(No Model.) 3 Sheets—Sheet 1.

# J. LYNAM.

## BOOK STAPLING MACHINE.

No. 412,712. Patented Oct. 8, 1889.

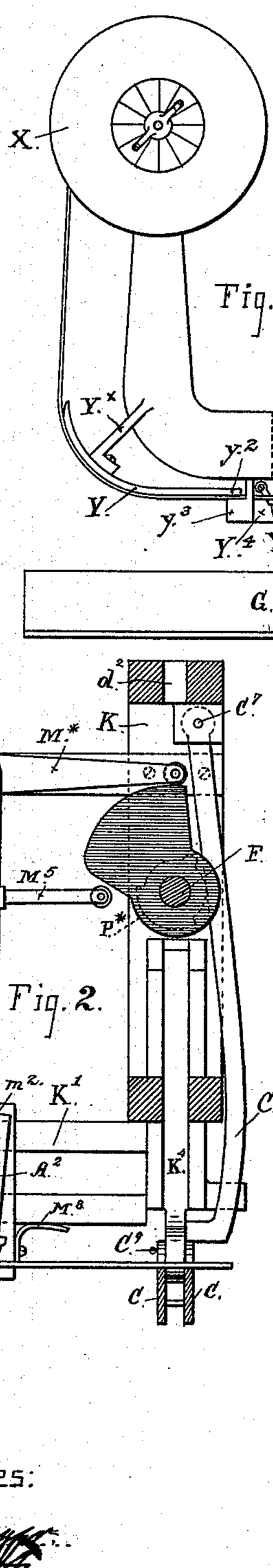

Fig. 1.



Fig. 2.



Fig. 3.

Witnesses:

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J. E. Ford

Inventor:

Joseph Lynam

By Smith & Osborn

Attys.

(No Model.) 3 Sheets—Sheet 2.

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## BOOK STAPLING MACHINE.

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Fig. 4.

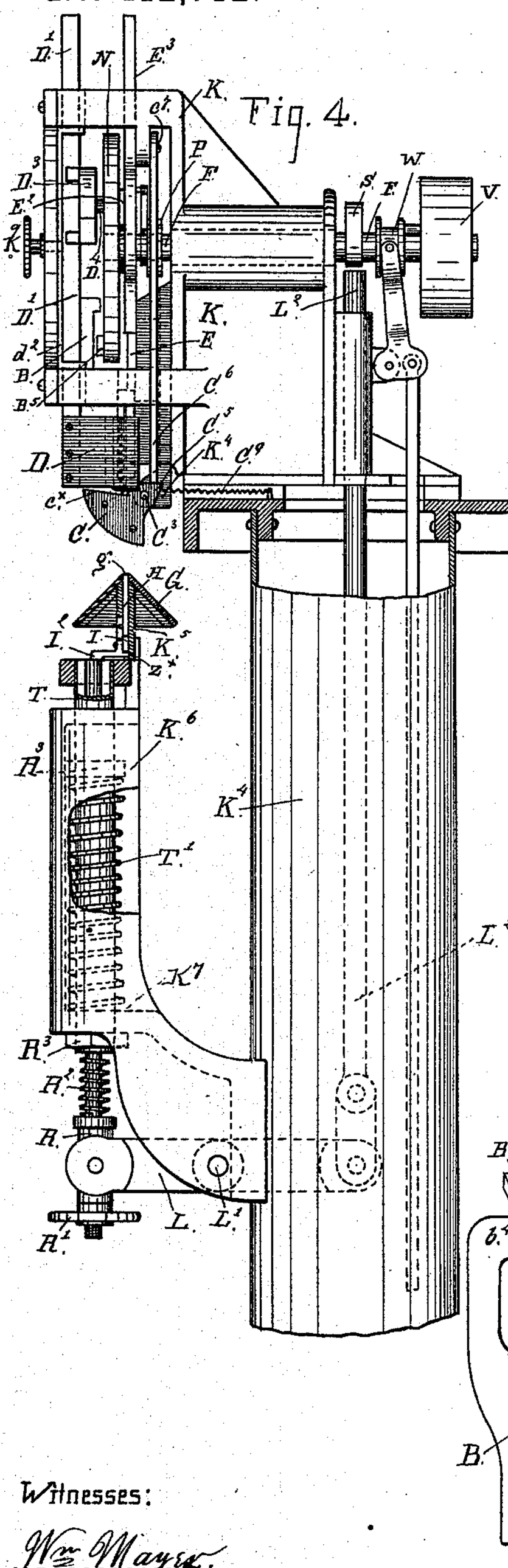

Fig. 5.

