(No Model.) 3 Sheets—Sheet 1.

# E. T. GREENFIELD.

## STAPLING MACHINE.

No. 520,735. Patented May 29, 1894.

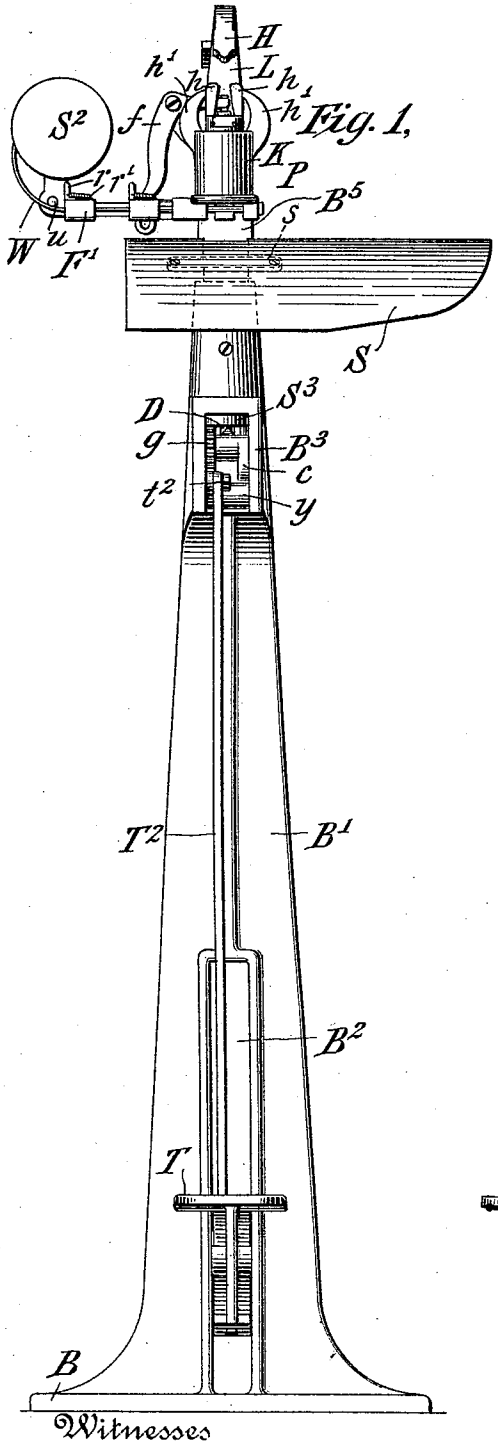



Fig. 1.

