(No Model.) 4 Sheets—Sheet 1.

E. WILLIAMS.

APPARATUS FOR FORMING AND DRIVING STAPLES INTO BOXES.

No. 589,058. Patented Aug. 31, 1897.

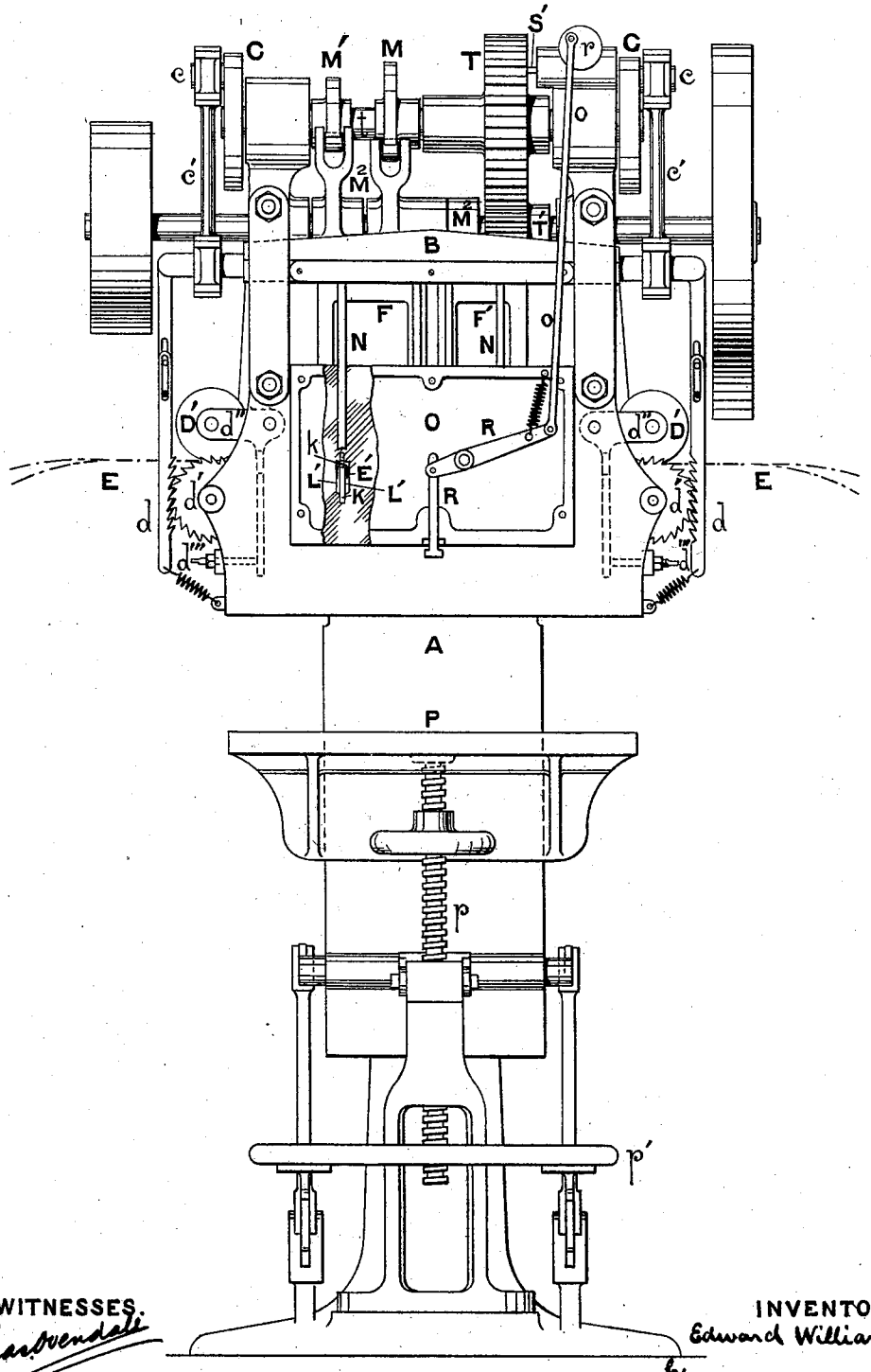

FIG. 1.

