



H. C. BRADFORD.  
SETTING BUTTON OR LACING HOOK.

No. 104,257

Patented June 14, 1870.

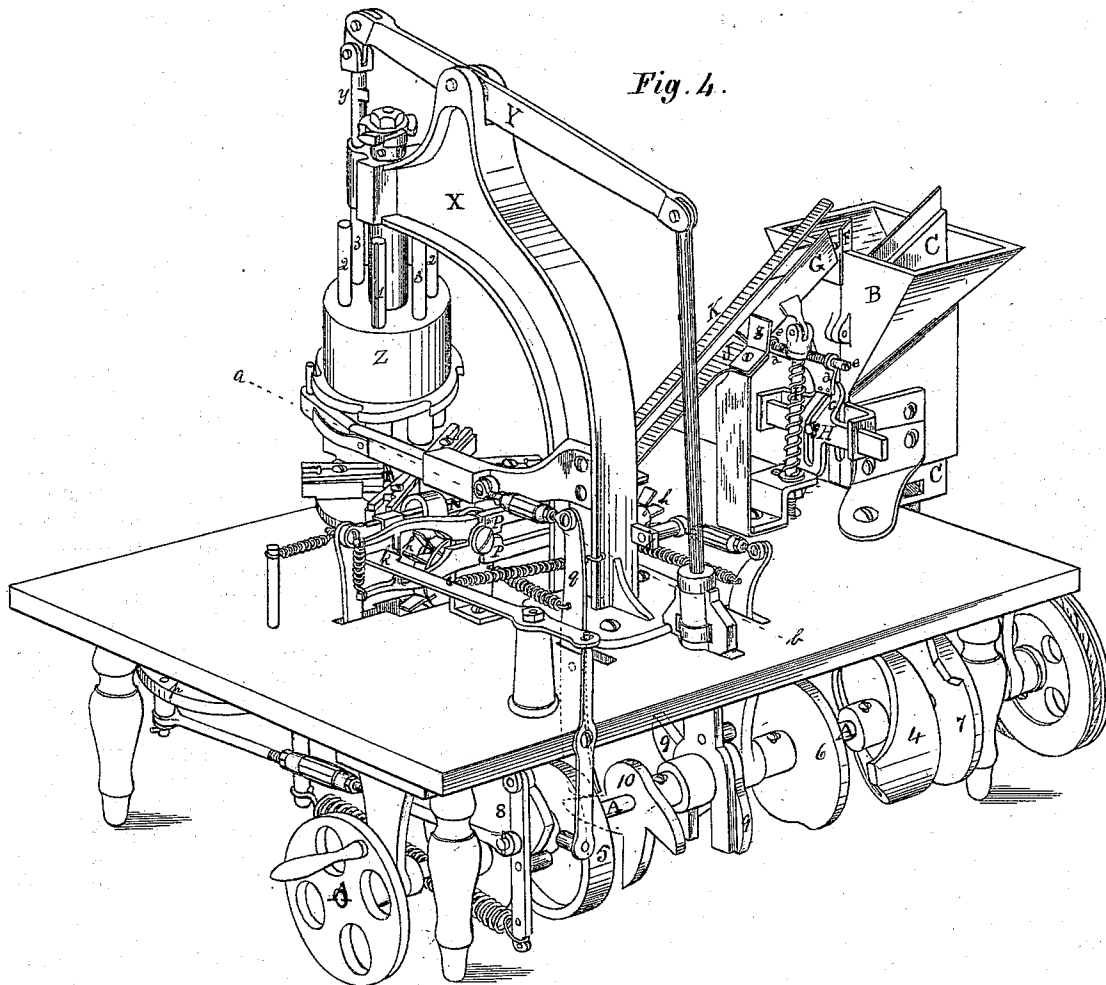


Fig. 4.

