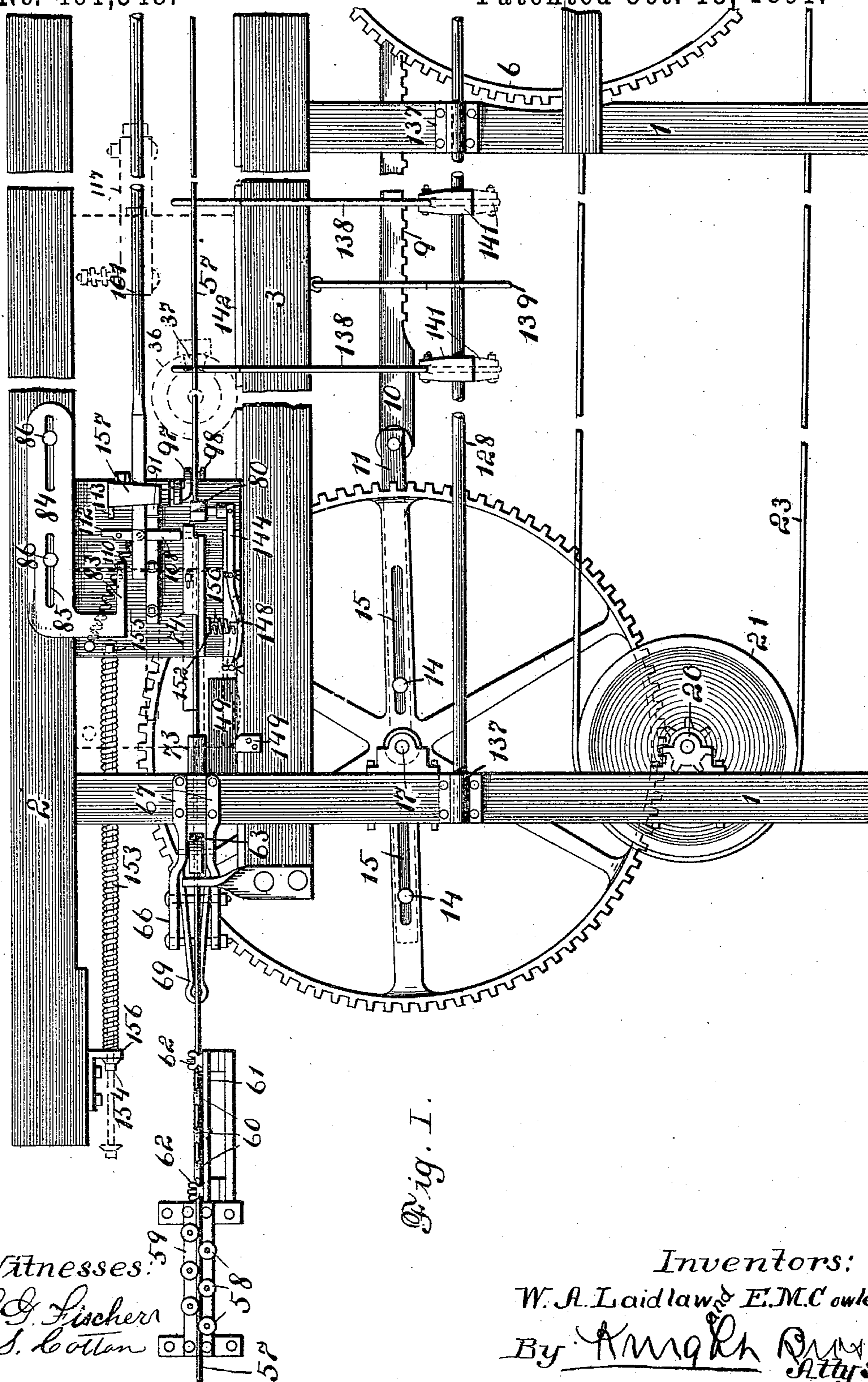


7 Sheets—Sheet 1.

No. 461,348.

Patented Oct. 13, 1891.



Witnesses:
J. G. Fischer
S. Cotton

Inventors:
W. A. Laidlaw & E. M. Cowley.
By Amogh B. B. Attys.

(No Model.)

7 Sheets—Sheet 2.

W. A. LAIDLAW & E. M. COWLEY.
WIRE BALE TIE MACHINE.

No. 461,348.

Patented Oct. 13, 1891.

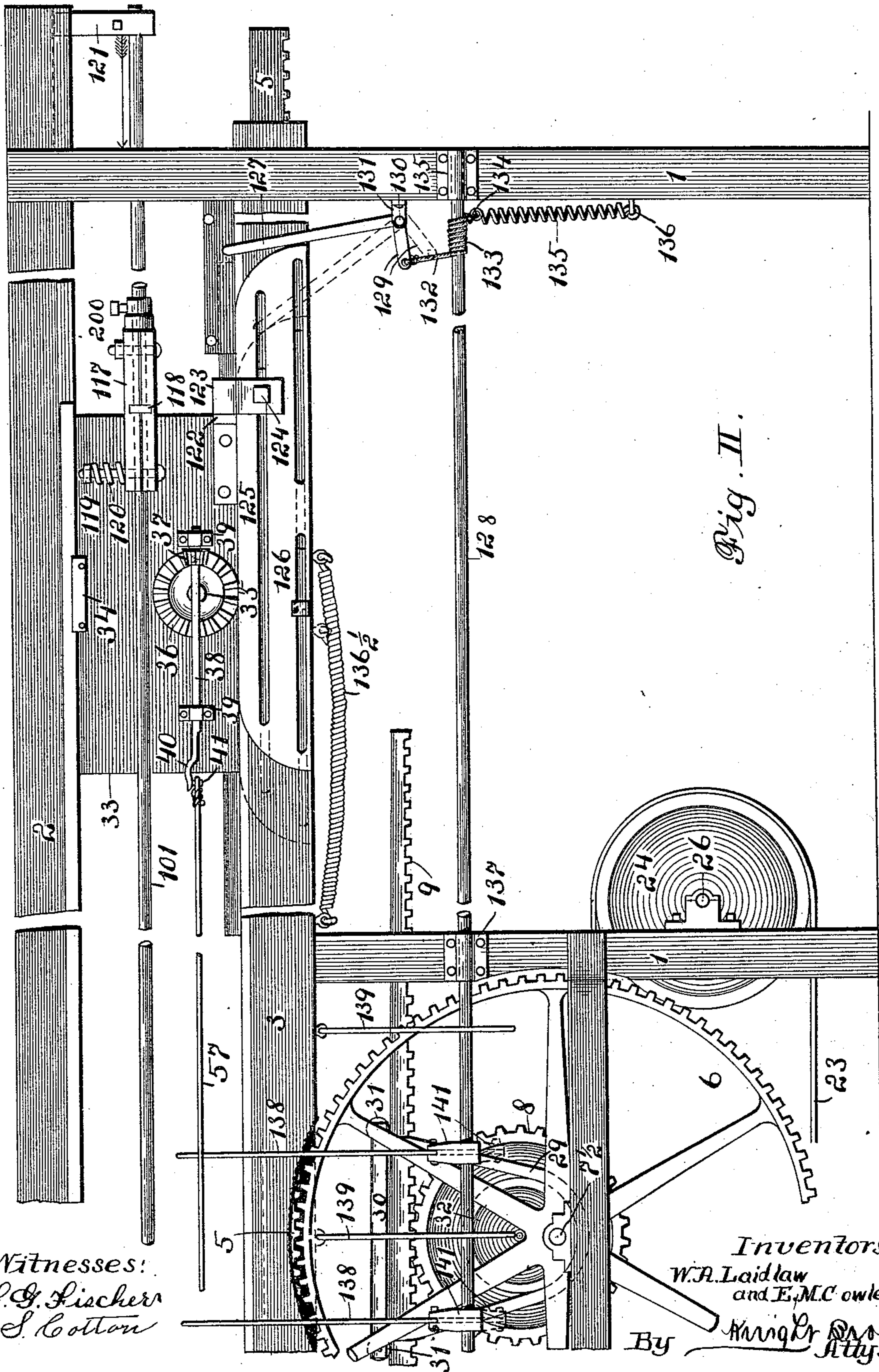


Fig. II.

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7 Sheets—Sheet 4.

W. A. LAIDLAW & E. M. COWLEY.
WIRE BALE TIE MACHINE.

No. 461,348.

