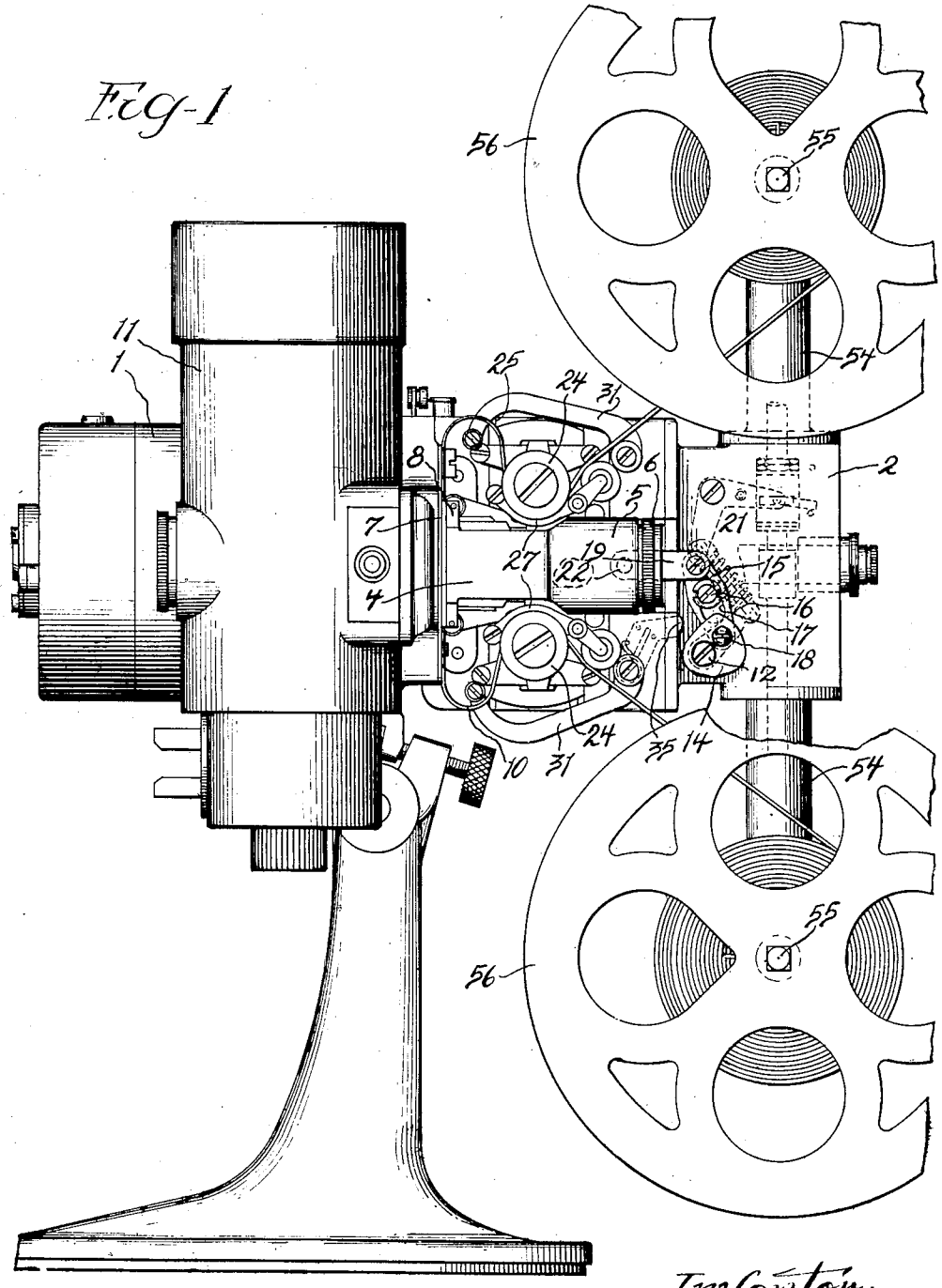
Nov. 6, 1934. A. S. HOWELL 1,979,800

MOTION PICTURE PROJECTING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 1

Fig-1



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MOTION PICTURE PROJECTING MACHINE

