

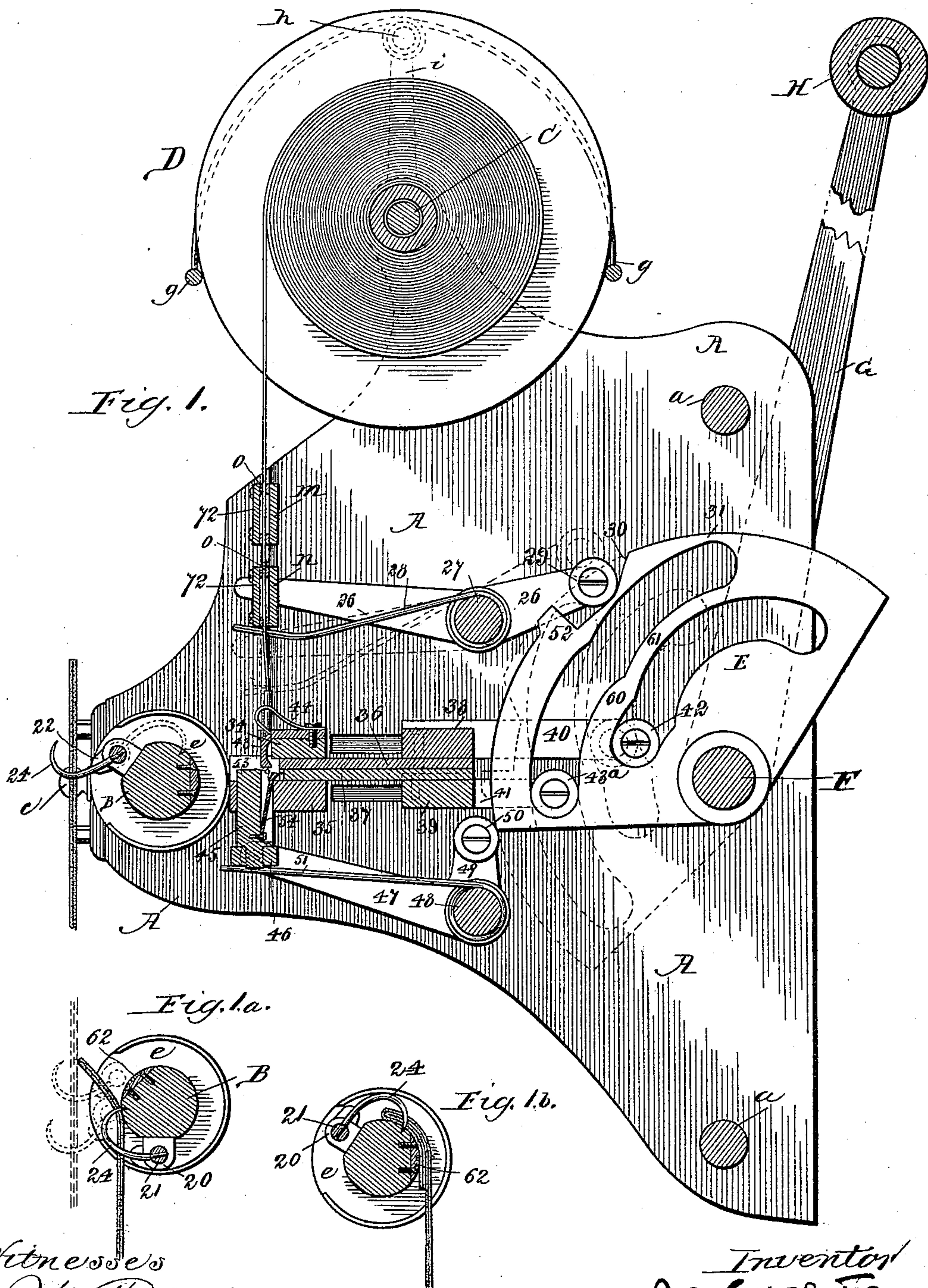
(No Model.)

4 Sheets—Sheet 1.

R. H. LITTLE.
STAPLE FASTENING MACHINE.

No. 449,779.

Patented Apr. 7, 1891.



Witnesses
W. Rossiter.
L. B. Carpenter.

Inventor
Robert H. Little
By Oliver Fisher
His Attys.

(No Model.)

