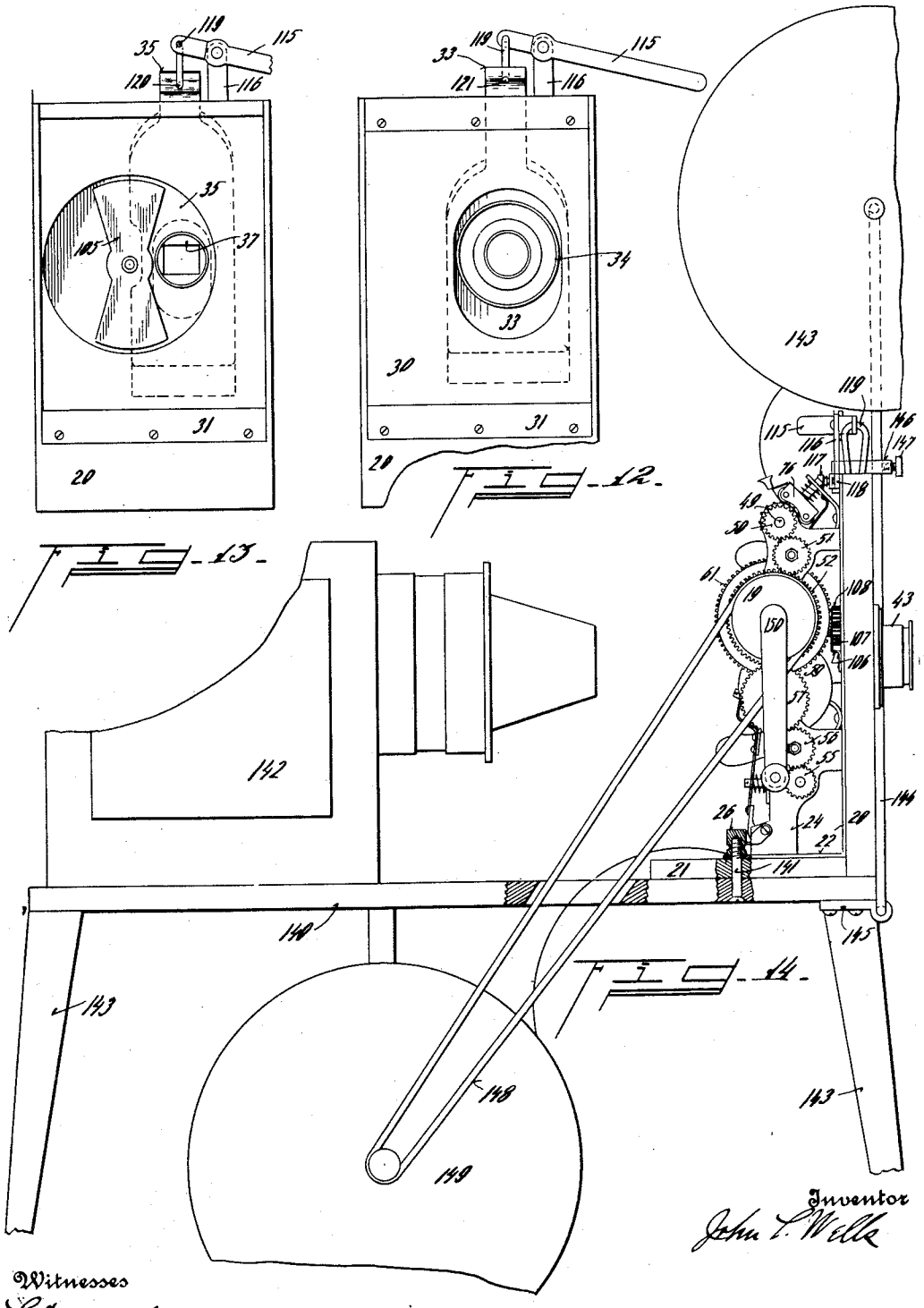


FIG. 12.

FIG. 13.

FIG. 14.

Witnesses

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UNITED STATES PATENT OFFICE.