Filed April 2, 1931 5 Sheets-Sheet 2

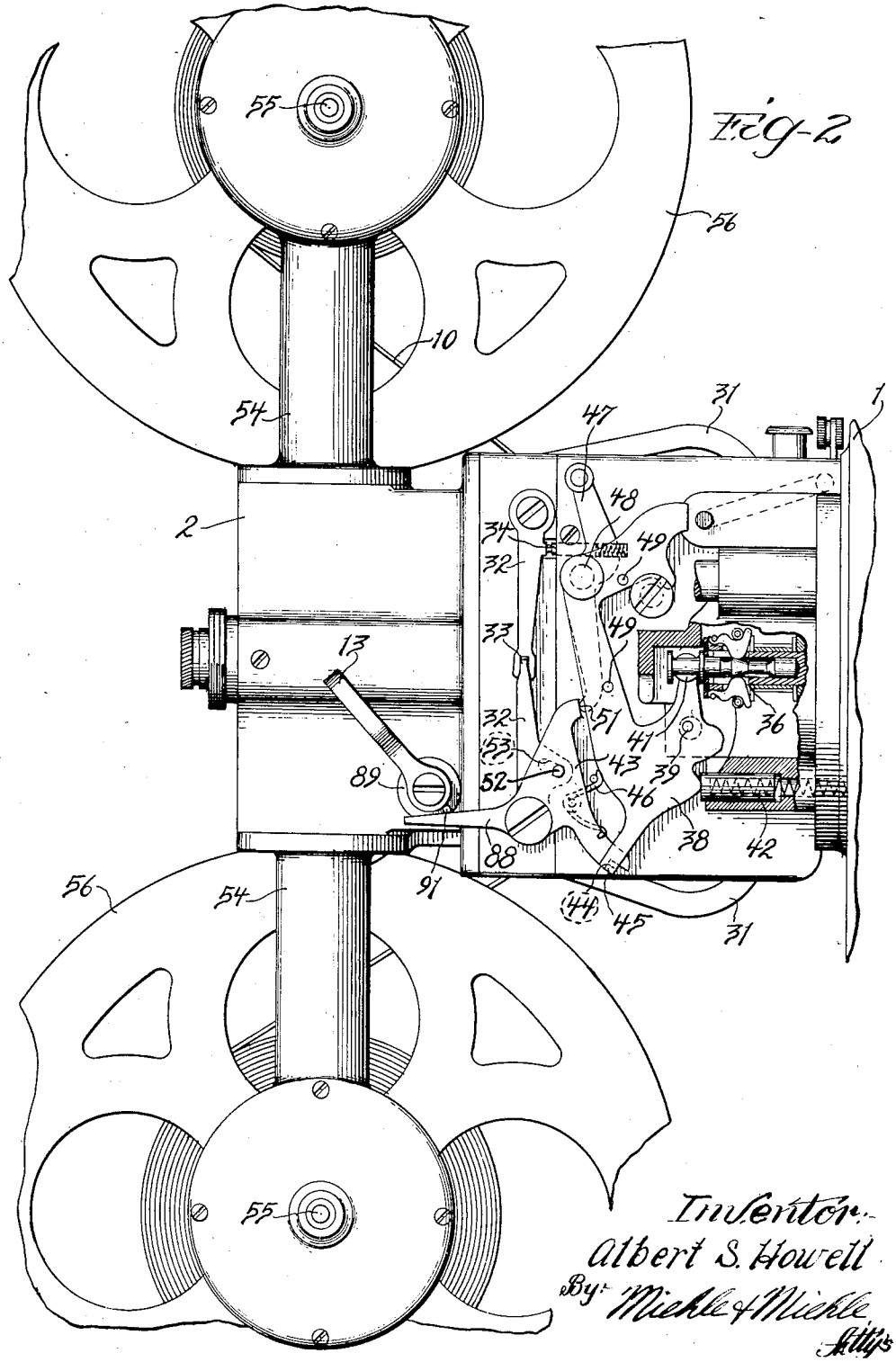

Fig-2

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MOTION PICTURE PROJECTING MACHINE

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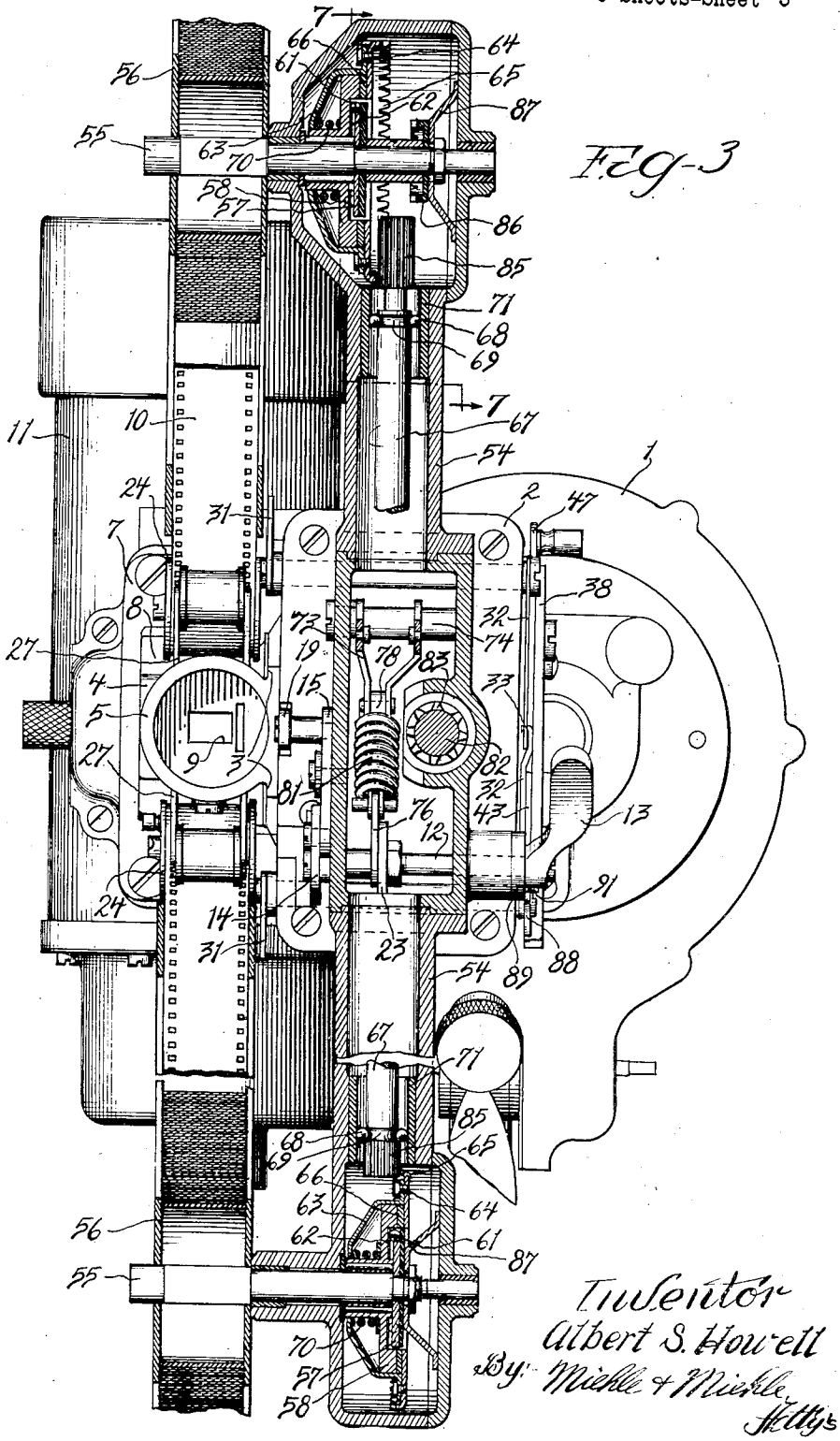