Patented Oct. 13, 1891.

Fig. V.

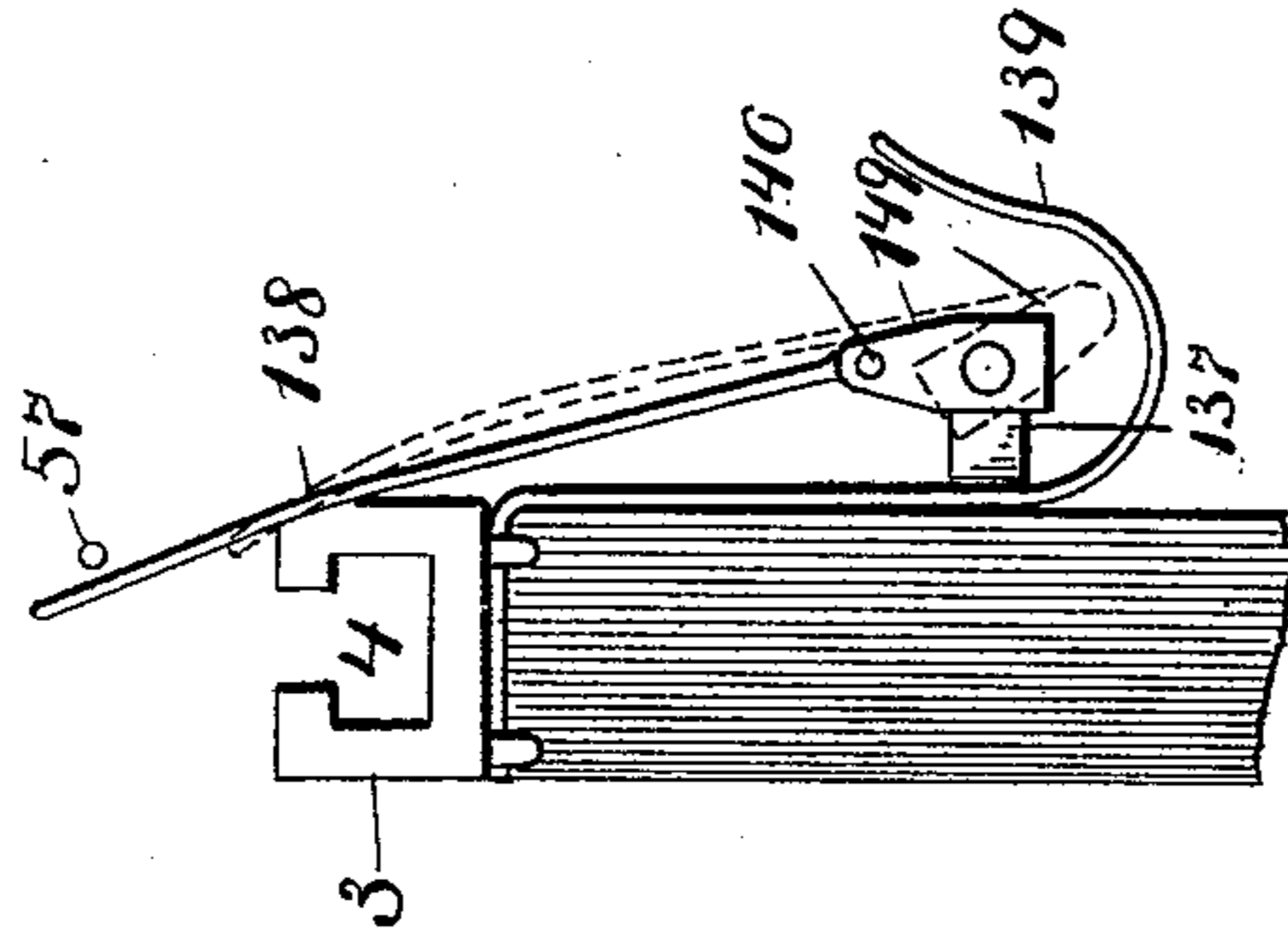
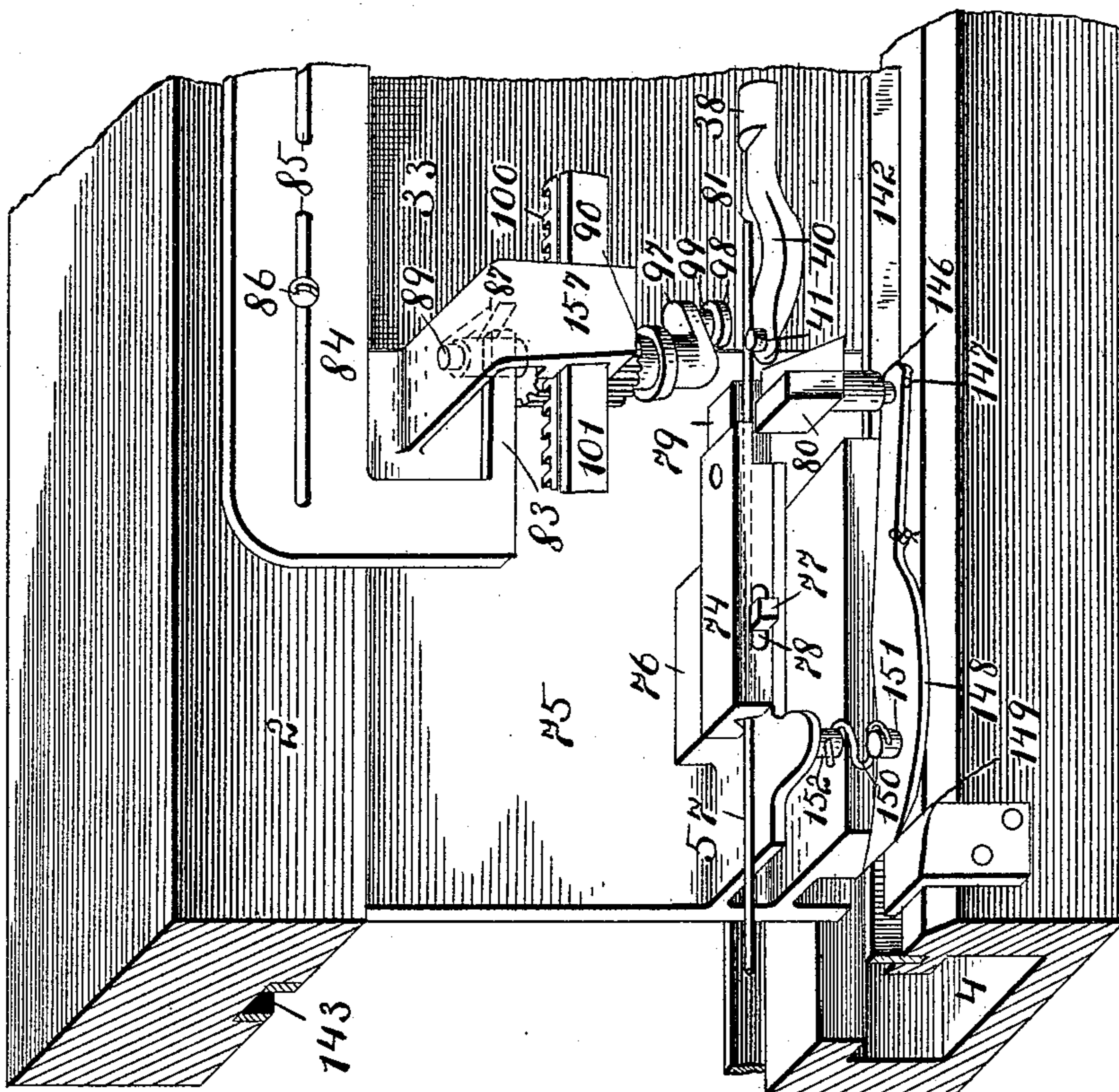


Fig. IV.