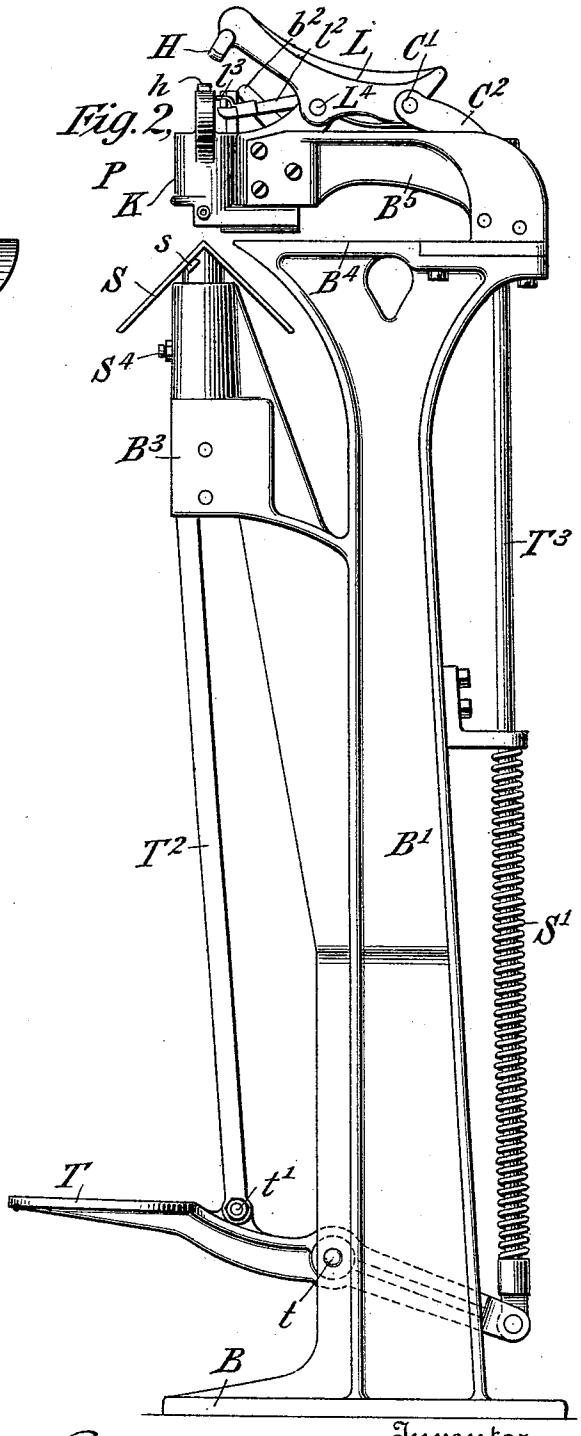



Fig. 2.

Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
Edwin T. Greenfield
By his Attorney
Charles J. Kintner

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

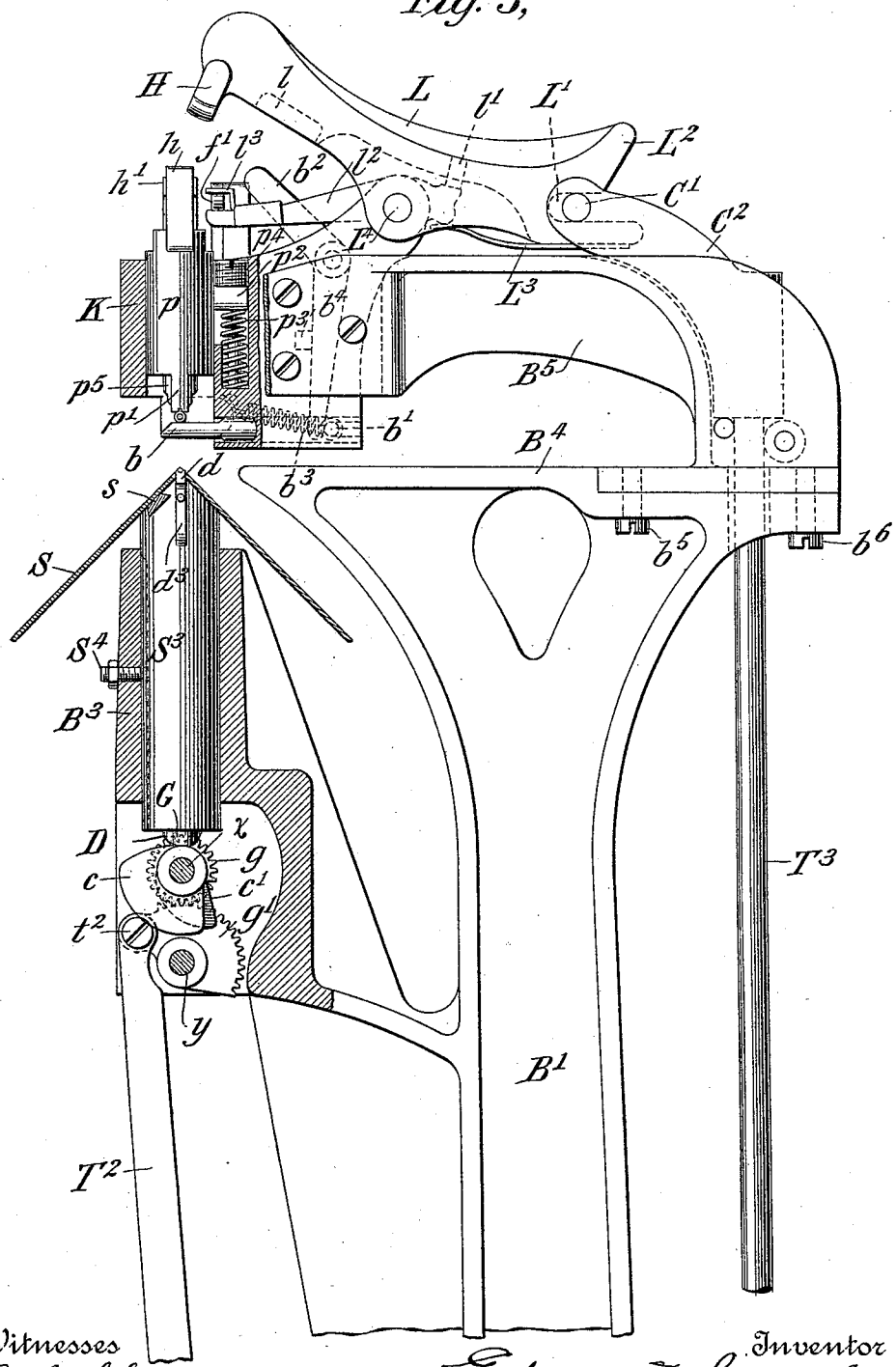
(No Model.) 3 Sheets—Sheet 2.