Fig-3

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MOTION PICTURE PROJECTING MACHINE

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Fig-4

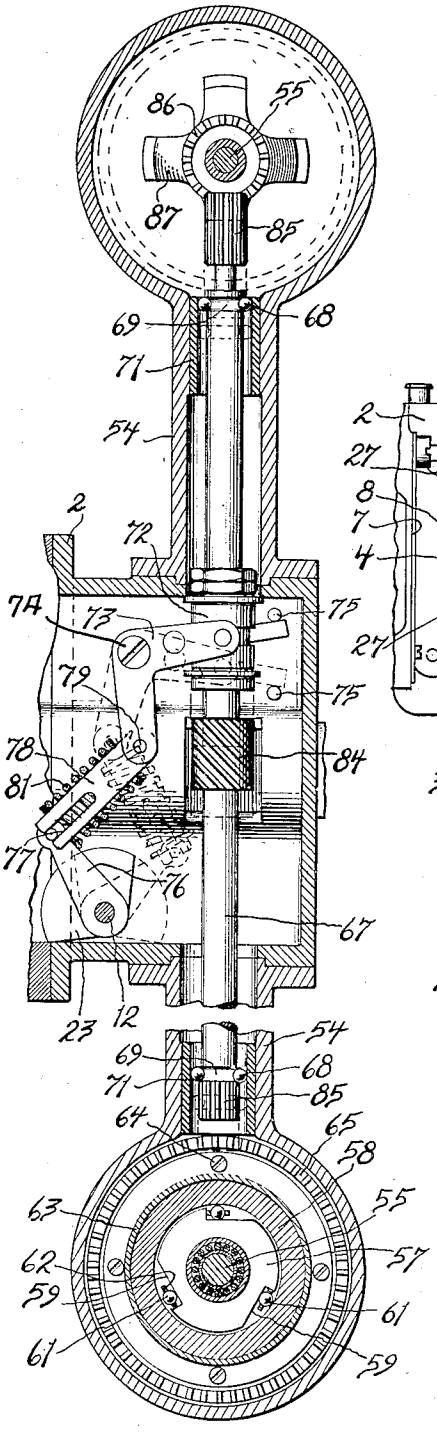
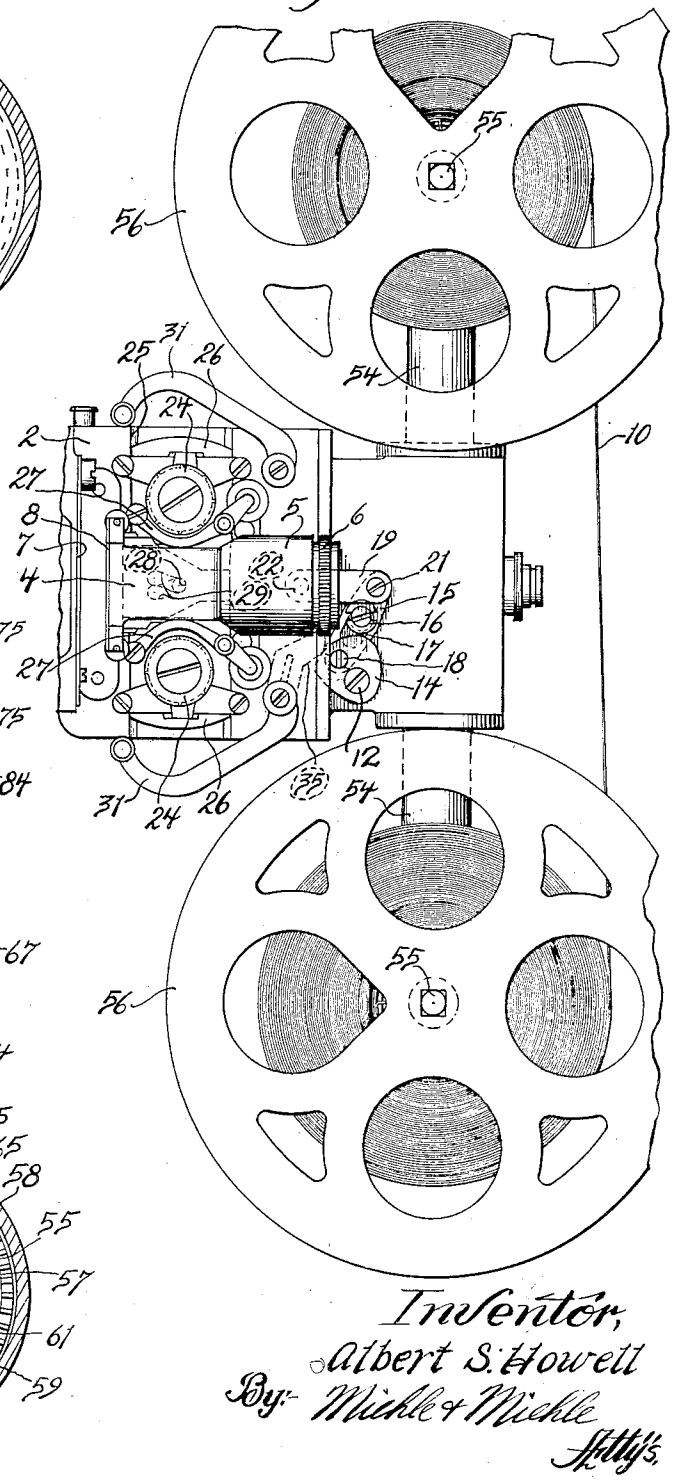


