

F. C. HALL.

BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 367,291.

Patented July 26, 1887.

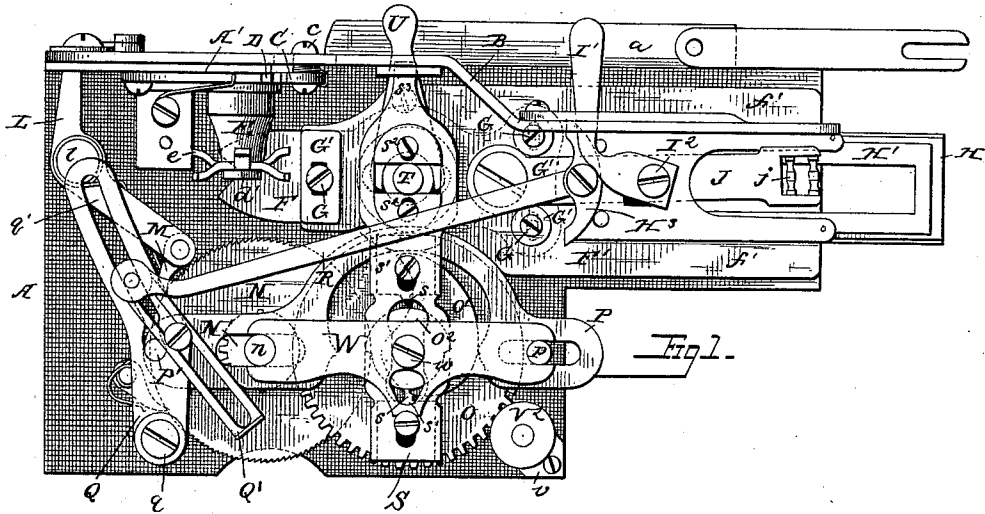


Fig. 1.

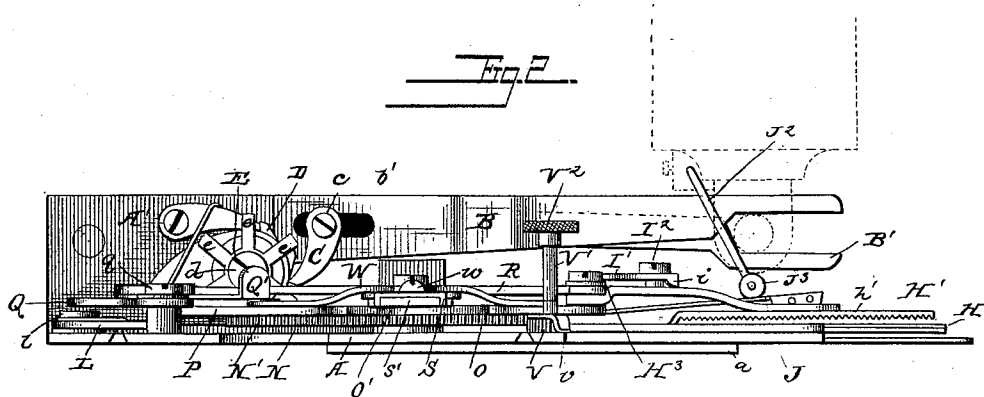
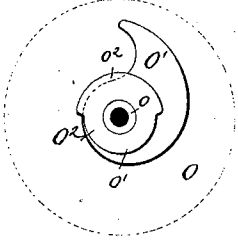


Fig. 2.



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(No Model.)

