

G. W. NELSON.
BUTTONHOLE MACHINE.
APPLICATION FILED DEC. 10, 1906.

3 SHEETS-SHEET 1.

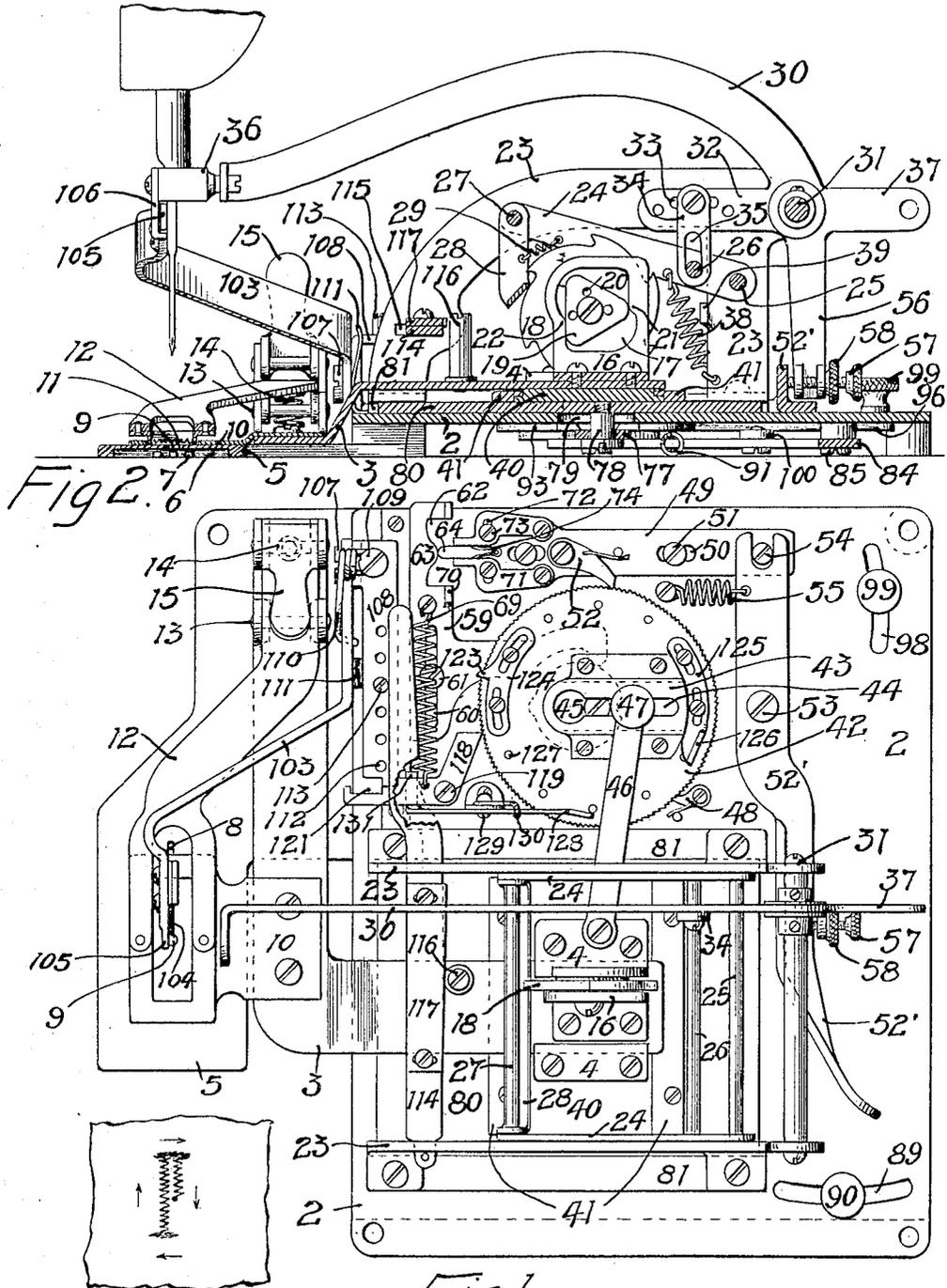


Fig. 2.

Fig. 11.

Fig. 1.

