975,850.

J. F. GAIL.

FABRIC CHAIN MACHINE.

APPLICATION FILED AUG. 2, 1909.

Patented Nov. 15, 1910.

9 SHEETS—SHEET 1.

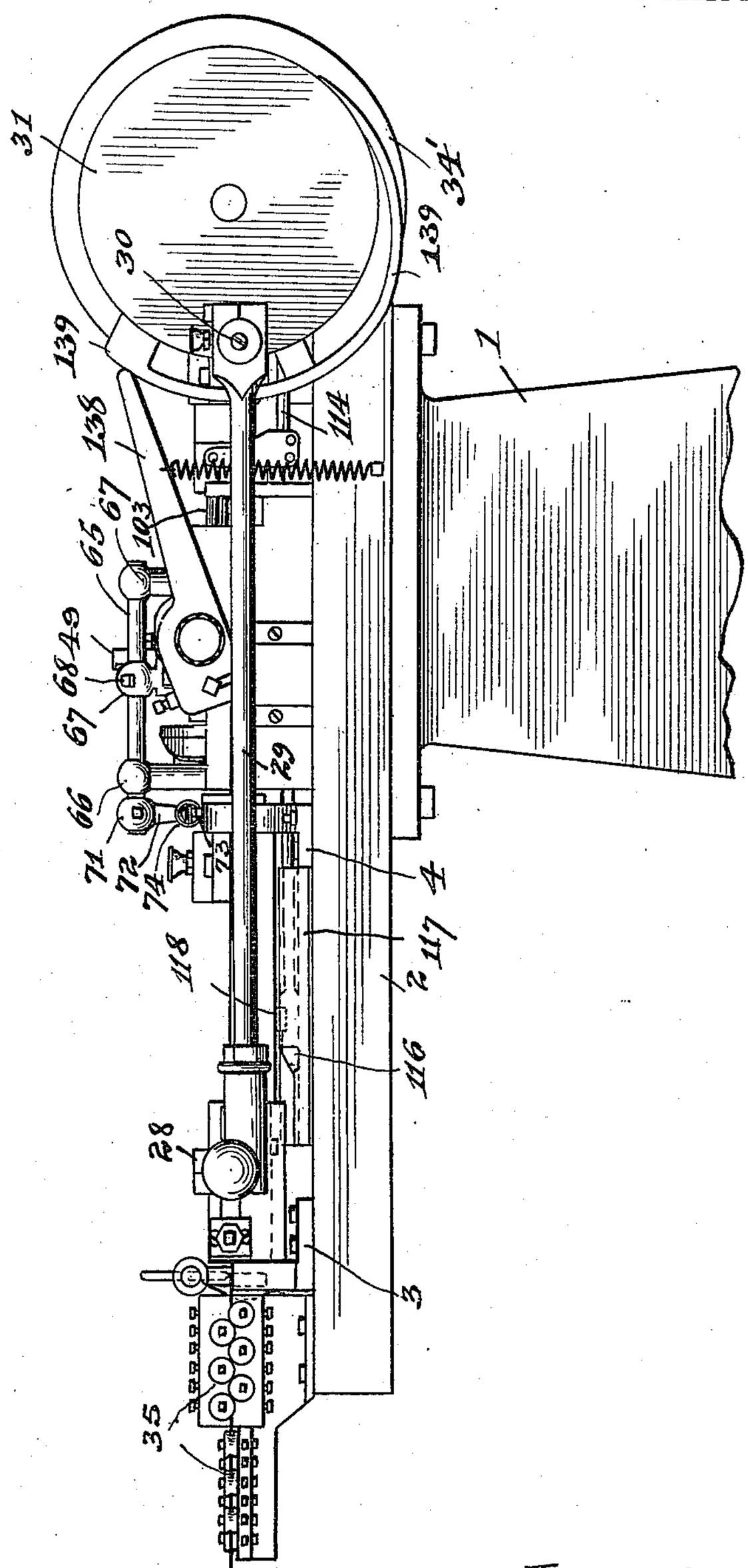

Fig. 1.

Witnesses,
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9 SHEETS—SHEET 2.

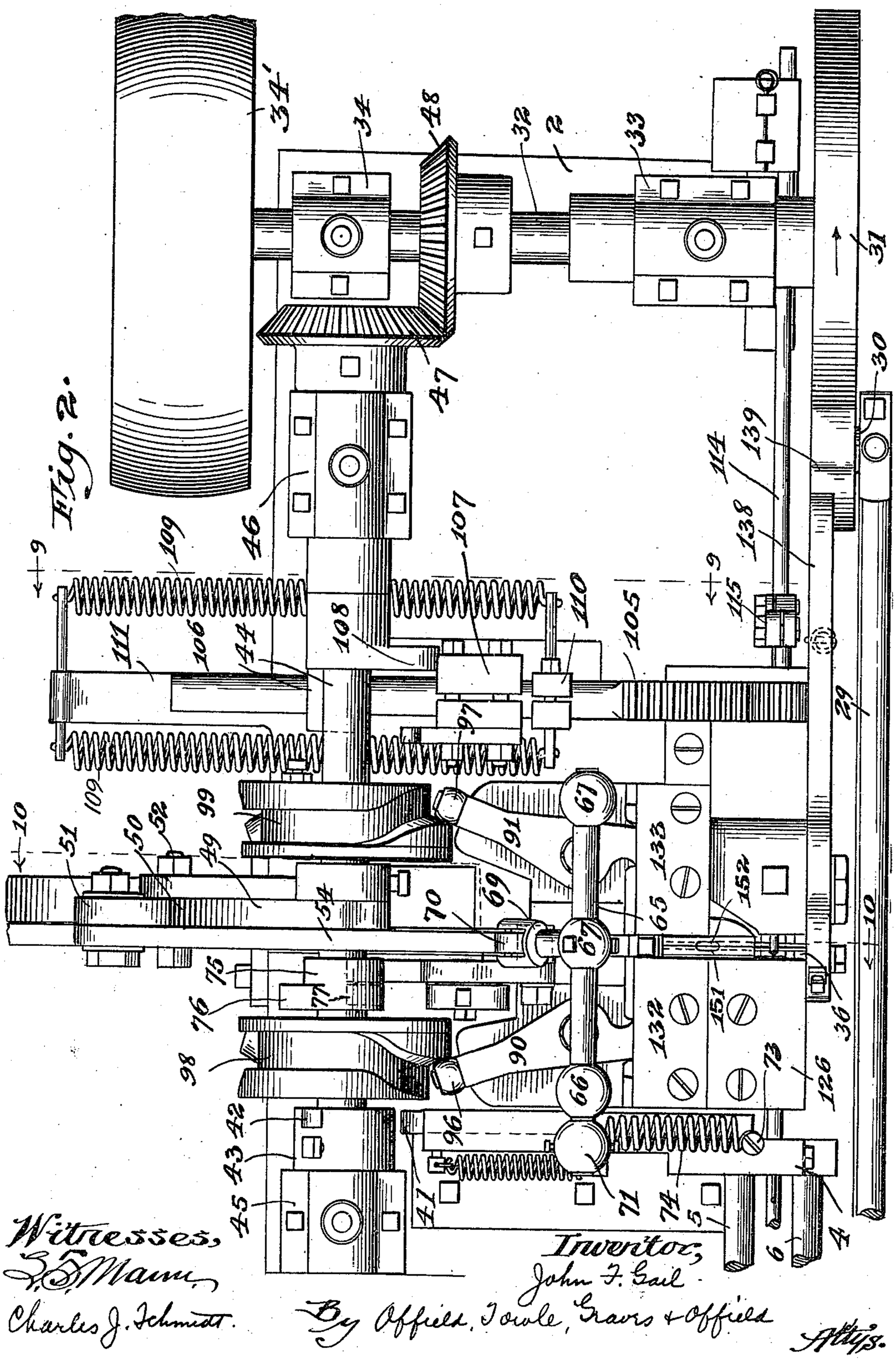

Fig. 2.