4 Sheets—Sheet 2.

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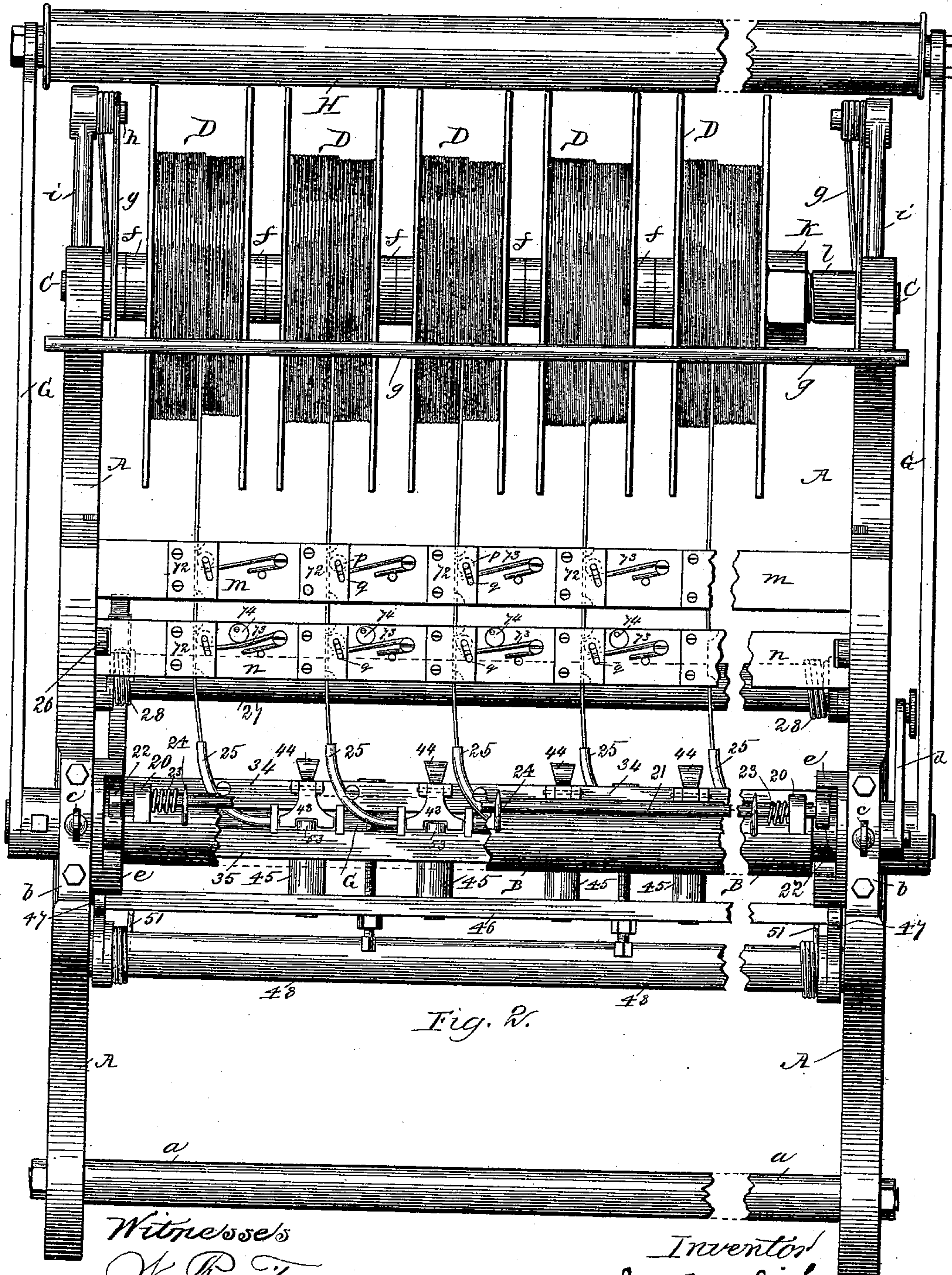


Fig. 2.

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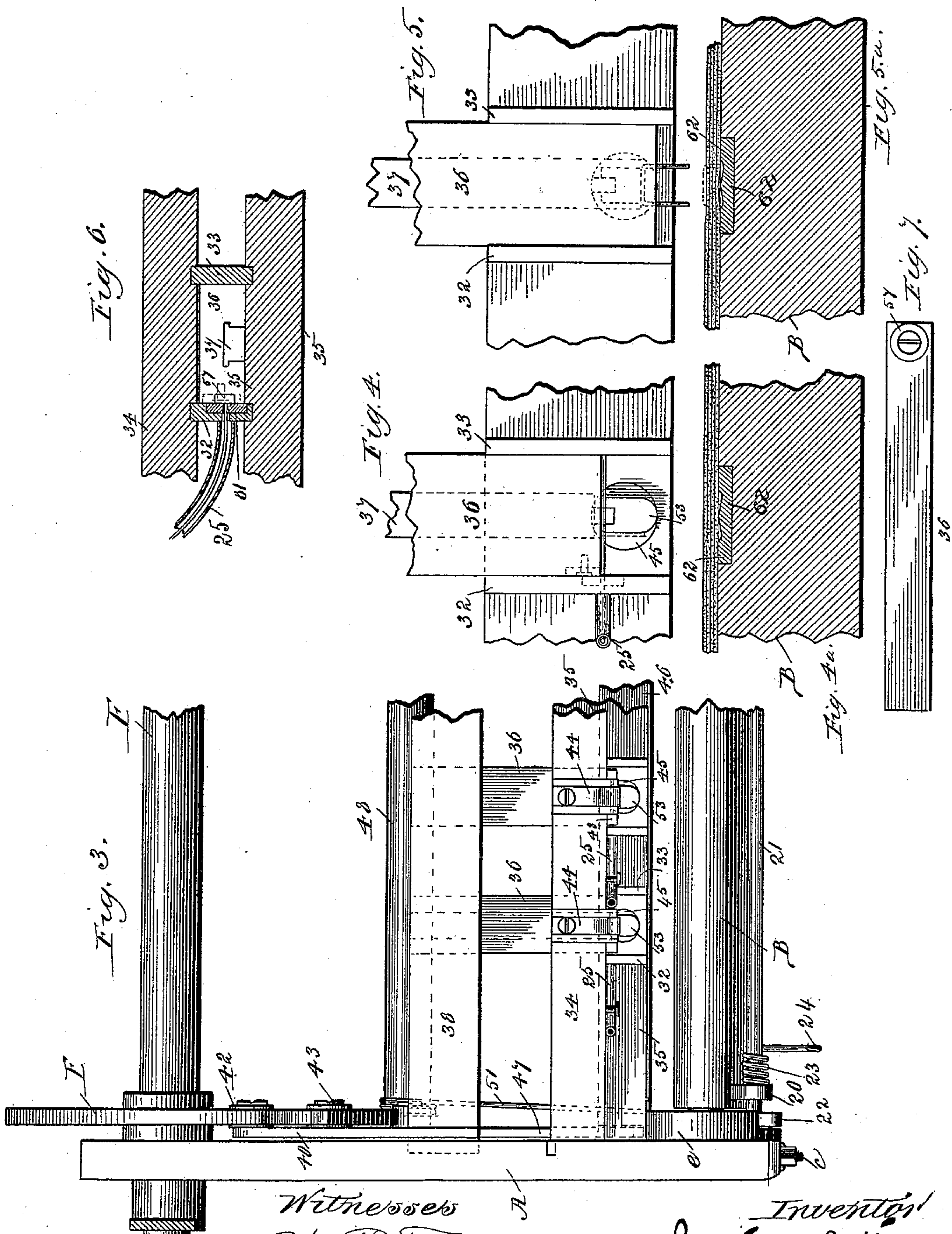
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Fig. 8.

