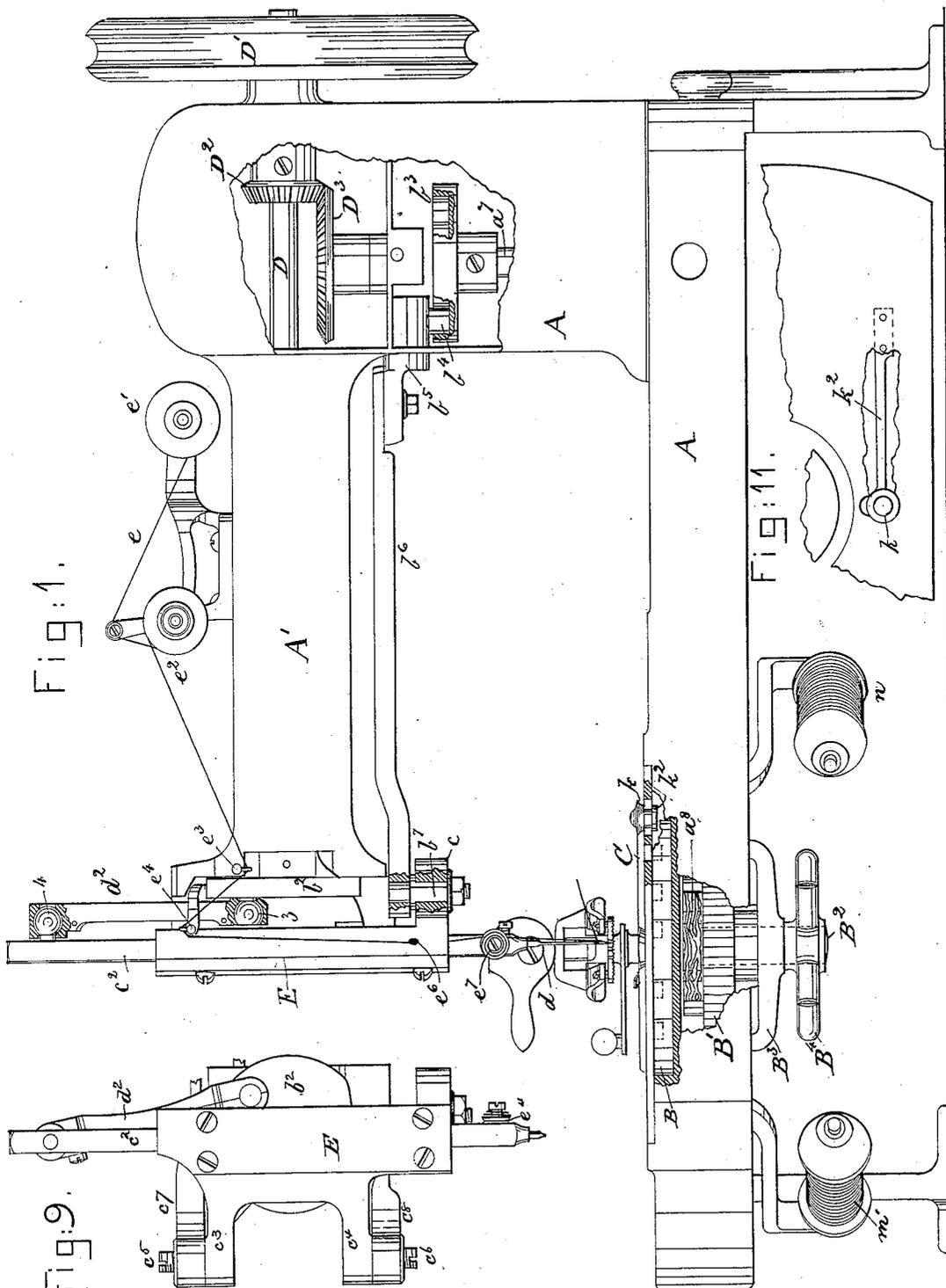


J. W. LUFKIN.

Button Hole Sewing Machine.

No. 242,462.

Patented June 7, 1881.



Witnesses.

Arthur Reynolds
L. J. Connor

Inventor.
John W. Lufkin
by Crosby & Morgan, Attys.

(Model.)

