

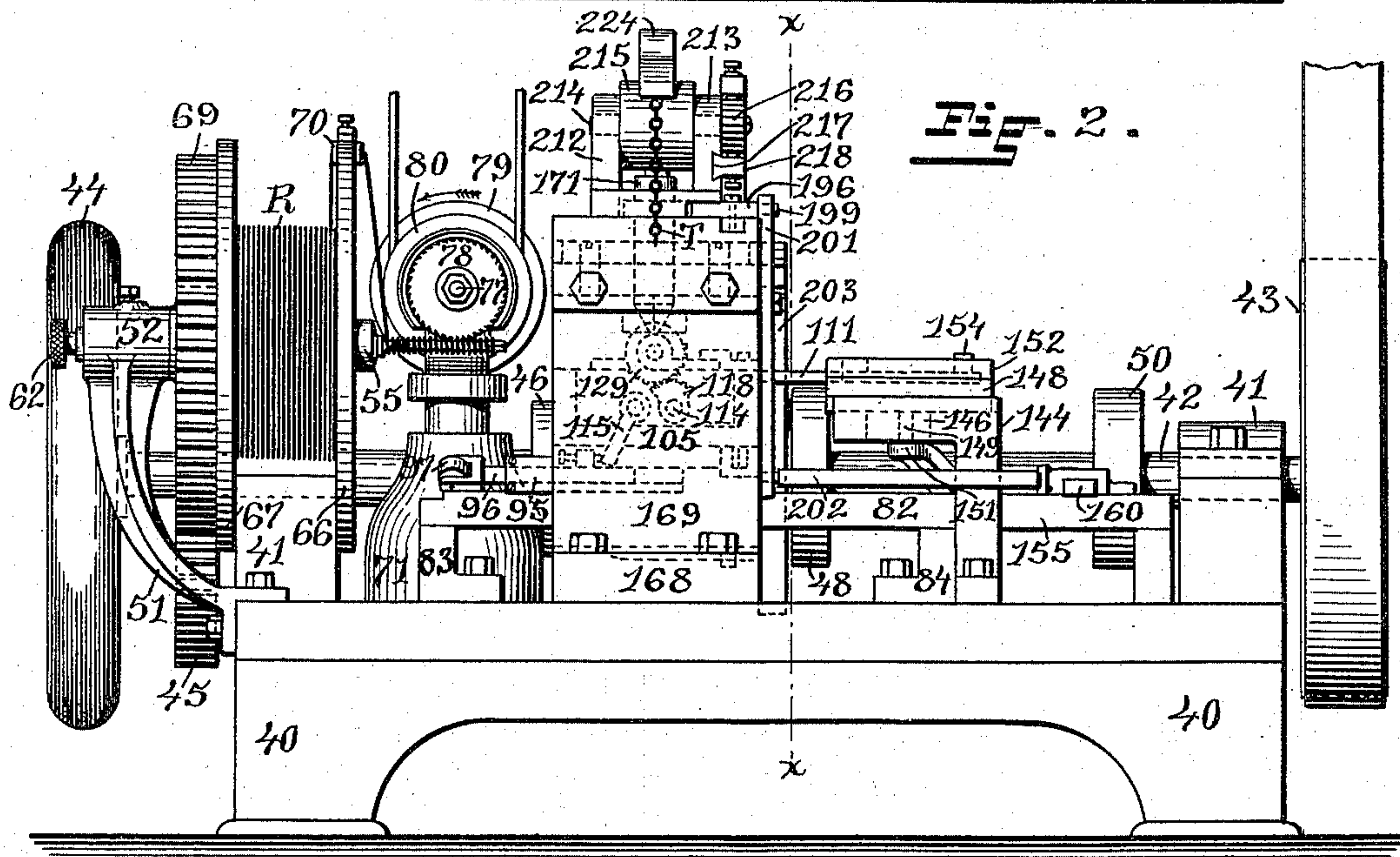
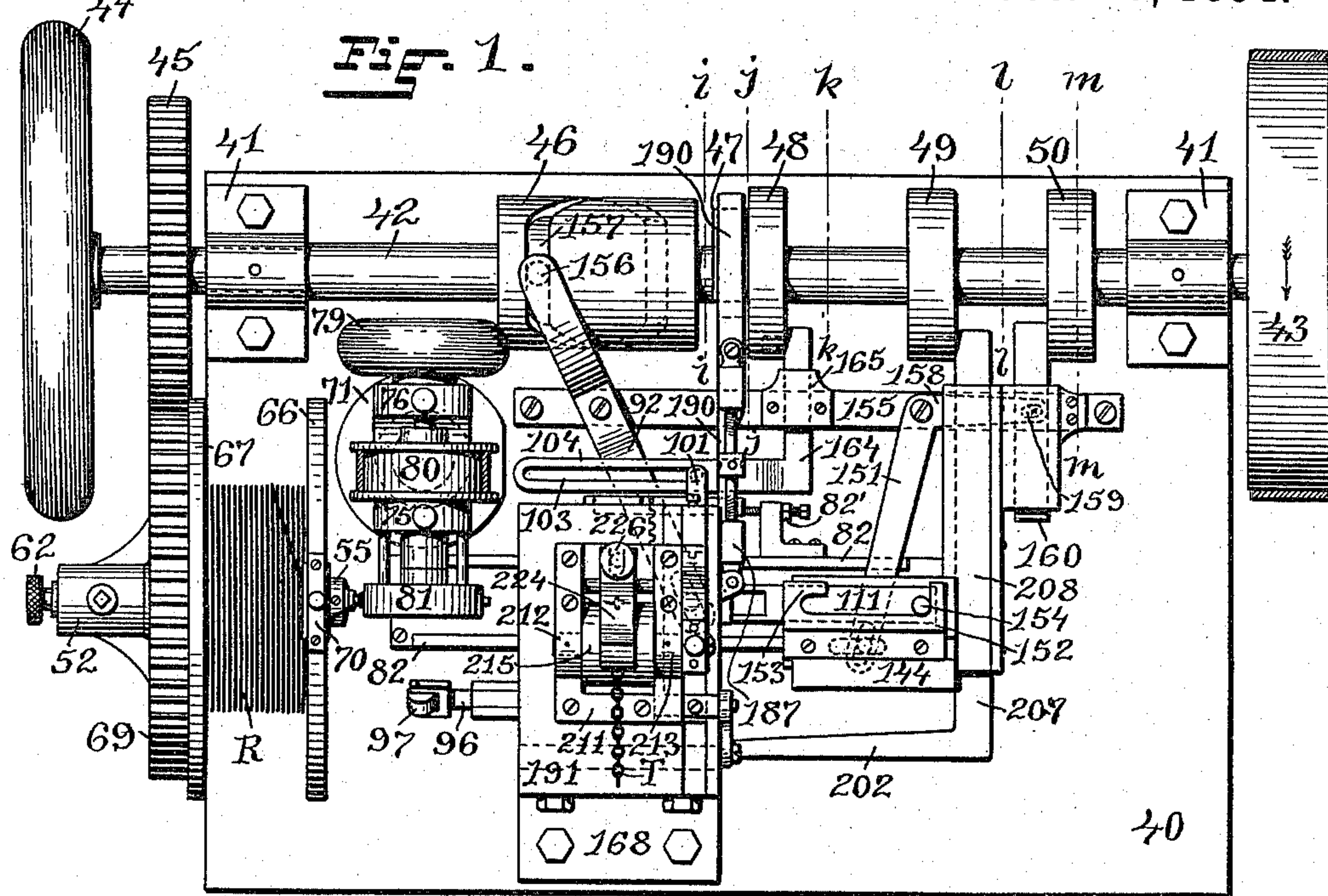
(No Model.)

7 Sheets—Sheet 1.

B. L. COLVIN.  
CHAIN MACHINE.

No. 528,076.

Patented Oct. 23, 1894.



WITNESSES:

Henry J. Miller  
Chas. H. Luther

INVENTOR:

Byron L. Colvin  
by Joseph A. Miller & Co.  
Attys.



(No Model.)

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Fig. 3.

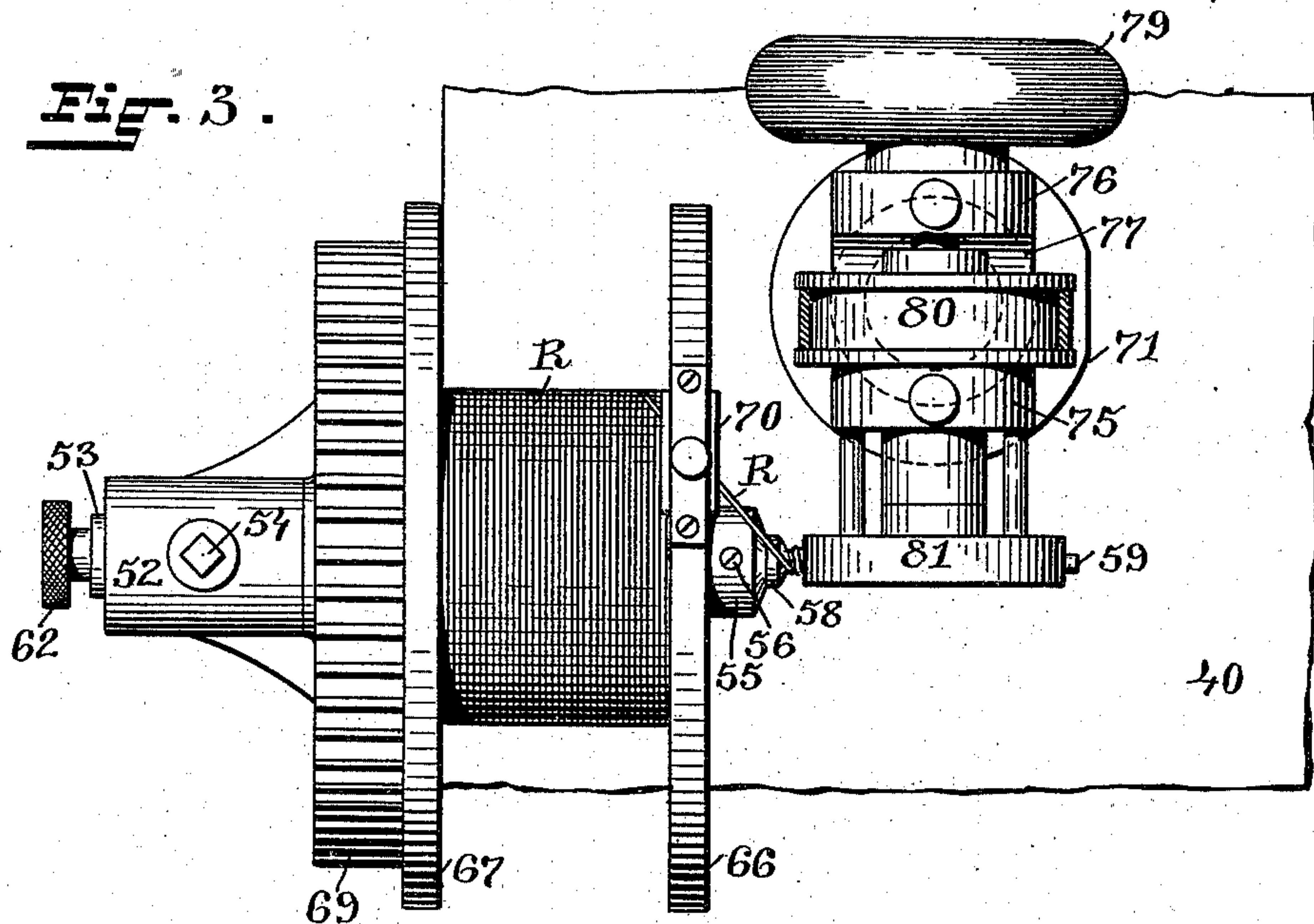
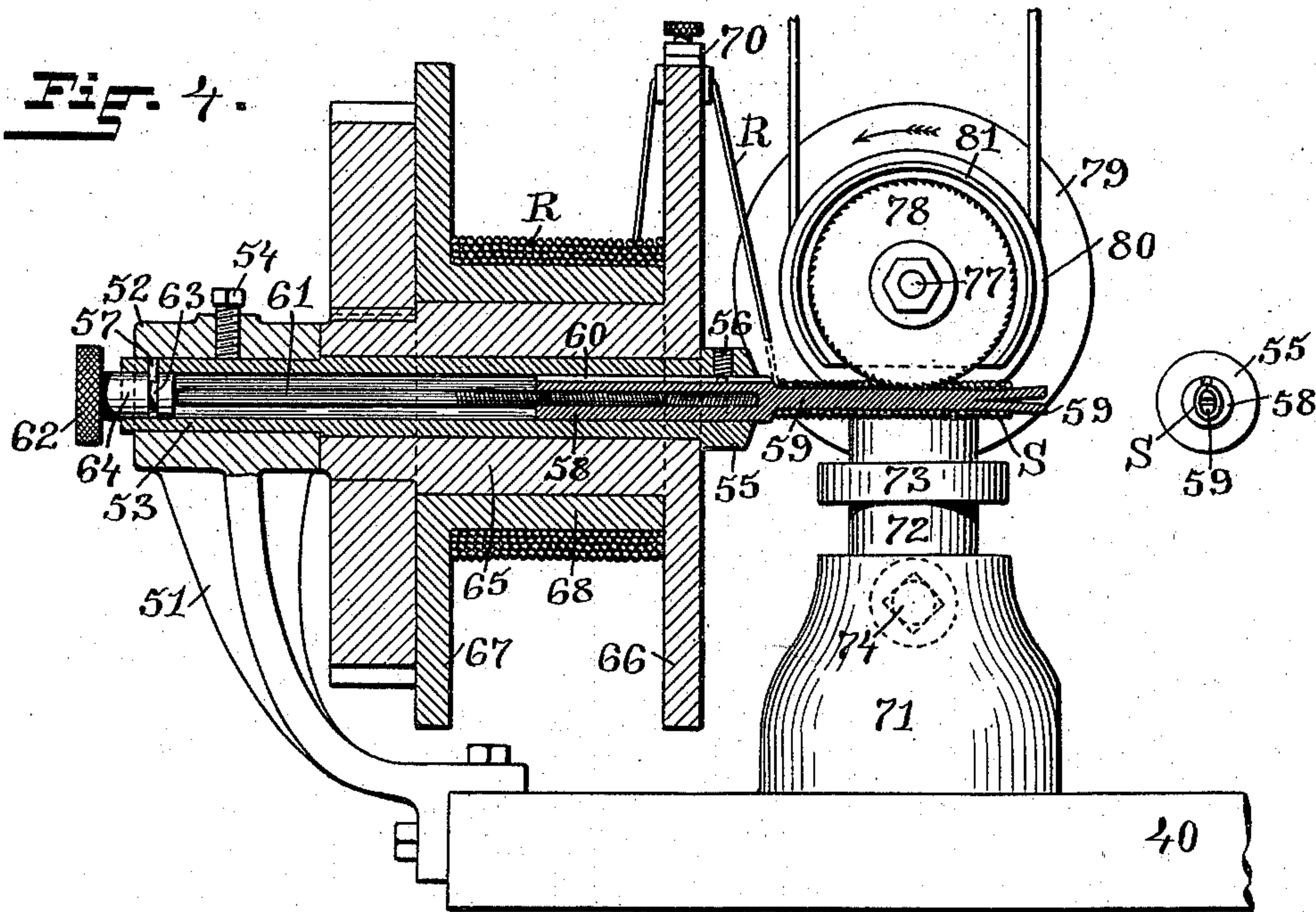


Fig. 4.