4 Sheets—Sheet 2.

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Fig 3

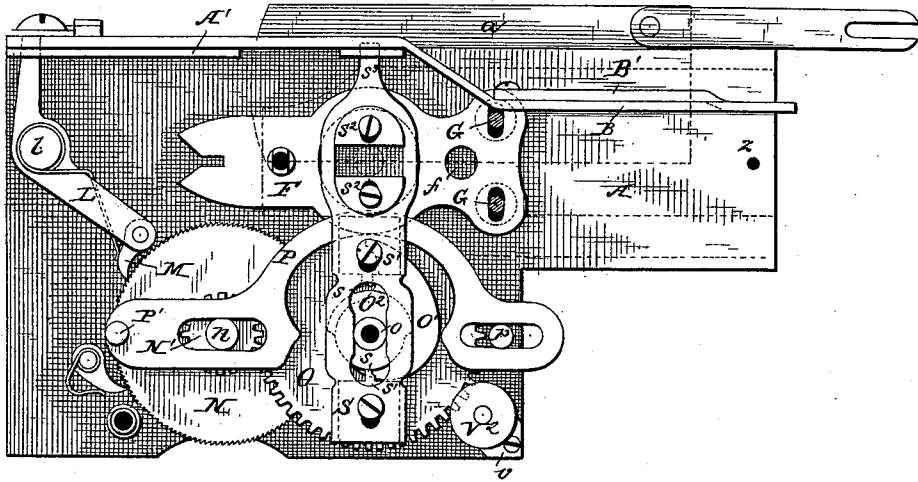


Fig 10

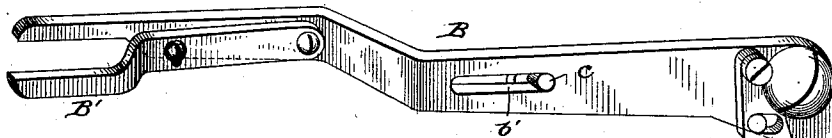
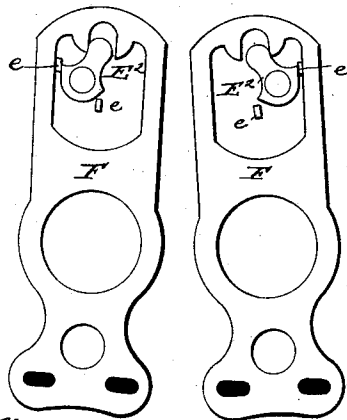


Fig 11



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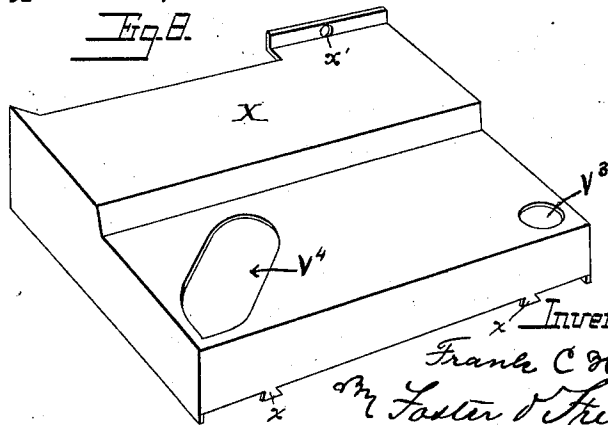
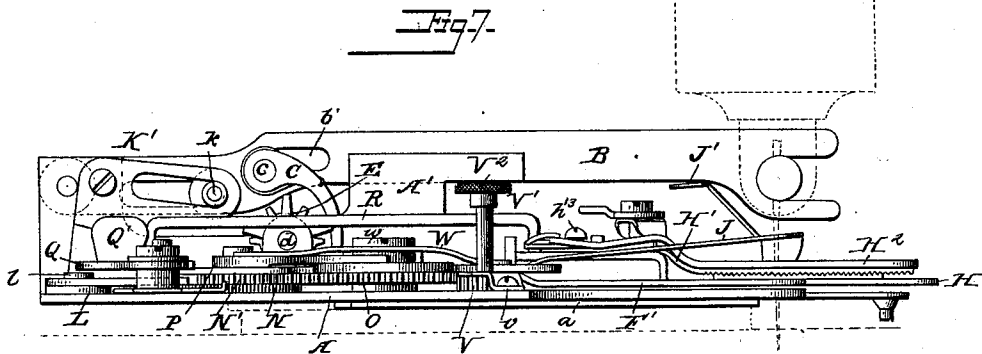
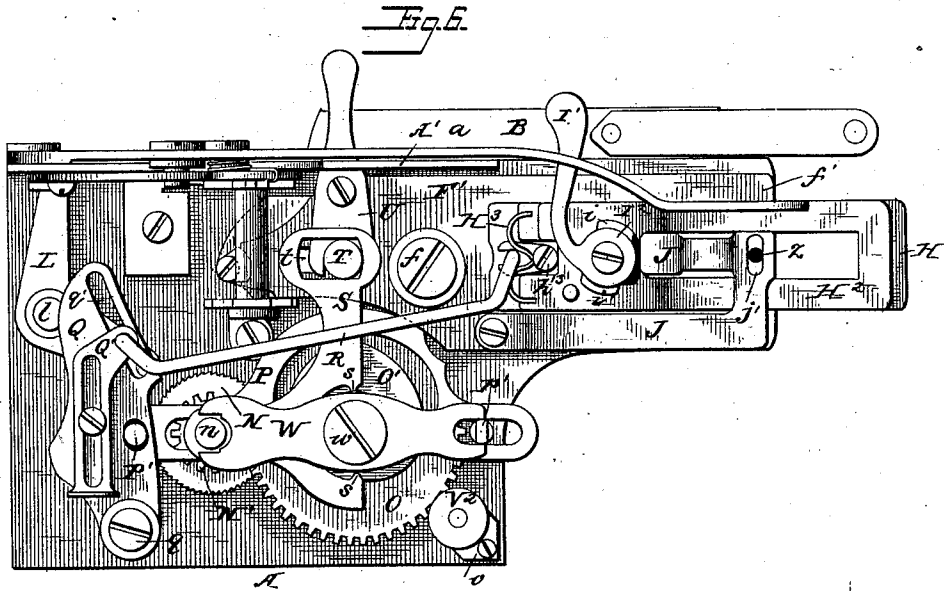
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BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 367,291.