3 Sheets—Sheet 2.

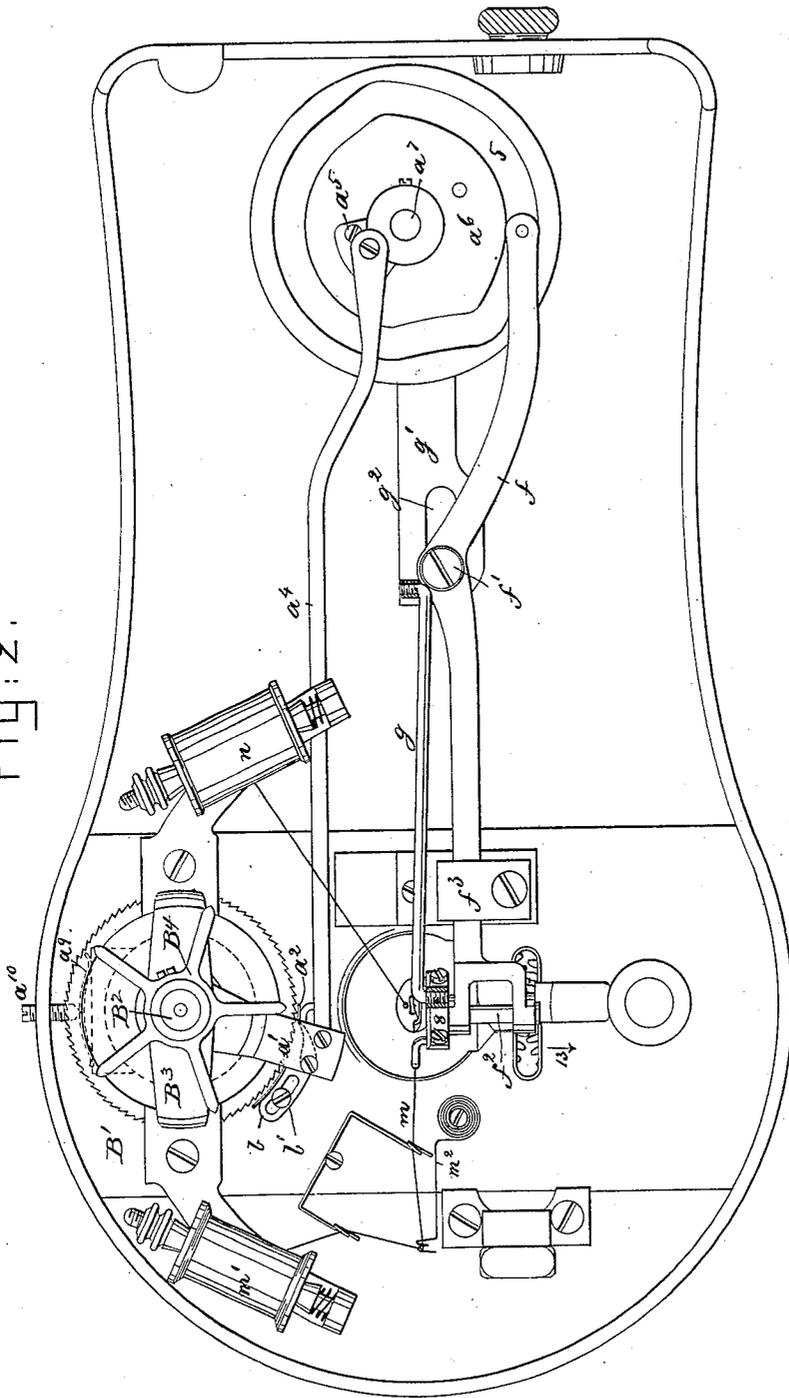
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Fig: 2.