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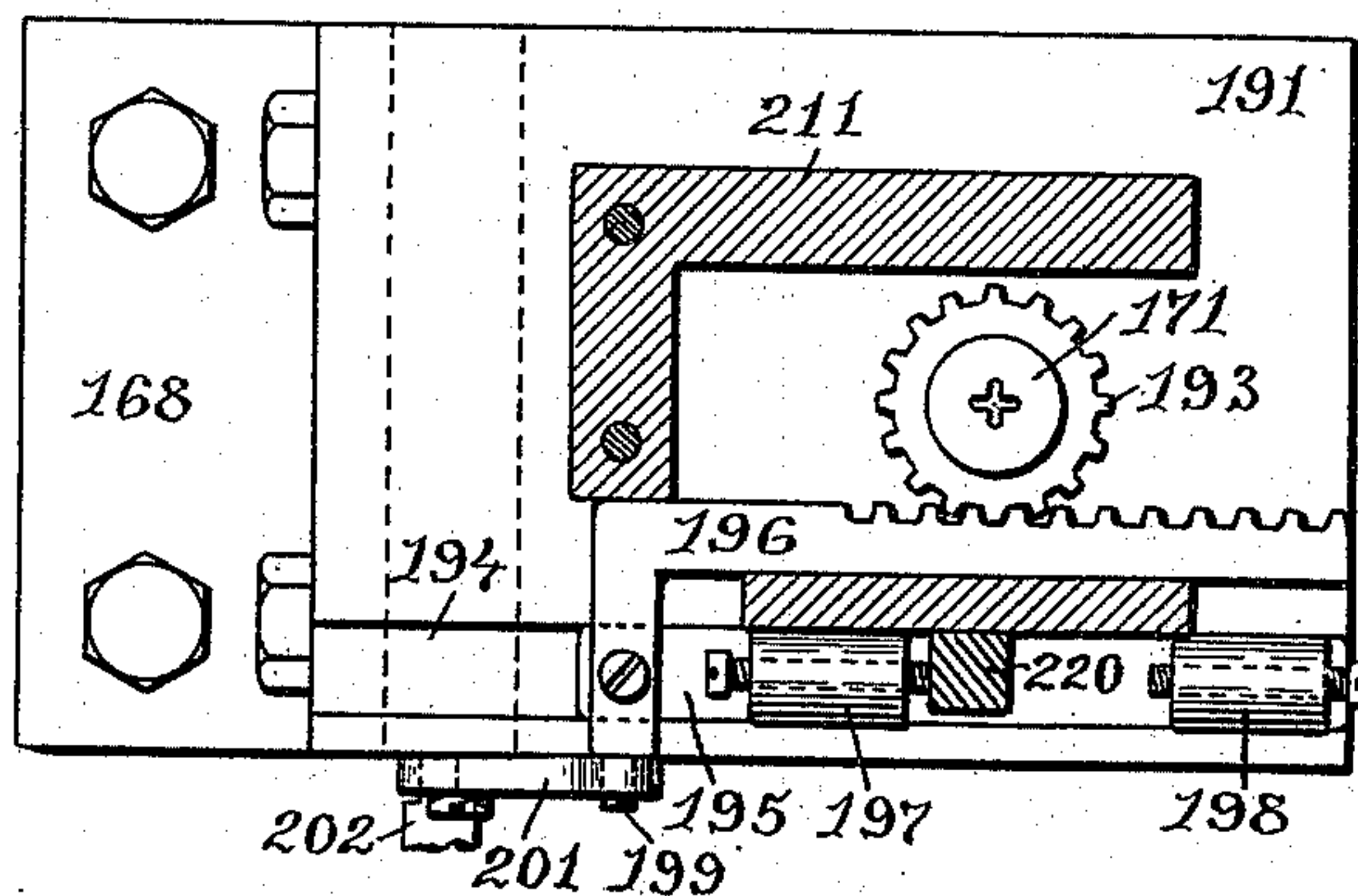
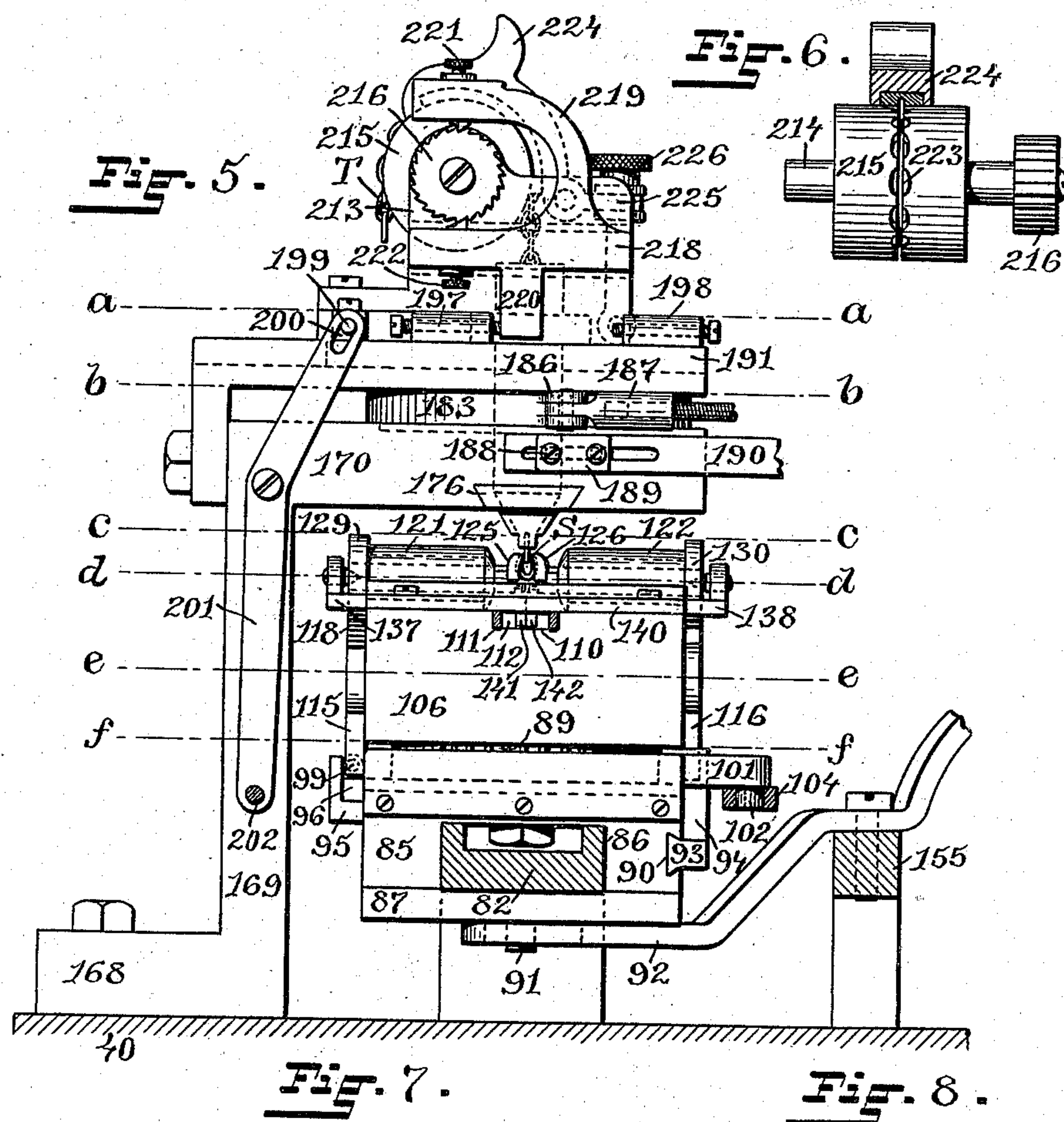
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Fig. 9.

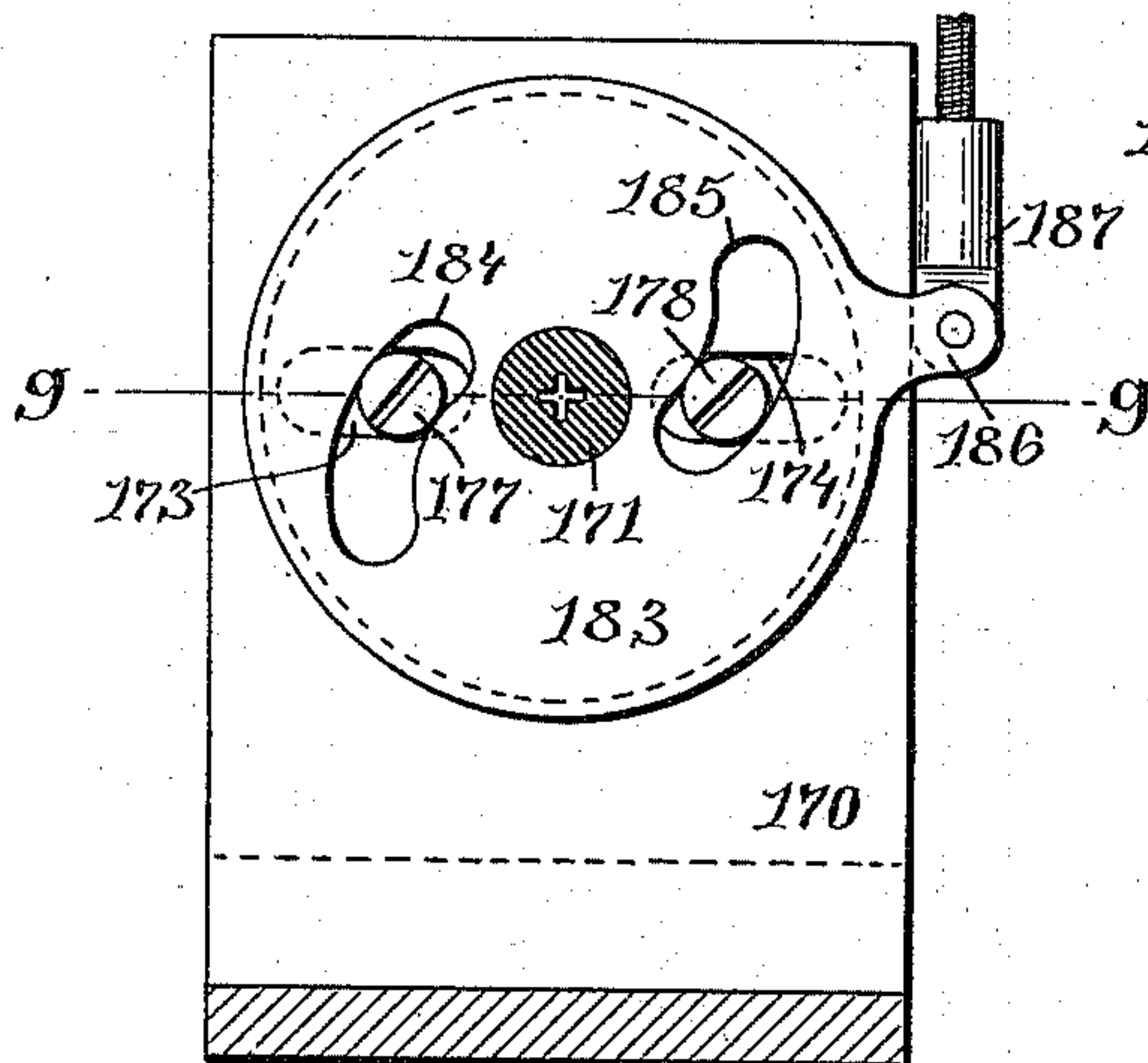


Fig. 10.