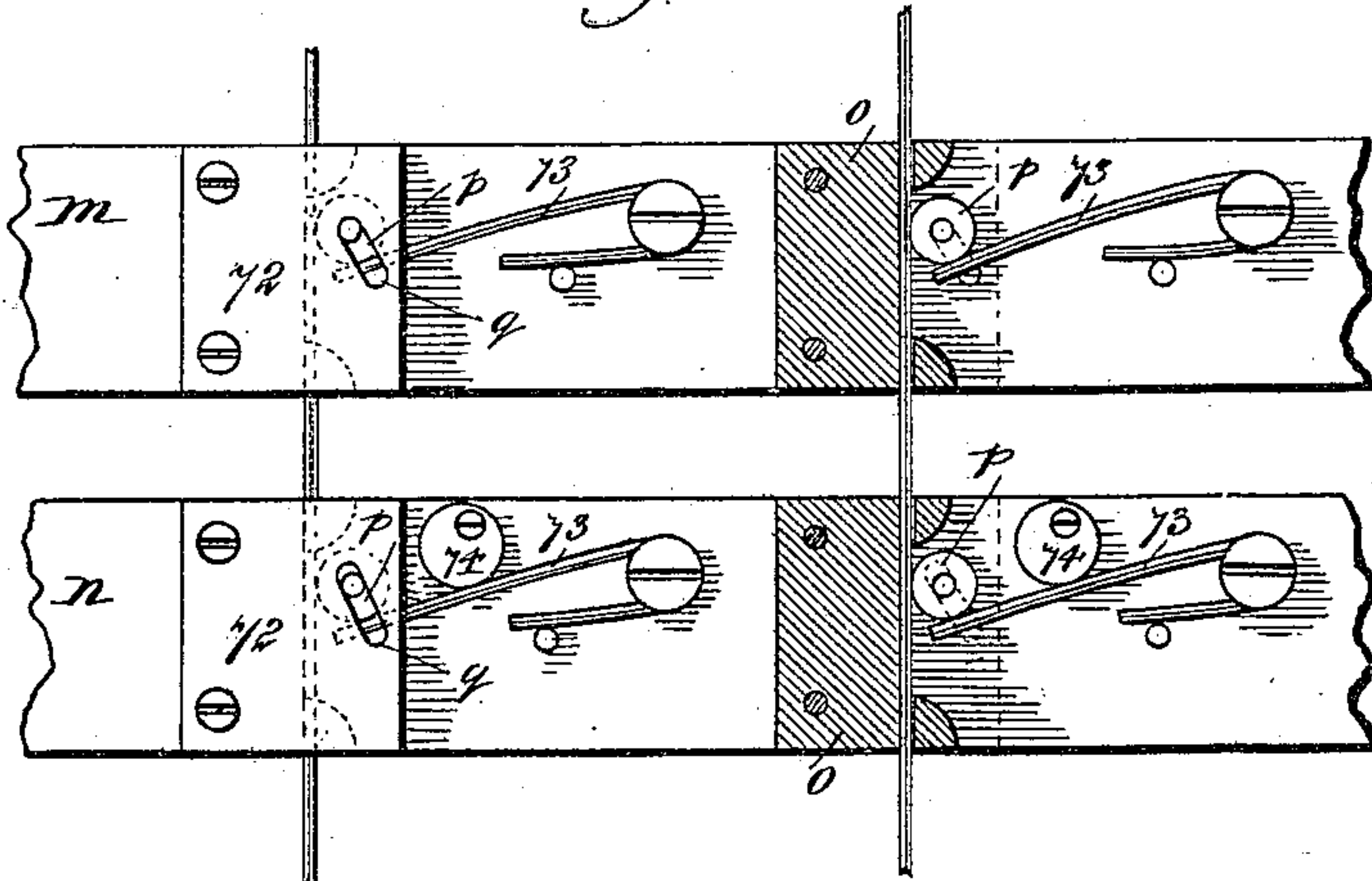


Fig. 9.