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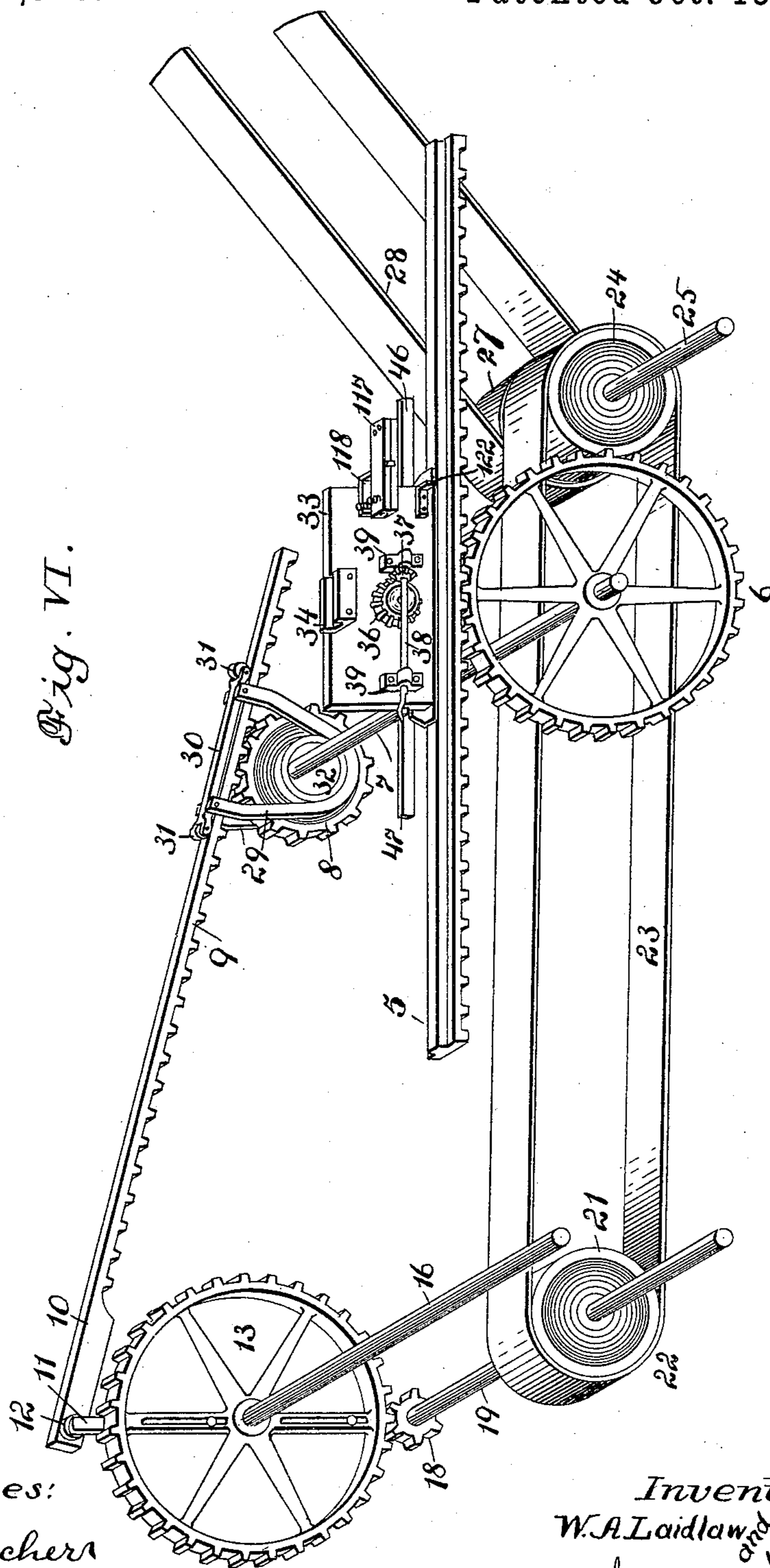
7 Sheets—Sheet 5.

W. A. LAIDLAW & E. M. COWLEY.
WIRE BALE TIE MACHINE.

No. 461,348.

Patented Oct. 13, 1891.

Fig. VI.



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7 Sheets—Sheet 6.

W. A. LAIDLAW & E. M. COWLEY.
WIRE BALE TIE MACHINE.

No. 461,348.

Patented Oct. 13 1891.

Fig. VII.

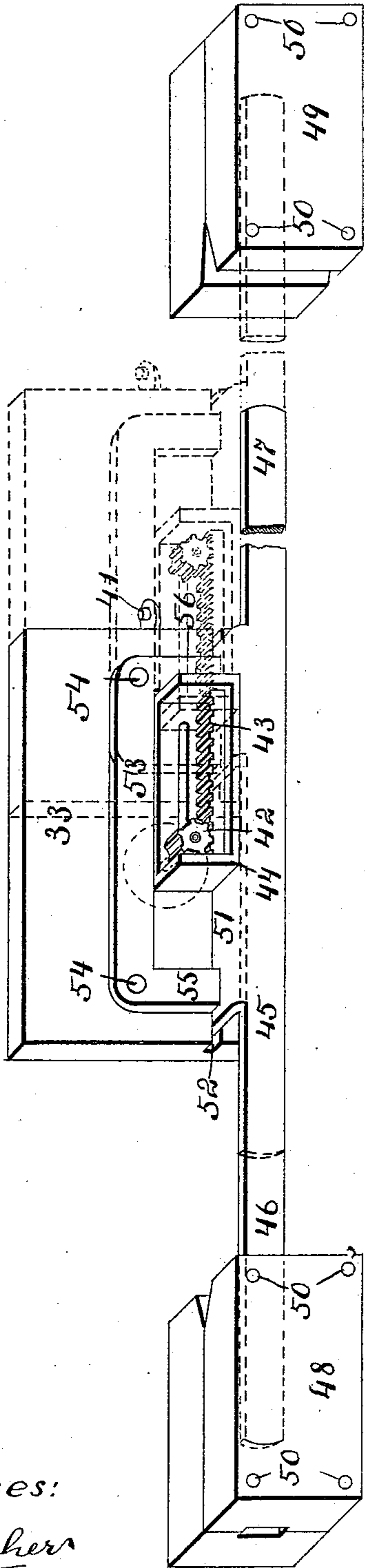


Fig. IX.

