(Model.) 3 Sheets—Sheet 1.

D. MILLS.

BUTTON HOLE SEWING MACHINE.

No. 305,624. Patented Sept. 23, 1884.

FIG. 3.

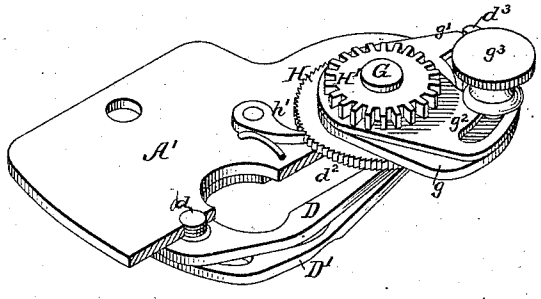


FIG. 1.

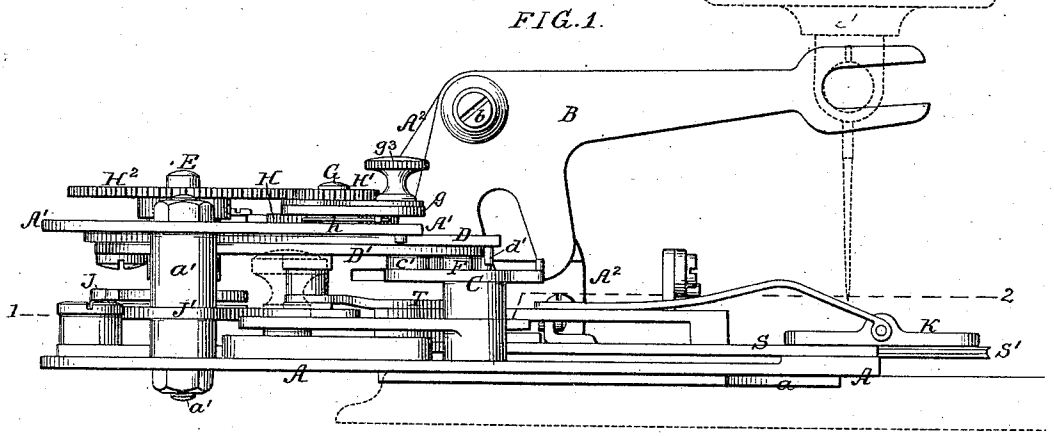
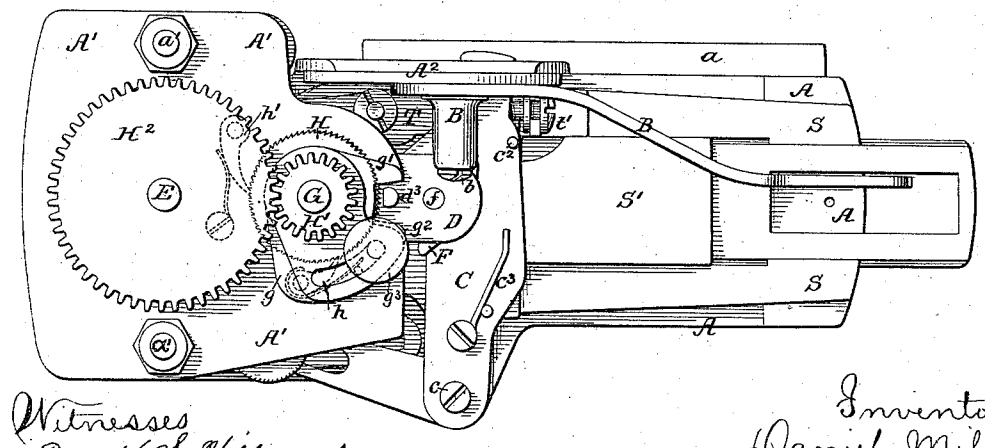


FIG. 2.



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(Model.) 3 Sheets—Sheet 2.

D. MILLS.

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FIG. 4.

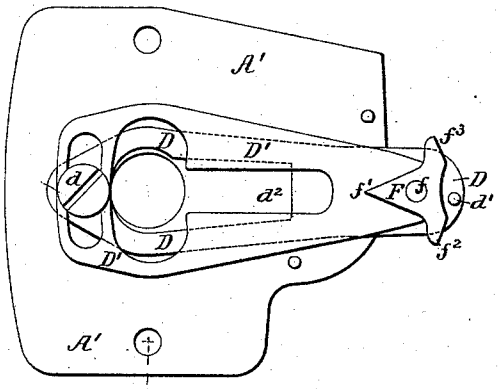


FIG. 5.