Witnesses,
F. S. Mann,
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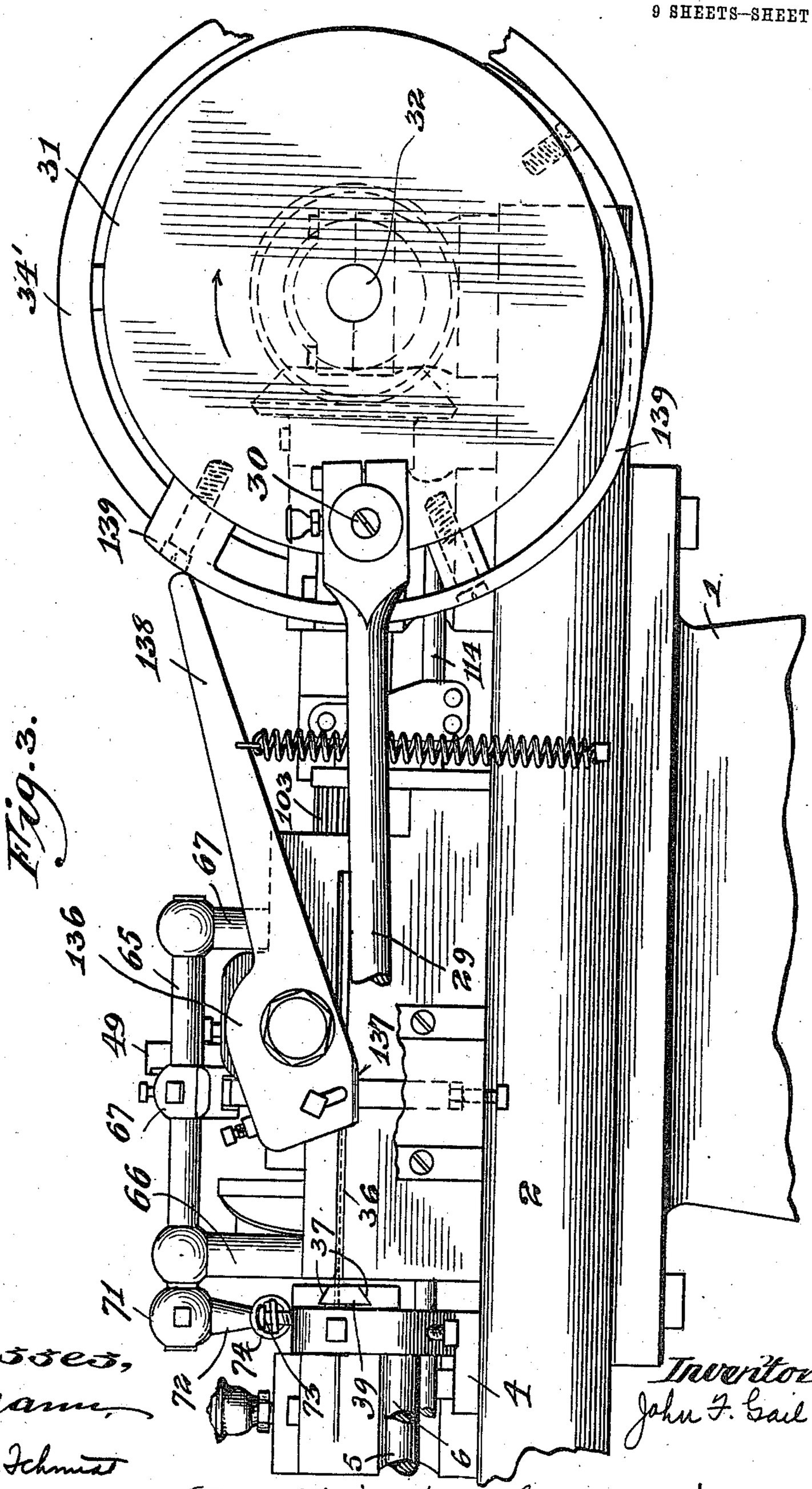

Fig. 3.

Witnesses,
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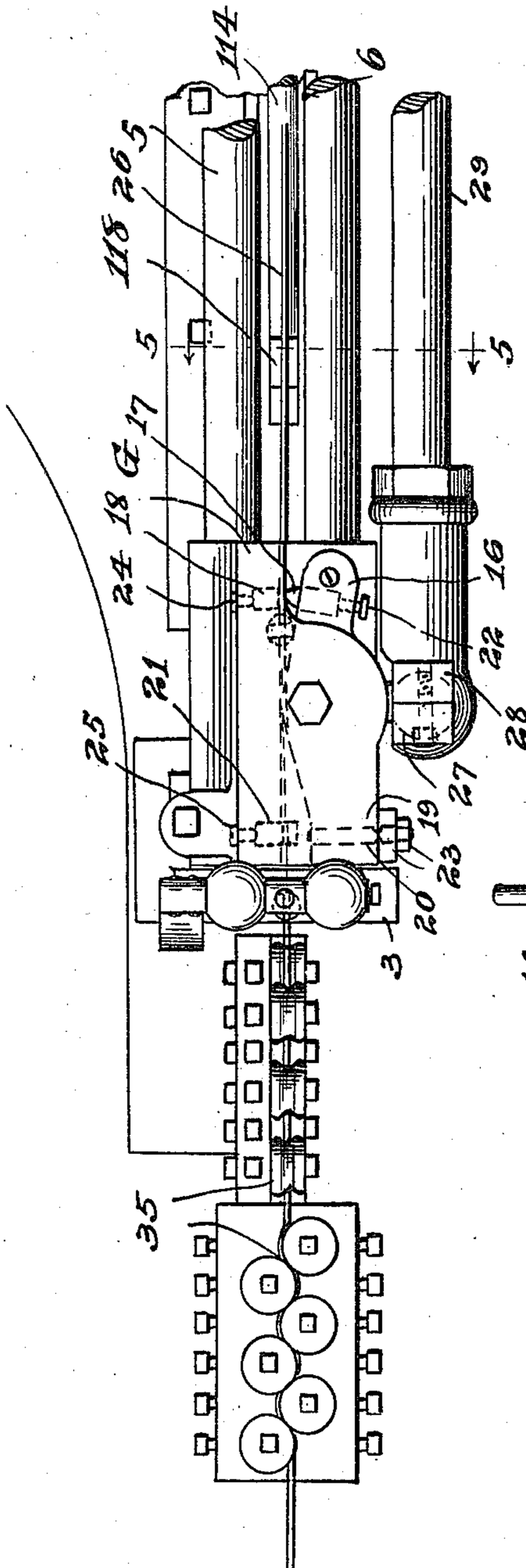

Fig. 4.

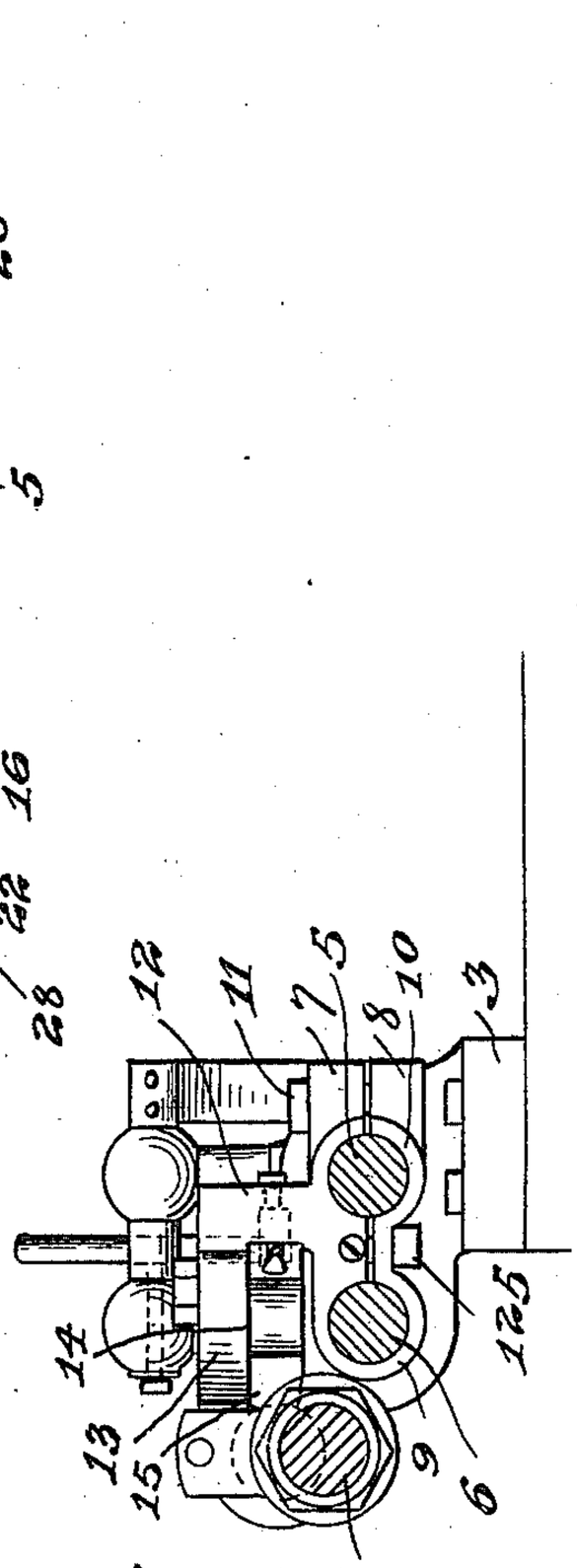

Fig. 5.