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MACHINE FOR TAKING, PRINTING, AND PROJECTING MOTION-PICTURES.

1,165,146. Specification of Letters Patent. Patented Dec. 21, 1915.

Application filed October 5, 1914. Serial No. 865,129.

To all whom it may concern:

Be it known that I, JOHN T. WELLS, a citizen of the United States, and residing at Newport, in the county of Campbell and State of Kentucky, have invented a new and useful Improvement in Machines for Taking, Printing, and Projecting Motion-Pictures, of which the following specification is a full disclosure.

My invention relates to moving-picture machines especially designed for use in taking, printing and exhibiting animated pictures and has more particular relation to that class of machines wherein a single film feeding and light controlling mechanism is combined in a unitary structure and removably mounted to facilitate its use in connection with other devices in the accomplishment of the three separate operations.

The features of this invention are more fully set forth in the description of the accompanying drawings, forming a part of this specification, in which:—

Figure 1 is a side elevation, partly in section, of my improved camera. Fig. 2 is a top plan view, partly in section, of one end thereof showing the film magazines. Fig. 3 is a vertical section through the center of the removable unitary structure comprising the film feeding and light controlling mechanisms. Fig. 4 is a rear elevation thereof. Fig. 5 is a section on line 5—5, Fig. 4. Fig. 6 is a detail section on line 6—6, Fig. 4, showing the operating means for the fire-shutter. Fig. 7 is a plan section on line 7—7, Fig. 6. Fig. 8 is a rear elevation, partly in section, with the back plate removed. Fig. 9 is a central vertical section of the upper portion of the back plate and adjacent parts, showing the resilient printing plate in place. Fig. 10 is a perspective view of the printing-plate. Fig. 11 is a detail view of the part of the camera-box, showing the magazine operating key. Fig. 12 is a front elevation, showing the means for elevating the lens-tube and focal-tube. Fig. 13 is a front elevation with the lens-board removed and showing the light shutter. Fig. 14 is a side elevation of a projecting table with the unitary film and light controlling unit attached thereto and ready for use as a projecting machine.

The camera-box consists of a base 1, and a box-like cover 2 secured thereto by suitable latches, one of which is shown in Fig. 11. Centrally disposed on the rear portion of said base are a pair of uprights 3, which serve as supports for the reel magazines 4, 5. These magazines are provided with pairs of eye brackets 6, adapted to be threaded over the uprights 3, the brackets of the magazine 5 resting on collars 7, and the brackets of magazine 4, resting on brackets of magazine 5, as shown in Fig. 1. Each magazine is composed of two telescoping sections 8, 9, the section 8 having a spindle 10, which supports the film reel 11. It will be noted that the rear eye brackets 6 are longer than the forward brackets, thereby causing the line of film feed to converge toward the forward medial portion of the camera. Each of the sections 8, 9, is apertured peripherally, and when the machine is ready for operation, these apertures register to provide film openings 12, but when the magazines are to be removed from the camera, these openings must be closed by partially rotating the section 9, to destroy said registry of the apertures. This is accomplished from the exterior of the camera by a key 13, (see Figs. 2 and 11), which is limited in its movements by stop projections 14, formed on a plate 15, secured to the camera and through which said key passes. This key has a bifurcated inner end which engages a bail 16, secured to the magazine section 9. Of course it will be understood, by referring to Fig. 2, that there is one of such keys for each magazine, and that the magazines are of the same construction, and, therefore, interchangeable.

As shown, the magazine 4 contains the supply reel and the magazine 5 the rewind reel, which is driven by a belt 17, leading from a belt pulley 19 on the power shaft of the machine to a pulley 18 screw threaded on the end of the film reel spindle.

The film and light controlling unit or interchangeable head is positioned on the forward end of the base 1, its frame work consisting of a front board 20, a base-board 21, and a lining plate 22, to which two side frames 23, 24, supporting the film feeding mechanism, are secured, and this frame extends in a vertical plane parallel with and only slightly separated from the lens-board, with which it is unitarily mounted. For clamping said unit to the camera base 1, I provide said base with a pair of bolts 25, extending upwardly therefrom and which register with holes bored through the base-

board 20 and lining plate 22 of said unit, the unit being clamped by thumb nuts 26.