Fig-5



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MOTION PICTURE PROJECTING MACHINE

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Fig-6

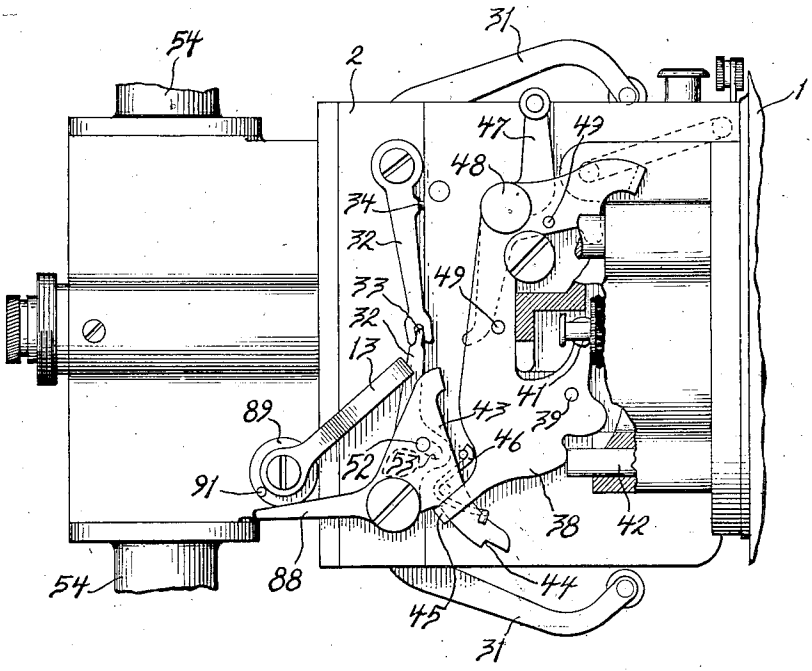
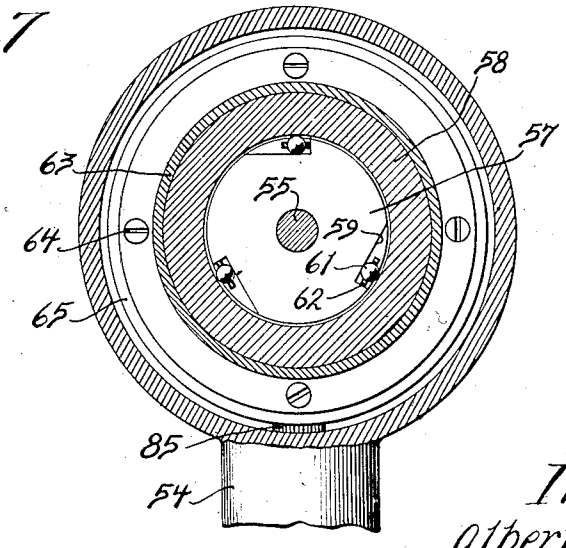


Fig-7



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Patented Nov. 6, 1934 1,979,800

UNITED STATES PATENT OFFICE

1,979,800

MOTION PICTURE PROJECTING MACHINE

Albert S. Howell, Chicago, Ill., assignor to The Bell & Howell Company, Chicago, Ill., a corporation of Illinois

Application April 2, 1931, Serial No. 527,099

6 Claims. (Cl. 242—55)

My invention has for its general object the provision in a motion picture projecting machine of a novel, convenient and effective means for rewinding a film on the machine.