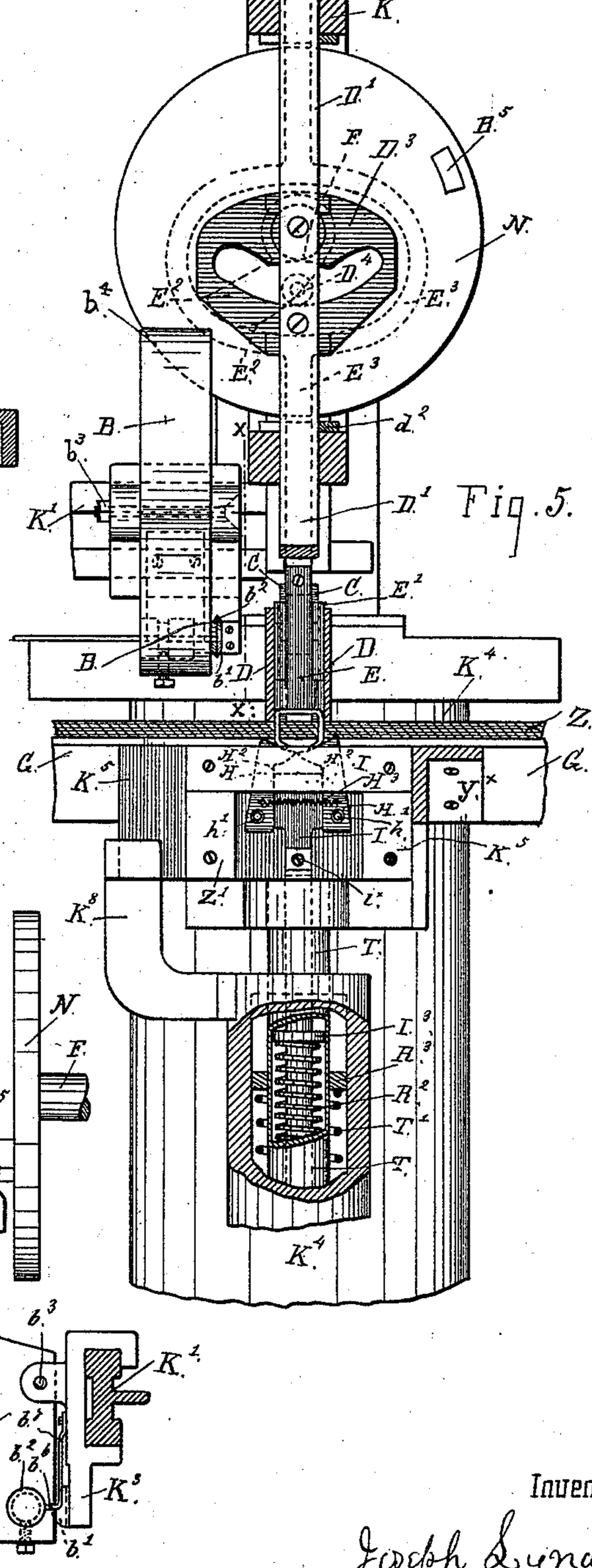

Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

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## BOOK STAPLING MACHINE.

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Fig. 9.

