

H. M. CONNOR & D. D. MILES.
MOVING PICTURE MACHINE.
APPLICATION FILED MAY 20, 1916.

1,234,136.

Patented July 24, 1917.

4 SHEETS—SHEET 1.

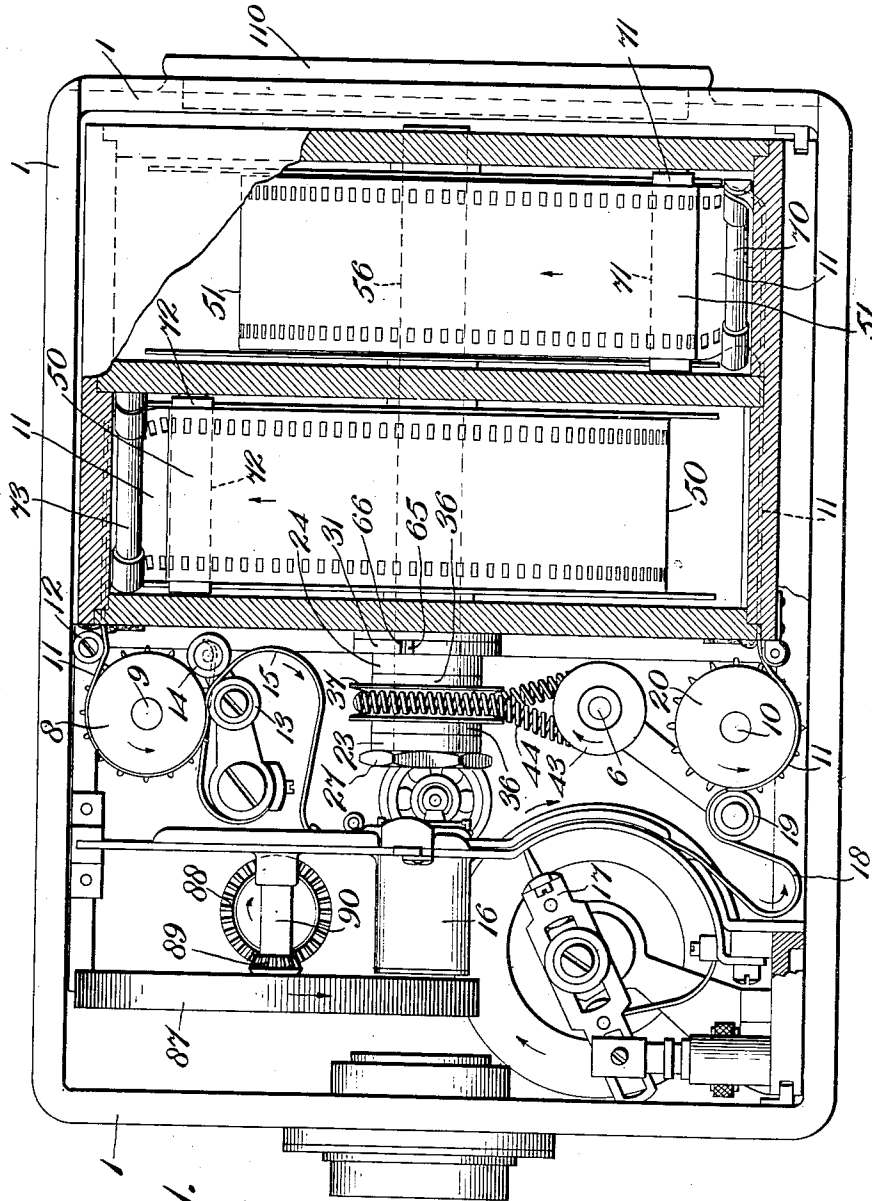


Fig. 1.

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4 SHEETS—SHEET 2.