With this object in view my invention consists in certain features of novelty in the construction, combination and arrangement of parts by which the said object and certain other objects, hereinafter appearing, are effected, all as fully described with reference to the accompanying drawings and more particularly pointed out in the appended claims.

In the said drawings—

Figure 1 is a side elevation of a motion picture projecting machine embodying my invention;

Figure 2 is a partial opposite side elevation of the same;

Figure 3 is a partial front elevation of the same with parts broken away and shown in section;

Figure 4 is a partial sectional view in side elevation similar to Figure 1;

Figure 5 is a partial view in side elevation similar to Figure 1 with parts in different positions from those in which they are shown in Figure 1;

Figure 6 is a partial view in side elevation similar to Figure 2 with parts in different positions from those in which they are shown in Figure 2; and

Figure 7 is a partial section on the line 7—7 of Figure 3.

Like characters of reference indicate like parts in the several views.

Referring to the drawings, 1 designates the body of the machine which is inclusive of a forward frame 2 disposed in a vertical rearwardly and forwardly extending plane. Slidably mounted, as designated at 3, on one side of the frame 2 for rearward and forward movement is a lens mount member 4 which is inclusive of a forwardly disposed rearwardly and forwardly extending bored portion 5 in which a projecting lens 6 is adjustably mounted. See Figures 1, 3 and 5.

Disposed at the rear of the lens mount member 4 is an apertured intermittent feed film guide which is inclusive of a rear face guide member 7 and a front face guide member 8 carried on the rear end of the lens mount member 4 for facewise movement therewith into and out of film retaining relation with the face guide member 7. The intermediate portion of the guide is apertured, as designated at 9, in alinement with the lens 6 for cooperation of a film 10 in the guide with the lens in the projection of pictures, projection light being derived from a suitable source arranged in a lamp chamber 11 at the rear of the guide. See Figures 1 and 3.

Extending through the forward portion of the frame 2 and journaled for pivotal movement in bores therethrough is a transversely extending horizontal shaft 12, and secured on this shaft, on the side of the frame 2 opposite that on which the lens mount member 4 is disposed, is a manually actuated lever 13. See Figures 2 and 3.

Secured on the shaft 12, on the side of the frame 2 on which the lens mount member 4 is disposed, is a cam member 14. A lever 15 is intermediately pivotally and slidably mounted on this side of the frame 2 by means of an adjustable eccentric device 16 engaging a longitudinal slot 17 through the intermediate portion of the lever 15. See Figures 1, 3 and 5. One end of the lever 15 is pivotally connected to the cam member 14, as designated at 18, and the other end of the lever 15 is pivotally connected to one end of a link 19, as designated at 21.

The other end of the link 19 is pivotally connected with the lens mount member 4, as designated at 22, so that movement of the lever 15 in one direction effects rearward positioning of the lens mount member 4 with the front face guide member 8 in adjacent film retaining relation with the rear face guide member 7, as shown in Figure 1, and movement of the lever 15 in the opposite direction effects forward positioning of the lens mount member with the face guide member 8 out of film retaining position for the lacing and unlacing of the film, as shown in Figure 5.

The frame 2 forms an enclosure and a segment plate 23 secured on the shaft 12 within this enclosure engages the lower wall of the frame 2 to limit movement of the shaft in both directions. See Figures 3 and 4.

Arranged, one above and one below the lens mount member 4, are two constant feed sprockets 24 which feed the film 10 to and from the ends of the intermittent film feed guide in timed relation with the intermittent feed mechanism, not shown, which intermittently feeds the film in the guide, the film being looped between the sprockets and the ends of the guide, as shown in Figure 1, to compensate for the intermittent feed of the film in the guide and the constant feed of the film by the sprockets.

Mounted for independent movement in a vertical slide 25 on the frame 2 immediately inward of the lens mount member 4, are two plates 26 which carry film retaining devices 27 movable with the plates 26 into and out of film retaining relation with the sprockets 24. See Figures 1 and 5.

Movement of these film retaining devices is controlled by the lever 13 and they are moved into and out of film retaining relation with the sprockets 24 with corresponding movement of the lens mount member 4 and the face guide member 8 by means of an inwardly projecting stud 28 on the lens mount member and slidably engaging in transverse cam slots 29 in the plates 26, see Figure 5, in a manner fully described and claimed in U. S. Letters Patent #1,624,730 granted April 12, 1927 for Motion picture apparatus on application of Albert S. Howell. Figure 1 shows the position of the parts with the film retaining devices 27 and the face guide member 8 in film retaining position with the film 10 laced therein for the operation of the machine to project pictures and Figure 5 shows the position of the parts with the film retaining devices 27 and the face guide member 8 out of film retaining position for the lacing and unlacing of the film, the film retaining or projection position of the lever 13 being shown in Figure 2 and the out of film retaining position of this lever being shown in Figure 6.

