

Nov. 26, 1935.

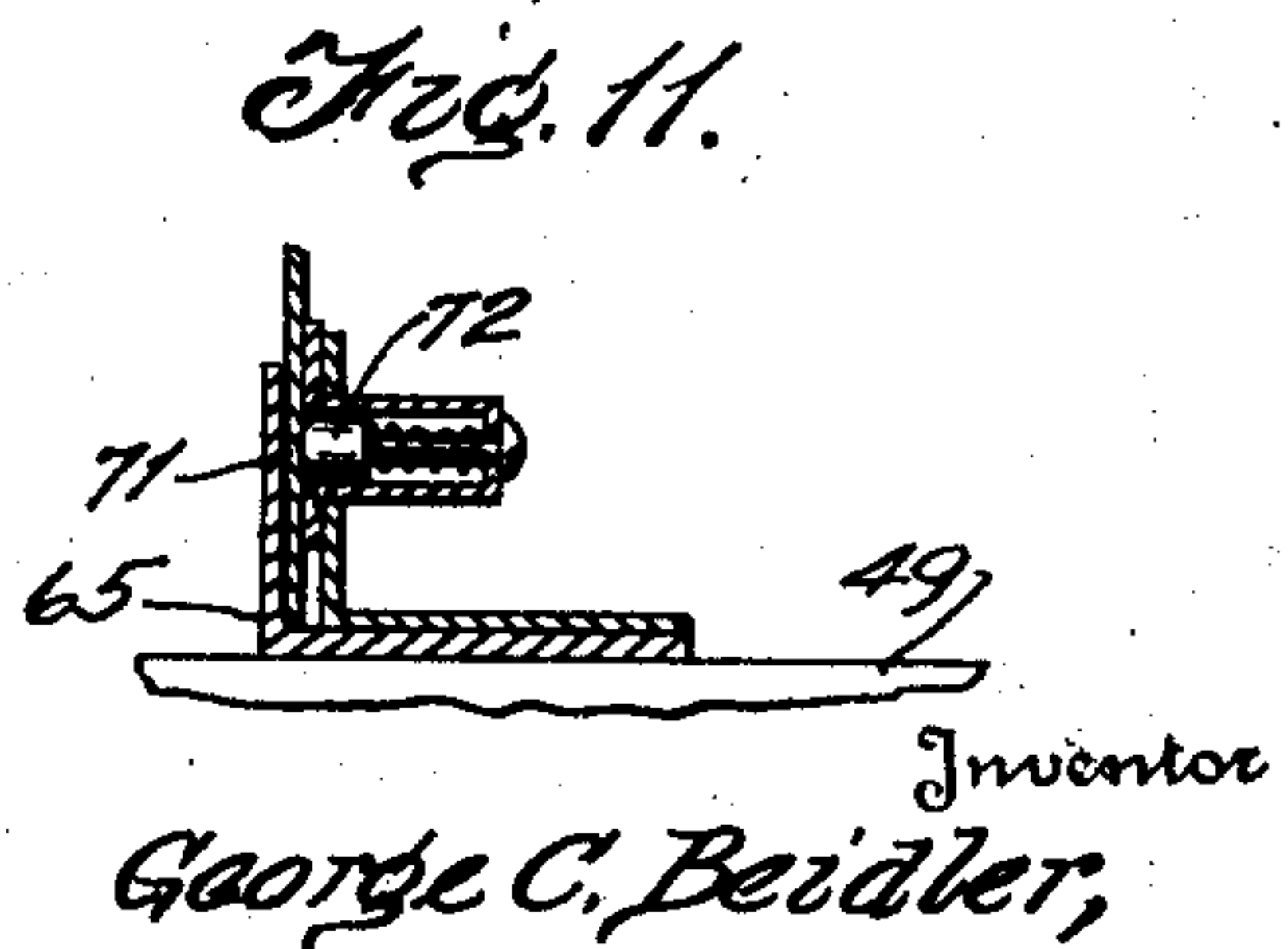
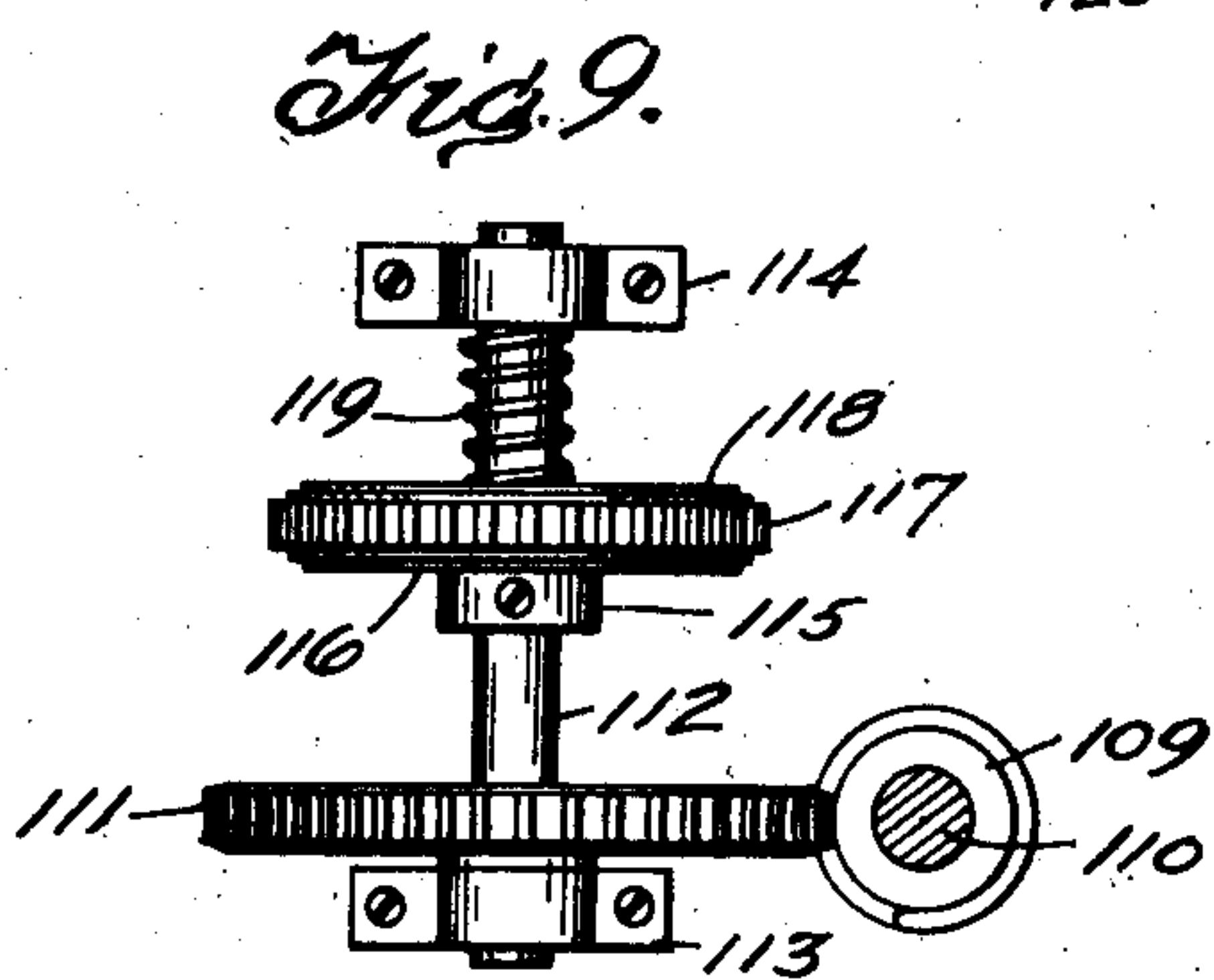
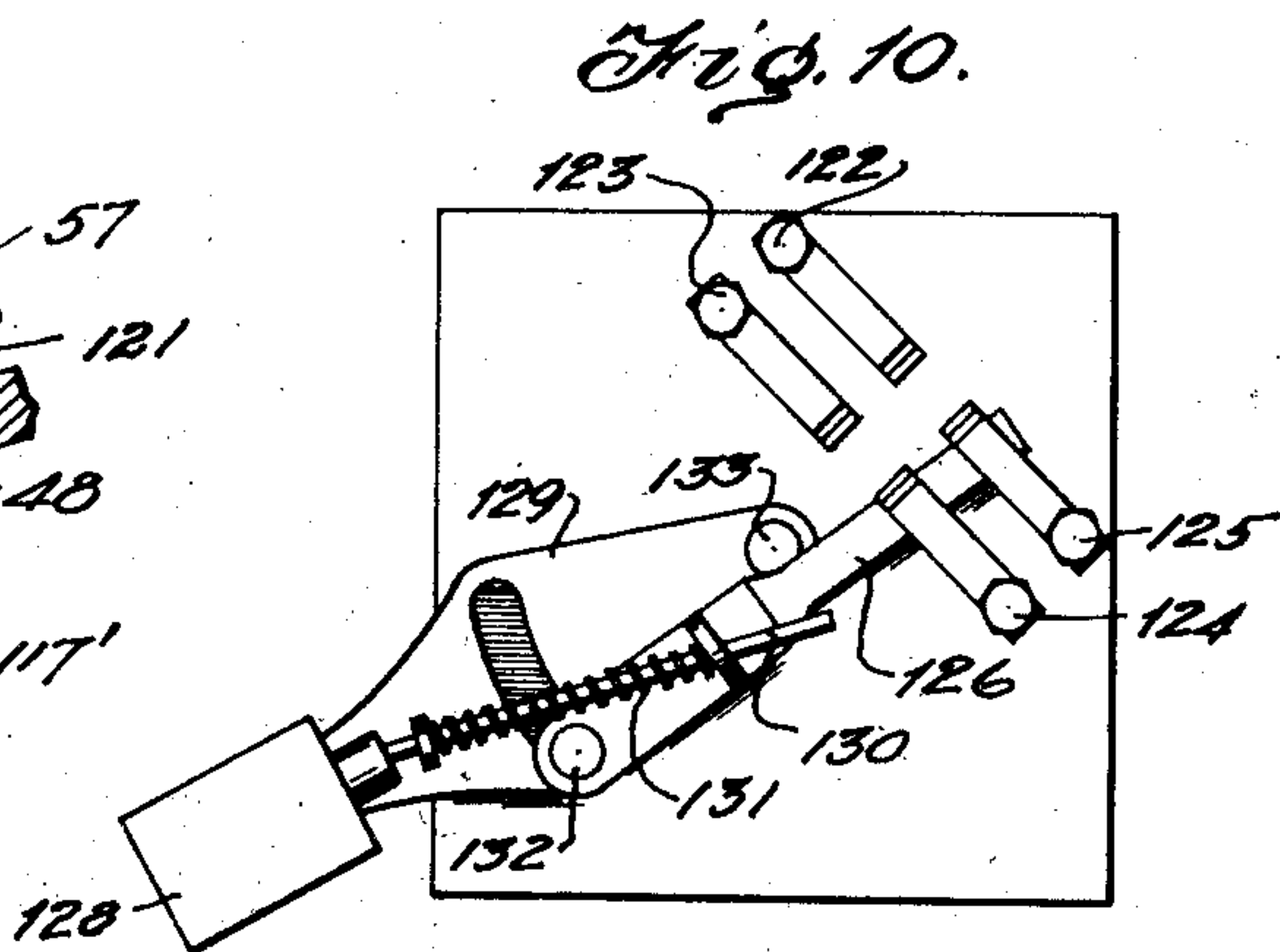
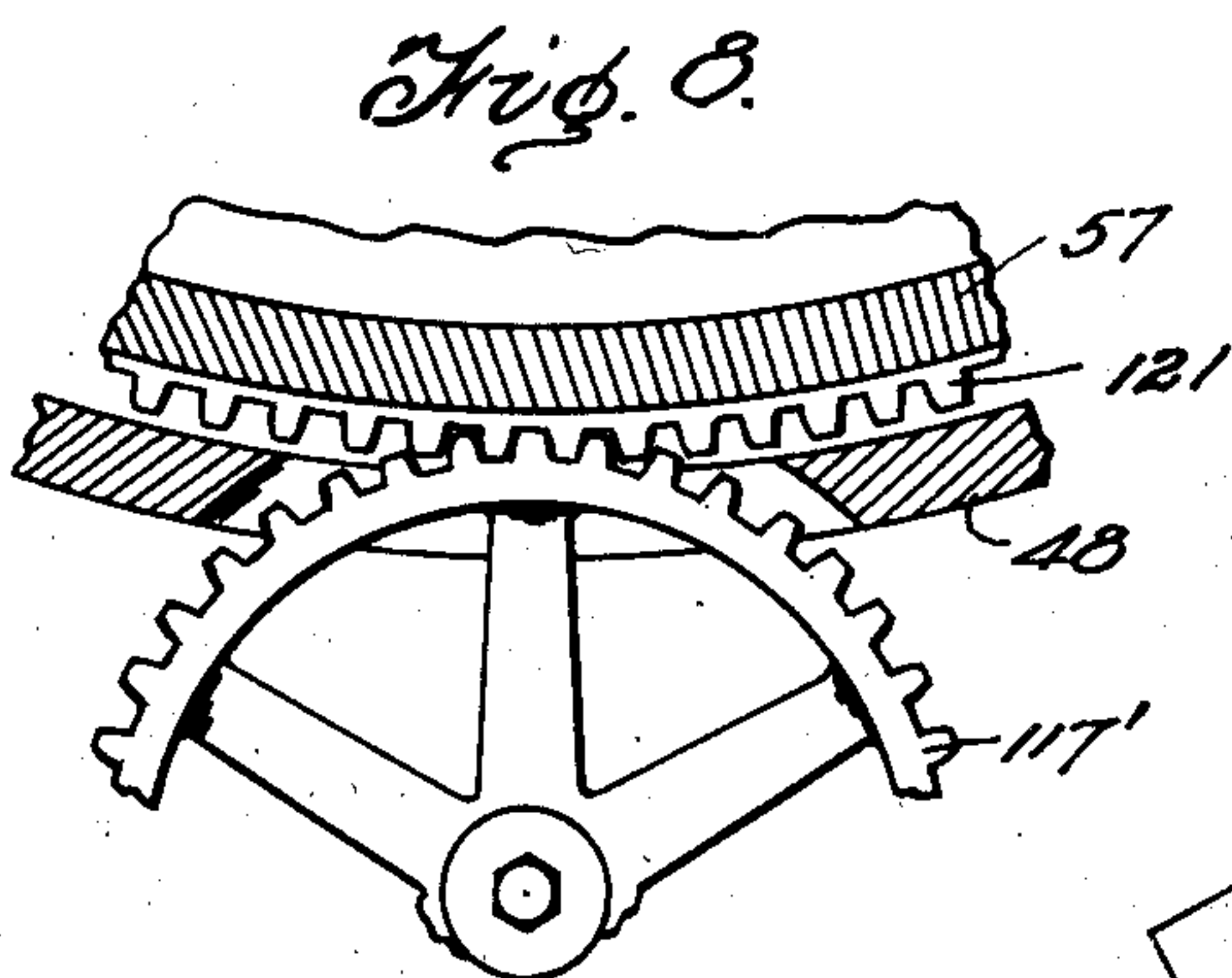
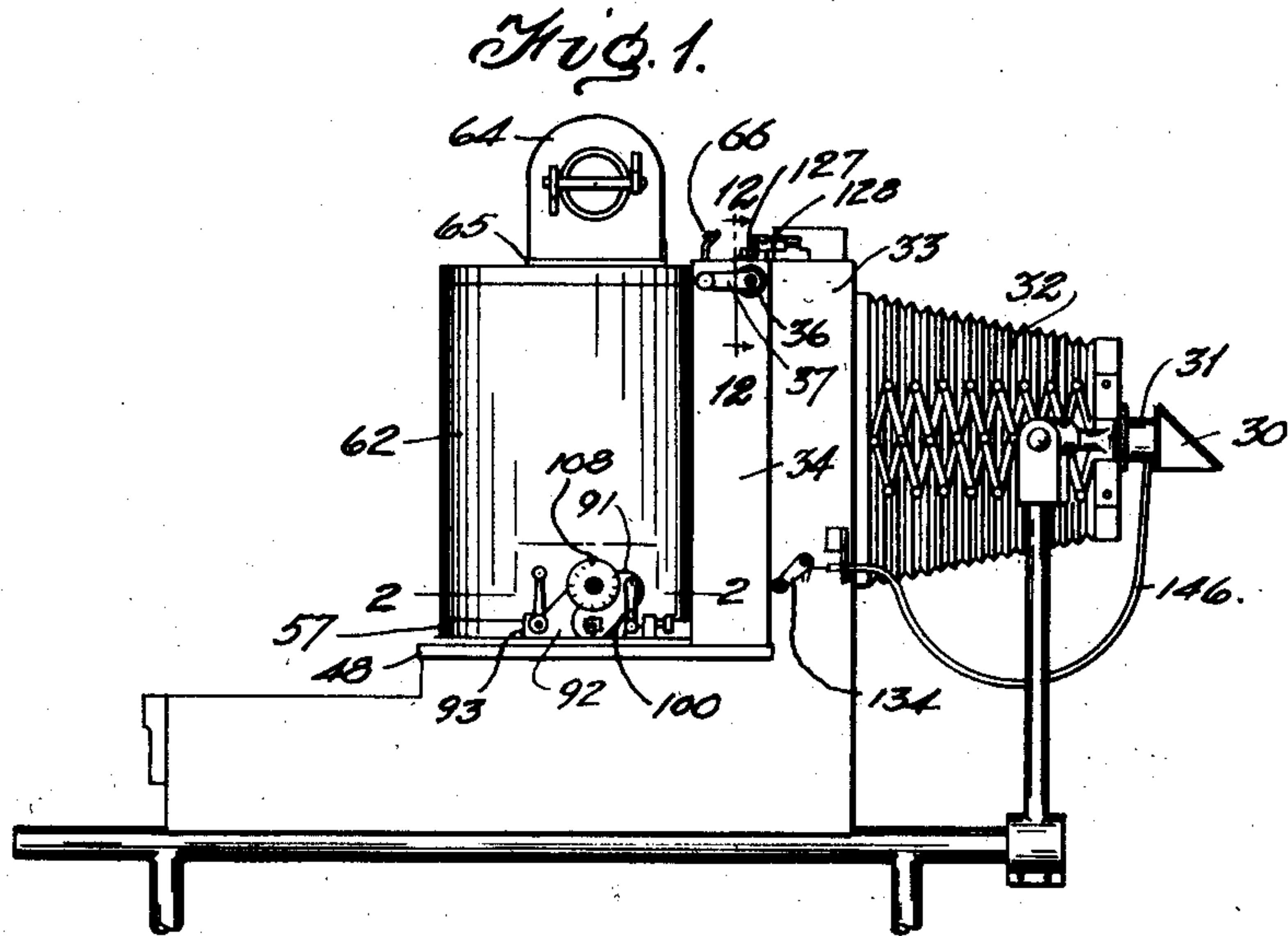
G. C. BEIDLER

