C. E. AKELEY.

MOVING PICTURE CAMERA.

APPLICATION FILED AUG. 3, 1914.

1,181,201.

Patented May 2, 1916.

7 SHEETS—SHEET 1.

Fig. 1

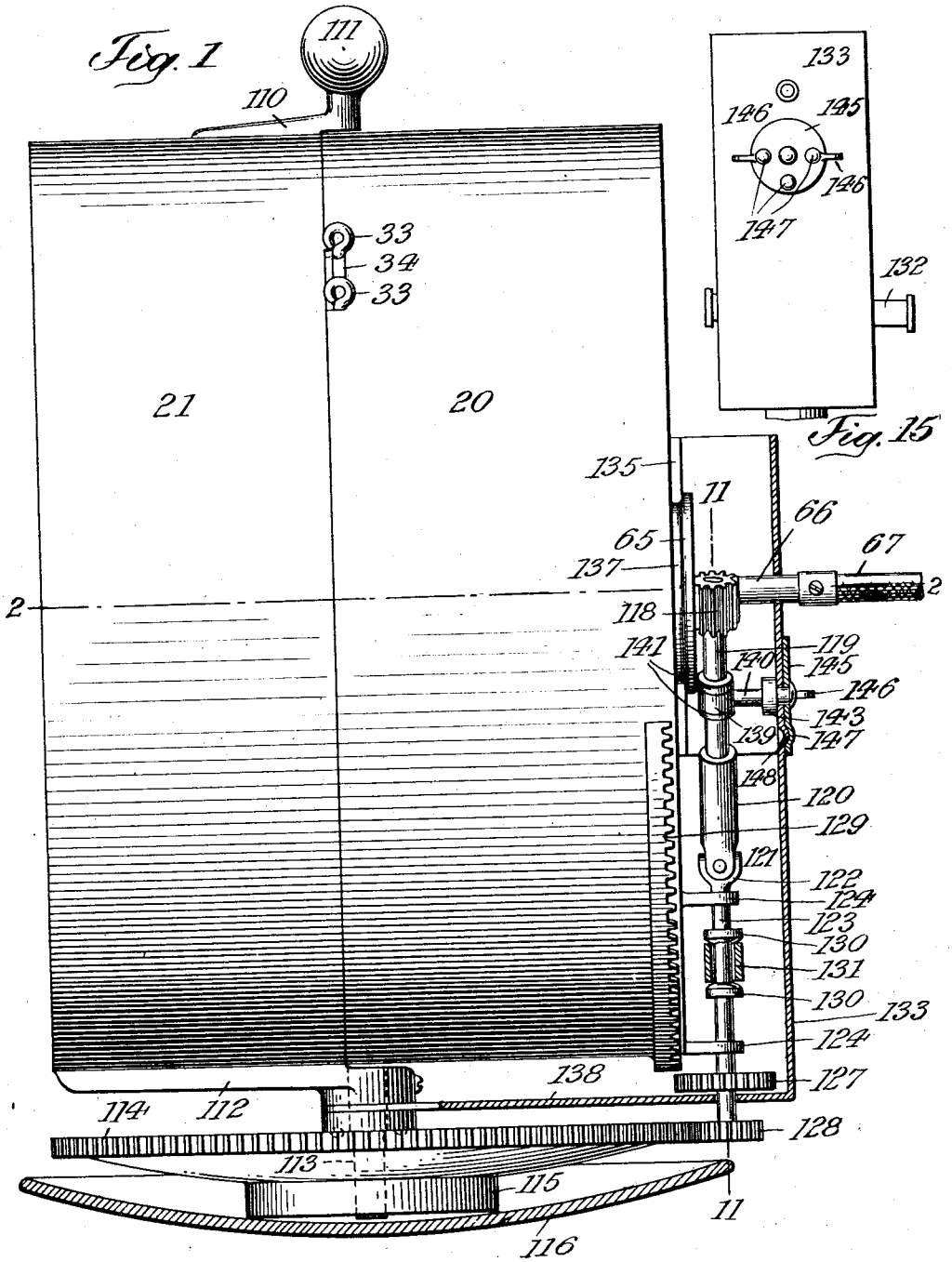

Fig. 15

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Bressler & Goepel

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7 SHEETS—SHEET 2.