Witnesses,
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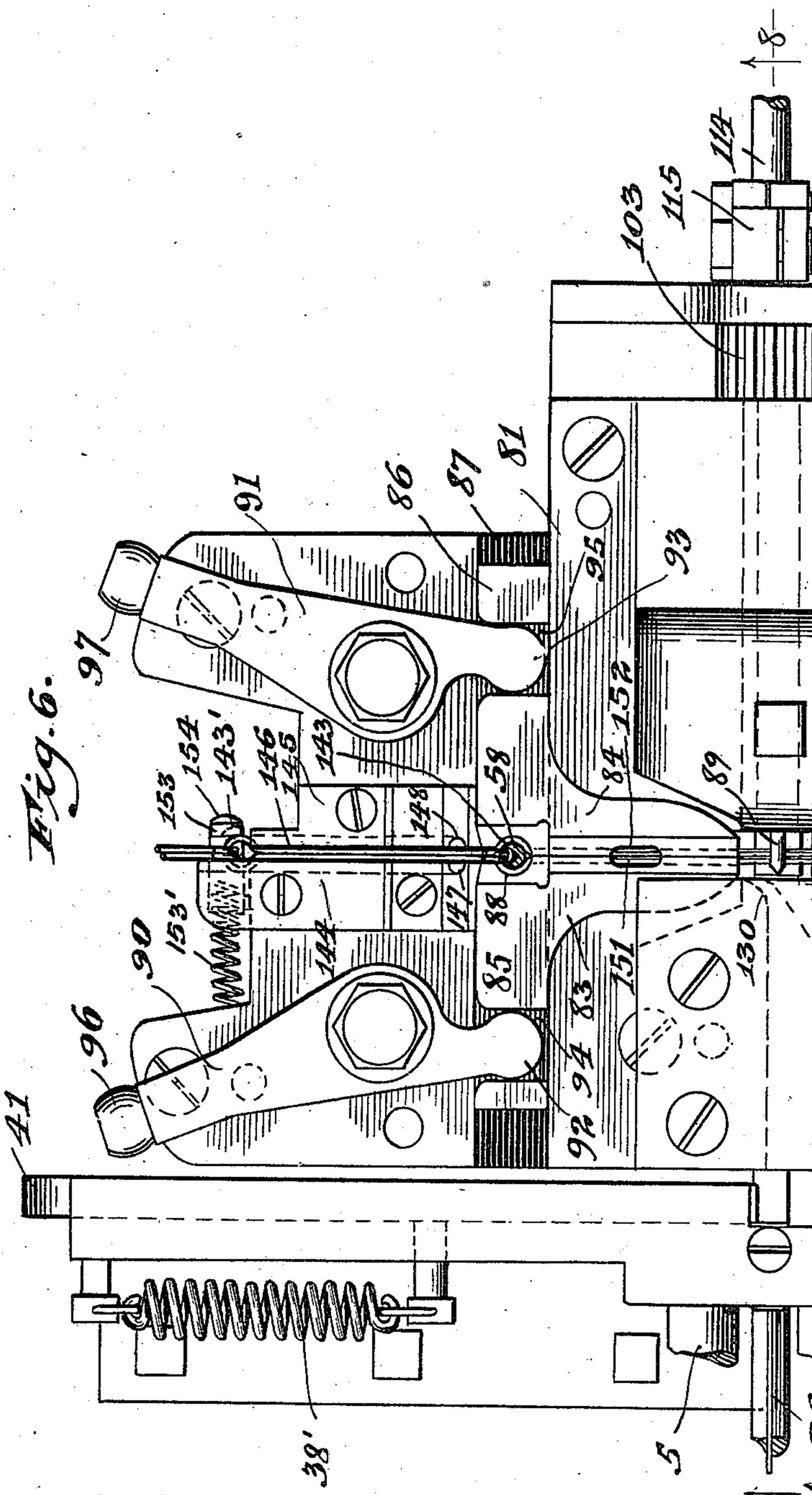

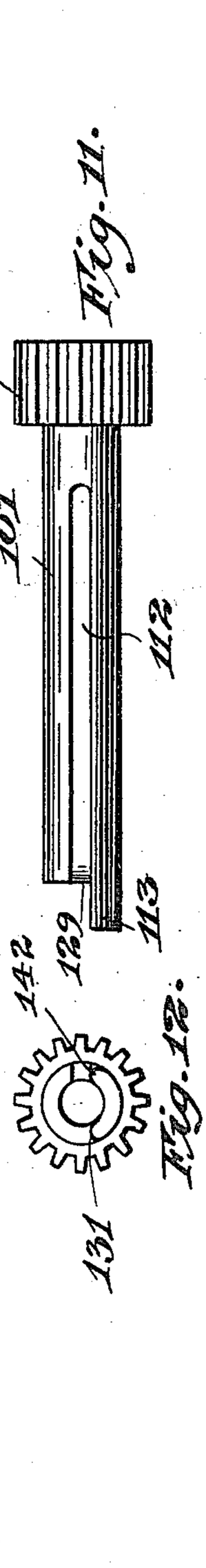

Witnesses,
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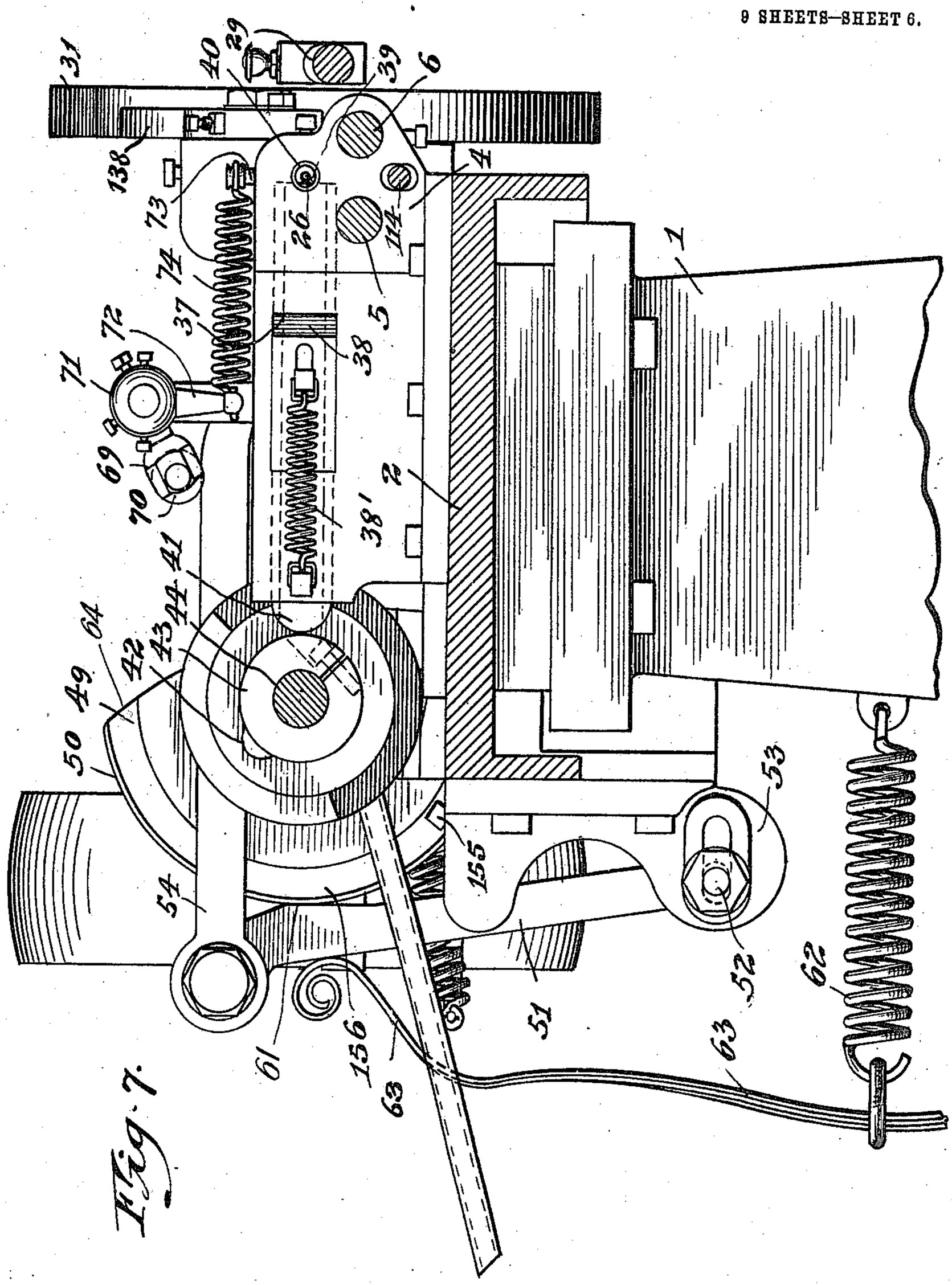

Fig. 7.