WITNESSES.
Am. Machine
J. B. E. and

INVENTOR
 GEORGE W. NELSON
 BY *Paul Paul*
 HIS ATTORNEYS

No. 887,503.

PATENTED MAY 12, 1908.

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BUTTONHOLE MACHINE.
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3 SHEETS—SHEET 2.

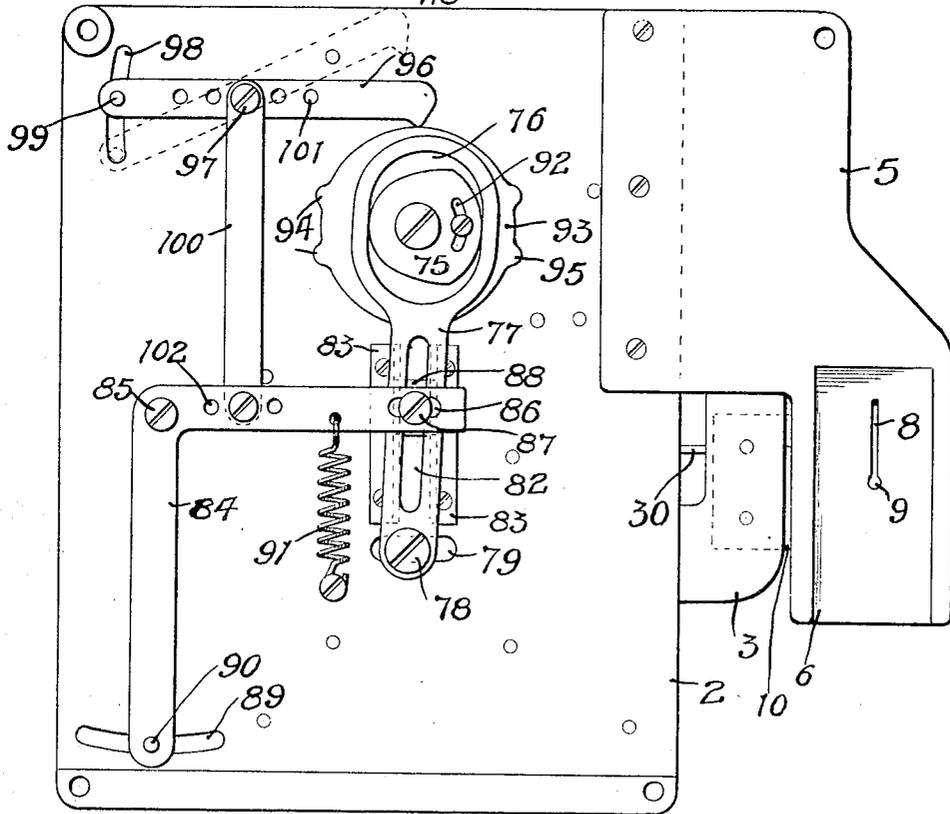
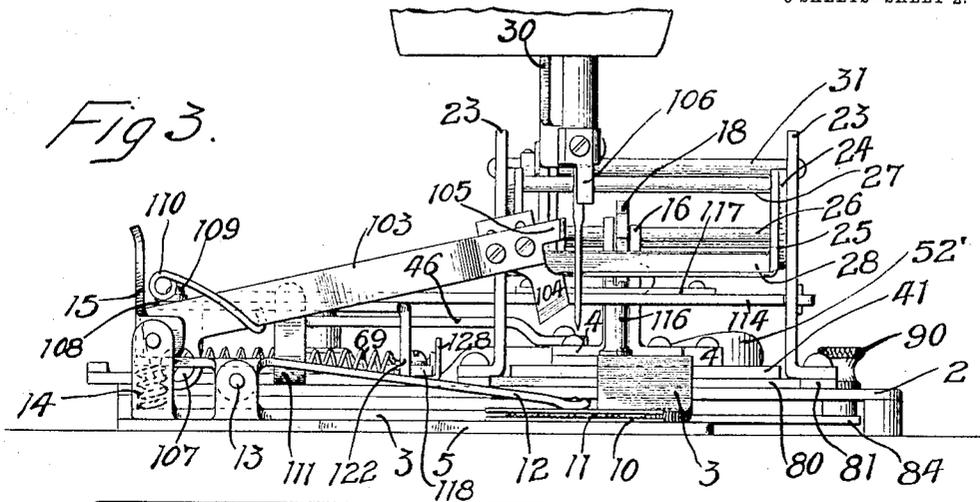


Fig 4.