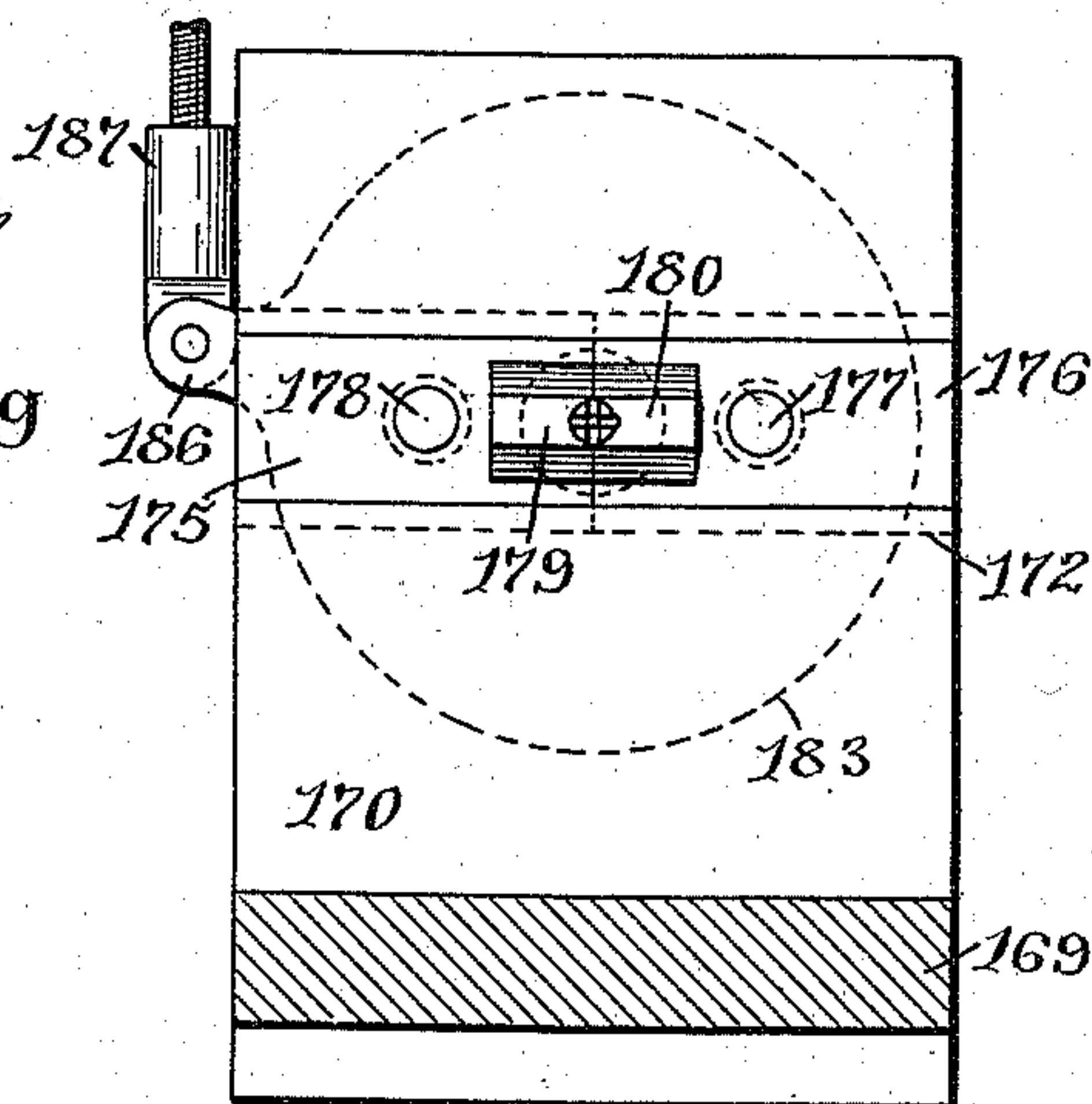


Fig. 11.

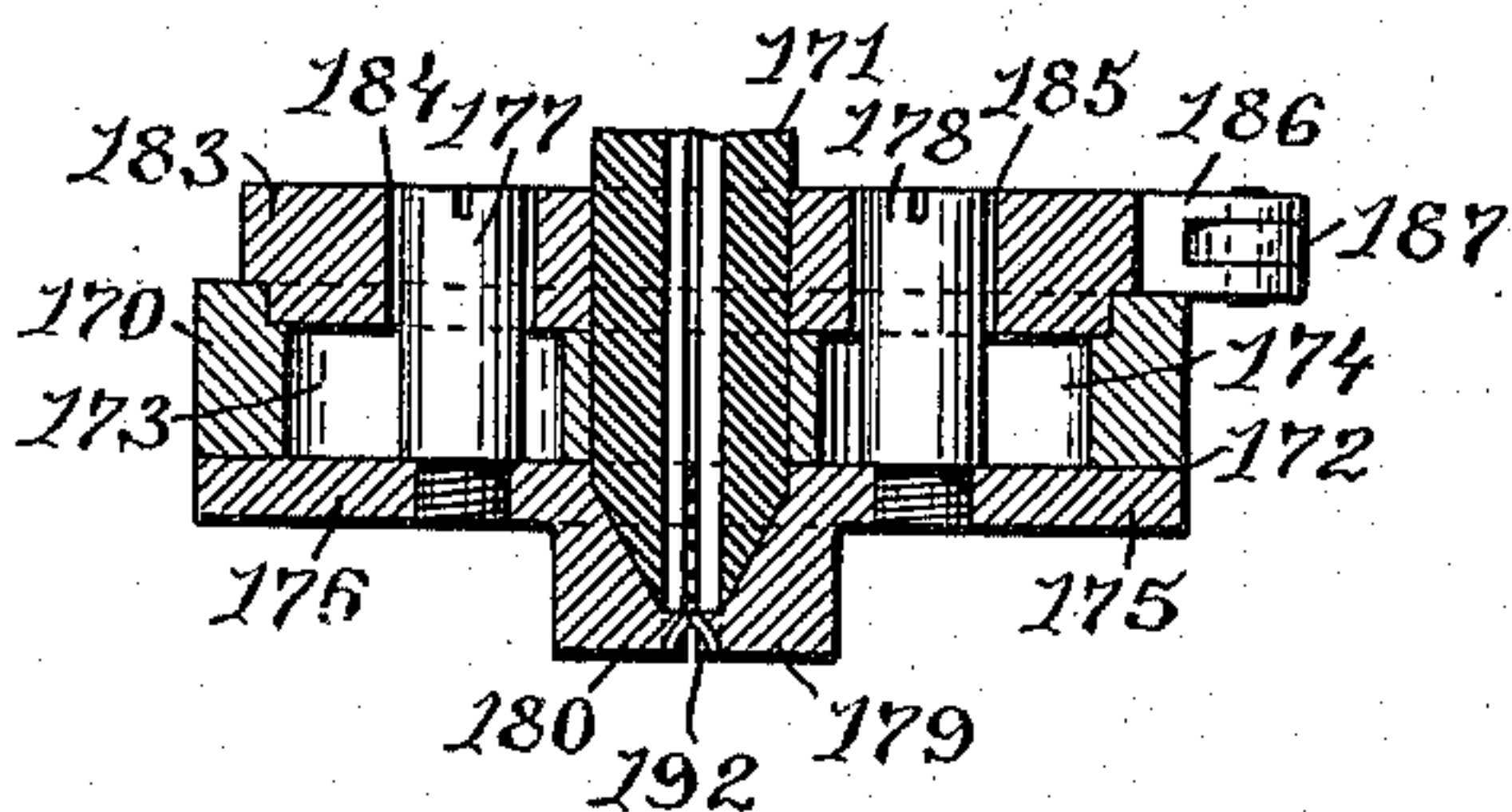


Fig. 12.

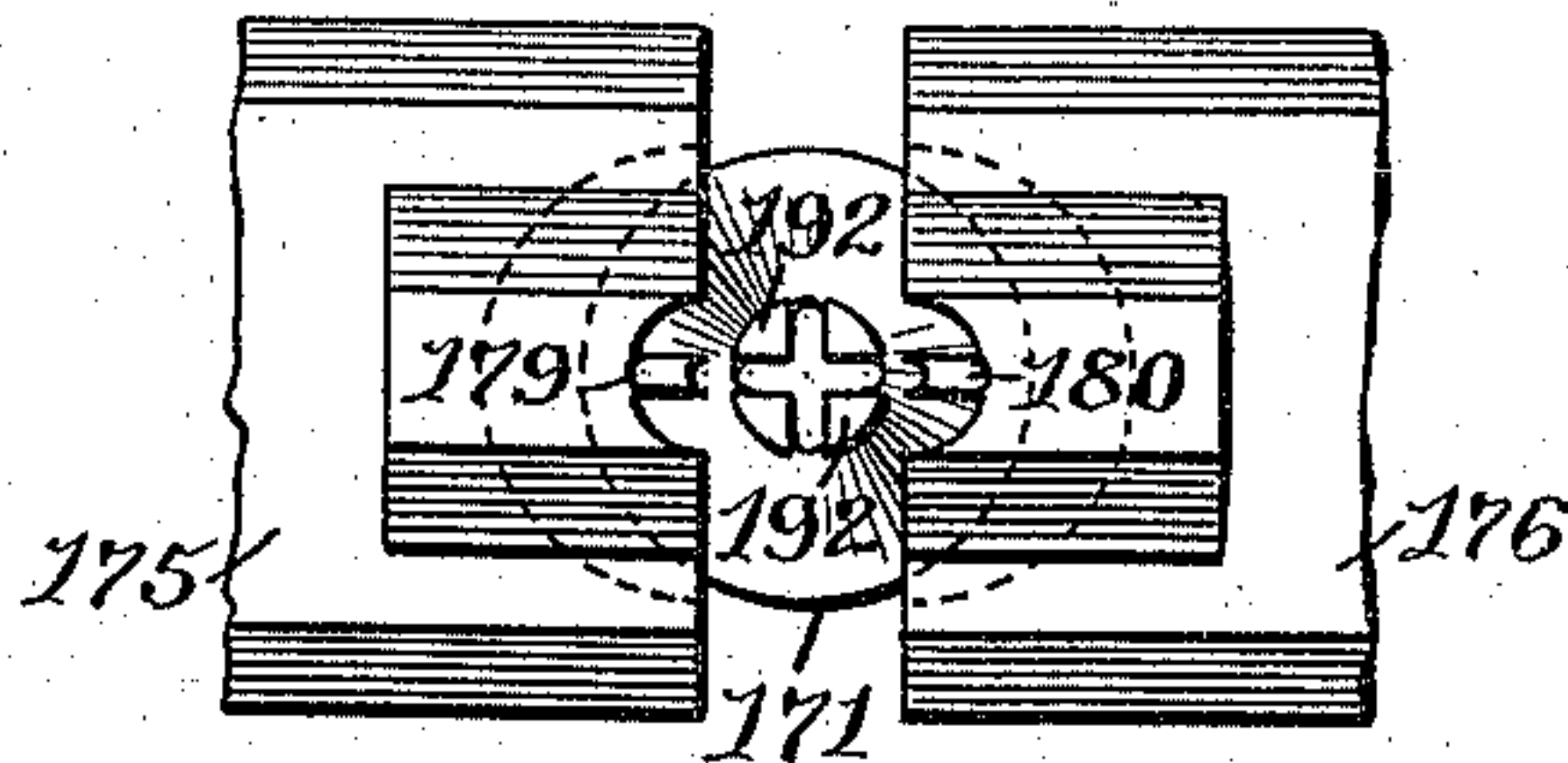
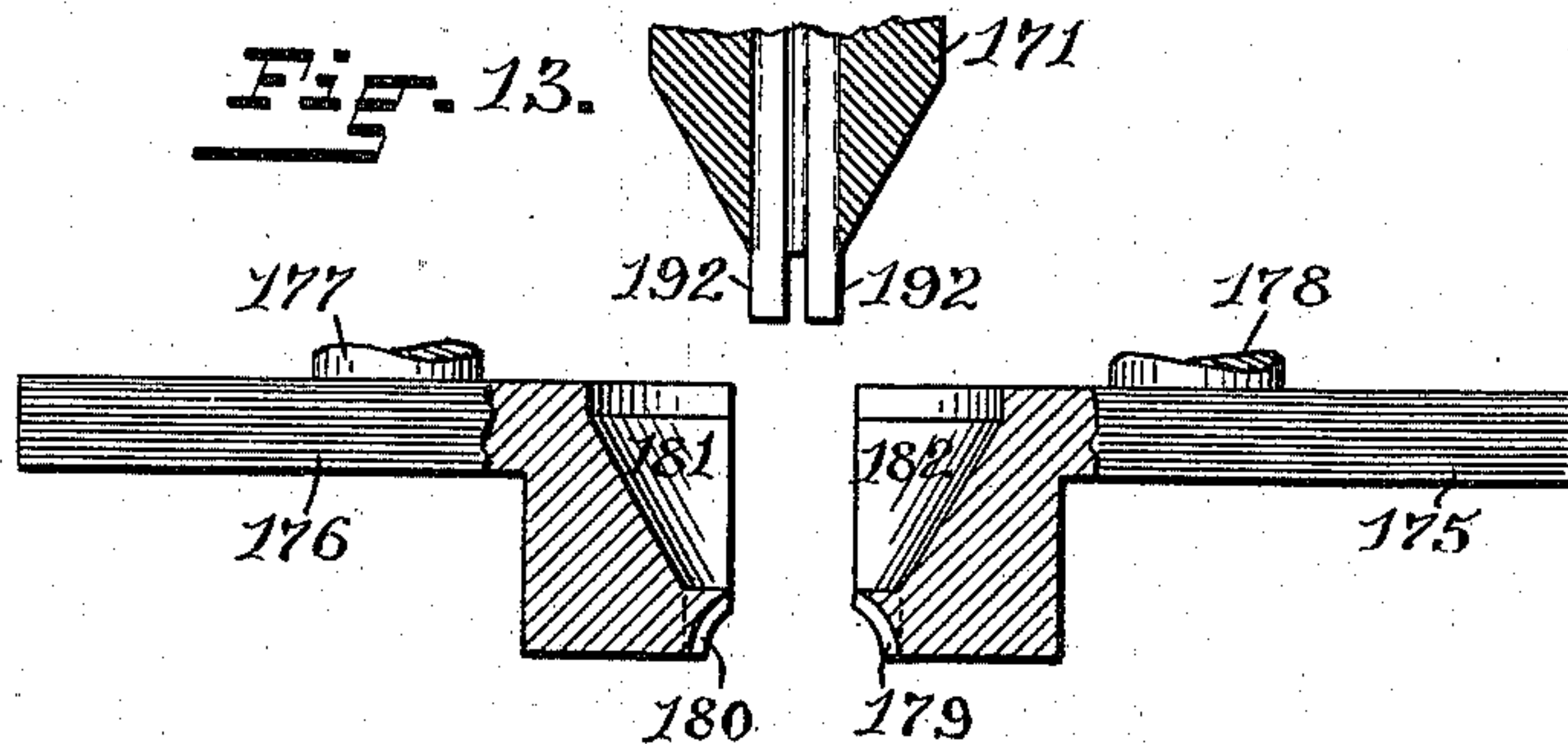


Fig. 13.