Witnesses,
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9 SHEETS—SHEET 7.

Fig. 8.

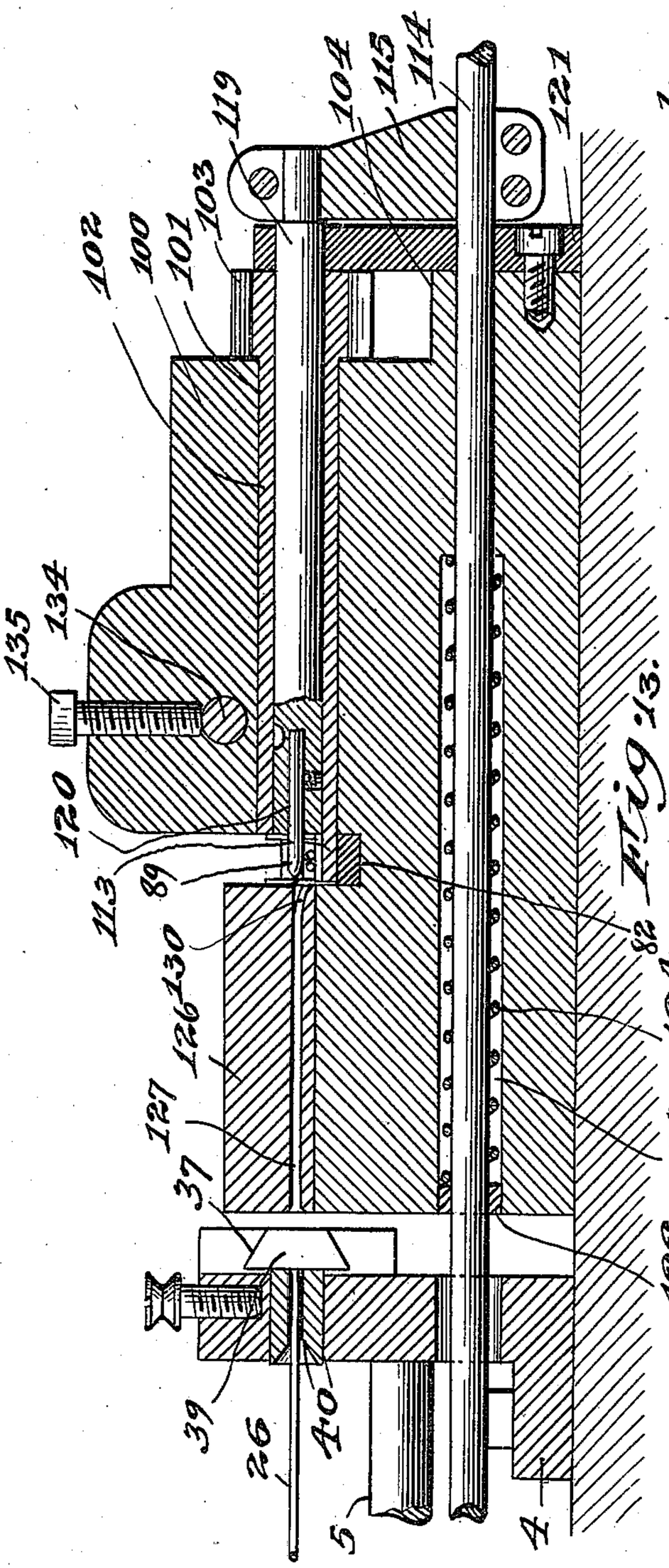


Fig. 13.

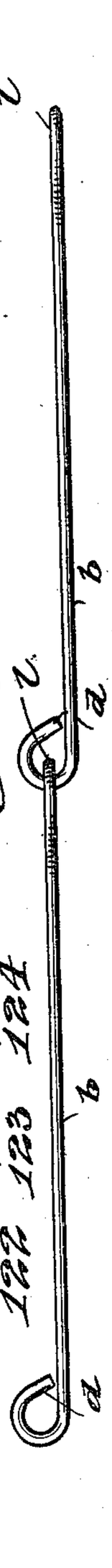
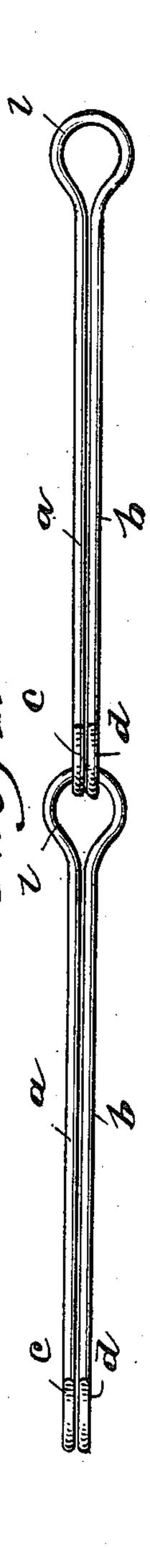


Fig. 14.



Witnesses

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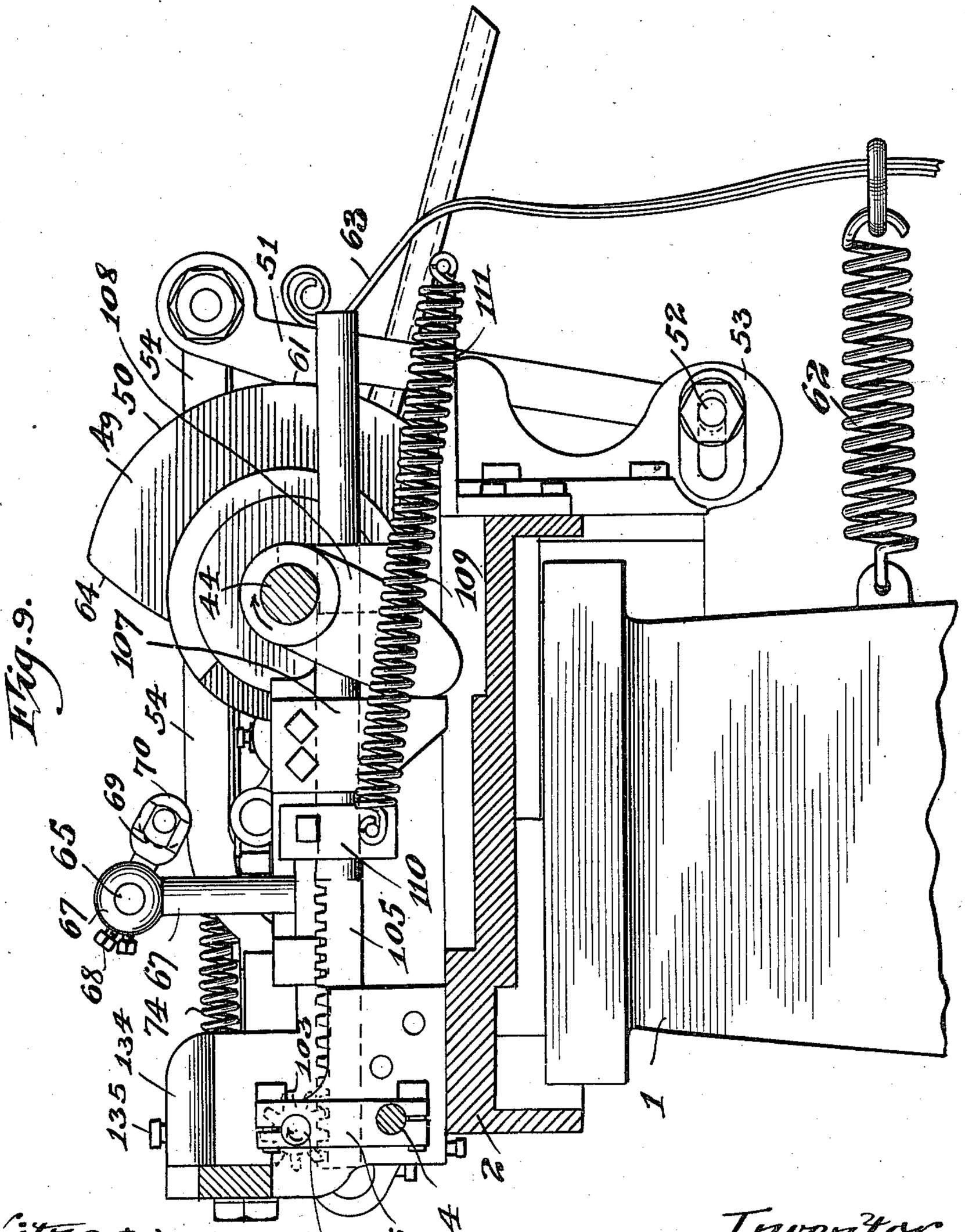
9 SHEETS—SHEET 8.

