

V. HOXIE.

WIRE STAPLE FORMING AND DISCHARGING MECHANISM.

APPLICATION FILED FEB. 3, 1905.

2 SHEETS—SHEET 1.

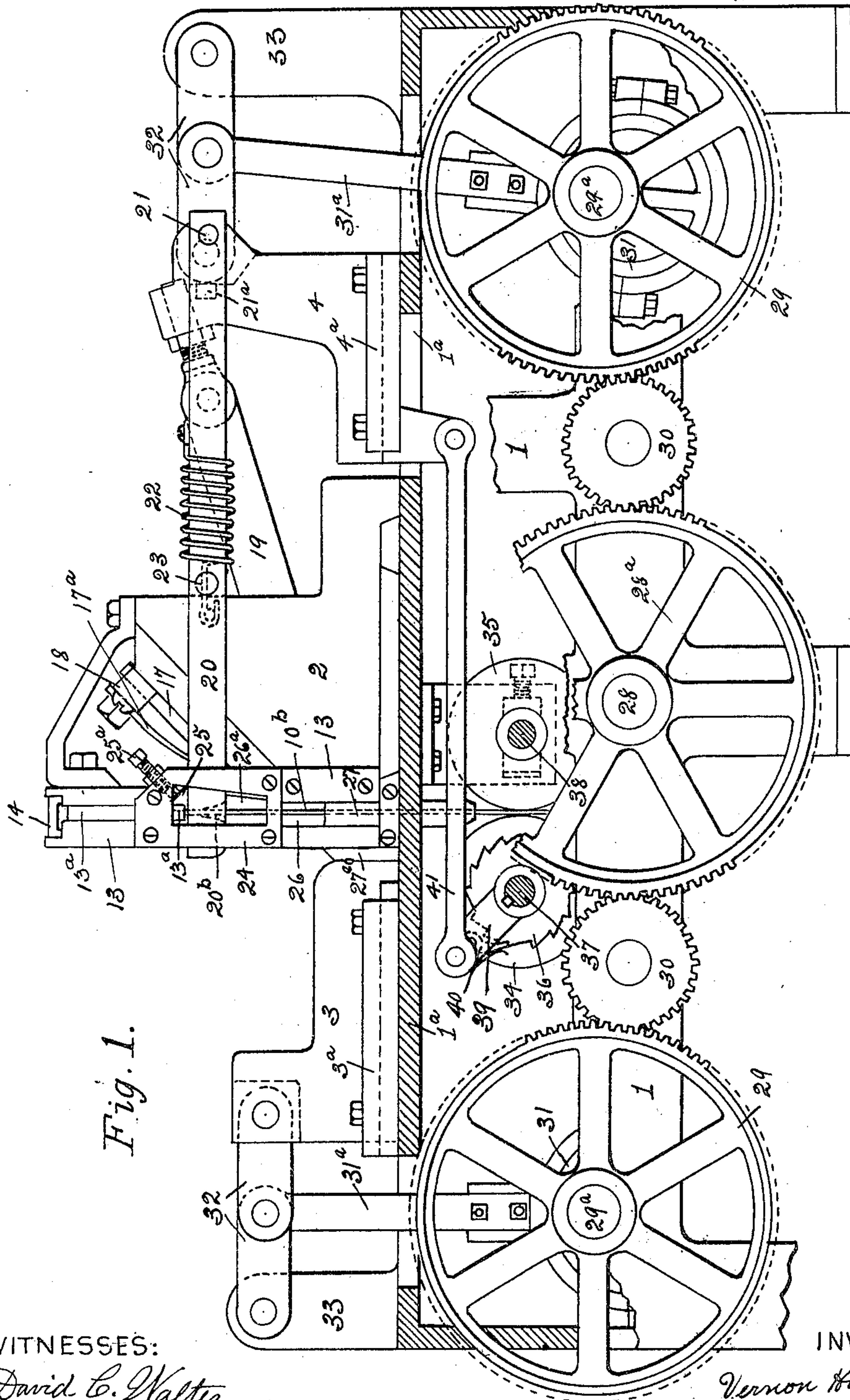


Fig. 1.