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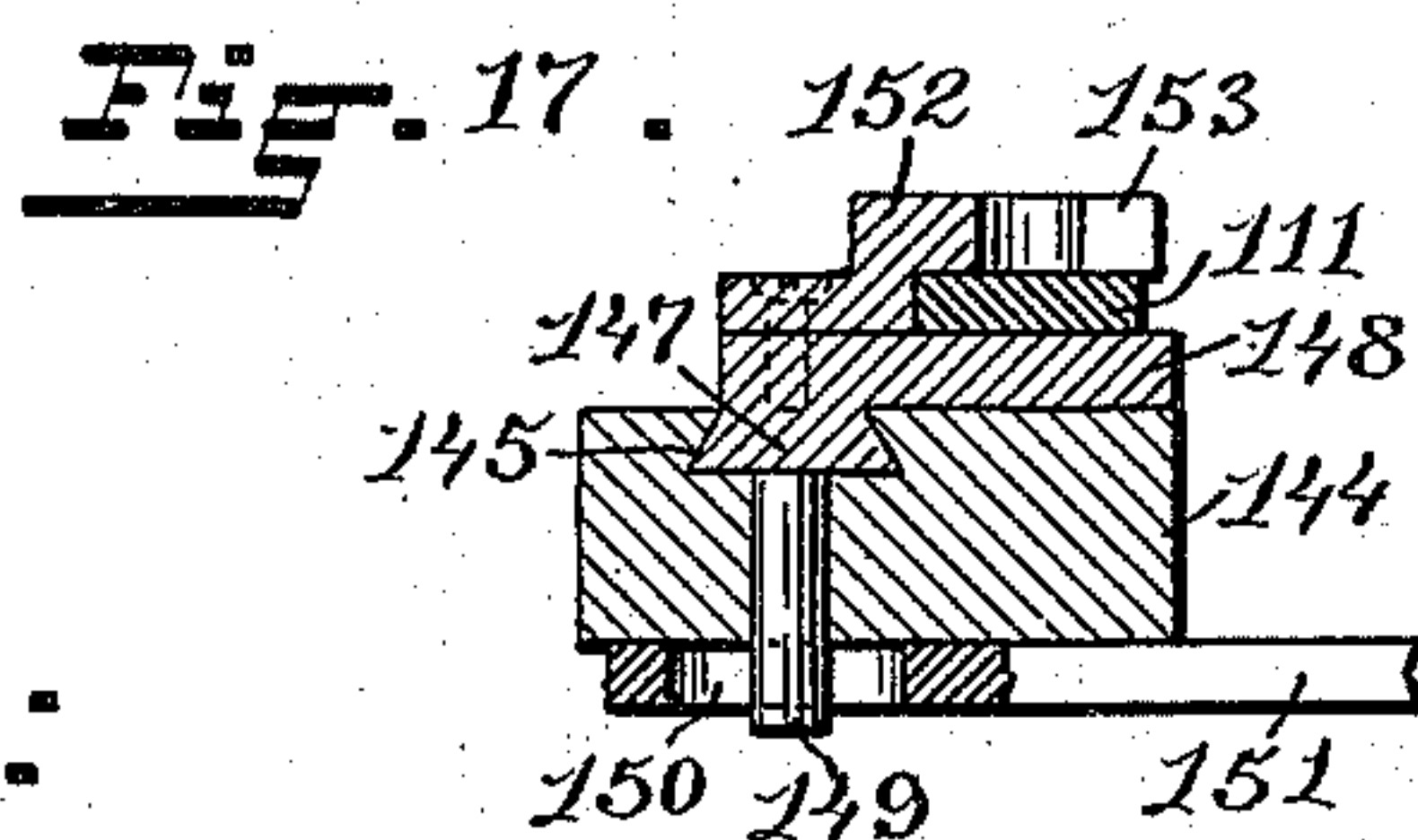
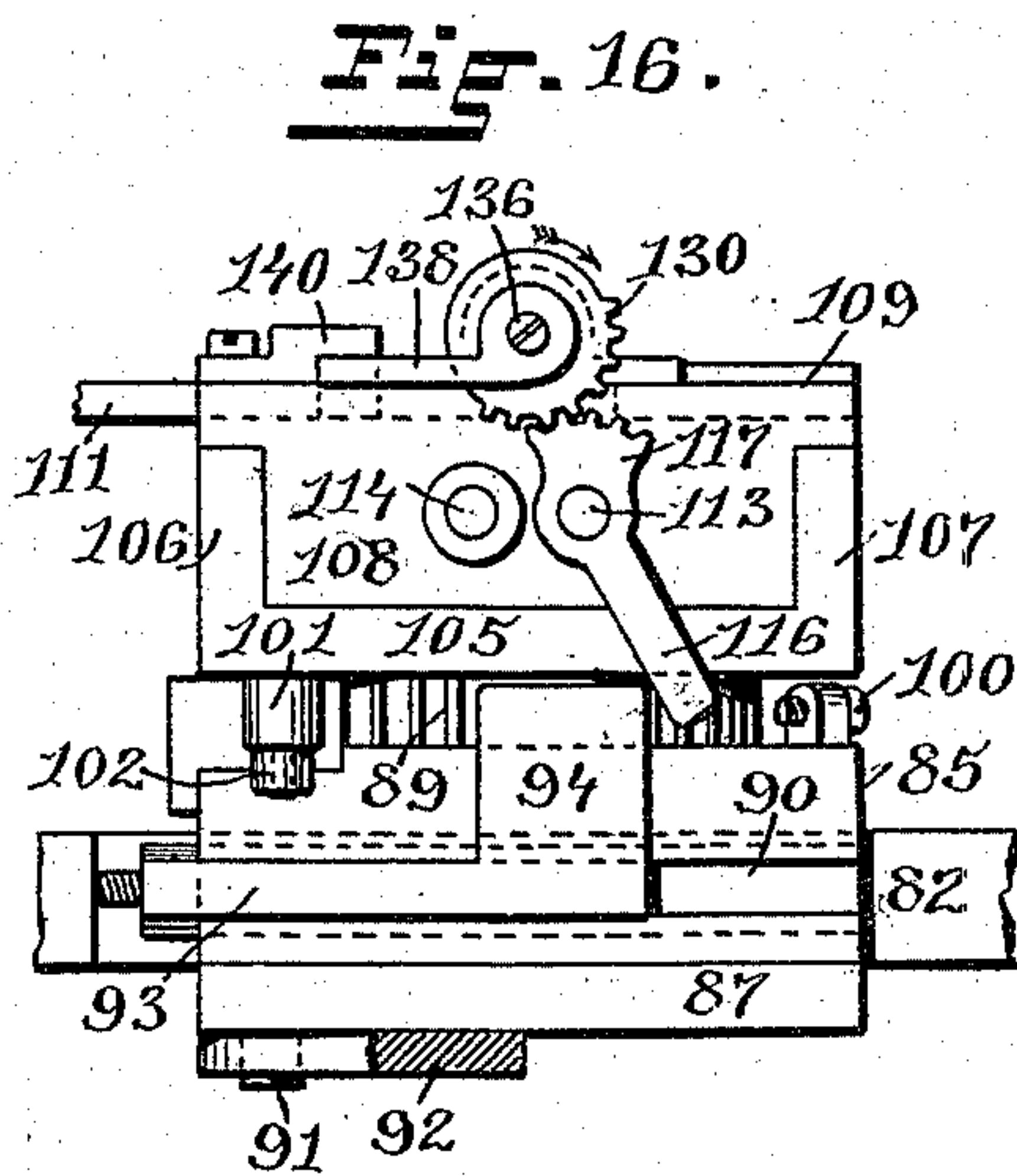
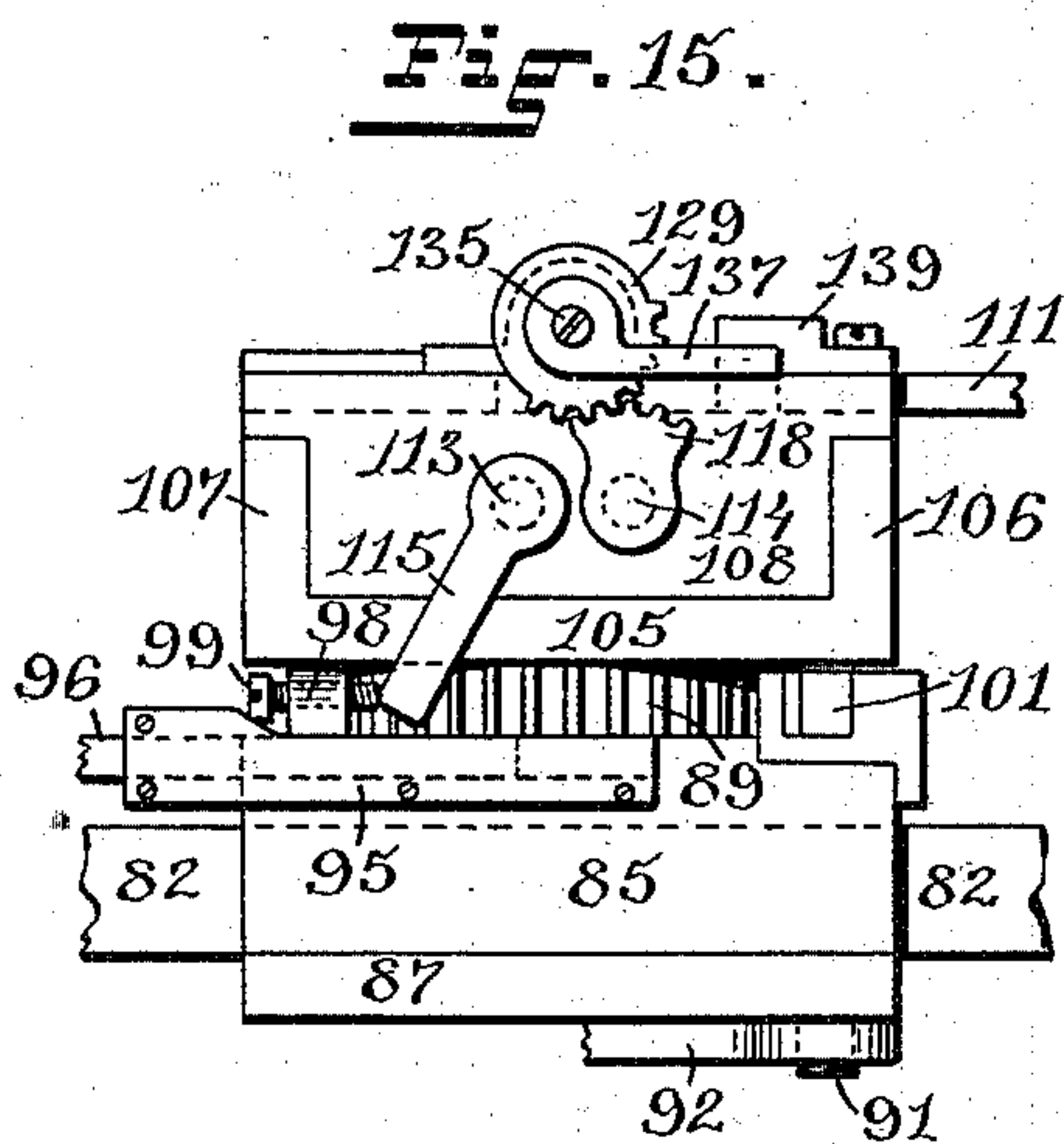
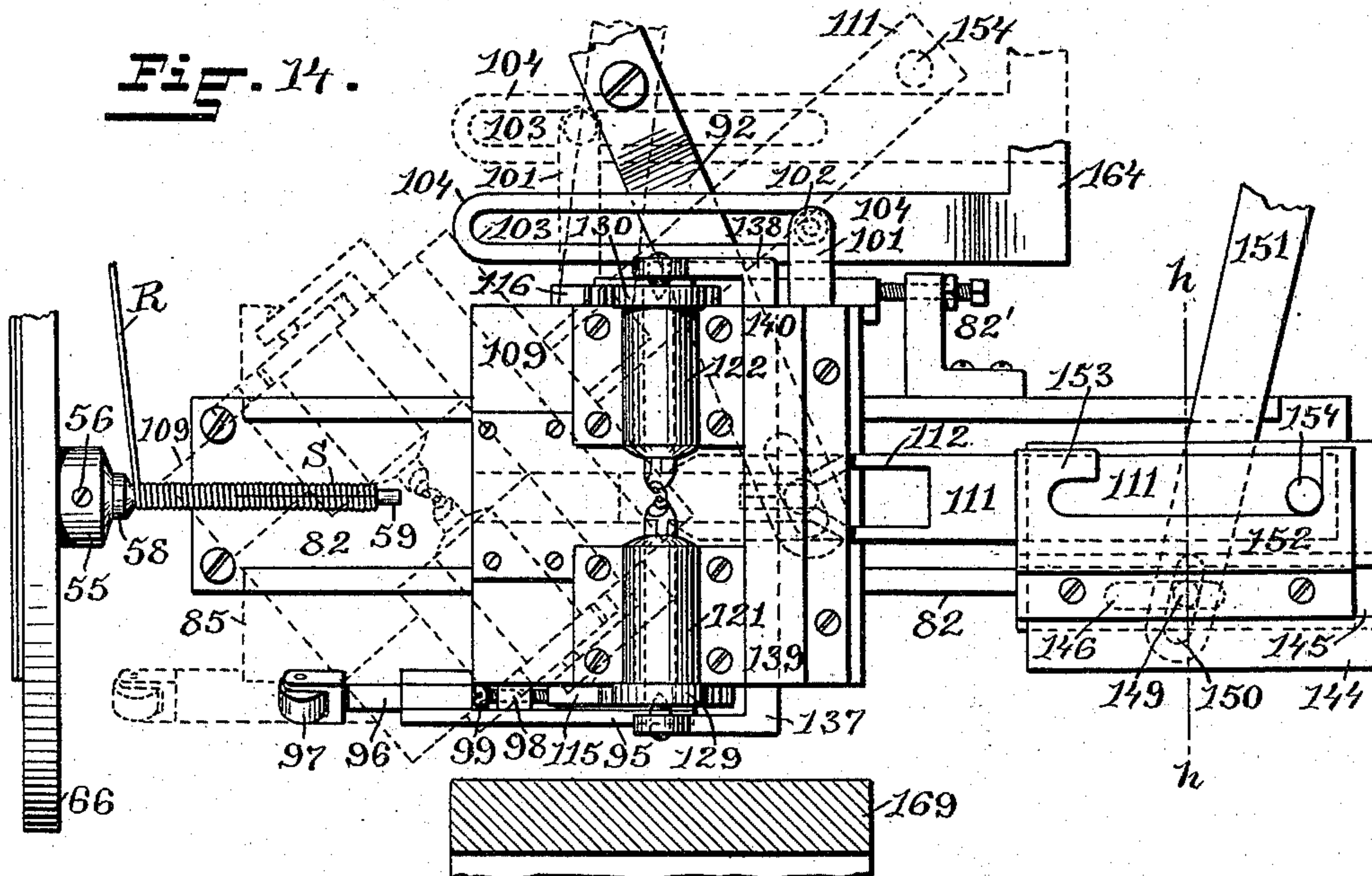
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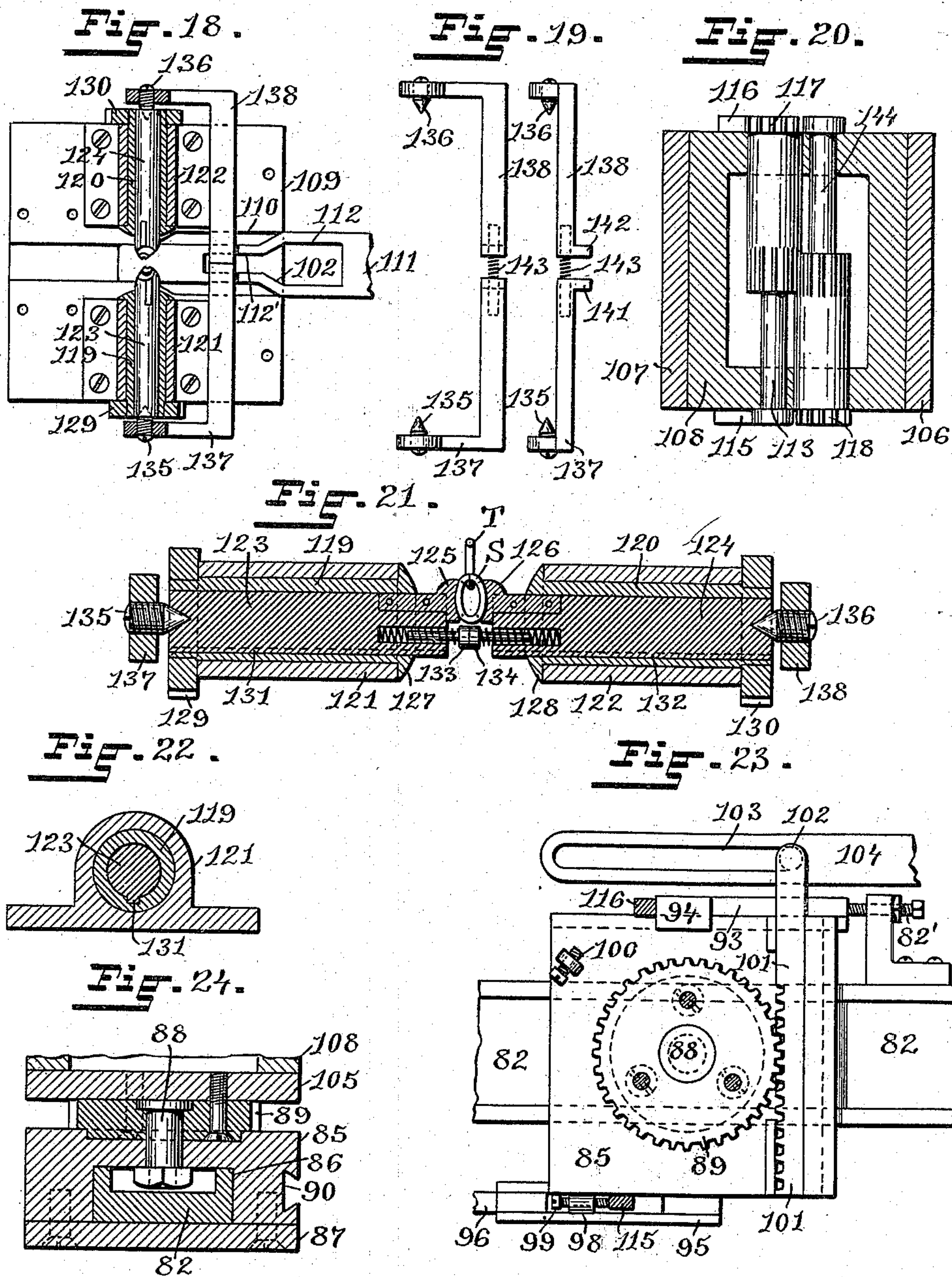
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(No Model.)