2,021,884

PHOTOGRAPHING APPARATUS

Filed April 4, 1934

5 Sheets-Sheet 1



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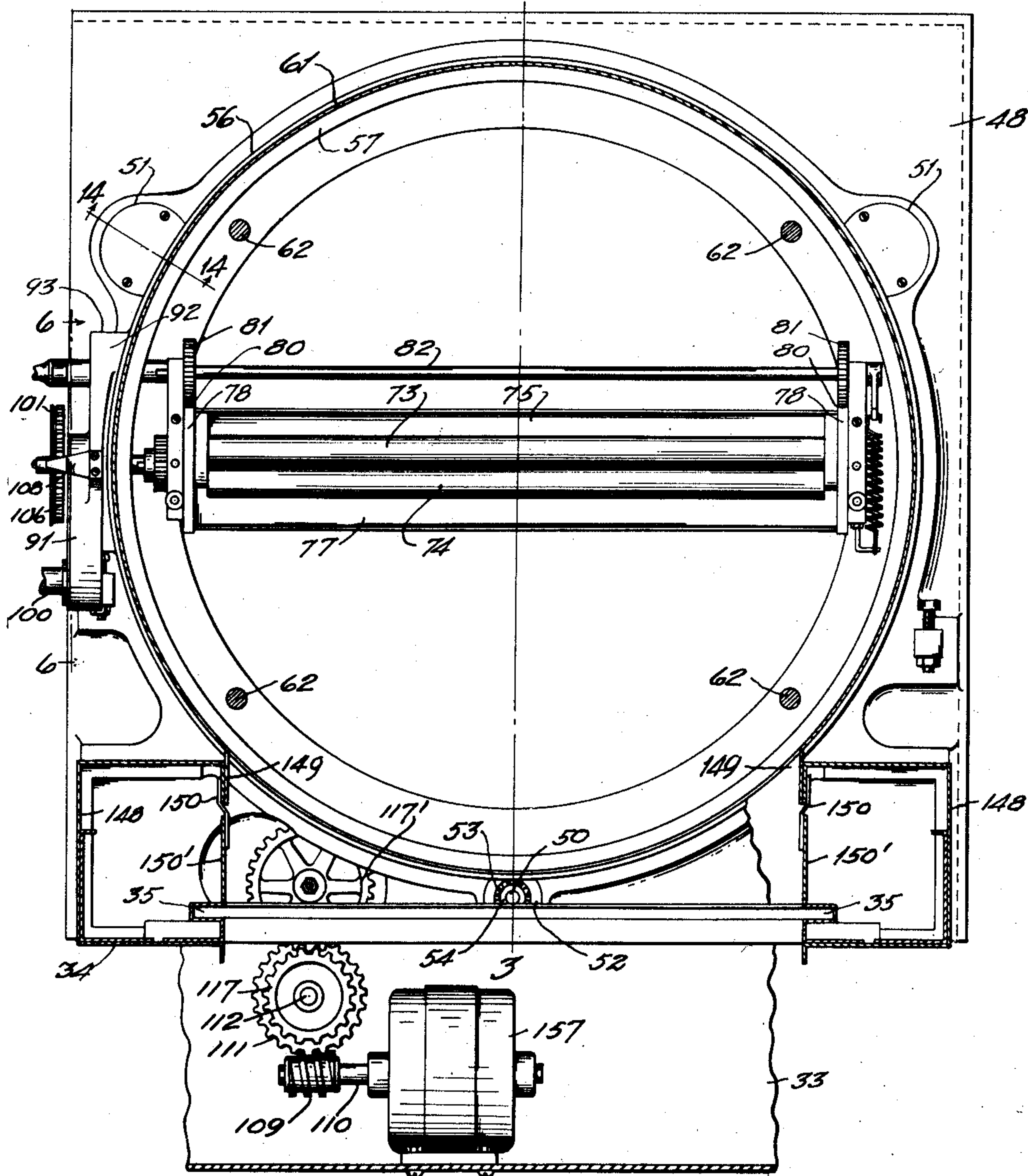
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Fig. 2.
3