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No. 804,403.

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Fig. 3.

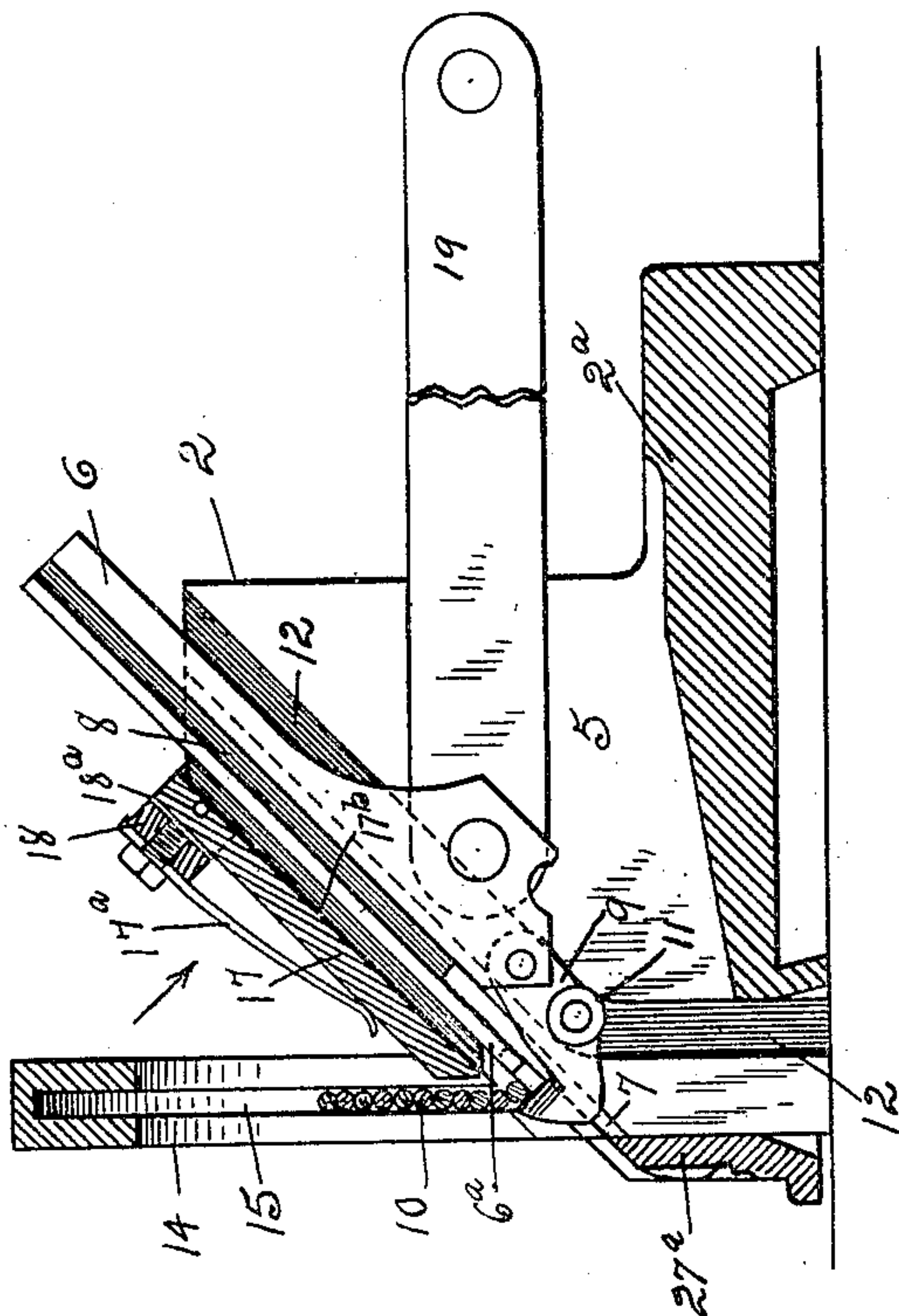


Fig. 4.