Fig. 2

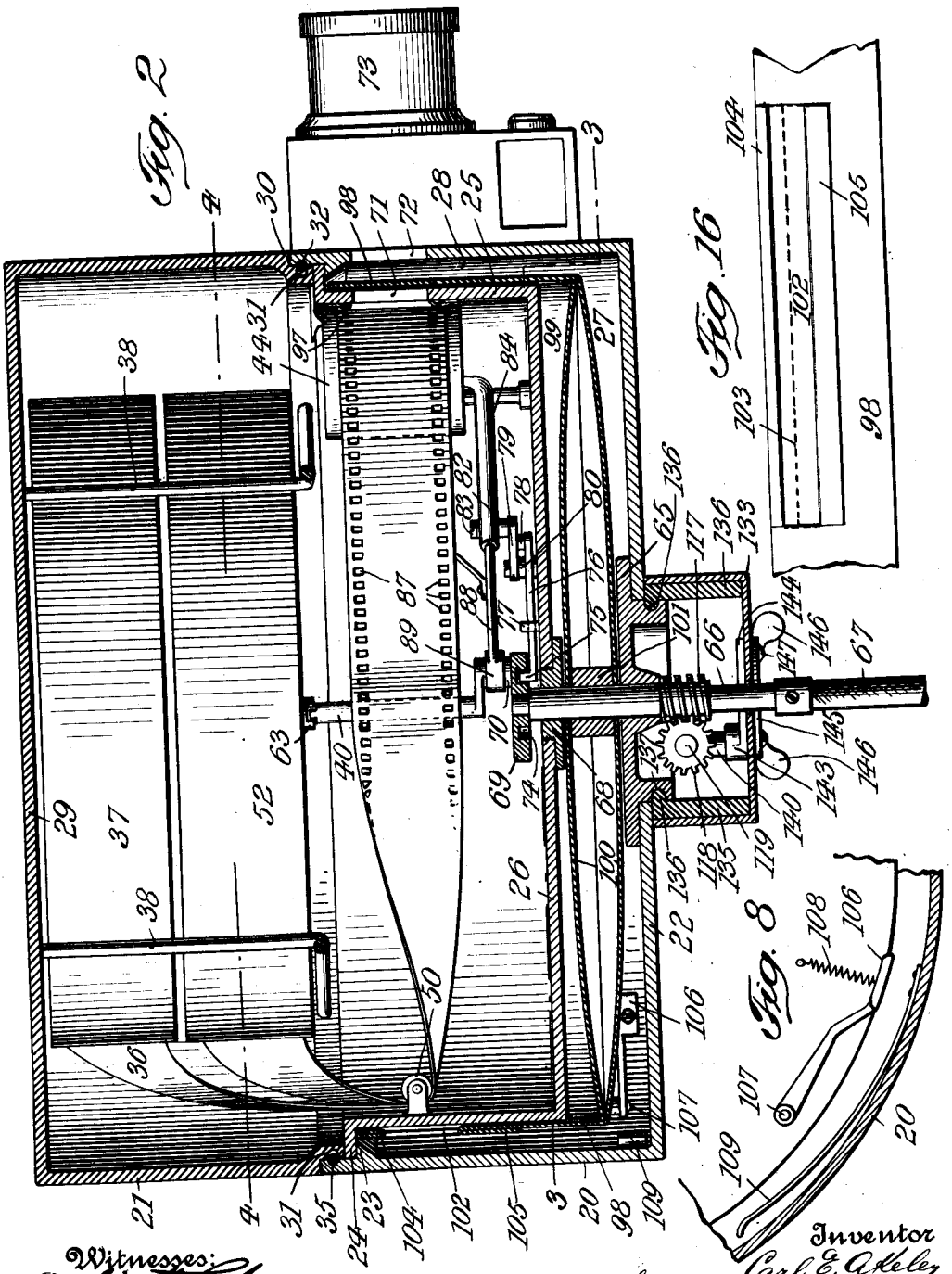

Fig. 16

Fig. 8

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7 SHEETS—SHEET 3.