WITNESSES.
Chas. Wendale
Joseph Bates.

INVENTOR
Edward Williams
by
Wm. Pierce Thompson & Co
attys.

(No Model.) 4 Sheets—Sheet 2.

E. WILLIAMS.

APPARATUS FOR FORMING AND DRIVING STAPLES INTO BOXES.

No. 589,058. Patented Aug. 31, 1897.

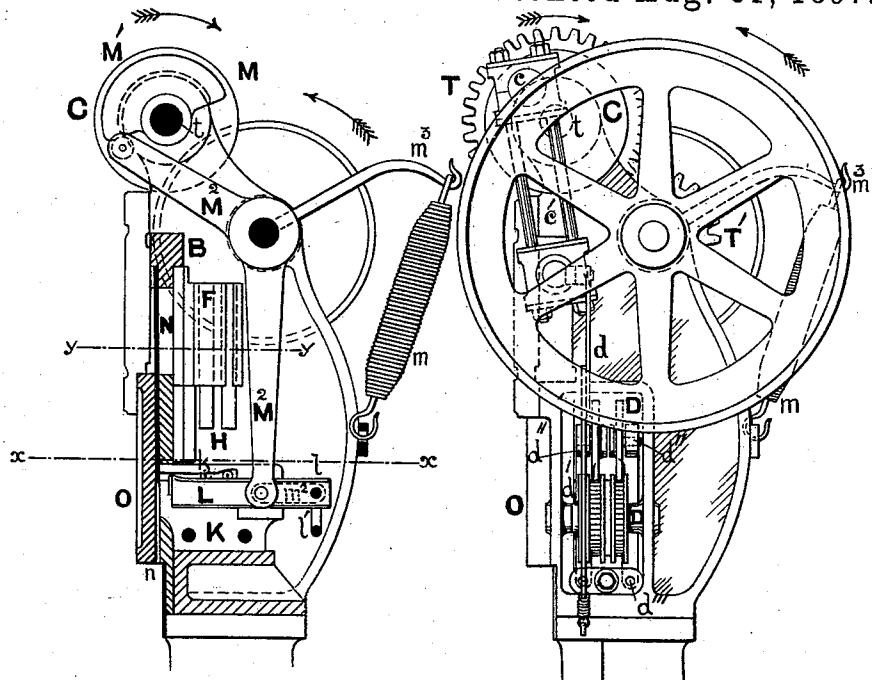

FIG. 4.

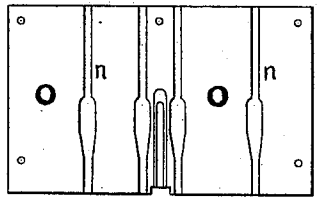

FIG. 9.

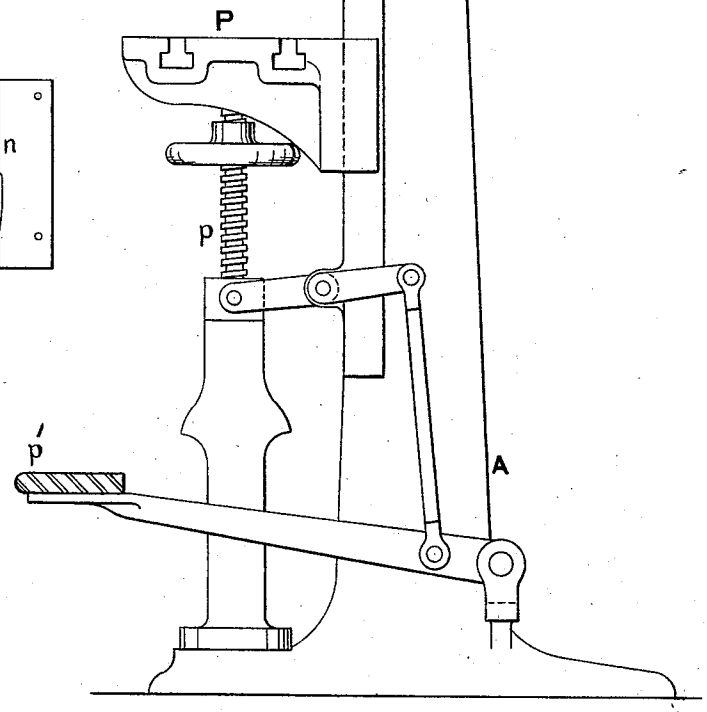

FIG. 2.