As shown in Figs. 3, 5, the lens-holder 30 is detachably retained within a recess in the front board 20, by a retaining plate 31, and a catch 32, and contains a vertically adjustable lens-plate 33, supporting the lens-tube 34. A vertically adjustable focal-tube plate 35 is mounted in the front board near the lining plate 22 and carries a focal-tube 36, which projects rearwardly through an elongated aperture in said lining plate and terminates with a framing plate 37. The member adjustably supporting these lens and focal tubes, may be conveniently regarded as a lens-board unit carrying the light controlling provision. The light shutter operates between the spaced ends of the axially alined lens and focal tubes, interior of the camera board. The film guide plate 38, (see Fig. 3), is of an elongated double S formation, having an intermediate straight portion provided with an elongated opening or film light exposure aperture 39, in which is disposed the framing plate 37 mounted on the inner end of focal-tube 36. This guide plate is secured to the lining-plate 22 and serves as a support for other parts as will be described.

To guide and laterally support the film in its travel past the focal exposure, I provide two sheet metal strips 40 secured to the guide plate 38, one on each side of the opening 39, and having inturned edges 41 forming guide channels.

The film in its travel through the machine is first engaged by a constantly driven feed roller 42, which serves to replenish the film loop 43 initially manually formed, during the threading of the film into the machine. The film is next intermittently fed through the guide channels and past the focal exposure provision, by an intermittently operated roller 44. The constantly driven roller 45 serves as a "take-up" roller and between said roller and the roller 44, is another, initially manually formed film loop 46. These film loops relieve the film of any excessive feeding strains and by reason thereof an even tension of the film past the focal plane is obtained.

The feed rollers are provided near their marginal ends with sprocket teeth 47, adapted to engage in perforations in the marginal edges of the film and between said sprocket teeth the rollers are surfaced with rubber, as indicated by the reference numeral 48, to insure a positive feed of the film in case the perforations in said film are mutilated. The feed roller 42 is secured to a shaft 49 journaled in the side frames and which on the outer side of the side frame carries a gear 50, in mesh with an idler 51, driven by a gear 52 secured to the power shaft 53. Said power shaft is journaled in the side frame 24 and is supported at its inner end by a bracket 54, secured to said side frame, see Figs. 1, 4 and 8. The "take-up" roller 45 is secured to a shaft 54, journaled in the side frames and provided with a gear 55, which, through the idlers 56, 57, is in driving connection with the gear 52. Loosely mounted on a stud shaft 58, secured to the side frame 24, is a cupped disk 59, to which is secured a pinion 60, in mesh with the peripheral teeth 61 of a double faced gear secured to the power shaft. The disk 59 has its rim cut away at diametrically opposite sides, as at 62, and is provided with two operating pins 63. The intermittent feed roller 44 is secured to shaft 64, which is journaled at one end in the side frame 23, and in a bracket 65 secured thereto. Said roller has an elongated hub 66, to which is secured a triangular shaped operating wheel 67, which is preferably made of fiber to make its operation noiseless. As shown in Fig. 5, this wheel is provided with tangential slots 68 and locking surfaces 69, said surfaces being concentric with the stud shaft 58 and engaging the inner periphery of the rim of the disk 59, to lock the wheel 67 and feed roller 44 against rotation during the dwell of the intermittent film feed. During the rotation of the disk 59, the pins 63 engage in the slots 68, of the wheel 67, to rotate the feed roller 44 one-third of a revolution, to advance the film. As shown in Fig. 8, the right hand end of the roller 44 is supported in a plate 70, which extends upwardly and is secured on the stud shaft 58, between lock nuts 71. The upper end of said plate is slotted, as at 72, to provide an adjustment of the wheel 67 relative to the rim of the disk 59.

For holding the film in contact with the feed roller 42, I provide a tension device consisting of a pair of rubber surfaced rollers 75, carried by a housing 76. Said housing is provided with studs 77, which project through orifices in the upper end of the guide plate 38, and is forced toward the feed roller by springs 79, surrounding said studs between the housing and guide plate.