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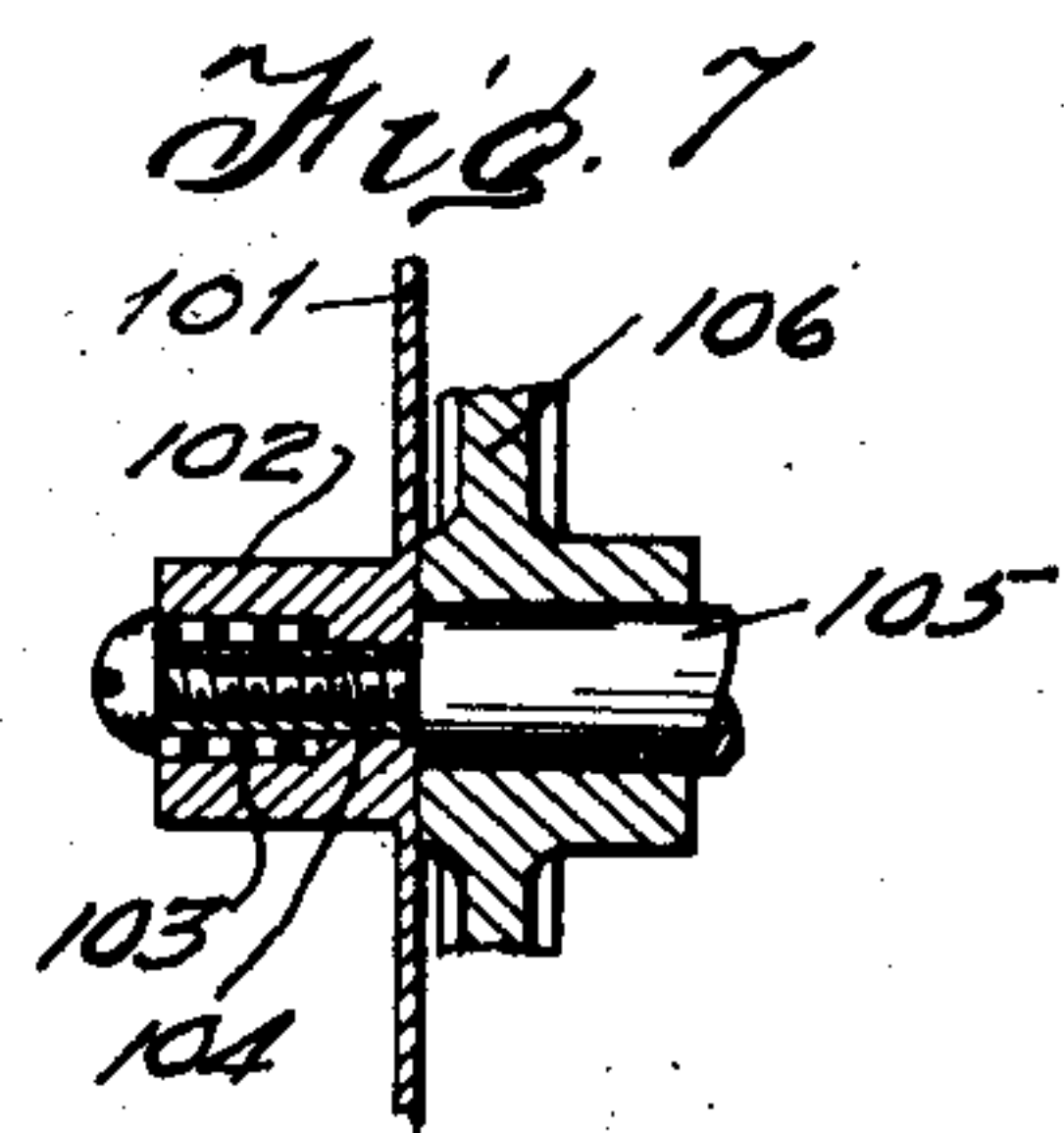
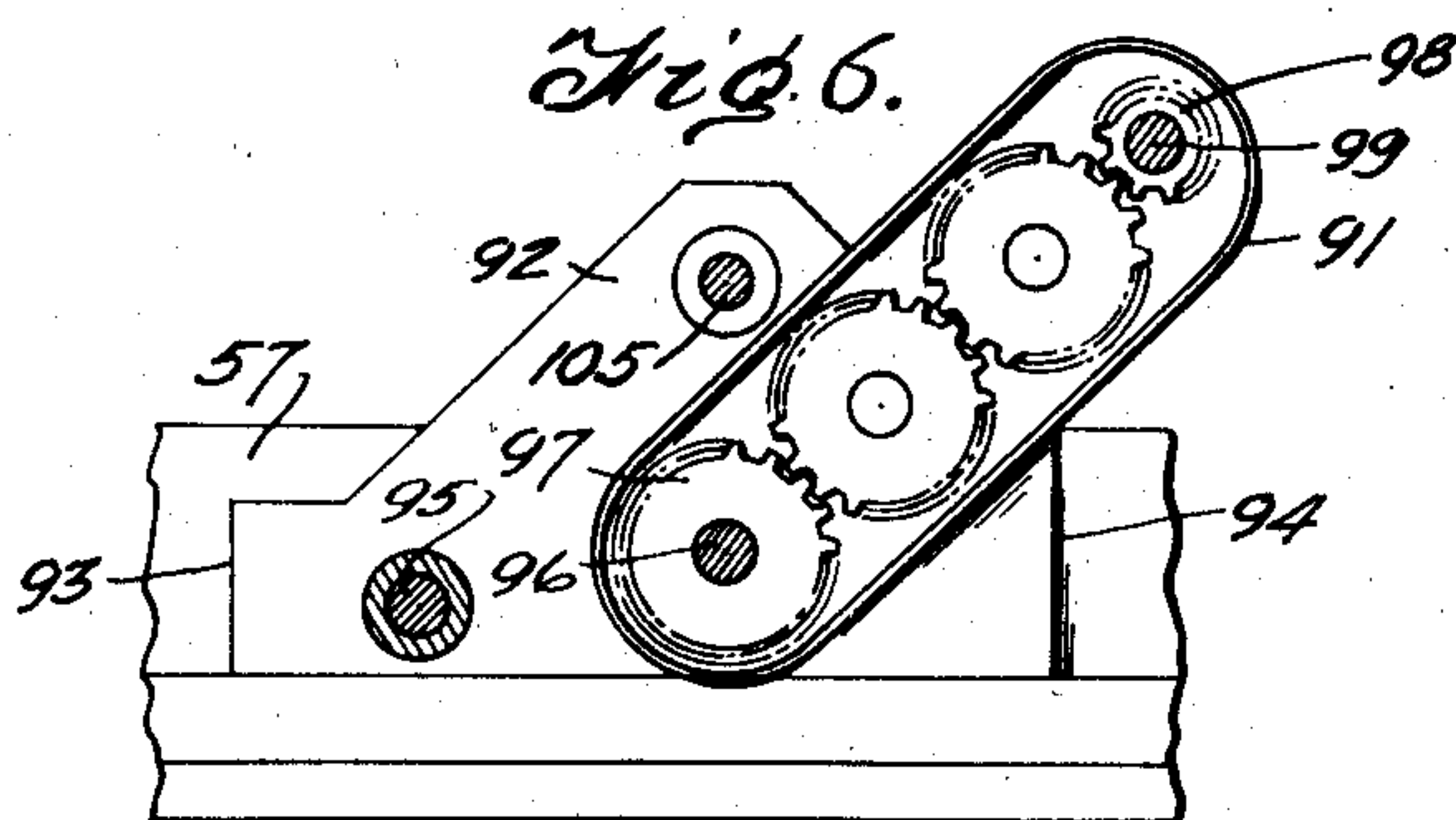
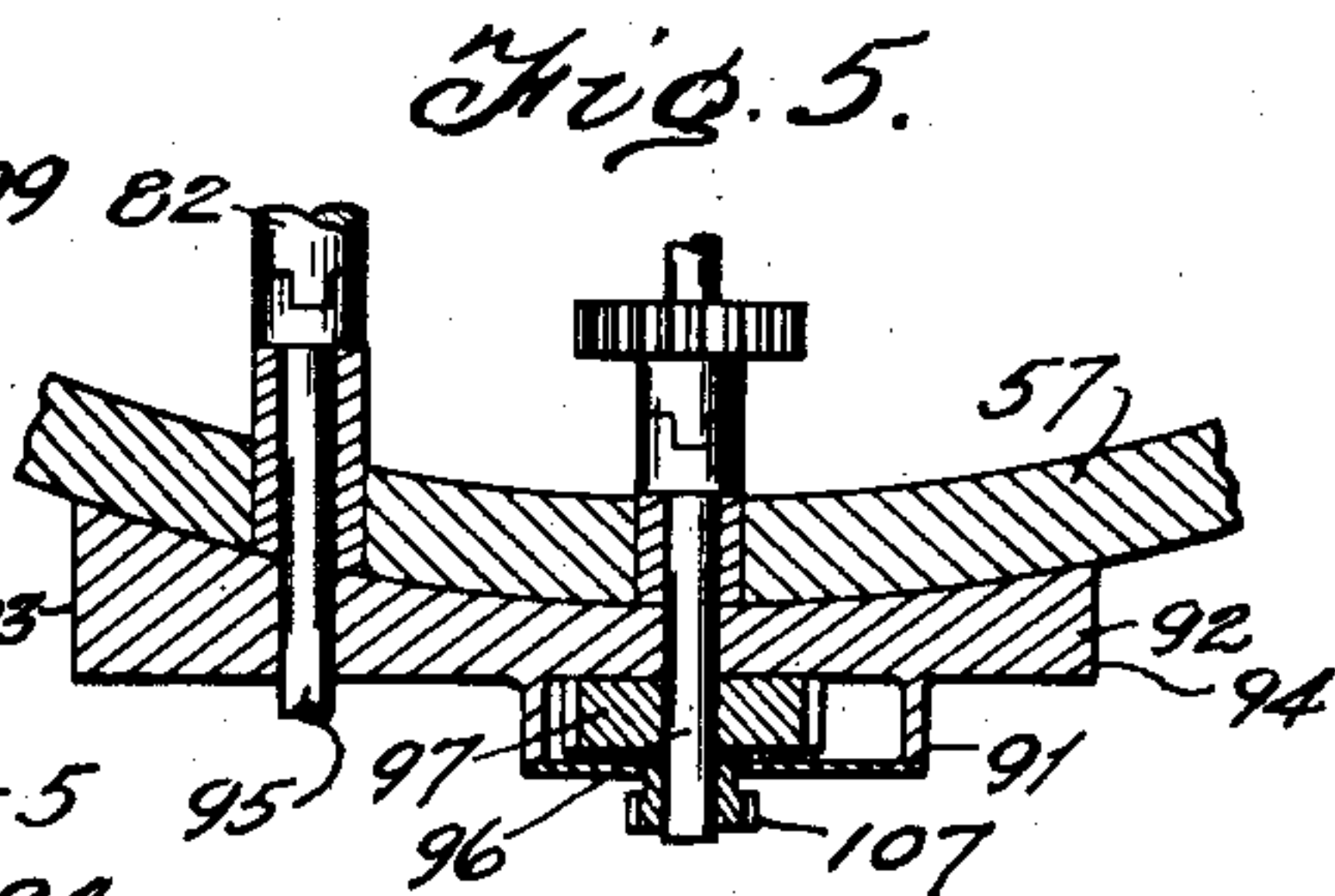
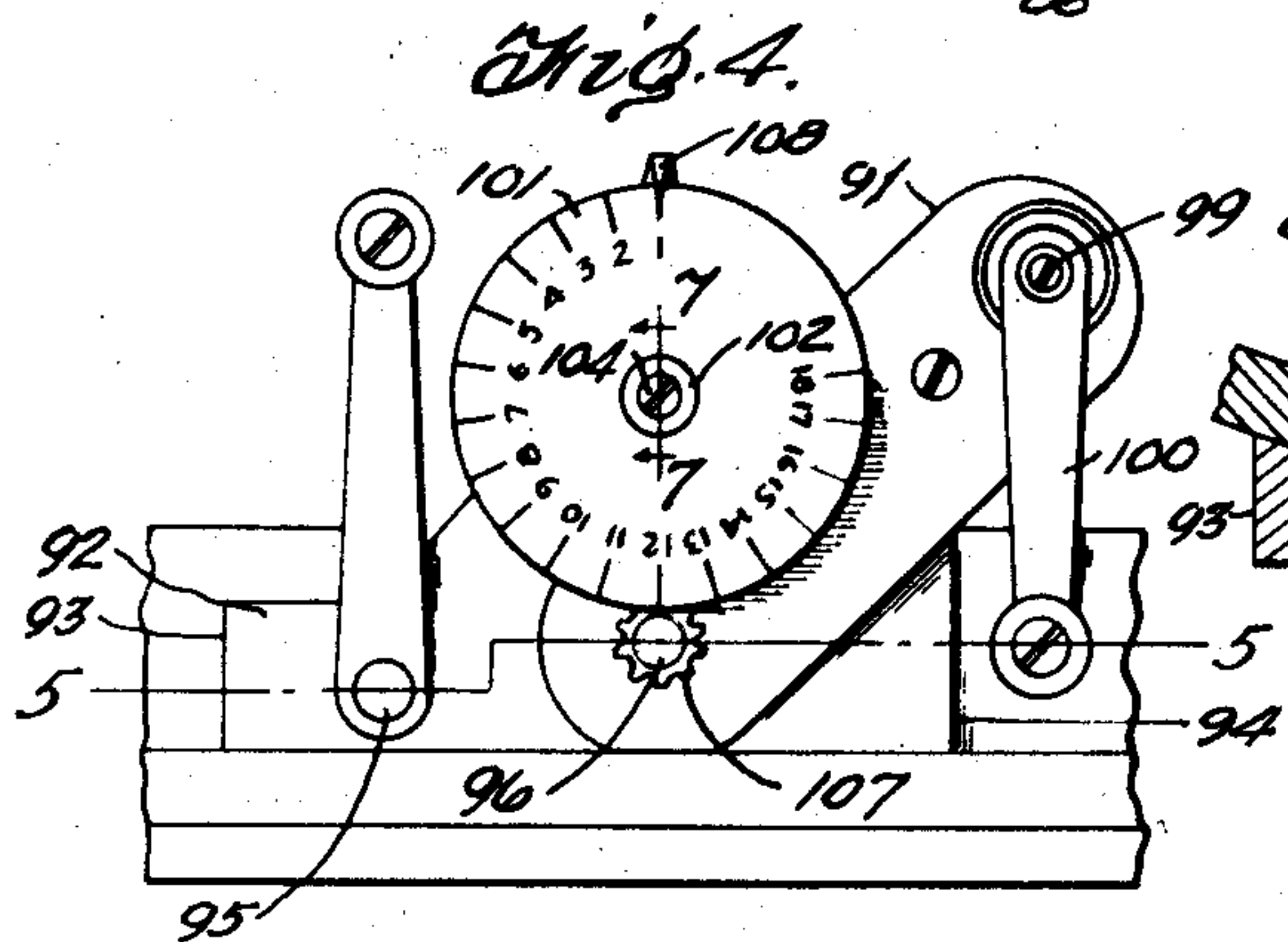
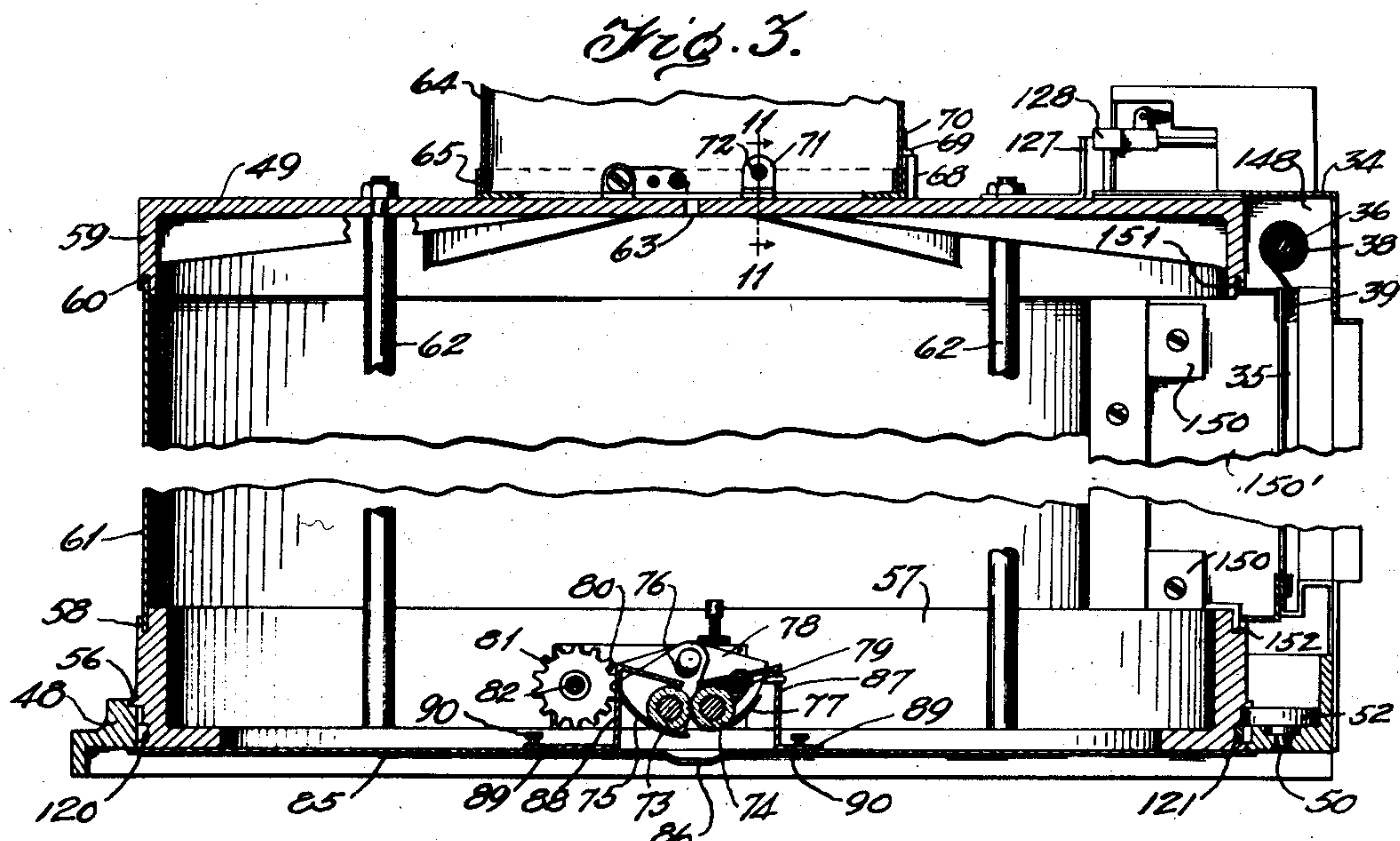
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5 Sheets-Sheet 3