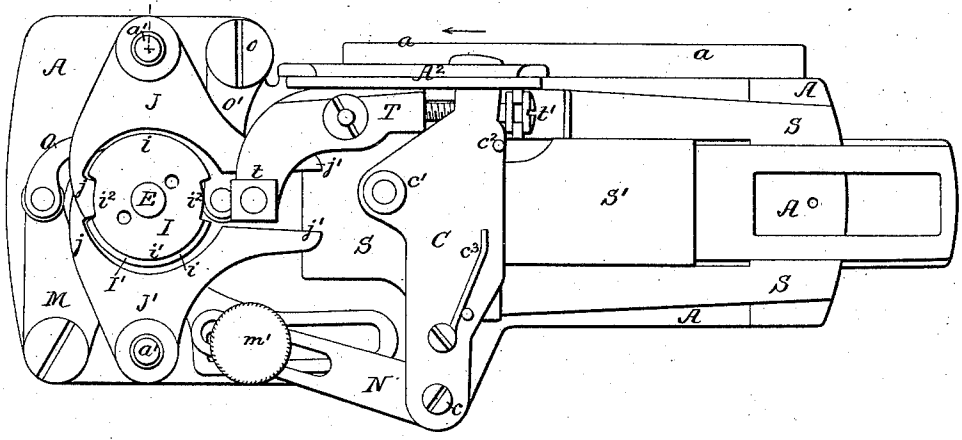
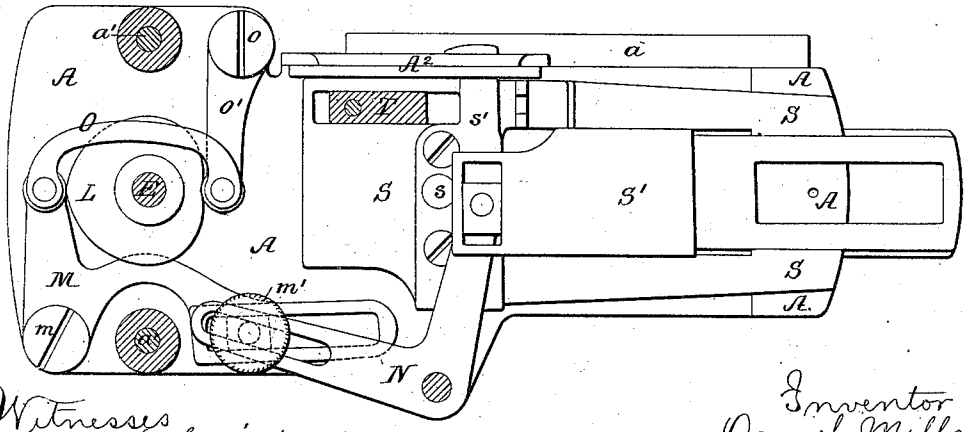


FIG. 7.



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3 Sheets—Sheet 3.

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BUTTON-HOLE SEWING MACHINE.

No. 305,624. Patented Sept. 23, 1884.

FIG. 9.

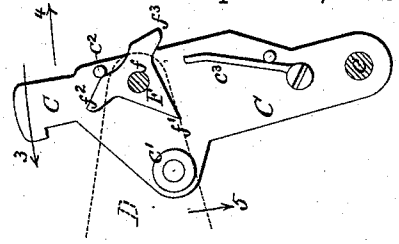

FIG. 8.

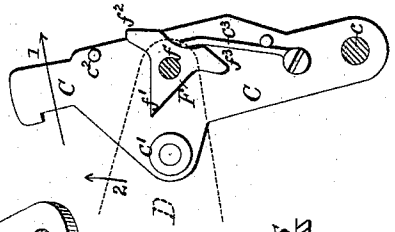

FIG. 10.

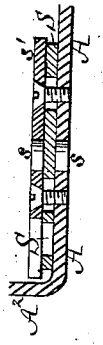

FIG. 6.

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UNITED STATES PATENT OFFICE.

DANIEL MILLS, OF PHILADELPHIA, PENNSYLVANIA.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 305,624, dated September 23, 1884.

Application filed February 18, 1884. (Model.)

To all whom it may concern:

Be it known that I, DANIEL MILLS, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Button-Hole Sewing Mechanism, of which the following is a specification.