# E. T. GREENFIELD.

## STAPLING MACHINE.

No. 520,735. Patented May 29, 1894.

*Fig. 3,*




Witnesses
C. E. Ashley
H. W. Lloyd.

Inventor
Edwin T. Greenfield
By his Attorney
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THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

# E. T. GREENFIELD.

## STAPLING MACHINE.

No. 520,735. Patented May 29, 1894.

Fig. 4,

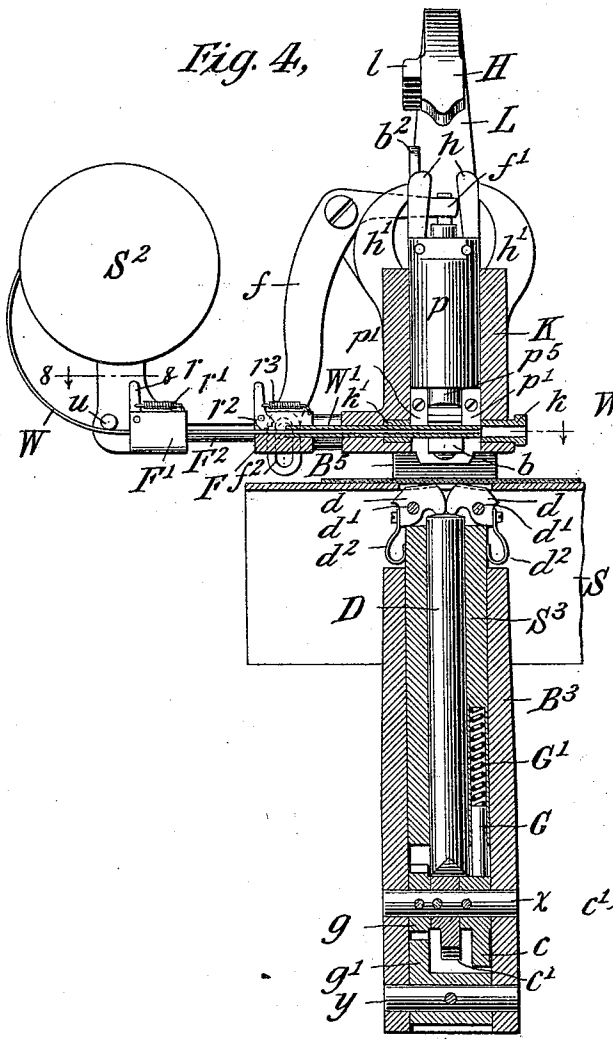



Fig. 5,

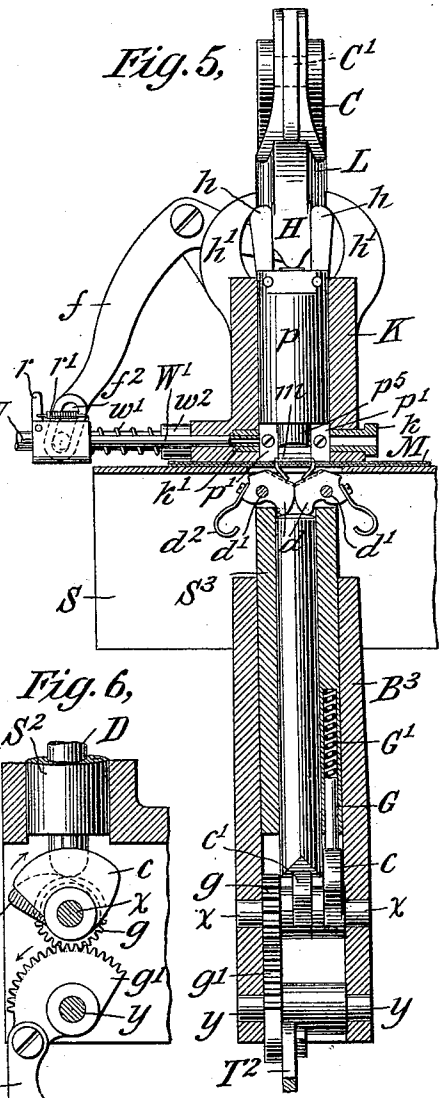



Fig. 6,




Fig. 8,

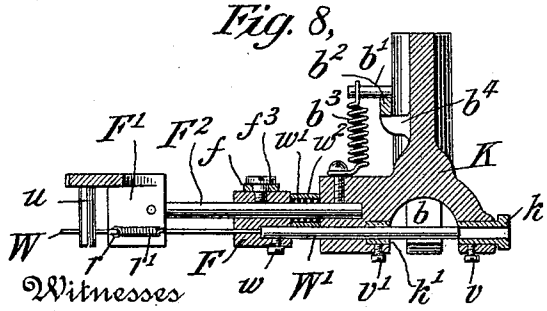
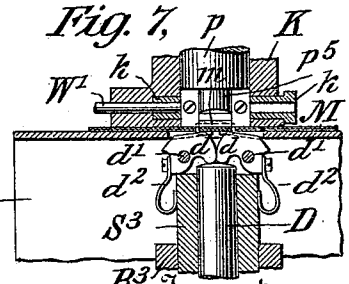



Fig. 7,




Witnesses

C. E. Ashley

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By his Attorney

Charles J. Kintner

THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

EDWIN T. GREENFIELD, OF NEW YORK, N. Y., ASSIGNOR TO THE GREENFIELD AUTOMATIC FASTENER COMPANY, OF SAME PLACE.

## STAPLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 520,735, dated May 29, 1894.

Application filed January 2, 1894. Serial No. 495,475. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN T. GREENFIELD, a citizen of the United States, residing at New York, in the county of New York and State of New York, have made a new and useful Improvement in Paper and Pamphlet Binding Mechanism, of which the following is a specification.

My invention relates particularly to improvements upon an invention disclosed in a prior patent granted to me on the 27th day of December, 1892, and numbered 488,735, and to this end it consists, first, in certain improvements in the feeding mechanism whereby the binding wire is fed to the machine as it is needed; second, in certain improvements in connection with the staple clinching apparatus disclosed in said patent whereby it is caused