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B. L. COLVIN.  
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No. 528,076.

Patented Oct. 23, 1894.

Fig. 25.

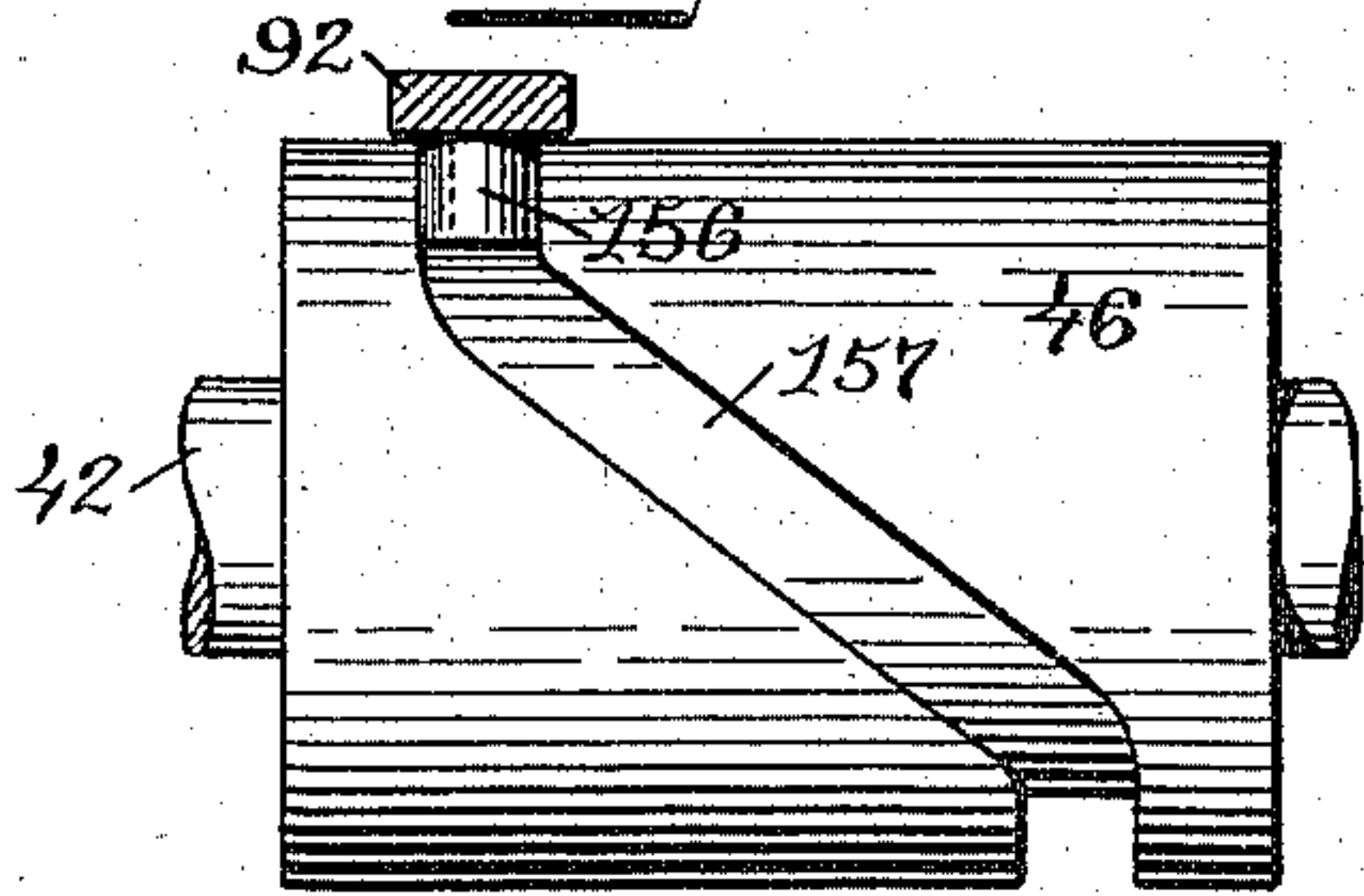


Fig. 26.

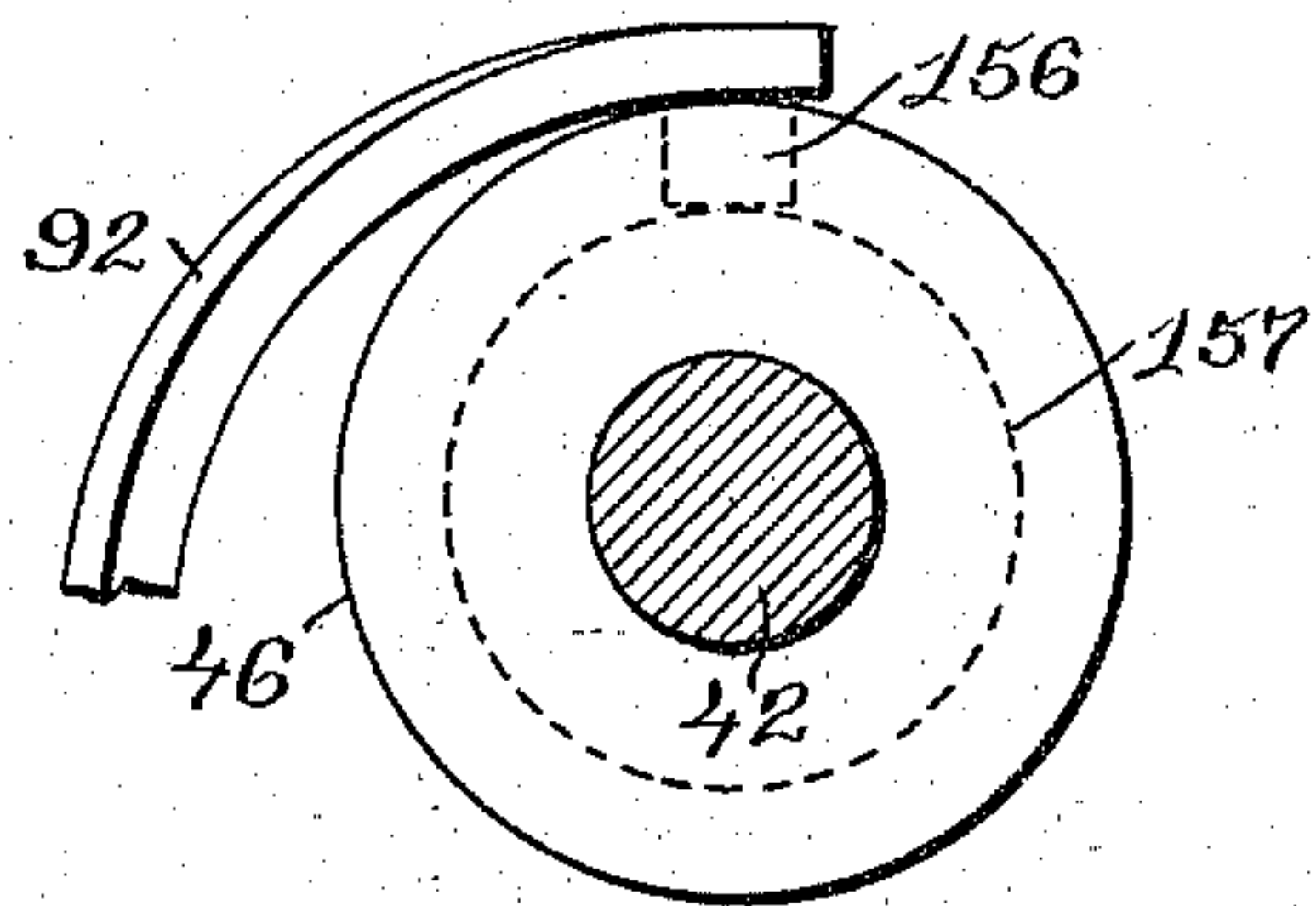


Fig. 27.