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UNITED STATES PATENT OFFICE.

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BUTTON-HOLE ATTACHMENT FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 367,291, dated July 26, 1887.

Application filed November 6, 1886. Serial No. 218,180. (No model.) Patented in Canada December 31, 1886, No. 25,657; in Belgium December 31, 1886, No. 75,516, and in England January 3, 1887, No. 60.

To all whom it may concern:

Be it known that I, FRANK C. HALL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Button-Hole Attachments for Sewing-Machines, of which the following is a specification, and for which foreign letters patent have been granted to me as follows, to wit: Canada, No. 25,657, December 31, 1886; England, No. 60, January 3, 1887; Belgium, No. 75,516, December 31, 1886.

My present invention relates to certain improvements in button-hole-attachment mechanisms which are adapted to be applied to an ordinary sewing-machine when button-holes are desired to be formed, and which may be readily removed therefrom when other work is to be done.

In the drawings, Figure 1 is a top plan view illustrating a button-hole attachment for a sewing-machine embodying my invention. Fig. 2 is an edge view of the same. Fig. 3 is a plan view, parts being removed. Fig. 4 is a perspective view of the vibrator and cloth-clamp. Fig. 5 is a longitudinal section of the same. Fig. 6 is a top plan view of an attachment in which are embodied modifications of certain of the parts. Fig. 7 is an edge view of Fig. 6. Fig. 8 is a perspective of the shield or cover which is placed over the main operating parts of the attachment. Figs. 9, 10, 11, and 13 are detail views, and will be more particularly referred to hereinafter. Figs. 12 and 12^a illustrate modifications.

The base-plate, upon which the mechanism of the attachment is supported, is represented by A, and is adapted to be secured to an ordinary throat-plate, *a*, or shuttle-plate, whereby it may be secured upon the bed-plate of the machine (represented by dotted lines Fig. 7) in proper position relatively to the needle. This plate A is bent along its rear edge to form a vertical flange, A', which is slotted and cut away in a peculiar manner, as will be described, and serves as the support for several parts of the apparatus.

B represents the main vibrating lever, forked

at its inner end to engage with a screw-stud or other projection on the needle-bar, (see dotted lines, Fig. 2,) from which it receives motion, and thence communicates it to all the operative parts of the device.

Lever B may be formed of a single piece, the jaws of the forked end being situated sufficiently far apart to fit over screws or other projections of any of the various sizes found upon needle-bars of different makes of machines; but I prefer to pivot one of the jaws to the vibrating lever, to which it may be adjustably secured by a set-screw, so that the distance between the jaws may be varied to fit different sizes of needle-bar screws. Such a form of lever is illustrated in detail in Fig. 10, wherein B' represents an arm pivoted to the lever proper and carrying one of the jaws which form the forked end of the lever. This lever is pivoted near its outer end to flange A' and carries a spring-pawl, C, projecting downward and engaging with a ratchet-wheel, D, mounted on a short horizontal shaft, *d*. The pin *c*, upon which the pawl C is pivoted, is adjustable in a slot, *b'*, in the vibrating lever, whereby it is insured that the pawl shall always have the proper movement, although the attachment be used upon machines the needle-bars of which have throws of different lengths.

In Figs. 1, 2, 6, and 7 I have shown the most simple arrangement of adjustable spring-pawl, in order not to complicate said figures more than necessary. In Fig. 12, however, I have shown in detail a modification. In said Fig. 12 the spring-pawl C is carried by a lever, C', fulcrumed at *c'* to the vertical flange or standard A', and slotted at *c''* to receive the pin *c* or the disengaging slide-block *c''*, Fig. 12^a. This lever, carrying the pin or block, regulates the movement of the pawl, and more certainly insures its proper engagement with the ratchet-wheel D than were it not employed. Both vibrating lever B and lever C' being slotted, and the pin *c* or the disengaging slide-block *c''* being movable in said slots, permits the adjustment of the throw of the pawl, as above described, and as will be understood without further explanation. The shaft *d* lines in a

plane at right angles to the flange A' , and is parallel with the base-plate A , and it may be journaled at one end in the flange A' , and at its opposite end in a standard, d' , rising from the base-plate, or it may be entirely supported by a standard rising from the base A and having a long bearing. Upon this shaft is mounted the star-wheel or star-wheels which give the reciprocating motion to the vibrator. I will now describe this vibrator, and also the cloth-clamp, which is carried thereby, and has also a sliding movement therein.