to more effectually clinch the binding staples; third, in the adaptation of certain parts of the apparatus disclosed in the aforesaid patent in connection with certain details of construction hereinafter described for the purpose of enabling one to bind books, pamphlets or kindred material by foot power or by any source of continuously acting power if desired.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 is an elevational view of the entire apparatus embracing an operating treadle and an angular support or rest for the material to be bound. Fig. 2 is a similar elevational view of the entire apparatus as seen looking at Fig. 1 from the right hand toward the left hand side of the drawings. Fig. 3 is an enlarged side elevational view of the major portion of the apparatus, certain parts thereof being shown in sectional view. Fig. 4 is a sectional view of the more essential working parts of the apparatus taken therethrough upon a plane at right angles to that portion of the sectional view shown in Fig. 3 and as seen looking at Fig. 3 from the left hand toward the right hand side of the drawings. Fig. 5 is a similar sectional view to that shown in Fig. 4 but as seen looking at Fig. 3 from the right hand to the left hand side of the drawings. Fig. 6 is an enlarged detail view of that portion of the apparatus which controls the movement of the rest or support upon which the material to be bound is sustained. Fig. 7 is a similar enlarged detail view of those immediate portions of the apparatus which drive and clinch the binding staples. Fig. 8 is a similar enlarged detail view taken through the same part of the apparatus but in a plane at right angles to that upon which Fig. 7 is supposed to be taken on the line 8—8, Fig. 4.