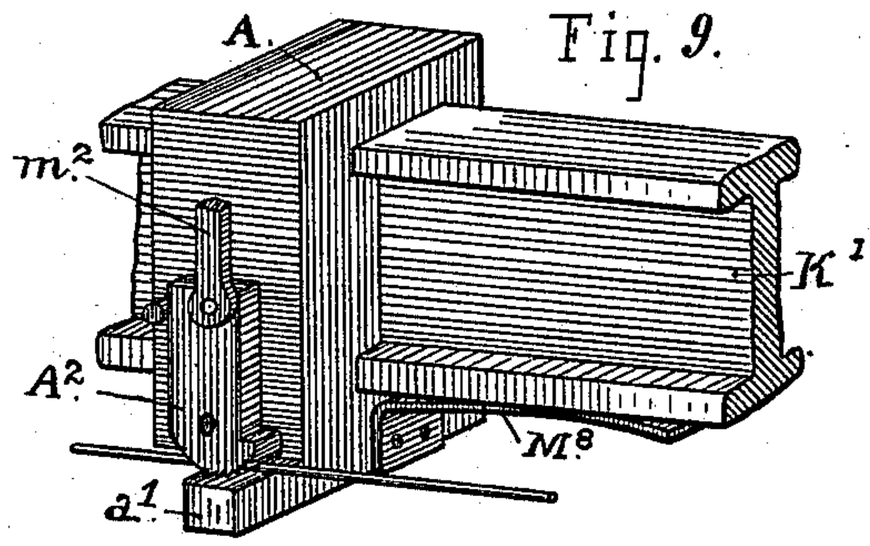



Fig. 7.

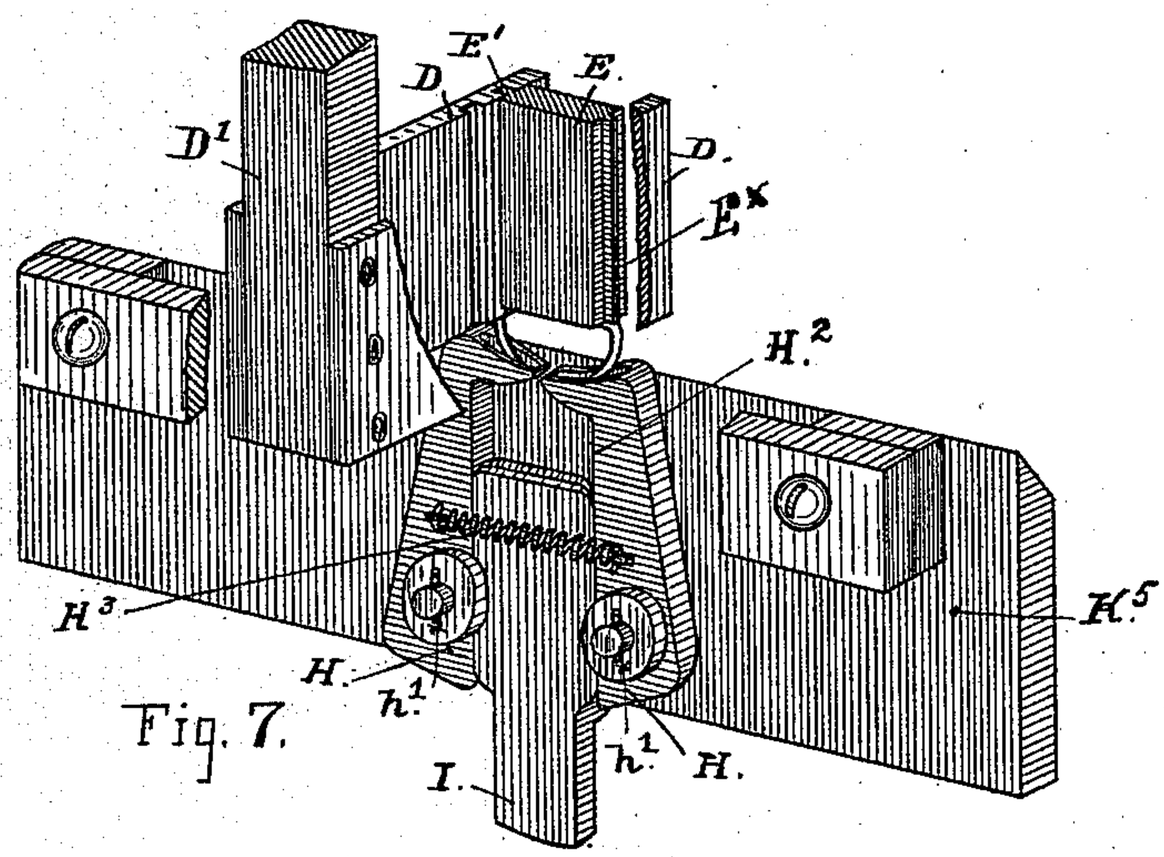
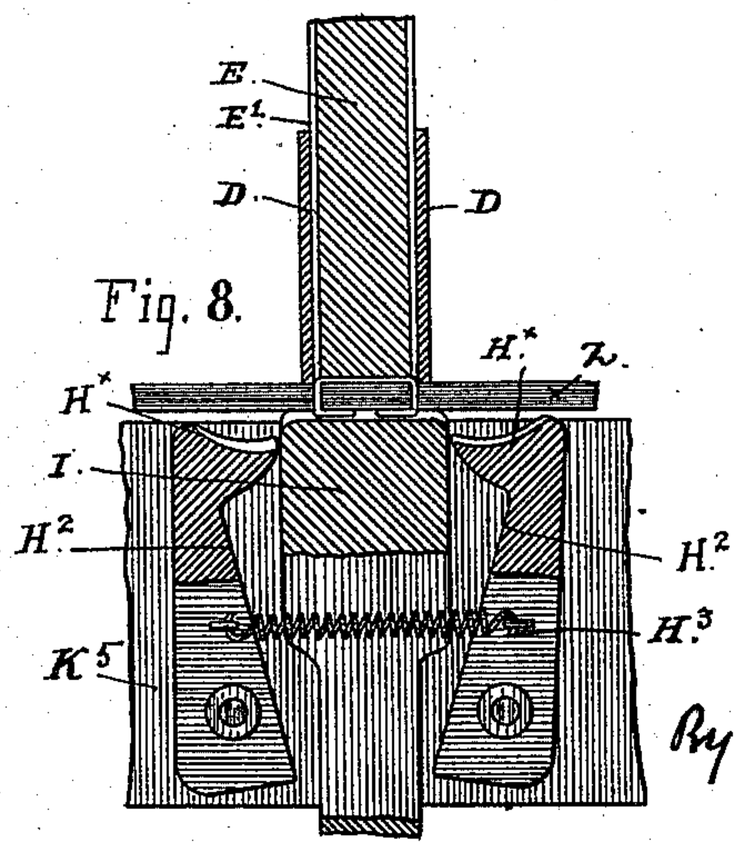