The vibrator consists of two plates, F F' , the latter covering the former, as shown in Fig. 1, and both fulcrumed upon a hollow post, f , rising from the bed-plate, whereon they are confined by a flat-headed screw. The lower plate, F , is the smaller of the two, and is, near its outer end, extended beyond the plate F' and formed with inclined faces, which are acted upon by the arms or rays of the star wheel or wheels on the shaft d . The upper plate, F' , is forked at its inner end to receive the sliding cloth-clamp, and at its outer end rests upon the plate F . In Fig. 7 the fingers f' of the forked part of plate F' are bent downward as they leave the main portion of the plate, so that the under faces thereof and the under face of the plate F shall lie in substantially the same horizontal plane directly upon the base-plate. The positions of the lower plate, F , are determined by the rays of the star-wheel projecting from the shaft d , which, alternately acting upon the plate F , give it a vibratory motion; but the upper plate, F' , which is secured to and moves with the lower plate, is adjustable relatively thereto around its fulcrum, whereby the position of the cloth-clamp carried by plate F' relative to the needle-hole z through the base-plate may be regulated. The two plates F and F' may be secured together and adjusted, as just described, in any desired or usual manner; but I prefer to unite them, in the manner shown, by means of screws G , passing through slots in the upper plate into threaded apertures in the plate below. I have found that it is best to interpose a spring or other elastic agent between said plates F F' , or between the heads of the screws G and plate F' , and hence pass screws G through elastic or spring plates or disks G' , upon which bear the heads of the screws.

I do not wish to be limited to the employment of three screws, as shown, for uniting the two parts of a vibrator, as a single one might be successfully used; but the arrangement which I have shown is the one which I consider most advantageous; nor do I wish to be limited to the interposition of a spring, as described, as that might be dispensed with.

The sliding cloth-clamp, Figs. 4 and 5, consists, essentially, of three plates, H H' H'' , they being superposed, and each provided with a quadrangular opening, whereby the necessary movements around the needle to form the button-hole are permitted.

The lower plate, H , is fitted to slide in grooves

formed therefor in the inner faces of the arms f' , which are made to spring inward slightly in order to securely hold the clamp-base H . The other two plates are carried by this lower plate, to which they are riveted near their outer ends, their inner ends being free in order to permit their being raised to allow the cloth to be passed between them and the lower plate. The edges of the intermediate plate, H' , are turned downward and serrated, as at h' , at the ends as well as at the sides, so that when plate H' is forced down upon the cloth it shall be securely held against slipping. In addition to the serrated edges h' , this plate is provided with downward-projecting flanges h'' , Fig. 5, at the ends of the quadrangular opening therein, these flanges operating when the plate is forced down to stretch the cloth in the direction of the length of the button-hole. The upper plate, H'' , is provided with flanges h'' similar to flanges h'' , except that they are formed along the edges or lower sides of the opening in the plate, and serve to stretch the cloth in the direction opposite to that in which do flanges h'' . The rear ends of the plates H' H'' are forked, one of the forked ends of the intermediate plate, H' , projecting beyond the superposed plate H'' .

H'' is a spring held in place by a screw, h'' , and bearing upon the forked arms of the upper and intermediate plates to lift their outer ends upward, so that the cloth may be easily inserted between these plates and the lower plate, H .

After the cloth has been properly placed between the members of the clamp the two upper members thereof are forced downward by means of a cam-lever, I' , pivoted upon a post, I'' , rising from the lower plate, H , thus gripping the cloth. The cam-lever has several cams. The first cam, i , situated under the lever, operates upon the upper face of plate H'' , to the left-hand side of the post I'' ; the second, i' , situated at right angles to cam i , works upon the upper face of plate H'' , in front of the post, and the third cam, i'' , situated opposite cam i , upon the upper face of the intermediate plate, H' . The engagement of these cams with the plates, as thus set forth, results in forcing them downward upon the cloth. Both plates, H' and H'' , are perforated to permit the passage of post I'' ; but the aperture in the upper plate is the larger of the two, so as to permit the working of cam i'' therein without interference until the jaws or plates H' H'' have been brought down close upon the cloth, when the cam i'' comes in contact with the rear wall of the aperture, and thus serves as a stop to limit the movement of the cams at the proper point. By preference, the cam-faces are so related that the intermediate plate is first brought down upon the cloth, holding it in place and stretching it in the direction of the length of the button-hole, after which the other plate, H'' , comes down and stretches the cloth in the opposite direction.