WITNESSES
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3 SHEETS—SHEET 3.

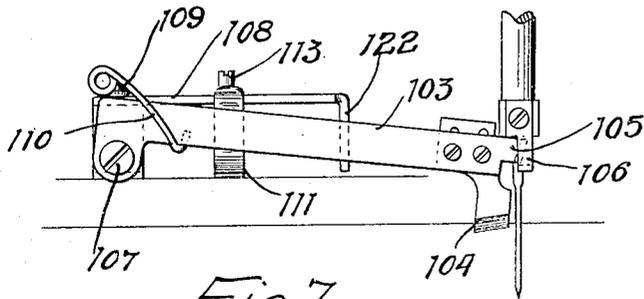


Fig. 7.

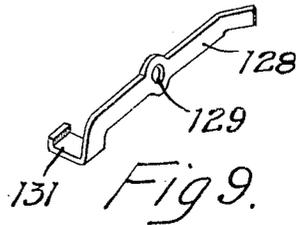


Fig. 9.

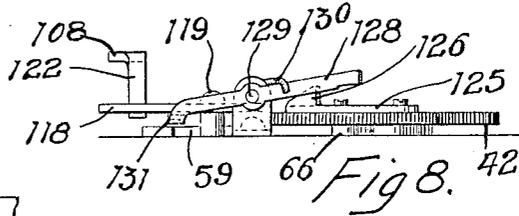


Fig. 8.

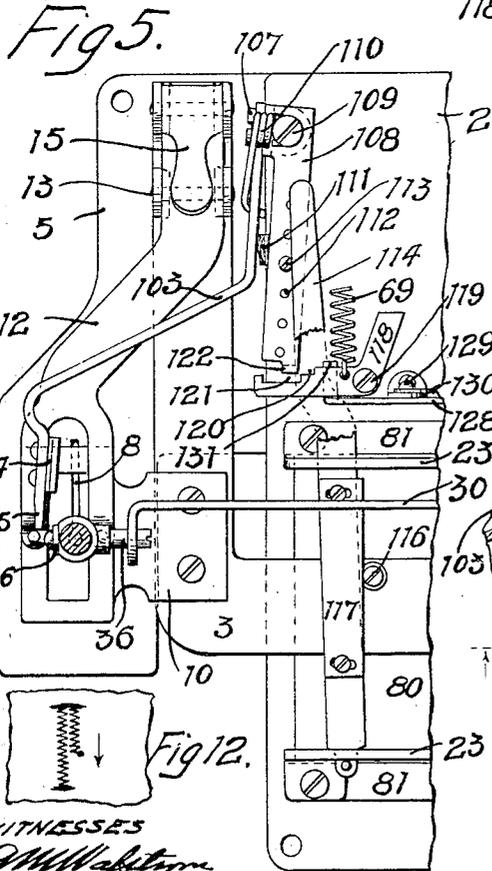


Fig. 5.

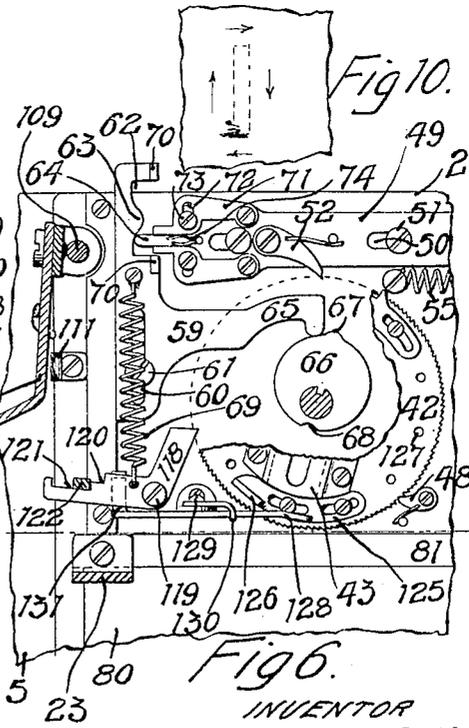


Fig. 6.