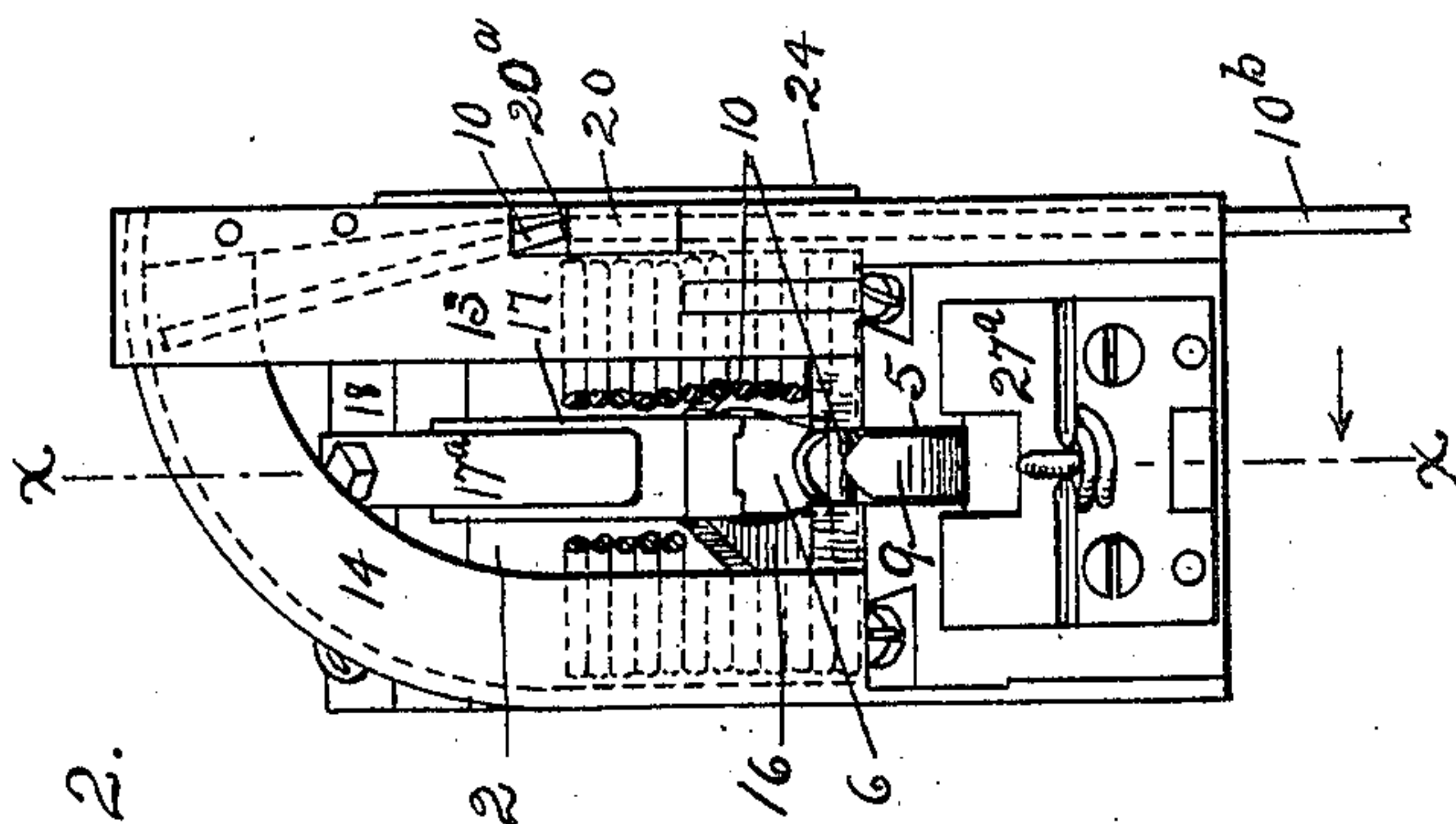
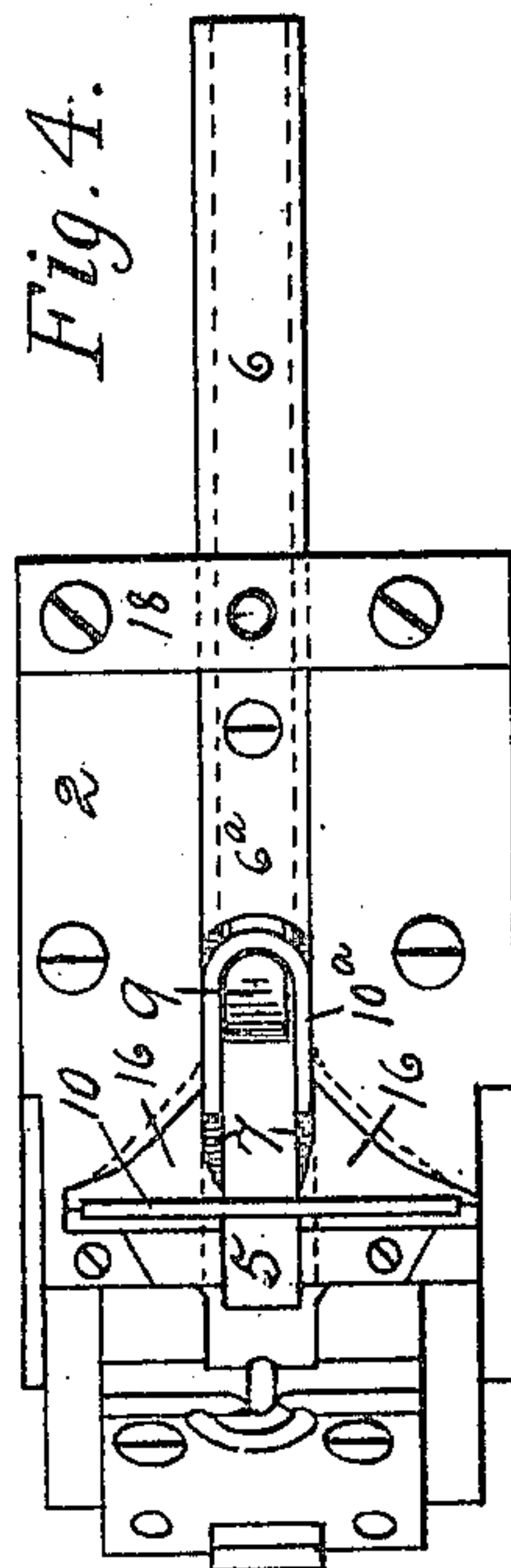