Fig. 8.




Witnesses:

Wm. Mayer.

J. E. Ford.

Inventor:

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Atty's.

# UNITED STATES PATENT OFFICE.

JOSEPH LYNAM, OF SAN JOSÉ, CALIFORNIA.

## BOOK-STAPLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 412,712, dated October 8, 1889.

Application filed December 24, 1888. Serial No. 294,522. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH LYNAM, a citizen of the United States, residing in the city of San José, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Wire Staple Forming and Driving Machines for Books and Pamphlets, of which the following is a specification.

My invention relates to machines for forming and inserting staples, and particularly to machines that are used in the book-binding trade to fasten together the leaves of books and pamphlets with wire staples as a substitute for stitching.

The improvements that constitute my invention include certain improved mechanism for feeding the wire and presenting a portion of suitable length to the staple-forming mechanism, according to the length of staple required; also, certain novel construction and combination of staple-forming devices, and in connection therewith a driver by which the formed staple is driven or forced into the book; also, certain novel mechanism operating beneath or on the opposite side of the book to turn the ends of the staple and clinch them. It includes, also, the general construction and combination of these parts, with certain operating mechanism, producing an improved machine by which a staple is formed, driven, bent, and clinched in the same plane, all as hereinafter fully explained and set forth.

In the accompanying drawings, that form a part of this specification, the said improvements and the manner in which they are constructed and arranged for operation are clearly shown, and the same are referred to in the following description by figures and letters.

Figure 1 of the drawings represents a front elevation of my improved machine with a portion of the front plate and work-supporting table broken away to expose parts behind. Fig. 2 is a front view, on a larger scale, of the wire-feed. Fig. 3 is a side elevation of the same mechanism, taken from the right-hand side of Fig. 2, and showing also parts of the staple-forming devices. Fig. 4 is a side elevation taken from the right-hand side of Fig. 1 and on a larger scale. Fig. 5 is a front elevation, with parts of the mechanism in section and the frame and supporting parts broken away. In this view is shown the position of the parts when bending back the points of the staple. Fig. 6 is a view of the cutting mechanism, taken from the right-hand side of Fig. 5 and through the section-line *x x*. Fig. 7 represents in perspective the parts that bend and clinch the points of the staple after they are forced through the sheets. Fig. 8 is a cross-section taken vertically through these parts, showing their several positions at the end of the operation. Fig. 9 is a perspective view of parts of the wire-feed.