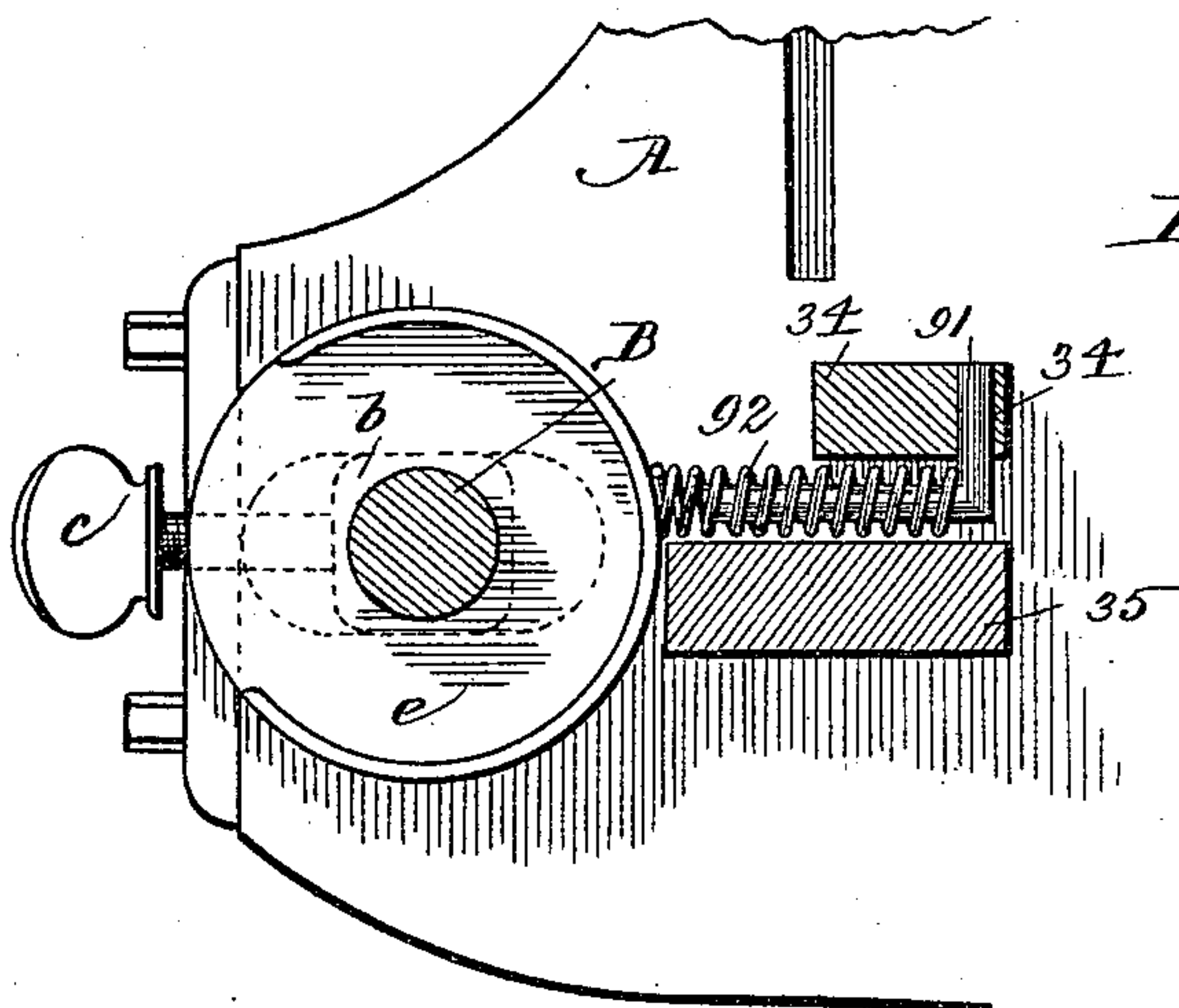
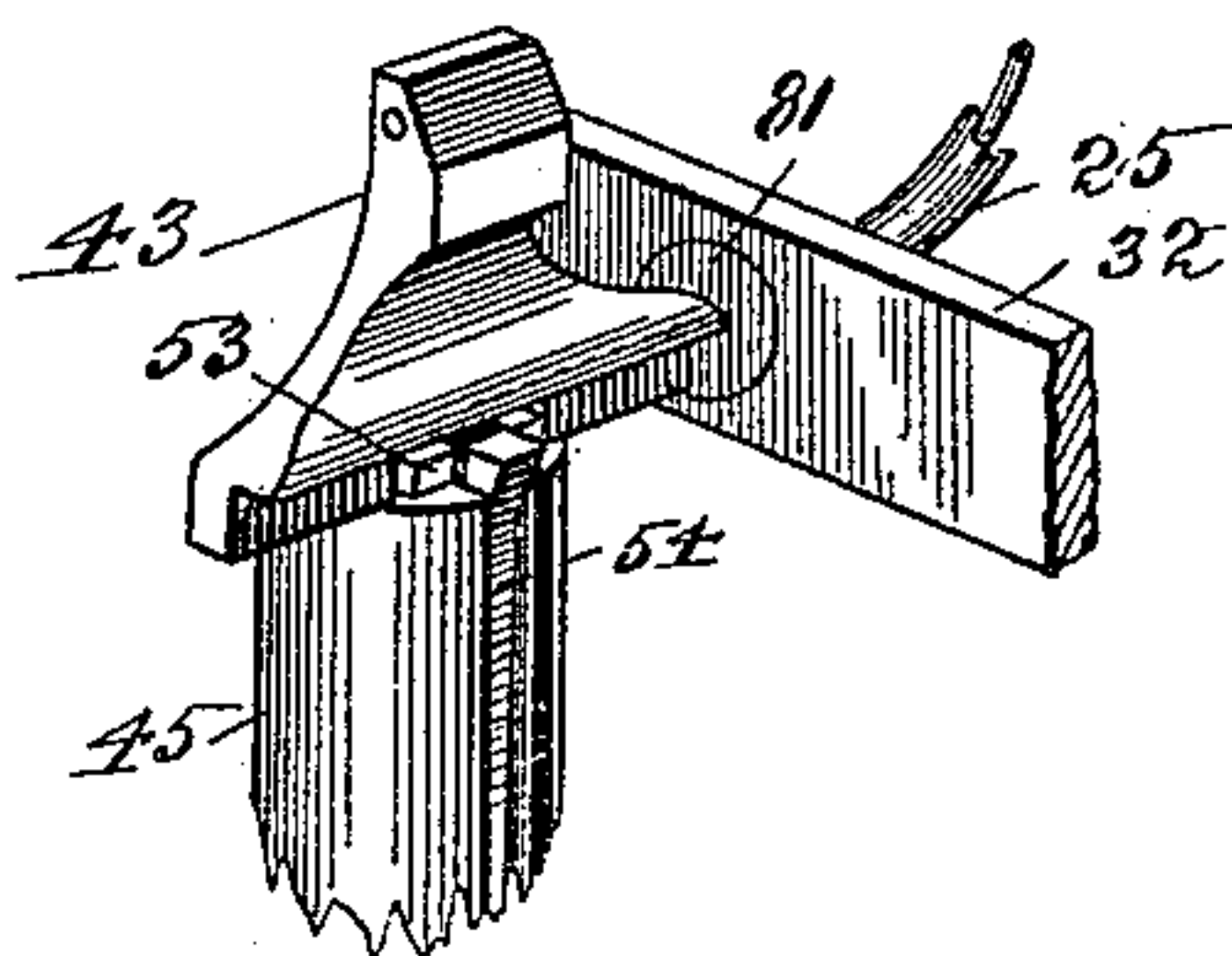