My invention consists of certain improvements in the construction of that class of button-hole feed mechanisms for sewing-machines in which the material is held between a pair of clamps having an automatic lateral reciprocating movement and an intermittent feed motion imparted to them, so that the needle may stitch the sides and bar the ends of the button-hole.

In the accompanying drawings, Figure 1 is a side view of my improved button-hole mechanism, which is in the form of an attachment constructed to be detachably applied to the bed of an ordinary sewing-machine, and to be operated from the reciprocating needle-bar thereof. Fig. 2 is a plan view of the attachment. Fig. 3 is a perspective view, partly in section, of the top plate and its attachments. Fig. 4 is an inverted plan view of the same. Fig. 5 is a plan view of the attachment with the top plate and its parts removed. Fig. 6 is a perspective view of the attachment, as seen in Fig. 5, but with some of the levers removed. Fig. 7 is a sectional plan on the line 1 2, Fig. 1. Figs. 8 and 9 are views illustrating the operation of a part of the device, and Fig. 10 is a sectional view on the line 3 4, Fig. 6.

A is the base-plate of the attachment, which may have on its under side a dovetailed guide-piece, *a*, of a size corresponding with the ordinary throat-plate of a sewing-machine, so that on withdrawing the throat-plate the attachment may be slipped into its place on the bed of the machine, as indicated in Fig. 1. In this figure a portion of the said bed and of the head and the needle-bar are indicated by dotted lines.

All the operative parts of the attachment receive motion from the reciprocating needle-bar, which has a pin on its lower end adapted to an open slot in the end of the long arm of a bell-crank lever, B, mounted on a center pin, *b*, fixed to an upright standard, A^2, on the base-plate A, Fig. 6. The short arm of the bell-crank lever B has jaws, which act on the outer end of a horizontal lever, C, free to vibrate on a fixed pin, *c*, on the base-plate. This lever C, by means hereinafter described, in turn imparts an intermittent vibrating motion to a lever, D, pivoted at *d* to the under side of the top plate, A′, which is bolted to the base-plate A through the medium of bolts *a*′, provided with suitable collars. From the lever D the necessary vibrating motion is imparted to the primary slide S, (with its secondary slide S′, carrying the cloth-clamp K, indicated only in Fig. 1,) to form the button-hole stitch, and from the same lever, D, an intermittent rotary motion is imparted to the cam for giving the necessary longitudinal feed to the secondary slide S′, and also what I may term the "pattern-cams," for limiting and determining the extent of vibration of the primary slide in the formation of the sides and barred ends of the button-hole.

I will describe these devices in their order—that is to say, first, the means for converting the constantly-vibrating motion of the lever C into an intermittently-vibrating motion of the lever D; second, the devices for operating the primary slide therefrom; third, the means for converting the intermittently-vibrating motion of the lever D into a rotary motion of the cam and pattern wheels; fourth, the devices for determining the extent of motion of the primary slide S, and the devices for imparting the longitudinal feed motion to the secondary slide S′.

On the lever C is mounted a pin, *c*′, Fig. 5, preferably provided with an anti-friction roller, this pin being adapted to act on a tappet, F, Figs. 1 and 4, free to have a motion on a pivot-pin, *f*, on the lever D, this motion being limited by the pin *d*′. This pivoted tappet has a tapering point, *f*′, and two arms, f^2 f^3, as shown in Fig. 4, and on the lever C are two projections, c^2 c^3, the latter, or both preferably, being spring or yielding projections or fingers. Supposing these parts to be in the relative positions shown in Fig. 8, and the lever C moving in the direction of the arrow 1, the pin *c*′ on the said lever will come into contact with the inclined side f' f^3 of the tappet, and the lever D will accordingly be thrown over in the direction of the arrow 2. On the return movement of the lever C in the direction of the arrow 3, Fig. 9, the arm f^2 of the tappet, being in the path of the projection c^2, will

be struck by the latter, so as to throw the tappet over to the position shown in said Fig. 9. Accordingly when the lever C is moved back in the direction of the arrow 4 the pin c' will strike the inclined side $f' f^2$ of the tappet, and the lever D will be thrown over in the direction of the arrow 5. This will bring the finger f^3 of the tappet into the path of the finger c^3 on the return movement of the lever C, and the tappet will be again reversed, and so on. Thus during the movement of the lever C inward in one direction the lever D is at rest and only the tappet is reversed; but the lever D is moved alternately from one side to the other on every alternate or outward movement of the lever C.