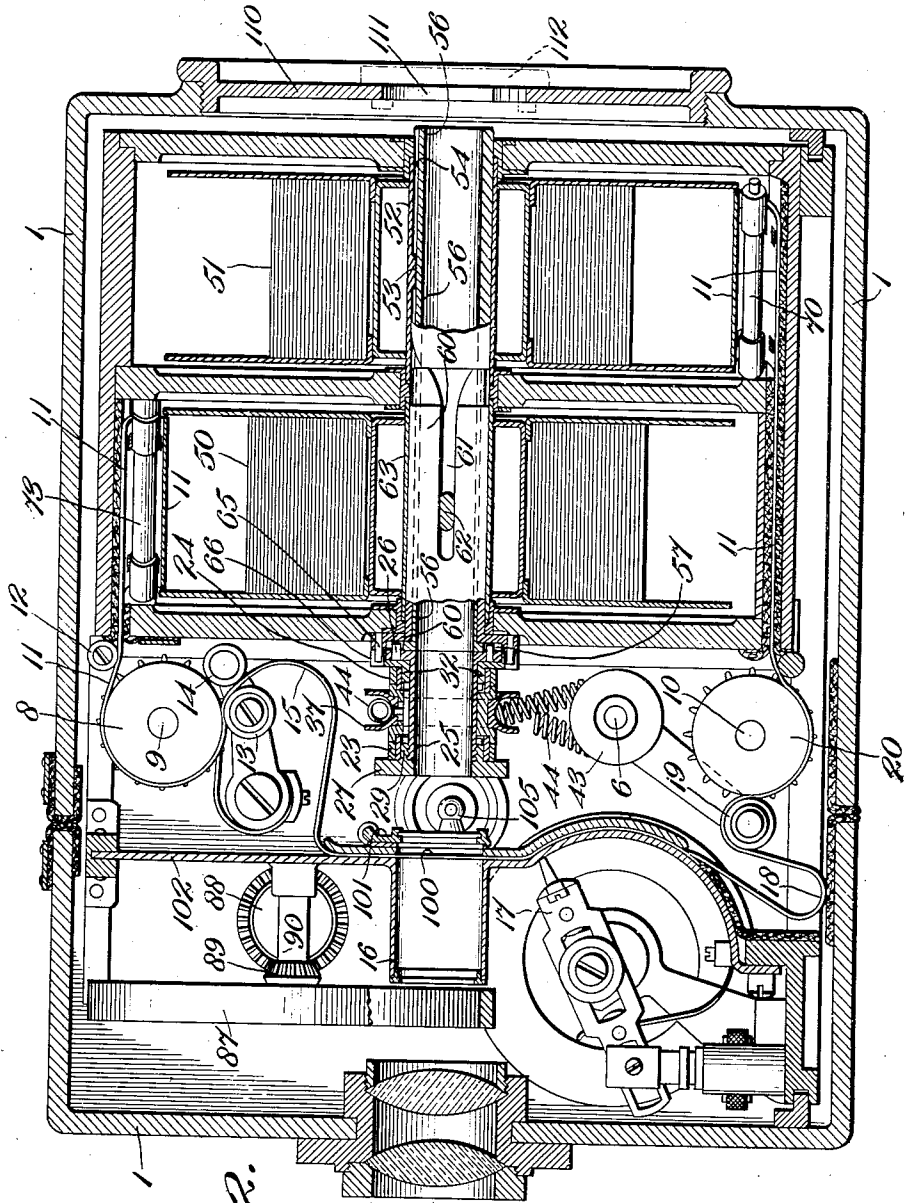


Fig. 2.

