3 Sheets--Sheet 1.

H. C. BRADFORD.

Improvement in Machines for Setting Button or Lacing Hooks.

No. 124,029. Patented Feb. 27, 1872.

Fig. 1.

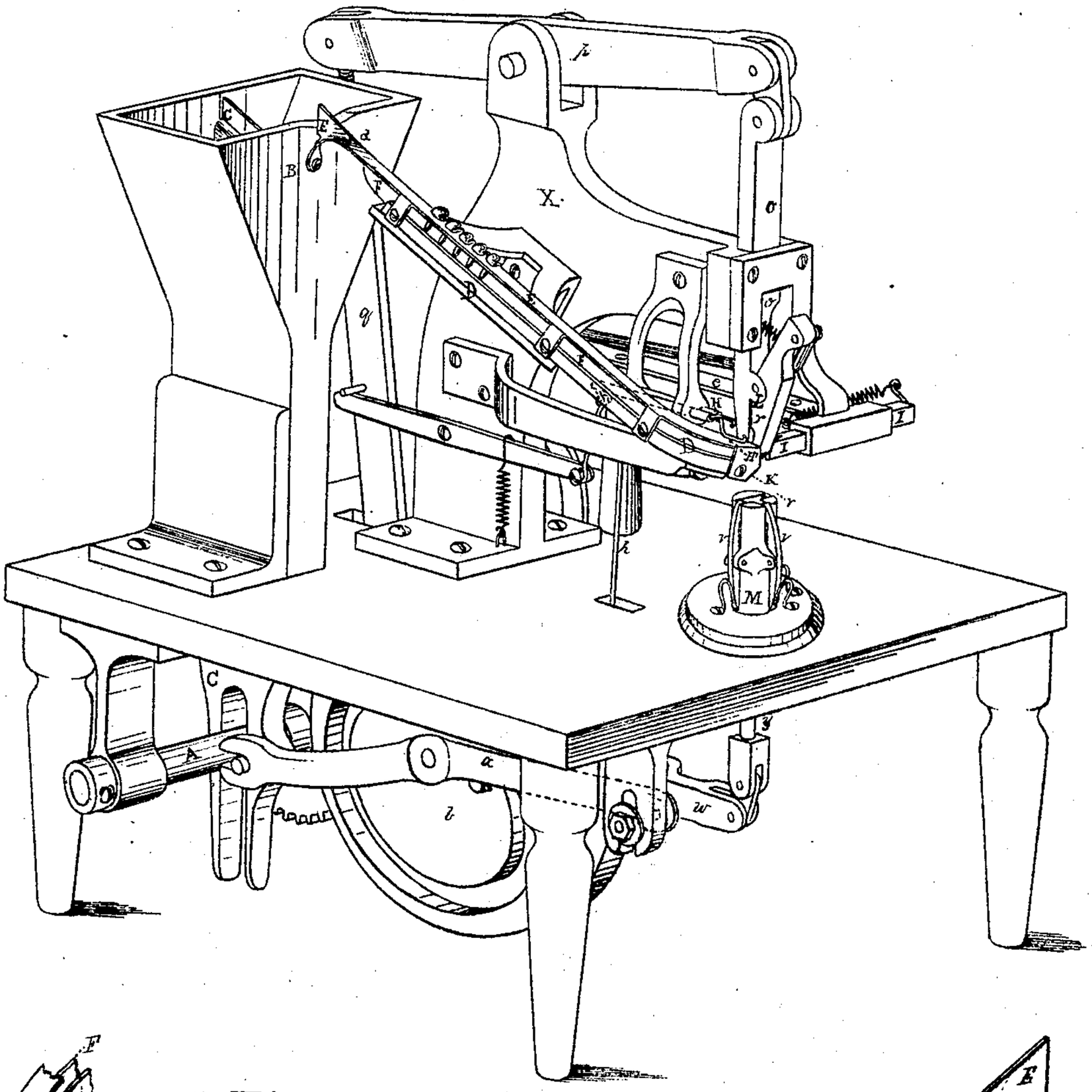


Fig. 2.