Fig. 9.



Witnesses,
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9 SHEETS—SHEET 9.

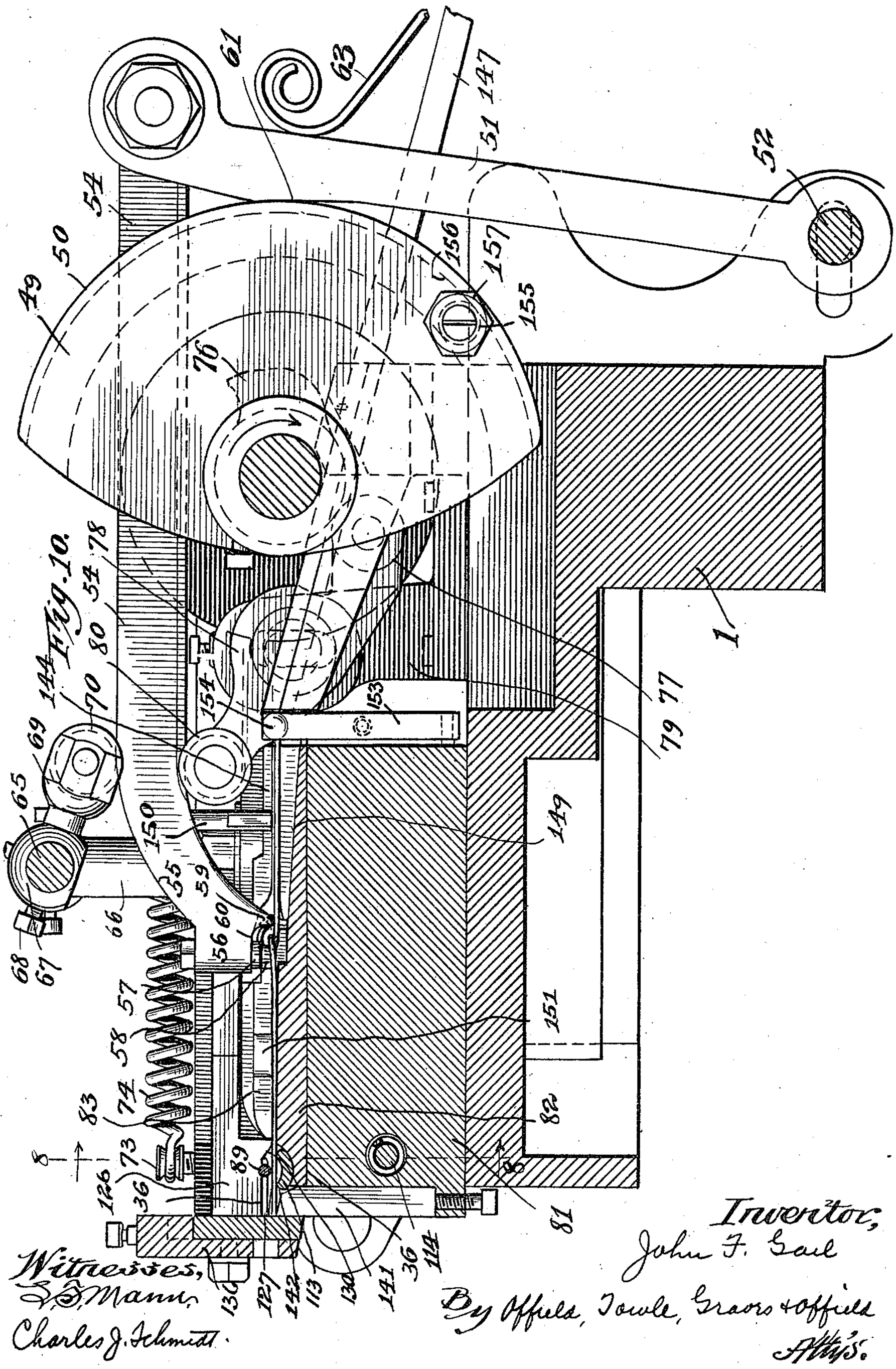

Fig. 10.

Witnesses,
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Charles J. Schmidt.

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Attys.

UNITED STATES PATENT OFFICE.

JOHN F. GAIL, OF KENOSHA, WISCONSIN, ASSIGNOR TO THE SIMMONS MANUFACTURING COMPANY, OF KENOSHA, WISCONSIN, A CORPORATION OF WISCONSIN.

FABRIC-CHAIN MACHINE.

975,850. Specification of Letters Patent. **Patented Nov. 15, 1910.**

Application filed August 2, 1909. Serial No. 510,765.

To all whom it may concern:

Be it known that I, JOHN F. GAIL, residing at Kenosha, in the county of Kenosha and State of Wisconsin, have invented certain new and useful Improvements in Fabric-Chain Machines, of which the following is a complete, clear, full, and precise specification.

My invention relates to fabric chain machines, particularly to machines for making chain to be used in building up wire fabric for beds, couches, seats, chairs and the like.

The objects of my invention are, first, to produce a simple, small and well balanced machine which will entirely automatically manufacture chain from raw wire; second, to have the machine produce the strongest and longest chain with the least wire; and, third, to do this with the least waste of material and in the shortest time.

Fabric for beds, chairs and the like should have as little thickness as possible and should be as smooth as possible, and, therefore, the links of the chain should be so formed and so connected together that all sharp corners and edges will be guarded to prevent tearing of the mattress, cushions or the like supported by the fabric.

My invention also incorporates many other novel and unique features of construction and arrangement, and in the accompanying drawings the construction and operation of the machine are clearly illustrated.

In these drawings; Figure 1 is a side elevation of the complete machine mounted on a suitable support. Fig. 2 is an enlarged top view of the right half of the machine. Fig. 3 is an enlarged side view of the part shown in Fig. 2. Fig. 4 is an enlarged top view of the left half of the machine. Fig. 5 is a sectional view taken on plane 5—5, Fig. 4. Fig. 6 is an enlarged view showing loop and hook forming parts. Fig. 7 is a view taken from the left of Fig. 2. Fig. 8 is a sectional view taken on plane 8—8, Fig. 6. Fig. 9 is a sectional view taken on plane 9—9, Fig. 2. Fig. 10 is an enlarged sectional view taken on plane 10—10, Fig. 2. Fig. 11 is a side elevation view of the hook forming sleeve. Fig. 12 is an end view of Fig. 11. Fig. 13 is a side elevation of the product of the machine; and Fig. 14 is a plan view thereof.

The machine is mounted on a standard 1 and its parts are supported from a bed-plate 2. On this bed-plate are supported right and left heads 3 and 4 connected by slide rods 5 and 6 on which a grip-frame G is slidable as best shown in Figs. 1, 4 and 5. This grip-frame comprises upper and lower sections 7 and 8 having the slide bearings 9 and 10, bolts 11 uniting the sections and serving for taking up any wear so that the grip-frame will be free from lost motion and will run true. An extension from the grip-frame has a vertical wall 12 and the horizontal wall 13 extending forwardly and forming with the grip-frame a bearing pocket 14 in which is pivoted, at an intermediate point, a jaw-frame 15. Projecting from the inner side of the arm 16 of the jaw-frame 15 is a clamping tooth 17 for engaging against a clamping abutment 18 extending from the front face of the vertical wall 12. Extending inwardly from the other arm 19 is a pin 20 for engaging an abutment 21 extending forwardly from the wall 12. The tooth 17 is adjustable by means of a set-screw 22 and the pin 20 is adjustable by means of nuts 23, while the abutments 18 and 21 are adjustable by means of set-screws 24 and 25, respectively. The adjustment is such that the jaw-frame may oscillate through a small angle sufficiently to allow wire 26 to be carried between the tooth and its abutment, as best shown in Fig. 4. The pin 20 and its abutment 21 are also either above or below the horizontal plane of the tooth to be out of the path of the wire. Extending forwardly from the jaw-frame between the arms is a spherical lug or ball 27 which is engaged by a socket bearing 28 carried at the left end of a connecting rod 29, whose other end engages the crank pin 30 extending from a crank disk 31. As best shown in Fig. 2, this crank disk is carried at the front end of the shaft 32 journaled in bearings 33 and 34 mounted on the right end of the bed-plate, the rear end of the shaft carrying a pulley 34′ adapted for connection with some driving source. With this arrangement rotation of the pulley results in longitudinal reciprocation of the grip-frame on the slide rods 5 and 6, the jaw-frame oscillating through a small angle at the beginning of each stroke. When the grip-frame starts its travel toward the right, the jaw-frame is oscillated to carry