To the lever D is pivoted, on the center f, a plate, D′, which is held in greater or less frictional contact with the lever D by the head of the screw-pivot d, passing through a segmental slot in the friction-plate. The latter has a longitudinal slot, d^2, to which is adapted a swivel-block, t, on an arm, T, on the primary slide S, this arm being mounted on guides on the said slides so as to be adjustable longitudinally thereon by a set-screw, t', Figs. 5 and 6, for a purpose explained hereinafter. The slide S is pivoted to the base-plate at s, so as to be free to vibrate thereon, and is steadied and retained in the positions to which it is moved by a cross-plate, s', secured to the base. The pivot-pin s, which is secured to the slide S, has bearings in both the base-plate A and the cross-plate s', thus securing an extended and firm bearing, as shown in Fig. 10. The secondary slide S′, to which any usual form of clamp may be attached, as indicated, for instance, in Fig. 1, is adapted to V-shaped guides in the outer end of the primary slide, Fig. 6, so that the secondary slide, while partaking of the vibrating movement imparted to the primary slide, can be moved longitudinally thereon through the medium of suitable devices, as hereinafter described.

Referring now to the devices for imparting intermittent rotary motion to the feed-cam and pattern-wheels, there is mounted in the top plate, A′, a center pin, G, on which is free to turn a ratchet-wheel, H, into which gears a spring-pawl, h, Figs. 1 and 2, on a vibrating pawl-carrier, g, having the center pin, G, as an axis. A pawl, h', Figs. 2 and 3, on the top plate also gears into the ratchet-wheel H to prevent back action. The pawl-carrier g has two fingers or jaws, $g' g^2$, between which projects a pin, d^3, Figs. 2 and 3, on the lever D, one of the jaws, g^2, being adjustable (and capable of being secured after adjustment by a thumb-nut, g^3,) so as to vary the extent of play of the pin d^3 between the jaws, and so vary the extent of feed imparted to the ratchet-wheel at each alternate movement of the lever D. Secured to or made in one piece with the ratchet-wheel H is a spur-wheel, H′, gearing into a pinion, H^2, on the spindle E. On this spindle are also mounted two pattern wheels or cams, I I′, and a heart-shaped cam, L, Figs. 5, 6, and 7, which are all three connected to, so as to turn with, the pinion H^2. Each pattern-cam is in the present instance provided with two diametrically-opposite recesses, $i^2 i^2$, with intermediate curved faces, $i i'$, drawn on radii from the center of the spindle E, the face i' of each pattern-wheel being drawn on a smaller radius than the face i. The recesses or notches i^2 in the two wheels are in line with each other, but the faces i and i' are alternated—that is, the face i of one wheel is on the same side of a center line drawn through the notches as the face i' of the other wheel, as shown in Figs. 5 and 6. Against the peripheries of these two wheels I I′ are adapted to bear the ends $j j$ of two bent levers, J J′, mounted on the bolts $a' a'$, the other ends, $j' j'$, of these levers being brought around to form a pair of straight-faced jaws, between which projects a swivel-block, t^2, on the arm T of the primary slide, Fig. 6, so that these jaws $j' j'$ will limit the extent of vibrating motion imparted to the slide S by the lever D and friction-plate D′. The extent of this motion will be determined by the parts of the peripheries of the two cams I I′, on which the other ends, $j j$, of the levers J J′ are bearing at any particular moment. When the pattern-wheels are turned to such a position that these ends of the levers occupy the notches i^2, as shown, the jaws $j' j'$ will be farthest apart and the slide S will have its fullest movement. The feed motion is so timed that at that moment the secondary slide is at one end of its movement, and the barring of the end of the button-hole will thus be accomplished. When the pattern-wheels are so turned that the ends of the levers J J′ bear on the faces $i i'$, the face i will throw the corresponding jaw so far inward as to limit the movement of the slide S to the extent desired in forming the stitches down or up one side of the button-hole until the ends j of the levers come into the notches i^2 opposite to those previously referred to, and the barring of the other end of the button-hole will be accomplished. As the pattern-wheels continue their movement, the relative positions of the jaws $j' j'$ will be changed to give the extent of motion to the slide necessary to form the opposite side of the button-hole.

By varying the depth of the notches i^2, or by making them flush with the faces i', the width of the bar at the end of the button-hole may be varied to any desired extent. Whenever notches are used, as in the drawings, the barring will be wider than the width of the button-hole.