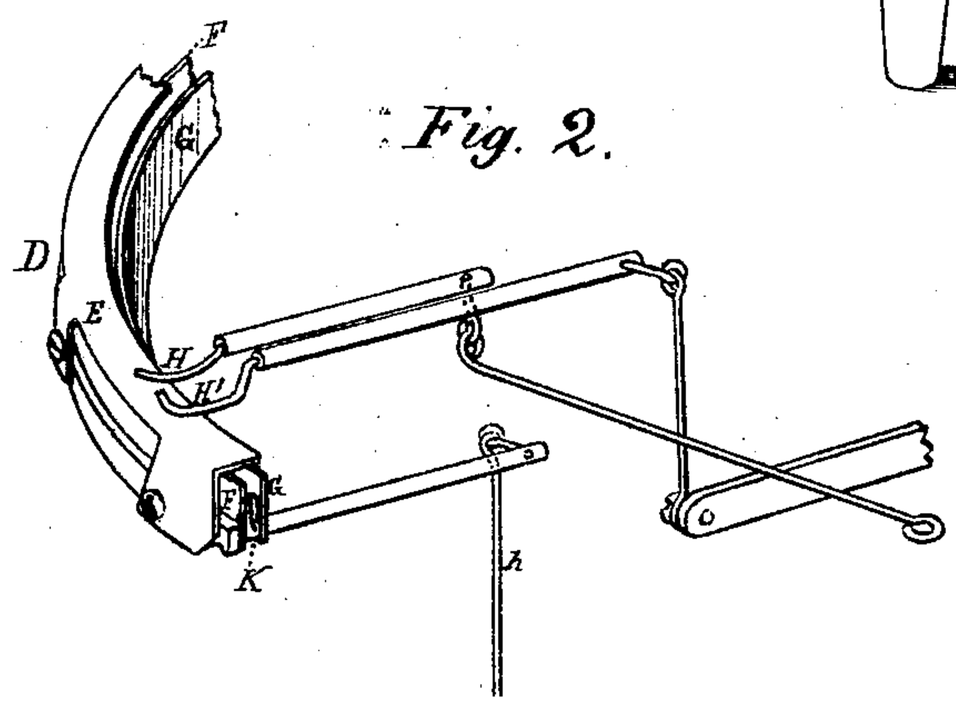
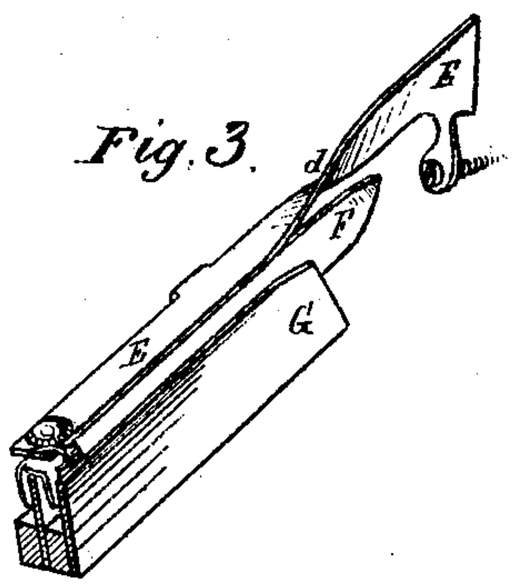


Fig. 3.



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3 Sheets--Sheet 2.