Carried by the vibrator and secured thereto is a spring presser-foot, J , adapted to bear

upon the cloth through the rectangular slots in the cloth-clamp plates. It is slotted, as at j' , to permit the passage of the needle, and carries two small rollers, j, j , the axes of which are at right angles to the line of travel of the cloth-clamp as it moves relatively to the vibrator, thus reducing friction. It will be seen that by attaching the presser-foot to or carrying it with the vibrator its harmony of motion is secured therewith, preventing any independent movements that would result from fastening the presser-foot at one end to a stationary pivot. These rollers are transversely corrugated or grooved, (see Fig. 1,) so as to furnish a direct bearing in the center and on both sides of the button-hole out of contact with the stitches, and are situated one on either side of slot j' . In order to force this presser-foot down upon the cloth, I remove the ordinary presser-foot from the presser-bar and attach thereto, in the manner in which quilters are ordinarily attached to sewing machines, a short bar or arm, J^2 , Fig. 2, carrying at its lower end a roller, J^3 , adapted to bear upon the plate of the spring presser-foot J and force it down until the rollers j come in contact with the cloth. In place of this arrangement the presser-foot may carry a rest, J' , Figs. 4, 5, and 7, upon which the end of the presser-bar is adapted to rest, and when brought down to force the rollers into contact with the cloth.

E represents the aforesaid star-wheel mounted upon the shaft d . The rays e of the wheel are bent alternately in opposite directions, so that one half of the rays lie to one side of the central line of the wheel and the other half to the other side.

The number of teeth on the ratchet-wheel is such that one of the arms or rays e is made to engage with and move the vibrator at each reciprocation of the needle-bar. This same result of oscillating the vibrator by means of a star-wheel can be effected in different ways, one being illustrated in Figs. 6 and 7, wherein two star-wheels are employed, the number of rays on the two wheels being equal to the number of rays on the single wheel of the character first described, the rays on one wheel being arranged alternately with those of the other. In such a construction it will be understood that the rays of the wheels need not be bent out of the plane of the wheel, and that the inclined faces with which they engage will be arranged to correspond with their position.

Another construction is illustrated in Fig. 11, wherein the rays e of the star-wheel E , arranged as before described, act successively upon opposite sides of a tappet, E^2 , pivoted to the base-plate and having an outwardly-projecting pin, e^3 , which enters an aperture, e^4 , in the lower plate, F . As the star-wheel revolves, its arms e strike first one side and then the other of the tappet, and, by swinging it to the different positions shown in Fig. 11, change the position of the plate F ; but this device need not be described in detail, as it is simply

shown to illustrate one of the different constructions in connection with which the star-wheel may be employed to reciprocate the vibrator.

I will now describe the mechanism whereby is given the forward-and-back movement to the cloth-clamp, in order to form the line of stitches on each side of the button-hole.

The outer end of the lever B is made in the form of a bell-crank, the lower or downwardly-projecting arm being formed with two jaws, between which extends one end of a bell-crank lever, L , fulcrumed upon the base-plate at l , and carrying at its opposite end a pivoted dog, M . One of the jaws K , which engages with the end of lever L , is adjustable, as shown in Fig. 10, whereby the length of stroke or oscillation of the bell crank L at each vibration of the lever B may be varied, for it will be seen that a greater motion will be imparted to the lever L when the two jaws are close together than when the jaw K is moved away from the stationary one.

I do not wish to limit myself to the means just described for connecting the levers B and L , as a like adjustable movement may be imparted to the lever L by means of a bell-crank lever, K' , (see Fig. 7,) pivoted to the vertical flange A' , and receiving motion from a pin or stud, k , carried by the lever B . The horizontal arm of the bell-crank K' and the lever B are both slotted, and the connecting-pin k is adjustable in said slots, whereby the movement of the lever K' , and, in turn, of the lever L , which engages with the forked end of the vertical arm of the lever K' , may be varied, as will be seen without further explanation.

N is a ratchet-wheel turning freely on a stud, n , rising from the base-plate, and with which engages the dog M , carried by the lever L , thus causing said wheel to turn as the levers L, B oscillate. Secured to or formed with this ratchet-wheel N is a small pinion, N' , which pinion meshes a larger gear-wheel, O , turning on a hollow post, o , there being a collar or annular plate surrounding the post o to raise the wheel O the proper height above the bed-plate to mesh with pinion N' . This wheel O has secured to and moving with it the feed-cam O' and pattern wheel or cam O^2 , Fig. 13, the feed-cam resting on the gear-wheel and the pattern-cam on the feed-cam, and both surrounding the post o .

P is a sliding yoke fitting over the cam O' and moved thereby, it being guided in its movements by the stationary stud n and another stationary stud, p , which studs extend into slots formed in the opposite arms of the yoke. It will be seen without further explanation that at each revolution of the cam the yoke will be reciprocated. At its outer end the yoke carries a pin, P' , projecting through a slot in a plate, Q , pivoted at q to the base-plate A , this plate Q being in turn connected by a link, R , with the sliding cloth-clamp.