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HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE W. NELSON, OF MINNEAPOLIS, MINNESOTA.

BUTTONHOLE-MACHINE.

No. 887,503.

Specification of Letters Patent.

Patented May 12, 1908.

Application filed December 10, 1906. Serial No. 347,035.

To all whom it may concern:

Be it known that I, GEORGE W. NELSON, of Minneapolis, Hennepin county, Minnesota, have invented certain new and useful Improvements in Buttonhole-Machines, of which the following is a specification.

My invention relates to button hole attachments for household sewing machines or those operated by power for forming button holes of various sizes and stitches.

One object of the invention is to provide an improved button hole cutting knife and means for rendering it operative or inoperative.

The invention consists generally in various constructions and combinations, all as hereinafter described and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a plan view of a button hole attachment embodying my invention. Fig. 2 is a transverse sectional view of the same. Fig. 3 is an end elevation showing the position of the knife bar with respect to the needle bar. Fig. 4 is a view of the under side of the work plate showing the mechanism for forming the bar at the end of the button hole and for extending the bar when desired. Fig. 5 is a detail view of the mechanism for throwing the knife to its inoperative position. Fig. 6 is a detail of the ratchet mechanism employed in connection with the knife controlling means and the mechanism for forming the bar at the ends of the button hole. Fig. 7 is a detail view showing the knife bar engaged by the needle bar. Fig. 8 is a detail view showing the edge of the ratchet and the device for tripping the knife locking means to allow the knife bar to return to its operative position. Fig. 9 is a perspective view of the lever actuated by the movement of the ratchet to release the knife bar. Figs. 10, 11 and 12 are diagrammatic views illustrating the manner of stitching the button hole.

In the drawing, 2 represents a work plate adapted to be secured to a sewing machine bed and whereon the operating mechanism of my improved button hole machine is mounted.

3 is a feed plate arranged to slide laterally, as will hereinafter appear, between guides 4. An extension plate 5 is provided on the work plate having a recess 6 to receive the feed plate 7 of the machine and avoid the necessity of removing this feed when the attachment is used. A slot 8 is formed in the ex-

tension plate 5 for the knife or cutter and a hole 9 for the needle. A plate 10 is secured to the feed plate 3 and is arranged to slide back and forth over the extension plate 5 between which and a clamping bar 12 having teeth 11, the work is held. This clamping bar is pivoted at 13 on the work plate and is normally held in yielding engagement with the plate 10 by means of a spring 14. A cam lever 15 is pivoted above the clamping bar and when swung to an upright position, as indicated in Fig. 3, the power of the spring will be applied to the bar to clamp the work. When the cam lever is thrown down the spring will be compressed and the bar raised to release the work.

A bracket 16 is mounted on the feed plate 3, preferably between the guides 4 and has an opening 17. A ratchet wheel 18 is mounted on one of the guides 4 and carries a cam 19 that projects into the opening 17. This cam is preferably triangular in form, as shown, and has a series of holes which permit different adjustments of the cam on the ratchet wheel. Shoulders or projections 21 and 22 are formed on the bracket 16 within the opening therein and in the path of the cam 19 so that as said cam revolves, the bracket and feed plate will be oscillated laterally to feed the work and regulate the length or bight of the stitch. This bight can be varied by changing the position of the cam. A frame 23 is mounted on the work plate and bars 24 connected by cross rods 25, 26 and 27, are pivoted in said frame and carry a yoke 28 that is adapted to engage the teeth of the ratchet and is held in engagement therewith by a spring 29. A lever 30 is pivoted at 31 on the frame 23 and has a forwardly extending arm 32 provided with a series of holes 33 wherein a link 34 having a slot 35 to receive the bar 26 is pivoted. The holes 33 allow the adjustment of the link to adapt the device for needle bars of different stroke. The forward end of the lever 30 has a suitable connection 36 with the needle bar and an oppositely extending arm 37 is provided on said lever to permit its operation from some other moving part of the machine than the needle bar. The bars 24 are normally held in their depressed position by a spring 38 with the rod 26 at the lower end of the slot 35 so that when the needle bar descends and the link 34 slides downward on the rod 26 the spring will draw down the bars 24 until the yoke 28 engages