H. C. BRADFORD.

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Fig. 4

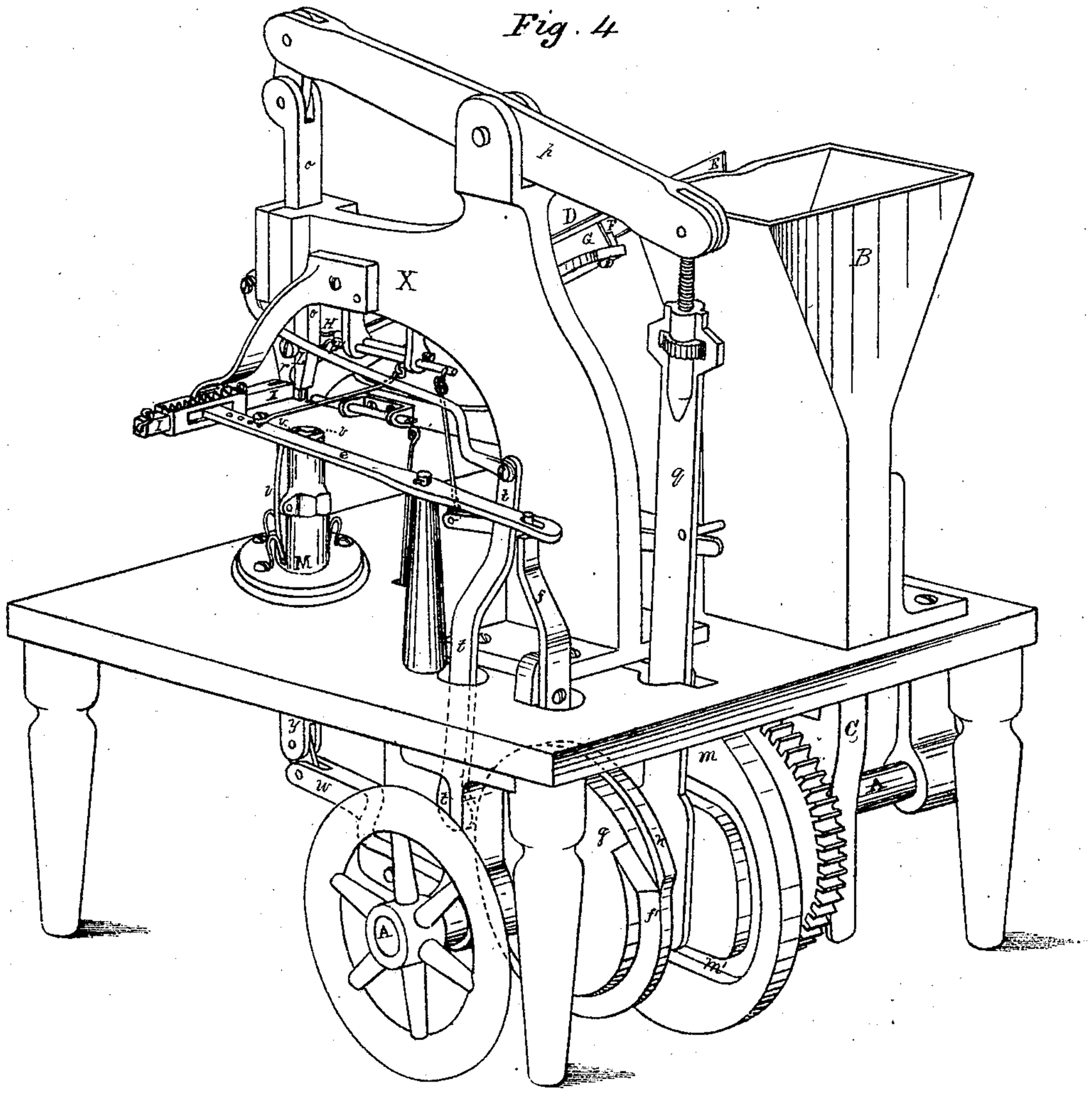


Fig. 5

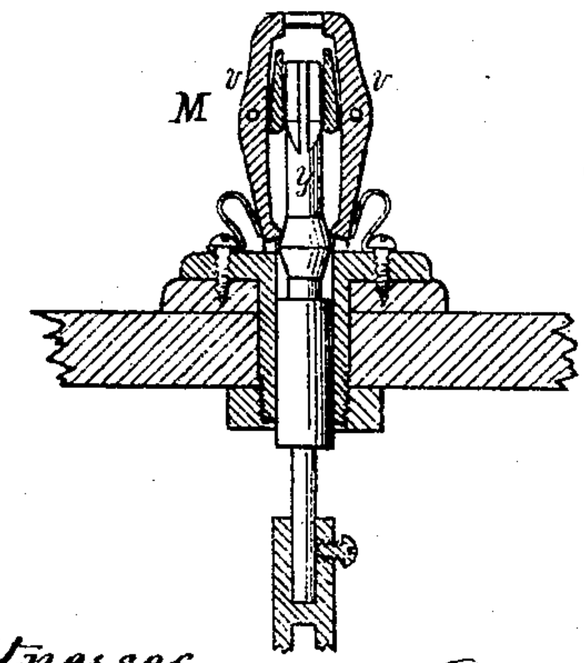
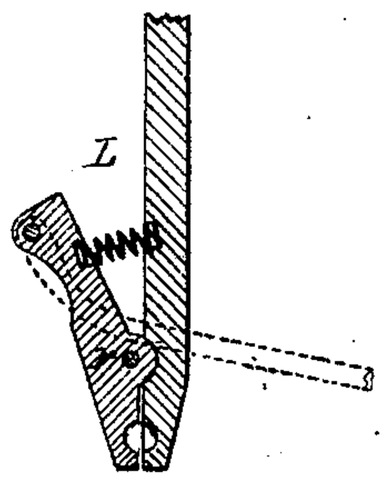


Fig. 6



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3 Sheets--Sheet 3.