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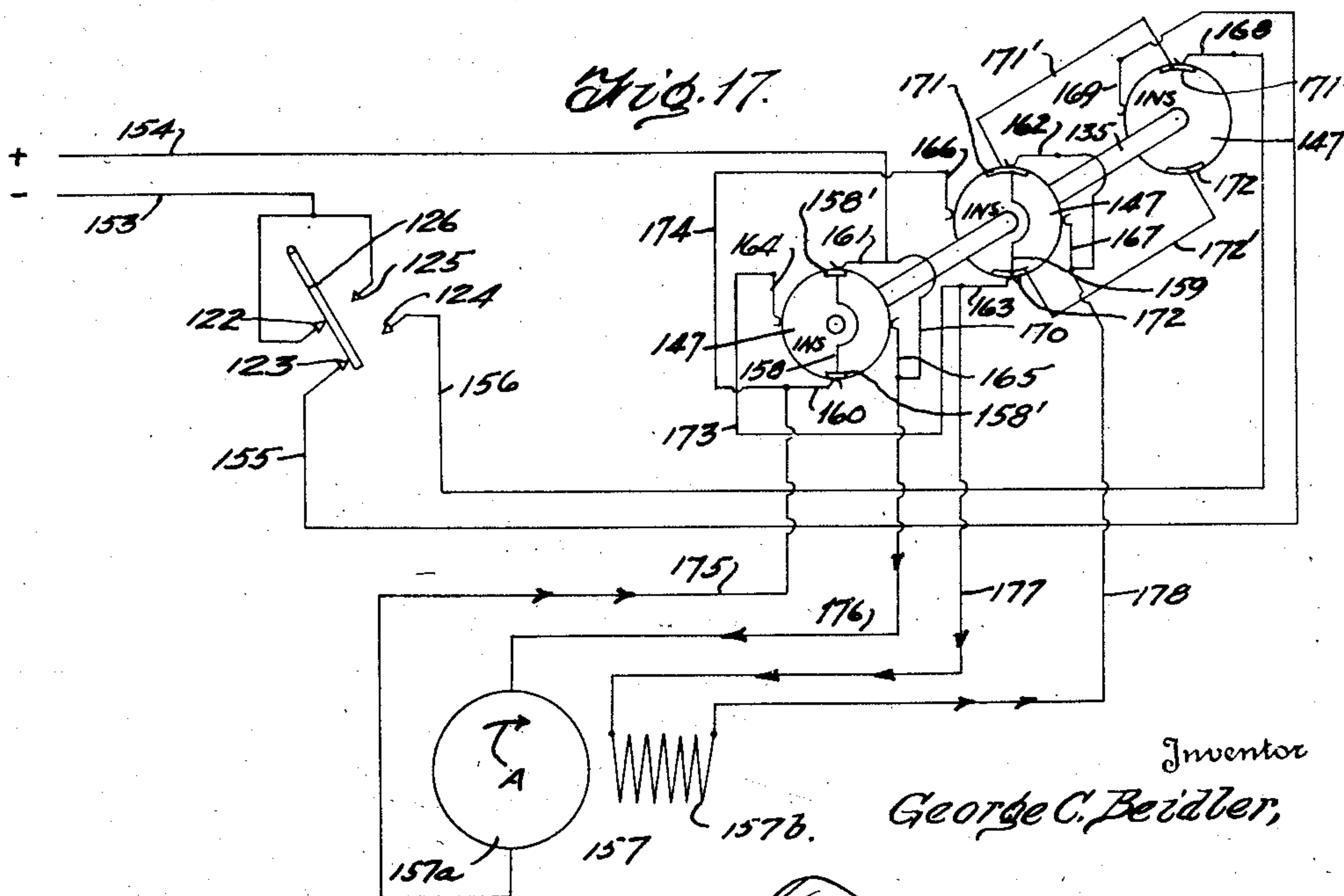
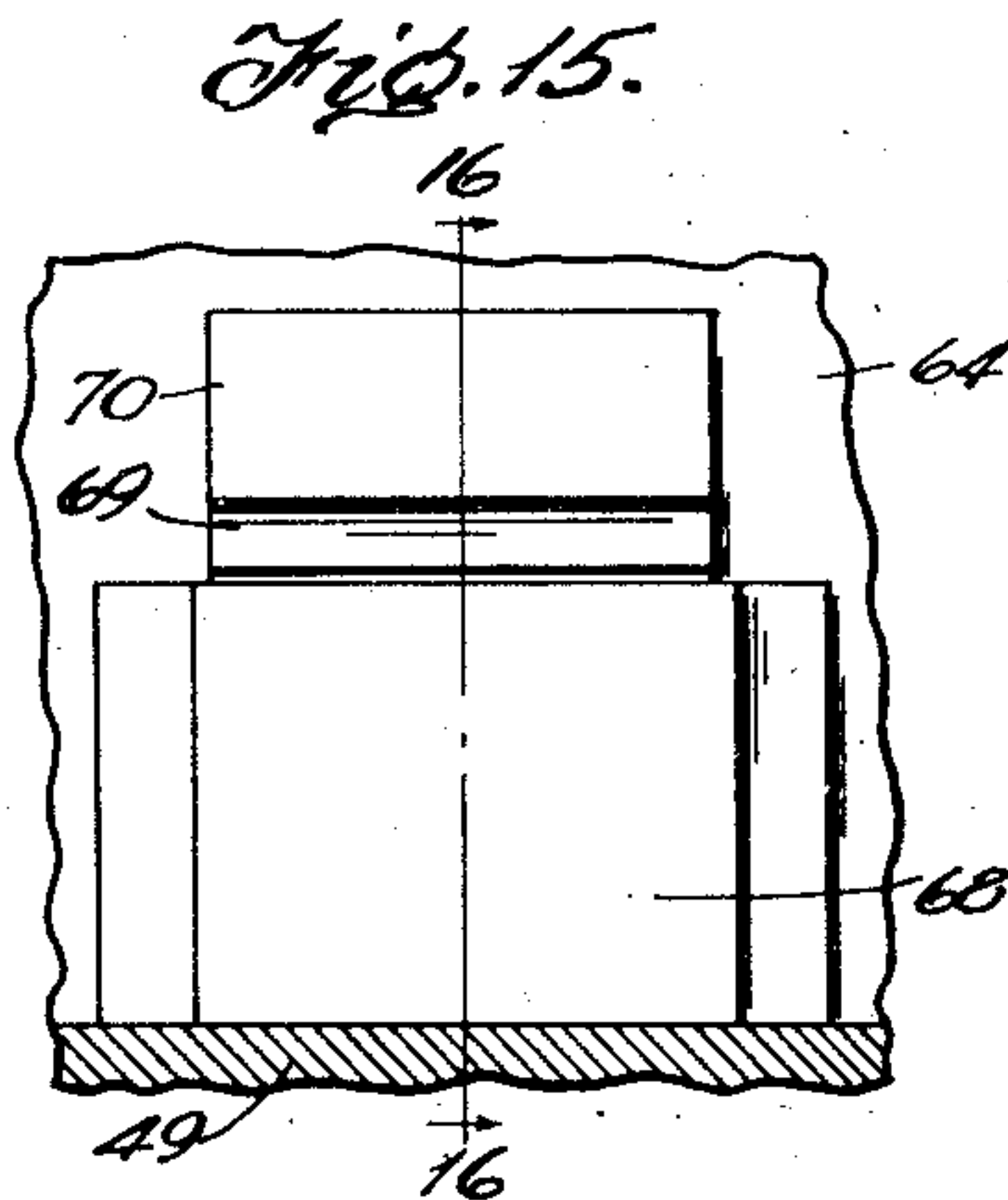
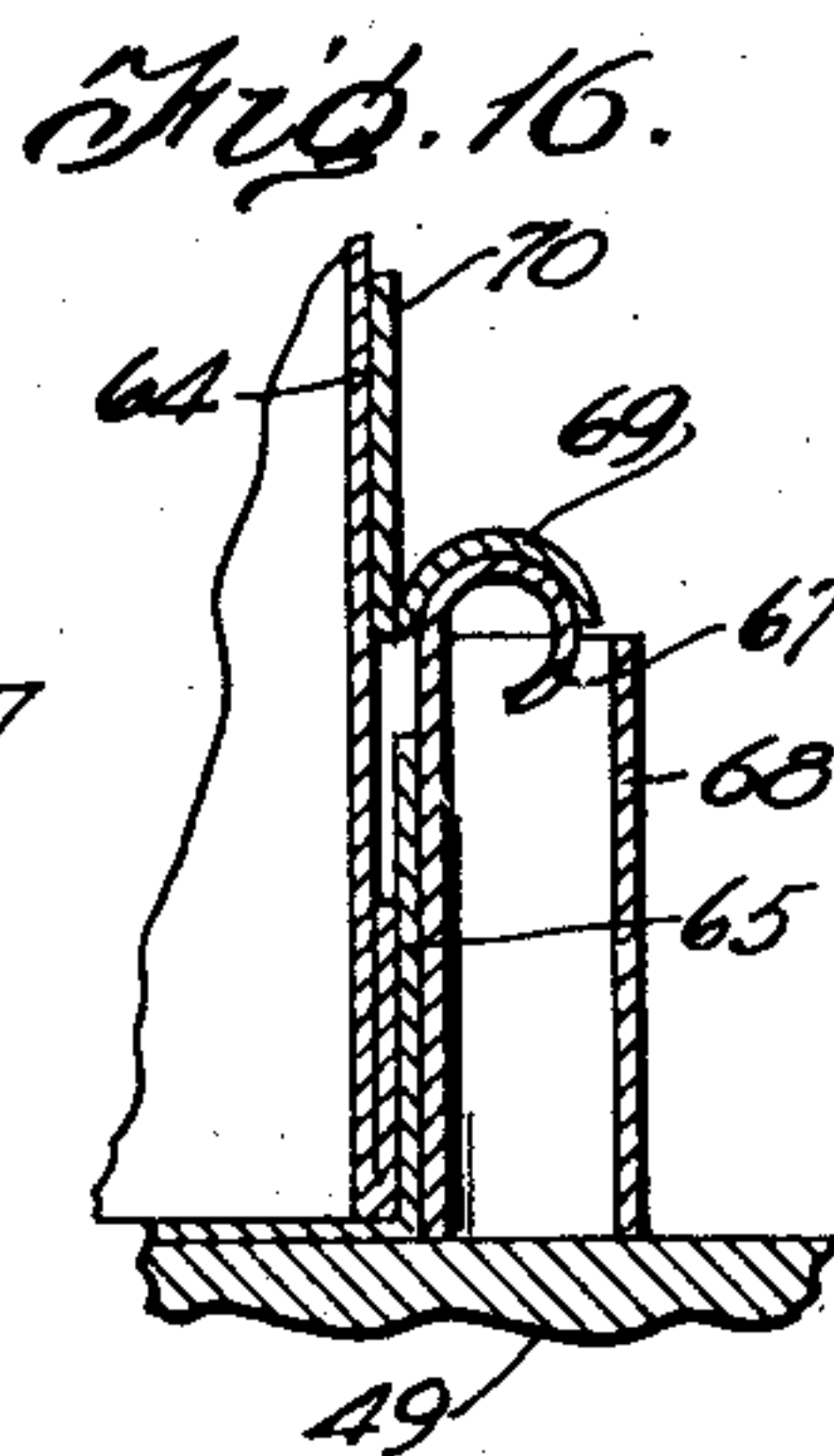
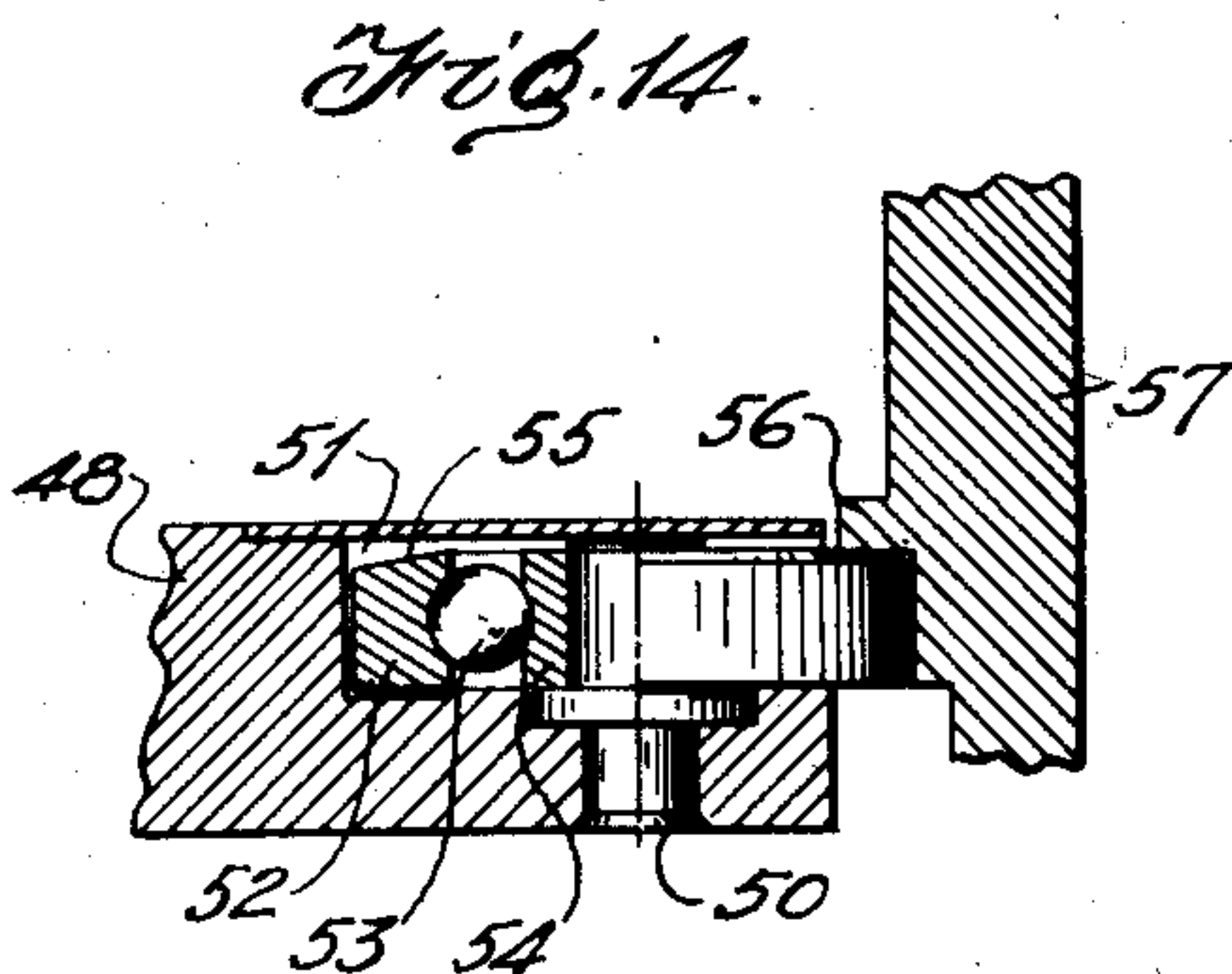
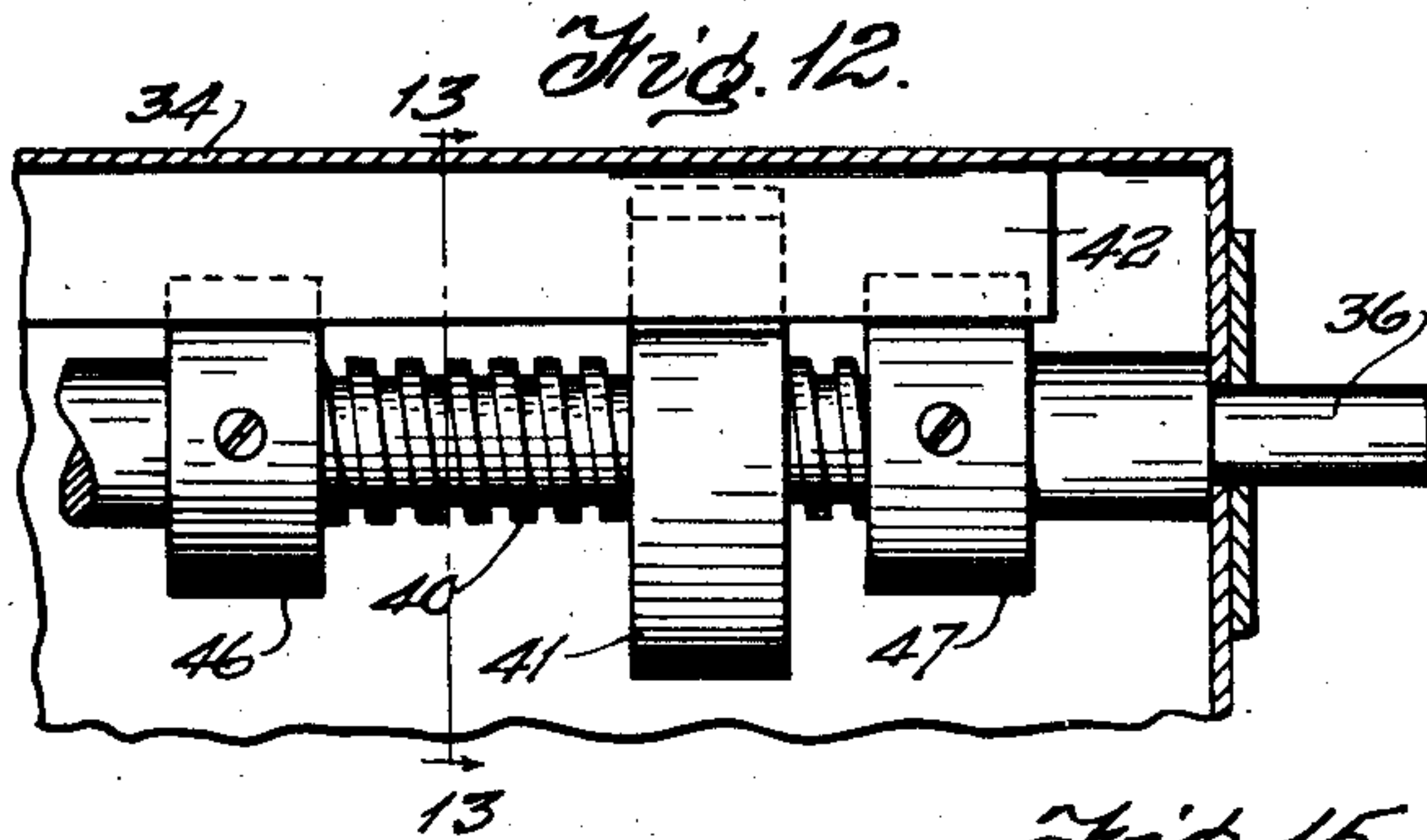
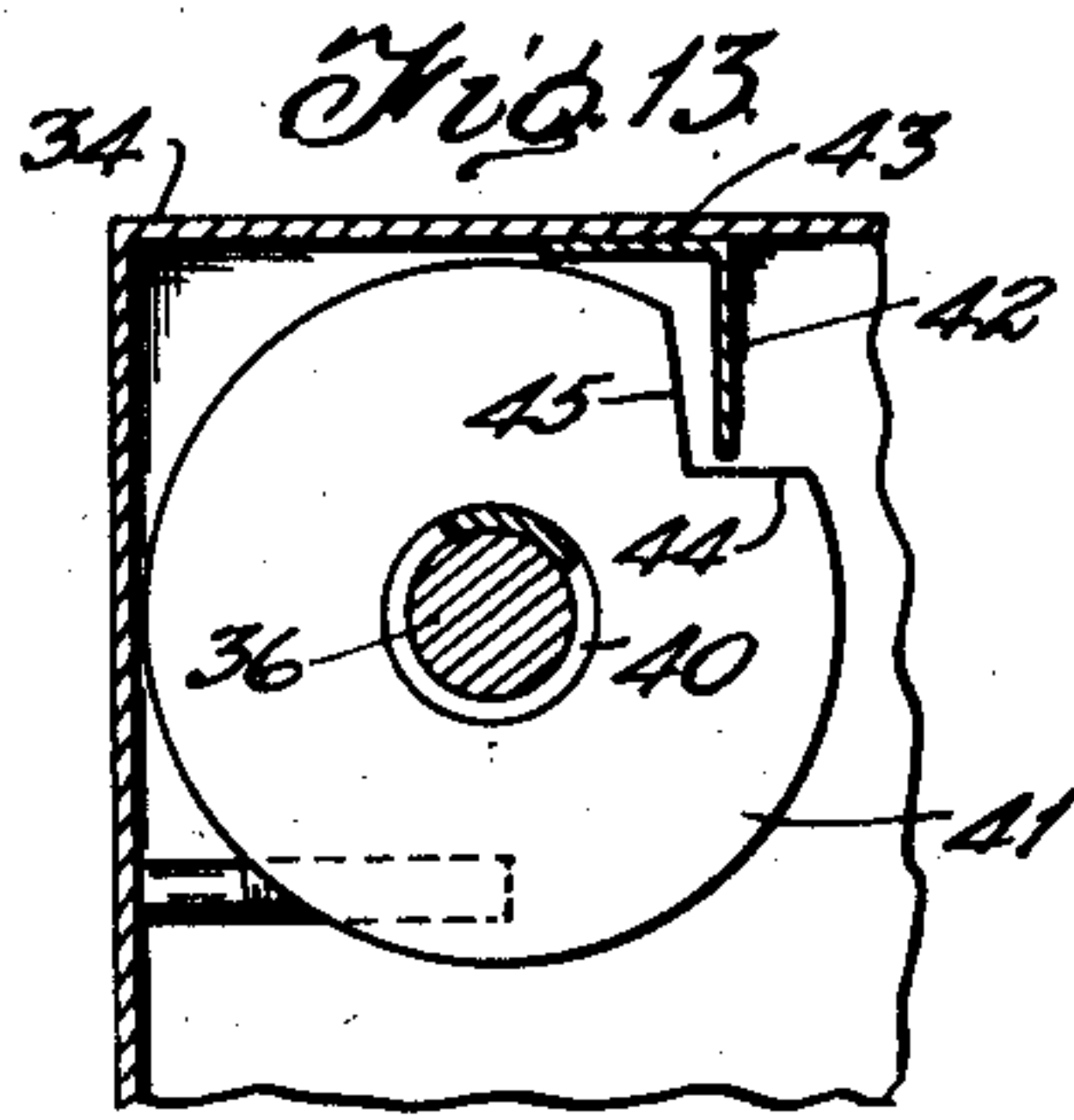
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PHOTOGRAPHING APPARATUS