Referring now to the drawings in detail: B represents the base and B′ the upright standard or frame to which the operative parts are attached, said base and frame being preferably adapted to be secured by bolts or screws to the floor.

T is an operating treadle pivoted in the frame B′ at $t$ and having secured at its opposite ends a pair of operating rods $T^2$ and $T^3$ by pivot bolts $t'$. The rod $T^3$ passes upward through a sliding bearing secured about the middle of the frame B′ and against the under side of which rests a strong spiral retractile spring S′, the lower end of which bears upon a shoulder near the lower end of the rod $T^3$, said spring being adapted to normally hold the foot treadle T in its upward position as shown in Figs. 1 and 2.

$B^5$ is a curved arm which constitutes the support for the operative parts of the upper portion of the machine. This arm is secured to the upper surface $B^4$ of the frame B′ by bolts $b^5$ $b^6$. In the secured end of the arm $B^5$ is a pair of grooved friction rolls adapted to act as guides to the upper end of the rod $T^3$, to which rod is secured a second curved arm $C^2$ having journaled in its free end a friction roll C′ which in turn is adapted to move in a groove L′ in the free end of an operating arm L, which arm is pivoted in turn at $L^4$ to the free end of the curved arm $B^5$. To the outer end of the arm L is secured a driving lug H of wedge shape adapted, when forced forward, to come into frictional contact with a pair of pivoted arms $h$ $h$ attached to the upper end of a hollow staple forming plunger $p$ having vertical movement in a hollow guide-way K provided with guiding arms $h'$ $h'$ adapted to allow the free ends of the pivoted arms $h$ $h$ to move outward as the plunger is forced downward by the wedge shaped lug H, these imme-

diate parts being not substantially different from the like parts disclosed in my prior patent above referred to.

$p^5$ is a staple driver or plunger which has vertical movement in the hollow staple forming plunger $p$ and is connected therewith by springs in the same manner as is the corresponding part in my prior invention, $p'$ $p'$ being steel cutting knives carried by the hollow plunger $p$ for cutting the staple forming wire into proper lengths for the staples before they are driven; $b$ being a staple forming mandrel having horizontal movement in the lower side of the free end of the curved sustaining arm $B^5$ and connected by a pin $b'$ to a pivoted bell crank lever $b^2$ which is held normally in the position shown in Fig. 3 against a back stop $b^4$ by a coil spring $b^3$, the upper end of the bell crank lever $b^2$ lying in the path of a lug $l$ located near the outer end of the pivoted arm L; these parts being also not substantially different in their operation from the like parts disclosed in my prior patent above referred to. The hollow staple forming plunger $p$ is held in its normal or upper position by an arm $p^2$ which rests upon a spiral spring $p^3$ coiled around a fixed pin in the body of the hollow guide-way K as clearly shown in Fig. 3, $p^4$ being a set screw bearing upon the pin $p^2$ and adapted to regulate the movement of the pin $p^2$ and the staple forming and staple driving plungers which are supported by said pin.

$f$ is a bell crank lever pivoted to an extension of the hollow guide-way K, one of its ends $f'$ being located between one of the ends of a second pivoted lever $l^2$ and an extension or loop $l^3$ the other end of said lever $f$ being provided with an oblong slot $f^2$ adapted to give backward and forward movement to a wire feeding block F through the agency of a screw $f^3$ secured to one side thereof, see Figs. 4, 5 and 8. The operating lever $l^2$ just referred to is in turn pivoted at $L^4$ to an extension of the hollow guide-way K, with its free end lying in the path of the pin $l'$ carried on the under side of the operating lever L, as clearly shown in Fig. 3.

$F^2$ (see Figs. 4 and 8) is a rod detachably secured to the hollow plunger guide K through the agency of a set screw and serving the double function of a guide for the wire feeding attachments and a support for the wire reel $S^2$, said reel being journaled in an upright extension F'; $u$ being a guide pin for the purpose of directing or guiding the wire W as it is drawn from the reel $S^2$.

$r'$ is a spiral spring having one end attached to an upright standard $r$ and the other to a gripping or holding device for gripping or holding the wire W while the feeding mechanism is being returned to its rear or normal position.

$r^2$ is a feeding pawl pivotally secured to the feeding block F and $r^3$ is a retractile spring therefor.