WITNESSES.

Chas. Wendale

Joseph Bates.

INVENTOR.

by Edward Williams

& Wm. P. Thompson Co.

attys

(No Model.) 4 Sheets—Sheet 3.

E. WILLIAMS.

APPARATUS FOR FORMING AND DRIVING STAPLES INTO BOXES.

No. 589,058. Patented Aug. 31, 1897.

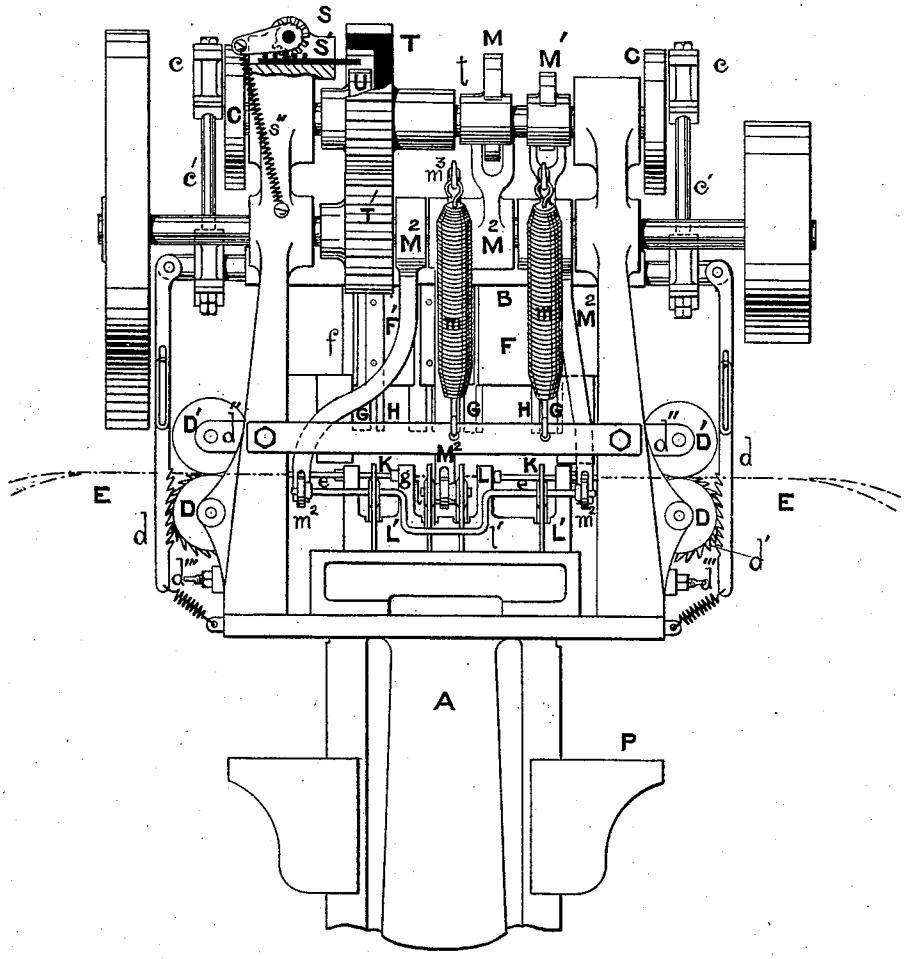

FIG. 3.

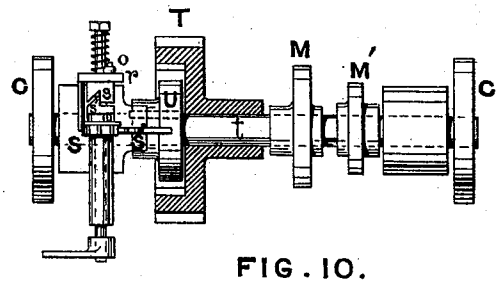

FIG. 10.