Fig. 2.

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UNITED STATES PATENT OFFICE.

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WIRE-STAPLE FORMING AND DISCHARGING MECHANISM.

No. 804,403.

Specification of Letters Patent.

Patented Nov. 14, 1905.

Application filed February 3, 1905. Serial No. 244,070.

To all whom it may concern:

Be it known that I, VERNON HOXIE, a citizen of the United States, and a resident of Adrian, in the county of Lenawee and State of Michigan, have invented certain new and useful Improvements in Wire-Staple Forming and Discharging Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in mechanism for forming a staple from a section of wire intermittently fed thereto and discharging and clamping the same about portions of a fabric or other object that may be disposed in advance thereof and in the path of movement of the discharging-plunger; and it has for one of its objects to simplify and improve upon the construction and operation of apparatus of this class by the arrangement and combination of the parts, as hereinafter described.

A further object of my invention is the provision, in combination with the staple forming and discharging parts, of a magazine adapted to hold a plurality of cut sections of wire, one of which sections is disposed at all times during the operation of the machine in position to be engaged and formed into a staple by the forming element thereof, thereby effecting a more positive and efficient operation of the apparatus.

The arrangement, operation, and construction of the parts of the invention are fully described in the following specification, and shown in the accompanying drawings, in which—

Figure 1 is a side elevation of my improved mechanism and associated operating means with the supporting-frame shown in vertical section. Fig. 2 is a front elevation of the mechanism forming the subject-matter of my present application with the central portions of the wire-sections disposed in the magazine broken away. Fig. 3 is a vertical longitudinal section of the holder, magazine, and pressure-plate, taken on the dotted line *x x* in Fig. 2, with the staple forming and discharging elements shown in full and in position to en-

gage and draw a wire-section within the forming part of the holder; and Fig. 4 is a view looking in the direction of the arrow in Fig. 3 with the magazine and pressure-plate removed.