W' is a steel guide tube or shuttle secured to the feeding block F and in alignment with the incoming wire W, its internal diameter being sufficiently large to admit of the free passage of said wire. This guide tube or shuttle W' is adapted to pass freely back and forth through an opening in the base of the hollow plunger guide K just beneath the staple driving plunger $p^5$ and above the sliding mandrel $b$, its free end being in alignment with a fixed sleeve $k$ situated in the outer side of the hollow plunger guide K and into which it is adapted to pass.

$w'$ is a spiral spring wound around the support $F^2$ and located, when compressed, in a thimble $w^2$ one of its ends having bearing against one face of the hollow plunger guide K and the other against the feed block F, its function being to aid in restoring the feed block F and guide tube or shuttle W' to their normal position.

$L^3$ is a flat or leaf spring fixedly secured at one end to the curved arm $C^2$ with its free end beneath the short arm of the lever $l^2$ (see Fig. 3) its function being to aid in restoring the feed block F and its attached parts to their normal position before a binding staple has been cut or formed.

I will now describe that portion of the apparatus which supports the material to be bound and completes the clinching of the binding staples after they have been driven through the material by the mechanism already described. In my prior patent above referred to the staples are driven through the material to be bound and clinched in a groove in a moving anvil, said anvil being held in its upper position by a cam actuated by an operating lever. It was necessary with that apparatus to first put the material into position to be bound, then lift the anvil with the material and grasp it firmly after which the staples were formed, driven and clinched through an independent action. In the present invention I have done away with this anvil and substituted therefor, a V-shaped or angular support or rest S which is secured by a dove-tailed extension $s$ to the top of an upright standard $S^3$ having vertical movement in an extension $B^3$ of the frame B'. This standard $S^3$ is provided with a groove in one side, $S^4$ being a guide screw therefor extending through the part $B^3$ and into the aforesaid groove. An opening is made through the angular support or rest S just above the top of the standard $S^3$ of such length and width as to admit of the free movement of a pair of clinching plates pivoted in a slot in the standard at $d'$ $d'$, $d^2$ $d^2$ being curved springs adapted under normal conditions to maintain the free ends of the clinching plates $d$ $d$ in frictional contact with the upper end of a plunger D, the lower end of which is of curvilinear form and bears upon an eccentric or cam $c'$ secured to an axis $x$ extending through the projection $B^3$.

$c$ is a second eccentric or cam of different shape from the eccentric or cam $c'$ and having different angular relation on the support-

ing axis $x$, and G is a vertically arranged pin located parallel with the plunger D with its lower end resting upon the eccentric or cam $c$ and its upper end resting against a spiral spring G′ in an opening in the standard $S^3$, said spring being of sufficient strength to raise the attached parts and vary the pressure upon the material to be bound between the support S and the binding base plate $B^5$ preparatory to forming and driving the binding staples.

$g$ is a pinion keyed to the shaft $x$ in the same manner as are the eccentrics or cams $c$ $c'$. This pinion meshes with a quadrant pinion or gear wheel $g'$ keyed to a shaft $y$ which quadrant pinion or gear wheel is connected in turn through a screw $t^2$ to the upper end of the treadle operating rod $T^2$.