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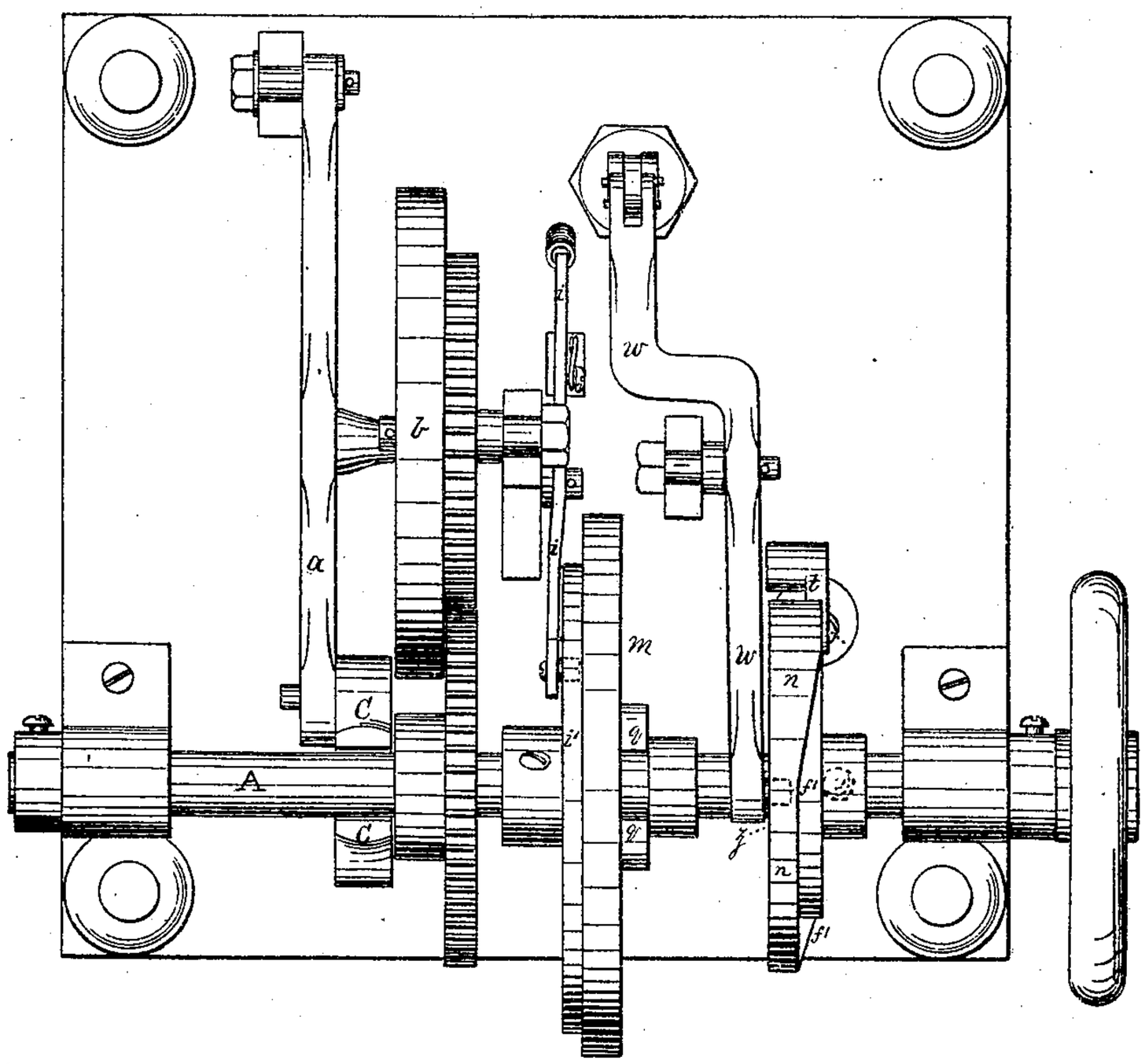
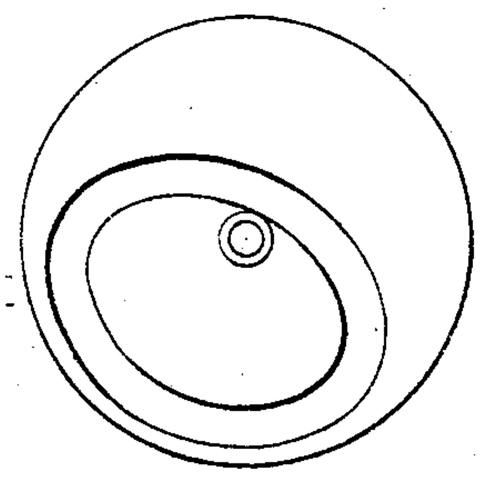
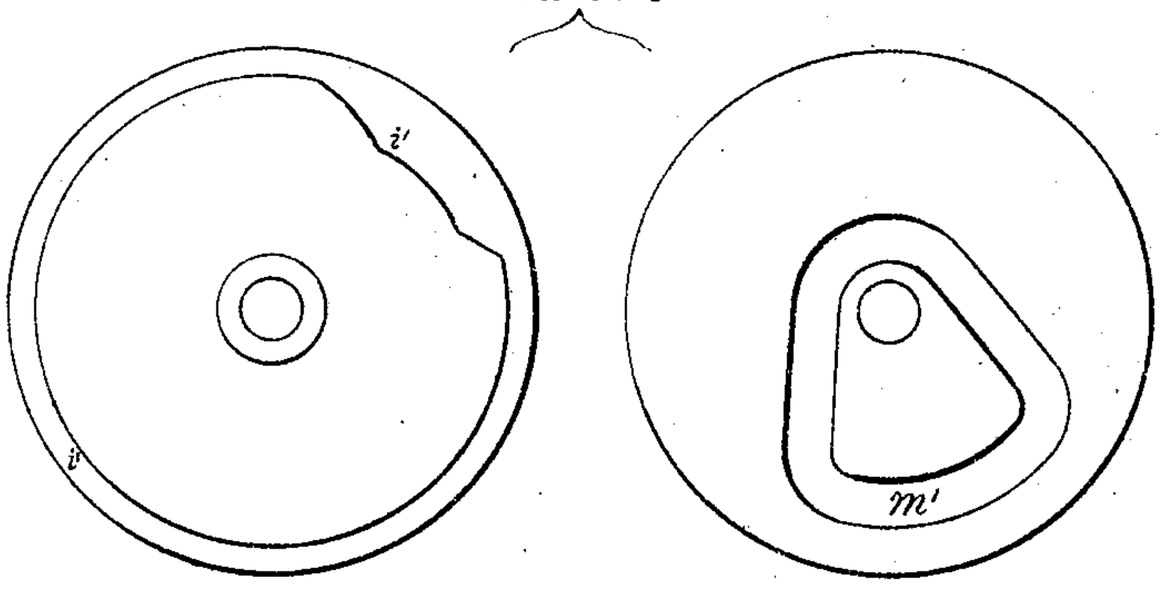
Fig. 7.