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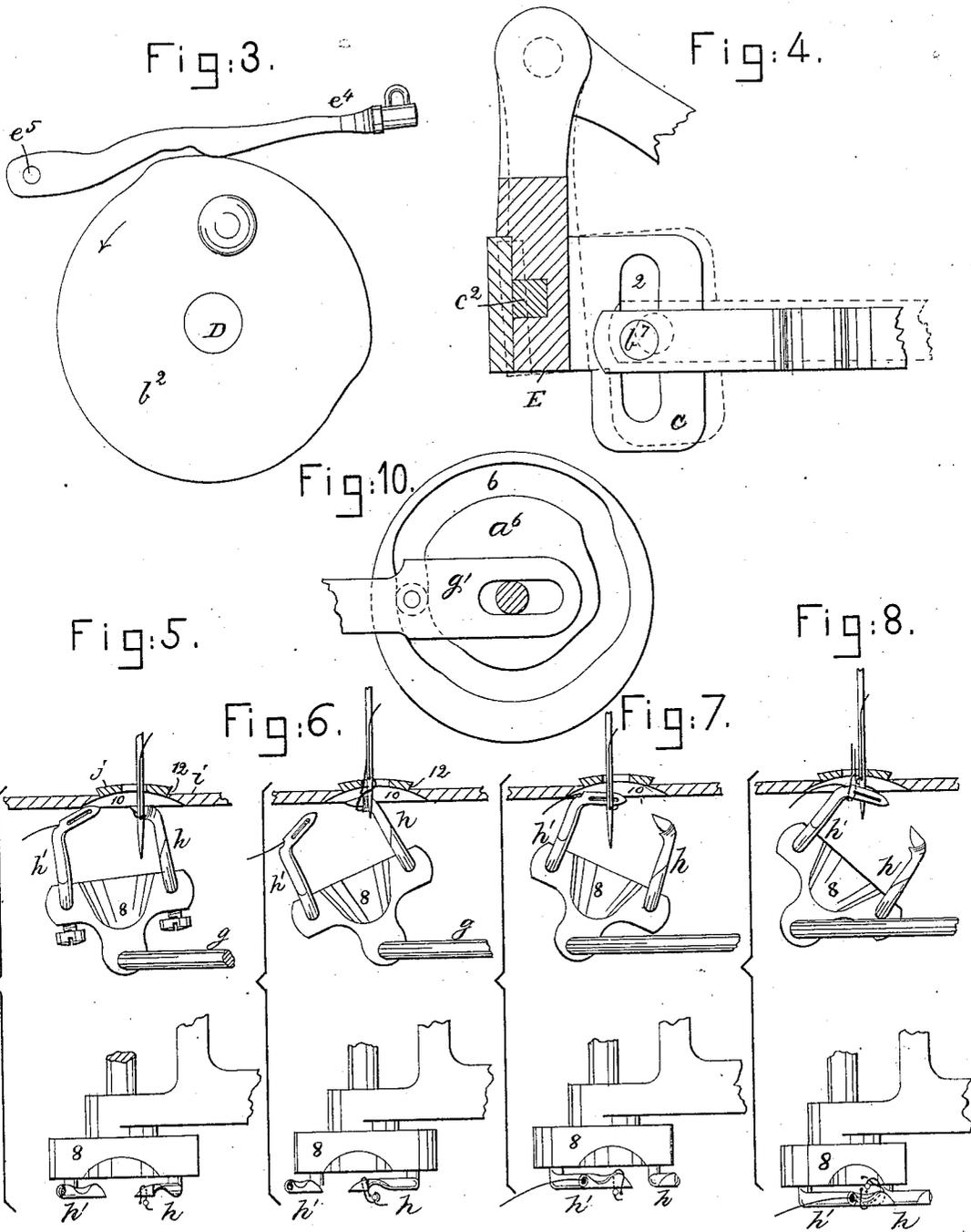
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UNITED STATES PATENT OFFICE.

JOHN W. LUFKIN, OF CHELSEA, MASSACHUSETTS.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 242,462, dated June 7, 1881.

Application filed December 11, 1880. (Model.)

To all whom it may concern:

Be it known that I, JOHN W. LUFKIN, of Chelsea, county of Suffolk, and State of Massachusetts, have invented a new and useful Improvement in Button-Hole Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification.

This invention in button-hole sewing-machines is an improvement on that class of machine represented in United States Patents No. 49,627 and Nos. 115,857 and 123,348, to which reference may be had.

My present invention consists, essentially, in a needle-bar-carrying head, supported to be vibrated about a vertical axis, and the needle-bar, its needle, and thread-nippers carried by the needle-bar, combined with means to reciprocate the needle-bar, and vibrate the said head in the arc of a horizontal circle, and with an intermittingly-operated cloth holding and moving clamp.

The backward movement of the said head and its needle-bar and needle by the same cam brings the head in such position that the needle in its descent penetrates the cloth or material at a certain distance back from the edge of the button-hole slit, this distance being more or less, as may be desired. The needle-bar carried by this vibrating head is actuated from a crank-pin on a rotating disk connected with a rotating shaft in the overhanging arm of the machine, the said shaft having only a movement of rotation, the said crank-pin and the pin or stud on the needle-bar having ball-like heads, which are received within the socketed ends of a connecting-link, the said connecting mechanism enabling the needle-bar to be reciprocated, no matter what may be the position of the head of the machine, without binding.