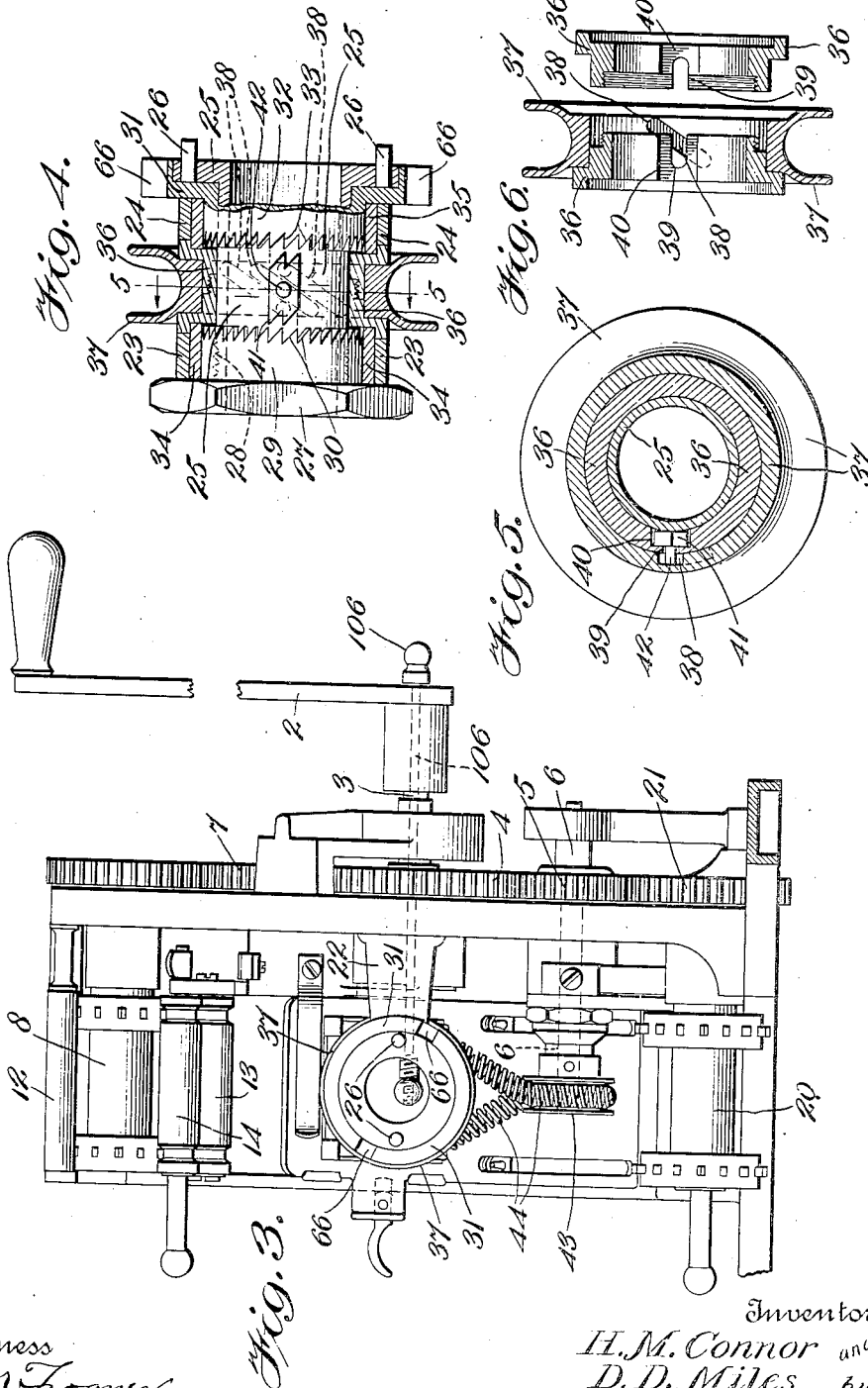
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

Fig. 7.

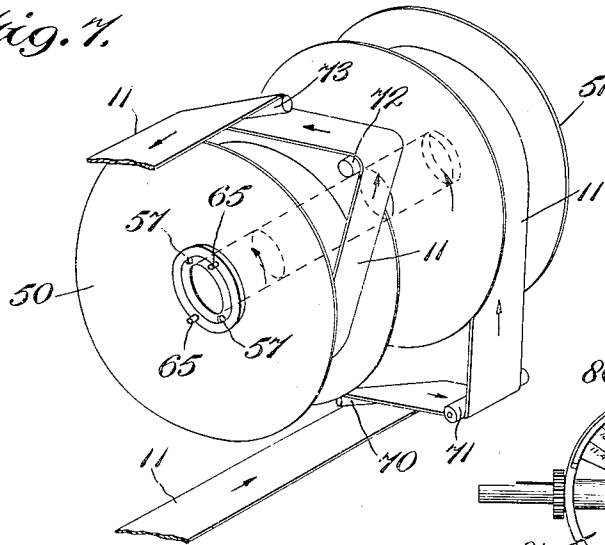


Fig. 8.

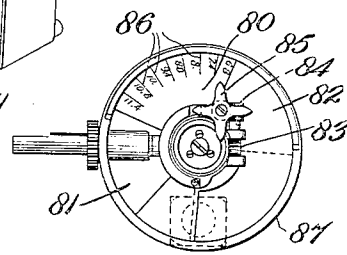


Fig. 9.