Fig. 3

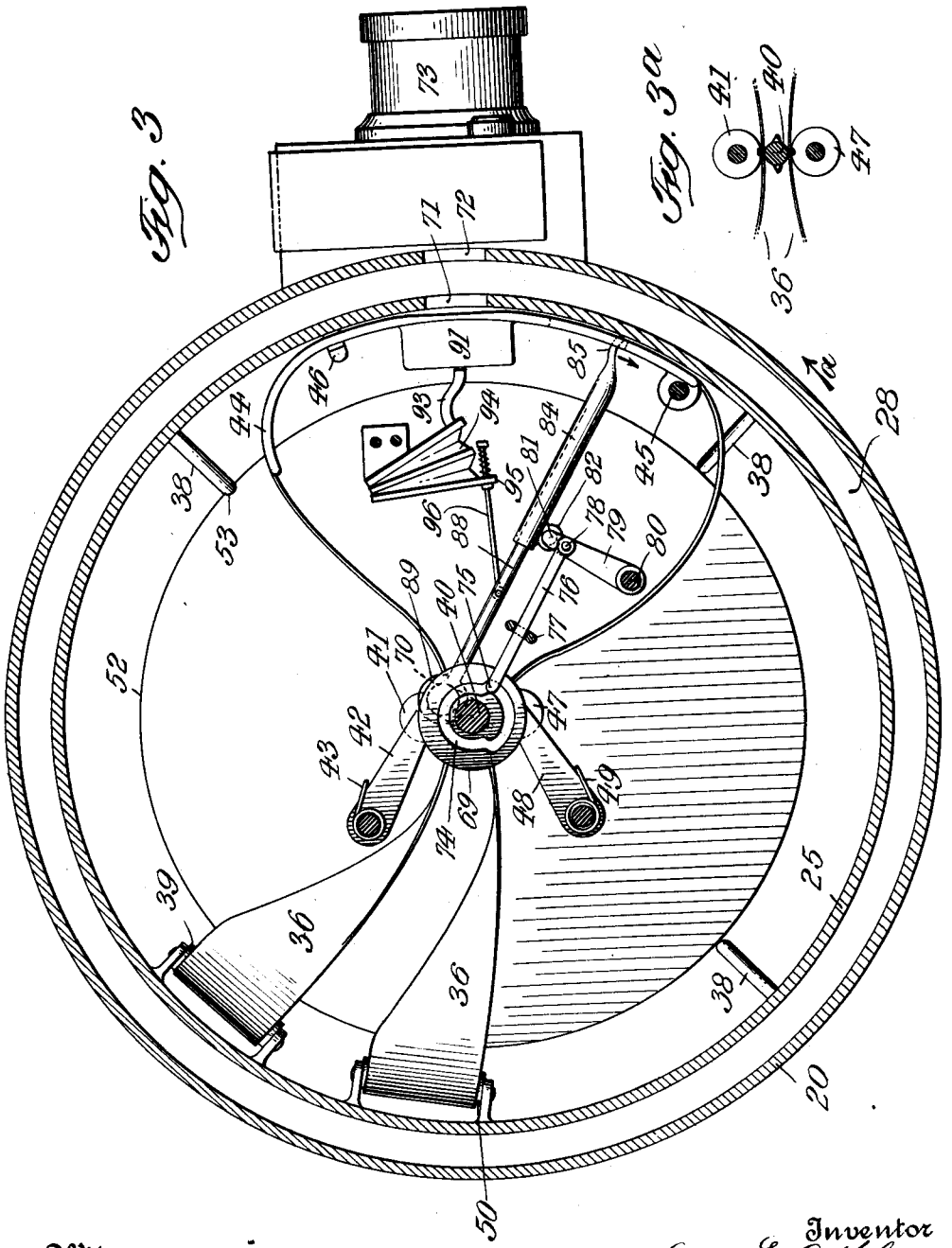

Fig. 3a

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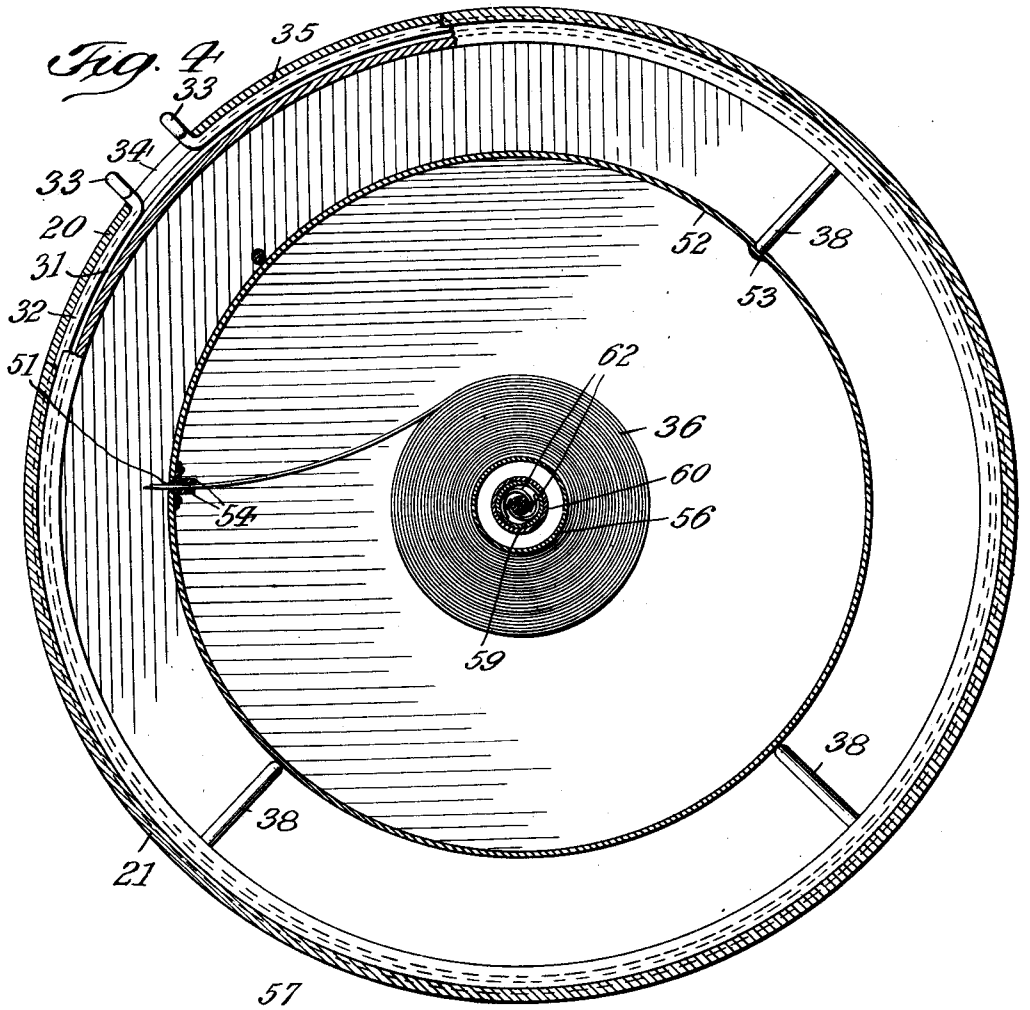
7 SHEETS—SHEET 4.

Fig. 4



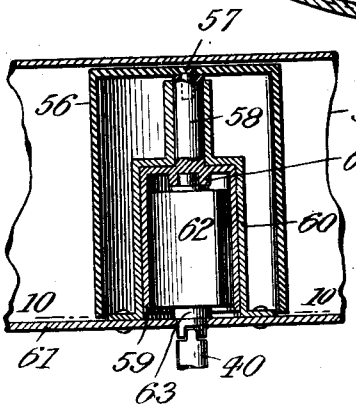
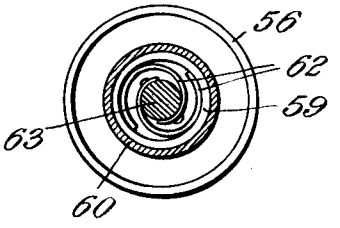


Fig. 9

Fig. 10



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7 SHEETS—SHEET 5.