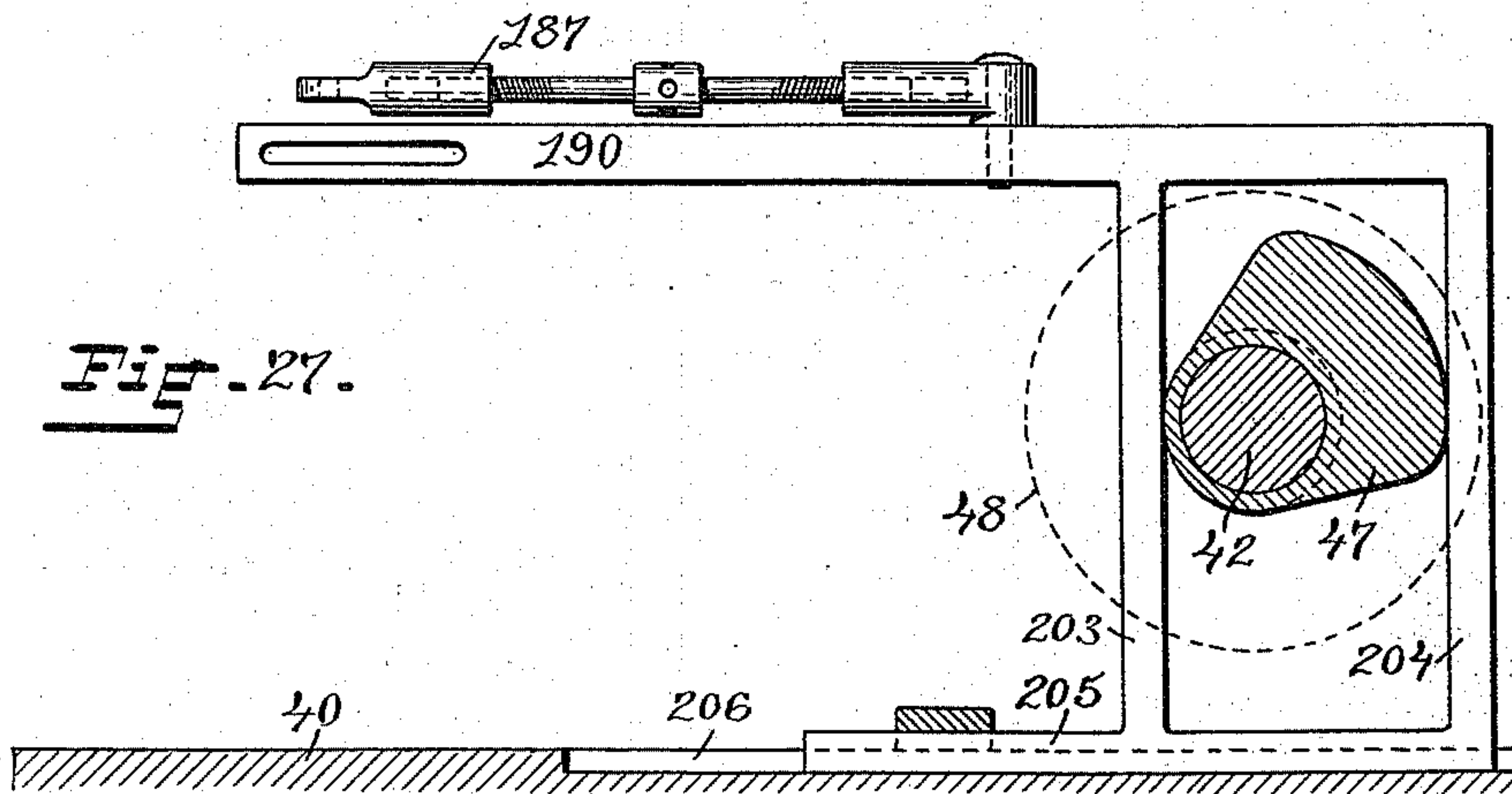


Fig. 28.

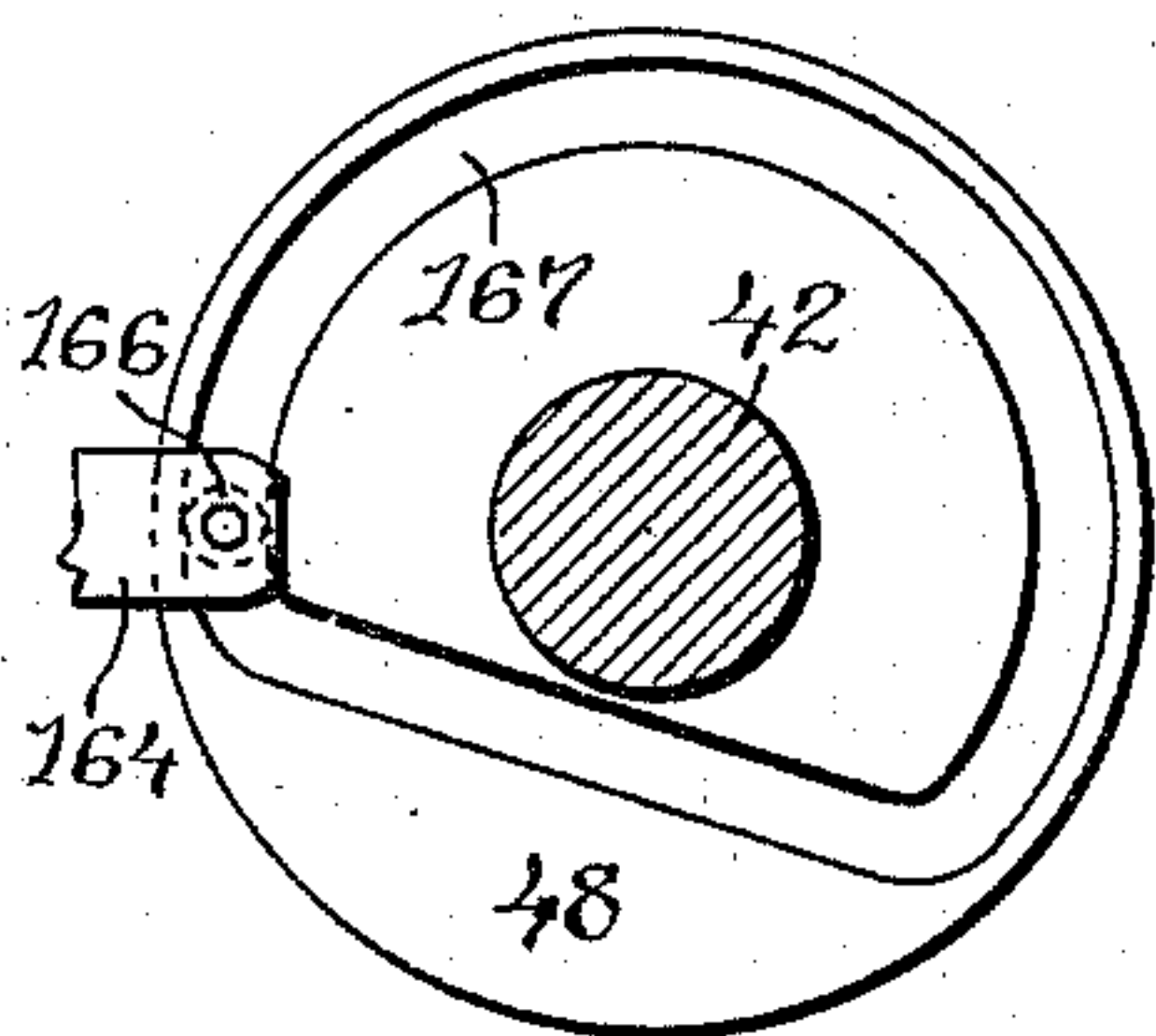


Fig. 29.

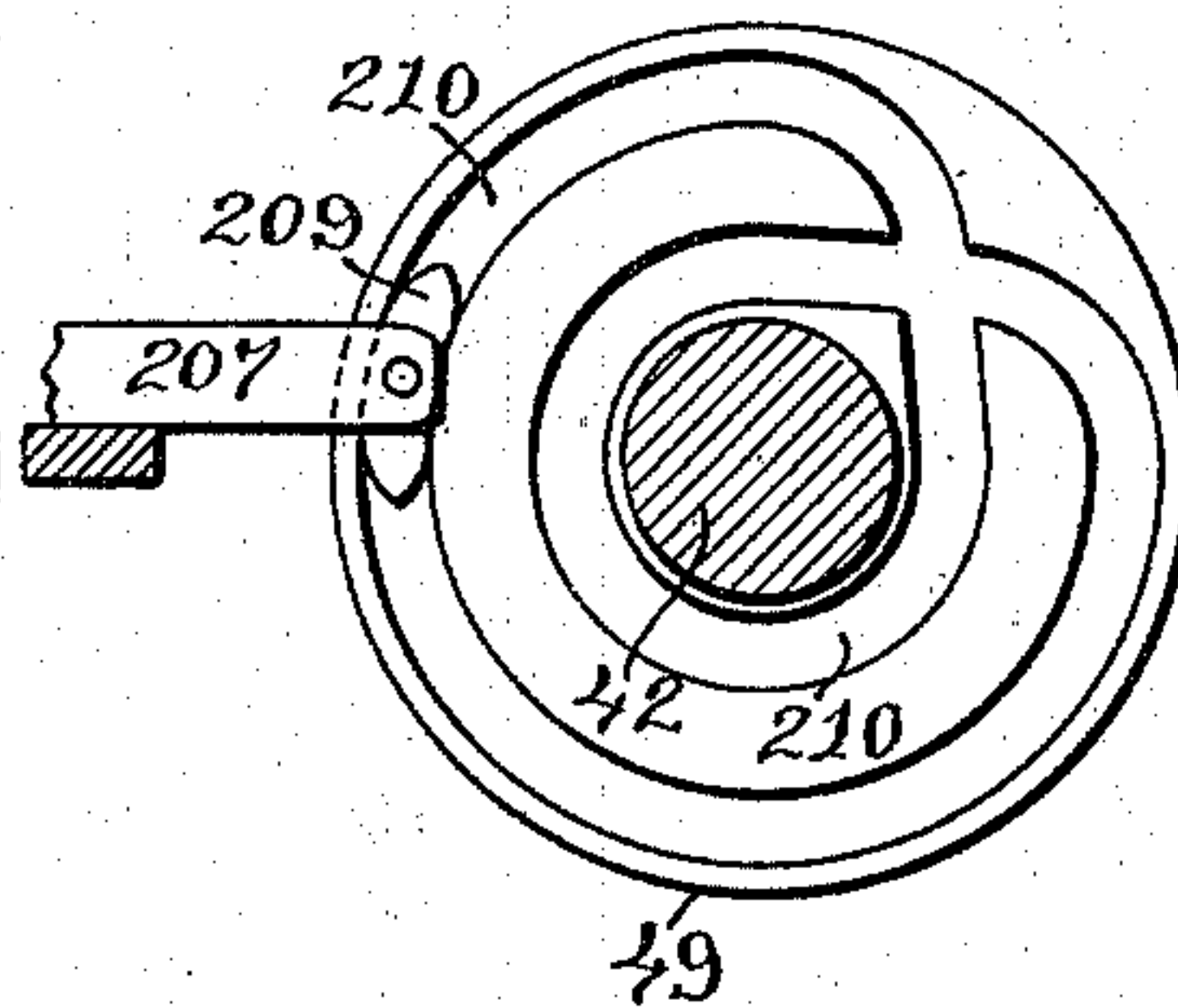
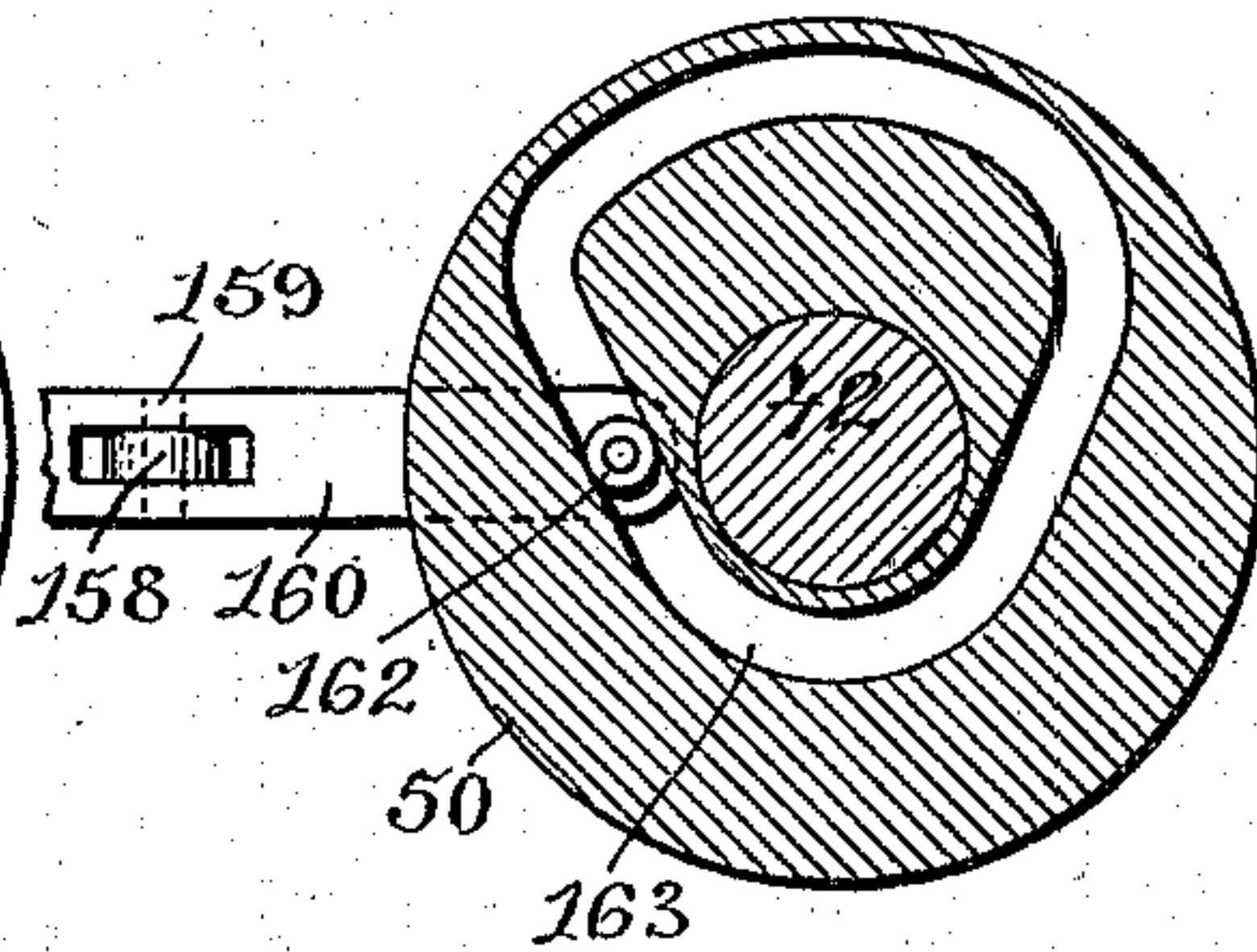


Fig. 30.



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# UNITED STATES PATENT OFFICE.

BYRON L. COLVIN, OF NORTH ATTLEBOROUGH, MASSACHUSETTS, ASSIGNOR  
TO JAMES G. CHEEVER, OF SAME PLACE.

## CHAIN-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,076, dated October 23, 1894.

Application filed March 24, 1894. Serial No. 504,975. (No model.)

*To all whom it may concern:*

Be it known that I, BYRON L. COLVIN, of North Attleborough, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Chain-Machines; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to improvements in machines for making chain-links and in devices and mechanisms for constructing chains from these links.

The object of the invention is to provide a chain-making machine by which a more perfect chain can be made than by the machines heretofore constructed.