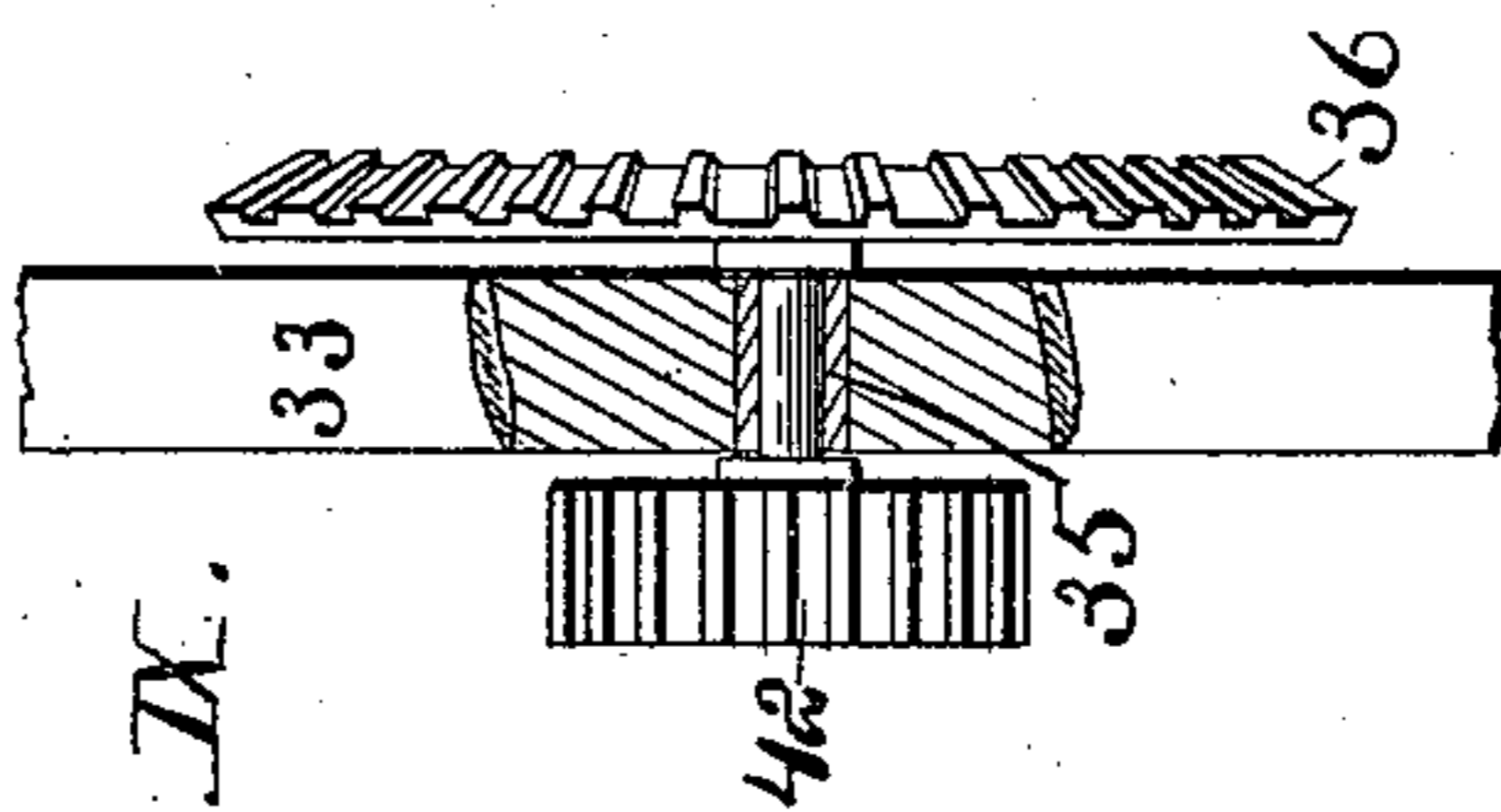


Fig. VIII.

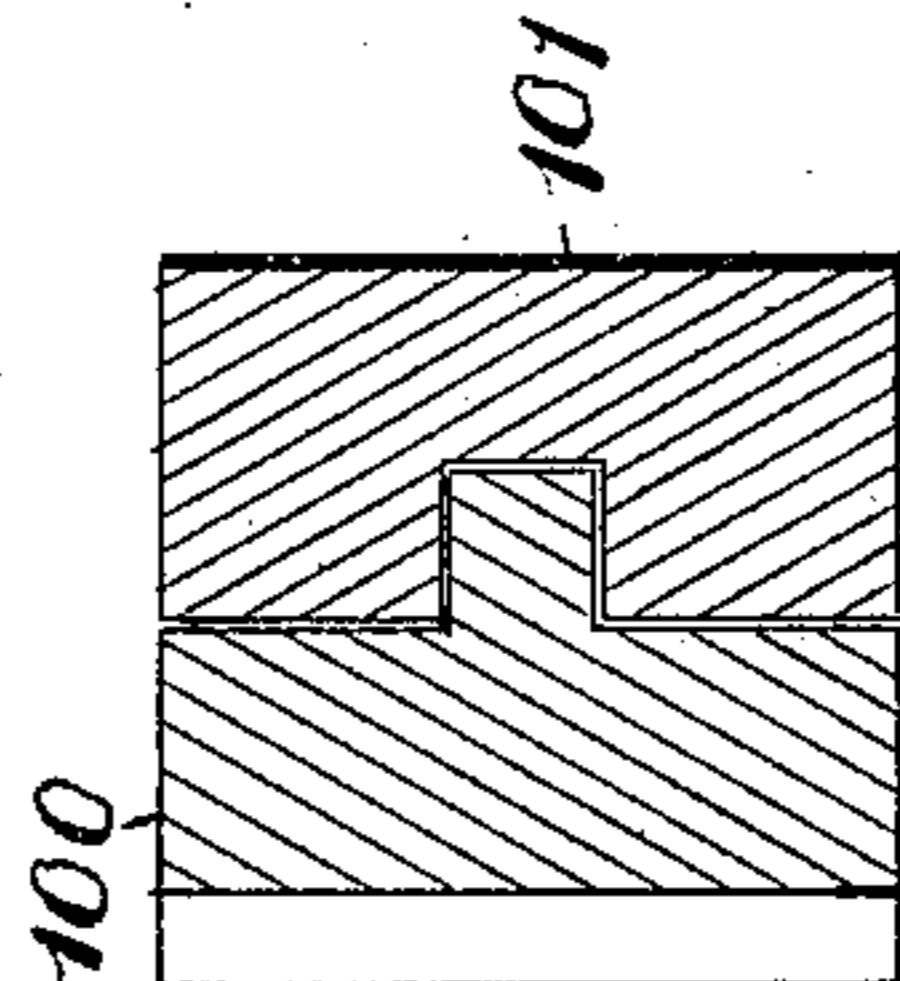
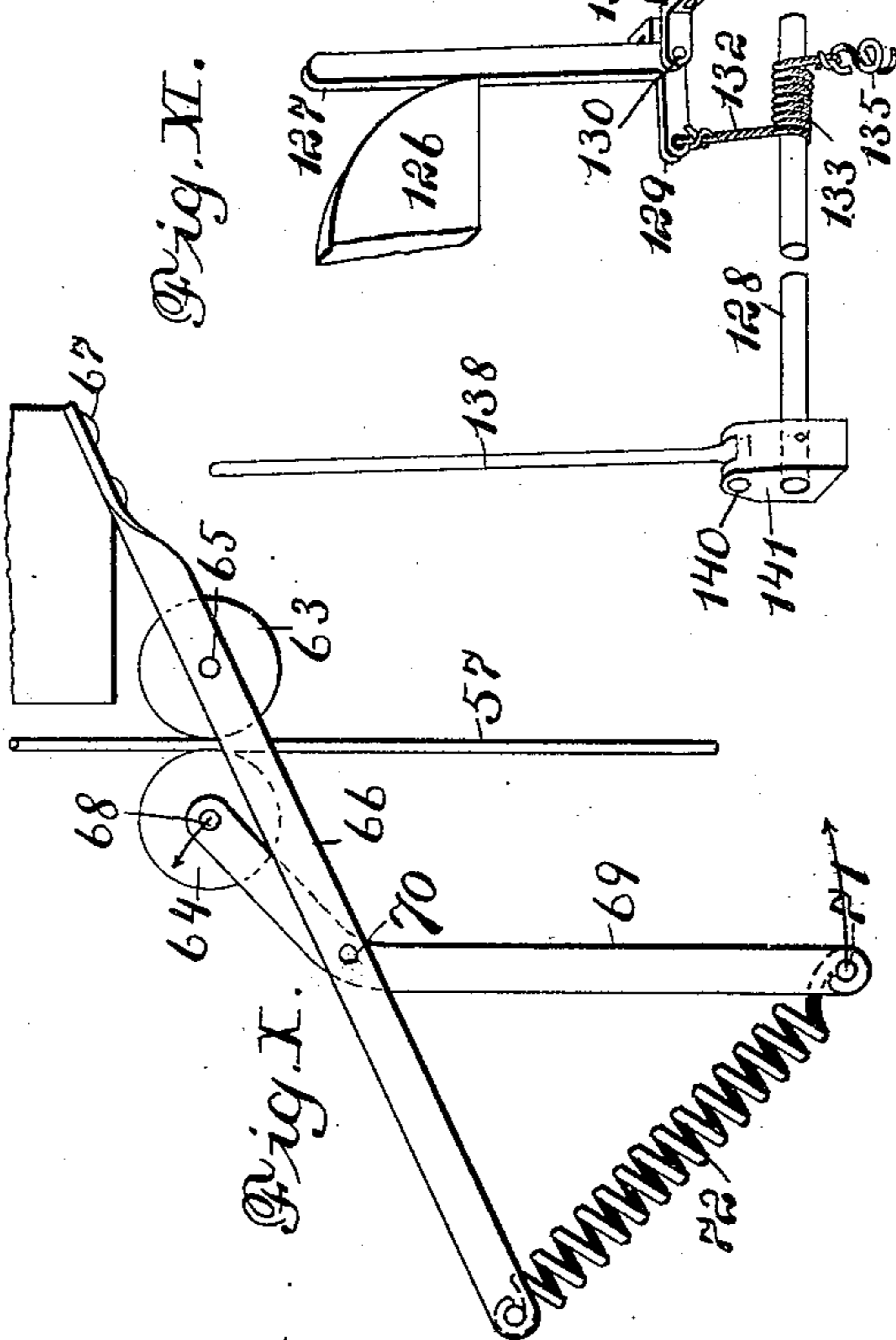


Fig. XI.