Fig. 5

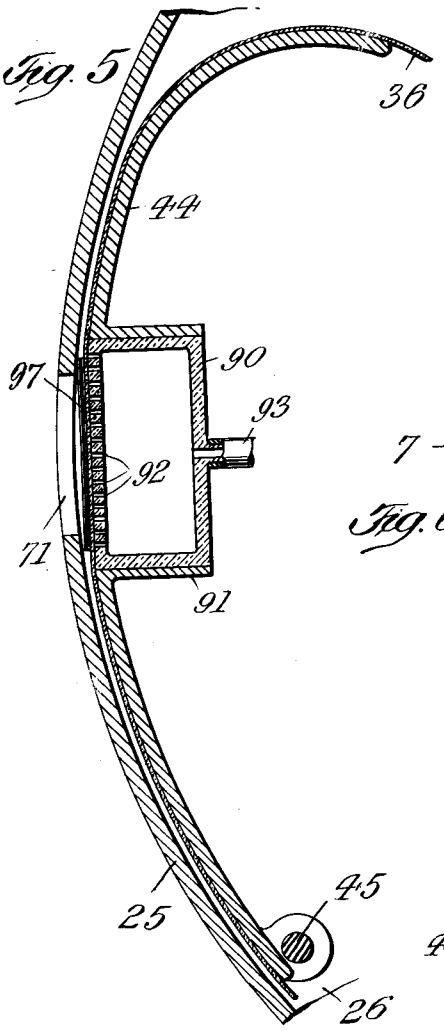


Fig. 6

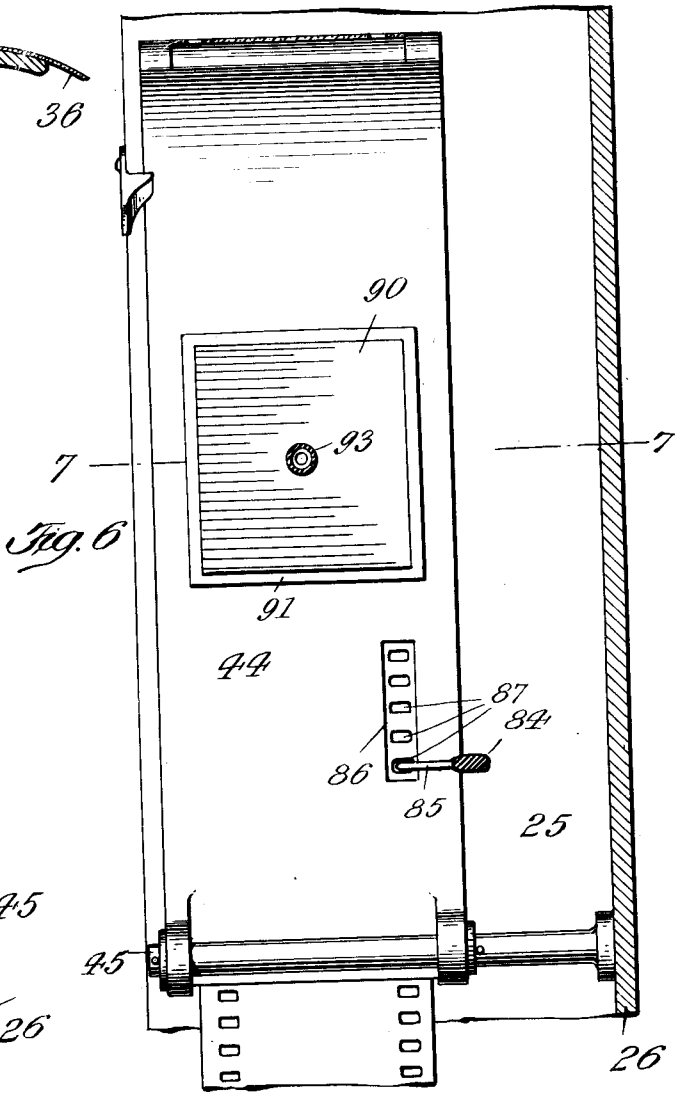
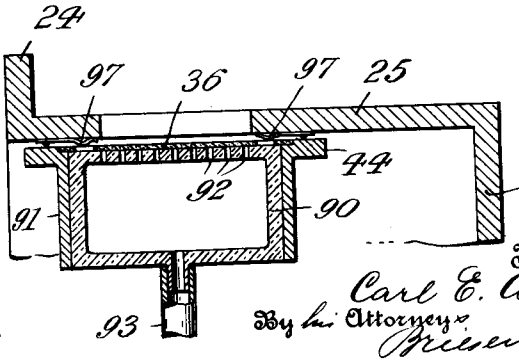


Fig. 7



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MOVING PICTURE CAMERA.

APPLICATION FILED AUG. 3, 1914.

1,181,201.

Patented May 2, 1916.

7 SHEETS—SHEET 6.

Fig. 11

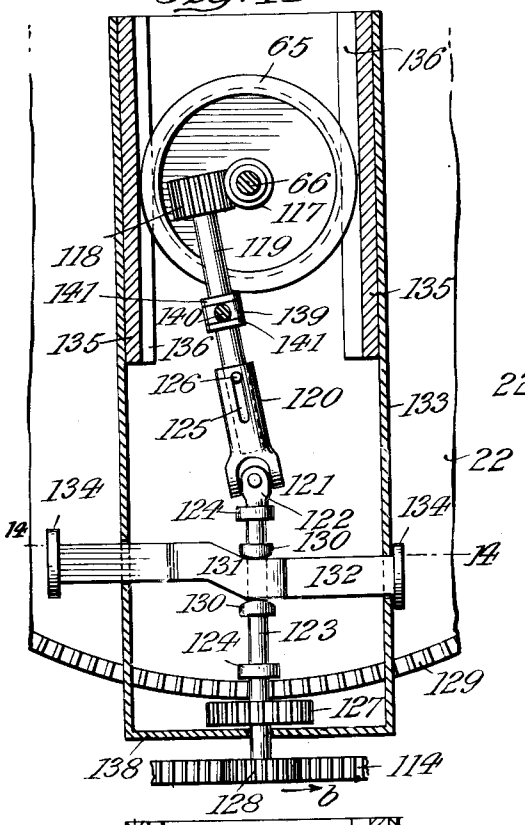
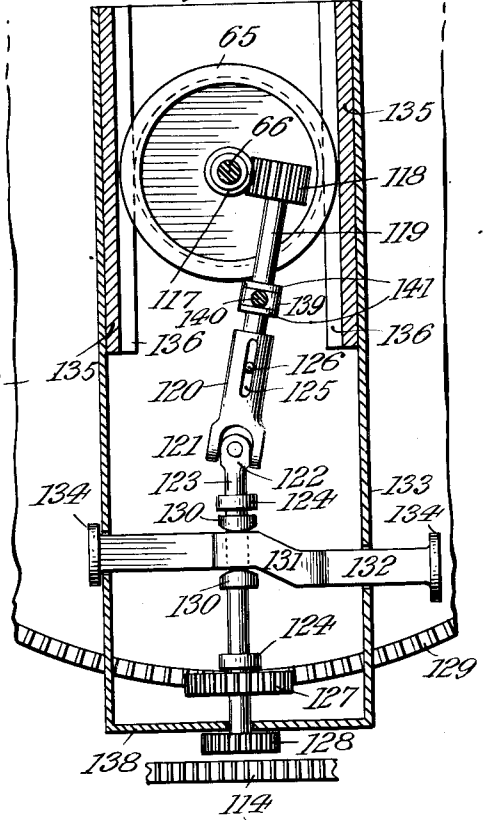