a tooth of the ratchet wheel. Then on the up stroke of the needle bar the lever will be raised and the bars 24 through their connections with said lever will be lifted also to rotate the ratchet wheel one step and actuate the triangular cam 19 to reciprocate the feed plate and the work. A lug 39 is preferably provided on the frame 33 for limiting the downward movement of the bars 24. A plate 40 is slidably mounted between guides 41 and carries the guides for the feed plates 3.

A ratchet 42 is mounted on the work plate and has a plate 43 secured thereon and provided with a radial slot 44 having an enlarged opening 45 at one end. A pitman 46 is pivotally connected at one end to the plate 40 and has an adjustable connection 47 at its other end with the slot 44, said connection being detachable by sliding it to the enlarged end of the slot. The pitman is locked in any desired position in the slot by a suitable thumb nut. By moving the pitman back and forth in the slot 44 the stroke of the feed plate 40 is regulated and the length of the side stitching on each side of the button hole determined. Obviously, if the end of the pitman be set in the center of the ratchet no movement whatever of the feed plate 40 would take place. A spring dog 48 engages the teeth of the ratchet and prevents backward movement thereof. A plate 49 is slidably mounted on the work plate by means of slots 50 and screws 51 and carries a spring dog 52 arranged on the other side of the ratchet wheel from the dog 48 and adapted to revolve the ratchet step by step. A lever 52' is pivoted at 53 on the work plate and has a forked end to receive a pin 54 on the plate 49. A spring 55 normally holds the lever 52' in its retracted position. The opposite end of the lever 52' projects into the path of a depending arm 56 on the lever 30, said arm carrying a thumb screw 57 having a lock nut 58 and adapted to be adjusted back and forth to regulate the time and distance of movement of the lever 52'. With each stroke of the needle bar the lever 30 will be vibrated and the plate 49 reciprocated to rotate the ratchet 42 and impart a reciprocating movement to the feed plate 40. This movement will produce a feed of the work lengthwise of the button hole as the stitches are formed therein.

In the operation of a device of this kind it is desirable to provide some means for forming a bar at the ends of the button hole and strengthening it at such points by piling up the stitches or causing them to be made shorter or closer together. To accomplish this I provide a plate 59 having a reciprocating movement on the work plate by means of a slot 60 and screw 61. A recess 62 is formed in one end of the plate having a centrally arranged shoulder 63, and a stud 64 provided on the end of the plate 49 extends

into said recess and is engaged by said shoulder to limit the reciprocating movement of the plate 49. The plate 59 has an arm 65 extending in under the ratchet 42 and arranged to bear on an eccentric 66 mounted on the same shaft preferably, as the ratchet 42 and having a peripheral lug 67 on one side and a correspondingly shaped depression 68 in its periphery on the other side of its center. With each revolution of the eccentric the lug will engage the arm 65 and move the plate 59 in one direction, and the arm will drop into the depression and allow the plate to move in the opposite direction being yieldingly held in engagement with the periphery of the eccentric, by a spring 69. The plate 59 is provided on each side of the recess 62 with lugs 70, and plates 71 are pivoted at one end on the plate 49 and project forwardly on each side of the stud 64 and have each a slot 72 and a screw 73 passing therethrough which allows the plates to be moved toward or from each other, a spring 74 arranged between them, normally holding them in their separated position.

The movement of the mechanism is timed so that the plate 59 will be actuated by the lug 47 to move one of the lugs 70 into the path of the contiguous plate 71 and thereby limit the stroke of the plate 49 and effect a corresponding reduction in the movement of the ratchet and produce a piling up of the stitches to form the bars at one end of the button hole. The arm 65 dropping into the recess 68 and allowing the spring 69 to move the plate 59 in the opposite direction and adjust the other lug 70 in the path of its contiguous plate 71 will cause a corresponding reduction in the movement of the plate 49 and the ratchet wheel and form the bar at the other end of the button hole. As soon as the lug 67 or the recess 68 has passed the arm, the lugs 70 will be removed from the path of the plates 71 and the plate 49 will resume its normal stroke.