Arranged, one above and one below the lens mount member 4, forwardly of the sprockets 24 are two pivotally mounted loop forming members 31, which are connected for simultaneous operation into and out of loop forming position by means of two arms 32 connected with the members 31 for pivotal movement therewith and arranged on the opposite side of the frame 2 and extending toward each other and having their free ends pivotally and slidably engaged with each other, as designated at 33.

The loop forming members 31 are yieldably urged out of loop forming position into an inner position, as shown in Figure 1, by means of a spring plunger device 34 on the frame 2 engaging the upper arm 32.

The loop forming members 31 are operated to their outer or loop forming positions, as shown in Figure 5, when the aforesaid film retaining means are moved out of film retaining position, by means of the aforesaid cam member 14 operatively engaging an arm 35 connected with the lower loop forming member 31.

Accordingly, the lever 13 controls the position of the loop forming members 31 together with the film retaining means, the loop forming members being positioned in loop forming position for the lacing of the film when the film retaining means is out of film retaining position, as shown in Figure 5, and being positioned in their inner position out of loop forming position when the film retaining means is in film retaining position for the operation of the machine to project pictures.

The mechanism of the machine is driven from an electric motor, not shown, through a releasable clutch 36, see Figure 2, and the clutch is controlled as follows.

A lever 38 is arranged on the side frame 2 on which the arms 32 are arranged and is pivoted on the frame, as designated at 39. See Figures 2 and 6. This lever 38 is connected with the clutch for controlling it, as designated at 41, and is yieldably urged into clutch released position, as shown in Figure 6, by means of a spring plunger device 42.

Pivoted coaxially with the lower arm 32 for movement independently thereof is a latch lever 43 arranged alongside this arm, and this latch lever is provided with a latch formation 44 adapted to engage a cooperating latch formation 45 on the lever 38 to maintain the lever 38 in clutch engaged position, as shown in Figure 2, against the influence of the spring device 42, release of the latch lever 43 permitting the spring device 42 to operate the lever 38 to clutch released position as shown in Figure 6.

A spring 46 yieldably urges the latch lever 43 into engaged position so that it automatically locks the lever 38 in clutch engaged position as the lever 38 is moved into such position.

A manually actuated lever 47 is pivotally mounted intermediately, as designated at 48, on the lever 38 adjacent its upper end, movement of the lever 47 with reference to the lever 38 being limited by stop pins 49 on the lever 38.

Forward movement of the lever 47 from the position shown in Figure 6 causes forward movement of the lever 38 to engage the clutch 36 by reason of the engagement of the lever 47 with the lower stop pin 49, the latch lever 43 automatically locking the lever 38 in clutch engaged position as shown in Figure 2.

Rearward movement of the lever 47 from the position shown in Figure 2 causes pivotal movement of this lever with reference to the lever 38 to cause the lower end of the lever 47 engaging the latch lever 43, as designated at 51 in Figure 2, to move the latch lever and release the lever 38 therefrom, whereupon the spring device 42 actuates the lever 38 rearwardly to release the clutch 36.

Thus is the clutch 36 manually controlled to start and stop operation of the machine.

Secured on the latch lever 43 is a pin 52 which is engaged for movement in an angularly arranged slot 53 in the lower arm 32, so that movement of the loop forming members 31 inwardly from their normal inward position effects movement of the latch lever 43 to release the lever 38 to release the clutch 36 to stop operation of the machine, this movement being effected by engagement of one end of the slot 53 with the pin 52. Movement of the pin 42 in the slot 53 permits movement of the latch lever into released position independently of the arms 24 and permits movement of the loop forming members 31 to their outer or loop forming position independently of the latch lever.

The arm 35 under the influence of the spring device 34 engages a stop, not shown, when released from the cam 14, as shown in Figure 1, and the inner position of the loop forming members 31 is so determined. The connection between the arm 35 and the loop forming members is such that movement of the loop forming members 31 inwardly from their said inner position is permitted against spring influence, and this movement, effected by abnormally shortening of either of the film loops, causes release of the latch member 43 from the lever 38 to release the clutch 36 and stop the machine, by reason of the engagement of one end of the slot 53 with the pin 52, all as fully described and claimed in my co-pending application for U. S. Letters Patent, Serial No. 515,246, filed February 12, 1931, for improvement in Motion picture machine.

Disposed at the front portion of the frame 2

are two alined tubular extensions 54 extending upwardly and downwardly from the frame and communicating with the enclosure thereof. See Figures 1 to 5 inclusive.

The outer ends of these extensions are enlarged to form gear chambers, and journaled centrally on these enlargements and extending across the enclosures thereof are transversely disposed revoluble film reel spindles 55 upon the projecting ends of which film reels 56 are interchangeably mounted to carry the rolls of the film 10.

Duplicate driving devices are carried on each spindle 55 within the aforesaid gear chambers, and one of these will be now described, it being understood that the description applies to both and that the reference characters thereof are applied to both devices on the drawings. See Figures 3, 4 and 7.

Secured on a spindle 55 is a clutch disk 57, and rotatably mounted on the spindle is a clutch member 58 having an enlarged bore portion encircling the clutch disk. The clutch disk 57 is provided with angularly spaced and extending cam formations 59, and balls 61, spaced by a spacing ring 62, are engaged between the enlarged bore portion of the clutch member 58 and the cam formations 59 to provide an overrunning clutch therebetween.