Referring to the drawings, 1 represents a portion of the frame by which my invention may be supported. Mounted on the upper horizontal portion 1^a of this frame are the fixed block or holder 2, in which the staple forming and discharging parts are located, and the longitudinally-movable tables 3 and 4, which are disposed at opposite ends of the block or holder 2 and guided in their reciprocatory movements by suitable leaders 3^a and 4^a, respectively, that are bolted to the frame portion 1^a.

The block or holder 2 has the forward portion of its upper surface formed on a plane at which it is desired to discharge a staple therefrom and is centrally provided with the vertical longitudinal bore 5, which severs the holder into two parallel parts, except for the lower connected portion 2^a, as shown in Fig. 3. A plunger 6 is mounted in the upper portion of the bore 5 in a plane parallel to that of the upper surface of the holder and is guided in its reciprocatory movement by reason of a rib 7 being formed in alining position on each wall of the bored portion 5 and fitting within a corresponding groove 8, formed longitudinal in each side of said plunger. Projecting rigidly from the forward end of the plunger 6 is a staple-discharging tongue 6^a, which is of a width substantially equal to that of the bore 5 and positioned to have its sides rest upon the surfaces of the guiding-ribs 7.

Pivoted to the forward end of the plunger 6 at a point below and slightly to the rear of the outer extremity of the tongue 6^a is a hooked staple-forming finger 9, which is of sufficient length to permit the hooked end thereof to be swung in advance of the tongue 6^a of the plunger. The hooked wire-engaging surface of the finger 9 is of a depth to adapt it to project above the upper surface of the tongue 6^a when in the position shown in Fig. 3 to enable it to engage a wire-section 10, lying in a plane immediately above that of the tongue, and it has its forward surface beveled to adapt it to raise and pass under the wire-sections in its forward movement. The proper oscillatory movement is imparted to

the finger 9 by reason of an antifriction-roller 11 being mounted on each side thereof and operating within a guiding groove or pathway 12, provided in each of the walls of the bore 5. The groove 12 begins and continues in a vertical plane to a point where it is desired to swing the hook in position to engage and draw a wire-section in advance of the tongue 6^a, where it abruptly changes to a plane parallel to that of the movement of the plunger, which position is retained until a staple 10^a has been formed and the plunger returned to the position at which the wire-section was engaged when the hook is moved from in advance of the tongue 9^a by the rollers 11 passing within the vertical portion of the grooves 12 to permit the formed staple to be discharged from the holder.

At the extreme forward portion of the upper surface of the block or holder 2 is mounted a magazine for holding a plurality of cut wire-sections. This magazine comprises the straight vertical member 13, which is secured to the right side of the holder 2, and the companion member 14, which is secured in opposite position to the left-hand side of the holder 2 and has its lower portion disposed in parallel relation to the member 13 and its upper end formed in the arc of a circle and joining the upper end of said member 13, as shown in Fig. 2. The contiguous sides of the members 13 and 14 are each formed with a deep groove or channel 15, which communicate at their upper ends and form transversely-aligning vertical guideways for receiving the opposite ends of a plurality of wire-sections 10, as shown in Fig. 3 and by dotted lines in Fig. 2, which wire-sections are fed, severed, and deposited therein, as hereinafter described. The grooves or channels 15 communicate at their lower ends with a reduced or counter-sunk portion 16, which is formed in the upper surface of the block or holder 2, with its lower surface disposed in a plane with the upper surface of the tongue 6^a, and has its forward portion of sufficient width to receive the wire-sections 10, and its side walls tapered toward and finally merging in those of the bore 5, as shown in Figs. 2 and 4. To facilitate the raising of the wire-sections in the magazine by the beveled portion of the forming-finger 9 on the forward movement thereof, I form the forward wall of the reduced portion 16 with a slight bevel, thus permitting the position of the lower wire-section with respect to the others to be substantially as shown in Fig. 3 and providing two oppositely-beveled surfaces for coacting with the wire-section in the raising thereof. A tapered guiding-strip 13^a is secured to the upper outer portion of the member 13, as shown in Fig. 1 and by dotted lines in Fig. 2, and acts as a means for deflecting the wire-sections laterally within the magazine as they are fed thereto.