To provide clearance for the sprocket teeth 47, I form grooves 78 near each edge of the rollers 75. The upper edge of the housing 76 is elongated and formed into a film chute to guide the film in true alinement to the feed roller.

Duplicate tension devices 80, 81, are provided for the intermittent feed roller 44 and the "take-up" roller 45. These are carried by a back-plate 82, which is removably pivoted near the bottoms of the side frames and is held in position by a bail 83, engaging its upper edge. By raising said bail the back plate 82 may be swung backward, as shown in dotted lines in Fig. 3, to permit the threading of the film into the machine.

The back-plate 82 is provided with a light aperture 84 for admitting the light rays of a projecting lantern to the film when the machine is used as a projecting machine.

As there is always danger of the film becoming ignited by the heat of the light rays, when it is run too slow or stopped, I provide a fire-shutter 90, which is governed by the speed of the intermittent feed roller 44. This fire-shutter extends over the full area of the light aperture 84, and is secured to an upright rod 91, journaled in the back-plate at 92, and in a bracket 93 attached thereto. A coil spring 94 surrounds the rod, one end bearing against the face of the fire-shutter and the other end extending into an orifice in the back plate. Said spring is normally under tension and tends to force the fire-shutter against the back-plate to close the light aperture 84, said movement being made noiseless by a rubber bumper 95, secured to the fire-shutter. Secured to the lower end of the rod 91, opposite the shaft of the roller 44 is a cylinder 96, having a plurality of elongated spiral teeth 97, which are adapted to be engaged with a camming action by the teeth 98 of a triangular wheel 99, to oscillate the fire-shutter and to expose the light aperture 84. The wheel 99 is secured to the hub of the roller 44, by a set screw 101, to provide for lateral adjustment of said wheel. In starting the machine, one of the teeth 98 will engage the first spiral tooth 97 and rotate the cylinder 96 sufficiently to bring the second spiral tooth into operative alinement with the plane of travel of the teeth 98, thereby commencing the opening movement of the fire shutter. If the next tooth 98, of the wheel 99, is brought into action with the second spiral tooth with sufficient rapidity, the rotation of the cylinder will be continued, otherwise the coil spring 94 will act when triangular wheel 99 assumes the position shown in Fig. 6, and before the second tooth 98 has had time to engage the second spiral tooth 97. Thus it will be seen that as long as the speed of action of the teeth 98 against the spiral teeth 97 is quicker than the action of the spring 94, the opening movement of the fire-shutter will continue until the last spiral tooth 100 is engaged. This tooth has less lead than the teeth 97, it being just sufficient to retain the shutter practically stationary in its open position. By laterally adjusting the triangular wheel 99, the point of contact between the teeth 98 and 97 will be varied with a corresponding variation in the speed required for effecting an opening movement of the fire shutter.

The fire-shutter and framing up devices herein disclosed are made the subject-matter of my companion applications respectively, Serial No. 865,131, filed October 5, 1914, and 865,130, filed October 5, 1914, and are only claimed herein as constituting elements of combinations in the organized machine.

In ordinary projecting machines it is permissible to place a light shutter in front of the lens, but in a camera or picture-taking machine, this would not be practical for the reason that a light tight joint could not be made between a rapidly moving shutter and the face of the lens-tube. When the machine is used as a printing-machine, the lens-board 30 is removed. These circumstances make it necessary to place the light shutter 105 within the hollow front board 20 just in front of the focal tube plate 35. The shaft of this shutter is journaled in the lining-plate 22 and a bracket 106 and carries a pinion 107 which meshes with the teeth 108 of a double-faced pinion loosely journaled on a stud 109. The beveled teeth 110 form continuations of the teeth 108 and mesh with beveled teeth 111 of the double-faced gear, previously described. Thus, the light shutter is positively driven in unison with the film feeding mechanism.