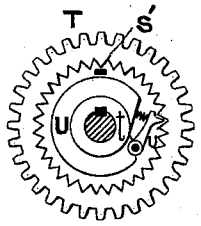

FIG. 11.

WITNESSES.

Chas. Dvendale

Joseph Bates.

INVENTOR

Edward Williams

by Wm. Pierce Thompson & Co

attys.

(No Model.) 4 Sheets—Sheet 4.

E. WILLIAMS.

APPARATUS FOR FORMING AND DRIVING STAPLES INTO BOXES.

No. 589,058. Patented Aug. 31, 1897.

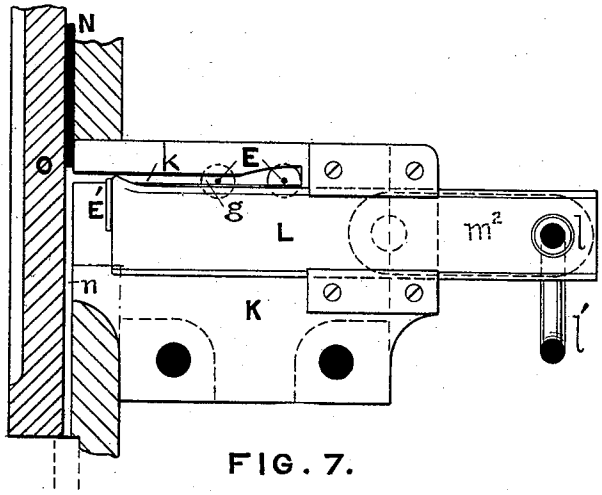

FIG. 7.

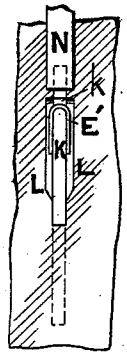

FIG. 8.

FIG. 7A.

FIG. 6A.

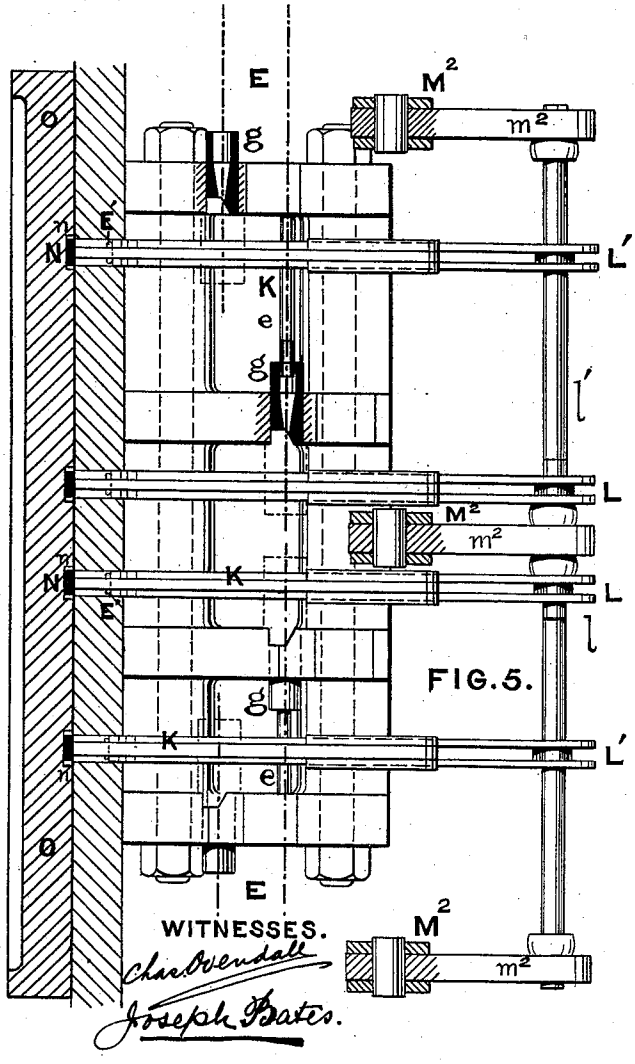

FIG. 5.