The invention consists in the peculiar mechanism whereby the links are removed from the mandrel, opened slightly, then carried forward to engage the last attached link and then closed on to the same.

The invention also consists in the novel mechanism for holding the last attached link of the chain in position to receive the next link.

The invention also consists in the peculiar take-up mechanism for taking up the finished chain as the links are added.

The invention still further consists in the peculiar construction of the driving-mechanism by means of which the various parts are operated.

The invention also consists in such other novel features of construction and combination of parts as will hereinafter be more fully described and pointed out in the claims.

Figure 1 represents a plan view of the improved chain-making machine with the link forming and cutting device attached. Fig. 2 represents a front elevation of the same. Fig. 3 represents an enlarged plan view of the link forming and cutting device. Fig. 4 represents a vertical sectional view of the same to more clearly show its construction. Fig. 5 represents a vertical sectional view of the chain-machine proper with the link-carriage and take-up mechanism, taken on a line  $x-x$ , Fig. 2, Fig. 6 being a front view of the take-up roll and its ratchet, the presser-arm being

shown in vertical cross-section. Fig. 7 represents a cross-sectional view taken on a line  $a-a$ , Fig. 5. Fig. 8 represents an elevation and an end view of the chain holding and rotating device removed from its bearing. Fig. 9 represents a cross-sectional view taken on a line  $b-b$ , Fig. 5. Fig. 10 represents a similar view taken on a line  $c-c$ , Fig. 5, and looking upward. Fig. 11 represents a vertical sectional view taken on a line  $g-g$ , Fig. 9. Fig. 12 represents an enlarged bottom view of the chain-holding device and the jaws for holding the chain from moving upward when a link is being attached, Fig. 13 being an enlarged vertical sectional view of the same showing details. Fig. 14 represents a plan view taken on a line  $c-c$ , Fig. 5, looking downward. Fig. 15 represents a front view of the link carriage, Fig. 16 being a rear view thereof. Fig. 17 represents a cross-sectional view taken on a line  $h-h$ , Fig. 14. Fig. 18 represents a view, partly in section, on line  $d-d$ , Fig. 5, of the carriage showing the link opening and closing jaws and the mechanism for operating the same. Fig. 19 represents a top and a side view of the arms by means of which pressure is applied to the link jaws. Fig. 20 represents a sectional view of the carriage, showing the means for rotating the jaw sleeves in unison, taken on a line  $e-e$ , Fig. 5. Fig. 21 represents an enlarged longitudinal section of the link-jaws, their sleeves and the gears secured to the sleeves, the jaws being shown in the act of closing a link. Fig. 22 represents a cross-sectional view of the same showing the manner in which the jaws are keyed to their sleeves against independent rotation but allowing free reciprocation. Fig. 23 represents a cross sectional view of the carriage taken on line  $f-f$ , Fig. 5, Fig. 24 being a vertical section of this portion of the carriage. Fig. 25 represents a face view of the cam by means of which and a connecting rod the carriage is reciprocated. Fig. 26 represents a cross-sectional view of the drive-shaft and the cam, shown in Fig. 25, taken on a line  $i-i$ , Fig. 1. Fig. 27 represents a similar view taken on a line  $j-j$ , Fig. 1, with the cam bearing-frame and its connecting rod, Fig. 28 being a cross-sectional view of the same taken on a line  $k-k$ , Fig. 1. Fig.



29 is a cross-sectional view taken on a line *l-l*, Fig. 1. Fig. 30 represents a similar view taken on a line *m-m*, Fig. 1.

Similar numbers and letters of reference designate corresponding parts throughout.

In the drawings 40 represents a substantial base at the rear of which are the bearings 41-41 in which the drive-shaft 42 is journaled. On this shaft is mounted the drive-pulley 43, the balance or hand-wheel 44, the gear 45, and the cams 46, 47, 48, 49 and 50, which will hereinafter be more fully described. On that end of the base at which the gear 45 is secured on the drive-shaft is fastened the bracket 51 having a horizontal-collar 52 in which the tubular-shaft 53 is rigidly clamped by the set-screw 54. The outer end of this shaft has a shoulder 55 in which the set-screw 56 works and the inner end is furnished with the pin 57 extending inward.

Reciprocally supported within the outer end of the shaft 53 is the tubular-shank 58 of the mandrel 59, this mandrel being of a cross-sectional shape corresponding to that of the proposed links. The tubular-shank 58 is furnished with an internal screw-thread and in the outer surface is formed a groove 60 in which the plain end of the set-screw 56 engages to prevent the rotation of the mandrel, while the outer end of the mandrel is slightly spread to prevent the too ready removal of the links. The adjusting-screw 61 engages the tubular threaded portion of the shank 58 and has, at its outer end, a knob 62 by which it is turned, the reciprocation of the same being prevented by the pin 57 engaging the groove 63 in the shoulder 64.

Journaled on the shaft 53 is the tubular-sleeve 65 of the reel-plate 66, and in turn the reel-plate 67 and the sleeve 68 are mounted on the sleeve 65, while the gear 69 is keyed to this sleeve 65 and intermeshes with the drive-gear 45. The reel formed by the plates 66 and 67 and the sleeve 68 is adapted to receive the wire R, which, passing through a tension-device 70 in the reel-plate 66, is bent around the mandrel, or arbor, 59 as the reel and the wire are rotated, thus coiling the wire around the mandrel at the base of the same, these coils advancing along the mandrel as each coil is added until the coils are presented to the cutting-device to be separated into links S-S.

The cutting-device is mounted on the base 71 which is secured to the plate 40. This base 71 has a vertical socket in which the member 72 having the enlarged shoulder 73 is adjustably secured by a set-screw 74. The upper portion of the member 72 is branched to form the bearings 75 and 76, and in these bearings is horizontally journaled the shaft 77 carrying the saw-cutter 78 at one end and a balance-wheel 79 at the other, while between the bearings the driving-pulley 80 is secured, this pulley being driven by a belt from a counter-shaft. The saw, or cutter, 78 is located in the vertical, axial plane of the

mandrel 59 and is partially covered by the dust-shield 81 supported from the bearing 75.

Secured to the plate 40 is the raised track 82 which is supported by the brackets 83 and 84 and extends between them, being furnished with the adjustable-stop 82'. On this track the base 85 of the link carriage travels. The base 85 is formed by a block in the under portion of which a transverse slot 86 is formed to receive the track 82, being secured from lifting by the plate 87 screwed to the bottom of the block. Through the center of the base is a vertical bearing in which the pivot 88 is secured. On this pivot is journaled the horizontal gear 89 having a contracted portion on its under side which is recessed in the upper surface of the base 85. In the rear side of the base is formed the dove-tailed groove 90 and depending from the plate 87 is a pivot 91 on which the lever 92 is pivoted. In the dove-tailed groove is movable the slide 93 having the raised stop 94, and secured to the front of the base is the guide-member 95, in which the arm 96 of the roller-bearing 97 is free to move. On this arm 96 is a raised collar 98 in which is mounted the screw 99. On the upper rear corner of the base 85 is secured the adjustable stop 100, and mounted in guides at one side of the upper surface of the base is the rack 101 the teeth of which engage the gear. The outer end of this rack has a pivot 102 which enters the slot 103 of the lever 104.

The carriage is formed with a casing having a bottom 105, to which the gear 89 is secured by screws, and the sides 106 and 107. Between these sides is secured the frame 108 having a cover 109 which is furnished with a central transverse guide-slot 110 in which the arm 111 having the contracting cam-slot 112 is movable, the slot being partially covered by a plate. In the front and rear walls of the frame 108 are journaled the shafts 113 and 114 each having oppositely-disposed enlarged portions which are geared together so that the rotation of one shaft will be conveyed to the other. On the outer end of the shaft 113 is fastened the depending-arm 115 adapted to be struck by the stop-screw 99, and on the opposite enlarged end is a similar arm 116 having a segmental-gear 117 and adapted to be struck by the extension of the slide 93. On the front end of the shaft 114 is the segmental-gear 118.

Mounted on the carriage is the link-grasping device. This consists of the rotatable sleeves 119 and 120 which are journaled in the bearings 121 and 122 secured to the top 109 of the carriage and carry the reciprocal spindles 123 and 124 to the inner ends of which the grasping-jaws 125 and 126 are secured. The inner ends of the sleeves 119 and 120 have the collars 127 and 128 which extend over the inner ends of their bearings. To the outer end of the sleeve 119 is fastened the segmental-gear 129 which intermeshes with the segmental-gear 118 of the



shaft 114. In like manner the segmental-gear 130 is secured to the outer or rear end of the sleeve 120 and engages the gear 117 of the shaft 113. The sleeves 119 and 120 have also internal longitudinal grooves in which the ribs 131 and 132 of the spindles 123 and 124 are free to reciprocate, but prevent the independent rotation of either. The inner ends of the spindles are furnished with sockets in which the spring-operated plungers 133 and 134 work. These plungers bear against each other and have a tendency to press the spindles apart. In the outer ends of the spindles are formed conical sockets in which the conical-pins 135 and 136 bear. These pins are adjustably secured in the ends of the arms 137 and 138 the main portions of which are movably mounted in guides 139 and 140 fastened to the top of the carriage. These arms have at their inner ends the depending studs, or ends, 141 and 142 which enter the double cam 112 of the lever 111 and are drawn together by the inwardly-extending sides of the slot when this lever is drawn outward until the narrow portion 112' of the cam is reached. Between the ends of these arms 137 and 138 is located a spring 143 which partially enters a socket in the end of each arm and tends to separate the arms when the studs 141 and 142 are in the large portion of the cam 112.

On the right hand portion of the plate 40 is secured a block 144 elevated above the track 82 by a bracket and having a dove-tailed groove 145 in its upper surface. From the central portion of this groove the vertical-slot 146 is cut through the block, while movable in the groove is the member 147 of the plate 148 having a pin 149 which extends through the slot 146 and is engaged by the slot 150 in the lever 151. To the plate 148 is secured the guide-plate 152 having its inner side open and being partially cut away to form the hook-shaped end 153 and an opening into which the free end of the lever 111 having the pin 154 may swing inwardly, while the guide-plate may be moved for the length the this opening without acting on the lever 111.

Intermediate the track 82 and the drive-shaft is secured the longitudinal-bar 155 to which the levers 92 and 151 are pivoted. This bar is on a plane with the lower surface of the lever 151, but the forward end of the lever 92 is bent downward to bring it in a proper position to engage the pin 91 of the carriage base. The rear end of this lever 92 curves upward, being furnished with a pin 156 which is free to follow in the cam-groove 157 of the cam 46. This groove is so shaped that at one revolution thereof the lever 92 will be swung sidewise carrying the link carriage to a position where the jaws 125 and 126 may engage the outermost link on the mandrel 59 and then returning the carriage to place.

The lever 151 has a member 158 extending nearly at right angles therefrom. This member has a slotted end in which the pin 159

of the reciprocating-bar 160 engages. The reciprocating bar is supported in a guide 161 which is secured to the bar 155 and has a roller-bearing 162 which follows the groove 163 in the cam 50, this cam-groove being shaped to first carry the pin 162 and the bar 160 sharply outward, then dwelling for about one-quarter revolution of the drive-shaft and making a quick return, the effect being, through the lever 151, to reciprocate the plate 148 first toward the left when the end of the plate 152 bearing on the pin 154 throws the lever 111 in the same direction, bringing the wider portion of the cam-opening 112 opposite the lugs, or ends, 141 and 142 of the arms 137 and 138 and allowing of their separation by the spring 143. The dwell of the cam-groove 163 now being reached by the bearing 162 no change will occur until the carriage has been moved forward in position to secure a link by the lever 92. At this time the bearing 162 having passed the dwell in the groove 163 the plate 148 will be thrown backward to the limit of the slot 146 and the pin 154 will be engaged by the hooked end of the plate 148 being drawn back sufficiently that the cam-opening 112 may act on the lugs 141 and 142, drawing them together to partially close the jaws 125 and 126 and thereby grasp a link, the final portion of the revolution of this cam-groove 163 acting to move the plate 148 again slightly forward to release the pin 154 from the hook-end 153 so that this end of the lever 111 may be swung outward.

The slot 103 in the lever 104 is as long as the necessary traverse of the link carriage and this lever has a member 164 movable in a guide 165 which is secured to the bar 155. On the end of this member is a roller-bearing 166 which enters the cam-groove 167 in the surface of the cam 48 and is operated thereby to reciprocate the lever 104 at the time when the cam 50 has finished its revolution. As the lever 104 is reciprocated backward the rack 101 is also drawn in that direction and acting on the gear 89 rotates the same and with it the link carriage for a one quarter revolution. This is accomplished just as the carriage starts on its backward traverse and is free of the mandrel 59. When the carriage is rotated for a one quarter turn the arm 116 strikes the stop 100 and is swung backward, the segmental-gear 117 being thus caused to act on the gear 130 to partially rotate the sleeve 120 and the spindle 124 in the direction opposite that indicated by the arrow in Fig. 16. At the same time the movement of the arm 116 partially rotates the shaft 113, and through the central gears this rotation is transmitted to partially rotate the shaft 114 in the opposite direction, the gear 118 on this shaft acting to rotate the gear 129 and with it the sleeve 119 and the spindle 123, the result being to twist the ends of the link, which is held between the jaws, in these opposite directions thus opening the link while it is held in a direct line with the last formed link.



As the carriage is rotated by the rack 101 the lever 111 swings outward to the position shown in dotted lines in Fig. 14. The action of the cam 46 on the lever 92 now brings the carriage back to its original position, the track 82 guiding the carriage in a straight course until the open ends of the link S, held in the jaws, are brought within the link T, last added to the chain. The further revolution of the cam 48 will now throw the lever 104 and the rack 101 forward, the gear 89 will be rotated in the same direction and the carriage will be moved to the same extent. The arms 115 and 116 striking the stop 99 and the elevated portion 94 of the slide 93 will cause the rotation of the shafts 113 and 114, the gears 129 and 130, and the sleeves 119 and 120 with their spindles 123 and 124 to twist the open ends of the link back into one common plane, the next operation being to release the link from the jaws, as previously described, by the forward movement of the plate 152 against the pin 154.