When projecting, it is necessary to properly frame the pictures with the framing-plate 37 by vertical adjustment thereof; also the lens-plate 33 must be simultaneously adjusted to maintain a true axial alinement of the focal-tube and lens-tube. When printing, the lens-board 30, in its entirety, has been removed, the adjustment of the focal tube being accomplished by inserting a finger in said tube and raising or lowering it as desired.

For adjusting both plates 33 and 35 in unison, I provide a handle 115 (see Figs. 12 to 14) pivoted on an upright 116, which is detachably secured by a set screw 117, in a bracket 118. Said handle carries a clevis 119, having hook ends 120 and 121, the hook 120 engaging into an aperture in the upper end of the focal-tube 35, and the hook 121 engaging into an aperture in the upper end of the lens tube plate 33. By pinching together the arms of the clevis 119, its hook ends may be disengaged from the plates. This mechanism is made in demountable form to permit its removal when the film and light controlling unit is to be mounted within the camera-box so that the size of said box may be confined to reasonable limits, although it is obvious that said mechanism may be permanently incorporated in the machine and a larger camera-box provided.

In the printing of the positive film, the developed negative and a sensitized film are simultaneously fed through the machine past the framing-plate 37, the negative being next to said plate. To yieldingly hold said films in close contact and to provide a backing therefor, I provide a detachable printing plate 130, (see Figs. 9 and 10), formed of spring sheet metal and provided with hook ends adapted to engage the top and bottom

edges of the light aperture 84, in the back plate 82.

In mounting the film and light controlling unit on the projecting table 140, the holes in the base-board 21 and lining-plate 22 register with bolts 141 in said table, which are similar in form and spacing to the bolts 25 of the camera base 1. Thumb nuts 26 clamp said unit securely to the projecting table. A projecting lantern 142, is mounted on the rear portion of the table, which is provided with supporting legs 143. The supply film reel magazine 143, is mounted on the upper end of a rod 144, which is pivoted in a bracket 145, secured to the front portion of the table and is provided with a vertically adjustable clamp member 146 secured in set position by a thumb screw 147. Said clamp 146 has a hooked inner end which hooks over the top of the front board 20 and lining plate 22, to support the rod 144 in vertical position. The rewind reel magazine 149 is supported below the table, said reel being driven by a belt 148, which runs through an aperture in said table and to the belt pulley 19 of the power shaft 53.

The outer end of the power shaft is bifurcated, the handle socket 150 being provided with a transverse pin 151, which, when said socket is telescopically engaged over the shaft end, engages between furcations to form a driving connection between the handle and shaft.

The complete series of operations and functions of the devices and attachments hereinbefore described in detail will now be described with respect to their sequential performance. One or more camera film magazines are loaded, in a dark-room, with reels of sensitized film, the magazine section 9 being turned to close the film opening 12, allowing the film to thread through the film aperture of the inner section 8, then circumferentially between the walls of both sections and out the film aperture of the outer section 9.

Film magazines containing an empty film reel and one of the loaded magazines are mounted on the uprights 3, as shown in Fig. 1, with the empty reel in driving connection with the power shaft. The film is threaded through the film controlling provision and to the rewind reel after which the cover 2 is positioned and latched on the base 1. The key 13 adjacent the loaded reel magazine 4 is then pushed inwardly to engage and turn the magazine section 9 thereof to bring the film apertures into registry, and the handle is inserted and engages the power shaft through an aperture in the cover. After the moving film of the loaded reel is exposed and rewound on the driven reel, the key 13 adjacent the magazine 5 is turned to close the film opening 12 thereof, after which the cover 2 is removed to change the magazines. The magazine 5, now containing a full reel of exposed negative film, is removed from the camera, the magazine 4, now containing an empty reel, being repositioned on the uprights 3 to assume the position previously occupied by magazine 5, and a new, previously loaded magazine placed in position as magazine 4. The film is again threaded through the camera and parts positioned, as above described. After the exposed negative films are developed they are rewound on the film reels with a strip of sensitized film. The lens-board of the film and light controlling unit is then removed and the printing plate 130 placed in position, as shown in Fig. 9. The individual pictures are now properly framed by adjusting the focal-plate 35, after which the films are run through the machine at a proper speed to print the sensitized film. The printed film, (which is a positive), is then developed, after which it may be used in any standard projecting machine.