Fig. 10.



Witnesses

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UNITED STATES PATENT OFFICE.

ROBERT H. LITTLE, OF CHICAGO, ILLINOIS.

STAPLE-FASTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 449,779, dated April 7, 1891.

Application filed February 10, 1890. Serial No. 339,834. (No model.)

To all whom it may concern:

Be it known that I, ROBERT H. LITTLE, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Staple-Fastening Machines, of which the following is hereby declared to be a full, clear, and exact description sufficient to enable others skilled in the art to which such invention appertains to make and use the same.

The invention relates to machines designed to secure two or more plies of fabric or other like material permanently together by means of wire staples forced simultaneously through the plies at suitable distances apart and firmly held in place by clinching.

The invention is more especially directed to machines of the class which are used to close the ends of shipping-bags—such, for example, as are employed in transporting grain, flour, dye-stuffs, fertilizers, &c.; and the object in view is to provide improved means whereby the free ends or plies of fabric can be folded and held during the stapling operation and be thereafter automatically cast off in readiness to receive the next bag or article.

In connection with the feed devices, which advance the wire in regular length to form into staples, the purpose is to simplify and render more effective the structural parts whereby the wire is cut and bent and the staples driven and clinched.

The machine is organized with reference to the orderly progression and performance of the several functions named, and the details of structure and the character of the invention will clearly appear from the description following, and be thereafter more distinctly pointed out by claims at the conclusion of the same.

In the accompanying drawings, forming part of this specification, like designating characters denote like parts of structure throughout.

Figure 1 is a cross-section view from front to back of the machine; Figs. 1^a and 1^b, detail section views of the carrier-roll, showing the hook-clips in different positions; Fig. 2, a general view of the machine in front elevation; Fig. 3, a part detail view, in plan, at the level of the carrier-roll, the wire-reels and the feed and tension mechanism being re-

moved; Figs. 4 and 5, similar views, on enlarged scale, showing different positions of the staple bender and driver; Figs. 4^a and 5^a, section views of the carrier-roll at the clinching-die; Fig. 6, a detail view immediately in front of the bender and driver, exhibiting the relation of the wire-delivery guide thereto; Fig. 7, a detail elevation at the side of the cutter and bender; Fig. 8, detail view of the tension-clamps and feed devices; Fig. 9, an end elevation (parts in section) of the box and race for the carrier-roll; Fig. 10, a perspective detail of the anvil and keeper in back view.

The parallel standards A, held rigidly apart at suitable distance by the through-bolts *a*, constitute the frame of the machine upon which these several operative parts are mounted.

Extending from side to side across the front of the machine is the carrier-roll B, which serves to sustain the free ends of the bag-plies or the like, and to present the same in proper position for fastening.

The standards A are furnished with journal-boxes *b*, which receive and afford bearings for the reduced ends or journals of the carrier-roll B, said boxes being adjustable by tension-screws *c* to vary the position of the carrier-roll in keeping with the thickness of the plies or folds of fabric to be fastened. A crank-arm *d* serves to rotate the carrier-roll B in either direction when desired.

Projecting from the inner face of the boxes *b* are the circular races *e*, having inturned flanges thereon, which latter are cut away for a short distance at the front to allow for the reverse play of the cam-lugs which actuate the hook-clips, as presently described. The races *e* are slotted at the center to admit the journals of the carrier-roll B through them and to allow for shift of said journals when the roll B is adjusted by means of its journal-boxes *b*.

Studs 20, projecting from the roll B, receive and sustain the clip-rod 21, which lies parallel with the roll, and at its terminals is furnished with cam-lugs 22, designed to travel against the flanged races *e*. Springs 23 bear upon the clip-rod 21 and tend to turn said rod in direction reverse to that determined by contact of cam-lugs 22 with the flanged races *e*. The rod 21 is furnished at suitable distances with the hooks 24, secured rigidly thereto, which in

open position receive the bag ends or plies preparatory to folding and fastening the same. The open position of the clips 24 is shown by Fig. 1 of the drawings, in which situation the springs 23 have thrown the clip-rod 21 forward, the cam-lugs 22 standing in the cut-away space clear and free from the flanges of the races *e*. On turning roll B by means of its handle *d*, the clip-rod 21 descends until the cam-lugs 22 encounter the inturned flanges of the races *e*, whereupon said rod 21 is turned in its lugs 22 and the hooks 24 caused to close inward against the end plies of the bag, as in Fig. 1^a. The further rotation of the roll B laps or folds the plies and brings the clip-rod and hooks into position shown by Fig. 1^b, in which situation the movement is temporarily arrested to permit the fastening of the folded plies by means of the staples, as will presently appear.