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5 Sheets-Sheet 4



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PHOTOGRAPHING APPARATUS

Filed April 4, 1934

5 Sheets-Sheet 5

Fig. 18.

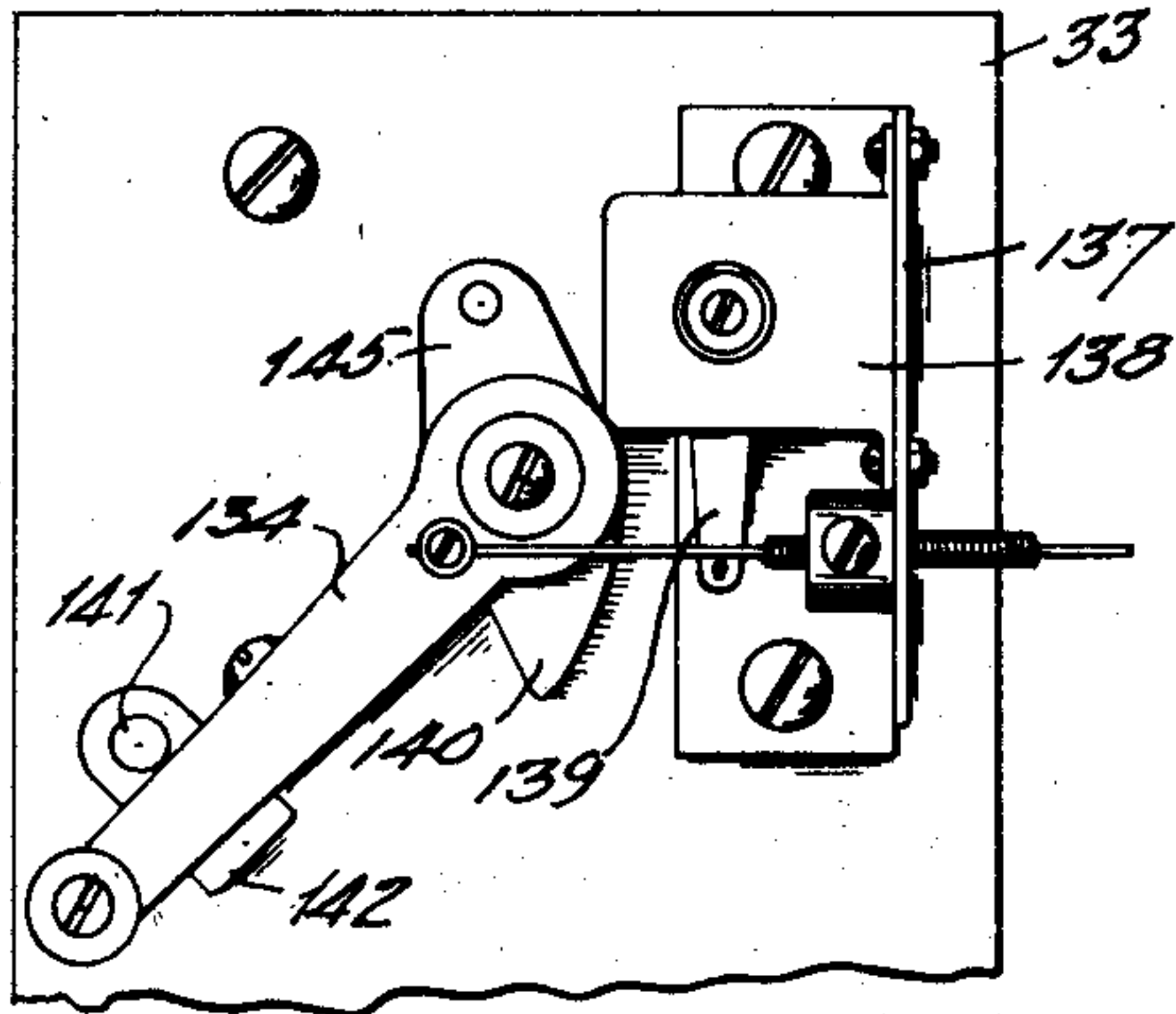


Fig. 19.

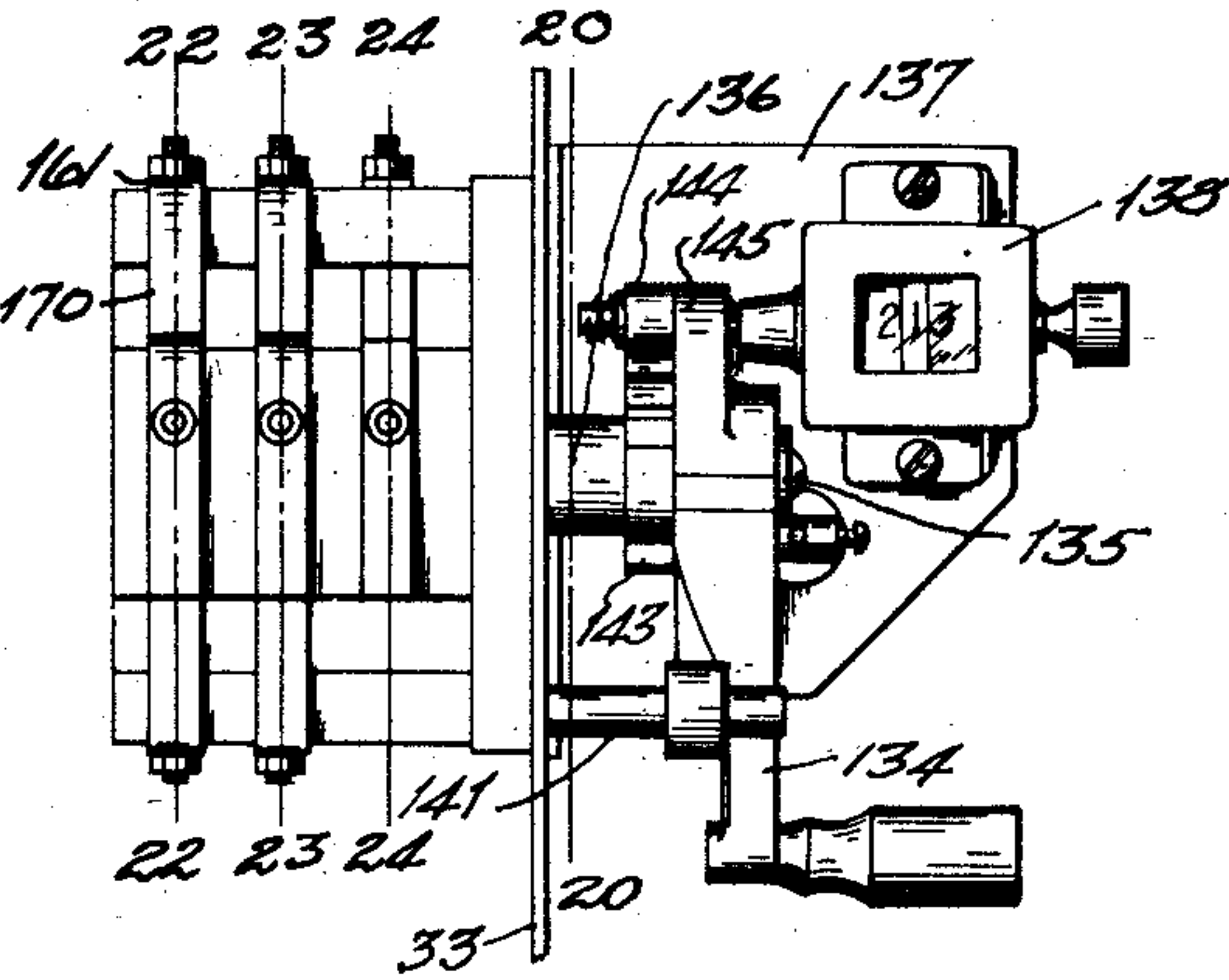


Fig. 20.

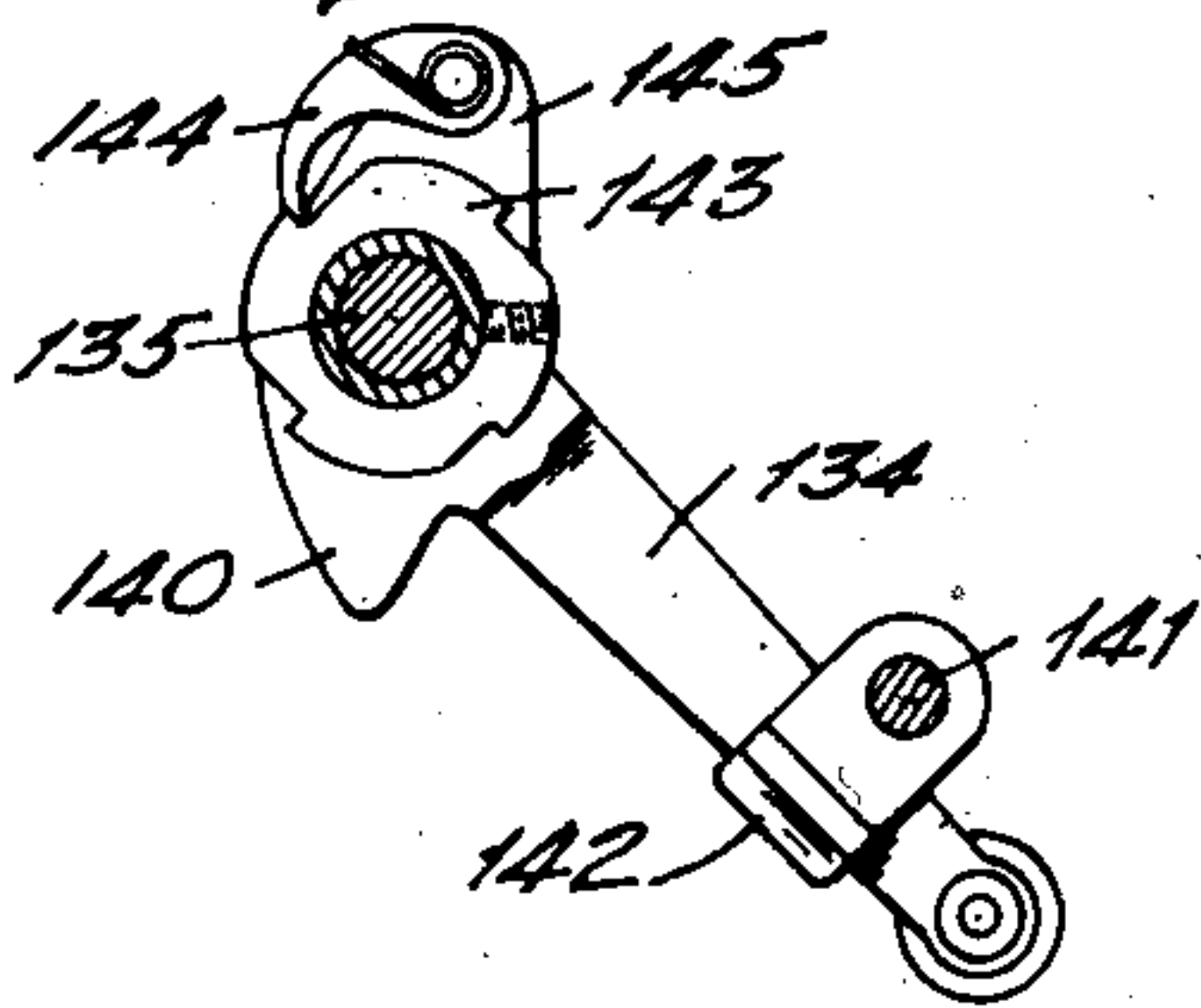


Fig. 21.