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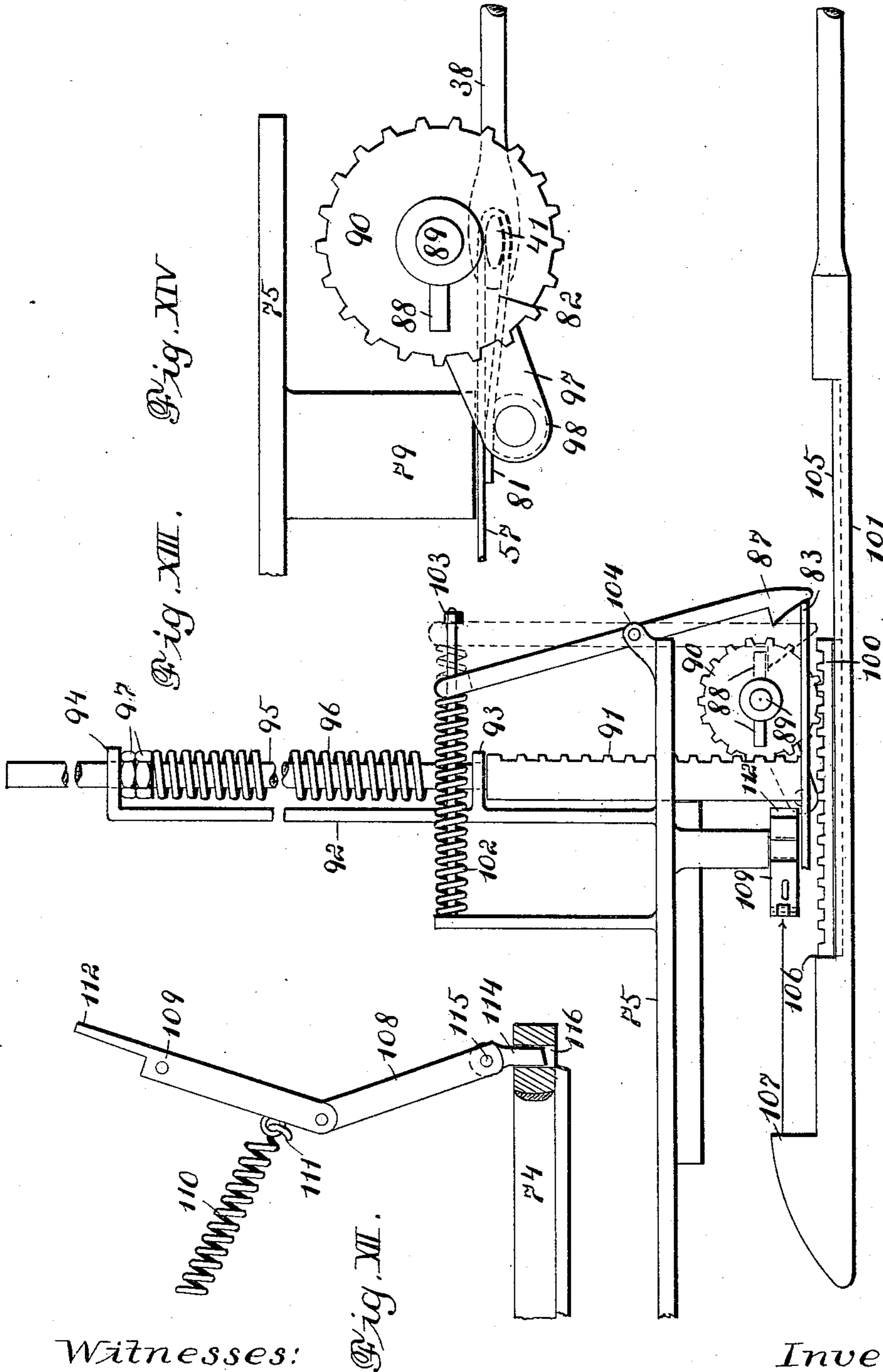
7 Sheets—Sheet 7.

W. A. LAIDLAW & E. M. COWLEY.

WIRE BALE TIE MACHINE.

No. 461,348.

Patented Oct. 13, 1891.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. LAIDLAW AND EDWARD M. COWLEY, OF CHEROKEE, KANSAS.

WIRE-BALE-TIE MACHINE.

SPECIFICATION forming part of Letters Patent No. 461,348, dated October 13, 1891.

Application filed January 31, 1891. Serial No. 379,798. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM A. LAIDLAW and EDWARD M. COWLEY, both of Cherokee, in the county of Crawford, in the State of Kansas, have invented certain new and useful Improvements in Wire-Bale-Tie Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to an improved machine for making wire bale-ties; and our invention consists in certain features of novelty hereinafter described, and pointed out in the claims.

Figure I is a side elevation of a portion of our improved device. Fig. II is a continuation of Fig. I, showing the remaining portion of our device in elevation. Fig. III is a perspective of the follower and looping-head, showing the various parts in their correct position before the looping-head has been forced backward to its extreme limit, in order that the wire may be forced into the correct position in which the loop is formed. Fig. IV shows the position of the follower and looping-head as the loop is about to be formed. Fig. V is an enlarged detail section showing hooks for catching the manufactured ties and the means for casting the ties onto said hooks. Fig. VI is a detail perspective showing the operation, gearing, and rack for operating the follower, the follower being shown secured to the upper side of the rack. Fig. VII is an enlarged detail perspective showing the friction device and means for operating the twister. Fig. VIII is a transverse section taken on line VIII VIII of Fig. XIII. Fig. IX is an enlarged detail view of the bevel-gear and pinion for operating the twister. Fig. X is an enlarged detail plan view of the pulleys for guiding and retaining the wire on its way to the looping-head. Fig. XI is an enlarged detail perspective view of the device for casting the ties from the twister. Fig. XII is an enlarged detail side elevation of the device for severing the wire after the tie has been formed. Fig. XIII is an enlarged detail plan view of the device for operating the looper. Fig. XIV is an enlarged detail plan view showing the position of the looper and tie after

the loop has been formed preparatory to forming the twist.

Referring to the drawings, 1 represents vertical posts, and 2 a horizontal frame, to which various portions of our improved device are secured.

3 represents a beam extending lengthwise of the machine, said beam having a groove 4 therein, (see Fig. V,) in which slides a rack 5, said rack meshing with a spur-gear 6, located on one end of a transverse shaft 7, said shaft being journaled to the frame, as shown at 7½. On the opposite end of the shaft 7 is an eccentric-gear 8, said eccentric-gear meshing with a toothed rack 9 on a pitman 10, one end of said pitman being pivoted to a crank 11 at a point 12, said crank 11 being adjustably secured to a spur-gear 13 by means of a bolt 14, working in slots 15 in certain of the spokes of said spur-gear 13. The gear 13 is rigidly secured to one end of a transverse shaft 16, which is journaled to the frame, as shown at 17.

18 represents a pinion rigidly secured to one end of a shaft 19, said pinion meshing with the spur-gear 13, and said shaft 19 being journaled to the frame, as shown at 20.

21 represents a pulley rigidly secured to the shaft 19, as shown at 22, said pulley being connected by a belt 23 with a loose pulley 24, mounted on a shaft 25, said shaft 25 being journaled in the frame, as shown at 26.

27 represents a pulley rigidly secured to the shaft 25 and having a belt 28 thereon for driving the same. Said belt 28 may be connected with suitable driving mechanism, and the loose pulley 24 may be readily thrown into connection with the tight pulley 27 by any suitable shifting device, and the same be operated by friction with said pulley. The crank 11, connected with the spur-gear 13, is made adjustable in order to shorten or lengthen the stroke of the pitman 10, and thereby vary the travel of the rack 5, in order to make a longer or shorter tie, as may be desired, the operation of which will be explained more fully hereinafter.

It is essential, in order to obtain the best results in the operation of our device as to quality of work performed, to reduce the speed of the follower at each end of the stroke of

the same. This is principally performed by the crank 11 on the spur 13, as a crank-motion always attains its minimum speed in passing the dead-centers and its maximum
5 at center of travel. We further increase the speed of the follower at its center and diminish it at each end by the use of the eccentric-gear 8.

The rack 9 is held in engagement with the
10 eccentric-gear 8 by means of a yoke 29, the upper end of which is secured to the retaining-piece 30, carrying anti-friction rollers 31, the eccentric-gear 8, having collars 32 thereon, which the yokes 29 partially surround, and
15 against which the collars 32 bear, thus at all times holding the rack in close contact with said eccentric-gear.