Fig. 12



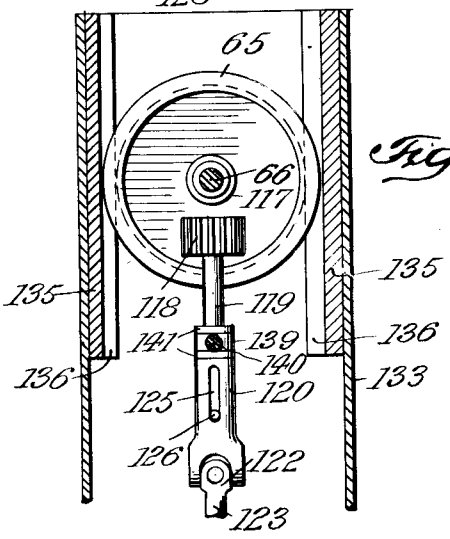
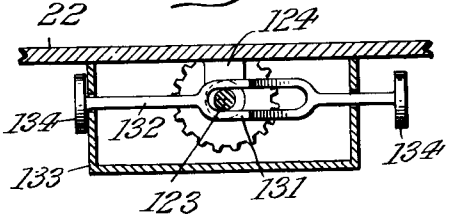


Fig. 13

Fig. 14



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MOVING PICTURE CAMERA.

APPLICATION FILED AUG. 3, 1914.

1,181,201.

Patented May 2, 1916.

7 SHEETS—SHEET 7.

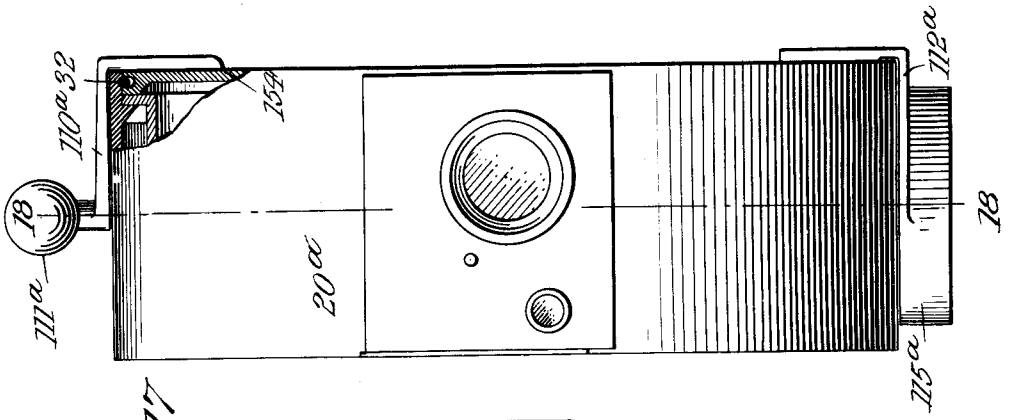

Fig. 17

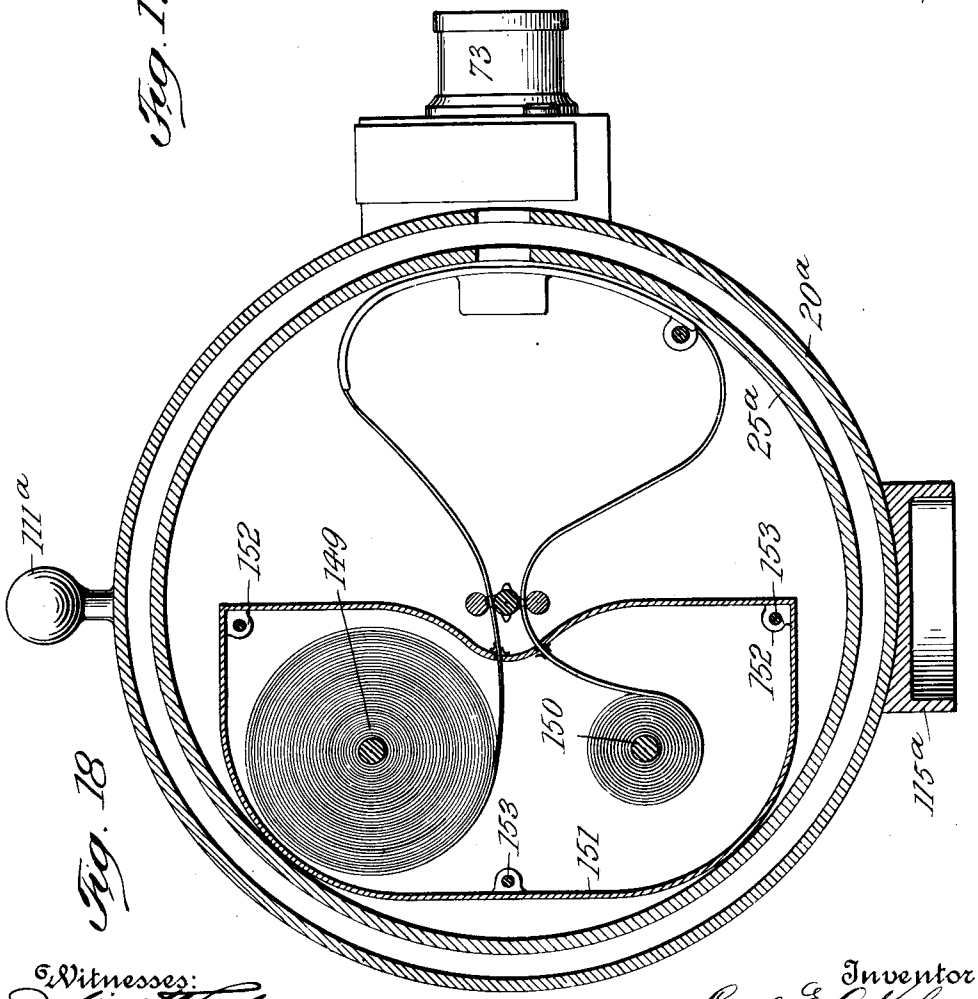

Fig. 18

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Breese & Zerwer

UNITED STATES PATENT OFFICE.

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MOVING-PICTURE CAMERA.

1,181,201. Specification of Letters Patent. Patented May 2, 1916.

Application filed August 3, 1914. Serial No. 854,777.