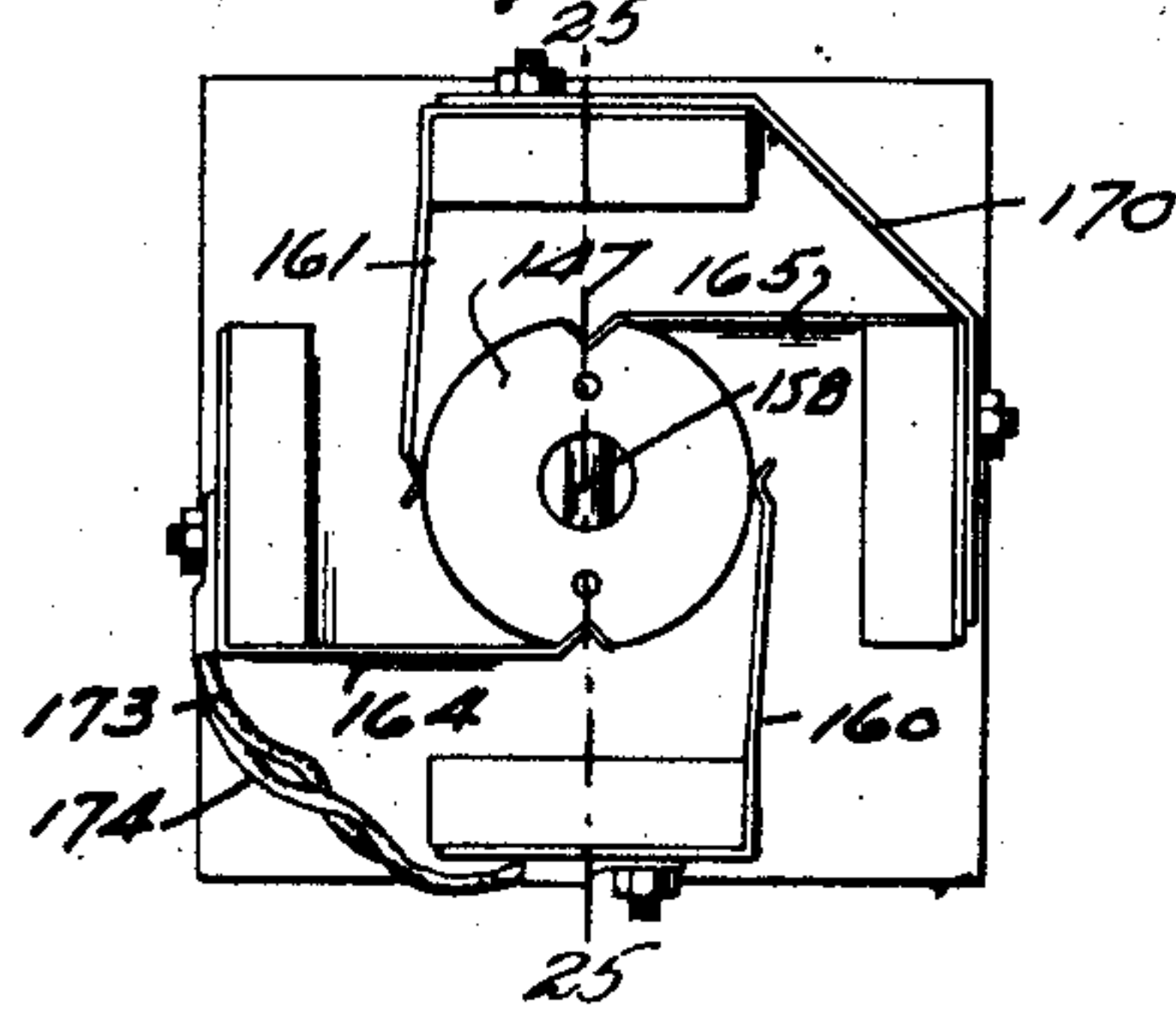


Fig. 22.

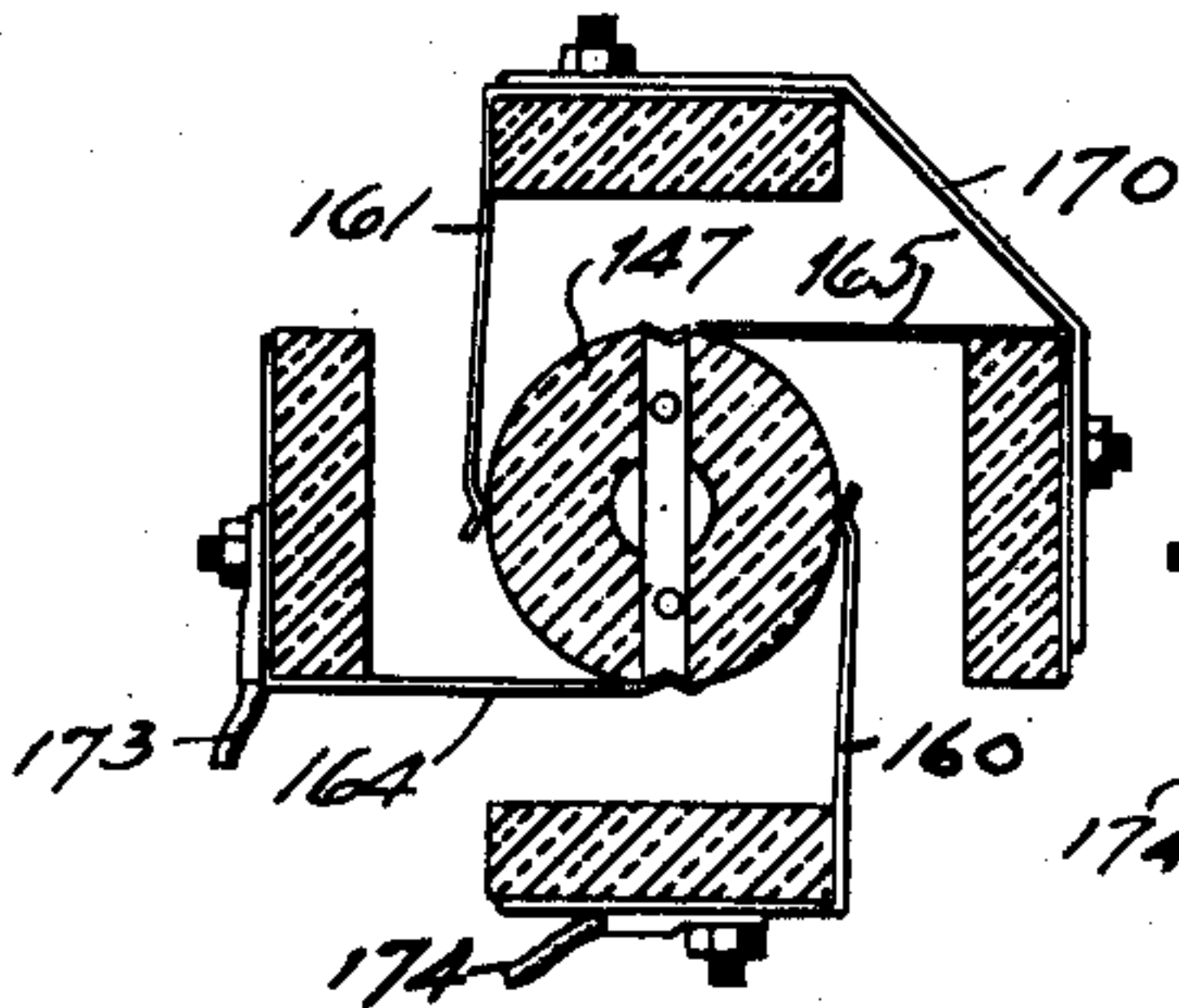


Fig. 23.

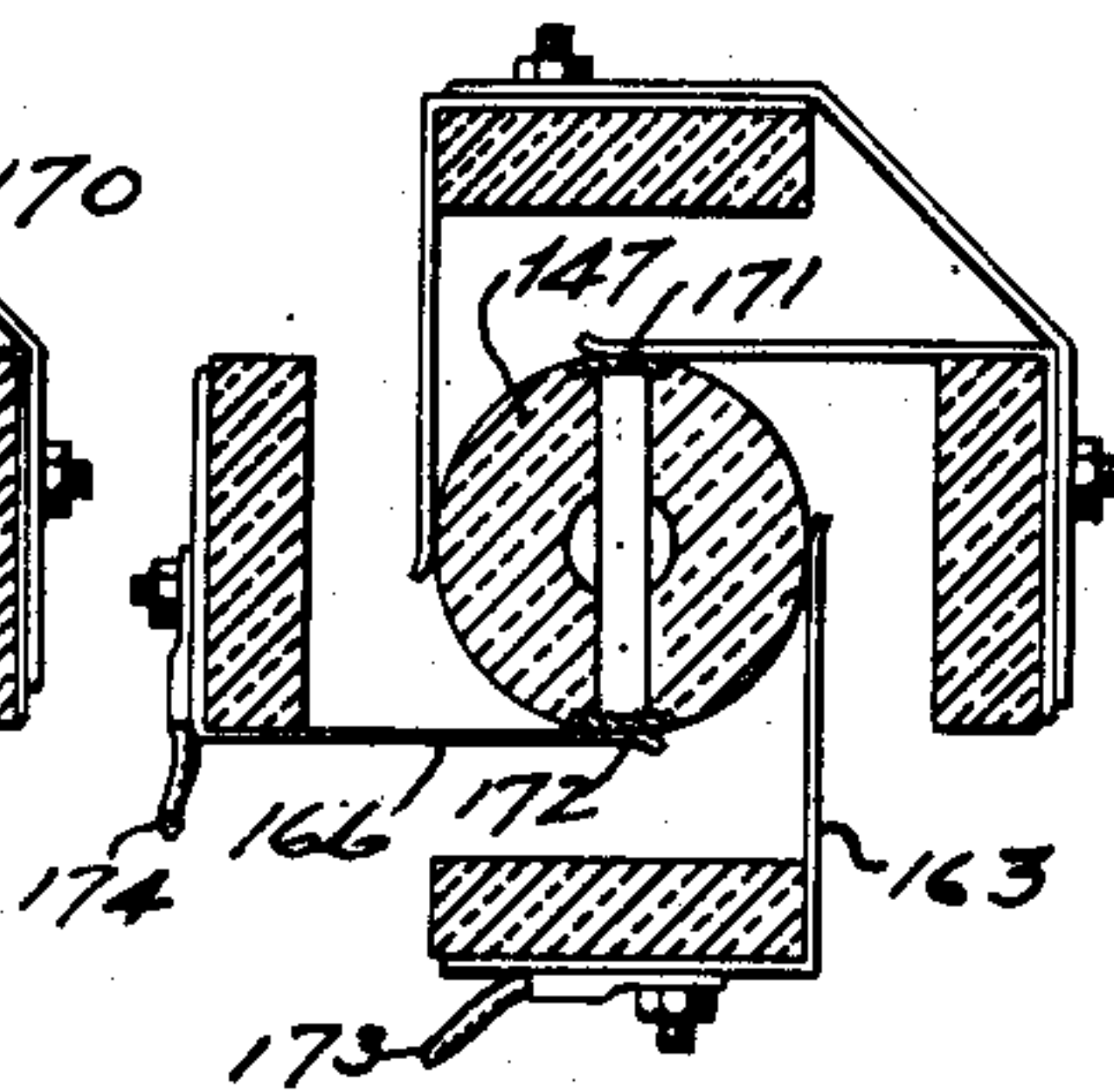


Fig. 24.

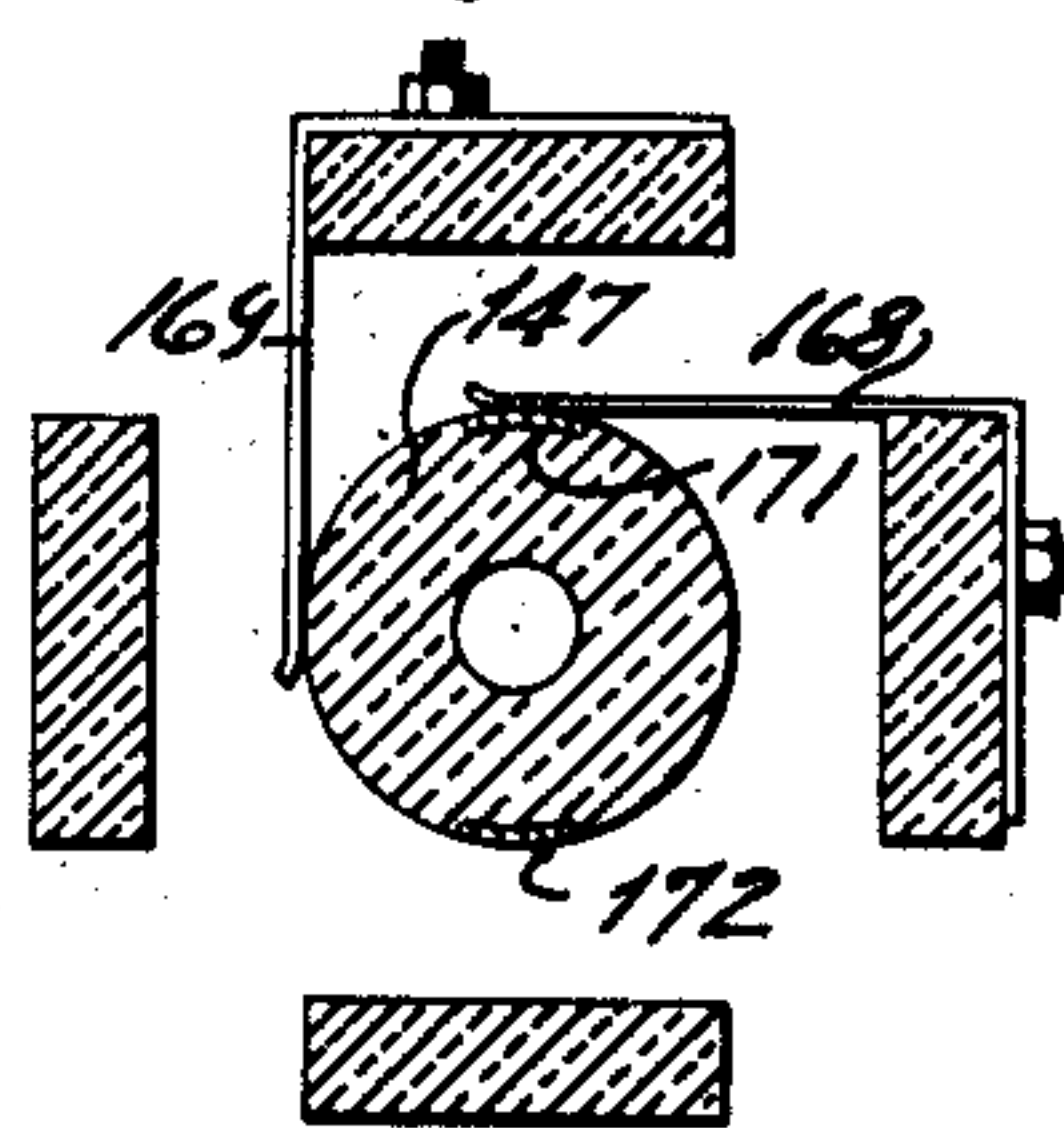
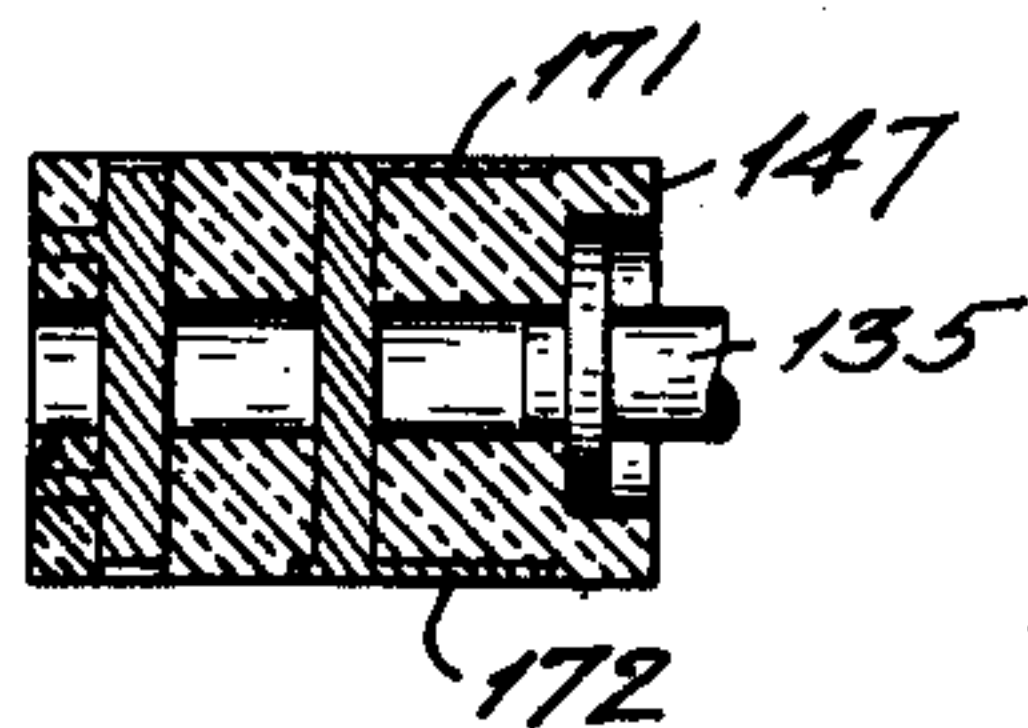