Near the top of the standards A is the transverse axle C, which sustains the wire-reels D, said reels being of any suitable number, according to the width of the plies to be fastened, and being free to turn upon the axle C to supply the wire in successive portions necessary in forming the staples. The spools D can be spaced apart by washers *f* or the like, if necessary. A set-nut *k*, threaded to a sleeve *l* upon the axle C, bears against the face of the adjacent spool D, and by adjustment acts brake-like to maintain the several spools against irregular rotation. A spring-guard, sustained by studs *h* from arms *i* above the standards A, bears at front and back against the rims of the reels D, and serves to insure the orderly delivery of the wire.

Slightly below the spools D and from side to side across the front of the machine extend the feed-clamps *m n*, the upper clamp *m* being fastened at its ends to the standards A, while the lower one *n* is received in guideways of the standards and has a limited vertical play therein. Each clamp *m n* consists of a base-bar having fixed blocks or jaws *o* secured thereto at proper distances, corresponding with the number of the staples and the spaces between them. The blocks *o* have a re-entrant edge furnishing top and bottom offsets, holes being drilled vertically through said offsets to allow for passage of the reel-wire. Slightly beneath the upper offset plays the roll *p*, which is journaled in slotted ways *q*, formed in the base-bar and in a small plate 72, fastened to it. A spring 73 bears upon the pin-tle of roll *p* and tends to throw the same upward in its slotted ways to pinch the wire between said roll and the opposing edge of block *o*. The block and roll thus constitute a fixed and movable jaw, between which the wire is held, fed, and released, according to the movements of the lower clamp *n*. An eccentric stop 74 can be set at will to depress the spring 73, pertaining to the several rolls *p* of the lower clamp *n*, thus allowing such rolls to drop away in their slotted bearings, so that they no longer grip and feed the wire. By

such expedient the number and relative position of the staples can be varied as the needs of the operator may require.

The staple-wire from the several spools D is led through the clamps *m n*, and by means of the curved delivery-guides 25 is presented in horizontal relation at the staple bending and clinching mechanism. The feeding of the wire in successive portions to such mechanism is effected by movements of the lower clamps *n*. Near each of its ends the clamp-bar *n* is slotted to receive the front terminals of the brackets 26, these brackets being loosely set to turn for a limited distance upon the cross-rod 27, and one of said brackets having a rear extension furnished with wrist-pin (and friction-roll) 29 to bear against the edge or face of an oscillating cam-plate E. A stout spring 28 encircles the rod 27 and rests at its free end beneath the clamp-bar *n*, and tends thereby to sustain said clamp and to take up the lost motion which is apt to develop in the shift of the clamp through the medium of the bracket-arms 26 and the cam-disk E. The rod 27 can be turned at will in its bearings in standards A to adjust the tension of spring 28, and thereafter be held tightly by use of clamp-nuts thereon, which are set against said standards. Cam-plate E is set rigidly upon rock-shaft F, which is mounted in the machine-frame and provided with arms G and cross-bar H to actuate said shaft and its cam. On drawing the cross-bar H forward the cam-plate E rotates, together with its shaft F, and quickly lifts the crank-pin 29 from its abruptly-notched seat 30, thus presenting the delay-surface 31, over which the crank-pin rides without further movement.

In clearing the notched seat 30 of the cam-plate the bracket-arms 26 are turned downward at their front ends, thereby depressing the clamp-bar *n* against the tension of the spring 28. The downward movement of the clamp-bar *n* (the wire being in position through it) causes the several rolls *p* to rise slightly in their slotted ways *q*, thereby tightly gripping the wires between them and the companion jaws *o*. The wire is thus fed forward from the reels D and is advanced through the delivery-guides 25 a distance sufficient to supply a length of wire for conversion into a staple. On reversing the movement of the cross-bar H the shaft F is returned to its normal position, the crank-pin 29 finally clearing the delay-surface 31 of the cam-plate and riding down into the notched seat 30. So long as the wrist-pin 29 remains upon the delay-surface 31 it is clear that the lower clamp-bar *n* is firmly held by the bracket-arms 26 in its downward position. During this interval the cutting, bending, and clinching of the staple are being accomplished, so that no retreat of the clamp-bar *n* occurs until the staple-length is fed and severed. The reaction-spring 28 tends to throw the crank-pin 29 into its notched seat on the cam-plate E, and thereby aids in raising the clamp-

bar *n* to its upper position in readiness to feed the next length of wire. During the upward movement of the clamp-bar *n* its several jaw-rolls *p* drop away in their slotted bearings *q*, slipping past the wires and against the stress of the springs 73, thus relieving the wires from risk of being bent or disarranged. Any tendency which the free end of the wires may have to recoil upon the spools *D* is effectually prevented at this stage by means of the clamp-jaws *p p* in the upper bar *m*, which firmly grip and hold the wire until the lower clamp-bar *n* begins its next descent.

The curved guides 25 at their lower or delivery terminals are fitted to holes which pass through the way-plate 32, said plates and their companion plates 33 being fixed at definite intervals between the cap-plate 34 and base-plate 35, which latter extend across the machine and are rigidly secured at their ends in the standards *A*. The cap and base plates 34 35 and side plates 32 33 constitute a box-like structure planed true and smooth, within which moves back and forth the bender 36 and staple-driver 37. At the middle portion of its bottom face the bender 36 is furnished with a T-like slot or groove, within which is received the driver 37, fitted to move snugly therein, and at the back these two parts are secured by screw or like device to the reciprocating bars 38 and 39, respectively. The base-plate 35 supports the wings of bender 36 at each side of its T-slot and also supports the lower face of the driver 37 during reciprocation. The bars 38 39 extend across the machine and are sustained in straight ways or rail-guides in the standards *A*, and are provided with arms 40 41, having wrist-pin (and friction-roll) 42 43^a, engaging with suitable camways in the oscillating plate *E*, by which arrangement it appears that the bender 36 and driver 37 move independently of each other. A keeper 43, pivoted, as shown, at the front of the cap-plate 34 and having a spring 44 to bear against the tail thereof, overhangs the front face of the bender 36 and stands with its lower edge slightly above the hole in the way-plate 32. The keeper 43 is notched at its lower edge, (see Fig. 1,) so as to clear the projecting head of the anvil and stand at rest under influence of the spring 44 in its lower or closed position. The keeper can be thrown upward about its pivot to inspect the several working parts concealed thereby.