To all whom it may concern:

Be it known that I, CARL E. AKELEY, a citizen of the United States, residing at the city of New York, county and State of New York, have invented a new and useful Moving-Picture Camera, of which the following is a specification.

This invention relates to a moving picture camera of novel construction and more particularly to a general combination of elements by which a reliable action of the camera is insured.

The invention comprises the various features of construction more fully brought out in the appended specification and claims.

In the accompanying drawing: Figure 1 is a sectional side elevation of a moving picture camera embodying my invention; Fig. 2 an axial section on line 2—2, Fig. 1; Fig. 3 a cross section on line 3—3 Fig. 2, with some of the parts omitted; Fig. 3ª a detail of the film-feeding means; Fig. 4 a section similar to Fig. 3 on line 4—4, Fig. 2; Fig. 5 a cross section through the film-guide; Fig. 6 a side view of Fig. 5; Fig. 7 a cross section on line 7—7, Fig. 6; Fig. 8 a detail of the speed regulator for the shutter; Fig. 9 an axial section through part of the film take up roll; Fig. 10 a cross section on line 10—10, Fig. 9; Fig. 11 a longitudinal section on line 11—11, Fig. 1; Figs. 12 and 13 are similar sections showing the parts in different positions; Fig. 14 is a cross section on line 14—14, Fig. 11; Fig. 15 a face view on a reduced scale, of the gear casing, partly broken away; Fig. 16 a detail of the shutter; Fig. 17 a sectional side elevation of a modified form of the camera with some of the parts omitted, and Fig. 18 a cross section on line 18—18, Fig. 16.

My improved moving picture camera as illustrated in Figs. 1 to 14 is composed essentially of a casing 20 made preferably of metal and containing the camera mechanism proper and of a casing 21 constituting a closure for casing 20 as well as a film-box receptacle, both of these casings being cylindrical and having preferably the same outer diameter. Casing 20 is closed at one end by an end plate 22 while near the other end, it is provided with an inner annular flange 23 that constitutes the seat for the outwardly extending flange 24 of a cylindrical box or container 25. The latter is provided with an end plate 26, and is considerably smaller than casing 20 to form a compartment 27 that communicates with an annular space 28. Case 21 is provided at one end with an imperforate end plate 29 while at its other end, it is recessed as at 30. In order to tightly join casing 20, 21 with each other, casing 21 is provided at its recessed section with a surface groove 31 adapted to receive a springy locking wire 32. The latter extends almost completely around casing 21 and is shown to be provided at its opposed ends with a pair of grips 33 extending outwardly through a corresponding recess 34 of casing 20. Wire 32 has the tendency to expand and thus engage an inner groove 35 of casing 20, which is considerably shallower than groove 31 as clearly illustrated in Fig. 2. If it is desired to remove the film box receptacle 21 from casing 20, grips 33 are forced toward each other to completely draw wire 32 into groove 31 and thus permit a removal of receptacle 21. After the latter has been reattached to casing 20, grips 33 are released so that wire 32 is free to expand into groove 35 and thereby lock receptacle 21 to casing 20.

The film negative 36 to be exposed is unwound from a reel contained within a film-delivery box 37 that is removably supported between a plurality of pins 38 extending inwardly from the end plate 29 of receptacle 21. From box 37, the film 36 runs partly around an idler 39 carried by box 25 toward a pin barrel 40 that receives rotary movement in manner hereinafter described. Film 36 is held against barrel 40 by means of a pressure roller 41 carried by an arm 42 that is forced toward the barrel by a spring 43. After clearing barrel 40, the film 36 passes along a curved guide 44 which is pivoted at 45, the play of the guide being limited by a fixed stop 46 of box 25. From guide 44, the film is returned to barrel 40 against which it is held by a pressure roller 47 arranged diametrically opposite roller 41, the roller 47 being carried by an arm 48 influenced by a spring 49. The film 36 finally passes partly around an idler 50 and through the slot 51 of a film-receiving box 52. The latter is likewise supported between the pins 38, one of which engages a recess 53 of the box 52 to prevent a rotation thereof after being placed in position. In order to prevent light from entering box 52 dur-

ing the exchange thereof, slot 51 is flanked by velvet flaps 54 contacting with the film it being of course understood that the film delivery box 37 is constructed in analogous manner. The end of film 36 is secured to a take-up spool 56 which is, by screw 57 connected to the stem 58 of a rotatable cylinder 59, the parts 58, 59 being contained within a corresponding housing 60 secured to the end wall 61 of box 52. Cylinder 59 is adapted to be rotated by means of one or more springs 62 frictionally bearing against the same and secured to a spindle 63 journaled in wall 61 and in a step bearing 64 of cylinder 59, the spindle 63 receiving rotary movement in the following manner: Into a central opening of the end plate 22 of casing 20 is fitted a circular flanged bearing 65 supporting a power shaft 66 that may receive rotary movement from a motor through a flexible shaft 67 or in any other suitable manner. Shaft 66 is further journaled in a bearing 68 fitted into the end plate 26 of box 25. At its inner end, shaft 66 carries a relatively fixed cam disk 69 adapted to operate the film-feeding means in manner hereinafter described. Disk 69 is provided with a wrist pin 70 shown to be integral with the barrel 40. The free end of the latter constitutes a coupling member that is adapted to engage a corresponding member of spindle 63 and thereby transmit rotary motion to spool 56.