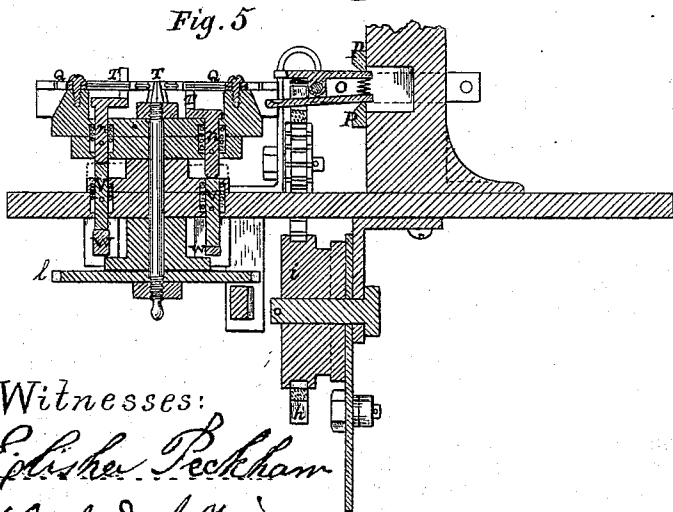


Fig. 5.

Fig. 6.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

HORACE C. BRADFORD, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR OF ONE-HALF HIS RIGHT TO H. N. FENNER.

## IMPROVEMENT IN MACHINES FOR SETTING BUTTON OR LACING HOOKS.

Specification forming part of Letters Patent No. 104,257, dated June 14, 1870.

### *To all whom it may concern:*

Be it known that I, HORACE C. BRADFORD, of the city and county of Providence, in the State of Rhode Island, have invented a certain new and useful Machine for Setting Button or Lacing Hooks.

My invention consists of certain novel devices and combinations of mechanism by means of which such button or lacing hooks as are described by William H. Shurtleff in his Letters Patent of June 5, 1866, are automatically set and secured into leather, cloth, or other fabric in connection with which they are to be used; and I do hereby declare that the following specification, taken in connection with the drawing furnished and forming a part of the same, is a true, clear, and exact description thereof.

Two sheets of drawing are numbered, respectively,

### *Sheet 1.*

Figure 1 represents a perspective front view of one of my machines. Fig. 2 represents, in elevation, on a larger scale, a portion of the front of the machine. Fig. 3 represents, in plan view, the faces of the forcing, turning, and clinching dies.

### *Sheet 2.*

Fig. 4 represents the same as Fig. 1, Sheet 1, in rear perspective. Fig. 5 represents the same, in cross-vertical section on line *a b*, Fig. 4. Fig. 6 represents a button-hook.

My machine may properly be divided into four general combinations of mechanism, as follows: First, that combination of devices which separates the single hook from a mass of hooks and delivers it in a certain essential position to certain conveying mechanism; second, that combination which conveys the hook while retained in a certain position, and delivers the same to certain presenting mechanism; third, that which presents the hooks in proper position to the action of forcing and clinching mechanism; fourth, that combination of devices by which the prongs of the hooks are forced through the fabric and then turned inward and clinched. These several combinations and their mode of operation will be separately described.

A is the main shaft of the machine, to which

power of any kind may be applied as desired. This shaft extends from end to end of the machine at its rear, and is sustained by hangers attached to the under side of its bed. B is the hopper for containing the button-hooks in mass.

C is a vertical separator. Its upper edge is sharp, and inclined downward from the outer end of the hopper toward its inner end. It is fitted to slide vertically in grooves cut in the inside of the ends of the hopper, while its lower end slides freely through a slot in the bottom.

D is a friction-pulley, mounted upon a screw-shank set in the lower end of the separator C, and is capable of vertical adjustment.

E is a rotary cam, mounted on a stud below the hopper. Its periphery engages with the pulley D, and by each revolution it causes the separator C to raise upward through the hopper. After being thus elevated, it descends by its own gravity as the cam continues to revolve, until, having arrived at the lowest point of depression, the bearing-surface of the edge of the cam again engages with the pulley and repeats the movement. Motion is imparted to this cam by means of a belt-connection with the main shaft.

F represents a vertical connecting-rail, extending from the lower edge of the separator C to the assorter. G is the swinging assorter. It consists of a thin strip of sheet metal, corresponding in character with the upper edge of separator C and connecting-rail F. It is pivoted to suitable bearings at the lower edge of each of its ends, so that it will freely swing on the pivots from a perpendicular to a horizontal position and back again.

H represents a horizontal slide, having suitable bearings projecting from and secured to the sides of the hopper. This slide has a vertical arm, *c*, provided at its upper end with two supplemental arms, *d*. Each of these latter is provided with a screw pin or finger, *e*, set at right angles to the vertical arm *c* and parallel with the slide. The face of this slide has an angular slot cut therein. A pin, *f*, set in the edge of the separator C, and extending through a vertical slot in the end of the hopper, engages with the angular slot in the slide H in such a manner that the slide is moved to the front as the separator C ascends, and to the rear as the separator descends.