its tooth to grip the wire and to carry the wire with the grip-frame to the right, and when the grip frame starts to move to the left, the jaw-frame is rotated in the opposite direction to carry abutments 20 and 21 together and to withdraw the clamping tooth from the wire. This operation continues, each complete reciprocation of the grip-frame resulting in the feed of a certain length of wire. As best shown in Figs. 2, 4 and 6, the wire, after leaving the reel, passes through one or more wire straighteners 35 before entering the grip-frame. To the right of the head 4 is a transverse slot 36 across which the wire is fed by the grip-frame to be operated upon, as will be shown in detail later. Immediately after each release of the wire by the clamping jaw-frame, the wire is cut to leave a section to be drawn into the transverse slot to be formed into a link, as will be shown in detail later. The cutting mechanism is best shown in Figs. 2, 3, 6 and 7. The head 4 is extended rearwardly over the bed-plate to form a slide channel 37 for receiving a knife-bar 38 whose front cutting edge 39 passes across an opening 40 in the head 4 through which the wire is fed, and during each forward movement of the knife-bar the wire will be sheared at the edge of said opening. The rear end of the knife-bar is rounded to form a cam head 41 to be engaged by a cam tooth 42 carried on the cam roller 43 secured to the shaft 44 extending longitudinally across the bed-plate at the rear thereof and journaled in bearings 45 and 46. The right end of this shaft 44 terminates in a bevel gear 47 which meshes into a similar bevel gear 48 carried on the drive shaft 32. The cam collar 43 is set on shaft 44 so that its tooth will engage the knife-bar after each release of the gripping-frame, a spring 38′ secured to the knife-bar and to the head 4 tending to hold the knife-bar in its rear position.

Referring particularly to Figs. 2, 7, 9 and 10, the shaft 44 carries a cam frame 49 having a cylindrical cam surface 50 whose angular extent is almost 180 degrees. This cam surface coöperates with a cam arm 51 pivoted at its lower end to a pin 52 having adjustable engagement in a slotted lug 53 extending from the rear of the bed-frame. Pivoted to the upper end of the cam arm is a finger 54 which extends forwardly and whose end 55 deflects downwardly and terminates in a lug 56. Through this lug extends a bar 57 which supports at its lower end a steel pin 58. The deflected section 55 terminates in a tip 59, which, with the pin 58 and lower end of the bar 57 forms a pocket 60. The cam frame 49 engages with the cam surface 61 on cam arm 51 to move the arm to the right against the force of springs 62 and 63 which tend to swing the arm to the left to carry the finger 54 forwardly. So long as the cam surface 61 engages the cylindrical cam surface 50 there will be no movement of arm 51, but as soon as the cam surface 64 is reached the arm will be swung forwardly and the dimensions of the cam frame 49 are such that the forward movement of the finger will carry its pin 58 just beyond the wire 26 fed across the transverse slot 36 by the gripping mechanism, the operation being such that the pin hooks over the wire section at its middle point and carries the wire rearwardly when the finger again moves to its rear position, as will be explained more fully later.

Bridging the front end of the finger is a shaft 65 journaled in uprights 66 and 67. As best shown in Fig. 10, a sleeve 67 is secured to the shaft by a set-screw 68 and carries a bifurcated extension 69 which pivots a roller 70. As best shown in Fig. 7, another sleeve 71 is secured to the shaft and has an arm 72 between whose end and the post 73 on head 4 a spring 74 is connected, this spring tending to rotate the shaft 65 and arm 69 to press the roller 70 against the top of the finger. As best shown in Figs. 2 and 10, a collar 75 is secured to shaft 44 to the left of the cam frame 50 and has a cam lug 76 which coöperates with a cam roller 77 carried at one end of a lever 78 pivoted to a standard 79 provided on the bed-plate. The other end of the lever carries a roller 80 which engages the lower edge of the finger 54. In the position shown in Fig. 10 the roller 77 engages the cylindrical part of the cam sleeve 75 and the finger is in its down position. Upon rotation of shaft 44 this roller is engaged by the cam lug 76 and the lever 78 is rotated to carry the roller 80 upwardly to raise the front end of finger 54. The position of the cam lug 76 with relation to the surface of cam frame 49 is such that the finger 54 will be raised just before it starts its forward movement and will be allowed to drop when it reaches its front position.

The particular form of link which the machine is designed for is illustrated in Figs. 13 and 14, each link is formed up of a section of wire fed across the transverse slot 36 and cut from the wire stock by mechanism already described. A loop *l* is formed at the middle of each section and the two halves *a* and *b* are brought together whereupon their ends *c* and *d* are bent over to form a hook *h*. The ends during movement of the hook encircle about the next section fed to the machine. The mechanism which coöperates with the finger mechanism just described to form the loop and to bring the section halves together is best shown in Figs. 2, 6 and 10. The transverse slot or channel 36 is formed in the top of a block 81 resting on the bed-plate and

in the bottom of this channel a plate 82 is laid. Resting on the block adjacent the channel are clamping plates 83 and 84 having at their ends left and right lateral extensions 85 and 86, respectively, which also extend downwardly into a transverse guideway 87 cut in the block. In the rear end of the clamping face of each plate a semi-cylindrical pocket 88 is cut, as best shown in Fig. 6, these pockets encircling the pin 58 at the end of the finger 54 when the plates are brought together at a time when the finger is in its rear position. As will be shown a little later, the clamping plates are apart when the finger pin 58 hooks over the wire section fed across the channel 36. When the finger is drawn rearwardly after thus catching the wire, the wire is bent at a middle point and drawn into the channel between the clamping plates, and when the finger reaches its rear position the clamping plates are brought together to close the pockets 88 against the wire to draw the wire about the pin to form the loop. Referring to Figs. 6 and 10, the adjacent clamping faces of the plates have their lower edges cut away to receive the two sections of the bent wire, these two sections being brought snugly together and against the plate 82 when the clamping plates are forced together, and the position of the link thus far formed is best shown in Figs. 6 and 10.

The mechanism for controlling the operation of clamping plates 83 and 84 is best shown in Figs. 2 and 6. Cam levers 90 and 91 are pivoted to the block 81 to the rear of guide-way 87, these levers terminating at their front ends in cylindrical heads 92 and 93 engaging respectively in grooves 94 and 95 cut in the lateral extensions 85 and 86 of the clamping plates 83 and 84, respectively. The rear ends of the levers pivot cam rollers 96 and 97 which are adapted for engagement with cylindrical cams 98 and 99 carried on shaft 44. The construction of these cylindrical cams and their position on the shaft is such that the clamping plates will be spread apart during the time that the finger moves rearwardly to carry a new section of wire into the forming channel 36, but during the remainder of the time the plates are together to form and to hold the link.

Referring to Figs. 2, 6, 8 and 9, the block 100 is mounted on block 81 at the front thereof and this block has a bore 101 which is concentric with the path of the wire drawn across the channel 36 by the grip-frame. In this bore journals a sleeve 102 which terminates at its right end in a pinion 103. The block 81 is extended to form a guide-shelf 104 for receiving a rack 105 whose teeth engage with pinion 103, the rear end of the bar being guided in a bearing 106. Secured to the rack bar at a point in front of the shaft 44 is a cam abutment 107 adapted to be engaged by a cam arm 108 secured to and extending from shaft 44. Springs 109 connect between a collar 110 on the rack bar and the extension 111 from the machine frame. These springs tend to hold the rack bar in a rear position, but upon rotation of shaft 44 the cam arm 108 comes into engagement with the abutment 107 and causes a forward movement of the rack bar and rotation of the sleeve 101. The construction of this sleeve is best shown in Figs. 11 and 12; one side of the sleeve is cut to leave a longitudinal slot 112, and the section below the plane of this slot is extended a distance to constitute a forming-tongue 113, this tongue, when the sleeve is in place, lying across the forming channel 36 (Fig. 6). Extending through the block 81 below the sleeve and parallel therewith is a reciprocating bar 114 whose right end is clamped to the lower end of clamping frame 115. The other end 116 of the rod is guided in a plate 117 resting on the bed-plate 2 and this end has an upward extension 118 (Fig. 1). The upper end of frame 115 is secured to the end of a rod 119, which is adapted to reciprocate in the forming sleeve 102 (Fig. 8). A forming pin 120 is secured to and extends from the left end of the rod 119 so that when the rod is entirely within the forming sleeve the end of the pin will register with the forming tongue 113. A plate 121 is secured to the end of the block 81, as shown, and serves to retain the rack-bar 104 and also aline the rods 114 and 119. The rod 114 also carries an abutment collar 122 which engages in a spring pocket 123 containing a compression spring 124, this spring abutting against the collar and against the end of the pocket (Fig. 8). As best shown in Figs. 1 and 5, a tongue 125 extends downwardly from the clamping frame G and upon reciprocation of this frame, this tongue will strike extension 118 on rod 114 to carry the rod 119 to the right and withdraw the forming pin from the forming channel 36. The adjustment is such that the tongue will strike the extension when the clamping frame is moved about half way to the right, as will be explained more fully later. Upon movement to the left of the clamping frame the spring 124 becomes effective to return the rods 114 and 119 to the left to again carry the forming pin across the forming channel.