As will be seen without further explanation, at each revolution of the wheel O , the yoke

P, the pivoted plate Q, the link R, and the cloth-clamp are each moved once forward and back, thus carrying the fabric under the needle to form the two rows of stitches, one on either side of the button-hole.

In order to adjust the distance which the cloth-clamp shall slide, and thus regulate the size of the button-hole, I slot the plate Q, as at q' , and mount the outer end of the link R in a slotted plate, Q' , Figs. 1 and 6, adapted to be secured to the plate in various positions by a set-screw. Thus by moving the end of the link R to or from the fulcrum of the plate Q, and there securing it, the movement of the clamp is varied to correspond to the length of the button-hole.

I will now describe the devices whereby the motions of the parts are so regulated that a row of stitches shall be formed down one side, across the end, up the other side, and across the other end of the button-hole at each revolution of wheel O. This movement is insured by the pattern-wheel O^2 , the periphery of which is formed of two parts, $o^1 o^2$, (see Fig. 13,) the latter of which is struck from the center of the post o with a greater radius than is the part o^1 . These parts $o^1 o^2$ are of slightly unequal lengths, the portion o^1 being longer than the part o^2 , so that there is a small portion of this wheel whereon diametrically-opposite points are both upon the portion of the wheel having the smaller radius.

S is a sliding yoke having bearing-points s , adapted to engage with the opposite faces on the periphery of the pattern-wheel. The distance between these points may be, and preferably is, somewhat greater than the diameter of the wheel on any line, or they may fit the periphery thereof quite closely, except when they are both upon the part o^1 . This yoke, near the end opposite that which engages with the pattern-wheel, is slotted to fit over a pin, T, rising from the plate F, and is provided at the end with a projection, s^3 , which passes through an aperture in the flange or standard A' , which assists in properly guiding the movement of the yoke. The arrangement of these parts is such that when the forward motion of the slide of the cloth-clamp begins one of the points s begins its contact with the portion o^2 of the pattern-wheel, the other point engaging with the part o^1 . When the wheel has made about a half-revolution, the point which had during the inward movement of the cloth-clamp been engaging with the portion o^2 of the pattern-wheel escapes therefrom, both points s then engaging with opposite parts of the portion o^1 of the wheel. This permits a much longer oscillation of the cloth-clamp, which accomplishes barring at the end of the button-hole. The further revolution of wheel O reverses the position of the cloth clamp and brings the opposite point s in contact with the portion o^2 of the periphery of the pattern-wheel, again limiting the movement of the vibrator, but in this case so limiting its movement that the stitches formed shall be laid on

a different line from that followed during the other movement of the cloth-clamp and upon the opposite side of the button-hole. The points at which this pattern-cam—through the yoke-plate S—shall limit the movements of the vibrator may be varied, and I have shown several ways for doing this. Referring to Fig. 3, $s^1 s^2$ represent blocks adjustably secured to the under side of yoke S by set-screws, and carrying the bearing-points s . By separating these blocks the oscillation of the vibrator before being arrested by one point s coming in contact with the periphery of wheel O^2 will be lengthened, and hence the width of the double row of stitches on either side of the button-hole will be greater than if the blocks s^1 and points s were closer together. The same end may be accomplished by having the points stationary, and placing movable blocks S^2 in the aperture through which projects the pin T. While I have illustrated both these means of adjustment as applied to a single yoke, S, it will of course be understood that where one is employed the other will be omitted, both being shown on one yoke-plate simply for the sake of illustration.

A further adjustment of the throw of the vibrator is provided for by slotting the plate F of the vibrator and seating therein a squared portion of the stud T, which slides back and forth in the slot. Engaging with this pin T is a forked shipping-lever, U, adapted to move the pin T from one position to another in the slot t in the vibrator, as desired, and having an operating-handle projecting through flange A' , where it may be conveniently reached and worked when the attachment is covered by shield X, Fig. 8.

V is a small pinion, Figs. 2 and 7, engaging with the gear-wheel O, it being mounted upon a vertical shaft, V' , supported in a bracket, v , upon the base-plate. The shaft V' is provided at its upper end with a milled head, whereby the shaft is adapted to be turned by the operator, and hence the position of the wheel O and the parts regulated thereby changed to any desired position. This permits the parts to be set as the work in hand may require.

W is a flat metallic bow-spring, bearing at once upon the yokes S and P. By means of a binding-screw, w , engaging with the hollow post o , this spring may be made to bear against the said yokes, whereby the tension of the mechanism may be accurately regulated.