I represents a vertical lever, jointed at its

upper end to the lower edge of the swinging assorter G. This lever is stepped loosely in a slotted bearing, and is embraced by a spiral spring, which sustains its weight. The screw-pins *e* in arms *d* engage loosely with the upper end of this lever, so that a lateral movement of the slide H will produce a vibratory movement of the lever and cause the assorter G to swing on its pivots.

J is the ground-rail of the chute. K is the side rail.

Having thus described in detail the devices generally constituting the combination of separating mechanism, I will now proceed to describe the operation.

The button-hooks in mass are poured into the hopper B. By the revolution of the main shaft and cam E the separator C is caused to move upward through the mass of hooks, and in its passage to gather upon its vertical edge hooks in various positions, some with their necks upon the edge with prongs to the rear, and others with prongs to the front.

Occasionally the separator will raise hooks upon its edge, having one prong on one side thereof and two on the other, and vice versa. This latter result, however, seldom occurs, owing to the shortness of the prongs and their wide distance apart, which admits of but little security in holding them.

Should the hooks be picked up by the separator in any manner other than by their necks with prongs to the rear the assorter G throws them off. When properly gathered upon the separator they slide down its inclined edge over the connecting-rail F upon the edge of the swinging assorter G. Their progress is then arrested by a vertical stop-block, *g*. By the continued rotary movement of the main shaft and cam E the separator is permitted to fall by its gravity. By this downward movement of the separator the assorter G leaves the perpendicular and assumes a horizontal position, returning to the perpendicular with its next upward movement.

When the assorter G, laden with one or more hooks, held in various ways, as described, is brought to a horizontal position, all hooks sustained by their necks and having their prongs pointing to the rear of the machine are caused to slide down the bottom rail, J, of the chute, being held in position by the side rail, K. All other hooks not thus held are thrown under the side rail, K, opposite the swinging assorter, into a box which may be placed there.

The distance between the edge of the assorter, when horizontal, and the inner edge of the side rail, K, is so great as to allow the side rail to engage only with those hooks whose prongs assume a vertical position as the assorter swings down. Such as are properly taken slide down to the bottom of the chute, ready for delivery to the conveying mechanism, next described, as follows:

L is an endless belt, having cross lugs or

projections on its under or inner side, and fingers *h* projecting at right angles thereto from its upper or outer side. This belt is mounted upon three pulleys, the peripheries of which are grooved laterally to receive the lugs on the inner side of the belt. Two of the pulleys simply serve as drums or conductors, and their bearings are above the bed of the machine on a longitudinal line with each other. The third pulley, *i*, is larger than the others, and is mounted on a stud below the bed of the machine on a line with the two already described, and midway between them. Intermittent rotary motion is communicated to this pulley by means of a ratchet-wheel, pawl, and lever, actuated by cam 4 on main shaft, every full revolution of which revolves the pulley to the extent of one notch of the ratchet, and conveys the belt a distance equal to the space between the fingers *h*.

M is a horizontal railway, connecting the bottom or ground rail, J, and side rail, K, and is in fact an extension of the same. N is a steadying-arm, arranged to slide longitudinally to and fro intermittently upon the bottom rail. At a point near the center of the machine the end of this arm and the end of the side rail of M abut, so as to make the arm a continuation of the rail. Motion is communicated to this arm by means of a spring-lever, actuated by a cam, No. 5, on the main shaft, arranged so that at every revolution of the shaft a complete intermittent longitudinal movement of the steadying arm will be made.

O is a pair of vertical holding-nippers. They are mounted upon a stud in the side of a slide-bar, *j*, which is attached to a spring-lever, actuated by a cam, No. 6, on the main shaft, so set and arranged that at every revolution of the shaft a backward and forward movement is rapidly effected, the nippers remaining at a rest between each backward and the next succeeding forward movement. The upper jaw of these nippers has an angular recess in its front edge, corresponding in part with the triangular position of the prongs of the button-hook. The lower jaw is somewhat longer than the upper, and has at or near its end a circular cup-like recess, corresponding to the form of the head of the button-hook. The arms of these nippers have between them an expansive spring, so set as to throw them apart, and in so doing to compress the jaws, which are fitted to seize the hooks and hold them firmly, with prongs in a vertical position.