Fig. 25.



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UNITED STATES PATENT OFFICE

2,021,884

PHOTOGRAPHING APPARATUS

George C. Beldler, Rochester, N. Y.

Application April 4, 1934, Serial No. 719,005

17 Claims. (Cl. 95—34)

This invention relates to photographing apparatus and particularly to the so-called "Duplex" type of such apparatus which is intended for use in successively photographing the two sides of film.

It is an object of this invention to provide an exposing chamber comprising a rotatable frame-like member and a stationary sheath or casing enclosing the same, except for a space through which light can be projected to the interior of the chamber, and to film which is located transversely thereof.

It is a further object of this invention to simplify the structure of photographing apparatus intended for use in photographing duplex film and, to that end, the rotatable frame has a top plate with a flange having an annular groove and a base ring having an annular groove corresponding to the annular groove of the flange of the top plate in which the casing has a light tight joint with the frame.

It is an object of this invention furthermore to provide novel means for rotatably supporting the base ring whereby friction is effectively reduced, as compared with known methods of mounting a rotatable element.

It is a further object of this invention to provide a novel film magazine in association with the top plate and means associated therewith for mounting the magazine on the top plate.

It is a still further object of this invention to provide novel means for communicating power or motion to the base ring and for turning the said base ring in opposite directions through approximately 180°, novel means being provided for controlling the driving means through the actuation of exposure controlling means.

It is another object of this invention to provide switch actuating devices for opening and closing circuits for a motor from which power is derived for rotating the base ring when the base ring has been rotated to locations near the limit of the 180° cycle.

It is furthermore an object of this invention to provide a curtain for guarding the exposure opening and to provide novel curtain operating means and arresting means therefor when the curtain is at the limit of its elevated or lowered positions.

It is a still further object of this invention to provide a novel rack associated with the base ring and with motor driven means for imparting the alternate rotary motion to the base ring.

With the foregoing and other objects in view, the invention consists in the details of construc-

tion and in the arrangement and combination of parts to be hereinafter more fully set forth and claimed.

In describing the invention in detail, reference will be had to the accompanying drawings forming part of this application, wherein like characters denote corresponding parts in the several views, and in which—

Figure 1 illustrates a view in side elevation of a photographing apparatus embodying the invention;

Figure 2 illustrates an enlarged sectional view on the line 2—2 of Fig. 1;

Figure 3 illustrates a sectional view of parts of the apparatus on the line corresponding with the line 3—3 of Fig. 2;

Figure 4 illustrates a view in elevation of those portions of the film feeding and cutting instrumentalities located externally of the casing;

Figure 5 illustrates a sectional view on the line 5—5 of Fig. 4;

Figure 6 illustrates a sectional view on the line 6—6 of Fig. 2;

Figure 7 illustrates an enlarged sectional view of the dial mounting on the line 7—7 of Fig. 4;

Figure 8 illustrates an enlarged sectional view showing a fragment of the base ring and its driving means;

Figure 9 illustrates a view in elevation, partly in section, of the power transmitting means from the motor driven shaft;

Figure 10 illustrates a plan view of a snap switch;

Figure 11 illustrates an enlarged sectional view on the line 11—11 of Fig. 3;

Figure 12 illustrates a sectional view on the line 12—12 of Fig. 1, omitting parts above the casing;

Figure 13 illustrates a sectional view on the line 13—13 of Fig. 12;

Figure 14 illustrates an enlarged detail view, partly in elevation and partly in section, on the line 14—14 of Fig. 2;

Figure 15 illustrates an enlarged detail elevation of the hinge for the magazine cover;

Figure 16 illustrates a sectional view on the line 16—16 of Fig. 15;

Figure 17 illustrates a diagrammatic view of the electric system;

Figure 18 illustrates a view in elevation of the shutter operating lever and reversing switch;

Figure 19 illustrates a side view thereof;

Figure 20 illustrates a sectional view on the line 20—20 of Fig. 19;

Figure 21 illustrates a rear view of the magazine shown in Fig. 19;

Figure 22 illustrates a section on the line 22—22 of Fig. 19;

Figure 23 illustrates a section on the line 23—23 of Fig. 19;

5 Figure 24 illustrates a section on the line 24—24 of Fig. 19; and

Figure 25 illustrates a section on the line 25—25 of Fig. 21.

10 The photographing apparatus may have a light projecting instrumentality including a prism 30, a lens 31, a bellows 32, and other characteristic features of such devices, but since they do not form a part of the present invention, except as they contribute to the projection of light, 15 they will not be described in detail.

The bellows is in light tight connection with a camera body 33 and there is a rectangular housing 34 between the camera body and the exposing chamber or that portion of the apparatus which contains the film. The parts 33 and 20 34 are more or less conventional in devices of this type, but the sides of the housing 34 have guides 35 in which a curtain may be lowered or raised. When the curtain is lowered, it is effective to protect film within the exposing chamber against the entrance of light thereto. In the present embodiment of the invention relating to the curtain, a shaft 36 is journaled in the sides of the housing and it projects at one 30 end. A crank 37 on the said shaft is a means provided for rotating the shaft in opposite directions in order that the curtain 38 may be wound on the shaft or unwound therefrom. In order to maintain the curtain in proper position when 35 it is lowered, its edge is provided with a weight 39 which moves in the guides 35 as the curtain is manipulated. As a means for indicating when the curtain is in a wound or unwound state, the shaft is provided with threads 40 which engage the threads of a nut 41. The rotation of the nut is restrained by reason of the presence of a flange 42 of a plate 43, which plate is secured to the inner surface of the housing. The nut has a 45 recess which constitutes a clearance for the flange, but the shoulders 44 or 45 of the nut will engage the flange and prevent rotation of the nut while it is being moved under the influence of the screw. When the screw has reached a predetermined position where the curtain is 50 at its extreme of adjustments, the nut will engage one of the abutments 46 or 47 and arrest the shaft, on which occurrence the operator will know that the curtain is in the position so indicated.

55 The base 48 has a plurality of anti-friction bearings each of which is mounted on a stud 50 anchored in the base and projects into a recess 51 formed in the base 48 at the inner edge thereof. An outer ball race 52 has a groove for an anti-friction element 53 in its inner surface and 60 an inner race 54 fitting on the stud 50 has a groove in its outer surface corresponding with the groove in the outer race. The upper surface 55 of the outer race is beveled or tapered toward its periphery and said upper surface constitutes 65 a support for the flange 56 of a base ring 57. The base ring 57 and a top plate 49 are provided as parts of a rotatable frame, to be presently described, and what may be termed the 70 "front" of the base ring and top plate is associated with the housing 34. Owing to the taper of the upper surface of the outer race, the area of the flange resting on the said race is restricted, resulting in a line contact; hence, friction 75 due to the operation of the base ring on the

bearing is minimized. In practice, three such bearings are employed, although the inventor does not wish to be limited with respect to this installation.

The upper edge of the base ring has an annular channel 58 and the lower edge of the flange 59 of the top or cover plate has an annular channel 60. A sheathing or housing 61 has its edges seated in the annular channels 58 and 60, respectively, and posts or rods 62 hold the base ring 10 and cover in spaced relation to each other and form a skeleton frame which rotates independently of the sheathing, as will presently appear.

The posts or rods have their lower ends anchored in appropriate way to the base ring as 15 by threaded joints, welded joints, or the like, and the upper ends of said posts are reduced in diameter, as compared with the main portions of the posts, and the extremities are threaded. The shoulders that are formed by reducing the diameter of the posts at the ends act as supports 20 for the top plate and, when the nuts are threaded on the outer ends of the posts, the frame structure comprising the parts described is rigid and strong.

25 The cover plate has a slot 63 through which film from a magazine will be fed and the said magazine, in the present embodiment of the invention, includes a cover or housing 64 which is intended to support a spool containing the film. 30 This housing is embraced at its lower edge by flanges 65 which are anchored in appropriate way to the top plate 49, the said housing being hinged to one of the flanges so that it is capable of being swung to an open position where it is engaged 35 and supported by a bracket 66 located on the housing 34, although this location may be changed to suit particular requirements.

The housing 64 is oscillatable on flanges 65 by what may be termed "half hinges", that is to 40 say, each flange has a member 65' with its upper edge curved so that it has a convex outer surface 67 which is in spaced relation to a guard 68, which guard comprises a strip of metal having an outwardly bent central portion, and the 45 ends of the strip of metal are secured to the flange. Flanges, such as the flange 69, of a plate 70 secured to the magazine are complementary in shape to the convex surface 67 and ride thereover when the magazine is swung to an open 50 position. The end of the flange 69 passes partially around the surface 67 and extends into the space inside the guard 68, in which position the magazine cannot be lifted free of the flanges. When, however, the magazine is in the position 55 where the flanges 69 are at the top of the convex surfaces 67, the magazine cover may be lifted. The magazine cover is latched in its closed position so that it will not be accidentally dislodged and, to that end, the inner surface of 60 the said cover has a recess 71 in which a spring pressed latch 72 is lodged. The structural features of the latch and cover at the location just mentioned is shown in Figure 11 and it is believed unnecessary to describe the latch in detail, as it 65 is comprehensively illustrated.

Assuming that film is contained in the magazine and has been introduced into the exposing chamber through the slot 63, it will then be delivered between the feeding rollers 73 and 74 and 70 succeeding lengths of film may be drawn through the exposing chamber and cut by the cutting mechanism, as is usual in this type of apparatus. The structural features of this cutting mechanism or knife and the drawing and feeding roll- 75

ers need not, it is thought, be described in detail since the subject matter thereof is described and claimed in a companion application of this applicant, Serial No. 662,337, filed March 23, 1933, (U. S. Letters Patent No. 1,976,156 dated October 9, 1934). It will be sufficient for an understanding of this apparatus to say that the feeding rollers 73 and 74 are associated with a knife blade 75 which is stationary, except for a slight upward movement imparted to it during the cutting operation, the said upward movement being provided by the clearance or slot 76 in the end plates which carry the knife. The blade 77 which contacts with the blade 75 has its ends attached to plates such as 78, each having a segmental slot 79 constituting a clearance for the shaft of the roller 74, and when the cutting mechanism is operated, the plates 78 oscillate to carry the blade 77 into engagement with the blade 75. The plate 78 is further provided with peripheral teeth 80 which are engaged by a pinion 81 on a shaft 82. Enough has been disclosed of the cutting mechanism, it is believed, for an understanding of the invention, and since it is possible to substitute other well known cutting mechanisms for those of the disclosure, no point of patentability as to this cutting mechanism is made in this application.

The base ring is enclosed at the bottom by a plate 85 having a slot 86 through which film is discharged in the usual way. In order to protect the interior of the exposing chamber from light, light guards 87 and 88 are associated with the cutting and drawing mechanism, as fully shown, and each has a base portion such as 89 secured to the plate 85 in any appropriate manner, as by screws 90.

As a convenient means for operating the drawing rollers in association with a base ring of this character, a housing 91 is provided and the said housing is carried by a metal block 92 whose ends form shoulders 93 and 94. A shaft 95 is journaled in the block and extends through the base ring and has a clutch connection with the shaft 82. A shaft 96 is also journaled in the block and extends through the base ring and has a clutch connection with a shaft of one of the drawing rollers. The shaft 96 has a gear wheel 97 on it and a train of gears is interposed between the gear wheel 97 and a pinion 98 on a shaft 99, which shaft 99 has a crank 100, by which the feed rollers are driven.

A disk 101 has a hub 102 which is recessed to receive a spring 103, the said hub being mounted on a screw 104 which is threaded in the end of a shaft 105. By this means the disk is frictionally held at different positions of adjustment and the outer surface of the disk is graduated so that as the shaft 105 is rotated, the disk will turn and the graduations are intended to indicate the length of film drawn into the exposing chamber by the turning of the crank 100 and the operation of the feeding rollers. A gear wheel 106 rotates with the shaft 105 and it meshes with a pinion 107 on an extension of the shaft 96. Hence, as the drawing or feeding rollers are rotated, the wheel 106 with the disk 101 is rotated, bringing the graduations successively into registry with an indicator 108 which is fastened to the block 92, as shown in Fig. 2.

As a means for turning the film in the exposing chamber, the frame comprising the base ring, cover or top and the posts connecting these elements is motor driven, and means of communicating the power from the motor to the frame

includes a worm 109 on the motor shaft 110 which meshes with a worm wheel 111 on a shaft 112 that is journaled in bearings 113 and 114 within the casing. The part of the casing to which the bearings are attached may be changed to suit particular requirements and need not, it is thought, be described in detail. The shaft is provided with a collar 115 which supports a friction disk 116 that is engaged by a gear wheel 117 rotatable on the said shaft 112. Another friction disk 118 engages the upper surface of the gear wheel 117 and is pressed thereagainst by a spring 119 encircling the shaft 112 and interposed between the bearing 114 and the said friction disk 118. By this means the wheel 117 is made to rotate with the shaft 112, although the wheel 117 may remain stationary when resistance to its motion overcomes the friction of the disk, since there is what may be termed an "over-run" of the driving means, due to its momentum at about the time of the arrest of the film carrying frame and after the motor is deenergized.