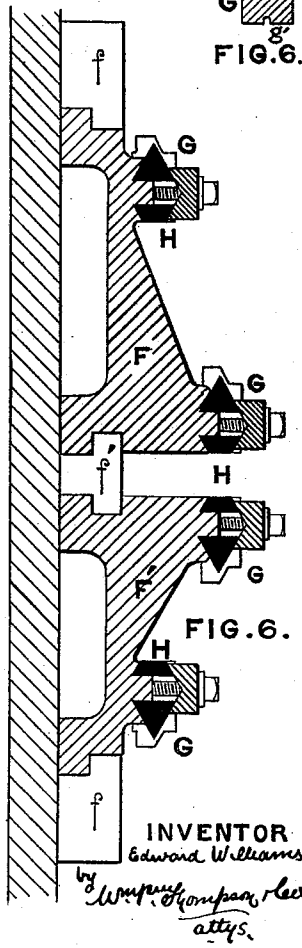

FIG. 6.

WITNESSES.
Chas. Wendell
Joseph Bates.

INVENTOR
Edward Williams
by Wright, Thompson & Lee
attys.

UNITED STATES PATENT OFFICE.

EDWARD WILLIAMS, OF CHESTER, ENGLAND.

APPARATUS FOR FORMING AND DRIVING STAPLES INTO BOXES.

SPECIFICATION forming part of Letters Patent No. 589,058, dated August 31, 1897.

Application filed April 11, 1896. Serial No. 587,168. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WILLIAMS, a subject of the Queen of Great Britain, residing at Chester, in the county of Chester, England, have invented certain new and useful Improvements in Apparatus for Forming and Driving Staples into Boxes, of which the following is a specification.

This invention is designed to provide apparatus for fastening boxes or cases with wire staple-shaped nails, in which the staples are cut from a continuous reel of wire and formed into the shape of a staple with shanks of equal or unequal length and driven into the sides of the box to secure the parts together by a series of successive and simultaneous operations.

The apparatus comprises feed-rolls by which the wire in a continuous length is fed into the machine, vertically-reciprocating cutting-tools by which the wire is cut to the desired length, reciprocating bending-tools and stationary anvils by which the wire is shaped to the form of a staple, horizontally-reciprocating pushers placed at the sides of the anvils, by which the staples are removed from the anvils, and vertically-reciprocating hammers or driving-tools by which the staples when formed are driven into the parts of the boxes to be secured together. It will be fully described with reference to the accompanying drawings, in which a machine is illustrated designed to form and drive four staples at one operation. It will be understood, however, that by increasing or reducing the parts the machine may be adapted for making and driving a greater or less number of staples at each operation.

Figure 1 is a front elevation; Fig. 2, a side elevation; Fig. 3, a back elevation; Fig. 4, a transverse section; Fig. 5, a sectional plan on line *x x*, Fig. 4, enlarged; Fig. 6, a sectional plan on line *y y*, Fig. 4, enlarged; Figs. 6ª and 7ª, a sectional plan and side elevation of cutting and bending tool G; Fig. 7, a detail of reciprocating pusher and anvil, side elevation, partly in section, enlarged; Fig. 8, a detail showing hammer, wire, and anvil, front elevation, enlarged; Fig. 9, a detail of front plate, back view; Fig. 10, a detail of actuating mechanism, plan; Fig. 11, a side elevation of part of same.

Upon an upright framing A of suitable contour and design is mounted a vertically-reciprocating cross-head B, which is moved up and down by the crank-pins *c*, carried in rotating disks or cranks C and connected to the ends of the reciprocating cross-head B by connecting-rods *c'*. This cross-head carries and operates the vertical reciprocating parts of the machine.