P represents a pair of vertical spring-jaws, the gripping ends of which embrace and engage with at right angles the outer ends or arms of the nippers O. These spring-jaws are provided with arms, which, by being thrown apart, cause the jaws to compress the arms of the nippers O. A wedge-spring lever, *k*, actuated by one face of the cam No. 5 on the main shaft is so set and arranged as at the proper time once to each revolution of the shaft, to force apart the arms of spring-jaw P,

which, by causing its jaws to compress the arms of nippers O, results in releasing the hook from the jaws of the latter.

The devices constituting the conveying mechanism having been described in detail, its operation is described as follows: The railway at the bottom of the chute (the latter being charged with button-hooks with prongs in a vertical position) is so located in relation to the endless belt L that the fingers *h* engage with the heads of the hooks and slide them along by the intermittent movement before described until they arrive, one at a time, at a point opposite the nippers O. The side rail, K, extends only to the edge of the nippers O, and the end of the steadying-arm N abuts against the end of the side rail, extending across the end of the nippers. When the hook has been conveyed to this point it rests upon the bottom rail, and is held in position by the steadying-arm N. The nippers O come forward, seize the hook from above and below, and simultaneously with the continued forward movement, the steadying-arm retires, opening a space through which the nippers O convey the hook, and deliver it to holding clamps or jaws, hereafter to be described. The spring-jaws P then compress the handles of the nippers O, causing their jaws to release the hook. Nippers O then retire to their original position, and await the arrival of another hook.

The next organism to be described is that by means of which the button-hooks are taken from the nippers O, conveyed and presented to the forcing, turning, and clinching mechanism.

Q represents in each case a pair of horizontal-acting spring-nippers, the jaws of which are slotted to receive the neck of the button-hook. The arms of these nippers are provided with an expansive spring, which serves to keep the jaws closed, except when the power of the spring is overcome by mechanism hereafter described.

R is a circular turn-table, upon the top of which six of the nippers Q are mounted. They are placed on lines radiating from the center, with their jaws equidistant apart at the periphery of the table. The table is mounted upon a vertical shaft extending downward through the bed of the machine, and is supported by collar-bearings. At the lower end of this shaft and keyed thereto is a horizontal ratchet-drum, *l*, with which a spring-lever, *m*, engages, which is actuated by cam No. 4, (which also operates the endless belt,) which is so arranged with duplex levers as to cause the table to make one-sixth of a revolution for every turn of the main shaft, and to allow of the table having a full rest during the time occupied by the main shaft in making five-sixths of a revolution. S is a stop-rod, sliding horizontally and at right angles to the vertical turn-table shaft.

Immediately above the ratchet-drum *l*, on the lower end of the turn-table shaft and secured thereto, is a collar having six recesses, corre-

sponding with the position of the several nippers, Q, on the turn-table. This stop-rod intermittently engages with these recesses. Its function is to securely hold the turn-table in position during the operation of forcing, turning, and clinching the prongs of the button-hooks, more fully described hereafter. This stop-rod is operated by cam No. 7 on the main shaft, and is arranged to make one rapid forward and back movement in each revolution of the main shaft, (or one-sixth of a revolution of the turn-table,) and remains at rest for the balance of each revolution of the main shaft.

T in each case represents a pair of vertical wedge-cams. They consist of two vertical prongs or wedges, narrow at their tops and increasing in width downward. The inner ends or arms of the nippers Q are each embraced within a pair of these cams. When the cams are depressed the jaws are closed, but when elevated the jaws are wide open. Each pair of these cams is attached to and forms a part of a platform, which is mounted upon a vertical spindle, *n*, which passes through the bed of the turn-table. This spindle is shouldered, and is embraced by spiral springs, so set as to constantly depress the cams by their expansive force, leaving the springs in the nippers Q free to act in closing the jaws.