The base ring near its lower edge is provided with a circumferential slot 120 in which a rack 121 is located and the gear wheel 117 engages an idler 117' which in turn engages the rack and when in motion turns the base ring and the frame of which it is a part.

The motor for driving the shaft 110 is of a type which drives alternately in opposite directions and, as a means for controlling current to the poles of the motor, a snap switch is provided that is actuated by a member on the rotatable frame and a type of snap switch is illustrated in Figure 10 which has proven satisfactory in practice. In this construction, switches 122 and 123 control the circuits to the motor for its operation in one direction and switches 124 and 125 control the circuit to the motor for operating it in the opposite direction, and a switch blade 126 connects the switches 122 and 123 for one of the circuits and the switches 124 and 125 for the other circuits. Thus, when the motor is operating to rotate the frame in one direction, the circuits through the switches are closed and just before the frame reaches the limit of its movement in the aforesaid direction, an abutment 127 on the frame strikes the side of the end 128 of the lever 129 and throws the lever until the outer end of the rod 130, which is under the influence of a spring 131, as shown, passes the axis of the pivot 132 of the switch blade 126 and the axis of the pivot 133 of the lever 129. The action of the spring then causes the switch blade to be transferred to the other switches 122 and 123 and, when the circuit is energized, the motor will be driven in the direction opposite to that in which it was driven when the switch was in the first mentioned position.

The circuit through the switches just described is completed, however, through the manipulation of a switch which is under the control of a lever, to be presently explained, by which the shutter of the lens is operated.

As to this last mentioned feature of the invention, the handle or crank 134 is rotatable on a shaft 135 journaled in a bearing 136 located externally of the casing. A bracket 137 is also secured to the casing in proximity to the shaft and it carries a meter 138, of known type, consisting of disks with peripheral numbers, and it is the purpose of the inventor that the meter shall be operated when the shutter is operated for the exposure so that the meter will indicate

the number of exposures that have been made. To this end, an arm 139 extends downwardly from the meter casing, and each time the crank 134 is moved to open the shutter, a cam 140, which forms a part of or is otherwise associated to move with it, contacts the depending arm 139 and swings it to a degree that the numbering of the meter is advanced one point.

A stud 141 acts as an abutment for limiting the motion of the crank 134 in one direction and a spring latch 142 on the stud engages the crank and frictionally retains it against movement until it is again manually operated.

As stated, the crank is freely rotatable on the shaft 135, and the said shaft has a ratchet wheel 143 secured to it, which is engaged by a spring-pressed ratchet 144 pivoted on a lug 145 integral with the crank 134. When the crank 134 is moved away from the latch 142, the shutter-operating wire 146 opens the shutter for exposing film. After a predetermined period of time, the shutter is closed and the crank 134 is returned to engage the latch. During this movement, the ratchet wheel is turned and hence, the shaft 135 is turned. The inner end of the shaft 135 is anchored to a switch block 147 and the switch block is given an intermittent step by step rotation, for a purpose to be presently explained, but it may be stated in a general way that through this control of the switch the circuits to the motor are established or interrupted in order that the motor will be energized as soon as the crank has been returned to inactive position after the exposure has been made, the motor being again energized upon the operation of the crank 134 on the completion of the next exposure, but in this last cycle of operation, the motor is energized to move the film carrier in a direction opposite that in which it was moved in the first occurrence.

What has been referred to as the "housing" includes hollow side members constructed of sheet metal, such as identified by the reference numeral 148, and a flange, such as 149, of the sheath is secured to each of the side members. Plates or cleats 150 are secured to the side members and form anchorages for a frame-like light shield 150' which is interposed between the top and the base ring. The structure of this frame may be changed but, in the present embodiment, it is composed of side, top and bottom members which close the space between the frame and the curtain or the curtain guide. The upper member of the frame has a curved flange 151 which fits in that portion of the annular groove that is not occupied by the sheath, and the lower portion of the frame has a flange 152 which fits in that portion of the groove of the base ring not occupied by the sheath.

In order to clarify the operation of the reversing motor and of the switches illustrated in Figure 10 and in Figures 18 to 25 inclusive, reference will now be had to the wiring diagram shown in Figure 17. In this figure there is shown a pair of conductors 153 and 154 receiving current from any suitable source of supply, the wire or conductor 154 being shown as the positive wire while the conductor 153 is shown as the negative wire. The wire 154 is connected to the brush 161 and this brush is connected by a conductor 170 with the brush 165. The contacts 122 and 123 of the circuit breaker are connected in multiple to the wire 153. The contact 123 of the circuit breaker is connected by a wire 155 with the brush 169 and the contact 124 is similarly connected by a wire

156 with the brush 168. Extending along the cylinder 147 at diametrically opposite positions are contact bars 171 and 172 which, for diagrammatic purposes, have been illustrated as separate contacts 171 and separate contacts 172, the separate contacts in each case having wiring connections 171' and 172' respectively. Obviously, the showing in the diagram is the full mechanical and electrical equivalent of the physical embodiment of the corresponding switch parts as shown in Figures 19 to 25. The conductor 158 is disclosed in the diagram as having contact ends 158' and the conductor 159 is similarly described as connecting the strips or bars 171 and 172. The brushes 164 and 163 are connected by a conductor 173 and the brushes 160 and 166 are connected by a conductor 174.

As shown in the diagram, the reversing switch is in one open position. This will be understood by observing that a partial circuit may be traced from the wire 154 through brush 161, contact 158', conductor 158, contact 158' and conductor 174 to brush 166 which, in this position of the switch, rests on the insulating cylinder 147. At the same time the armature winding of motor 157 which is connected to brush 160 by a conductor 175 and to brush 165 by a conductor 176 is short circuited, since a circuit exists from conductor 154 through brush 161, conductor 170, brush 165, conductor 176, armature 157, conductor 175, brush 160, contact 158', conductor 158, contact 158', brush 161 and back to conductor 154. Obviously under these conditions no current will flow and the motor will not operate.

If now, the cylinder 147 be rotated 90° by the action of the arm or lever 134, then the following condition obtains. Current will flow from conductor 154 through brush 161, conductor 170, conductor 176, armature 157, conductor 175, conductor 174, brush 166, contact 172, conductor 172', contact 172, brush 169, conductor 155, contact 123, bar 126, contact 122, and thus to conductor 153. At the same time a branch circuit will be established from conductor 175 through conductor 177, field winding 157^b, conductor 178, brush 167, contact 172, conductor 159, contact 171, conductor 171', contact 171 to brush 169, and thus as before to the negative wire 153. The course of these circuits is indicated by arrow heads on the conductors 175, 176, 177 and 178. The motor may now be assumed to run in the direction of the arrow A which will act to rotate the paper carrier until one of the stops 127 engages the handle and trips the cut-out switch to move the arm out of engagement with the contacts 122 and 123 and thus to break the circuit whereupon the motor stops.

Upon the next movement of the cylinder through 90° a circuit is established in the same direction through the armature winding but will flow in a reverse direction through the winding 157^b so that the direction of rotation of the motor will be reversed and the rotating parts of the machine will rotate in the opposite direction to that just described and the rotation will continue until the other stop 127 trips the cut out switch.

While the means for supplying current to the motor has been illustrated and described in detail, it is obvious that other well known circuits and controls may be substituted therefor which are capable of operating to produce the results fully stated herein.

I claim:

1. In a photographing apparatus, means for projecting light, a film carried rotatably mount-

ed in operative relation to the means for projecting light, said carrier comprising a frame, means associated therewith for drawing film therethrough, and stationary means enclosing the frame for maintaining the frame in light-proof association with the means for projecting light, the said stationary means having an opening through which light is projected to film on the film carrier.

2. In a photographing apparatus, means for projecting light, a film carrying frame rotatably mounted in operative relation to the said projecting means, means with relation to which the frame is movable forming therewith an exposing chamber, means for rotating the frame, a reversing switch for controlling current, means movable with the frame for tripping the reversing switch, electrically driven means, means for transmitting the drive of the last mentioned means to the frame, an electric circuit including a source of electricity, the reversing switch, a manually controlled switch and the electrically driven means, whereby power is communicated to the frame for turning it alternately in opposite directions.

3. In a photographing apparatus, a rotatably mounted frame comprising a base ring, posts and an apertured top plate, a stationary sheathing partially enclosing the side of the frame and therewith forming an exposing chamber, a light and image projecting instrumentality in operative relation to the exposing chamber, a film holder on the plate from which film is projected into the exposing chamber, means for drawing film through the exposing chamber, means for turning the film alternately in opposite directions, and means for controlling the last mentioned means.

4. In a photographing apparatus, a rotatably mounted frame comprising a base ring, posts and an apertured top plate, a stationary sheathing between the base ring and top plate partially enclosing the side of the frame and therewith forming an exposing chamber, a light and image projecting instrumentality in operative relation to the exposing chamber, a film holder on the plate from which film is projected into the exposing chamber, means for drawing said film through the exposing chamber, means for turning the frame in one direction from a normal position, and means for returning the frame to its normal position.

5. In a photographing apparatus, a rotatably mounted frame comprising a base ring, posts and an apertured top plate, a stationary sheathing partially enclosing the side of the frame and therewith forming an exposing chamber, a light and image projecting instrumentality in operative relation to the exposing chamber, a film holder on the plate from which film is projected into the exposing chamber, means for drawing said film through the exposing chamber, a reversing motor for turning the frame alternately in opposite directions, means for controlling current to the motor including an exposure controlling device, means for controlling the rotatable frame, and means actuated by the rotating frame for reversing the circuit to the motor.

6. In a photographing apparatus, a rotatably mounted frame comprising a base ring and a slotted top plate, posts holding said frame and base ring assembled, a sheathing partially enclosing the side of the frame, a light and image projecting means communicating with the interior of the frame through the opening unguard-

ed by the sheathing, a base with relation to which the base ring is rotatable, anti-friction elements supported by the base on which the base ring travels, said anti-friction elements each comprising a horizontally rotatable ball race having a beveled upper surface engaged by the base ring, an inner ball race coacting with the first mentioned ball race, and a stud supported by the base to which the second mentioned ball race is applied and by which it is supported.

7. In a photographing apparatus, a film supporting frame having means for drawing film therethrough and means for cutting the film, a light projecting instrumentality and a sheathing forming with the said frame a light-proof exposing chamber with which the light projecting means communicates, anti-friction elements on which the frame rotates, each of said anti-friction elements comprising a horizontally rotatable ball race for supporting the frame, an inner ball race with which the outer ball race coacts, and a suitably supported stud to which the inner ball race is applied and by which it is supported.

8. In a photographing apparatus, a frame having means for drawing film therethrough and means for cutting the film, a light projecting means, means for maintaining the interior of the frame in light-proof association with the light projecting means, means for rotatably supporting the frame comprising anti-friction elements, each of which comprises an inner ball race, a vertically positioned stud on which the inner ball race is mounted, and an outer ball race coacting with the inner ball race rotatable horizontally, the outer ball race having a beveled frame supporting surface whereby the said frame is in line contact with the ball race.

9. In a photographing apparatus, a rotatable film holder, means for operating a shutter of the photographing apparatus, a switch, means operated by the said means when moved to close said shutter for operating the switch and closing a circuit to a motor, means for communicating power from the motor to rotate the film holder, and a switch tripped by the film holder for opening said circuit.

10. In a photographing apparatus, a rotatable film holder, a light projecting means in operative relation to said holder, means for operating a shutter of the light projecting means, a motor including an electric circuit, means whereby the motor rotates the film holder, a switch in said electric circuit operative to make and break the motor circuit and to establish said circuit when the shutter operating means is moved to close the shutter.

11. A magazine comprising a suitably supported frame, a housing, interengaging half hinges supported by the housing and frame whereby the said housing may be swung to open the magazine, the said hinge sections being operative to prevent dislodgment of the housing vertically from the frame and to permit disconnection of the housing and frame when the said housing is open.

12. A magazine comprising a suitably supported frame and a housing, hinge guards applied to the frame, hinge elements, one of which is located in each guard, said hinge elements having convex portions elevated above the guard but terminating inside the guard in spaced relation to the outer wall of said guard, and a member secured to the housing having a curved portion complementary to the curved portion of the first mentioned hinge member movable on said curved por-

tion and extendible into the housing between the curved portion of the first mentioned member and the outer wall of the housing.

13. A magazine comprising a suitably supported frame and a housing, hinge guards applied to the frame, hinge elements, one of which is located in each guard, said hinge elements having convexed portions elevated above the guard but terminating inside the guard in spaced relation to the outer wall of said guard, a member secured to the housing having a curved portion complementary to the curved portion of the first mentioned hinge member movable on said curved portion and extendible into the housing between the curved portion of the first mentioned member and the outer wall of the housing, and a latch associated with the frame and engaging the housing for retaining the housing closed.

14. A camera having an exposing chamber and light admitting means, a film holder rotatably mounted in the exposing chamber in position to expose the sides of film successively to light, film drawing means and film cutting means carried by the holder, motor driven means for imparting rotary motion to the said film holder in one direction, including means for imparting rotary motion to the film holder in the opposite direction after the first mentioned rotary motion has ceased, means for operating the film drawing means, and means for operating the film cutting means, the last mentioned means for operating the film drawing means and for operating the film cutting means being in stationary position with relation to the film holder.

15. A camera having an exposing chamber and light admitting means, a film holder rotatably mounted in the exposing chamber in position to expose the sides of film successively to light, film drawing means and film cutting means carried by the holder, a reversible motor, means whereby the motor imparts rotary motion to the said film holder in one direction, means for interrupting current to the motor when predetermined movement is imparted to the film holder, means for reversing the current in the motor to drive it oppositely and

impart rotary motion to the film holder in the opposite direction, means for switching current of the motor when the holder has returned to its initial position, and means stationary with relation to the moving film holder for operating the film drawing means and the film cutting means in succession.

16. A camera having an exposing chamber and light admitting means, a film holder rotatably mounted in the exposing chamber in position to expose the sides of film successively to light, film drawing means and film cutting means carried by the holder, a reversible motor, means whereby the motor imparts rotary motion to the said film holder in one direction, a current reversing switch for the motor, means actuated in time with the movement of the film holder for operating the reversing switch at cycles of operation of the said film holder, means for interrupting current to the motor when predetermined movement is imparted to the film holder, means for reversing the current in the motor to drive it oppositely and impart rotary motion to the film holder in the opposite direction, means for switching current of the motor when the holder has returned to its initial position, and means stationary with relation to the moving film holder for operating the film drawing means and the film cutting means in succession.

17. In a photographing apparatus, means for projecting light, a film carrier rotatably mounted in operative relation to the means for projecting light, said carrier comprising a frame, means associated therewith for drawing film therethrough, motor driven means for partially rotating the film carrier alternately in opposite directions to present first one side and then the other side of the film to the projected light, and stationary means enclosing the frame for maintaining the frame in light-proof association with the means for projecting light, the said stationary means having an opening through which light is projected to film on the film carrier.

GEORGE C. BEIDLER. 45