Another feature of my invention is comprehended in a peculiar looper having two separate arms or hooks, one of which is to carry a thread, the said arms or hooks being extended vertically upward from a rock-shaft, which, besides its rocking motion, has at times a horizontal movement in such direction as to expand or open the loops of needle-thread close up to the needle-hole and material, both when the needle descends through the material and

through the slit, the said shaft moving in one direction with the loop of needle-thread after the needle rises, returning to its position as the needle again descends.

The needle throat-plate, instead of having a projection or device below it to help enlarge the loop of needle-thread acted upon by the usual spreader common to the Patents Nos. 49,627 and 123,348, has its under side concaved or cut out, so that the ends of the arms or hooks for manipulating the thread may work close up to the under surface of the cloth, which enables me to employ a shorter needle and to use a shorter loop of needle-thread, the movement of the mechanism for expanding the said short loop being reduced to the minimum.

In this my present invention I have made the arms or hooks connected with the rocking and sliding shaft before referred to to spread the loops of needle-thread, thus doing away with an independent spreader common to the patented machines last above referred to.

The clamp-holding and guiding button on the cloth-plate has its sides undercut to receive the beveled inner edges of the clamp, such construction enabling the cloth on the clamp to be brought close down to the throat-plate, so that the arms or hooks before described may operate as closely as possible to the cloth, the shorter the loop of needle-thread, and the closer it can be spread under the cloth in the path of the descending needle, the less the liability of skipping a stitch, the less the loop to be taken up to finish the stitch, the greater the certainty of operation of the parts.

Figure 1 is a front-side elevation, partially in section, of a sufficient portion of a button-hole sewing-machine to illustrate my improvements; Fig. 2, an under-side view of Fig. 1; Fig. 3, a detail of the take-up and its operating cam-disk; Fig. 4, a detail showing in full lines a horizontal sectional view of the needle-bar-carrying head and the connecting-rod for vibrating it; Figs. 5 to 8, inclusive, show, in side and top views, in their various positions, the arms or hooks for making the stitch. Fig. 9 is a front-end view of the needle-bar-carrying head. Fig. 10 is a top view of the disk at the lower end of the vertical shaft *a*, it showing the shape of the cam for working the rock-

shaft carrying the arms or hooks; and Fig. 11 is a detail, to be referred to.

The frame-work A and the overhanging arm A' are as usual. The upper or cloth-spreading arms or jaws are also common.

The clamp feeding mechanism is the same as represented in United States Patent No. 115,857. Referring to this latter patent, it will be seen that the shaft of one of the spirally-grooved clamp-moving cams has upon it a friction-wheel engaged by a pawl to move the said cam intermittingly. I have shown one such grooved cam, B, in section in Fig. 1, it having a ratchet, B', partially shown behind the broken edge of the bed-plate flange, the said ratchet being keyed to the shaft B². The shaft B² is steadied near its lower end in a yoke, B³, and at its lower end has connected with it a hand-wheel, B⁴, by which to readily move the said shaft and spiral cam independently of the ratchet when it is desired or is necessary to move the clamps C into proper position to commence the stitching of a button-hole, this movement of the clamps by hand being more or less at each operation, according to the size of the button-hole slit. By being able to move the clamps in this way quickly by hand much time is saved. To enable me to so operate the clamps by hand, I have interposed between the pawl a (shown in dotted lines, Fig. 2) and the ratchet B a shield, a², which receives the end of the said pawl when the pawl-carrier a' is back in the position shown in said Fig. 2, at which time the ratchet and its shaft and grooved cam may be turned freely in either direction.

The pawl-carrier a' derives its movement from a link, a⁴, connected with a crank, a⁵, on a disk, a⁶, at the lower end of the upright shaft a⁷.

To prevent the shaft B², ratchet-wheel B', and grooved cam B from being moved except positively at the proper times, I have placed above the said ratchet-wheel, and to bear on a flange or hub thereon, a stationary block, a⁸, preferably of wood, and have placed against the said block a spring, a⁹, adjustable by means of a screw, a¹⁰.