Mounted in the upper portion of the bore 5 of the block or holder 2 in position to engage upon the upper surface of the plunger 6 is the pressure-block 17, which has its upper or rear end pivoted within a recess 18^a, provided in the under surface of the transverse piece 18, which is secured to and connects the walls of the bore 5 at their extreme upper portions. The pressure-block 17 has its forward end normally held in engagement with the upper surface of the plunger 6 or tongue 6^a by the pressure-spring 17^a, and has its under surface longitudinally grooved, as shown at 17^b, to receive the hooked portion of the finger 9 on the rearward movement thereof. The pressure-block 17 also has its lower forward edge rounded to facilitate its being raised by a staple as it is forced thereunder by the action of the forming-finger 9.

It is found from experimenting that in the perfect forming of a staple it is necessary to terminate the forward end of the pressure-block 17 as closely to the wire-sections 10 in the magazine as is permissible in view of its slight oscillatory movement when a wire-section is forced thereunder, as shown in Fig. 3, thereby causing the central portion of a wire-section to be gripped between the grooved end of said block and the hooked portion of the finger 9 as soon as it is drawn from the magazine by the action of said finger. The finger 9, acting against the resisting pressure of the spring 17^a on the block 17, causes a slight crimping or indenting of the wire at its central point, so that it is prevented from sliding laterally with respect to the finger in the rearward movement thereof, as would otherwise be the case, and thereby forming a staple with uniform legs. When the resisting pressure of the spring 17^a has been overcome by the pressure exerted on the wire-section by the finger 9, the block 17 is raised by said section and the forming operation continued.

A reciprocatory movement is imparted to the plunger 6 and attached parts from the table 4, which connects therewith through the medium of the link or rod 19, as shown in Figs. 1 and 3.

A knife 20 for severing the wire-sections 10 from the feed-wire 10^b when a predetermined length has been fed to the magazine, as hereinafter described, has its forward end mounted in a horizontal receiving-socket 20^a, provided in the outer side of the vertical magazine member 13, as shown in Fig. 2, and its rear end provided with a stud or pin 21, projecting in alinement with and adapted to be engaged by a pin or lug 21^a, formed on the side of the actuating-table 4 just prior to the limit of rearward movement of said table, whereby a slight reciprocatory movement is imparted to said knife for the purpose of severing a wire-section from the feed-wire. After the knife 20 has been moved to sever the wire it is actua-

ted to return to its normal position by the coiled spring 22, which is mounted on and has one end fixed to a portion of the knife and its other end fixed to the holder 2. The forward movement of the knife is restricted by reason of the stud or pin 23 thereon coacting with the rear edge of the holder 2, as shown in Fig. 1. Secured to the outer face of the vertical magazine member 13 in position to cover the socket 20^a is the plate 24, which prevents lateral play of the knife 20. A die 25 for coacting with the knife 20 in the cutting of the wire-sections is mounted in the socket 20^a in shearing engagement with the upper edge of the knife 20 and is held in properly-adjusted position by means of the adjusting-screw 25^a. The die 25 has its forward or shearing edge extending by the inner side of the lower reduced end of the guiding-strip 13^a to the edge of the aperture 20^b in the knife through which the wire is fed, so that when the knife receives its rearward movement the wire is severed by the shearing contact of the die 25 with the edge of the aperture 20^b.

The wire 10^b is fed to the aperture 20^b in the knife 20 through the vertical groove 26, which is formed in the outer face of the member 13 and communicates at its upper end with the socket 20^a therein and through the tube 27, which projects through the upper portion 1^a of the supporting-frame 1 and a suitable distance within the groove 26. The upper portion of the groove 26 is gradually broadened, as shown at 26^a, to permit the wire 10^b to have a lateral movement as the knife 20 is reciprocated in the severing operation. As the end of the wire 10^b is fed within the upper portion of the member 13 it is caused to be laterally deflected by contact with the tapered wall of the groove 15 therein, as shown by dotted lines in Fig. 2, thereby causing the fed section when severed to fall laterally and rest in horizontal position within the magazine.