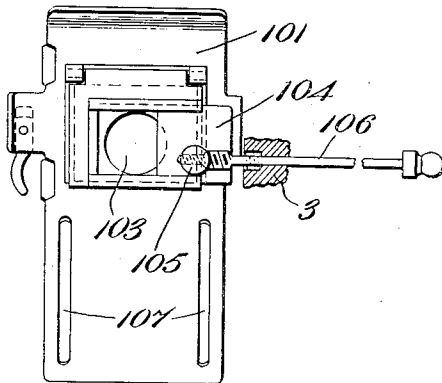
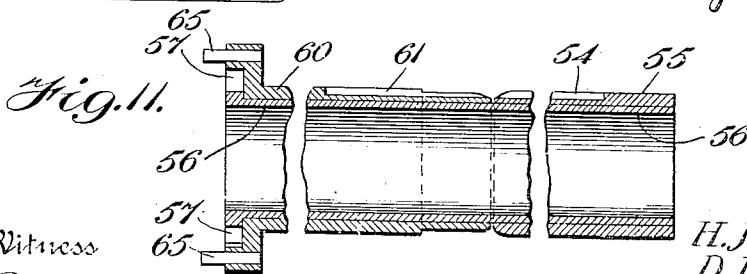
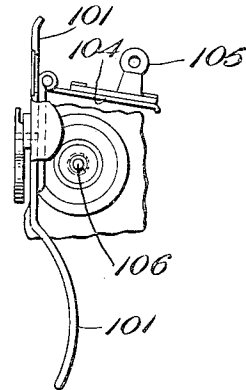


Fig. 10.



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UNITED STATES PATENT OFFICE.

HERSCHEL M. CONNOR AND DON D. MILES, OF SAN FRANCISCO, CALIFORNIA, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-FIFTHS TO ALBERT H. HERBERT, ONE-FIFTH TO PANSY I. CONNOR, ONE-FIFTH TO MYRTLE C. MILES, AND ONE-FIFTH TO R. J. GRAF, ALL OF SAN FRANCISCO, CALIFORNIA.

MOVING-PICTURE MACHINE.

1,234,136.

Specification of Letters Patent.

Patented July 24, 1917.

Application filed May 20, 1916. Serial No. 98,883.

To all whom it may concern:

Be it known that we, HERSCHEL M. CONNOR and DON D. MILES, both citizens of the United States, both residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Moving-Picture Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to moving picture cameras and has for one of its objects to provide a means by which the movement of the film may be readily reversed without stopping the turning of the power shaft.

With this and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification, in which like numerals designate like parts in all the views:

Figure 1 is a side elevational view partly in section of a camera made in accordance with this invention;

Fig. 2 is a longitudinal sectional view of the parts shown in Fig. 1;

Fig. 3 is an elevational view of the film feeding and film reversing mechanism as seen from the right of Fig. 2, with the film reels and casing removed;

Fig. 4 is a longitudinal sectional view of the film reversing mechanism;

Fig. 5, is a transverse sectional view of the parts shown in Fig. 4, taken on the line 5-5 of said Fig. 4;

Fig. 6 is a detail sectional view of the reversing pulley and its associated bushing;

Fig. 7 is a perspective view illustrating the path of travel of the film after leaving the reel;

Fig. 8 is a diagrammatic view of a shutter and shutter closing device especially adapted for use in connection with the film reversing mechanism;

Fig. 9 is a detail rear elevational view of the aperture controlling mechanism;

Fig. 10 is a side elevational view of the parts shown in Fig. 9; and

Fig. 11' is a longitudinal sectional view of the reel supporting tube.

1 indicates any suitable casing, but preferably of the general shape shown, 2 a crank or other means of transmitting power to the power shaft 3, carrying the gear 4 meshing with the gear 5 on the shaft 6, operating a clutch mechanism to be later described and also meshing with the train of gears 7 for operating the film feeding sprocket 8. The gear 21 meshing with the gear 5 operates the film feeding sprocket 20 mounted on the shaft 10 and the film 11 passes under the guide roll 12 over the said sprocket 8 and between the guides 13 and 14 to form the loop 15, whereupon it passes down across the end of the aperture tube 16 past the film feeding lever 17 to form the loop 18, then over the guide 19 around the sprocket 20 and then back to the winding up reel all as will more fully appear hereinafter.

Rigid with the framework is a bracket 22, see Fig. 3, and rigid with said bracket is a pair of supporting ring like members 23 and 24, see Fig. 4, which support the film reverse clutch mechanism now to be described. Said clutch mechanism consists of an inner tube 25 carrying the pins 26, and said tube extends from one side of the clutch mechanism to the other and is provided at its end, opposite the pins 26 with the nut member 27 provided with the tubular extension 29 constituting a clutch member, which is secured to said tube 25 by means of the screw threads 28 indicated in dotted lines in Fig. 4.