A is the wire-feeding device, by which the wire is drawn from a reel X and fed in measured quantity in an intermittent manner to the staple-forming mechanism.

B is the cutter that separates a piece of suitable length for the staple from the end portion of the fed wire. These parts are arranged at one side of a pivoted anvil C, that co-operates with a pair of vertically-moving jaws D D to form the staple, and in suitable relation to these parts is arranged a vertically-sliding hammer E, that drives the formed staple into the sheets Z on the table below.

Beneath the work-supporting table, and in the same plane with the forming and driving mechanisms, are the remaining devices, that bend the points and finally clinch them on the under side of the sheets. These parts consist of the pivoted dies H H and the upwardly-acting hammer I.

The shaft F is the principal operating-shaft of the machine, and from it is actuated the wire-feed, cutter, anvil, and forming-jaws above the table G, and the remaining mechanism beneath the table, through the medium of cams and levers, as hereinafter described in detail.

The wire-feed is constructed as follows: The fixed rail K′ at one side of the frame supports the reel X and forms a track for the carriage A. This part slides back and forth on the rail in feeding the wire, and is operated by the mechanism illustrated in Fig. 2 of the drawings, consisting of a face-cam P* on the shaft F and the rocking lever M, that is pivoted at $m^3$ to a fixed arm on the frame, and

is connected at the lower end $m^2$ to the pivoted dog $A^2$. This part $A^2$ is attached to the front of the carriage at $m^4$, on which point it is free to move under the vibrations of the lever M, and its bottom face below the pivot $m^4$ is rounded, and also serrated or roughened to bite and firmly hold the wire. A foot or projection $a'$ beneath the dog forms a flat ledge or surface to hold the wire directly under the dog and in position for the rounded end to grip the wire when the top of the dog is drawn forward or toward the frame, the part $a'$ being an extension of the lower portion of the carriage. The lever M has a horizontal member $M^\times$, extending from the center of movement $m^3$ over the cam P*, and also below this part an adjustable arm $M^5$, sliding in a slotted collar $m^6$ and held by a set-screw $m^7$. The ends of these two parts $M^\times$ and $M^5$ set in the path of the cam P* and give the two movements to work the grip and the carriage. The upper arm when raised by the cam throws the lower end of the lever inward, and this motion, acting first on the pivoted dog, causes it to grip the wire, after which the carriage is drawn forward by the continued movement of the lever. By the length of such movement of the carriage a longer or shorter portion of wire is drawn from the reel and fed to the bending mechanism, and the same is regulated by setting the lower arm $M^5$ to meet the cam sooner or later in its rotation, the effect of which is to make the backward stroke of the feed-carriage longer or shorter, and consequently set the starting-point of this part on the rail K′ either nearer to or farther from the front, thereby affecting the length of the feeding movement. In the backward movement the dog $A^2$ strikes a stop-pin on the carriage, so that the motion of the lever then acts directly on the carriage to run it back. In the operation of these parts the wire is carried from the reel under the spring-plate Y, which is a curved piece fastened to an arm $Y^\times$ at the back of the reel-bracket and at the free front end $y^2$ bearing on a ledge or projection $y^3$ of a block $Y^4$, secured under the bracket. This block has a recessed face and apertures through its ends for the wire to pass forward to the feed-carriage, and attached to the front within the recess it is provided with a wire-straightening device consisting of an adjustable pin or stud $Y^5$, that may be set either up or down with respect to the line of wire running through the apertures in the block, by means of which it will be seen that the wire is drawn straight in passing over this part $Y^5$. In passing from the reel the wire is carried under the spring Y and thence forward between the end of the spring and the block $Y^4$ through the straightener to the feed-carriage. The office of these parts is to take the bend or coil out of the wire and prevent it from springing back out of the machine while the feed-carriage is running back. The spring $M^8$, fixed to the bottom of the carriage, bears continually against the fixed rail K′, and is applied in this manner for the purpose of producing a suitable degree of friction or resistance to cause the dog $A^2$ to bite firmly on the wire before the carrier begins its forward movement, as otherwise the feed-dog would simply slip on the wire without drawing it forward. The spring $M^8$ is therefore regulated to produce the necessary amount of resistance to the carriage at the beginning of the feed-motion.