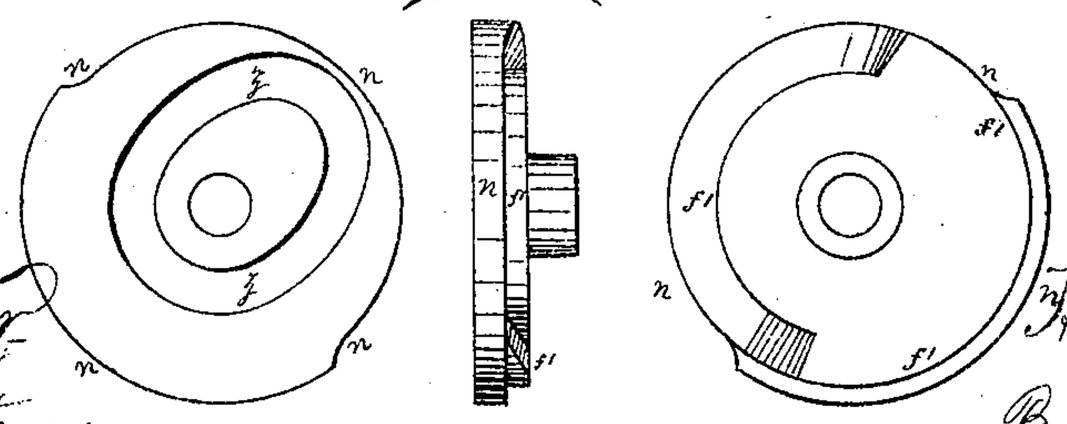
Cam b



Cam m



Cam g.



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124,029

UNITED STATES PATENT OFFICE.

HORACE C. BRADFORD, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN MACHINES FOR SETTING BUTTON OR LACING-HOOKS.

Specification forming part of Letters Patent No. 124,029, dated February 27, 1872.

To all whom it may concern:

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

My invention consists in certain novel devices and combinations of mechanism by means of which lacing-hooks may be automatically set in leather, cloth, or other fabric.

The lacing-hook for the setting of which my machine is adapted was patented by William H. Shurtleff, June 5, 1866.

The following specification, taken in connection with the drawings furnished and forming a part of the same, is presented by me as a true, clear, and exact description of a machine embodying the several and combined features of my invention.

Three sheets of drawings are presented.

Sheet 1: Figure 1 is a front perspective view of one of my complete machines. Fig. 2 represents in detail the lower end of the chute, and the devices for separating a single hook from the line of hooks in the chute, and presenting it to the forcing mechanism. Fig. 3 represents an enlarged view of the upper end of the chute, and a cross vertical section of the same, with a lacing-hook in position. Sheet 2: Fig. 4 is a rear perspective view of one of my machines. Fig. 5 represents the turning and clinching mechanism in vertical section. Fig. 6 represents the forcing-nippers in vertical section. Sheet 3: Fig. 7 is a plan view of one of my machines as seen from beneath it. On this sheet, also, are figures representing the several cams, exhibiting their grooves and operating-surfaces.

For the purposes of convenient illustration, I will divide my machine into four general divisions, viz.: First, that combination of mechanism which separates the lacing-hooks from the mass of hooks and arranges them in a certain essential position ready for delivery to the forcing mechanism. Second, the combination of mechanism which delivers the single hook to the forcing mechanism. Third, the forcing mechanism, by which the prongs of the lacing-hook are forced through the leather or other fabric. Fourth, the combination of mechanism by which the turning and the clinching of the prongs of the lacing-hook is effected.

My machine as herein described differs from all others for setting the "Shurtleff hooks" with which I am acquainted, in this—it will set the lacing-hooks in leather or other fabric while the leather is stationary and right side up, and by forcing the prongs of the hook downward through the fabric. Heretofore in all cases the hooks have been presented to the forcing mechanism with their heads downward, with prongs pointing upward, and the fabric, upon being placed thereon wrong side up, was forced down upon the prongs until they protruded upward through it. With my machine the operator can see whether every hook is to be set in the proper position, because the hooks and the fabric are both right side up at all times.

In the drawings my machine is represented as if mounted upon a bed-plate and supported on four legs, after the manner of a table.

A denotes the main shaft. It is located at the rear of the machine below, and sustained in hangers connected to the bed-plate. To this shaft a crank or driving-pulley is applied. B denotes the hopper for containing the mass of lacing-hooks, which are loosely thrown therein. C denotes a vertical separator operating within the hopper. It has a thin upper edge, which inclines downward from rear to front, and is fitted to slide up and down vertically through the mass of hooks. During its upward movement it engages with a portion of the hooks with which it comes in contact, and conveys them upward above the remainder of the hooks within the hopper. The separator thus lifts all hooks which engage with it, whether by the spaces between the prongs, or by the lacing-space below the head. The hooks, sustained by the edge of the separator, slide down the inclined edge to its lowest point, from which, when the separator is at its highest elevation, they slide, as hereafter more fully described. Motion is communicated to this separator by means of the lever *a*, which is pivoted at one end to the under side of the plate. Its free end is connected to the lower shank of the separator, which extends through and below the bed-plate adjacent to the main shaft. The lever *a* is actuated by a grooved cam, *b*, with which it is operatively connected by a projecting stud. The cam *b* is mounted on a stud and hanger projecting from the under side of the bed-plate, and is operatively