When my improved machine is used, the film and light controlling unit is removed from the camera-box and mounted on the projecting table and connected to the film magazines 143 and 149, as shown in Fig. 14, the lever 115 being used to vertically adjust the lens-tube and focal-tube in unison to properly frame the individual picture of the film.

It is therefore apparent that I have invented a simple, condensed moving-picture machine, unit or head, comprising a light control member, a film control member, the unitary, mounting and condensed arrangement, enabling the ready interchangeability of the unit for these different uses.

I have disclosed, but not claimed herein, certain novel and useful features such as the film reel mechanism, and certain features adapting the device for printing work, these mechanisms constituting independent inventions, for which applications are filed simultaneously with this amendment, said two applications being respectively Serial No. 7842, filed February 12, 1915, and Serial No. 7841, filed February 12, 1915.

Having described my invention, I claim:—

1. In a motion-picture machine, a lens-board having a fixed frame unitarily supporting a complete film feed mechanism comprising a main shaft, a film slide-way adjacent the lens aperture, and intermitting film feed mechanism adjacent the slide-way, continuously rotating tension rolls upon opposite sides of the slide-way and intermitting feed, said two sets of tension rolls and the intermitting film feed being substantially alined with the film slide-way and arranged to loop the film both above and below the lens aperture, transmission mechanism connecting said continuous and intermitting feed mechanisms

in positively driven relationship to the main shaft, and means for supporting the film reels in relation to the camera-board, and operating the same from the main shaft, enabling said unitary film feed mechanism to be interchangeably used for taking, printing and projecting pictures.

2. In a device of the class described, a unitary structure comprising a hollow apertured lens board and a parallel closely adjacent film frame, a lens tube and a framing up device unitarily adjustable on the lens board, relative to the fixed film frame, a lens shutter operating in said hollow lens board, a film guide on said frame and an intermitting film feed on said frame, continuously rotating film feed tension rolls, a main shaft, gearing for operating the intermitting and continuous feeds as well as the lens shutter, all located on said frame, and means for supporting the film rolls and operating the same from the main shaft.

3. In a device of the class described, front and rear members supported and fixed relative to one another, and unitarily mounted in closely-adjacent parallel vertical planes, light controlling mechanism comprising an adjustable lens tube and framing-up device carried by the front member and film controlling mechanism carried by the rear member, constituting a compact unit adaptable for interchangeable use in taking, printing or projecting motion-pictures.

4. In a device of the class described, a front or lens-board member, and a rear or film support member, mounted in fixed relation to one another and in closely adjacent parallel vertical planes, and constituting a compact unitary structure, light controlling mechanism comprising a detachable lens, light-proof framing-up provision, and light shutter on the front member, means for unitarily adjusting the lens and framing-up device on said front member, and film controlling mechanism comprising film feeding and guiding mechanism on the rear member, appropriately exposing a given portion of the traveling film to the light controlling provision of the front member, said structure and coöperative mechanism constituting a unit enabling the interchangeable usage thereof, as described.

5. In a device of the class described, a lens-board, a pair of uprights secured in fixed relation thereto, in closely adjacent vertically-parallel planes, light controlling mechanism on the lens-board, and film guide, supporting and feeding mechanism mounted on said uprights, constituting a laterally compact, unitary, structural and operative head, adapted for interchangeable usage in taking, printing or projecting motion-pictures.

6. In a device of the class described, a front and rear member secured in fixed relation to one another in closely adjacent vertically parallel planes, light controlling means on the front member, comprising a unitarily adjustable lens and framing-up device, film controlling means on the rear member, comprising a top, bottom and intermediate shaft, approximately coincident vertically, continuously driven feed rollers controlled by the top and bottom shafts, intermittent feed rollers controlled by the intermediate shaft, and a vertically disposed gear train on said rear member for simultaneously operating said continuous and intermittingly driven film feed shafts.