The operation of the apparatus is as follows: The material to be bound, usually in the nature of a pamphlet or book, is opened at its middle and laid face downward upon the angular support or rest S. The operator then places his foot firmly upon the treadle T and forces it downward to the full extent of its movement. The first portion of the movement causes the operating rod $T^2$ to impart rotary motion to the quadrant gear wheel $g'$ which in turn imparts a like motion to the pinion $g$ and the eccentrics or cams $c$ $c'$. Inasmuch as the eccentric or cam $c$ is of different contour from and slightly in advance of the eccentric or cam $c'$ during its movement in the direction of the arrow it will cause the pin G to first rise suddenly and impart a lifting movement to the standard $S^3$ under the influence of the strong spiral spring G′, thereby causing the book or pamphlet to be firmly grasped between the angular support S and the base plate $B^5$ before the action of binding takes place, the spring G′ being of sufficient strength to lift all of the parts and take any strain which may be put upon it before the pin G assumes the position shown in Fig. 6. It will be understood therefore that the apparatus will bind books or pamphlets of varying thickness, the function of this spring, the pin G and the eccentric $c$ being to compensate for such variation in the thickness of the material. During the time that the eccentrics $c$ and $c'$ were being rotated to the position shown in Figs. 5 and 6, the strong spiral spring S′ was simultaneously being put under compression and the operating rod $T^3$ moved upward carrying with it the curved arm $C^2$, thereby imparting a continued motion to the free end of the arm L which continued until the wedge shaped lug H had driven the staple forming plunger $p$ forward, cut the staple, formed it around the mandrel $b$, withdrew the mandrel $b$, and forced the staple forward through the material to be bound; this operation being not substantially different from that of the corresponding parts disclosed in my prior patent above referred to and the location of the parts being substantially the same at this time as shown in Fig. 5 of the drawings; with this difference, however, that in the present invention the clinching of the ends of the staple is effected by a subsequent movement of other parts of the apparatus. In this position of the apparatus the friction roll C′ has passed out of the slot L′ and the lever L has assumed such a position that for any further forward movement of the arm $C^2$ and operating rod $T^3$, the arm L will not be tilted but will simply be held in a constant position while the friction roll C′ moves upward upon the inclined face $L^2$, thus converting the lever L and its operative parts through to the staple driving plunger $p^5$ for the time being into an anvil which shall maintain its position until the clinching is effected by the further movement of the lower parts of the machine as will now be described. During the time that the friction roll C′ is passing upward upon the inclined face $L^2$ of the lever L the operating rod $T^2$ is being forced downward and consequently the quadrant gear wheel G′ is imparting further rotary motion to the pinion $g$, thereby ultimately bringing into action the second eccentric or cam $c'$ under the lower inclined edge of the plunger D as clearly shown in Figs. 3, 4 and 5. As this downward motion continues therefore the plunger D is driven forward, and with it the two pivoted clinching plates $d$ $d$, until they assume the position shown in Fig. 7 ultimately completing the staple. As the operator removes his foot from the treadle T the strong spiral spring reverses the operation of the parts. The friction roll C passes down the inclined end $L^2$ of the lever L and into the slot L′. The pin $l'$ on the under side of the lever $L^2$ comes into frictional contact with the short arm of the lever $l^2$, thereby causing the free end of that lever to impart an upward motion to the arm $f'$ of the lever $f$ which in turn through the oblong slot $f^2$ and the screw $f^3$ imparts motion to the feeding block F, forcing the latter to the right, (see Figs. 4 and 8) carrying with it the guide tube or shuttle W′ and also the wire W which is gripped or held in position in said guide sleeve by the friction pawl $r^2$ and retractile spring $r^3$, the holding device controlled by the spiral spring $r'$ being now released during this advance motion. This motion continues therefore until the guide tube or shuttle W′ and its inclosed wire have been carried entirely beneath the staple forming plunger and driver $p$ $p^5$ into the position shown in Fig. 4, this guide tube or shuttle serving the function of always carrying the staple forming wire into position and insuring its entrance into the fixed outlet or sleeve $k$ without any danger of being bent or otherwise disturbed should it be fed too far forward as is liable to be the case on a partial operation of the mechanism. The apparatus stands therefore normally in this position with the guide tube or shuttle and its inclosed wire as shown in Fig. 4 so that the first action of the apparatus upon depressing the

treadle T is to actuate through the agency of the operating rod $T^3$ a strong spiral spring $L^3$ upon the lever $l^2$ and extension $l^3$ and through said extension to the feed block retracting levers $f'$ and $f$, this operation being aided by the strong spiral spring $w'$ which is normally held in its compressed position in the surrounding thimble $w^2$ as shown in Fig. 8. It is only necessary therefore for the attendant to place the book or pamphlet in position, then quickly depress the operating treadle T to its extreme extent and again release it, afterward moving the book or pamphlet to the desired distance upon the angular support or rest S for in the same manner driving each succeeding binding staple. Should the wire W be at any time fed forward too far through the guide tube or shuttle W' the operation of the machine will not be interfered with in any manner, as under that condition of affairs the shearing or cutting knives $p'$ $p'$ will cut the staple wire of the proper length as is usual, the loose end remaining in the opening $k$ and being ejected as the wire is again fed forward. This feature of the double cutting knives $p'$ $p'$ in connection with the fixed outlet or sleeve $k$ and the guide tube W' constitutes a very important feature of the present invention for that this combination of parts prevents any possibility of a failure of the apparatus to feed the wire forward in proper lengths.