The main operative parts of the mechanism are covered by means of a shield, X, having an opening, v^2 , to permit the shaft V' and the milled wheel V^2 to project a sufficient distance through the same to be easily operated. There is also a comparatively larger opening, v^1 , through which the binding-screw which unites the pivoted plate Q and the slotted plate Q' may be operated, in order to change the distance which the sliding cloth-clamp shall move to adjust the length of the movement of the cloth-clamp to suit the size of the button-hole. This shield is provided at its edges with dove-

tail-shaped projections x , which are adapted to correspondingly-shaped recesses formed in the base-plate A and flange A', whereby it is securely held in place, it being screwed to the flange A' or to base-plate A, as at X', and secured in any other desired or necessary manner.

I do not here claim the constructions illustrated in Figs. 12 and 12^a, as the same will constitute the subject-matter of a separate application for Letters Patent.

I claim —

1. In an attachment for sewing-machines, the combination, with a vibrator and an independent sliding cloth-clamp carried thereby, of a vibrating lever operated by the needle-bar, a shaft and connections for rotating it from said lever, and arms or contact-pieces of uniform shape and arrangement mounted on said shaft and directly engaging with and vibrating the vibrator, substantially as described.

2. In an attachment for a sewing-machine, the combination, with a vibrator and an independent sliding cloth-clamp carried thereby, of a vibrating lever operated by the needle-bar, a shaft carrying a ratchet-wheel, a pawl carried by the lever engaging the ratchet-wheel, and an independent star-wheel mounted on said shaft and directly engaging with the vibrator to move it, substantially as described.

3. In an attachment for a sewing-machine, the combination, with a vibrator and cloth-clamp carried thereby, of a vibrating lever operated by the needle-bar, a shaft, d , an adjustable spring-pawl carried by the said lever for rotating said shaft, and a series of alternately arranged rays projecting from said shaft and adapted to engage with the vibrator and to oscillate the same, substantially as described.

4. In an attachment for a sewing-machine, the combination of a vibrator consisting of two parts, one of which carries the cloth-clamp, mechanism engaging with the other part of the vibrator to oscillate it, and means for adjustably connecting the part of the vibrator carrying the cloth-clamp with the other part, substantially as and for the purpose set forth.

5. In a button-hole attachment for a sewing-machine, the combination of a vibrator having the lower plate, F, and the upper plate, F', both fulcrumed at f , the cloth-clamp carried by the plate F', means engaging with the plate F for oscillating the vibrator, and devices adjustably connecting the two plates, substantially as described.

6. In a button-hole attachment for a sewing-machine, the combination, with a vibrator consisting of two parts adjustable relatively to each other, the cloth-clamp carried thereby and sliding independently thereof, a spring interposed between or mounted on the two parts of the vibrator, and means for moving the vibrator, substantially as described.

7. In a button-hole attachment for a sewing-

machine, the combination of a vibrator, mechanism for moving the same, and a sliding cloth-clamp consisting of the lower plate, H, and the two superposed plates H' H², secured to said lower plate, substantially as and for the purpose set forth.

8. In a button-hole attachment for a sewing-machine, the combination of a vibrator, mechanism for moving the same, and a sliding cloth-clamp having a lower plate, a plate provided with end flanges, and another plate having the side flanges, h^2 , and a device for forcing the said plates downward, substantially as described.

9. In a sliding cloth-clamp of a button-hole attachment for a sewing-machine, the combination of the lower plate, two superposed plates secured thereto, a spring bearing against said superposed plates to force the cloth-engaging portions away from the lower plate, and a device for forcing said superposed plates into contact with the cloth against the action of said spring, substantially as and for the purpose set forth.

10. In a sliding cloth-clamp of a button-hole attachment for a sewing-machine, the combination of a lower plate, two upper plates, and a cam having faces which bear against both of said upper plates, whereby they may be separately brought into contact with the cloth, substantially as set forth.

11. The combination, with a button-hole attachment having an opening through which the needle passes, of a presser-foot arranged adjacent to said opening in position to be struck on the descent of the needle-bar, whereby the presser-foot is then depressed, substantially as and for the purpose set forth.

12. In a button-hole attachment for a sewing-machine, the combination of a vibrator, a cloth-clamp, a spring presser-foot secured to and carried by the vibrator and adapted to engage with the cloth in proximity to the needle, and the presser-bar of the sewing-machine adapted to force said presser-foot down, substantially as set forth.

13. In a button-hole attachment for a sewing-machine, the combination of a vibrator, a cloth-clamp, a spring presser-foot carried by the vibrator, and an arm carried by the presser-bar and having a roller at its lower end, which when brought down bears upon the spring presser-foot and forces it into contact with the cloth, substantially as described.