7. In a device of the class described, an apertured hollow lens-board, light controlling mechanism adjustable therein, a film supporting member mounted in fixed relation and closely adjacent to the lens-board, a film guide on said supporting member apertured adjacent the lens-board aperture, film feed rolls and actuating mechanism on said supporting member, a member hinged to the lower portion of said supporting member and closing against the film guide, and film feed rolls on said hinged member coacting with the film feed rollers of the supporting member, said hinged member being apertured adjacent to the aperture of the film guide.

8. In a device of the class described, a top, bottom and intermediate set of film feed rolls, means continuously rotating the top and bottom rolls and intermittingly rotating the intermediate feed rolls, each set of feed rolls comprising sprocket members, and yielding surface-contact members, and means for unitarily and simultaneously opening up the intermediate and bottom film feed rolls.

9. In a device of the class described, a unit comprising a closely adjacent and parallel lens-board and film frame correspondingly apertured, continuously rotating and intermittently rotated film feed rolls on said frame, a vertical opening member hinged to said frame and having corresponding light apertures, tension feed rolls on said hinged member above and below said apertures coacting with said continuously and intermittently rotated rolls respectively, the film being released from the feed roll grip when said hinged member is swung away from the frame.

10. In a device of the class described, a lens-board, a rectangular lining member therefor, a film support frame erected on the base of said lining member closely parallel to the lens-board, and secured at its upper portion to the lens board, a member hinged to the lower portion of said lining member, light controlling means on the lens-board, and film feed devices on said frame and hinged member.

11. In a device of the class described, a

lens-board, a rectangular member, the front face of which is fixed to and forms a lining plate for the inside of the lens-board, a film feed frame fixed to and within said rectangular member, a film feed guide on said frame, film feed rolls on said frame, and a plate hinged relative to the lower portion of said frame and having rolls coacting with the frame feed rolls, said hinged member opening away from and closing against the film guide, and adapted to release the film feed roll grip when open.

12. In a device of the class described, the combination of continuously and intermittingly driven film feed rolls, each comprising sprocket and tension surface members, the continuous rolls and intermitting feed rolls being disposed on opposite sides of the film exposure aperture, said rolls being disposed to form three sets of film feeds, with the intermitting feed rolls between the continuously driven rolls and below the film aperture, and a threading chute leading the film to the continuously driven sprocket and tension feed rolls constituting the initial film feed provision, said chute and the film engaging portions of said feed rolls being in substantial vertical alinement.

13. In a device of the class described, a fixed film guide, a coacting hinged film guide plate, feed rolls for the film fixed in relation to the fixed guide, coacting film feed rolls on the hinged plate, said plate and fixed guide being correspondingly apertured for film exposure, and said plate having a film loop aperture adjacent the feed rolls mounted on said swinging plate.

14. In a device of the class described, a hollow apertured lens-board, a fixed film frame fixed in relation thereto, a film guide plate vertically hinged to said frame, feed rolls and feed drive on said frame, a light shutter rotatable within the hollow lens-board and intercepting the focal aperture, means for driving said shutter from the film feed mechanism on the frame, framing-up mechanism adjustable on the lens-board, and a film feed fire-prevention shutter on said hinged plate.

15. In a device of the class described, a lens-board, light controlling means thereon, a frame fixed in relation to the board, film supporting, guiding, and feeding mechanism on said frame, said board and frame constituting an upright unit, a camera-box section, detachable relative to said unit, the lens-board forming the front member of said section to provide a light-tight box, film magazines detachably supported within said box for taking pictures, and adapted to be secured relative to the board in positive non-interfering with the film exposure area for projecting pictures.

16. In a device of the class described, a unitary lens-board and frame, light and film controlling mechanisms respectively mounted thereon, a box section forming with the lens-board a separable light-tight camera-box, film magazines detachably secured within the box in alinement with the film controlling mechanism, film reels within said magazines, and propelling means therefor operated by the film feed.

In witness whereof, I hereunto subscribe my name, as attested by the two subscribing witnesses.

JOHN T. WELLS.

Witnesses:
CLARENCE B. FOSTER,
L. A. BECK.