It therefore follows that as the tube 25 revolves, the nut 27 and clutch member 29 having the pawl engaging teeth 30, revolves with it. Said film reversing clutch mechanism also consists of the member 31 integral with the clutch member 32 having the pawl engaging teeth 33 capable of revolving independently of the clutch member 29.

Located between the supporting ring 23 and the clutch member 29 is the anti-friction bushing 34 and located between the supporting ring 24 and the clutch member 32 is the similar anti-friction bushing 35. Located between the said rings 23 and 24

and also between the said bushings 34 and 35, is the loosely fitting bushing 36 having a depression in its outer surface into which fits the power pulley 37, all as will be seen from Figs. 4, 5 and 6.

The said pulley 37 is provided with the inclined slot 38 and the said loosely fitting bushing 36 has a slot 39 which, when the parts are in the position shown in Fig. 4, extends across the said slot 38. In Fig. 6 the bushing 36 is shown in part removed from the pulley 37 for the sake of clearness. Half of its slot 39 however is illustrated in its true position, and the other half to the right of said pulley.

In addition to the slot 39 carried by the bushing 36, said bushing 36 has a larger slot 40 extending parallel to the slot 39 and which accommodates the pawl 41. The said pawl 41 is provided with the pin 42 extending through the slot 39 and into the inclined slot 38. The said slot 40 is of sufficient dimensions to permit the pawl to move longitudinally of the tube 25 and to engage on the one side the clutch member 32 and on the other side the clutch member 29.

From the construction disclosed, in Figs. 4 to 6, it will now be clear that if power is applied to the pulley 37, the said pulley will turn until the pin 42 approaches one end or the other of the slot 38 according to the direction of the motion. While said pulley 37 is thus turning, the cam action of the slot 38 will force the pin 42 to one end or the other of the slot 39, and this motion of said pin 42 will cause the pawl 41 to contact at one end or the other with either the clutch member 29 or the clutch member 32.

In other words, it will now be clear that when the shaft 6 is turned by the gear 5 in the manner above disclosed, the pulley 43, carried by said shaft will turn the yielding belt 44, which passes around the pulley 37, and the movement of said belt will be imparted to the pulley 37, whereupon one clutch member 32 or the other 29 will be engaged by the pawl 41, and will in turn rotate either the tubular member 31 or the tubular member 25, as the case may be.

Stated in still other language, it is clear that the tubular member 25 or the tubular member 31 will be rotated by the pulley 37 and pawl 41 according to the direction of motion of the shaft 6, and that this said direction of motion will in turn depend upon the direction of motion of the gear 5 and of the crank 2.

It is therefore clear that by merely reversing the motion of the crank 2 the operator is enabled to cause either the tubular member 25 or the tubular member 31 to be driven at will. The driving of these said tubular members 25 and 31 at will, constitutes an important feature of the invention, as will now appear.

Referring more particularly to Fig. 2, it will be observed that the magazine carrying the film consists of a paying out reel 50 and a winding up reel 51. The construction of these reels is substantially alike, and considering the reel 51, for example, it is provided with an inner tube 52 provided with a key 53 which fits in a longitudinal slot 54 carried by the tubular member 55 integral with the tubular member 56 extending through the reel 50 as will be clear from Figs. 2 and 11, and provided at its left hand end as seen in said figures with the holes 57 into which the pins 26 are adapted to fit.

It therefore follows that if the tubular member 25 is turned in the manner above disclosed, the said pins 26 fitting the said holes 57 will cause the tubes 56 and 55, together with the tube 52 and reel 51 to turn in the same direction.

Slipping over the said tube 56 is a second tube 60 provided with a slot 61 in which fits a key 62, see Fig. 2, and this said key 62 is rigid with the inner tube 63 of the paying out reel 50. The said tube 60 is provided with the pins 65 adapted to fit the holes 66 carried by the clutch member 32 and therefore it is obvious that if the movement of the pulley 37 turns the clutch member 32 that the said holes 66, pins 65, tube 66, key 62 and paying out reel 50 will turn in the same direction.