U is a holding-block, nearly semicircular in form, placed upon the bed of the machine below the turn-table. Its round edge extends from a point near the center of the table in front toward the right, and terminates at a corresponding point in the rear of the turn-table. A vertical edge on a straight line extends from its periphery in front and rear toward its center. Its office is, by the contact of its upper surface with the lower ends of the cam-spindle *n*, to maintain the cams in an elevated position during a little less than one-half of the revolution of the turn-table, in order that the nippers L may be presented with their jaws extended to the point opposite nippers O.

V in each case represents a vertical spring-spindle. One of these is in front of the turn-table shaft, closely adjacent to the vertical edge of the holding-block U, on a line with the several spindles *n* in the turn-table. The other is at a corresponding position in the rear. The tops of both these spindles engage with the lower ends of the vertical cam-spindle *n*, one by one, as the table revolves. The front spindle V, when elevated, raises the cam-spindle *n*, with which it may be engaged, to the level of the holding-block U, to which it is transferred by the movement of the table. The rear spindle V, when elevated, is on a level with the surface of the holding-block U, and receives therefrom each cam-spindle *n* as the table revolves, and sustains the same until a certain proper moment arrives, when it is permitted to fall, depressing the cams T and permitting the jaws of nippers Q to close upon the hook after receiving it from nippers O.

W in each case represents a horizontal sliding rod. Both have on their upper edges an inclined plane, which engages with the lower ends, respectively, of the front and rear spindles, V. These sliding rods are connected at one end by connecting-rods to opposite sides of a rocker-plate, *p*, which is in turn connected by a graduated rod to a lever actuated by a cam, No. 8, on the main shaft, so set and arranged that every revolution of the same produces a backward movement of one rod and a forward movement of the other.

The action of the sliding rods is as follows: The front rod, by a forward movement, elevates, by contact with its inclined plane, the front lifting-spindle V, which, by engaging with the lower end of the cam-spindle *n*, then in contact, raises the same, so that its lower end will be on a level with or slightly above the surface of the holding-block U, and holds it thus until, by the motion of the turn-table, it is conveyed to the upper face of the holding-block. After being relieved from this duty the sliding rod recedes and the spindle V falls, as before.

The rear sliding rod has an inclined plane, like the one last described, and is arranged to engage in the same manner with the rear vertical spindle V, corresponding in general character with the front one. By its inclined plane it elevates this spindle to a point slightly below the level of the holding-block U, and it remains in that position until, by the movement of the turn-table, the lower end of a cam-spindle, *n*, is placed upon its upper end, after which the sliding rod recedes and the spindle V descends, followed by the cam-spindle *n*.

It will therefore be understood that the sliding rods W operate two vertical spindles, which elevate or lower the cam-spindles and open and close the jaws Q while the turn-table is at rest.

Having thus described the parts of the delivering mechanism in detail, I will now describe their mode of operation.

A button-hook having been delivered by the vertical-acting nippers O to the horizontal nippers Q, the nippers O immediately retire.

The turn-table revolves one-sixth of a revolution by means of the ratchet-lever and cam 4 on the main shaft. Prior to the commencement of this movement the vertical cams T, in the rear of the nippers just fed, fall to their lowest point, and by that action permit the jaws to close upon the button-hook with the full force of the spring. The hook is thus firmly held until, by the intermittent movement of the turn-table, the jaws thus charged arrive at the point in front, where the forcing, turning, and clinching is performed, more fully hereafter to be described.

After being clinched the vertical wedge-cams are elevated by means of the lifting-spindle V and sliding rod W to a point from which, as the table next revolves, the lower end of the wedge-cam spindle can be delivered to the upper bearing-surface of the holding-block U.

By this elevation of the wedge-cams T the jaws of the nippers are opened and the button-hook released.

As the table continues to revolve, the holding-block U sustains the cams T until the nippers Q, with jaws wide open, arrive at a point nearly opposite the holding-nippers O, when the cam-spindle *n* is transferred to the top of the rear spindle V, which, by the action of the rear sliding rod, W, is permitted to fall when the jaws have received another hook, after which the operation is repeated, as before.

I will now proceed to explain the forcing, turning, and clinching mechanism.

X is a standard rising from the bed of the machine. Y is a beam-lever, with its fulcrum at top of standard X. It is attached at its front end by a connecting-link to a plunger, *y*, for operating the dies. This lever is actuated by a triple-arm cam, No. 9, on the main shaft, with which it engages through the medium of a vertical connecting-rod. Cam 9 is so set and arranged that, during about one-half a revolution of the main shaft, three separate and distinct vertical movements are given to the plunger *y*, which is permitted to remain at rest during the remainder of the revolution.