The cutting device is composed of the stationary blade $b'$, that is set in the front of the bracket $K^3$, Fig. 6, and the vibrating jaw B, having the cutting-disk $b^2$, fixed in the face adjacent to the stationary cutter. These parts are arranged in front of the feed-carriage, or between it and the staple-forming mechanism, and are fastened on the rail K′ at suitable distance from the anvil, according to the length of wire required for the staple. The jaw B is pivoted at $b^3$, and its upper end $b^4$ sets in the path of the projection $B^5$ on the face of the disk N, by which the cutter is worked. The wire rests in the slit $b^6$, and is held up to the cutter by the spring-tongue $b^7$. The wire is gripped between the anvil and the bending-jaws D D at the time the cutter is separating a portion of suitable length for the staple, and the position of the staple-blank thus held by these parts is such that the ends of the wire project an equal distance beyond either side of the anvil to give the prongs the same length.

The construction and arrangement of the parts that form the staple-bending mechanism will be understood from Figs. 4, 5, 7, and 8. The part C, which I have designated the "anvil," is composed of two segment-shaped plates fixed together in upright and parallel position at proper distance apart, according to the length of the body of the staple to be produced, and they are attached by a pivot-bolt $C^3$ to the stationary foot $K^4$ on the lower part of the frame K. At this point of attachment one of the plates has a rearward extension $C^5$, setting beyond the pivot and under a stop-lever $C^6$, that is pivoted at $c^7$ on the frame K and rests against a surface-cam P on the principal shaft. The top edges of the plates C are straight, as seen at $c^\times$, and the bottom edges are curved, so that they are somewhat like a quadrant in shape; but the straight top edge that supports the wire-blank is longer from pivot to point than the vertical distance from pivot down to the heel. The coil-spring $C^9$ draws the anvil up into position, and the lever $C^6$ holds it rigidly in place while the jaws D D are moving downward and bending the ends of the wire. At the end of this operation the lever $C^6$ is thrown out to release the anvil, and this part then turns on its pivot under the pressure of the hammer upon the body of the staple, which drives the points through the sheets on the table beneath. The spring $C^9$ at this time acting against the pressure causes the anvil

to turn gradually on its pivot toward the table, so that the staple moves down the inclined top edge, which comes finally to a vertical position as the anvil is forced back in this manner from under the staple as the top sheet is reached. The movements of the locking-lever are properly timed to hold the anvil while the points of the staple are being bent and then to release it for the driving mechanism to act.

The upright slide-bar D′, on which the jaws D D are fixed, is set in guides $d^2$, that are parts of a movable plate, in the frame immediately behind the face-plate $K^8$, and by means of a set-screw $K^9$, properly placed for the purpose, the guides are adjusted horizontally either forward or backward in the frame K, the parts $d^2$ at the top and bottom of the movable plate being set in slots in the frame. The object of this feature of adjustment is to change the position of the jaws D in order to work different thicknesses of wire. The jaws are provided with two or more sets of grooves in their inner faces, varying in size from the thinnest or finest wire to the coarsest wire that will be worked in the machine, and the hammer E, that fits and works in one set of grooves, will be removed and another hammer having splines $E^\times$ of suitable size to fit the set of grooves to be used will be substituted for it. Vertical movement is given to the slide-bar by the grooved cam $D^3$ on the bar and the roller-stud $D^4$ on the face of the disk N. The jaws move downward closely against the sides of the anvil, and at the end of their stroke coming down against the sheets of paper on the table they remain at rest until the staple is driven. The prongs of the staple are thus confined in the grooves and guided while the hammer drives them into the work. In this last-mentioned operation the jaws act also as a guide for the hammer as the splines $E^\times$ on its sides fit in the grooves between the jaws. The cam $E^2$, fixed on the shaft F, operates the slide-bar $E^3$, on which the hammer is fixed, as shown in dotted lines, Fig. 5. In the joint operation of these parts the anvil is held in position while the jaws bend down the prongs, and then as the hammer forces the staple into the work the anvil is released and is pressed back from under the staple as the pressure upon its top edge causes it to turn on its pivot. Both the jaws D D and the curved bottom edge of the anvil are pressed down upon the paper at this time, so that the staple between them is always entered properly and driven squarely. When the staple is thus formed and driven to place, the parts return and the hammer and jaws remain at rest while the next blank or portion of wire is being fed and cut. During the feeding the anvil is held with its outer end slightly depressed, or with its top edge about horizontal, so that the wire shall slip easily over it and between the straight edges and the bottom of the jaws that stand somewhat above them, and then as the cutter is about to act the anvil is brought into position shown in Fig. 3, that throws the wire back toward the heel or lower part of the straight edge, and also slightly elevates it. These two positions are brought about by the movements of the stop-lever $C^6$ and the spring $C^7$, attached to the back of the anvil, the lever being thrown out by the cam P and returned by gravity. The longest portion of the cam-surface is set to strike and throw out the lever immediately before the anvil begins to move under the action of the hammer E and to hold the lever back while the anvil rises, and then to release the lever just before the anvil reaches the horizontal position, so that the bent end of the lever sets in under the back of the anvil. In this position the anvil is held while the feed is working, and then the short projection of the cam throws out the lever sufficiently to cause it to drop into position above the extension $C^5$, and thus lock the anvil while the wire is being cut and bent.