In other words, it is now clear that if the pulley 37 is continuously turned in a clockwise direction, as seen in Fig. 3, the pins 42 will be so moved as to cause the pawl 41 to engage the clutch member 29, and to cause the tube 25 and the reel 51 to also turn in a clockwise direction and to thereupon wind up the film. On the other hand, since in this case the tube 60 is free to turn relatively to the tube 56, the reel 50 will not be given any motion at all from the said pawl 41, but the sprocket 8 will pull the film out of the said reel 50 and thus cause said reel 50 to turn in the same direction as will be clear from Fig. 7.

It will be observed in connection with Fig. 7 that the guide rollers 70, 71, 72 and 73 enable the film to be led from the reels and brought back thereto in directions parallel to the axis of said reels. This enables the said film 11 to be fed across the axis of said reels or in other words enables the axis of said reels to be in line with the optical axis of the lens and it therefore enables the operator to sight along said axis for a purpose which will be disclosed below.

Coming back to the turning of the reel 51 in a clockwise direction, and the pulling of the said film 11 out of said reel 50 by the sprocket 8, it is obvious that should the crank 2 be reversed in its direction of motion, the said sprocket 8 will likewise be re-

versed in its motion, as will also the sprocket 20. In other words, the reversal of the crank 2 will cause the pulley 37 to turn in a counter-clockwise direction, as well as the clutch member 32, tubular member 31, tubular member 60, and will cause the said clutch member 29 and tubular member 56, as well as the reel 51 to remain idle. In this latter case the motion of the sprocket 20 will pull the film 11 out of the reel 51 and the motion of the clutch member 32 will cause the reel 50 to wind up said film.

Stated in still other language, it will now be clear that upon turning the crank in one direction the film will be passed across the aperture of the camera in a corresponding direction and upon reversing the motion of the crank the film itself will be at once and immediately reversed without having to stop the camera except momentarily and without having to disarrange any of its mechanism. This constitutes an important feature of the invention as will presently appear.

In connection with the above operation it is further important that the belt 44 be made of a yielding character as illustrated, because in such case its tension is such that the belt will slip to accommodate the varying strains on the reels due to the constantly enlarging diameter of the film as it is reeled up. We prefer to make the said belt 44 from a helically wound steel wire.

In our copending application Serial No. 98,881 filed May 20 1916, and entitled Shutter closing mechanism for moving picture machines, there is disclosed a device by which a predetermined number of feet of film can be used up with certainty in making the first exposure of a dissolving view, and whereby without disturbing the condition of the shutter aperture the film may be reversed for the same length of film and the second exposure made with certainty upon the undeveloped film when it again is moved in its original direction.

It is an important feature of this invention that by means of the film reversing clutch mechanism above described, the said film can be moved forward or backward by the simple reversal of the turning crank 2. It therefore results that the said film reversing clutch mechanism is very useful to employ in connection with our said shutter closing mechanism.

The above shutter closing mechanism will be more clearly understood in so far as it relates to the clutch reversing mechanism by a reference to Fig. 8. In said figure 80 represents the apertured plate provided with the aperture 81, and 82 represents a shutter closing plate provided with gear connections comprising a worm 83, a helical gear 84 and a star wheel 85 adapted to be turned a predetermined number of degrees upon each revolution of the said shutter

plate 80 upon the manipulation of a push pin, not shown in this application, but fully disclosed in said copending application above mentioned. The said shutter plate 80 is also provided with a scale 86 enabling the operator to set the shutter closing plate 82 at predetermined points with the result that when so set a length of film corresponding to the value of the particular selected division on the scale 86 will be used up in making the first exposure of a dissolving view.

87 represents the outer rim of the shutter carrying the various mechanisms disclosed in said copending application, 88 represents a bevel gear for transmitting power to the pinion 89, and 90 designates the sleeve supporting the said shutter and turning therewith. With the shutter mechanism just referred to and fully disclosed in said copending application, a large number of different lengths of film can be readily selected for expending in making a dissolving view, which particular selected length of film can be readily again arrived at upon reversing the direction of travel of the said film for making the second exposure and precisely the same selected length of film can likewise be arrived at in again feeding the film forward while making the second exposure of a dissolving view, while the clutch mechanism above described enables the operator to readily move the film in either direction desired without stopping the movement of the film except momentarily and without having to open the camera or to perform any other time consuming and annoying operations which have heretofore been necessary.

It often happens that when taking moving pictures the operator is not sure that the focus is just right. It is however well known that if one can see back of the unexposed film with an image on it, he can with a little practice judge from the appearance of said image through said film as to whether or not the apparatus is in proper focus to bring out clearly and sharply the exposures after development.