connected to the main shaft by gearing. D denotes the chute for conveying the lacing-hooks from the separator. It is connected to the hopper, and is sustained in part by it and by arms extending from the main standard X. The chute extends downward and to the front from the hopper, and is then, by an easy curve, turned to the right at nearly a right angle, and continued to the end with a uniform incline. E denotes the top plate of the chute. At its upper end it is connected to the hopper. It consists of a thin flat strip of metal, which, at the hopper, is vertical, and corresponds in form and character with the edge of the separator. When the separator is at its highest elevation, its lowest or front end is coincident with the upper end of the top plate. A short distance from the upper end the top plate is twisted from a vertical to a horizontal position, and so continues throughout its length. This twist *d* in the top plate constitutes an important feature of my invention, and its peculiar function is hereafter more fully described. F denotes the turning-plate of the chute. Like the top plate, it is composed of flat sheet metal, and is connected to the chute in such a manner as not to be in contact with the top plate, but at right angles thereto, and at a certain equal distance from it throughout its entire length. It commences adjacent to the twist *d* in the top plate, and extends to the lower end of the chute. The upper end is pointed and twisted so as to correspond with the under side of the top plate at the twist *d*. The distance between the upper edge of the turning-plate and the under side of the top plate is a little greater than the thickness of the shank-plate of the lacing-hook. G denotes the back plate of the chute. It, like the others, consists of a strip of sheet metal. It is vertical, and connected by the frame-work and bottom rail of the chute to the top and turning plates, but is not in contact with either. Its inside upper edge is parallel with, but below, the rear edge of the top plate. Its inner side is parallel with the inner face of the turning-plate. It extends from a point near the twist *d* downward to the end of the chute. The top plate, turning, and back plates are secured to each other, and to the standard X, and constitute as a whole a chute possessing peculiar and novel features. The separator, on being forced upward through the mass of hooks in the hopper, lifts therefrom such as may engage with its thin upper edge. All those hooks which are retained by their necks on the edge, and have their prongs extending to the right hand, will slide downward semi-horizontally on the separator, and off from it to the edge of the top plate, and continue downward in that position, until they arrive at the twist *d*. By the configuration of the top plate at the twist the hook is made to assume a vertical position, with the head upward. The shank-plate and prongs being heavier than the head, it is natural for the hook to incline somewhat with the prongs downward. As the hook descends on the top plate at the upper end of the twist *d*, the upper end of the turning-plate F engages with one prong of the hook, and causes this prong to enter the space between the turning-plate and the top plate, and prevents the hook from falling off as it changes its position. When the hook arrives in its downward course at the lower end of the twist, and at the upper end of the back plate, the other two prongs will enter the space between the two inner faces of the back plate and turning-plate, as shown in Fig. 3. Whenever hooks are lifted from the mass by the separator, by its engaging in the spaces between the prongs, or by its engaging with the necks of other hooks, with their prongs extending toward the left hand, they will all be delivered upon the edge of the top plate, as if properly presented, but, as they descend, they will all be thrown from the chute at the twist *d*, as there will be nothing to hold them on while passing the twist. In practice, the separator will average a little more than one hook properly delivered in its every movement, and it, therefore, keeps the chute supplied with hooks somewhat in advance of immediate requirements.

Having thus described the mechanism and its mode of operation by which the chute is automatically supplied with lacing-hooks from the hopper, and by which they are presented in a certain essential position, I will now describe the mechanism by which the hooks are separated from the line of hooks in the chute, and delivered or allowed to advance singly to the forcing mechanism. H and H′ denote two releasing-fingers. Both are bow-shaped, and project outward to the front horizontally from the ends of two parallel shafts, which are mounted in bearings sustained by the standard X. These releasing-fingers are so curved longitudinally from the lines of their respective axes that when they are semi-rotated they alternately approach and recede from the upper surface of the top plate of the chute. When the finger H is turned down into close relation to the top plate, it prevents the hooks already in the chute from continuing downward by its actual contact with the head of the lowest hook in the line. When this finger H is turned up, the hook with which it was in contact is allowed to continue downward in the chute, until again arrested in its movement by the finger H′, which, like the other, is, when turned down, also in close relation with the upper side of the top plate. The following downward movement of the finger H brings it into contact with the next upper hook in the line; the following upward movement of the finger H′ releases the lowest hook, and allows it to continue downward to the end of the chute. Motion may be communicated to these fingers in a variety of methods, and they may as well operate vertically as in the manner described. In the present instance, motion is communicated to the finger H by a crank and rod connected to the horizontally-vibrating