Z is a die-drum, mounted upon and keyed to a suspended vertical shaft at the front of the standard X, and sustained thereon by collar-bearings. In this drum are two sets of vertical dies. Each set is marked, respectively, Nos. 1, 2, and 3. They are arranged so that, as the drum revolves, each will rest for a while on a vertical line with the plunger *y*, and also with the jaws of nippers Q while they are at rest.

Die No. 1 has in its lower end or race three cavities, corresponding with the prongs of the button-hook. Die No. 2 has a concave circular recess, the diameter of which is slightly greater than the distance between the prongs of the button-hook. Die No. 3 has a plain smooth face. These dies are each set within a recess in the drum, and embraced with a spiral spring, which sustains its weight.

When in operative position, one of the dies, the plunger *y*, and jaws of nippers Q are on a true vertical line. To prevent any rotary movement in die No. 1 it is grooved and splined to the drum Z.

At the upper end of the shaft to which die-drum Z is keyed is a circular stop-block attached to the shaft. Its edge is provided with vertical V-shaped recesses or notches, with which a corresponding projection on the inner side of plunger *y* engages as it descends. These notches are on a vertical line with the dies 1, 2, and 3. The upper edges of the recesses are slightly beveled, so as to secure proper relation between them and the plunger, and also between the lower end of the plunger and the upper ends of the dies.

The drum Z is revolved with three prompt intermittent movements for one-half of a revolution, followed by a rest.

Motion is communicated to this drum by

means of the cam No. 10 on the main shaft, the lever *g*, and a slide provided with a pawl, which engages with a ratchet upon the lower edge of the drum.

The cam 10 is substantially the same as cam 9. Their form and effect are the same; but they are so set on the shaft that the action of the arms on cam 10 slightly precedes the action of those on cam 9.

Each movement of the drum *Z* is equal to the distance between the centers of the dies 1, 2, and 3.

Having thus described the forcing, turning, and clinching mechanism in detail, I will proceed to describe its mode of operation.

The button-hook, with its prongs vertical, having been presented by the nippers *Q* at a point beneath the die No. 1, the fabric to which the hook is to be attached is placed upon the prongs. Die No. 1 then descends and forces the prongs through the fabric into the recesses in the face of the die already described. Upon being relieved from the pressure of the plunger *y* the die ascends. The drum then revolves one-sixth, and presents die No. 2, which, with its concave recess, turns the ends of the prongs inward, and partially clinches them, after which, operated in the same manner, die No. 3 is presented with its smooth flat face, and completes the clinching. Immediately after the nipper *Q* opens its jaw, and releases the head of the hook from its grasp. The turntable then moves up with another hook, and the operation is repeated. The beam-lever *Y* and separator *C* accomplish their return movements by their own specific gravity. All other return movements in the machine are accomplished by spring motions, although in every case positive motions are fully practicable.

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

1. In combination with the hopper of an automatic button-hook-setting machine, the separator *C*, provided with an inclined edge, the inclined chute composed of bottom rail, *J*, and side rail, *K*, and the swinging assorter *G*, operating substantially as described, for separating the hooks from a mass in the hopper and presenting the same with prongs upright to the conveying mechanism.

2. In combination with the separating mechanism of an automatic button-hook-setting machine, the railway *M*, endless belt *L*, with fingers *h*, steadying-arm *N*, and presenting-nippers *O*, by means of which the button-hooks are taken from the chute of the separating mechanism, conveyed, and delivered to the holding-nippers *Q*, substantially as described.

3. In combination with the series of forcing, turning, and clinching dies Nos. 1, 2, and 3, the series of holding-nippers *Q*, so arranged as to receive and present a button-hook to the alternate action of the dies, substantially as shown and described.

4. The combination of the railway *M* with the endless belt *L*, provided with fingers *h*, substantially as shown and described.

5. The improved button-hook-setting machine herein described, consisting, essentially, of the four distinct and separate organisms or series of mechanism, as follows: first, the separating mechanism; second, the conveying and delivering mechanism; third, the presenting mechanism; and, fourth, the forcing, turning, and clinching mechanism, arranged to operate in conjunction with each other, for the several and final purposes specified.

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