I do not limit myself to the special details of construction herein shown and described. I may apply any source of driven power for operating the apparatus and in any well known manner. I believe it is broadly new with me to so arrange the operative parts of a pamphlet or book binding machine that in its operation it will adjust itself to books or pamphlets of any desired thickness without changing or adjusting any part of the apparatus and my claims are generic as to this feature. I believe it is also broadly new with me to provide means for protecting and guiding wire from which the staples are formed into position beneath the staple forming apparatus and then withdrawing such protecting mechanism before the staple is formed and my claims are broadly to mechanism for effecting such results and may have a like application for this purpose in connection with other well known forms of binding machines where wire or thin metallic strips are automatically cut for staples and clinched through the material to be bound and my claims are therefore of the most generic nature in this respect.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A paper or book binding machine provided with means for cutting, forming and driving binding staples, in combination with a spring supported rest for sustaining and firmly holding the material in position while it is being bound, said rest being provided with means for lifting it into a gripping or holding position against the pressure of its supporting spring, and mechanical connections between the two sets of mechanism whereby the entire machine automatically adapts itself to the binding of material of different thicknesses.

2. A paper or book binding machine composed of a staple forming plunger, a staple driving plunger and a movable staple forming mandrel, means for giving to said parts positive motion, a spring sustained support or rest for the material to be bound, means for giving to said support or rest movement toward the staple forming and staple driving mechanism and placing the material to be bound under yielding pressure of the spring support in combination with a source of power operatively connecting both sets of mechanism together, substantially as described.

3. A paper or book binding machine having a supply of binding wire, staple forming and staple driving plungers, a movable mandrel, wire feeding mechanism for feeding the wire between the mandrel and the plungers, a spring sustained support or rest for automatically adapting itself to the thickness of the material to be bound, in combination with means for giving to said support positive motion toward the staple forming and staple driving mechanism, and intermediate mechanical connections between both sets of mechanism and a source of driven power whereby the material to be bound is first firmly gripped, the binding staples cut, driven and clinched and the bound article subsequently released, substantially as described.

4. A paper or book binding machine consisting of staple driving mechanism, in combination with a spring sustained support or rest for automatically adapting itself to the thickness of the material to be bound, mechanism for lifting the support and gripping the material, and independent connections between the staple forming staple driving and material supporting mechanism and a source of driven power whereby the material to be bound is first gripped, the staple formed, driven and clinched and the material then released, substantially as described.

5. A paper or pamphlet binding machine provided with a supply of binding wire, staple forming and staple driving plungers, a staple driving mandrel, means for feeding the wire forward in proper lengths for the staples, and additional movable means actuated by the feeding mechanism for carrying the wire in front of the staple forming and staple driving plungers and protecting it during the time that it is being thus carried forward, and leaving it in position to be cut, formed and driven, substantially as described.

6. A paper or pamphlet binding machine having means for feeding binding wire in successive lengths, in combination with a pro-

tecting tube or guide which directs the wire into position and is subsequently removed so as to leave the exposed length of wire in position to be cut, formed into a staple and driven through the material to be bound, substantially as described.

7. In a paper or pamphlet binding machine staple forming and staple driving plungers, a moving mandrel and mechanism for feeding forward binding wire, in combination with a protecting tube or shuttle which is carried forward with the feeding mechanism and protects and guides the wire to its ultimate destination and means for causing the protecting tube to be removed before the plungers are driven forward, substantially as described.

8. In a paper or pamphlet binding machine wire feeding mechanism provided with a guide tube or shuttle adapted to convey the staple forming wire past the staple forming plunger, in combination with a hollow sleeve adapted to receive the free end of the staple forming wire and a pair of cutting knives carried on opposite sides of the staple forming plunger and adapted to cut off both ends of the staple blank, substantially as described.

In testimony whereof I have hereunto subscribed my name this 28th day of December, 1893.

EDWIN T. GREENFIELD.

Witnesses:
C. J. KINTNER,
M. M. ROBINSON.