lever *e*, and to the finger H′ by a crank and a horizontal lever, the free end of which is adjacent to and operated by a stud projecting from the side of the connecting-rod *q*, more fully hereafter described. The return movement of finger H′ is effected by a retractile spring, which is connected to the bed-plate and to its horizontal lever, as clearly shown in Fig. 1. I denotes a transfer-bar, by means of which the lacing-hooks are transferred from the chute to the forcing mechanism. This transfer-bar consists of a metallic rod fitted to horizontal bearings, and is arranged to alternately move to the right and left to and from the lower open end of the chute at proper intervals. The end of the bar adjacent to the chute is slotted vertically for a short distance. The width of the slot corresponds with the distance between the turning-plate and back plate, while the bar on both sides of the slot corresponds, in width and thickness, to each of the two plates of the chute referred to. When the end of the transfer-bar is in contact with the end of the chute, the bar constitutes, in fact, to the length of its slot, a movable continuation of the chute without its top plate. The alternate movement of the transfer-bar is effected by a horizontal lever, *e*, which is mounted on a standard above the bed-plate, and which is actuated by a vertical lever, *f*, which, in turn, extends downward through the bed-plate, and which is actuated by contact with the surface *f′* on the side of the rotary cam *g*, mounted on the main shaft. This portion of the cam *g* is so formed that, during every complete revolution, it will cause the transfer-bar to move from contact with the chute quickly to the right, away from the chute, then to rest for, say, about two-thirds of the revolution, after which it quickly returns the bar to its former position, and follows by a rest of about one-third of the revolution. As shown in the drawing, the cam works in but one direction, the return movement being made by a retractile spring connected at one end to an arm of the standard of the machine, and at the other to the outer end of the transfer-bar. By a double-acting cam, this entire movement can be accomplished with a positive motion. K denotes a vertically-vibratory transfer-finger, which transfers the released lacing-hook from the chute to the transfer-bar. It occupies the space intervening between and below the back and turning plates of the chute at its lower end. It is mounted on the end of a shaft, which is sustained in bearings projecting from that arm of the standard X which immediately sustains the lower end of the chute. The transfer-finger, when at rest, has its upper end inclined toward the chute, and does not project upward into the space between the vertical plates until the finger is vibrated by the semi-rotary movement of its axis or shaft. In its vibratory movement, the free end of the finger describes an are equal to about one-quarter of a circle. It is actuated by a crank-lever, to which a connecting-rod, *h*, is attached, which is, in turn, connected with a spring-lever, *i*, beneath the bed-plate. The lever *i*, at its free end, is in contact with the edge *i′* of the cam *m* on the main shaft. As the cam revolves, it forces the connected end of the lever *i* downward, and holds it in that position until the proper time arrives for the vibration of the finger. The movement of the finger to the right is accomplished by the spring which is attached to the lever, while the return movement is effected by the cam, which is so formed that, during about seven-eighths of its movement, the finger is at rest and held in that position, the complete vibratory movement being effected during the remaining one-eighth portion of the revolution. L denotes a pair of clamping-nippers, which automatically seize the lacing-hooks as they are presented singly on the transfer-bar I, and force their prongs downward through the leather or fabric with which they are to be used, and holds them in proper position during the subsequent clinching operation. These nippers are secured to the lower end of a rod, *o*, which is fitted to vertical slides in an arm of the standard X. A horizontal beam-lever, *p*, is mounted on an axis at the top of the main standard X. The front end of the beam-lever is pivoted to the upper end of the rod *o*, and its rear end to a vertical connecting-rod, *q*, which extends downward through the bed-plate and is capable of being shortened or lengthened, as desired. Motion for the beam and nippers is derived from the cam *m* on the main shaft, which is provided with a groove, *m′*, in its side, with which a stud projecting from the side of the lower end of the rod *q* engages. The groove *m′* of cam *m* is of such a form that it gives to the nippers in every revolution a downward movement followed by a slight rest, a continued downward movement followed by a longer rest, and then a full upward movement. The nippers L have one stationary and one movable jaw, *r*. The latter is pivoted to the stationary jaw in a manner common to nippers or pliers, and a spring is so applied that its force will keep the jaws closed when not overcome by a counter force. At its lower end the movable jaw *r* is provided with an inward projection, which is fitted to enter the lacing-space between the under side of the head and the top of the shank-plate of the hook, and thus hold and sustain the hook during the subsequent setting operation. The peculiarly-constructed clamping-nippers, with their inward projection, are of my own invention, but constitute in part the subject of former Letters Patent. The automatic opening of the jaws is effected by the edge *n* of the cam *g* on the main shaft. It actuates a vertical lever, *t*, which projects upward through the bed-plate, to the upper end of which a rod is pivoted, which is, in turn, at its opposite end, pivoted to the upper end or arm of the movable jaw *r*. The edge *n* of cam *g* is so formed that, during every complete revolution, it will cause the jaws to be open at their highest elevation, and so remain at rest until they have descended to the