The mechanism for forming the link, its taking up by the carriage, the opening of its ends and their final closing on the last formed link, having thus been described, it will be found necessary in a complete automatic machine that provision be made to hold the last added link rigidly, in a position to receive the next link, as well as for both taking up the chain and giving it a one-quarter turn as each link is taken up.

To the front portion of the plate 40 is secured the bracket 168 having a vertical member 169 and a horizontal member 170 which overhangs the link carriage. Through the center of this horizontal member is a vertical bore in which the chain-guide 171 is free to rotate. In the under side of this member is formed a transverse dove tail groove 172 and through the remaining thickness of the member, above the center of the groove, are the slots 173 and 174. In the groove 172 are movable the slides 175 and 176 each having a pin 177 and 178 extending through the slots 173 and 174 and for a distance above the surface of the member 170. At the inner ends of the slides 175 and 176 are formed depending-jaws 179 and 180 adapted to grasp the upper portion of a link, and above these are formed semi-conical recesses 181 and 182. In the upper surface of the member 170 is a recess which forms a bearing for the cam-plate 183. This plate has a central vertical perforation through which the rotatable chain-guide 171 extends and is supplied with cam-slots 184 and 185 in which the upper ends of the pins 177 and 178 are engaged. On the cam-plate is an arm 186 which is pivoted to the forward end of the connecting-rod 187. By the reciprocation of this rod the cam-plate is rotated and it is evident that the pins 177 and 178 following in the cam slots of the plate will be so moved that during the partial rotation of the cam-plate to and fro they will be separated or moved toward each other thus open-

ing and closing the jaws 179 and 180. On the side of the member 170 are secured the guide-screws 188 and the plate 189 serving as a guide for the slotted end of the arm 190.

Secured to the upper portion of the member 169, by a bent portion, is the plate 191 which extends above the cam-plate 183. Through the center of this plate is a vertical bore located in a line with the bore of the cam-plate 183 and of the member 170. In this bore and extending downward is the rotatable chain-guide 171 having a bore shaped to correspond to the cross-section of the completed chain, in this case being cross-shaped. The lower end of the chain-guide is conical in shape to correspond with the conical recesses in the slides 175 and 176 when they are closed together. Pendent from this lower end are the four fingers 192 in the openings between each pair of which the jaws 179 and 180 may enter, these fingers preventing the side swinging of a link held from undue upward movement by the jaws. At the upper portion of this chain-guide is the gear 193, and in the upper surface of the plate 191, at one side, is the guide-slot 194 in which the slide 195 is free to move. To this slide is secured the rack 196 by means of which the gear 193 and its chain-guide are rotated. On the slide 195 are mounted the adjustable stops 197 and 198, and extending from the rack-member is a pin 199 extending through the slot 200 at the upper end of the bent lever 201. This lever is pivoted to the side of the member 169 of the bracket 168, being pivotally connected at its lower end with the end of the lever-arm 202.

The arm 190 forms the upper part of a frame having vertical-bars 203 and 204 against which the cam 47 alternately bears to reciprocate the frame, the lower member 205 of the frame being movable in a guide-slot 206 formed in the surface of the plate 40. To the arm 190 is pivoted the connecting-rod 187 which is adjustable as to its length and at its forward end is pivoted to the cam-arm 186, the cam 47 being so shaped that the frame will be driven forward and backward during one revolution of the drive-shaft 42, the forward movement of the frame and the consequent partial rotation of the cam-plate 183 to open the jaws being accomplished immediately after the jaws of the link carriage have released the link. The lever-arm 202 forms part of the lever 207 which is reciprocal in a guide 208 secured to the end of the track 82 and to the bar 155. At its rear end it is provided with a pivoted-shoe 209 which follows the cam-groove 210 in the cam 49 being of a length slightly greater than the width of this groove, the traversing of this shoe through the entire path of this cam-groove requiring two revolutions of the drive-shaft, the bearing and its lever 207 being driven forward on the first quarter of one revolution, then dwelling for the remaining three quarters of the revolution while the link S is being brought to position and clamped to the



last added link T. The lever 207 is then drawn back for one quarter revolution of the cam and then dwells for the remaining three quarters while the same process is repeated.

5 To the plate 191 is fastened a base 211 one edge of which overlaps the rack 196 and on this base are mounted the side-plates 212 and 213 in which the shaft 214 carrying the take-up roll 215 is journaled, the outer end of this  
10 shaft being furnished with the ratchet-wheel 216. In the side-plate 213 is formed a horizontal dove-tail groove 217 in which the corresponding slide 218 is free to move. This slide is furnished with an upwardly-curving  
15 member 219 and a depending-arm 220 while through the slide 218 and the upper end of the member 219 extend the oppositely-beveled spring-operated pawls 221 and 222 for alternately engaging the teeth of the ratchet 216  
20 as the slide 218 is reciprocated through contact with the stops 197 and 198 on the slide 195 when this slide is operated by the lever 201 to rotate the take-up roll and thus draw the chain upward.

25 In the face of the take-up roll 115 is a continuous recess 223 adapted to receive the chain which is held in place by a presser 224 pivoted on a shaft between the side-plates 212 and 213 and having rearwardly-extending  
30 pins 225 which are engaged by the adjusting-screw 226 also pivoted at its lower end between the side-plates.

Having thus described my invention, I claim as new and desire to secure by Letters  
35 Patent—

1. The combination with a supporting bracket, the tubular-shaft 53 secured at one end therein, the mandrel 59 having a base furnished with a threaded socket movable in  
40 the bore of the shaft, an adjusting device having a screw for engaging the threaded socket of the mandrel base, and a feed-drum rotatably mounted on the shaft, of a base secured at one side of the mandrel, a post 72  
45 adjustable vertically in said base and having bearings at its upper end, the shaft 77 journaled in said bearings, a drive-pulley on said shaft, the cutter 78 secured on the end of the shaft and supported above the mandrel, and  
50 the dust-shield 81 supported on rods extending from one of the shaft bearings, as described.

2. In a chain-machine, the combination with a link-carriage furnished with bearing sleeves  
55 at opposite sides thereof, sleeves rotatable in said bearings, spindles reciprocal in said sleeves but held from independent rotation, and jaws for grasping a link mounted on the inner ends of the spindles, of means for rotating the sleeves in opposite directions, devices for moving the spindles inward, and  
60 springs for separating the same when released.

3. In a chain-machine, the combination with  
65 a traversable base, a pin extending from the lower portion of the base, a pivoted lever having at its forward end a slot in which said

pin enters and provided at its rear end with a bearing-pin, and a rotatable cam having a cam-groove in which the bearing-pin of the  
70 lever engages, said cam-groove being shaped so that the following of the bearing-pin will vibrate the lever horizontally, of a carriage rotatably mounted on said base, and mechanism secured to said carriage for grasping  
75 a link.

4. In a chain machine, the combination with a traversable base, a shaft vertically mounted therein, a gear journaled on the shaft, a guide  
80 on the upper surface of the base, a toothed rack movable in said guide and engaging the gear, and means for reciprocating the rack, of a link-carriage secured to said gear, and mechanism carried thereby for grasping a  
85 link.

5. In a chain-machine, the combination with a traversable base, and stops carried by the base, of a carriage rotatably mounted on the base, parallel shafts journaled in the carriage  
90 and furnished with intermeshing gears, a depending arm secured to the outer end of one shaft and adapted to strike the stops carried by the base when the carriage is rotated, jaws mounted on rotatable spindles at the upper portion of the carriage, and means for  
95 conveying the rotation of the shaft to the spindles.

6. In a chain-machine, the combination with a traversable base, a stop mounted thereon, and a slide movable in a guide slot in the rear  
100 portion of the base and having an upward extension, of a carriage rotatably mounted on the base, parallel shafts journaled in the carriage and furnished with intermeshing gears, an arm, secured to the rear end of one shaft,  
105 having a gear at its upper portion and adapted to be intercepted alternately by the stop and the upward extension of the slide on the base as the carriage is rotated back and forth, sleeves journaled in a line on said carriage,  
110 a gear on one of said sleeves for engaging the gear on the arm, spindles mounted in said sleeves keyed against independent rotation, and jaws secured to the inner ends of the spindles, as described.  
115

7. In a chain-machine, the combination with a track, an adjustable stop secured thereto, a base traversable on the track, means for traversing the base, a slide, movable in a slot in  
120 the rear face of the base, having an upward extension and adapted to be intercepted by the stop on the track, a guide secured to the front face of the base, a slide movable therein, an adjustable stop secured thereto, and a roller-bearing journaled in the end thereof,  
125 of a carriage rotatably mounted on the base, rotatable mechanism carried thereby for opening the link, and pivoted arms adapted to operate said mechanism and to be operated by the sliding stops of the base.  
130

8. In a chain-machine, the combination with a carriage, bearings mounted thereon in line, sleeves journaled in these bearings and held against reciprocation, spindles reciprocally



mounted in the sleeves and keyed against independent rotation, jaws secured to the inner ends of the spindles, and spring-actuated devices for exerting an outward pressure on the spindles, of a guide on the upper surface of the carriage parallel with the spindles, arms movable in the guide and having bent ends extending over the outer ends of the spindles, bearing-pins mounted in the ends of the arms and bearing on the spindles, and mechanism for drawing these arms together.

9. In a chain-machine, the combination with a carriage, spindles carrying jaws reciprocally mounted thereon, arms movable in guides having downwardly-extending inner ends and bent outer ends which extend over the outer ends of the spindles, and bearing-pins mounted in these ends and bearing against the spindles, of a lever movable in a guide-slot having at one end a cam opening adapted to engage the downwardly-extending ends of the arms, a pin on the outer end of this lever, a sliding plate movable in a guide at a distance from the carriage having a hook-shaped end and a bearing end.

10. In a chain-machine, the combination with a traversable base, of a carriage rotatably mounted thereon, oppositely rotatable jaws reciprocally mounted on the carriage, and means for rotating and reciprocating the same.

11. In a chain-machine, the combination with a base traversably mounted, a pivoted lever for traversing the same, a drive-shaft, and a cam for operating the lever, of a carriage rotatably mounted on the base, a gear secured to the carriage, a rack for engaging this gear having a pin at its outer end, a lever having a slot longer than the traverse of the base in which the pin on the rack engages, and a cam mounted on the drive shaft for reciprocating this lever.

12. In a chain-machine, the combination with a carriage, the shafts 113 and 114 journaled therein and having intermeshing gears, gears secured to the ends of the shafts, an arm secured to one of the shafts, and means for operating the arm, of the sleeves 119 and 120 journaled in horizontal bearings on said carriage, gears on these sleeves which intermesh with the gears on the ends of the shafts, the spindles 123 and 124 reciprocal in the sleeves and held from independent rotation, jaws on the inner ends of the spindles, and means for reciprocating the spindles.

13. In a chain-machine, the combination with a link frame, a carriage for conveying the links to points of attachment to the chain, and means for closing the link, of a chain-guide having pendant fingers for preventing the swaying of the lower end of the chain, and separable jaws adapted to prevent the undue upward movement of the chain.

14. In a chain-machine, the combination with a carriage provided with means for closing a link, of a plate extending above said carriage and having a transverse groove in its

lower surface, a vertical rotatable chain-guide extending through a perforation in said plate, slides movable in the groove and furnished with pendent jaws between which portions of the chain-guide extend.

15. In a chain-machine, the combination with a horizontal plate having a central vertical perforation, a transverse guide-slot, and lateral openings extending between the groove and the upper surface of the plate, of a chain-guide having a suitable bore, a conical end and depending fingers rotatable in the central perforation, slides movable in the guide-slot having depending jaws and concavities into which the conical end of the chain-guide fits, pins secured to such slides and extending through the lateral openings, a cam plate supported on the upper surface of the horizontal plate having cam slots in which the ends of said pins extend and a central perforation for the chain-guide, and means for partially rotating the cam.

16. In a chain-machine, the combination with a link-forming device, and a link-attaching device, of the chain-guide journaled in a vertical bearing and having pendent fingers, and means for preventing the undue upward movement of the finished chain.

17. In a chain-machine, the combination with a chain-guide vertically journaled in a bearing and having a gear at its upper portion, separable jaws inclosing the lower end of the chain-guide, and means for operating the jaws, of a rack reciprocal in a guide and engaging the gear of the chain-guide, and means for reciprocating the rack.

18. In a chain-machine, the combination with a rotatable chain-guide, separable jaws partially inclosing the lower end thereof for preventing the undue movement of the chain, and means for operating the jaws, of a take-up mechanism supported above the chain-guide, and means for operating the same in unison with the separation of the jaws.

19. In a chain-machine, the combination with a horizontal plate supported on a bracket, a slide reciprocally mounted thereon, stops secured to the slide, and means for reciprocating the slide, of a take-up device journaled in bearings and having a ratchet, a plate reciprocally mounted and having an extension adapted to be operated by the stops on the slide, and oppositely operating pawls carried by the plate and adapted to alternately engage the ratchet.

20. In a chain-machine, the combination with the plate 191, the slide 195 reciprocally mounted thereon, the adjustable-stops 197 and 198 secured to the slide, a take-up device actuated by said stops, a pin extending from the slide, and the bent lever 201 having a slot at its upper end with which the pin engages, of the lever 207 reciprocally mounted having at its rear end the bearing 209 and pivotally connected at its forward end with the lever 201, the drive-shaft 42 journaled in bearings,



and the cam 49 having the cam-groove 210 with which the shoe 209 is engaged.

21. In a chain-machine, the combination with side plates one of said plates being furnished with a horizontal guide-slot, a shaft 5 journaled in said side plates, a take-up roll mounted on the shaft between the side plates, and a ratchet secured to the outer end of the shaft, of a plate having a slide movable in 10 said guide-slot and provided with two oppositely acting pawls for actuating the ratchet, and means for reciprocating this plate, as described.

22. In a chain-machine, the combination

with the side-plates 212 and 213, the shaft 214 15 journaled therein, and the take-up roll 215 having the chain-groove 223 mounted on the shaft, of the presser 225 pivoted between the side plates and bearing on the take-up roll, and means for adjusting the same, as de- 20 scribed.

In witness whereof I have hereunto set my hand.

BYRON L. COLVIN.

Witnesses:

HENRY J. MILLER,  
M. F. BLIGH.