The means for intermittently moving the film across the alined openings 71, 72 of the parts 25, 20 which openings are in turn alined with the lens tube 73 of the camera, are as follows: On the face opposite to wrist pin 70, disk 69 is provided with a cam groove 74 which is engaged by the bent end 75 of a rod 76 guided in a staple 77 of plate 26. The free end of rod 76 is pivoted at 78 to an arm 79, fulcrumed at 80 to plate 26. Arm 79 is provided with a pin 81 which is rotatably received within a sleeve 82 to which it is held by screw 83. Sleeve 82 forms part of a tubular feed dog 84 which extends at right angles thereto. Dog 84 is provided with a reduced bent end section or finger 85 adapted to extend through an oblong opening 86 of guide 44 into one of the perforations 87 of film 36 for feeding the latter. The bore of dog 84 is slidably engaged by a guide bar 88 having an eye 89 that engages wrist pin 70. As will be seen from Fig. 3, cam groove 74 embraces two substantially semicircular sections of different radius, so that rod 76 together with arm 79 and dog 84 is alternately moved toward and away from film guide 44. While dog 84 with its finger 85 is thus reciprocated, it receives simultaneously an oscillating movement through wrist pin 70 and bar 88 that is free to slide within the bore of dog 84 during the revolving movement of said pin. These movements of dog 84 and finger 85 are so timed that when the finger arrives at its outermost position, it engages one of the film perforations 87. Finger 85 is then moved in the direction of the arrow (Fig. 3) thereby advancing film 36 whereupon it is retracted from the film and returned to its original position to be again advanced into one of the film perforations, whereupon the operation is continued. In this way the desired intermittent advance movement of the film is obtained in a simple and efficient manner.

In order to hold that film portion which is temporarily located opposite the lens tube, in a flat condition while being exposed, there is arranged back of the film, a suction box 90 made preferably of vitreous material and firmly held in position by a correspondingly shaped neck 91 of guide 44. The straight or flat front wall of box 90 is provided with a plurality of perforations 92. The box communicates through a flexible tube 93 with a pair of bellows 94, the movable board 95 of which is by a spring-influenced rod 96 connected to bar 88. It will thus be seen that by the construction described, the air is exhausted from box 90 to suck the film against the front wall thereof, while owing to the smoothness of said glass front, the intermittent advance movement of the film will not be impeded. For properly guiding the latter along box 90, there is riveted or otherwise secured to the inner face of box 25 a pair of spring blades or guards 97 that engage the film in proximity to its edges.

As thus far described it will be seen that when shaft 66 is started, the film will be uniformly unwound from box 37 by means of feed barrel 40 and pressure roller 41, while a like length of film is simultaneously taken in by the drum 40 and roller 47 to be finally wound upon the take-up spool 56, the latter receiving a yielding rotary motion through springs 62 and cylinder 59. In this way a loose loop of uniform length is maintained between rollers 41, 47 and around guide 44, so that the intermittent advance of the film by finger 85 may readily take place, said intermittent advance movement causing but an alternating change of the shape of the free loop portion.

Within the annular space 28 there is adapted to rotate closely around box 25, the cylindrical shell 98 of a rotary shutter 99. The latter is firmly mounted on shaft 66 by means of a pair of oppositely bulged disks 100 secured to a hub 101, and united along their periphery thereby combining light weight with comparative great strength. Shell 98 is provided with an opening 102 of a size to permit an exposure of sufficient time when alined with the lens tube. In order to maintain a true balance of the shutter and to prevent a swerving thereof,

opening 102 is not simply cut out from shell 98, but a substantially H-shaped incision 103 is first provided in shell 98, and then the flaps 104, 105 thus formed are folded against the unmutilated portions of the shell, as clearly illustrated in Figs. 2 and 16.

For preventing the rotatable mechanism of the camera from being operated with an excessive speed, a brake is provided which is shown to comprise a brake shoe 106 pivoted to the shutter at 107 and influenced by a spring 108. Opposite the path of shoe 106 is arranged a resilient blade or buffer 109 which is secured to casing 20 in suitable manner. The weight of shoe 106 and the strength of spring 108 should be so calculated that during the normal speed of the shutter, etc., the centrifugal force will be insufficient to cause an engagement between the shoe and blade. As soon as the speed increases however, shoe 106 will come in contact with blade 109, thereby retarding the movement of the shutter and the other movable parts of the camera.

My improved camera is further provided with means for securing the same to a suitable stand, and more particularly to a camera stand shown and described in a copending patent application filed by me August 3rd, 1914 Serial No. 854775, (renewal filed June 15, 1915 Serial No. 34302). For this purpose, casing 21 is provided at its top with an arm 110 carrying a ball 111 and partly overlapping casing 20, the ball 111 being adapted to engage a fixed bearing of the stand (not shown). At its bottom, casing 21 is provided with an arm 112 the free end of which carries a pintle 113 upon which is mounted a toothed wheel 114 having an annular flange 115 that is adapted to engage a dished plate 116, the construction being such that when a pressure is exercised upon the ball 111, the flange 115 and toothed wheel 114 will be firmly clamped to plate 116, while permitting a free rotation of casings 20, 21. The dished plate 116 and the means for depressing ball 111 are described and shown in the above mentioned copending patent application and do not form part of the present invention.

The panorama device with which my improved camera is provided, is constructed as follows: Shaft 66 is provided with a worm 117 which is adapted to be engaged by a worm wheel 118 firmly attached to one end of a spindle 119. The other end of the latter is telescoped by a sleeve 120 constituting one member of a universal joint 121 the other member 122 of which forms part of a rotatable and axially displaceable spindle 123 journaled in bearings 124. Sleeve 120 is provided with a longitudinal slot 125 that accommodates a pin 126 projecting outward from spindle 119. Near its lower end, spindle 123 carries a pair of relatively fixed pinions 127, 128. Of these, pinion 127 is adapted to engage a toothed sector 129 of casing 20 while pinion 128 is adapted to engage the toothed wheel 114. The relative distances between pinions 127, 128 and between the lowermost portion of sector 129 and toothed wheel 114 are such that while the parts 127, 129 are in engagement, the parts 128, 114 are out of engagement, and vice versa, as clearly illustrated in Figs. 11 and 12. For axially moving spindle 123, the latter is provided with a pair of opposed bulged collars 130 between which said spindle is straddled by the slanting eye 131 of a slide 132 the ends of which are guided by and project outwardly through a pair of corresponding perforations formed in the side walls of a gear casing or box 133. At its protruding ends, slide 132 is provided with finger pieces 134. Casing 133 is so constituted that it occupies permanently the vertical position illustrated in Figs. 1, 11, 12, 13 while permitting a rotation of casing 20 around its axis for a purpose hereinafter more fully explained. For obtaining this result, casing 133 is secured to a pair of blocks 135 having flanges 136 that engage a peripheral groove 137 of bearing 65. At its bottom, casing 133 is closed by a plate 138 interposed between arm 112 and toothed wheel 114, the plate 138 being provided with a perforation that permits the passage of pintle 113. It will thus be seen that when slide 132 occupies the position illustrated in Fig. 11, pinion 128 is in engagement with toothed wheel 114, while when the slide is pushed into the opposite position (Fig. 12) pinion 127 is in engagement with sector 129. As is further apparent from Figs. 11 and 12, the worm wheel 118 may be brought into engagement with worm 117 either on one or on the other side thereof, thereby causing spindle 123 to rotate either in one or the other direction. For setting the worm wheel 118, spindle 119 is loosely embraced by the eye 139 of a pin 140, said eye being mounted between a pair of fixed collars 141 of spindle 119. The pin 140 is loosely set in a boss 143 of an interior rotary disk 144. The latter is firmly connected to an exterior disk 145 provided with finger pieces 146. It will be seen that by properly manipulating disk 145, the pin 140 and eye 139 may be moved in an arc about the center of disks 144, 145. This movement will, by eye 139, be transmitted to spindle 119 and worm wheel 118, the sleeve 120 permitting a corresponding axial displacement of the spindle. In order to fix the device in one of the positions shown in Figs. 11, 12 and 13 of which Fig. 13 indicates the position occupied by the parts when spindles 119, 123 are rendered inoperative, disk 145 is provided with three sockets 147 either of which is adapted to engage a projection 148 of gear casing 133.