It has already been explained that the finger 54 travels forwardly to hook over a wire section fed to the machine and to draw this section rearwardly between the forming plates to have the loop formed therein. When the finger starts to move rearwardly with the wire section engaged thereby the ends of the section should be able to fly outwardly without being bent. As shown in Fig. 8, a block 126 is secured to the top of

block 81 and to the left of the forming channel 36, and this block has the longitudinal slot 127 through which the fed wire passes. Now when the finger draws the wire section rearwardly, the left leg strikes the rounded corner 129 of the sleeve 101, while the ends of the legs swing outwardly through the slots 127 and 112, respectively, and can then be drawn through the forming passage-way with the finger 54. When the wire gripping-frame is carried to the right a wire section is fed through the slot 127, across the forming channel 36 and into the sleeve 101 from which the rod 119 will be partly withdrawn to accommodate the right end of the fed wire section. As plainly shown in Fig. 8, the axis of the fed wire is slightly above the plate 82, but the right end 130 of slot 127 deflects downwardly and the inner edge 131 of the forming-tongue 113 is rounded so that the wire can find its way to the plate 82 to be engaged by the forming plates. The block 126 and the blocks 132 and 133 are secured to the block 81 and engage over the forming plates 83 and 84 to hold said plates to the block 81.

Before the hook can be formed on the link the ends of the link legs *a* and *b* must be trimmed off. This is accomplished by knife mechanism best shown in Figs. 1, 2, 3 and 10. A pivot shaft 134 extends forwardly from and is secured to the block 100 by means of a set-screw 135 and on this shaft is pivoted a knife bar 136 carrying a blade 137 which travels across the forming channel 36 upon oscillation of the knife bar. An arm 138 extends to the right from the knife bar and coöperates with a cam frame 139 carried by the crank disk. After the wire section has been drawn into the forming plates by the finger 54 the ends *c* and *d* project a distance beyond the edge 140 of a knife bar 141 secured to the block 81 in front of the forming channel 36 and at the proper time the arm 138 is engaged by the cam frame 139 to reciprocate the knife bar 136 to carry its cutting edge 137 past the cutting edge 140 thereby snipping off and truing up the ends *c* and *d*. After this snipping operation the embryo link is in position to have its hook formed. The forming pin extends across the forming channel and over the ends *c* and *d* which rest on the edges of the forming tongue 113. Now, as the cam arm 108 engages the abutment 107, the rack-bar 105 is moved forwardly and the forming sleeve 101 rotated in a clock-wise direction (Fig. 10). During this rotation of the forming sleeve the edge 142 of the forming tongue carries the ends *c* and *d* about the forming pin and against the legs *a* and *b*. As the cam 108 leaves the abutment 107, springs 109 retract the rack bar and the forming sleeve is restored to its normal position with its edges 131 and 142 lying in a horizontal plane across the forming channel to receive the next link. This formation of the hook takes place while the wire gripping frame travels half way to the right, and during the remainder of the travel to the right the forming pin is withdrawn from the forming-passage-way and from the hook just formed and is replaced by a new section of wire, this new section being carried to the right until its middle point reaches the hook. The new section is then cut from stock and the finger 54 again comes forwardly preparatory to drawing back this new section to have it shaped by the forming plates 83 and 84. As best shown in Figs. 6 and 10, the rear of the pin 58 and the bar 57 have a slot 143 for receiving the head of the hook just formed, the ends of the hook engaging the point 59 so that the newly formed hook is securely held in the pocket 60 when the finger is down and in front. Now, when the finger moves rearwardly the link just formed is carried therewith and the new wire section which was fed through the hook is drawn rearwardly between the clamping plates to be subsequently brought together to form the loop which links in the hook of the link already formed, and this operation continues, each hook being engaged by the finger and drawn rearwardly to carry with it a new section of wire which has been fed therein by the wire feeding mechanism. Of course, when a machine is first started the pin 58 hooks directly about the fed end wire section, but after the first link has been formed the finger will engage about the hooks of the links. Each link after it is formed passes between guide blocks 144 and 145 secured to the block 81 to the rear of the plates 83 and 84. The blocks are separated a distance to form a channel 146 and the opposed faces of the plates have grooves 147 and 148 through which the loops of the links pass, the hooks of the links passing through the channel 146. The rear surface 149 on which the blocks 144 and 145 rest tapers rearwardly so that any scale or other foreign matter may be discharged and will not cause clogging. To prevent buckling or bending of the links as they pass between the blocks 144 and 145, a pin 150 is pivoted, this pin extending downwardly from the front end of finger 54 to engage through the channel 146 and with the link near its central part thus preventing buckling. When the finger is in its front position, this pin passes between slots 151 and 152 cut in the forming plates 83 and 84, the pin in this position also serving to prevent buckling or distortion of the link while the forming plates are withdrawn therefrom and while the link is being drawn rearwardly.

As best shown in Fig. 6, the rear end of

the block 145 is cut away and its place taken by the upper end of a vertical bar 153 which is pivoted at its lower end. This bar has a groove 143′ forming a continuation of groove 148 in block 145. The side of the bar 153 has a bump 154 which is in the path of the shoe 155 carried on cam frame 49 (Figs. 7 and 10). The bar 153 is in position to be opposite the hook ends of the links as they rest in the forming channel, and when the shoe 155 strikes the bar a blow, the hook ends will be struck and pinched, so that any distortion will be cured and so that the hooks come into the plane of the link-legs on which they are formed. A compression spring 153′ between the bar 153 and the machine frame restores the bar to normal position after being struck. The shoe 155 is adjustable in the channel 156 of the cam frame 49 and is held in place by a nut 157. The adjustment of the shoe of the cam frame is preferably such that the bar 153 will be struck just before the forming finger is raised by the cam 76 so that the finger will assist in holding the link in position when its hook ends are struck by the bar 153.

The complete operation of the machine can now be readily understood. The wire is fed from a reel through the straighteners 35 and between the heads 3 and 4 and into the opening 40. The wire grip-frame G oscillates between the heads to feed section after section of wire through the slot 127, across the forming channel 36 and into the forming sleeve 112. Starting with the position of the apparatus as shown in the drawings, the crank disk is rotated in the direction indicated by the arrow and the shaft 44 will be driven in the direction of the arrow at the same rate as the crank disk. During the first 90 degrees of rotation of the shafts 32 and 44 the finger 54 remains stationary, owing to the engagement of the cam surface 61 with the cylindrical cam surface 50 (Fig. 10). The cam arm 108, however, immediately engages abutment 107 to carry the rack-bar 105 forwardly (Fig. 9), and the forming sleeve is rotated as has already been described, and if an embryo link is held in the forming channel 36, its ends will be turned over to form a hook. During this first 90 degrees period the forming plates 83 and 84 are held together by the cam levers and their actuating cams 98 and 99. During the second 90 degrees advance of the parts the wire is still being gripped by the gripping-frame and is carried through the hook just formed and into the forming sleeve, the pin rod 119 being withdrawn from the sleeve in advance of the wire, owing to the engagement of the gripping frame with the extension 118 on rod 114. During this second 90 degrees period, the cam arm 51 comes into engagement with the surface 64 of cam arm 49, but just before the arm begins to swing to the left, the cam lug 76 will have become effective to swing lever 78 and roller 80 to raise the finger 54. After the finger has thus been raised it is carried forwardly by force of the spring mechanism 62 and 63 acting on arm 51, and after the finger reaches its foremost position, the lever 78 is disengaged from the cam lug 76 and the finger falls to carry its end into engagement with the hook of the link just formed, this hook engaging snugly in pocket 60 as has already been shown. During the third 90 degrees advance of the shafts the connecting rod starts to move to the left which results in release of the gripping-mechanism from the wire, and at the same time, also, the cam tooth 42 comes into engagement with the cam head 41 of the knife-bar 38 to carry this knife-bar forwardly to cut off the fed in section adjacent the inner end of opening 40. During this third period, also, the cams 98 and 99 become effective to rotate the levers 90 and 91 to spread apart the forming plates 83 and 84 to make way for the finger 54 which is carried to its rear position by the cam frame 49 during this third 90 degrees period, the finger starting to move rearwardly immediately after the wire has been cut. During the fourth 90 degrees advance of the shafts the cam frame 49 and the cam 76 move back to their initial position, the finger 54 remaining stationary. The cams 98 and 99, however, are again effective to clamp and to form the wire section brought into the forming channel by the finger during the third 90 degree period. Just before this last 90 degree advance is completed, the cam lug 139 on the crank disk is carried into engagement with arm 138 of the knife-bar 136 and the ends *a* and *b* of the embryo link just formed between the forming plates are snipped off.