Accordingly, it is further an important feature of the invention that the tube supporting the reels 50 and 51 has its axis coinciding with the optical axis of the camera, so that one may look through said tube to the back of the film as indicated at 100, see Fig. 2, and thereupon be able to at once determine whether or not a proper focus is being employed.

In order to enable the reels 50 and 51 to be compactly stored within the casing 1 without wasting space, it is very desirable that the said reels should occupy planes at right angles to the optical axis of the camera, as shown, and this disposition of the said reels compels the changing of the path of travel of the film through an angle of 90°

as is indicated in Fig. 7. In order to accomplish this change in the direction of the path of travel of the said film, the guide rollers numbered from 70 to 73 are disposed as illustrated.

Not only is the said tube 56, disposed as shown, useful for judging the actual focus being employed, but it is also useful when using this camera as a printing apparatus, in the manner disclosed in our other copending application Serial No. 98,884, filed May 20, 1916, and entitled Film printing and projecting apparatus.

As is well known in taking moving pictures it is very desirable to have a light tight closure behind the film, and for this purpose I have provided the plate like member 101 adapted to slide in and out of position on the aperture plate 102, and said member 101 is provided with the aperture 103 controlled by the sliding gate like member 104 provided with the projection 105 into which conveniently screw threads the sliding rod 106 conveniently passing to the outside of the casing 1 through the main driving shaft 3, all as will be clear from Figs. 3 and 9 of the drawings. Said plate 101 is conveniently provided with the slots 107 through which pass the film feeding fingers carried by the feeding lever 17.

Accordingly when it is desired to view the back 100 of the film through the tube 56, it is only necessary to pull out the rod 106 whereupon the gate 104 uncovers the aperture 103 and the image may be plainly seen on the back 100 of the said film.

The operation of this invention will be readily understood from the foregoing, but may be briefly summarized as follows: Upon turning the crank 2 the film 11 is fed down past the aperture in the usual way it being paid out by one reel 50, and it is fed to and taken up by the other reel 51. Upon reversing the rotation of the crank 2 the automatic reversing mechanism comprising the pawl 41 and its associated parts causes the take up reel 51 to become the paying out reel and the paying out reel 50 to become the take up reel, so that the mere reversal of the motion of the power shaft 3 automatically causes a reversal in the direction of travel of the film. In the same way a reversal of the motion of the shaft 3 causes a reversal in the direction of rotation of the shutter 87. In the first named copending application above mentioned, it is made clear that the shutter 87 may be rotated in one direction until different predetermined lengths of film have been exposed, whereupon a reversal in the direction of motion of the shaft 3 will cause said shutter to reverse its motion without disturbing its aperture and that therefore a predetermined length of film may be rewound onto the paying out reel with the shutter aperture undisturbed so that a second expo-

sure may be made on the previously exposed film with a gradually opening aperture instead of a gradually closing aperture. The above disclosed reversing mechanism characterized by the pawl 41 lends itself to the use of such a shutter and therefore enables the operator to make dissolving views with great certainty and facility upon the mere reversal of his crank 2.

In addition to the above, the open ended tube 56 enables the operator to view an image through the back 100 of the film in order to ascertain whether or not the camera is in proper focus. The back 100 of the film is normally covered by the plate 101, but said plate is provided with the aperture 103 which is readily opened and closed by manipulating the rod 106 and the closing member 104.

The coiled wire spring 44 permits of a greater or less slip on the driving pulley 37 when the tension is increased owing to the growing diameter of the take up reel.

The mechanism comprising the camera is readily slipped in and slipped out of the casing 1 on the ways illustrated but not thought deemed necessary to describe in detail, and the reels 50 and 51 being disposed as shown occupy comparatively little space so that the entire instrument is exceedingly compact and easily carried about in the hand. In fact the entire mechanism is included in such a small space that this camera lends itself to the use of amateurs as well as professionals.

The casing 1 is conveniently provided with the detachable cap member 110 provided with an opening 111 closed by the cap member 112 through which images on the film back 100 may be readily seen.

It is obvious that those skilled in the art may vary the details of construction, as well as the arrangement of parts, without departing from the spirit of the invention, and therefore we do not wish to be limited to the above disclosure except as may be required by the claims.