At the forward end of the block or holder 2 is secured a die 27^a of any suitable formation, which is adapted to coact with the contiguous end of the table 3 in the clenching of a discharged staple from the holder.

Having thus described the arrangement and construction of the parts comprising the features of my invention, I will now briefly describe the form of mechanism shown in the drawings for intermittently feeding the wire and actuating the movable parts thereof, the said mechanism being similar to that shown and described in the application, Serial No. 213,925, filed by William F. Truman and myself on June 24, 1904, and the application, Serial No. 217,105, filed by me on July 18, 1904.

Motion is transmitted to the shaft 28, which is mounted in the frame 1, and to the spur-gear 28^a thereon from any suitable power and is communicated from said gear to the gears 29 and shafts 29^a, which are mounted at either end of said frame, through the medium of the

idler-pinions 30. Eccentrics 31 are employed for communicating a reciprocal movement from the shafts 29^a to the tables 3 and 4 and are connected with said tables through the medium of the eccentric-rods 31^a and the links 32, the latter pivotally connecting said rods with a boss 33 at either end of the frame 1 and the associated table. The wire 10^b from which the staples 10^a are formed is caused to be intermittently fed to the magazine member 13 by the feed-wheels 34 and 35, the former, together with the rigidly-connected ratchet 36, being loosely mounted on the stud or shaft 37 and the latter being loosely mounted on the stud 38. An arm 39 is mounted on the shaft 37 and carries a pawl 40 for engaging the ratchet 36 and imparting the proper movement to the feed-wheel 34 at each forward movement of the arm 39, which latter is occasioned by reason of the link 41 connecting the arm 39 with the table 4, thereby causing the feed-wheel 34 to be rotated a predetermined distance at each forward movement of the said table and to feed the required length of wire to the magazine.

In the operation of my invention the revolving of the eccentrics 31 causes a properly-timed reciprocal movement of the tables 3 and 4, the former receding to release the object being stapled and the latter moving for the purpose of imparting the proper movement to the plunger 6 and attached forming-finger 9. As the table 4 recedes the plunger 6 is moved rearwardly on the guiding-ribs 7 and the finger or hook 9 caused to swing upwardly in position to centrally engage and draw the lower wire-section 10 in the magazine within the holder 2, said finger being guided in its movement by reason of the rollers 11 thereon operating within the grooved ways 12 of said holder. As the wire-section is drawn within the holder its ends are engaged by the converging walls of the reduced or countersunk portion 16 and is gradually drawn into U shape and under the pressure-block 17 and within the bore 5 of the holder, the pressure-block being raised against the tension of the spring 17^a as the staple engages the rounded lower forward edge thereof. As soon as the legs of the staple have been drawn in parallelism it is forced by the pressure-block 17 from the plane of the reduced portion 16 of the holder to the plane of operation of the tongue 6^a and in advance thereof, thus placing it in position to be discharged from the holder on the return movement of the plunger. As the plunger returns to discharge the formed staple the forward beveled portion of the finger 9 raises the wire-sections 10 in the magazine to enable it to pass thereunder and then drops from in advance of the tongue 6^a to permit the discharge of the staple 10^a. On each rearward movement of the table 4 a proper length of feed-wire 10^b is caused to be fed to the upper portion of the magazine, and

this is severed to permit it to fall laterally and rest in horizontal position on top of the previously-cut section by reason of the lug 21^a on said table coacting with the stud or pin 21 on the knife 20 at the limit of rearward movement of the table and causing the apertured portion of the knife through which the wire is fed to shear against the die 25, thereby causing the supply of wire-sections in the magazine to be replenished as rapidly as they are removed by the action of the finger 9. The magazine is stocked in the first instance by cutting and positioning the wire-sections therein by hand, after which the initial supply is constantly maintained by the operation of the feeding and cutting mechanism.