Figs. 2 and 3 show the arrangement of these parts more particularly. The parts that bend and clinch the ends of the staple are located beneath the table G, and consist of the pivoted dies H H and the hammer I. The construction and operation of these parts will be understood clearly from the detail views, Figs. 7 and 8. The dies are pivoted at $h'$ $h'$ to the front of the stationary plate $K^5$, and set upright directly under the staple-driving hammer, with their inner edges meeting in the center at the top over the clinching-hammer. In this position the inner edges $H^2$ stand vertical and parallel, and the hammer is of suitable width to fit and slide smoothly between them; but the inwardly-extending heads $H^\times$, setting over the hammer, are curved, so that the end of the hammer will readily throw them apart and pass between them in the upward stroke, as illustrated in Fig. 8. The top face of the hammer is grooved, and also that of the dies H, to properly turn the ends of the staple, and as the dies when closed present a concave bed or surface under the work the points of the staple are regularly and evenly turned in as they are forced against this surface by the driving mechanism above, and are finally clinched by the upward stroke of the hammer I. The dies are held together by the spring $H^3$, that keeps them pressed against the sides of the hammer. This arrangement serves to hold the dies rigidly in position while the staple is being driven through the work, as the hammer is at rest during that part of the operation, and its head or wider part sets partly below and partly above the line of the pivots $h'$, as shown in Fig. 7. The support for the work is fixed on the end of the upright tube T, that is held in the bracket $K^6$ on the front of the standard $K^4$, and the hammer-rod $I^2$, to the upper end of which the hammer is fixed by the screw $i^\times$, is carried through the tube and connected at the lower end to

the lever L. This lever is pivoted at L′ in the frame, and is attached at the inner end to the upright rod $L^2$, which is acted on by the cam S on the main shaft F. Connection of the lever with the hammer-rod is made by a sliding collar R, confined between the nut R′ on the screw-threaded end of the rod and the coil-spring $R^2$, that is placed on the rod between the collar and a fixed collar $I^3$, near the upper end. By this means the quality of the blow, as well as the position of the hammer, can be regulated to the work, according as a long or short staple is to be driven. The tube that carries the table or work-support is held in the guides furnished in the bracket $K^6$, but is set on the coil-spring T′, that bears at the bottom on the fixed surface $K^7$ and at the top against the adjustable nut $R^3$ on the tube. The position of the table is thus regulated according to the thickness of the work by setting the nut $R^3$ up or down on the tube. The triangular table shown in the drawings is fixed in position with the slot *g* in its apex in line with the bending-dies, which set about level with the top of the slot, and the plate $K^5$, that supports the dies, has the table G fastened to it at $y^\times$, and is itself fixed on the end of the tube T at Z′, as shown in Figs. 4 and 5. At one side of the bracket $K^6$ an arm $K^8$, standing upright and in close relation to the plate $K^5$, forms a guide for this vertically-sliding part and keeps it in line against any tendency to turn when the tube T or the hammer is being adjusted.

The machine is arranged to be driven by power from a line of shafting by means of belting and pulleys, and is furnished with a clutch W to connect and throw off the pulley V. Suitable connection of the clutch is made with a foot-lever U at the bottom of the standard, as shown in Fig. 1.