What we claim is:

1. In a moving picture camera the combination of a pair of film holding reels; concentric tubes having axes coinciding with the optical axis of the camera on which said reels are mounted; a power shaft for driving said tubes and reels one at a time; and a reversing connection between said power shaft and tubes adapted to drive one reel only when said shaft is turned in one direction and adapted to drive the other reel only when said shaft is turned in an opposite direction, substantially as described.

2. In a moving picture camera the combination of a pair of film reels each adapted to rotate in opposite directions and to act as a film feeding or a film taking up reel according to the direction in which it may

be turned; concentric tubes having axes coinciding with the optical axis of the camera on which said reels are mounted; a power shaft adapted to rotate in opposite directions; and a reversing connection between said power shaft and tubes adapted to cause one of said reels to roll up the film when said shaft is turned in one direction, and to cause the other reel to roll up said film when said shaft is turned in an opposite direction, substantially as described.

3. In a moving picture camera the combination of a main driving shaft; a pay out reel; a take up reel; concentric tubes having axes coinciding with the optical axis of the camera on which said reels are mounted; means operated from said shaft for pulling the film out of said pay out reel; a second means operated from said shaft for feeding the film toward said take up reel; a reversing mechanism connected to said tubes; and a third means operated from said shaft for driving either of said tubes independently through said reversing mechanism, substantially as described.

4. In a moving picture camera the combination of a pair of film reels; concentric tubes having axes coinciding with the optical axis of the camera on which said reels are mounted; a film moving mechanism associated with each reel capable of pulling the film from its corresponding reel when moving in one direction and capable of feeding said film toward its corresponding reel when moving in a reverse direction; a power shaft for operating each of said film moving mechanisms; and a reversing mechanism operated from said power shaft adapted to rotate either tube or reel independently and to cause either reel to roll up the film according to the direction in which said shaft is turned, substantially as described.

5. In a moving picture camera the combination of a pair of film holding reels; concentric tubes having axes coinciding with the optical axis of the camera on which said reels are mounted; a power shaft for driving said tubes one at a time; and a reversing connection comprising a pair of clutch members located between said power shaft and tubes adapted to drive one reel only when said shaft is turned in one direction and adapted to drive the other reel only when said shaft is turned in an opposite direction substantially as described.

6. In a moving picture camera the combination of a rotating shutter adapted to close after a predetermined length of film has been exposed; a pair of reels; a pair of concentric tubes on which said reels are mounted; one of said reels adapted to pay out said film while rotating in one direc-

tion; means for operating said shutter and rotating said reels one at a time; and a reversing means adapted to reverse the direction of rotation of the paying out reel when the rotation of said shutter is reversed and thereupon cause said paying out reel to take up said film, substantially as described.

7. In a moving picture camera the combination of a rotating shutter, means adapted to cause said shutter to close after a predetermined length of film has been exposed; means for varying said lengths and periods of closing at will; a reel adapted to pay out said film when said lengths are moving in one direction; and means for simultaneously reversing the directions of rotation of said shutter and paying out reel and thereupon causing the latter to take up said lengths, substantially as described.

8. In a moving picture camera the combination of a rotating shutter, means adapted to cause said shutter to close after a predetermined length of film has been exposed; a reel for paying out said length of film; means for reversing the direction of rotation of said shutter without disturbing its aperture; and means for simultaneously causing the direction of travel of said film to be reversed and the latter to be wound up on said paying out film, substantially as described.

9. In a moving picture camera, the combination of a pair of film holding reels; a tube on which one of said reels is mounted, a second tube fitting inside said first named tube on which said second reel is mounted; a clutch member adapted to be engaged with and disengaged from said first named tube; a second clutch member adapted to be engaged with and disengaged from said second named tube; a pawl adapted to alternately engage said clutch members and to drive the same; a pulley controlling said pawl, and adapted when rotating in one direction to cause said pawl to engage one clutch member and to rotate the same, and when rotating in an opposite direction to cause said pawl to engage the other clutch member and to rotate the latter; a yielding belt adapted to slip passing around said pulley; means for transmitting power to said belt; and a crank adapted to rotate said last named means in a clockwise or a counter-clockwise direction at will, substantially as described.

In testimony whereof we affix our signatures, in presence of two witnesses.

HERSCHEL M. CONNOR.
DON D. MILES.

Witnesses:

T. A. WITHERSPOON,
GERALD A. GUFF.