The anvils 45 are substantially cylindrical in form and in number corresponding with that of the several feeding and bending devices. The anvils snugly project, as shown, through holes in the base-plate 35, being fastened at their lower ends to the carrier 46. The carrier 46 is a long bar extending from side to side across the machine and fixed at the front ends of the bracket-arms 47, which latter pivot loosely upon the cross-rod 48. One of the brackets 47 has a rear extension 49, constituting, with said bracket, a bell-crank lever, said extension being furnished

with a wrist-pin (and friction-roll) 50, which rests against the face of the cam-plate *E*. The springs 51 encircle the cross-rod 48 and bear at their free front ends beneath the carrier-bar 46. The tension of said springs can be varied at will by loosening the nuts on the ends of the cross-rod 48, where said rod passes through the standards *A*, and turning such rod until the desired adjustment is obtained, after which the nuts are screwed down tight, and the springs 51 thus kept in condition to act promptly upon the carrier 46 and to take up any lost motion in the bracket-arms 47 and extension 49. Ordinarily the springs 51 hold the carrier 46 and its anvils 45 in upper position, so that the anvils protrude slightly above the base-plate 35. This position is maintained until such time as the lug 52 on cam-plate *E* encounters (during the forward turn of such plate) the wrist-pin 50, whereupon the bracket-levers 47 49 will be rocked about their shaft 48 to depress the carrier-bar and anvils 45 for a brief interval, during which the driver is acting to force the staples home and clinch them. The anvils 45 are smoothly shaped to slide within the holes of base-plate 35, but are reduced at their upper ends to present a projecting head 53 of approximately U shape, about which the severed length of wire is bent to produce the staple. A notch or ledge is cut across the back of the protruding portion 53 of the anvil—that is to say, along the back of the U-head—which ledge serves as a seat for the middle part of the wire-length as the wire is projected through the side plate 32 and laid across the path of the bender. The wire is thus sustained temporarily to await the advance of the cutter 57, said cutter being carried at the front of the bender 36 and at the side adjacent the perforated die 81 in the guide 32. The cutter 57 is conveniently made circular in form to seat within the bender 36 and so as to be readily readjusted to present a new shearing-edge.

In preferred practice the groove of the oscillating plate *E*, within which travels the wrist-pin 43^a for the driver 37, is made of cam form for a slight distance just before the delay-surface 60 is reached, so that at the outset of the downturn of disk *E* the arm 41, bar 39, and driver 37 will be projected a brief space sufficient to enable the front of the driver to barely abut against the back of the U-head 53 of the anvil. By such expedient the notch or ledge on the anvil-head is supplemented by the front face of the driver in affording a secure pocket or seat for the middle portion of the wire length, so that the staple-piece may not become displaced or drop down upon being severed. The nicety and precision of this preliminary movement of driver 37 may not be always maintainable, so that in lieu thereof, or as an adjunct thereto a spring-tongue 54 is set within a longitudinal recess of the anvil 45, being secured near the lower end thereof and furnished at its upper

end with an expanded tip, which has a limited play to and fro across the anvil-slot. As the anvil descends the upper front edge of the base-plate 35 bears against the expanded tip of the tongue 54, so that finally said tongue rests snugly within its slot and below the plane of the advancing driver 37. In its upper or open situation the top of the tongue-tip 54 is at the level of the notch-seat in the U-head of the anvil and spans the space, extending thence backwardly toward the driver 37. The tongue acts, therefore, in conjunction with the notch-ledge, to seat the mid portion of the wire length, so that this cannot drop down any farther after being severed. Unless the staple were held thus from dropping lower, it might be sheared and broken instead of being bent by the advancing bender 36, as desired. The parts being in position shown by Fig. 1, and the wire length for the staple laid straight across the path of the bender by means of the feeding mechanism, the delivery-guide 25, and keeper 43, it will be seen that the advance rotation of the cam-plate E must cause the wrist-pin 42 and arm 40 to push forward the slide 38, thereby carrying with it the cutter and bender 36. At this juncture the situation of the several parts will be as shown in Fig. 4. The cutter 57 first shears the wire length at the hole in guideway 32, and the severed staple-piece sustained upon the ledge at the back of the anvil-head 53 is caught almost immediately by the advancing face of bender 36. The bender encounters the extended wire at the level of the cross-slot which constitutes a part of the T-channel in the bender. The middle portion or body of the U-staple remains stationary upon the anvil-ledge, while on either side the corners of the T-slot bear against the wire and quickly fold it outward along the sides of the anvil-head to form the staple-shanks. The shanks are received snugly within the edges of the T-slot as the folding proceeds, so that the staple when finished lies true and straight therein in readiness to be thrust forward by the plunger-like action of the driver on withdrawal of the anvil below the path of said driver. The staple being now formed, the further rotation of the cam-plate E causes the lug 52 to encounter the crank-pin 50, depressing the carrier 46, and thus effecting the retreat of the anvil 45 and its tongue 54 to a position below the upper face of the base-plate 35. By this time the wrist-pin 43^a has cleared the delay-surface 60 on the oscillating plate E and encounters the cam-surface 61 on said plate, thereby pushing forward the arm 41 and bar 39 and with it the driver 37. The driver 37, moving in the T way or channel of the bender 36, quickly encounters the staple and advances the same toward the carrier-roll B. The folded end of the plies is held in position shown by Fig. 1^b, and as the staple is forced forward the shanks thereof pass through the folds and encounter the clincher-die 62, fast-