33 represents the follower, which is rigidly secured to the upper side of the rack 5; said
20 follower having a short portion of channel-iron 34 secured thereto, said channel-iron passing on each side of the under portion of the horizontal frame 2, thus forming a guide for the upper edge of the follower.

35 represents a transverse shaft journaled in the follower. On one end of said shaft is a beveled gear 36, said gear meshing into a beveled pinion 37 on one end of a twisting-shaft 38, the twisting-shaft being journaled
30 to brackets 39, secured to the follower 33. The free end of the twisting-shaft is slightly bent and flattened, as shown at 40, and having near its point a pin or teat 41. On the opposite end of the shaft 35 is a pinion 42, which
35 meshes in a rack 43, said rack being secured in an oblong box 44, said box being secured rigidly to a bar 45, having extensions 46 47, which at times engage with friction-blocks 48 49, said friction-blocks being made in two
40 parts and secured by bolts 50, in order that the same may be adjusted, and thus increase or diminish the friction. On the bar 45 is a bent portion 51, which works in a groove 52 in the follower 33, and thus serves as a guide
45 for said bar.

53 represents a bar secured at 54 to the follower 33, the said bar having downwardly-extending legs 55 56, which at times come in contact with the box 44, as the follower 33 is
50 operated, thus operating the bar 53, sliding with the follower, and causing the rack 43 to operate the pinion 42, and thus operate the twisting-rod 38, the same being more fully explained farther on.

57 represents the wire which is uncoiled from a reel located at any desired point, the wire first passing through a series of vertical zigzag rollers 58, which straighten the wire to some extent. These rollers are journaled to
60 bars 59, said bars being suitably secured to a supporting device, the wire then passing between additional straightening-rollers 60, arranged the same as the rollers 58, which rotate in a horizontal instead of a vertical plane,
65 the rollers 60 being secured to an adjustable bar 61, which may be adjusted by set-screws 62. The wire then passes between horizontal

rollers 63 64, the roller 63 being pivoted at 65 to a bar 66, which is secured to the frame, as shown at 67, said bar being rigid. The roller
70 64 is pivoted at 68 to a bent arm 69, pivoted to the bar 66 at 70, and connected at its upper end, as shown at 71, with the outer end of the bar 66 by a coil-spring 72, said spring at all times holding the arm 69 in such a position
75 that the pulley 64 will press the wire 57 against the pulley 63. The object in said pulleys is to form a guide for the wire and at the same time prevent the wire from springing backward after the tie has been severed by means
80 described later on. It will readily be seen that owing to the construction and position of said pulleys if the wire were to press against them backwardly the pulley 64 would force the wire against the pulley 63 and prevent
85 the same from traveling backward and kinking or buckling. The wire after passing between said pulleys passes through a guiding-block 73, suitably secured to the frame, and then through a guiding-block 74 on the
90 looping-head 75. The guiding-block 74 is adjustably secured to a block 76 on the head 75 by means of a bolt 77, which works in a slot 78, thereby permitting the guiding-block 74 to be adjusted lengthwise, the wire thence
95 passing between an anvil 79 and a movable block 80, and extending out a sufficient distance, as shown in Fig. IV, so that the end of the wire 81 has sufficient length to be bent backward against the anvil 79, a loop being
100 thereby formed in the wire. The follower 33 is forced by the spur-gear 6 and rack 5 backward until the same comes in contact with the looping-head 75, as shown in Figs. III and IV, at which time the end 40 of the twisting-
105 rod 38 is in the position shown in Fig. IV, with the end 81 of the wire 57 extending beyond the teat 41 a sufficient distance, so that the end 81 may be bent around said teat against the anvil 79, as shown in Fig. XIV, to form a loop
110 82 preparatory to being twisted. As the head 75 is forced back into the position shown in Fig. IV by the follower 33, an arm 83, connected with a sliding bracket 84, which is adjustably secured to the frame 2 by means of
115 slots 85 and set-screws 86, comes in contact with the spring-catch 87, which is in engagement with a lug 88, located near the upper end of a vertical shaft 89, and forces said spring-catch out of engagement with said lug
120 88 and permits the shaft 89 to partially rotate from the position shown in Figs. III and IV to the position shown in Figs. XIII and XIV. Said shaft 89 is rotated by the following means: 90 represents a gear on said shaft,
125 with which meshes a rack 91, having bearing in a frame 92, which is secured to the head 75, said frame 92 having portions 93 94, through which a rod 95 on said rack passes, there being a coil-spring 96, surrounding said
130 portion 95, having jam-nuts 97 thereon for adjusting the tension of said spring. Thus, when the catch 87 is forced out of engagement with the lug 88 on the shaft 89 the

spring 96 on the rod 95, which is secured to the rack 91, will cause said rack to move from the position shown in Fig. III to the position shown in Fig. XIII, thereby partially rotating said shaft 89. As said shaft 89 is partially rotated, a crank or arm 97 on the lower end of said shaft carrying a collar 98, (between which and the body of the arm is a groove 99,) will travel from the position shown in Fig. IV to the position shown in Figs. XIII and XIV, bending the end 81 of the wire around the teat 41 on the twisting-rod 38 and clamping the end of the wire against the body of the wire and the anvil 79, as shown in Fig. XIV, holding the same securely until the twisting device has twisted the end and body of the wire together, and thereby formed a permanent loop, the end of the wire being held and guided in the groove 99 of the arm 97. After said loop has been formed the motion of the follower 33 is reversed by the gearing already described, the twisting-rod 38 drawing the wire along by the loop still being in contact with the teat 41, and as said follower travels forward the bar 47, which is at this time in engagement with the friction-block 49, which is located at the rear end of the machine, is held by said friction-blocks until the follower 33 travels a sufficient distance for the leg 56 on the bar 53 to come in contact with the box 44, thus moving the rack 43 from the position shown in the dotted lines, Fig. VII, to the position shown in the full lines in said figure, and as said rack moves the pinion 42 is operated, thus operating the bevel-gear 36, which in turn operates the bevel-gear 37, as the twisting-rod 38 rotates said shaft, forming a twist in the wire, the end portion of the wire being twisted around the body and leaving a loop where the same passes over the teat 41. After the twist has been formed the leg 56 will come in contact with the box 44, carrying the bar 45 along with the head to the opposite end of the machine, where the end 46 of said bar comes in contact with the friction-blocks 48, located at the opposite end. As said twist is being made, the follower 33 is moving forward and head 75 is following it up, a bar 101, being moved at the same rate of speed, being propelled by a friction device attached to the follower. When the head 75 has traveled forward to its extreme limit, the bar 101 will be stopped by a rack 100, secured to the same by a tongue-and-groove connection (see Fig. VIII) coming in contact with the gear 90 on said shaft 89, the friction device sliding on said bar 101 until the end of said friction device comes in contact with an adjustable collar 200 on said bar 101 and positively moving said bar forward, the rack 100 at this time rotating the gear 90 and forcing it and the looper 97 into the position shown in Fig. IV, the catch 87 at this time engaging the lug 88 on the shaft 89 and holding the same in said position, said catch being held normally in engagement with the said lug by

means of a spring 102, working on a rod 103, said rod also passing through the outer end of said spring-catch, as shown in Fig. XIII, said rod and spring being suitably supported and connected with the head 75, the spring-catch 87 being pivoted at 104 to the head 75. The rack 100 works loosely by its tongue-and-groove attachment in the rod 101, it having a space 105, which gives the same a certain degree of latitude. As the follower 33 travels toward the forward end, a projection 106 on the rod 101 comes in contact with said rack 100 and causes it to partially rotate said gear 90. As said rod 101 still continues to travel forward, a projection 107 thereon comes in contact with a toggle 108, (see Fig. III,) pivoted at 109 to the head 75 and held normally in the position shown in Fig. III by spring 110, which is connected with the toggle at 111, 112 representing a stop on the upper end of the toggle which comes in contact with a plate 113, which is secured to the head 75, said stop preventing the spring 110 from drawing the toggle too far backward. The lower end of the toggle 108 is pivoted to the knife 114, as shown at 115, said knife passing through an opening 116 in the block 74, said knife being located directly over the wire as it is being drawn through. As the rod 101 is drawn forward by the follower and at the time that the wire has been drawn out a sufficient distance to make the desired length of tie, the projection 107 comes in contact with the toggle 108, forcing the same from the position shown in Fig. III to the position shown in Fig. I, and as the knife is forced downward the wire is severed. The rod 101 is operated by a two-part friction-block 117, which is secured to the follower 33 by an angle-bar 118, through which the rod 101 passes, said friction-block 117 being connected at one of its ends by bolts 119, on which are placed coil-springs 120, in order to adjust said blocks and create a greater or less amount of friction. The forward end of the rod 101 passing through the movable guide 121, said guide, by coming in contact with post 1, limits the backward movement of rod 101, to which point it is forced by the friction-block 117 as the follower travels backward, said guide also acting to keep rod 101 from turning, thus keeping rack 100 square with gear 90. As the follower 33 travels forward, an angle-bar 122, secured thereto, comes in contact with an adjustable lug 123, which is secured by a bolt 124, working in a slot 125, in a sliding frame 126. As the bar 122 strikes the lug 123, the frame 126 is forced forward, its forward end coming in contact with a lever 127 and forcing it from the position shown in dotted lines, Fig. II, to the position shown in full lines in said figure, thus partially rotating the shaft 128, which is connected with an arm 129 on said lever 127, the lever being pivoted at 130 to a bracket 131, secured to the operating-frame. The rod 128 is connected with the portion 129 of the lever, preferably by a rope 132, wound around said rod, as