In a device of this kind where a ratchet and pitman drive is employed, it will be understood that the movement of the feed plate will be somewhat irregular, slowing up as the pitman passes the center and moving faster at other points. This irregular movement would, of course, be objectionable in a machine of this type as it would result in uneven spacing of the stitches, and I therefore provide for a regular uniform stroke by arranging the projection 63 heretofore referred to, in the recess 62 where it will be engaged by the stud 64. As the eccentric 66 revolves, the plate 59 will be reciprocated and through the engagement of the stud 64 with the shoulder 63 the stroke of the plate 49 will be gradually increased as the stroke of the pitman is reduced while on the dead center. At other points in the movement of the pitman where its stroke is the longest

the movement of the plate 49 will be gradually decreased. For instance, referring to Fig. 1, the ratchet and pitman are shown in position under ordinary conditions to move the feed plate its greatest distance, but by means of the regulator referred to, the travel of the plate 49 is lessened and the rotation of the ratchet will be correspondingly reduced. When the pitman approaches the point where ordinarily the least movement would be transmitted to the feed plate, the stud 64 slides off the shoulder 63 and the travel of the ratchet is increased and thus the travel of the feed plate 40 will be made uniform and the stitches evenly spaced.

On the under side of the work plate on the same shaft as the ratchet and eccentric 66, is a cam 75 operating within an opening 76 in a shifter bar 77 that is mounted at one end on a screw 78 that operates within a slot 79 in the work plate and extends up into a plate 80 that carries the other feed plates 40 and 3, and is slidable between guides 81 on the work plate. This plate 80 and the mechanism for operating the same controls the width or distance between the rows of stitches at the sides of the button hole. The bar 77 has a longitudinal slot 82 above which guides 83 are secured to the bottom of the work plate. A bell crank 84 is pivoted at 85 to the work plate and has a slot 86 in one of its arms through which a screw 87 passes into a plate 88 that is slidable between the guides 83. A curved slot 89 is provided in the work plate and a thumb screw 90 passes through this slot and into the other arm of the bell crank 84 and allows the arm to be oscillated on its pivot or locked as desired. A spring 91 is attached to one arm of the bell crank and normally tends to draw the said arm to the outer end of the slot 82 in the shifting bar. The position of the slide 88 in the slot 82 will regulate its throw in the slot 79 and control the cutting opening or the width between the rows of stitches. If the slide is near the inner end of the slot then the throw of the bar will be greater and the space between the rows of stitches wider. On the other hand, if the slide by the adjustment of the bell crank is moved toward the outer end of the slot the throw of the bar will be correspondingly decreased at that end and the space between the rows of stitches made narrower. The cam 75 has a slot 92 whereby the cam may be adjusted and the movement of the parts properly timed. In an attachment of this kind, it is sometimes desirable to extend the bar at the ends of the button hole for the purpose of strengthening the material around the hole and I therefore provide a disk 93 above the cam 75 having pairs of lugs 94 and 95 on its periphery. A lever 96 is centrally pivoted at 97 and has one end arranged to bear on the periphery of said disk and engage said lugs, its other end having an

adjustable connection with the work plate by means of a curved slot 98 and the thumb screw 99. A link 100 connects the lever 96 with one arm of the bell crank and holes 101 and 102 in said lever and bell crank respectively, permit adjustment of the link thereon for the purpose of increasing or decreasing the length of the bar extensions. The movement of the parts is so timed that one of the lugs 94 or 95 will engage the lever 96 and actuate it just at the time when the stitches are being completed at the end of the bar and the movement of the lever 96 will be transmitted through the link 100 and the bell crank to the shifter bar to give a momentary increase to the movement of the work and cause the formation of an extension to the bar at the end of the button hole beyond the point where the bar is normally formed. Whenever desired this lever may be rendered inoperative by loosening the screw 99 and swinging the lever to the position indicated by dotted lines in Fig. 4. By providing the pairs of lugs I am able to form extensions at both ends of the bars and at each end of the button hole.