At either side of the machine, below the cross-head B, are placed two pairs of feed-rolls D D', by which the wires E, from which the staples are formed, are fed into the machine. Thus the wire for forming two staples is supplied at one side or end of the machine and the wire for the other two staples at the opposite side or end. The rolls or disks D D' are fluted or otherwise formed to rough the surface of the wire as it passes through and are actuated by racks *d*, connected to the reciprocating cross-head B, engaging the ratchet-wheels *d'* on the roll-spindles. The amount of feed which determines the length of the staples is regulated or adjusted by altering the length of the racks *d*, or it may be regulated by the diameter of the feed-rolls D, which are made changeable. The top rolls D' are mounted in pivoted or swiveling brackets d^2, to which any required amount of pressure may be applied by the screws d^3. In advance of the feed-rolls D D' are placed tubes *e*, which guide the wires E as they are fed forward to be cut.

At the back of the cross-head B are affixed two brackets or tool-holders F F', which move up and down with the cross-head and slide in guides *f f'*. To the tool-holders are clamped by set-screws or other suitable means the reciprocating cutting-tools G and the reciprocating bending-tools H. Each of the reciprocating cutting-tools G operates in conjunction with a fixed cutting-tool *g* to cut off a length of the wire and with an anvil or block K to bend or form the staple.

The cutting-tool G is formed with a V-shaped groove in the bottom and a small groove *g'* in the side to allow it to pass over the wire as it descends and bends it.

The fixed cutting-tool *g* is preferably in the form of a short tube beveled at one side, placed at the end of the guide-tube *e*.

The anvil or block K is placed beside the

fixed cutting-tool g and below the reciprocating cutting and bending tools G and H, so that one descends at one side of it and the other at the other side thereof. The wire is thereby cut off and bent over the anvil K into a staple E', being left suspended or hanging over the anvil. The anvil or block K is formed with a longitudinal groove or slot k, through which the wire E has been passed before being operated upon, and should there be any tendency of the cutting-tool G and bending-tool H as they recede to lift or carry away the staple the groove in the anvil will prevent it.

At either side of each of the anvils K are placed horizontal sliding pushers L L', which move to and fro in a plane at right angles to the cutting-tools G and bending-tools H to deliver the staple E', when formed, from the end of the anvil. The end of the pusher L is raised above the top of the groove or slot k in the anvil or block K above the top or head of the staple E'. As the throw or travel of the center sets of the pushers L is greater than that of the outer sets L', they are connected by rods l l' and worked together in pairs. The cams M M' are connected with the sliding pushers L L' by the bell-crank levers M^2 and short links m^2, and the springs m m' are attached to the levers M^2 by a rod m^3, extending therefrom. The slides are moved in one direction by the cams M M' and in the opposite direction by the springs m m'. I prefer to arrange the springs to move the slide inward, and the inward movement of the slides delivers the staples E' to the grooves n, in which the hammers or driving-tools N slide up and down.

The hammers or driving-tools N are formed of straight strips of metal and are attached to the front side of the reciprocating cross-head B, by which they are moved up and down in the grooves n. The number of these hammers may correspond with the number of feed-rolls or ends of wire fed into the machine, or there may be a greater number of hammers than staples, so that without altering the position of drivers staples may be driven in at different positions along the edge of the box.

The hammers move up and down in the grooves or races n, formed in the front plate O, into which the staples E' are delivered, when formed, by the pushers L L'. Each staple E', when it is formed and delivered to the groove n, is driven by the hammer N into the place it is required to occupy in the box.

The grooves n in back of the front plate O are enlarged at the center and taper toward the bottom to allow for any expansion of the staples E' as they leave the bending blocks or anvils K.

In front of the machine is placed a table P, upon which the box is placed to be stapled. The height of the table is capable of adjustment by the screw p to permit of boxes of any size being stapled thereon. The table may also be raised and lowered by means of the treadle p' against the under edge of the front plate O.

To the front plate O is pivoted a lever R, which is raised to set the machine in operation each time the table P is lifted into position with a box to be stapled. Each time the lever R is raised the driving-shaft is caused to rotate one revolution and one cycle of operations of the machine is carried out.

The lever R is connected by a rod o with a disk r, to which it imparts a rotary movement and on the other side of which is placed a spiral clutch s, engaging with a stationary or fixed clutch s', placed beside the toothed wheel S. Rotary movement is imparted from the disk r to the toothed wheel S by a finger or pin projecting therefrom engaging with a tooth or pin on the periphery of the wheel S. The toothed wheel S engages with a rack S', which is moved to and fro by the rotary movement of the tooth-wheel S and disk r. When in its normal position, the end of the rack-rod lies between the rotating toothed wheel T and the disk U and holds the pawl u out of gear with the internal teeth of the wheel T.