shown at 133, the opposite end of said rope being connected at 134 with one end of a coil-spring 135, and the opposite end of said spring being connected at 136 to supporting-frame.

5 When the follower again travels backward, the spring 136 $\frac{1}{2}$ draws the frame 126 back to its normal position, thus releasing the lever 127, which again assumes the position shown in dotted lines, Fig. II, the frame being drawn
10 down by the rope 132, which is again wound on the rod 128 at that end by the action of the spring 135. The rod 128 is suitably journaled to the supporting-frame, as shown at 137. The object in partially rotating the rod
15 128 is to move a series of fingers 138 from the position shown in the dotted lines, Fig. V, to the position shown in the full lines in said figure and in Figs. I and II, said fingers passing in behind the wire, and as the same is
20 severed from the body of the wire and the tie formed the tie is cast from the twisting-rod onto a series of hooks 139, from whence they can be formed into bundles ready for the market.

25 The fingers 138 are pivoted at 140 to heads 141, which in turn are secured to the rod 128 in such a position that the rods or fingers 138 will reciprocate in an inclined plane, passing between the points and shanks of the hooks
30 139, in order that the fingers may guide the wires into the hooks. At the time the ties are cast from the twisting-rod the same will be in the position shown in Fig. II. As it is necessary that it should receive a half-turn
35 in order to be in the correct position for a new loop to be formed or in the position shown in Fig. IV, this half-turn is performed by the friction-block 48 engaging the end 46 of the bar 45 and holding said bar as the follower
40 33 travels backward until the rack 43 has traveled from the position shown in the full lines, Fig. VII, to the position shown in the dotted lines in said figure, thereby rotating the pinion 42 and the twisting-shaft through
45 the connections heretofore described.

142 represents a track on which the lower portion of the head 75 travels, the upper portion traveling in a groove 143 in the frame 2.

As the loop is formed, it is necessary that
50 the guiding-block 80 be depressed in order that the end of the wire may be forced around against the anvil 79, said block being depressed by the lever 144, pivoted at 145, said block having a stem 146, secured to its under
55 side, and said stem being pivoted to the lever 144, as shown at 147.

148 represents a bevel-shoe on one end of the lever 144, said shoe coming in contact with a lug 149, as the head 75 is forced back-
60 ward, thereby forcing the block 80 downward from the position shown in Fig. III to the position shown in Fig. IV, permitting the wire to be bent around into a loop, as heretofore described. The lever 144 is held in its nor-
65 mal position, as shown in Fig. III, by a spring 150, connected with the shoe 148 at one of its ends, as shown at 151, and having its oppo-

site end connected with the head 75, as shown at 152. The head 75 is held normally in its position (see Fig. I) by means of a spring 153, 70 which forces said head into the position shown in Fig. I after it has been released by the follower. The spring 153 is located on a rod 154, said rod being connected at 155 to the head 75 and having its rear end pass through 75 a bracket 156, whereby when said head 75 is forced backward said rod may be permitted to slide in said bracket and the spring compressed ready to force the head back into its normal position as soon as the same has been 80 released by the follower. The rear end of the rod 101, which supports the rack 100, is supported by a bracket 157, which is connected with the head 75.

Owing to the frictional connection of the 85 rod 101 with the follower 33, it will be seen that when the rod 101 has traveled to its limit in either direction the follower may still travel farther without affecting said rod, as the block 117 will slide thereon. 90

We claim as our invention—

1. In a bale-tie machine, the combination of a suitable support, a movable follower located in said support, a wire-twisting device secured to said follower, and means for reciprocating said follower for the purpose of manu- 95 facturing bale-ties, substantially as described, and for the purpose set forth.

2. In a bale-tie machine, the combination of a reciprocating follower working in a suitable support, means for operating the same, a twisting device connected with said follower, a projection on said twisting device, around which the wire loop is formed, and means for rotating said twisting device, substantially as 100 described, and for the purpose set forth.

3. In a bale-tie machine, the combination of a reciprocating follower working in a suitable support, means for reciprocating said follower, a twisting device connected with said 110 follower, a projection on said twisting device, around which the wire loop is formed, means for forming the wire loop, and means for rotating said twisting device, thereby forming an eye in the bale-tie, substantially as set forth. 115

4. In a bale-tie machine, the combination of a reciprocating follower working in a suitable support, means for reciprocating the same, a twisting-shaft 38, having a teat or projection 41 thereon, around which the wire loop 120 is formed, a bevel-gear 37 on said twisting-shaft, a bevel-gear 36, meshing with said gear 37, and means for rotating said gear 36, substantially as set forth.

5. In a bale-tie machine, the combination 125 of a reciprocating follower, a twisting-shaft 38, journaled in said follower, a teat 41 on said twisting-shaft, around which the wire loop is formed, a bevel-gear 37 on said shaft, a bevel-gear 36, meshing with the gear 37, said gear 130 36 being located on one end of a shaft 35, journaled in the follower, a pinion 42 being located on the opposite end of said shaft, and means for rotating the pinion 42, and thus,

through the connections described, rotating the twisting-shaft 38, substantially as set forth.

6. In a bale-tie machine, the combination of a reciprocating follower, a twisting-shaft journaled thereto, a teat 41 on said shaft, around which a wire loop is formed, a bevel-gear 37 on said shaft, a gear 36, meshing with said bevel-gear, a shaft 35, to which said bevel-gear 36 is attached, a pinion 42 on the shaft 35, a rack 43, meshing with the pinion 42, a box 44, in which said rack is located, a bar 45, connected with the box 44, and suitable means for retarding at times the travel of the bar 45, substantially as described, and for the purpose set forth.

7. In a bale-tie machine, the combination of a reciprocating follower, a twisting-shaft 38, journaled thereto, suitable gear for rotating said twisting-shaft, a pinion 42, having connection with said gear, a rack 43 for operating the pinion 42, a bar 45, supporting said rack 43, a projection 51 on said bar working in a slot 52 in the follower, and a bar 53, secured to said follower, having legs 55 56, adjustable friction-blocks 48 49 for engaging and holding the bar 45, whereby the legs 55 56 may be at times thrown into contact with the box 44, and by moving the same cause the rack 43 to operate the pinion 42, and thus operate the twisting-shaft, substantially as described, and for the purpose set forth.

8. In a bale-tie machine, the combination of a reciprocating follower, a twisting-shaft journaled thereto, a pin or teat 41 on said shaft, around which the wire loop is formed, a crank 97 for forming said loop, and means for partially rotating said crank, substantially as set forth.

9. In a bale-tie machine, the combination of a reciprocating follower, a twisting-shaft journaled thereto, a teat 41 on said shaft, a crank 97 for forming a wire loop around said teat, a shaft 89, supporting said crank, a gear 90 on said shaft, a rack 91 in connection with said gear, and means for reciprocating said rack, and thus partially rotating the crank 97, thereby forming a wire loop around the teat 41, substantially as described.

10. The combination of a reciprocating follower, a twisting-shaft secured thereto, a teat 41 on said shaft, a shaft 89, journaled in a head 75, a gear 90 on said shaft, and rack 91, meshing with said gear, and a spring in connection with said rack for reciprocating the same, and thus operating the gear 90, substantially as described, and for the purpose set forth.