A centrally bored cup member 63 has the bore thereof engaged on the small portion and has the lip portion thereof engaged on the enlarged bore portion of the clutch member 58 for rotation with reference thereto, and has its lip secured, as designated at 64, to the web of a crown or angle gear 65 which has its web disposed on the side of the enlarged bore portion of the clutch member 58 opposite that upon which the small portion of this clutch member is disposed.

A friction ring 66 is interposed between the enlarged bore portion of the clutch member 58 and the web of the gear 65, and a helical compression spring 70 encircles the small portion of this clutch member between the enlarged bore portion thereof and the transverse wall of the cup member 63 and yieldably urges the cup member and the gear 65 in the direction to frictionally engage the web of the gear, the friction ring 66 and the enlarged bore portion of this clutch member, thus forming a friction drive device.

During operation of the machine in projecting the gears 65 are both driven from the mechanism of the machine, as hereinafter described, in order to take up the film in both directions of operation of the machine, the overrunning clutches being arranged to drive the reel taking up the film and to release the other reel for the feeding of the film therefrom by the adjacent sprocket 24, and the friction drive accommodating the speed of the reel taking up the film to the speed of feed of the film thereto from the adjacent sprocket 24.

Referring to Figures 3 and 4, a drive shaft 67 extends vertically within the tubular extensions 54, and through the enclosure of the frame 2, and is journaled for rotation and axial movement by means of balls 68 engaged in circumferential grooves 69 on the shaft adjacent the ends thereof and bushings 71 secured in the bores of the extensions and engaged by the balls 68.

The intermediate portion of the shaft 67 within the enclosure of the frame 2 is provided with a shift collar 72, and a double bell crank lever 73, within the enclosure of the frame 2 and pivotally mounted on a stud 74 on the frame, has one arm thereof connected with the shifter collar for axially shifting the shaft, stop pins 75 on the frame limiting the movement of the lever and shaft in both directions.

An arm 76 is secured on the shaft 12 within the enclosure of the frame 2, and the free end of this arm is pivotally and slidably connected, as designated at 77, with one end portion of a link 78 the other end of which is pivotally connected, as designated at 79, with the end of the lever 73 which is not connected with the shifter collar 72. A helical compression spring 81 encircles the link 78 and yieldably urges the arm 76 in its sliding connection with the link in a direction away from the bell crank lever 73.

Thus is provided an over center spring positioned toggle device operative between the shaft 12 and the shaft 67 to position the shaft 67 in opposite axial positions with opposite angular positioning of the shaft 12 as hereinbefore described. The arrangement is such that, when the lever 13 and shaft 12 are positioned with the film retaining devices, that is, the face guide member 8 and the retaining devices 27, in film retaining position for the projection of pictures, as shown in Figures 1 and 3, the shaft 67 is in its lower position, and, when the lever 13 and shafts 12 are positioned with the film retaining devices out of film retaining position, as shown in Figures 4 and 5, the shaft 67 is in its upper position.

The mechanism of the machine is inclusive of a forwardly extending revoluble shaft 82 within the frame 2, and a spiral angle gear 83 is fixed on this shaft which meshes with a second spiral angle gear 84 fixed on the intermediate portion of the shaft 67. See Figures 3 and 4. Thus is the shaft 67 driven from the mechanism of the machine, the engaged spiral angle gears 83 and 84 permitting axial movement of the shaft 67.

Fixed on the ends of the shaft 67 are pinion gears 85 which, when the shaft is in its lower position, as shown in Figures 1 and 3, mesh with the gears 65 for driving the same, this drive of both gears 65 cooperating with the aforesaid overrunning clutches between the gears 65 and their reel spindles to provide means for alternately driving automatically said reel spindles with operation of the mechanism of the machine in opposite directions to take up the film during projection in either direction of operation of said mechanism.

Secured on the upper reel spindle 55 in spaced relation with the gear 65 on this spindle, is an angle or crown gear 86, these gears facing each other. When the shaft 67 is in its lower position, sa shown in Figure 3, the pinion gears 85 are engaged with the gears 65, as above described, and the gear 86 is not engaged. When, however, the shaft 67 is in its upper position, as shown in Figure 4, the pinion gears 85 are disengaged from the gears 65 and the upper pinion gear 85 is engaged with the gear 86 to drive the upper reel spindle 55 at a relatively high speed to rewind the film on a reel mounted on this spindle.

It will be observed that the gear 86 is driven by the shaft 67 in a direction opposite that in which the gears 65 are driven, so that the upper reel spindle and reel thereon are driven through

the gear 86 in a direction to rewind the film while the mechanism of the machine is operating in the direction with which the lower reel spindle and reel thereon are driven through the lower gear 65.