The wheel T revolves loose on the shaft t and is constantly rotated by the toothed wheel T', and the disk U is keyed to the shaft and carries the pawl u, which when in contact with the internal teeth of the wheel T is carried round with it. The cranks C and the cams M M' are keyed to the shaft t and are rotated by it.

The raising of the free end of the lever R draws down the rod o and rotates the disk r, spiral clutch s, and tooth-wheel S, withdrawing the rack S' from the wheel T. The rotary movement of the spiral clutch s against the fixed clutch s' causes it to move longitudinally upon its spindle, so that by the time the rack S' has been drawn out its full distance the clutch s has been drawn back until the pin projecting from the disk r is clear of the teeth of the wheel S and the rack S' is again automatically moved back by the spring s^2. As soon as the wheel-disk U has completed one revolution the pawl u comes again into contact with the rack-rod S' and is thrown out of gear with the internal teeth. It is also to be understood that the machine may be placed with the cutters G, benders H, and drivers N horizontal and the blocks or anvils K and the slides L vertical, the latter raising each staple when cut.

In operation the box or parts of the box to be fastened together are placed upon the table P in front of the machine and the table raised into position by the treadle p' until the parts are held tightly against the edge of the front plate O. This also raises the lever R and sets the machine in motion, and the cross-head B descends, carrying down with it the hammers or driving-tools N at the front of the machine and the cutting and bending tools G and H at the back. This downward movement of

the cross-head B by means of the hammers N drives the already-formed staples which have been delivered into the grooves *n* into the box, and at the same time by means of the cutting and bending tools G and H cuts off and forms a number of fresh staples. At the same time as the cross-head B, with the hammers N and tools G and H, are descending the pushers L L′ are drawn back by the action of the cams M M′. The upward movement of the cross-head B raises the hammers N and the tools G and H and also operates the feed-rolls D D′, by which another length of wire is fed into the machine. As the cross-head B is raised the pushers L L′ are moved forward by their springs to deliver the staples just formed in readiness for the next stroke of the hammers.

What I claim as my invention, and desire to protect by Letters Patent, is—

1. In a box-nailing machine the apparatus for setting it in motion comprising the lever R which is raised by the box or case the connecting-rod *o* the disk *r* rotated thereby the spiral clutch *s* the fixed clutch *s′* the toothed wheel S operated by the finger projecting from disk *r* and the rack S′ which penetrates the interior of the wheel T to throw the pawl *u* into and out of gear with the internal teeth substantially as described.

2. In a box-nailing machine the combination with the mechanism for driving the nails of the movable table P upon which the box is placed capable of adjustment at any desired height the adjusting-screw *p* the treadle *p′* and lever by which the box is raised into position for nailing the lever R which is raised by the box or case the connecting-rod *o* the disk *r* rotated thereby, the spiral clutch *s* the fixed clutch *s′* the toothed wheel S operated by the finger projecting from the disk *r* and the rack S′ which penetrates the interior of the wheel T to throw the pawl *u* into and out of gear with the internal teeth substantially as described.

3. In a machine for forming staple-shaped nails the combination with the reciprocating cross-head of a tool-holder of angular formation F F′ to carry one tool behind another substantially as described.

4. The combination with the vertically-reciprocating cross-head B cutting-tools G bending-tools H and driving-tools N all attached to and moving to and fro with the cross-head of the fixed anvils K over which the wire is bent the horizontally-reciprocating pushers L placed at each side of the anvils to deliver the finished staple-shaped nail to the driving-tools of the cams M M′ on the driving-shaft the cranked levers M^2 which transmit the movement of the cams to the pushers and the springs *m m′* which move the pushers in the reverse direction substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 24th day of March, 1896.

EDWARD WILLIAMS.

Witnesses:
J. OWDEN O'BRIEN,
CHAS. OVENDALE.