11. The combination of a reciprocating follower, a movable head 75, a twisting-shaft journaled to the follower, a pin 41 on said shaft, a vertical shaft 89, pivoted to the head 75, a gear 90 on said shaft, a rack 91, meshing with said gear for operating the same, a crank 97 on the shaft 89, a collar 98, situated beneath said crank, whereby a space 99 is formed between the collar and said crank, into which

the end of a wire 81 passes as said crank is partially rotated, and a loop formed by bending the end of the wire around against the body of the same, substantially as described, and for the purpose set forth.

12. The combination of a reciprocating follower, a twisting-shaft journaled thereto, a pin on said shaft, and a crank 97 for bending a portion of wire around said pin and clamping the same against the anvil 79 and holding it in said position until the twisting-shaft has been rotated and a loop thereby formed in the wire, substantially as set forth.

13. The combination of a reciprocating follower, a twisting-shaft journaled thereto, a projection on said twisting-shaft, around which a portion of wire may be bent to form a loop, a head 75, a shaft 89, journaled in said head, a gear 90 on said shaft, a crank 97, located at the lower end of said shaft, a rack 91, meshing with the gear 90 for rotating said shaft, means for reciprocating said rack, and a lug 88 on the shaft 89, and a pivoted spring-catch 87 for engaging the lug 88 and at times holding the shaft 89 and preventing it from rotating, substantially as set forth.

14. The combination of a reciprocating follower, a twisting-shaft journaled thereto, a teat 41 on said shaft, a movable head 75, a shaft 89, journaled thereto, a wire-bending crank 97 on said shaft, a gear 90 on said shaft, a rack 100, meshing with the gear 90, and a rod 101, having connection with the rack 100, guide 121, and with the reciprocating follower, substantially as described, and for the purpose set forth.

15. In a bale-tie machine, the combination of a reciprocating follower, a rod 101, connected therewith by friction-block 117, adjustable collar 200 on said rod, a rack 100, sliding in a space 105 in the rod 101, said rack being connected with said rod by a tongue and groove, a gear 90, with which said rack meshes, the teat 41, and looping mechanism operated by said gear 90 to form a wire loop, substantially as described.

16. The combination of a reciprocating follower, a movable head 75, a toggle 108, connected to the head 75, a knife located on the lower end of said toggle, a guiding-block adjacent to said knife and through which the wire passes, and means in connection with the reciprocating follower for depressing said knife in order to sever the wire, substantially as described.

17. The combination of a reciprocating follower, frictional blocks 117, secured thereto, a rod 101, working in said friction-blocks, a projection 107 on said rod, a toggle 108, located on a movable head 75, a spring 110, and a stop 112 on said toggle for holding the same in a bent condition, a knife 114 on the lower end of said toggle, a guiding-block through which the wire passes, and means for reciprocating the follower and forcing the end 107 of the rod 101 against the toggle, thereby straight-

ening the same and forcing the knife downward, thereby severing the wire, substantially as described, and for the purpose set forth.

18. The combination of the movable head 75, an adjustable guide 74, secured thereto, an adjustable block 80, pivoted to the head, the anvil 79, the twister, the looper, and means for moving the block 80 in a vertical direction out of the way of the looper, substantially as described, and for the purpose set forth.

19. The combination of the movable head 75, adjustable guiding-block 74, vertical moving guide-block 80, lever 144, pivoted to the head, said lever having a bevel-shoe 148, a projection 149 for raising the beveled end of the lever 144 upward, and thus depressing the guiding-block 80, and a spring 150 for depressing the beveled end of the lever after the same is out of engagement with the lug 149 and raising the guiding-block 80 back to its normal position, substantially as described, and for the purpose set forth.

20. The combination of a reciprocating follower carrying a twisting device, a teat 41 on said twisting device, a movable head 75, a shaft 89, journaled to said head, a looping-crank 97 on said shaft, a lug 88 on said shaft, a spring-catch 87, which at times engages the lug 88, an adjustable bracket 84, and a projection 83 on said adjustable bracket, said projection at times coming in contact with the outer end of the catch 87 and forcing the same outward, thus releasing the lug 88 and shaft 89 and permitting the looping-crank 97 on the lower end of said shaft to partially rotate in order to form a loop, substantially as described, and for the purpose set forth.

21. The combination of a reciprocating follower, a twisting device in connection therewith, a movable head 75, through which a wire is fed, and a spring 153 for forcing said head forward as the follower travels forward, substantially as described.

22. The combination of a beam 3 and frame 2, a reciprocating follower traveling between the same, the twisting mechanism carried by said follower, a movable head 75, traveling on a track 142, secured to the beam 3, and in a slot 143 in the frame 2 and having means for holding the wire while being twisted, and a spring 153 for forcing the head 75 forward, substantially as described.

23. In a bale-tie machine, the combination of the wire-straightening pulleys 58 60, pulleys 63 64, between which the wire travels, and means for holding said pulleys in close engagement with said wire, substantially as set forth.

24. The combination of the head 75, having a guiding-block 74, through which the wire passes, a guiding-block 73, pulleys 63 64, an arm 66, to which said pulley 63 is journaled, a movable arm 69, to which the pulley 64 is journaled, and a spring 72, connecting the arms 66 69, for holding the said pulleys in close contact with the wire, substantially as set forth.

25. The combination of a reciprocating follower, a twisting device in connection therewith, means for looping wire over the end of said twisting device, fingers 138, adapted to project upward under the wire for casting the same from the twisting device, hooks for catching the wire, and means for raising and lowering said fingers, said fingers being arranged to reciprocate in a plane passing between the points and shanks of the hooks, substantially as described, and for the purpose set forth.

26. The combination of a reciprocating follower 33, rod 128, and fingers 138, having pivotal connection with said rod, a lever 127 connected by a rope with said rod 128, and means in connection with said follower for operating said lever, thus operating the rod 128, and fingers 138 for the purpose of casting the bale-tie from its connection with the follower, substantially as described, and for the purpose set forth.

27. The combination of the follower 33, twisting device in connection therewith, a teat 41 on said twisting device, around which a wire loop is formed, a rod 128, fingers 138, having pivotal connection with the rod 128, a lever 127, rope 132, connecting the lever with the rod 128, a spring 135, connecting said rope with the frame 1, frame 126, carrying an adjustable lug 123, an angle-bar 122 on the follower which comes in contact with the lug 123, forcing the same forward and operating a lever 127, and a spring 136 $\frac{1}{2}$, in connection with the beam 3 and frame 126, for forcing the same backward, substantially as described, and for the purpose set forth.

28. The combination of a reciprocating follower, a twisting device, a rack 5, to which said follower is connected, a gear-wheel for operating said rack, the rack 9 for operating said gear-wheel, and an adjustable crank for operating the rack 9, substantially as set forth.

29. The combination of a reciprocating follower 33, a wire-twisting device in connection therewith, a rack 5, to which said follower is attached, a spur-gear 6 for operating said rack, and an eccentric-gear 8, having suitable connection therewith for operating the gear 6 and rack 5, substantially as set forth.

30. The combination of the follower 33, rack to which the same is secured, spur-gear 6 for operating said rack, an eccentric-gear 8 for operating the spur-gear and pitman 10, and a rack 9 on said pitman for operating the eccentric-gear 8, substantially as set forth.

31. The combination of the reciprocating follower, twisting device in connection therewith, a rack 5, on which the follower is mounted, a spur-gear 6, shaft 7, eccentric-gear 8, mounted on shaft 7, eccentric collars 32 in connection with said gear, a yoke 29, having a portion 30, friction-rollers 31 in connection with said yoke, a pitman 10, having a rack 9, meshing with the eccentric-gear 8, and means for operating said pitman, in order to recip-

rocrate the rack 5, substantially as set forth, and for the purpose described.

32. In a bale-tie machine, the combination of a reciprocating follower, a rack 5, to which
5 the same is attached, a spur-gear 6, meshing with said rack, a shaft 7, on which the spur-gear 6 is mounted, an eccentric-gear 8, a pitman 10, having a rack 9 in connection with the eccentric-gear 8, a spur-gear 13, means for
10 operating the same, and an adjustable crank

11 in connection with said spur-gear 13, to which the outer end of the pitman 10 is pivoted, substantially as described, and for the purpose set forth.

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Witnesses:

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