The various operations are now repeated, the forming sleeve being again rotated to hook the ends of the embryo link about the forming pin and the other operations follow in sequence as described, the chain resulting from these operations passing through the chute 147 to a take-up reel.

Modifications both in construction and arrangement could be made in the machine which would still manufacture the chain described, and these modifications will still come within the scope of my invention. I do not, therefore, wish to be limited to the embodiments of my invention which I have shown.

I claim as new and desire to secure by Letters Patent.—

1. In a machine of the class described, the combination of a supporting frame having a forming channel, means for feeding wire across said channel, means for engaging the

wire at a middle point and drawing it bodily longitudinally through said channel to bring the wire halves together, means for forming a loop at the bend of the wire, and means for turning over the ends of the halves to form a hook.

2. In a machine of the class described, the combination of a supporting frame having a narrow forming channel, means for feeding wire across said channel, means for separating the wire into sections, means for engaging a section at its middle point and drawing it bodily longitudinally through said channel to bring the section halves together, means for forming a loop at the bend of the section, means for turning over the ends of the halves to form a hook, and means whereby a next section of wire is applied through the hook after formation thereof.

3. In a machine of the class described, the combination of a supporting frame having a narrow forming channel, means for feeding wire across one end of said channel, means for separating the wire into sections, an arm having a forming lug, means for moving said arm through said channel to cause its forming lug to engage a wire section at its middle and to draw said section through the channel to cause its halves to be brought together by the sides of the channel, forming plates adjacent said channel, means for bringing said forming plates together after said section has been drawn through said channel to bring the halves close together and to draw the material at the section bend closely about the forming lug to form a loop, and means for turning over the ends of the halves to form a hook.

4. In a machine of the class described, the combination of a supporting frame having a narrow forming channel, feed mechanism for feeding wire across the front of said channel, means for cutting the end sections from the wire, a finger adapted to be moved forwardly to the front of said channel to be associated with a wire section at its middle and to be drawn rearwardly to carry with it said section whereby the halves of the section are bent together upon engagement with the sides of the channel, means for turning over the ends of the halves to form a hook, the succeeding section of wire being applied through said hook, and a forming lug at the end of said finger, said forming lug engaging with the outer end of said hook so that when the finger is moved rearwardly, the preceding formed section will be drawn rearwardly to carry with it the succeeding section, whereupon the succeeding section also has its halves brought together.

5. In a machine of the class described, the combination of a supporting frame having a narrow forming channel, feed mechanism for feeding wire across the front of said channel, means for cutting the end sections from the wire, a finger adapted to be moved forwardly to the front of said channel to be associated with a wire section at its middle and to be drawn rearwardly to carry with it said section whereby the halves of the section are bent together upon engagement with the sides of the channel, means for turning over the ends of the halves to form a hook, the succeeding section of wire being applied through said hook, a forming lug at the end of said finger, said forming lug engaging with the outer end of said hook so that when the finger is moved rearwardly, the preceding formed section will be drawn rearwardly to carry with it the succeeding section whereupon the succeeding section also has its halves brought together, and forming plates adjacent said channel adapted to be brought together against the halves of a section after it has been drawn through the channel to bring said halves closely together and to draw the wire at the bend tightly about the forming lug of the finger to form a loop.

6. In a machine of the class described, the combination of a rotatable cylindrical sleeve having a section extending from its end to form a forming lug, feed mechanism for feeding a wire into said sleeve, forming mechanism for bending the wire at its middle to form a loop and for bringing the halves close together and for bringing the ends of the halves into association with said forming lug, and means for rotating said sleeve to cause said lug to turn over the ends of the halves to form a hook.

7. In a machine of the class described, the combination of a rotatable cylindrical sleeve having an extension at one end forming a forming lug, feed mechanism for feeding the end section of a wire through said sleeve, means for severing said end section from the wire, forming mechanism for bending said section at the middle to form a loop and for bringing the halves close together with the ends thereof adjacent said forming lug, a forming pin normally removed from said lug, means operable after the section has been bent to move said pin into position so that the ends of the halves will lie between said pin and said forming lug, means for rotating said sleeve whereby said lug is rotated to carry the said ends about said pin to form a hook, and said pin being controlled by the feed mechanism to be withdrawn from the hook after formation thereof so that the succeeding end section of the wire will be fed through the hook.

8. In a machine of the class described, the combination of a supporting frame having a narrow forming channel, a rotatable cylindrical sleeve having a protruding section at one end extending transversely into the

channel, feed mechanism for feeding a straight wire transversely through one end of the channel and concentrically into said sleeve, means for separating the wire into sections, a finger adapted to reciprocate through said channel, a lug on said finger for engaging a wire section where it crosses the channel and to draw said section through the channel whereby the section is bent at its middle about the lug and its halves brought together by engagement with the sides of the channel, a forming pin adapted to be brought concentrically through said sleeve and into position in the channel so that the ends of the halves will lie between said pin and the section protruding from said sleeve, means for rotating said sleeve whereby said ends are carried by the protruding section about the pin to form a hook, and means for withdrawing the pin from the channel so that the next wire section may be fed through the hook.

9. In a machine of the class described, the combination of a supporting frame having a forming channel, feeding mechanism for feeding wire across the front end of said channel, means for cutting the wire into sections, a finger adapted to reciprocate from one end of said channel to the other, a lug extending from the end of said finger for engaging a wire section when the finger is at the front of the channel so that said section is bent and drawn through the channel to have its halves brought together by the channel sides, means for turning over the ends of the halves to form a hook, a succeeding wire section being applied through the hook of the preceding section, said lug having a slot for receiving the hook of the preceding section upon engagement with the lug of the succeeding section, means for raising said finger before and during its forward movement, and means for moving said finger downwardly into the slot just before and during the travel of the lug through said channel to carry a wire section therethrough.

10. In a machine of the class described, the combination of a supporting frame having a forming channel, feed mechanism for feeding wire across the front of said channel, means for cutting the wire into sections, a finger adapted to reciprocate from one end of the channel to the other, a lug on said finger for engaging a wire section when the finger reaches the front of the channel, said section being bent about said lug and its halves brought together by the channel sides when the finger moves to the rear of the channel, means for cutting off the ends of the halves after said halves have been brought together, and means for turning over the ends to form a hook.

11. In a link forming machine, the combination of a supporting frame having a narrow forming channel, means for feeding a wire across the front end of said channel, a finger having a lug at its front end, cam mechanism for actuating said finger to repeatedly travel forwardly over the channel and rearwardly to carry its lug through the channel, said lug hooking over the wire at its middle point to draw the wire rearwardly through the channel whereby the halves of the wire are brought together by the channel sides, and means for turning over the adjacent ends of the halves to form a hook.

12. In a link forming machine, the combination of a supporting frame having a narrow forming channel, blocks adjacent the front end of said channel, one of said blocks having a groove, a forming sleeve rotatable in the other block and having a lug extending across the front end of said channel and having also a lateral slot, means for feeding a wire through said groove and into said forming sleeve, said wire extending across the front of said channel and across said forming lug, a finger having a lug at its front end, means for causing said finger to repeatedly move forwardly over said channel and rearwardly to carry its lug through said channel, said lug at the end of the forward movement of the finger hooking over the wire at a middle point whereby the wire is bodily drawn through said channel upon rearward movement of the finger, the ends of the wire deflecting outwardly through said groove in said block and said slot in said sleeve, a forming pin, means for arranging said forming pin over said forming lug and the adjacent wire ends thereon, and means for rotating said sleeve to carry said lug about said pin to thereby bend the adjacent ends of the wire to form a hook.

13. In a machine of the class described, the combination of a supporting frame having a forming channel, feed mechanism for feeding wire across said channel, means for engaging said wire at an intermediate point and for drawing the wire through the channel to cause the ends of the wire to be brought together, means for trimming off the ends, and means for turning over the ends to form a hook.

In witness whereof, I hereunto subscribe my name this 30 day of July A. D. 1909.

JOHN F. GAIL.

Witnesses:
GUS JACOB,
C. E. HAWLEY.