14. In a button-hole attachment for a sewing-machine, the combination of a vibrator, a sliding cloth-clamp, and a presser-foot carried by the vibrator, having a slot for the passage of the needle and provided with rollers adapted to engage with the cloth to hold it firmly upon the base-plate near to the needle, and having the axis of the rollers at right angles to the line of travel of the cloth as it is moved by the cloth-clamp, substantially as set forth.

15. In a button-hole attachment for a sewing-machine, the combination of the vibrating lever B, horizontal bell-crank lever L, bearing

directly on the lever B, the dog M on the lever L, a ratchet-wheel driven by said dog, a feed-cam intermediately driven by said ratchet-wheel, the sliding cloth-clamp, and mechanism interposed between the cloth-clamp and feed-cam, substantially as described.

16. In a button-hole attachment for a sewing-machine, the combination of a feed-cam, mechanism for operating it, a sliding and guided yoke engaging with said cam, a pivoted plate operated by said yoke, a sliding cloth-clamp, and a longitudinally-movable link positively connecting said plate and cloth-clamp, the link being adjustably secured to the pivoted plate, substantially as described.

17. In a button-hole attachment for a sewing-machine, the combination of a feed-cam, mechanism for operating it, a slotted plate, Q, pivoted at one end and connected with and operated by said cam, a second slotted plate, Q', secured to the plate Q, a sliding cloth-clamp, and a longitudinally-movable link connecting the cloth-clamp with said pivoted plate, it having one end engaging with said plate Q' and entering the slot thereof, whereby the slide of the cloth-clamp may be varied to suit the size of the button-hole being formed, substantially as described.

18. In a button-hole attachment for a sewing-machine, the combination, with the vibrator composed of an upper and lower plate laterally adjustable one upon the other, of the cloth-clamp carried by the upper plate of the vibrator, mechanism for sliding the cloth-clamp, a single pattern-wheel having its periphery formed of two parts of different radii, and a sliding yoke independent of the vibrator provided with two bearings engaging with said pattern-wheel at opposite sides, and connections between the yoke and the vibrator, whereby the movements of the latter are regulated to properly vary the lay of the stitches to form the button-hole, substantially as described.

19. In a button hole attachment for a sewing-machine, the combination of the vibrator, the cloth-clamp, mechanism for sliding the cloth-clamp, a single pattern-wheel having its periphery formed of two parts, σ' σ'' , of different radii, the portion with the shorter radius being the longer, and a laterally-sliding yoke independent of the vibrator having engaging-points s , and connections, substantially as described, between the yoke and vibrator, as and for the purpose set forth.

20. In a button-hole attachment for a sewing-machine, the combination of the vibrator, mechanism for oscillating the vibrator, a pattern-wheel, a yoke engaging with said pattern-

wheel and connecting it with the vibrator, and means, substantially as described, for adjusting the positions at which the pattern-wheel shall arrest the movements of the vibrator, substantially as described.

21. In a button-hole attachment for a sewing-machine, the combination of the vibrator, mechanism for oscillating the vibrator, a pattern-wheel, a yoke engaging with said pattern-wheel and connecting it with the vibrator, and adjustable blocks s' , carrying bearing-points s , which engage with the periphery of the pattern-wheel, substantially as described.

22. In a button-hole attachment for a sewing-machine, the combination of a vibrator, the cloth-clamp, mechanism for sliding the cloth-clamp, a pattern-wheel, a yoke engaging with said wheel, a pin whereby said yoke is connected with the vibrator, and means for adjusting the said pin upon the vibrator, substantially as set forth.

23. In a button-hole attachment for a sewing-machine, the combination of the vibrator, the independent longitudinally-movable cloth-clamp carried thereby, feed-cam O', connections between the latter and the clamp to slide the same lengthwise upon the vibrator, the pattern-wheel O'', and independent connections between the same and the vibrator to shift the latter, whereby the longitudinal feed and lateral position of the clamp are regulated and effected from one center by said cams, substantially as described.

24. In a button-hole attachment for a sewing-machine, the combination, with the vibrator and the sliding cloth-clamp carried thereby, of the feed-cam and the pattern-wheel, two yokes which respectively engage therewith, guides directing the yokes at right angles to each other, and connections, one between one yoke and the vibrator and the other between the other yoke and the clamp, substantially as described.

25. In a button-hole attachment for a sewing-machine, the combination of the sliding cloth-clamp, gear-wheel O, cam O', pivoted lever Q, and connecting mechanism, and the setting device consisting of the pinion V, meshing with wheel O, and the pinion-shaft V', whereby the position of the cloth-clamp may be conveniently changed at any desired time, substantially as described.

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

FRANK C. HALL.

Witnesses:

F. L. FREEMAN,
W. C. DUVALL.