transfer-bar I, at which point it will permit the jaws to close by the action of their spring, and so remain at rest until the lowest point is reached, and, after a slightly-continued rest, it will open the jaws wide, and so hold them during the entire upward return movement. M denotes the clinching-block. It is a metallic tubular structure, secured to and projecting upward from the bed-plate beneath the nippers L, and on a vertical line therewith. The top of the clinching-block is so set with relation to the nippers that when the latter are at their lowest point they will be separated only by a space equal to the thickness of the leather or fabric in which the lacing-hooks are to be set. The block M is slotted vertically on three sides for the reception of three vertical turning-fingers, *v*, which are pivoted to the block at a point about midway between their two ends. Each finger is provided at its lower end with a spring, so set as to bear inward against its outer edge, and by that means force the upper ends outward when not otherwise prevented. When the fingers *v* are forced outward at their upper ends, an open T-shaped space is formed in the top of the clinching-block, of such dimensions as will permit the prongs of the button-hook to enter as they are forced through the leather. Within the clinching-block is a clincher, *y*. It is a metallic rod fitted to vertical bearings in the base of the block, and extends downward through the bed-plate. Its upper end is T-shaped, and corresponds in form and dimensions with the T-shaped space in the top of the clinching-block referred to. A short distance below its upper end, it is enlarged in the form of two cones, joined at their bases with conical inclined planes above and below the largest diameter. The fingers *v* are so set with relation to these inclined planes on the clincher that their inner edges are in constant contact with the inclines, actuated by the finger-springs, and, therefore, as the clincher is moved down and up it causes the fingers to vibrate in and out at their tops, and by that action to incline the prongs of a hook inward toward a center common to all of them, and on arriving at its highest elevation its T-shaped end forces the inclined prongs flat against the leather, and completes the clinching operation. The holding-nippers are so adjusted that they receive the force of the rising clincher without yielding, and, therefore, the prongs are well flattened, and more or less cushioned into the leather. The clincher *y* is actuated by a lever, *w*, below the bed-plate, which is pivoted to a hanger suspended therefrom. The lever at one end engages with the groove *z* of the cam *g* on the main shaft. This portion of the cam is so formed that, during every complete revolution, it will cause a complete rise and fall of the clincher, and this movement will be accomplished during about one-half of the revolution of the cam, and during the remainder of its rotary movement the clincher will stand at full rest.

Having thus described in detail the several portions of my machine, I will now describe its operation: Supposing the hopper to be supplied with lacing-hooks in mass, the separator C will readily lift, at each movement, more or less of them on its edge, and transfer them to the top plate E of the chute D. As the hooks descend the inclined plane, all which are not suspended by their necks with their prongs toward the right hand will be thrown from the chute at the twist *d* into a box provided for the purpose. Those that are in proper position are turned from a horizontal to a vertical position at the twist *d*, and are immediately afterward fully entered into the chute, down which they slide until arrested in their course by the contact of the lowest one with the releasing-finger H, at which point, in practice, some fifteen or twenty hooks are held in check. An upward movement of the finger H, resulting from a semi-rotary movement of its axis, releases the hook with which it is in contact, and the whole line of hooks then slide down a little further, until again arrested by the releasing-finger H′, which turns down to the top plate as the finger H turns upward, and vice versa. The finger H next turns down again, coming in contact with the second lowest hook in the line, and simultaneously therewith the finger H′ releases the lowest hook, which slides down to the end of the chute. The fingers H and H′, by the alternate movement described, deliver or release the hooks one by one as they are presented in the chute. On arriving at the bottom of the chute the transfer-finger K, by its semi-rotary movement on its axis, throws the hook beyond the end of the chute into the custody of the transfer-bar I, and then returns to its former position ready for another hook. The lacing-hook, when entered into the slot at the end of the transfer-bar, has its prongs in the same relation to the sides of the bar at the slot that they occupied while in the chute to the back plate and turning-plate. While the hook is being sustained by the transfer-bar, the clamping-nippers L descend with jaws open, and, at the bar, close on the neck of the hook and there rest until the transfer-bar, by a quick movement to the right, opens a passage for its further descent. The nippers then descend to the clinching-block, and force the prongs through the leather into the T-shaped space in the top of the block and there rest. The clincher *y*, by a vertical movement, draws inward the tops of the turning-fingers *v*, and causes thereby the prongs of the lacing-hook to be all inclined toward the center. After this turning operation is effected the clincher rises and forces the prongs flat against the leather. The holding-nippers then open and resume their highest elevation, and the several devices are ready to repeat the operation described. In many instances return motions are effected by springs. It is practicable in all cases to dispense with springs when desired, and effect all movements by the positive action of cams.

Having thus described my invention, I claim

as new and desire to secure by Letters Patent—

1. The top plate E, partially vertical and partially horizontal, with the intervening section twisted or curved, in combination with the turning-plate F, substantially as described.

2. The combination of the chute with fingers H and H′, arranged to vibrate alternately to and from the upper surface of the chute, as and for the purposes specified.

3. The combination of the chute, the transfer-finger, and the transfer-bar, as and for the purposes specified.

4. The automatic holding and forcing nippers, in combination with the transfer or holding bar, as and for the purposes specified.

5. The clinching-block, in combination with the turning-fingers and the clincher, substantially as and for the purposes specified.

6. The machine for automatically setting lacing-hooks, composed of the several mechanical devices, organized and combined substantially as described, for separating single hooks from a mass of hooks, for presenting them in a proper position for seizing each hook adjacent to its lacing-space as presented, and forcing its prongs through the fabric in which it is to be set, and for turning and clinching the prongs.

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