ened upon the roller B. The clincher-die 62, Fig. 4^a, is recessed, as shown, so that the shanks of the staple are turned inward toward each other, and at the end of the forward stroke are tightly set by the clinching action of the driver 37. The cross-bar H is now thrust backward, thus reversing the oscillatory movement of the cam-plate E and eventually restoring the anvil 45, bender 36, and driver 37 to normal position, Fig. 1, in readiness to sever the next wire and form and drive the staple. A further turn of the crank *d* on the carrier-shaft B allows the cam-lugs 22 to clear the races *e*, thus releasing the clip-rod 21 and causing the hook-clips 24 to fly open. In doing so the folded bag end is cast off, so that the bag being closed and fastened drops away in readiness for the next to be set upon the hooks 24. Obviously the roller B and rock-shaft F can receive movement through a shaft common to both by means of intermediate gear, cams, clutch mechanism, or the like arranged to bring said roller and shaft successively into action, as the progressive operations of the machine may require. The conversion of the device from a hand to a power form would thus be effected without essential departure in invention. Nor is it material that the precise details of structure hereinbefore described, be employed, since these may be varied by the skill of the mechanic without departure from the spirit of the actual advance made. Thus, for example, while the slot in the bender 36 is referred to, for greater precision, as of T shape, it will be manifest that any other approximate form which will serve in like fashion to accomplish the same functions in sustaining the driver and as a support for the legs of the staple must be the substantial equivalent of the T-slot and included within the definition thereof.

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

1. In staple-fastening machines, the combination, with the staple-support and with the drive mechanism, of the sustaining-roll having a clinching-seat thereon and suitable clips to retain the plies between said seat and the staple-driver during the fastening operation, substantially as described.

2. In staple-fastening machines, the combination, with the revolving roll, of the oscillating rod carried thereby and having clip-hooks thereon to receive the plies and to bear at intervals against said roll, and the cam-race to determine the oscillation of said rod and hooks, substantially as described.

3. In staple-fastening machines, the combination, with the sustaining-roll, of the clip-hooks projecting beyond said roll and suitable means to oscillate said hooks to and from the same, whereby the plies to be fastened may be received and folded during the revolving movement, substantially as described.

4. In staple-fastening machines, the com-

5 bination, with the staple-support and with the driver, of the adjustable roll and the clip-hooks projecting beyond said roll and oscillating to and from the same, whereby plies of different thicknesses may be received, lapped, and held for stapling, substantially as described.

10 5. In wire-feed mechanism for staple-fasteners, the combination, with the clamp and its movable grip-jaw, of the tension-spring to determine the shift thereof and the adjustable stop bearing against said spring to throw said jaw in and out of action, substantially as described.

15 6. In staple-fastening machines, the combination, with the shifting anvil having a U-like head, of the reciprocating bender having substantially a T-channel therein, whereby in co-operation the staple-shanks are bent and held, and a driver moving in said T-channel to force the staple home, substantially as described.

25 7. In staple-fastening machines, the combination, with the bender and with the anvil reciprocating substantially at right angles thereto, of the keeper extending across the anvil and in front of the bender to lay the wire, substantially as described.

30 8. The combination, with the plate having guide-inlet therein, of the bender and anvil reciprocating substantially at right angles to each other and the pivoted keeper extending across the anvil and in front of the bender to lay the wire, substantially as described.

35 9. The combination, with the anvil having U-like head and a cross-notch at its back, of the reciprocating bender having T-channel to inclose said head, substantially as described.

40 10. The combination, with the anvil having U-like head and a cross-notch at its back, of the reciprocating bender having T-channel to inclose said head and the staple-driver moving in said T-channel, substantially as described.

45 11. The combination, with the wire-guide and with the keeper, of the anvil having U-like head and the reciprocating bender having T-channel to inclose said head, substantially as described.

50 12. The combination, with the anvil having

U-like head and a vibrating tongue, of the reciprocating bender having T-channel to inclose said head, substantially as described.

13. The combination, with the wire-feed and its vibrating brackets, of the reciprocating bender having T-channel therein, the staple-driver moving in said channel, the shifting anvil having U-like head and actuating-brackets, and the oscillating cam-plate connected up with said several parts to effect the orderly movement thereof in succession, substantially as described.

14. In staple-fastening machines, the combination, with the series of wire-supply devices, such, for example, as a set of reels, of a wire-feed mechanism common thereto and comprising a stationary and a movable clamp each provided with grip-jaws, the jaws of the fixed clamp acting in unison to hold the several wire strands, while the jaws of the movable clamp are in release position, and vice versa, whereby the multiple wires are fed simultaneously in successive portions, substantially as described.

15. In staple-fastening machines, the combination, with the series of anvils, benders, and drivers acting in unison, of the wire-feed mechanism common to the several anvils and co-operating to advance the wire lengths simultaneously for each anvil, substantially as described.

16. In wire-feed mechanism for staple-fastening machines, the combination, with the clamp having a series of stationary jaws, of the corresponding set of shifting jaws mounted by inclined bearings in said clamp and the tension-springs resting against the respective shifting jaws to determine the play thereof, substantially as described.

17. In wire-feed mechanism for staple-fastening machines, the combination, with the clamp having a stationary jaw, of the shifting jaw mounted by inclined bearings in said clamp and the tension-spring resting against said shifting jaw to determine the play thereof, substantially as described.

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