It will thus be seen that when the parts occupy the position illustrated in Fig. 13, shaft 66 may be freely rotated for taking motion pictures while the panorama device is out of operation. If it is desired to take a horizontal panorama view while the camera rotates in the direction of the arrow *a* (Fig. 3), the parts are set to occupy the position illustrated in Fig. 11. After shaft 66 has been started, pinion 128 will roll about the fixed wheel 114 in the direction of arrow *b*, thereby imparting to the camera the desired rotary movement. In case, the camera is to be rotated in the opposite direction, disk 145 is rotated by finger pieces 146 through an angle of about 180 degrees, so that worm wheel 118 occupies the position shown in Fig. 12 thus reversing pinion 128, as will be readily understood. For taking an upright panorama picture, slide 132 is shifted into the position illustrated in Fig. 12 so that pinion 127 engages rack 129. A rotation imparted to said pinion will thus cause a corresponding rotation of casing 20 about its horizontally disposed axis, a reversal of said rotation being effected in analogous manner.

The motion picture camera above described is designed for exposing a comparatively great length of film, say four hundred feet thereof. If it is desired to take a picture of a shorter scene, requiring say but one hundred feet of film, a camera such as illustrated in Figs. 18 and 19 may be used. This camera corresponds with respect to the means for intermittently advancing the film, for operating the rotary shutter, etc., substantially to the camera above described, so that these parts have been omitted from said figures. The film delivery reel 149 and film receiving reel 150 are inclosed within a film box 151, the inwardly extending eyes 152 of said box being fitted upon pins 153 of a container 25^a that corresponds substantially to container 25. Container 25^a is seated within a casing 20^a and is closed by a circular disk or cover 154 normally anchored to said casing by a locking wire 32. Disk 154 is provided with an arm 110^a carrying a ball 111^a and with an arm 112^a provided with an annular rim 115^a, the parts 111^a and 115^a corresponding respectively to the parts 111 and 115 above described.

I claim:

1. A moving picture camera comprising a cylindrical casing having an annular seat, a cylindrical container inclosed within the casing and having an outwardly extending flange that engages the casing-seat, means located within the container for intermittently advancing a film, and a removable closure for said casing, said closure holding the container in position.

2. A moving picture camera comprising a cylindrical casing having an annular seat, a cylindrical container inclosed within the casing and having an outwardly extending flange that engages the casing-seat, means located within the container for intermittently advancing a film, a closure for said casing, said clousre holding the container in position, and means for removably securing said closure to the casing.

3. A moving picture camera comprising a cylindrical casing having an annular seat and an inner circumferential groove above said seat, a cylindrical container inclosed within the casing and having an outwardly extending flange that engages the casing-seat, means located within the container for intermittently advancing a film, a closure having a circumferential outer groove opposite the casing-groove, and a locking wire within said grooves.

4. A moving picture camera comprising a cylindrical casing having an annular seat and an inner circumferential groove above said seat, a cylindrical container inclosed within the casing and having an outwardly extending flange that engages the casing-seat, means located within the container for intermittently advancing a film, a closure having a circumferential outer groove opposite the casing-groove, the closure-groove being deeper than the casing-groove, a springy locking wire received within the closure-groove and tending to expand into the casing-groove, and manually accessible means for contracting said wire.

5. A moving picture camera comprising a cylindrical casing having an annular seat, a cylindrical container inclosed within the casing and having an outwardly extending flange that engages the casing-seat, means located within the container for intermittently advancing a film, a closure for said casing, and means for removably securing said closure to the casing, said means permitting a rotation between casing and closure.

6. A moving picture camera comprising a first cylindrical casing, a second-cylindrical casing removably secured thereto, a film-delivery box and a film-receiving box contained within said second casing, and film-advancing means and film-exposing means contained with the first casing.

7. A moving picture camera comprising a first cylindrical casing, a second-cylindrical casing removably secured thereto, a film-delivery box, and a film-receiving box contained within said second casing, a take-up spool journaled within the film-receiving box, a film-advancing means and film-exposing means contained within the first casing, and common means for operating film-advancing means, the film-exposing means and the take-up spool.

8. A moving picture camera comprising a first cylindrical casing, a second cylindrical

casing removably secured thereto, a film-delivery box and a film-receiving box contained within said second casing, a take-up spool journaled within the film-receiving box, a pin barrel adapted to feed the film, a coupling adapted to connect the barrel to the spool, means for intermittently advancing the film independent of the movement imparted thereto by the pin barrel, a rotary shutter, said pin barrel, film-advancing means and shutter being inclosed within the first casing, and a common shaft for operating the pin barrel, the film-advancing means and the shutter.

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