For cutting the button hole, I provide a bar 103 carrying a knife blade 104 and having a beveled end 105 that is adapted to be struck by the descending needle bar and forced downward through the work between the rows of stitches. A guard 106 is provided on the needle bar for the beveled end 105. The bar 103 is pivoted at 107 on a plate 108 that has a pivot 109 and is adapted to swing in a horizontal plane or at right angles to the plane of movement of the knife bar. A spring 110 normally holds the knife bar in its raised position and the spring 111 bears on the edge of the plate 108 and tends to hold it in its retracted position and the knife bar in the path of the needle bar. The plate 108 has a series of holes 112 and a pin 113 fitting therein and engaged by one end of a lever 114 that is pivoted at its opposite end in the frame 23 and has a horizontal sliding movement in a slot 115 in said frame. A pin 116 mounted on the feed plate 3 is adapted to engage an adjustable plate 117 on the lever 114 and oscillate the same during one part of the stroke of the feed plate 3, the spring 111 returning the lever and its plate to their normal position and holding the plate 117 in contact with the pin 116. By adjusting the plate 117 the time of movement of the lever and the plate 117 may be regulated. The knife bar is designed to be operative when the needle is stitching one side of the button hole and inoperative when it is working on the other side. It is therefore, desirable to provide a mechanism for automatically moving the knife bar out of the path of the needle bar while the needle is stitching the outer side of the button hole. With this end in view, I provide a lever 118

pivoted at 119 and having notches 120 and 121. A finger 122 is provided on the plate 108 and depends therefrom in position to enter one of these notches. The spring 69 is attached to the lever 118 and normally holds one end of the same in the path of a lug 123 provided on a plate 124 that is adjustably mounted on the ratchet wheel 42. A second plate 125 having a lug 126 is also adjustably mounted on said ratchet and said ratchet has a series of holes 127 to permit the plates 124 and 125 to be moved around the periphery of the ratchet to vary the time of their engagement with their operative connections. The lever 128 is pivoted at 129 and has one end in the path of the lug 126, being held in that position by a spring 130. The other end of the lever has a downwardly and inwardly turned part 131 that extends in under the lever 118 and locks the same against oscillation until the lever 128 is actuated.

In the position shown in Fig. 5 the plate 108 will oscillate horizontally on its pivot with each stroke of the feed plate 3 and the knife bar will be forced down through the work. As soon, however, as the lug 126 engages the lever 128, the lever 118 will be released and will assume the position shown in Fig. 6, the finger 122 entering the notch 121 and the knife bar being locked out of the path of the needle bar, and this condition will obtain while the needle is stitching the outer side of the button hole.

When the stitching of the outer side of the button hole has been completed and the needle is working on the inner side and at any point in the stitching of the inner row, I provide for the engagement of the lever 118 by the lug 123 whereupon the said lever 118 will be oscillated, the finger 122 released from the notch 121 and the lever 128 will return to its normal locking position, whereupon the spring 111 will return the plate 108 and the knife bar to their normal position and the descending needle bar will strike the knife bar and cut the button hole. This cutting operation is preferably made by a series of strokes, the number depending upon the time of the release of the lever 118 with respect to the position of the needle in forming the inner row of stitches.

I claim as my invention:—

1. In a button hole machine, the combination, with means for clamping the work, of a needle bar and needle, a knife bar carrying a knife blade and arranged in the path of said needle-bar, a horizontally oscillating plate whereon said knife bar is mounted, a feed plate, and means for operating the same to regulate the length of the bight of the stitches, mechanism for regulating the distance between the rows of stitches at the sides of the button hole and means controlled by the movement of said plate for rendering said knife bar and blade inoperative when

the needle is forming one of the rows of stitches, substantially as described.

2. In a button hole machine, the combination, with means for clamping the work, of a needle bar and needle, a pivoted knife bar and knife carried thereby, an oscillating plate whereon said knife bar is mounted, a feed plate, a lever arranged to be actuated by said plate to oscillate said knife bar and move it out of the path of said needle bar, and means for temporarily locking said knife bar in its inoperative position, substantially as described.

3. In a button hole machine, the combination, with a knife bar arranged to oscillate in a vertical and a horizontal plane and having a knife blade, a feed plate, means actuated by the movement of said plate for oscillating said knife bar horizontally, a lever arranged to lock said knife bar in its inoperative position, means for locking said lever against premature movement, and means for tripping said lever and said locking means successively, substantially as described.