While it has been necessary in the description and drawings illustrating my invention to show and describe some means for operating the staple-forming mechanism and feeding the wire thereto, it will be obvious that numerous methods of performing these functions might be devised without detracting from the merits of my invention and also that such changes in the form, proportion, and minor details of construction of the parts as fairly fall within the scope of my invention may be made without departing from the spirit or sacrificing any of the advantages thereof.

In the construction, operation, and arrangement of the parts of my invention special attention has been given to the adaptation and use of the same in connection with machines employed for weaving wire fabric of the class in which the woof-wires are secured to the warp-wires by staples, one of the staple forming and discharging devices being mounted at the intersection of each warp-wire with a freshly-fed woof-wire.

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

1. In a staple-forming machine, a holder having a cam-groove therein, a plunger reciprocally mounted in said holder in contiguous position to a portion of said cam-groove, a hooked finger pivoted to the forward end of said plunger and guided in its movement by said groove and adapted to be swung by said groove on the receding movement of the plunger into position to engage a wire-section disposed on the opposite side of the plunger to that of the finger and draw it into U shape within said holder in advance of said plunger.

2. In a staple-machine, a holder having a longitudinal bore therein and parallel cam-grooves in said bored portion, a plunger reciprocally mounted in the bored portion of the holder and having a discharging-tongue at its forward end, a magazine for holding wire-sections disposed on one side of said tongue, and a hooked finger pivotally secured to the forward end of the plunger and having lateral projections formed thereon to operate

within the cam-grooves whereby to cause the finger to be swung into position to engage and draw a wire-section from the magazine at a fixed point in the movement of the plunger, draw the section into U shape and on its return movement be moved to permit the discharge of the staple.

3. In a staple-machine, the combination with the forming and discharging elements, of a magazine for holding a plurality of sections of wire to be consecutively engaged and formed into staples by the forming element, mechanism for intermittently feeding a section of wire to said magazine, and means for severing the wire-sections fed to the magazine.

4. In a staple-machine, the combination with a staple-discharging plunger and a staple-forming element disposed at one side thereof, of a magazine for holding a plurality of wire-sections, said magazine being disposed on the opposite side of the plunger to that of the forming element, mechanism for intermittently feeding a section of wire to said magazine, and mechanism for severing the fed section for replenishing the supply in the magazine.

5. In a staple-machine, a holder having guiding means for a plunger and cam-guiding means for a forming element, a plunger operatively mounted in said holder and guided by said first guiding means, a forming element pivotally attached to the end of the plunger and guided in its movement by said cam-guiding means, said cam-guiding means being disposed to cause the forming element to be moved to engage a wire-section fed to the opposite side of said plunger and draw it into U shape on the rearward movement of the plunger, and means for causing the formed staple to be moved in advance of the plunger to permit its discharge on the return movement of said plunger.

6. In an apparatus of the class described, a holder having a vertical bore therein and a portion of its upper surface recessed, the side walls of said recessed portion rearwardly converging and merging in the walls of the bored portion, a discharging-plunger reciprocally movable in a plane immediately below said recessed portion, a hooked finger pivoted to the under side of the plunger and movable in one direction to engage a section of wire fed to said recessed portion and form it into a staple by drawing it within the bored portion of the holder and in the other direction to recede from in advance of the plunger, and a pressure-block for moving the formed staple in advance of the discharging-plunger.

7. The combination in a staple-machine, of a holder, an element movable in said holder to discharge a staple formed therein, a magazine mounted in a plane intersecting the plane of movement of the plunger and having its discharge in contiguous position thereto, said magazine being adapted to hold a plurality of

wire-sections at one time, mechanism for feeding wire-sections to said magazine, mechanism for severing such sections and a staple-forming element movable by said plunger
5 under said magazine and adapted to engage a wire-section, form it into U shape within said holder, and leave it in advance of the discharging element.

In witness whereof I have hereunto signed my name to this specification in the presence 10 of two subscribing witnesses.

VERNON HOXIE.

Witnesses:

H. P. STEARNS,
M. H. VOWLES.