The shield a² is connected with a curved and slotted block, b, by means of screws b' inserted through elongated slots therein, (see Fig. 2.) which shows one of the said screws. By adjusting this block b and shield the pawl a, the throw of which is always the same, may be made in its forward movement to engage the ratchet sooner or later and move it more or less for a long or short stitch.

The main horizontal shaft D of the machine, having a grooved belt-receiving wheel, D', has upon it a bevel-gear, D². The bevel-gear D² engages a bevel-gear, D³, on the upright shaft a⁷, and rotates the latter once while the shaft D rotates twice.

The shaft a⁷ is provided with a cam-grooved disk, b³, which receives a roll, b⁴, on a slide, b⁵, bolted to a connecting-rod, b⁶, the latter being

adjustably attached at its forward end with the slotted arm c of the needle-bar-carrying head E by means of a stud, b⁷.

The needle-bar-carrying head E, properly grooved to receive the needle-bar c² and guide it in its reciprocation, has extended from one side of it toward the rear of the machine two lugs, c³ c⁴, which are held by vertical pivots c⁵ c⁶ in arms or bearings c⁷ c⁸, forming part of the overhanging arm. These vertical pivots form a vertical axis, about which the needle-bar-carrying head may be vibrated.

The axis of the said head is placed in a vertical plane intersecting and coincident with the longitudinal center line of the button-hole slit, so that when the said head is in its outermost position the needle will pass into the button-hole slit in the material held by the clamp, and into the center of the throat-plate below the material; but when the said head is moved in the opposite direction into its innermost position by the cam b³ and connecting-rod the said needle will penetrate the material at a greater or less distance back from the edge of the slit being covered, this distance being determined by the position of the stud b⁷ in the slot 2 of the arm c of the said head. This slot 2 is so shaped and located with relation to the axis or pivoted points of the head E that the stud b⁷ therein, no matter what may be its position with relation to the length of the slot, will always move the head out to one position; but the inward position of the said head will be variable, according to the position of the said stud in the said slot.

I am aware that a needle-bar-carrying head has been moved out and in in a right line; also, that such a head has been pivoted upon a horizontal pivot and vibrated; but in this latter form the needle cannot penetrate the material vertically, which is essential in the sewing operation, for the inclined needle, when rising, has to slide over an inclined rather than over a vertically-held thread, which deflects the needle from its proper course and breaks the thread.

The disk b² has upon its front side a ball-like stud, 3. The needle-bar c² has a like stud, 4. These two studs 3 and 4 are joined by a link, d², having caps or end pieces, the link and caps being properly socketed to fit the ball-like heads of the said studs, and reciprocate the needle-bar without binding, in all positions of the head E.

The needle-thread e, supplied from a suitable spool, e', is passed over a tension device, e², of usual construction; thence through the stationary eye e³ into the eye of a take-up, e⁴, pivoted at e⁵, (see Fig. 3;) thence through an eye, e⁶, in the head E, and between a pair of spring-held friction-disks, e⁷, secured to the needle-bar near its lower end, and thence through the eye of the needle.

The take-up arm or lever is extended horizontally over the edge of the disk b² which operates the needle-bar, and its cam-shaped edge

is made to raise and lower the take-up in such time as to properly control the needle-thread. When the needle-bar is in its highest position the take-up will also be at its highest position, as in Fig. 3, and the stitch composed of the loop caught at the next to the last descent of the needle will be completely finished. The operation of this cam on the take-up arm will be further described when describing the operation of making the stitch.

The disk a^6 at the lower end of the shaft a^7 is provided with a cam-groove, 5, and at its upper side with a cam-groove, 6. (See Fig. 10.)

The cam-groove 5 receives a roller of a lever, f , having its fulcrum at f^1 , and bifurcated at its front end to receive a rock-shaft, f^2 , the said lever, near its front end, being guided by a cap, f^3 , which keeps the lever and rock-shaft up into working position. This rock-shaft, at one end, has a cross head or bar, 8, to the lower portion of which is attached a rod, g , swivel-jointed at its rear end, with a slide, g^1 , which is slotted at g^2 to be guided in a right line by the stud or fulcrum of the lever f , the rear end of the said slide having a suitable roller-stud to enter the cam-groove 6. (See Fig. 10.)

The shaft f^2 , by the devices described, is moved longitudinally, and is also rocked.