The normal direction of operation of the mechanism of the machine during the projection of pictures is that in which the lower reel is driven to take up the film, the film being fed from the upper reel. In this direction of operation of the machine, the film is fed to and wound on the lower reel. When it is desired to rewind the film upon the upper reel, the machine is stopped and the film is arranged to extend directly between the reels, as shown in Figure 5. Then upon moving the lever 13 to its opposite position and starting the mechanism, the film is rewound on the upper reel, it being observed that the lower gear 65 is disengaged from the lower gear pinion 85 during the rewinding of the film so that the lower reel is free to be rotated by the film drawn from the film roll thereon. In order to prevent undue spinning of the reels under their momentum and that of the film rolls thereon, particularly during rewinding, spring friction members 87 are secured on the reel spindles 55 and frictionally engage the inner wall surfaces of the gear chambers within which they are disposed. See Figures 3 and 4.

Thus is provided means for alternately driving the two reels while the mechanism of the machine is operated in the same direction, one of said reels to take up a film during projection and the other reel element to rewind the film from the first mentioned reel.

It will be observed that the lever 13 controls the film retaining devices, the loop forming members and the reel driving mechanism with obvious convenience, and this intercontrol is arranged as follows.

When the lever 13 is in one position, as shown in Figures 2 and 3, the shaft 67 is positioned for normal or take up driving of the film reels, the film retaining devices are in film retaining position and the loop forming members are in their inner positions, as shown in Figure 1. The projection of pictures takes place when the lever 13 is in this position.

When the lever 13 is in its opposite position, as shown in Figure 6, the shaft 67 is positioned for rewind driving of the upper reel, the film retaining devices are out of film retaining position and the loop forming members are in their outer or loop forming positions, as shown in Figure 5, the lacing, unlacing and rewind of the film being effected in this position of the lever 13.

The convenience of this arrangement is obvious, and in order that the stoppage of the mechanism of the machine be assured during shifting of the shaft 67 and the pinion gears 85 to alternately engage the gears 65 and the gear 86, the following is provided. See Figures 2 and 6.

The latch lever 43 is provided with a forwardly extending arm 88 underlying the lever 13, and a disk 89 secured with the shaft 12 immediately inward of the lever 13 is provided with a crank pin 91 which in the movement of the lever 13 from one position to the other engages the arm 88 and depresses it to operate the latch lever to release the clutch lever 38 and thereby release the clutch 36 to stop the mechanism of the machine.

While I have described and shown the preferred embodiment of my invention I do not wish to be limited to the precise details of construction as changes may readily be made without departing from the spirit of my invention, but having thus described my invention, I claim as new and desire to secure by Letters Patent the following:

1. In a motion picture machine the combination with two film reel elements, of two crown gears for driving said reel elements and disposed coaxially therewith, a third crown gear for driving one of said reel elements and disposed coaxially therewith and facing the corresponding gear of said two gears and having a diameter smaller than said corresponding gear, and additional gear means driven from the mechanism of the machine and axially shiftable to alternately engage said third gear and said two gears and including a pinion alternately engageable in its shifting movement with said third gear and said corresponding gear.

2. In a motion picture machine the combination with two film reel elements, of two oppositely facing crown gears for driving said reel elements and disposed coaxially therewith, a third crown gear for driving one of said reel elements and disposed coaxially therewith and facing the corresponding gear of said two gears and having a diameter smaller than said corresponding gear, a longitudinally shiftable drive shaft driven from the mechanism of the machine, and gear pinions fast on the ends of said shaft engageable with said two gears in one longitudinal position of said shaft and disengageable therefrom in a second longitudinal position of said shaft, one of said pinions being engageable with said third gear in said second position of said shaft.

3. In a motion picture projecting machine the combination with two film reel elements, of shiftable drive means for alternately driving said reel elements from the mechanism of the machine while said mechanism is operating in the same direction, one of said reel elements to take up a film during projection and the other reel element to rewind the film, a releasable clutch for driving said mechanism, a manually actuated member, means whereby opposite movements of said manually actuated member effect shifting of said shiftable drive means to alternately drive said reel elements, and means whereby movement of said manually actuated member in either direction effects release of said clutch prior to the shifting of said shiftable drive means into a driving position.

4. In a motion picture projecting machine the combination with two film reel elements, of shiftable drive means for alternately driving said reel elements from the mechanism of the machine while said mechanism is operating in the same direction, one of said reel elements to take up a film during projection and the other reel elements to rewind the film, a releasable clutch for driving said mechanism and yieldably urged into released position, a releasable latch for retaining said clutch in engaged position, a manually actuated member, means whereby opposite movements of said manually actuated member effect shifting of said shiftable drive means to alternately drive said reel elements, and means whereby movement of said manually actuated member in either direction effects release of said latch member to release said clutch prior to the

shifting of said shiftable drive means into a driving position.

5. In a motion picture machine the combination with a film spindle, of an angle gear arranged coaxially therewith, a drive connection between said gear and said spindle comprising a friction drive device and an overrunning clutch, a second gear arranged coaxially of said spindle and angularly secured therewith, and a third gear driven from the mechanism of the machine and shiftable to alternately mesh with said first mentioned and second gears.

6. In a motion picture machine the combination with a film spindle of an angle gear arranged coaxially therewith, a drive connection between said gear and spindle comprising a friction drive device and an overrunning clutch, a second angle gear having a diameter smaller than said first mentioned gear and secured on said spindle, said gears facing each other, and a gear pinion driven from the mechanism of the machine and shiftable to alternately mesh with said first mentioned and second gears.

ALBERT S. HOWELL.