4. In a button hole machine, the combination, with a horizontally oscillating plate, of a pivoted knife bar mounted thereon and having a knife blade, a lever 118 having notches to receive said oscillating plate, means for swinging said plate and said knife bar to an inoperative position, a locking lever 128 arranged to prevent premature movement of said lever 118, and means for tripping said locking lever, substantially as described.

5. In a button hole machine, the combination, with means for clamping the work, of a needle bar having a needle, a feed plate arranged to regulate the length of the bight of the stitches, mechanism for regulating the distance between the rows of stitches at the sides of the button hole, a horizontally oscillating plate, a knife bar pivoted thereon and having a knife blade, said knife bar being normally in the path of the needle bar to be actuated thereby and adapted to make a series of strokes to cut the button hole, means for swinging said plate and knife bar horizontally to an inoperative position while the needle is stitching the outer row of stitches, and means whereby said knife bar will be returned to its normal operative position at any predetermined time while the needle is forming the inner row of stitches, substantially as described.

6. In a button hole machine, the combination, with a horizontally oscillating plate having a series of holes and a pin adjustably fitting therein, of a knife bar pivoted on said plate and having a vertical swinging movement and provided with a knife blade, a reciprocating feed plate, a pin mounted thereon, a lever in the path of said pin and arranged to engage the pin on said oscillating plate, a spring for normally holding said

plate pin in contact with said lever and said lever in contact with said feed plate pin, and whereby the reciprocation of said feed plate will oscillate said knife bar, and means for temporarily locking said knife bar in an inoperative position.

7. In a button-hole machine, the combination, with mechanism for forming the rows of stitches on either side of the button-hole including a needle-bar, of a knife bar and a knife blade carried thereby, said knife bar being arranged to oscillate in a horizontal plane toward or from the path of said needle bar, a feed plate and mechanism for operating the same, mechanism for regulating the distance between the rows at the sides of the button-hole and mechanism for swinging said knife bar out of the path of said needle bar during the formation of one of the rows of stitches.

8. In a button hole machine the combination, with a needle bar and its needle, of a knife bar arranged to oscillate in a vertical and a horizontal plane and having a knife blade, a feed plate, means for oscillating said knife bar horizontally to move it out of the path of said needle bar, and means for temporarily locking said knife bar in its inoperative position.

9. In a button hole machine, the combination, with a needle bar and needle, of a knife bar arranged to oscillate in a vertical and horizontal plane and having a knife blade, means for swinging said knife bar to an inoperative position out of the path of said needle bar, means for locking said knife bar in its inoperative position, and means for tripping said locking means to release said knife bar at a predetermined point in the work of the needle.

10. In a button hole machine, the combina-

tion, with a needle bar and needle, of a knife bar arranged to oscillate in a vertical and horizontal plane and having a knife blade, and means for moving said knife bar out of the path of said needle bar and temporarily locking it in its inoperative position, substantially as described.

11. In a button hole machine, the combination, with a needle bar and needle, of a knife bar having a knife blade and arranged to oscillate in a vertical and horizontal plane, mechanism for feeding the work to said needle and regulating the distance between the rows of stitches forming the sides of the button hole, means for moving said knife bar horizontally to an inoperative position out of the path of said needle bar, and mechanism for releasing said knife bar to allow it to return to its normal position in the path of said needle bar at a predetermined point in the formation of the button hole.

12. In a button hole machine, the combination, with a horizontal oscillating plate having a series of holes and a pin adjustably fitting therein, of a knife bar pivoted on said plate and having a vertical swinging movement and provided with a knife blade, a needle bar and a needle therefor, mechanism for moving said oscillating plate to swing said knife bar to an inoperative position out of the path of said needle bar and means for temporarily locking said knife bar in its inoperative position, the horizontal stroke of said knife bar being determined by the position of said pin in the holes in said plate.

In witness whereof I have hereunto set my hand this 5th day of December, 1906.

GEORGE W. NELSON.

Witnesses:

RICHARD PAUL,
J. B. ERA.