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

1. In a stapling-machine, the combination of a slotted table to support the sheets, a staple-forming device consisting of a swinging anvil to support the staple-blank in horizontal position above the table, having a width of supporting-surface corresponding to the size of the staple to be formed, a pair of reciprocating jaws setting outside of said anvil to reciprocate against the sides thereof, and having edges to strike and turn down the end portions of the blank against the sides of the anvil, and grooves in the inner faces to take in the turned-down portions, a vertically-acting hammer reciprocating between said jaws and adapted to drive the formed staple and force back the anvil from beneath it, a prong-clinching device beneath the table and in the same plane with the driver, and a wire feed and cutting device arranged at one side of the forming device above the table to feed and place a blank or cut-off portion of wire at right angle to said staple-forming device, substantially as described.

2. In a stapling-machine, the combination of the swinging anvil held rigidly in position during the forming operation while the ends of the blank are being bent squarely and released and allowed to swing from beneath the staple during the driving operation, and the vertically-reciprocating jaws arranged outside of said anvil to work in close relation to the sides thereof, and having grooves in the inner faces to take in and confine the bent prongs of the staple, substantially as described.

3. In a stapling-machine, the combination of the swinging anvil C, spring $C^7$, stop-lever $C^6$, operating, as described, to hold and release the anvil, the reciprocating jaws D D, adapted to bend the staple-blank over the anvil, and the driving-hammer E, arranged to work between said jaws and to force back the anvil from under the staple during the driving operation, substantially as described.

4. A staple-forming device consisting of a swinging anvil having a blank-supporting face of equal width to the length of the staple to be formed, a pair of bending-jaws embracing and reciprocating outside of said anvil at right angle to the supporting-face and in close relation to the sides of the anvil, and having grooves in the inner faces to take in the bent portions of the staple, and the driver moving in the same plane with the said jaws and in the grooves thereof above the staple and adapted to force out the formed staple and throw back the anvil from beneath it, substantially as described.

5. In a staple forming and driving mechanism, the combination, with staple-bending jaws and a driving-hammer, of the swinging anvil and mechanism, substantially as described, whereby the anvil is held in position to receive the staple-blank during the feeding operation, and is set and locked to hold the blank while the jaws are bending the prongs, and is finally released and allowed to turn and be pressed back from under the formed staple by the stroke of the hammer, as specified.

6. The swinging anvil C, having a straight top face to support the staple-blank, vertical sides over which the prongs of the staple are bent, and a curved bottom edge set for operation with relation to the work-supporting table, as described, in combination with the reciprocating jaws having grooves for confining and guiding the prongs of the staple, and the driving-hammer arranged for joint operation, as specified.

7. In a staple-forming mechanism, a pair of reciprocating jaws formed of two parallel plates with a space between them corresponding to the length of staple to be formed, and having vertical grooves in their inner faces, in combination with a staple-blank support of corresponding width of blank-supporting sur-

face, which is adapted to present the blank to said jaws while they descend and bend the prongs, and then swing or move outwardly from beneath the staple as the latter is pressed down, substantially as specified.

8. In a staple forming and driving machine, the combination of staple-forming jaws and a driving-hammer adapted to place and drive the formed staple and then remain in position to hold it down while the clinching is being done, and the clinching dies and hammer arranged for operation, as described, to turn and clinch the prongs of the staple.

9. The wire-feed consisting of the stationary carriage-guide, reciprocating carriage having a rest or support for the wire, the pivoted dog with wire-gripping face set with relation to the said rest, as described, mechanism connected directly to said dog above its pivot to move the carriage, and a resistance-spring applied to produce the required friction of the carriage on its guide in the feeding movement, as specified.

10. In combination with the wire-feed and the blank-supporting anvil, the stationary cutter $b'$, the vibrating jaw B, having a cutter $b^2$, and means whereby said jaw is actuated with respect to the movements of the wire-feed, as specified.

11. In a stapling-machine, the combination of staple forming and driving mechanism, a yielding table or support for the sheets to be bound, and a reciprocating clinching-hammer operating in an upward direction through a slot in the table and capable of adjustment to regulate the intensity of the blow, substantially as specified.

In testimony that I claim the foregoing I I have hereunto set my hand and seal.

JOSEPH LYNAM. [L. S.]

Witnesses:
C. W. M. SMITH,
CHAS. E. KELLY.