The cross-head 8 has adjustably connected with it two arms or hooks, h h' . The arm h takes a loop of thread from the needle when the latter descends through the material, and the arm h' enters the loop of needle-thread only when the needle descends through the slit or over the edge.

The plate i (see Figs. 5 to 8) is concaved at its under side, as at 10, below the clamp-guiding button j , which also serves as the throat-plate, and the ends of the arms h h' are permitted to work close up into the said concaved part 10, near the lower side of the said button and throat-plate, and near the level of the top of the plate i , on which the base part of the usual clamp, C, rests.

The slot in the throat-plate is wide enough to permit the needle to enter it, both when penetrating the material and when descending through the slot in the said material.

The outer edges, 12, of the button j to guide the clamp are undercut, as shown most clearly in Figs. 5 to 8, to receive the beveled edges of the clamp C, as in Fig. 1, and hold the said clamp down closely upon the plate i , one edge of the said clamp being acted upon by a roller, k , held on a spring-arm, k^2 , the said roller acting on the edge of the clamp traveling past it, keeping the beveled edge of the said clamp close under the beveled edge of the button j . Bringing the clamp closely down upon the plate i and concaving it, as described, enables the material being stitched to be brought very close to the level of the top of the plate i , and the arms or hooks h h' to be brought as near as possible to the material.

I am aware that it is not new to groove the edges of the clamps to fit a rib on the outside

of the button; but in such construction the clamp cannot be kept as close to the plate i as with the beveled stud, as herein described.

As the shaft f^2 is rocked the upper ends of the arms or hooks move in the arc of a small circle.

Assuming the needle to be in its highest position, the movement of the machine will cause the needle to descend and penetrate the material at the desired distance back from its edge. During this descent of the needle the take-up descends and gives up sufficient thread for, and the needle rises to form, a loop, which is entered by the arm or hook h , as in Fig. 5. This hook having entered the loop of needle-thread, the needle continues to rise vertically, and as it reaches its highest point it is moved outward or laterally. While the needle rises the shaft f^2 is rocked forward to place the arm h in the needle-loop and open it, and then the needle-head is moved forward, and at the same time the said shaft, with the arm h fully in the needle-loop, is moved longitudinally in the direction of the arrow 13 (see Fig. 2) to spread the loop diagonally and hold it open close up to the material and in the cavity 10 while the needle is descending in its outward throw, the needle passing through the slit or over the edge and into the said loop of needle-thread held by the arm h . Just as the needle enters this loop the shaft f^2 is moved back longitudinally, so that the side notch of the said arm may be placed back of the needle's path, and then the shaft is rocked in the opposite direction, or back, to withdraw the arm h from the loop of needle-thread held by it, leaving the said loop on the needle. At this time the take-up is raised sufficiently to draw the loop so cast off from the arm h up to the under surface of the cloth. The needle-bar and needle during this time have continued to descend, and on reaching their lowest position the take-up arm is permitted to fall far enough to form slack for a loop of needle-thread as the needle again rises. While the needle so rises, after forming the loop, the shaft f^2 is rocked sufficiently back to bring the thread-carrying arm h' into the said loop, as in Fig. 7, and the said arm continues to enter the said loop until it reaches the position shown in Fig. 8, and the needle continues to rise, and having risen the take-up draws the loop of needle-thread then held on the arm h' closely about the said arm and draws the previous stitch taut. After the needle has been fully raised the head E is moved toward the rear of the machine to its inner position, and the thread-carrying arm h' , then fully into the loop of needle-thread, is moved longitudinally to place it at the opposite side of the path in which the needle is reciprocated, so placing the said arm h' with its second or under thread that the needle, after passing through the material and through the button j , will pass between the arm h' and its under thread, the said arm having a notch or swell at one side for such purpose. As the needle continues to

descend the shaft f^2 is again moved longitudinally for a short distance in the direction of the arrow 13, until the projection or swell at the side of the arm h' is moved sufficiently far away from the path of the descending needle to clear it, when the shaft f^2 is again rocked in the opposite direction to withdraw the arm h' from the loop of needle-thread previously left on its shank, leaving its own loop of under thread on and about the descending needle. The take-up lever is now lifted to draw up to the cloth the loop cast off from the arm h' , and with the said loop the under or second thread extended through it, and the shaft f^2 is moved longitudinally in the direction opposite to that indicated by the arrow 13, and is rocked to bring the arm h' into proper position to again enter the loop of needle-thread as the said thread is again slackened and the needle rises.