By making the radius of the faces $i i'$ greater or less, various depths of bight or lengths of the stitches forming the sides of the button-hole may be obtained. In using the attachment, the variation of depth of bight is obtained by the adjustment of the arm T, as one or both of the jaws $j' j'$ always present inclined faces, so that the space between them is wider at their ends than nearer the wheels I I′. At the same time there is a corresponding adjust-

ment of the block *t* in the slot of the friction-plate D′ toward or from the fulcrum of the lever D, this friction-plate forming the yielding connection between the lever D and slide S, made necessary by the limiting action of the jaws *j′ j′*. The larger faces *i* of both wheels I I′ are of such a radius, however, that when either lever J or J′ bears on that face the inner face of the jaw *j′* of that lever will be parallel, or thereabout, with a line drawn through the center of the spindle E, primary-slide axis, and needle-hole of the machine, so that in forming the sides of the button-hole the inner lines thereof will always be at the proper distance apart.

The construction of the feed-movement for the secondary slide will be best understood by referring to Fig. 7, in which I is the heart-shaped feed-cam, having an intermittent motion with the wheels I I′. This cam bears on one edge on an anti-friction roller on the short arm of a bell-crank lever, M, pivoted at *m* to the base, while the diametrically-opposite edge bears on an anti-friction roller on a radius-bar, O′, pivoted at *o* to the base, the two levers O′ and M being connected by a curved link, *o*. The long arm of the lever M is connected by a bolt and thumb-nut, *m′*, to a bell-crank lever, N, pivoted on the pin *c*, while the opposite arm of this bell-crank lever has a pin and block adapted to a slot in the secondary slide S′. The bolt *m′* is adapted to slots in the two levers M N, so that by adjusting this in the said slots the extent of movement of the secondary on the primary slide, and consequently the length of the button-hole, may be varied, as will be readily understood. The intermittent rotation of the cam I will give the necessary feed motion to the secondary slide in a manner which will need no description.

I claim as my invention—

1. The combination of the primary and secondary slides of a button-hole sewing mechanism, and cloth-clamps carried thereby, and means, substantially as described, for limiting the movement of the primary slide, with a lever, D, and a friction-plate, D′, carried thereby, to impart motion to the slide, a tappet, F, carried by said lever D, and a vibrating lever, C, carrying a pin, *c′*, and fingers for reversing the tappet.

2. The combination of the primary and secondary slides of a button-hole sewing mechanism, cloth-clamps carried thereby, and a feed-cam operating the said slides, with a vibrating lever, D, having a pin, d^3, a ratchet-feed wheel, H, controlling the cam, a pawl, and a vibrating pawl-carrier having jaws $g' g^2$, one of which is adjustable, substantially as described.

3. The combination of the primary and secondary slides of a button-hole sewing mechanism, cloth-clamps carried thereby, and an operating-lever, D, with a friction-plate, D′, pivoted to the said lever, and having a slot for the reception of a projection on the primary slide, and pattern-wheels for limiting the vibrating motion of the primary slide, substantially as described.

4. The combination of the primary and secondary slides of a button-hole sewing mechanism, cloth-clamps carried thereby, and an operating-lever, D, and friction-plate D′, with an adjustable arm, T, carried by the slide, and having a projection adapted to a slot in the friction-plate, and means, substantially as set forth, for limiting the movement of the primary slide.

5. The combination of the primary slide of a button-hole sewing mechanism, and an operating-lever for vibrating the said slide, with two rotary pattern-wheels, and a bent lever for each wheel, arms on the two bent levers forming a pair of jaws, between which is adapt- a projection on the said slide, substantially as set forth.

6. The combination of the primary slide of a button-hole sewing mechanism, an operating-lever therefor, two pattern-wheels, and means for intermittently rotating the same, and two corresponding bent levers, forming a pair of jaws, with an arm adjustable on the said slide, and having a projection entering between said jaws, as and for the purpose set forth.

7. The combination of the primary slide of a button-hole sewing mechanism, and an operating-lever therefor, with two pattern-wheels, having alternate faces *i i′* and intermediate notches, i^2, and bent levers controlled by said wheels and forming jaws, between which is adapted a projection on the said slide.

8. The combination of the primary and secondary slides of a button-hole sewing mechanism, cloth-clamps carried thereby, and devices, substantially as described, for vibrating the said slides, with a heart-shaped rotary cam, a lever, M, controlling the secondary slide, radius-rod O′, and connecting-link O.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANL. MILLS.

Witnesses:
JOHN E. PARKER,
HUBERT HOWSON.