In other button-hole stitching-machines of the class upon which this is an improvement a needle-guard has been employed to rest close to one side of the ascending needle to insure the throwing of the loop of needle-thread out always at the same side of the needle. To do away with this guard, and enable me to work close up to the under side of the clamp and needle-throat, I have added to the needle-bar the thread-clamping disks e^7 , before referred to. These disks in themselves are of common construction. They are on one stud, receive the thread between them, and one disk is held against the other by a spring. These disks or "thread-nippers," as I shall call them, are placed at that side of the eye of the needle into which the thread is entered, and they keep sufficient tension on the needle-thread to prevent the formation of slack between them and the needle-eye, thus insuring the formation of slack in the needle-thread always at that side of the needle from which the thread emerges.

The under or second thread, m , taken from the spool m' , is led through suitable guide-eyes and a slack-controlling spring, m^2 .

The button-hole cord is supplied from the spool n .

The upper part of the clamp, or that part of it to bear upon the material and spread open the slit, being of common construction, I have not described it by letter.

I claim—

1. The needle-bar-carrying head supported to be vibrated about a vertical axis, and the needle-bar, its needle, and thread-nippers carried by the needle-bar, combined with means to reciprocate the needle-bar and vibrate the said head in the arc of a horizontal circle, and with the intermittingly-operated cloth holding and moving clamp, substantially as described.

2. The needle-bar-carrying head supported to be vibrated about a vertical axis, and provided with a slotted arm, e , combined with the connecting-rod and means to reciprocate it, and the stud to adjustably connect the said rod

with the said slotted arm, the slot in the said arm being arranged with relation to the axis about which the head vibrates to enable the connecting-rod to always move the said head in one direction into the same position, and to move it in the other direction into different positions, according to the position of the stud in the slot of the said arm, substantially as described.

3. The shaft D and its disk and ball-like stud 3, the needle-bar-carrying head, and needle-bar therein, and its ball-like stud 4, combined with the link d^2 , fitted to the said ball-like studs, and with means to vibrate the said head laterally, substantially as described.

4. The plate i , provided with the button j , having its edges beveled upwardly and outwardly from the plate, as shown, combined with the clamp C, having its base beveled at the edges of the slot to fit under the beveled edges of the said button, to keep the clamp close to the plate i , on which the clamp is moved, and with the roller and spring to press the beveled edge of the clamp closely under the button and between it and the plate i , substantially as described.

5. In combination, the eye-pointed needle, needle-bar, means to reciprocate it, the cam-disk b^2 , means to move it, the thread-nippers carried by the needle-bar, arms $h h'$, to hold the needle-thread below the cloth, and suitable means to move the said arms, and the take-up to operate upon the needle-thread, substantially as described.

6. The grooved cam B, its shaft and ratchet-wheel, and the pawl and pawl-carrier, and means to move it, combined with the shield a^2 , and with the hand-wheel on the said shaft, to permit the latter and its cam B to be moved freely by hand in either direction when the pawl is supported on the said shield, located between it and the ratchet-wheel, substantially as described.

7. The shaft f^2 , and means to rock and move it longitudinally, and its arm h , combined with the eye-pointed needle and needle-bar, and head E, and means to reciprocate the needle-bar and vibrate the head, substantially as described.

8. The shaft f^2 , and means to rock and move it longitudinally, and the second or under thread carrying arm, combined with the eye-pointed needle, needle-bar, and means to operate it, substantially as described.

9. The arm h , the arm h' , to carry the second or under thread, the shaft f^2 , and means to rock and move it longitudinally at the proper times, combined with the eye-pointed needle and needle-bar, means to reciprocate it, and the head E, and means to vibrate it, substantially as described.

10. In combination, the arms $h h'$, the shaft f^2 , and means to rock and move it longitudinally, as described, the eye-pointed needle, needle-bar, vibrating head E, and means to reciprocate the needle-bar and vibrate the head, and

the combined throat-plate and button, provided with the cavity 10 at its under side, and the clamp to hold the material, to operate all substantially as described.

5 11. The lever *f*, means to vibrate it and the shaft *f*², and arms *h h'*, combined with the link *g* and its connected slide-bar *g'*, and means to slide the said bar, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two sub- 10 scribing witnesses.

JOHN W. LUFKIN.

Witnesses:

G. W. GREGORY,
ARTHUR REYNOLDS.