



(No Model.)

5 Sheets—Sheet 2.

E. B. MOORE & G. REHFUSS.

BUTTON HOLE SEWING MACHINE.

No. 349,445.

Patented Sept. 21, 1886.

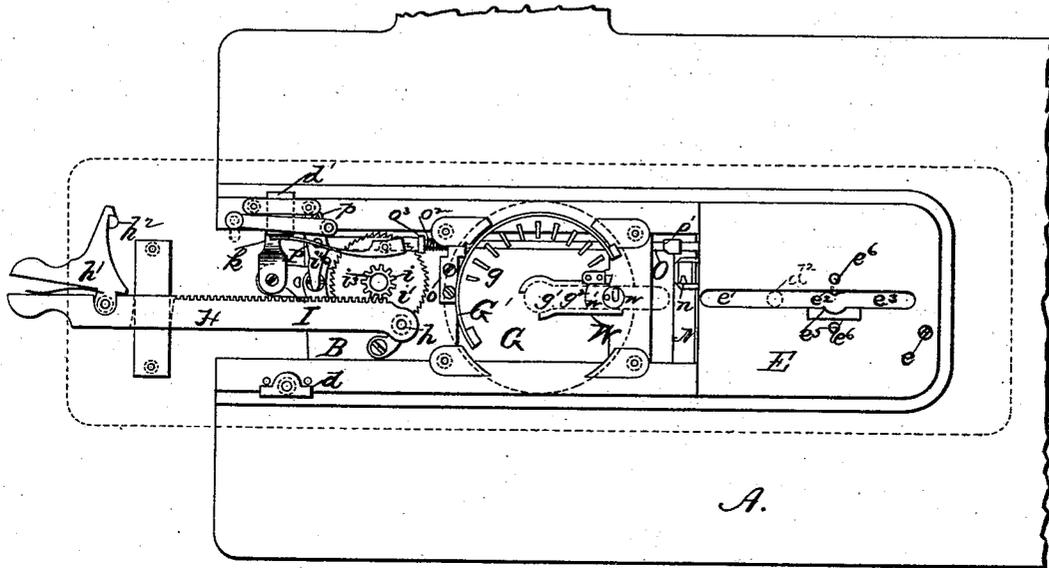


Fig 4

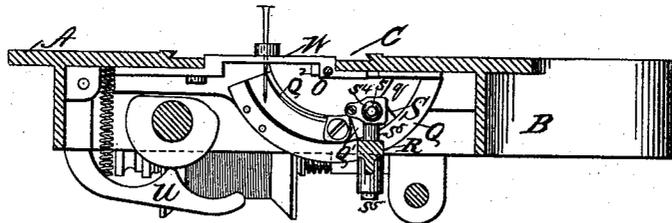


Fig. 5

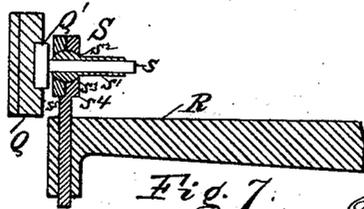


Fig. 7.

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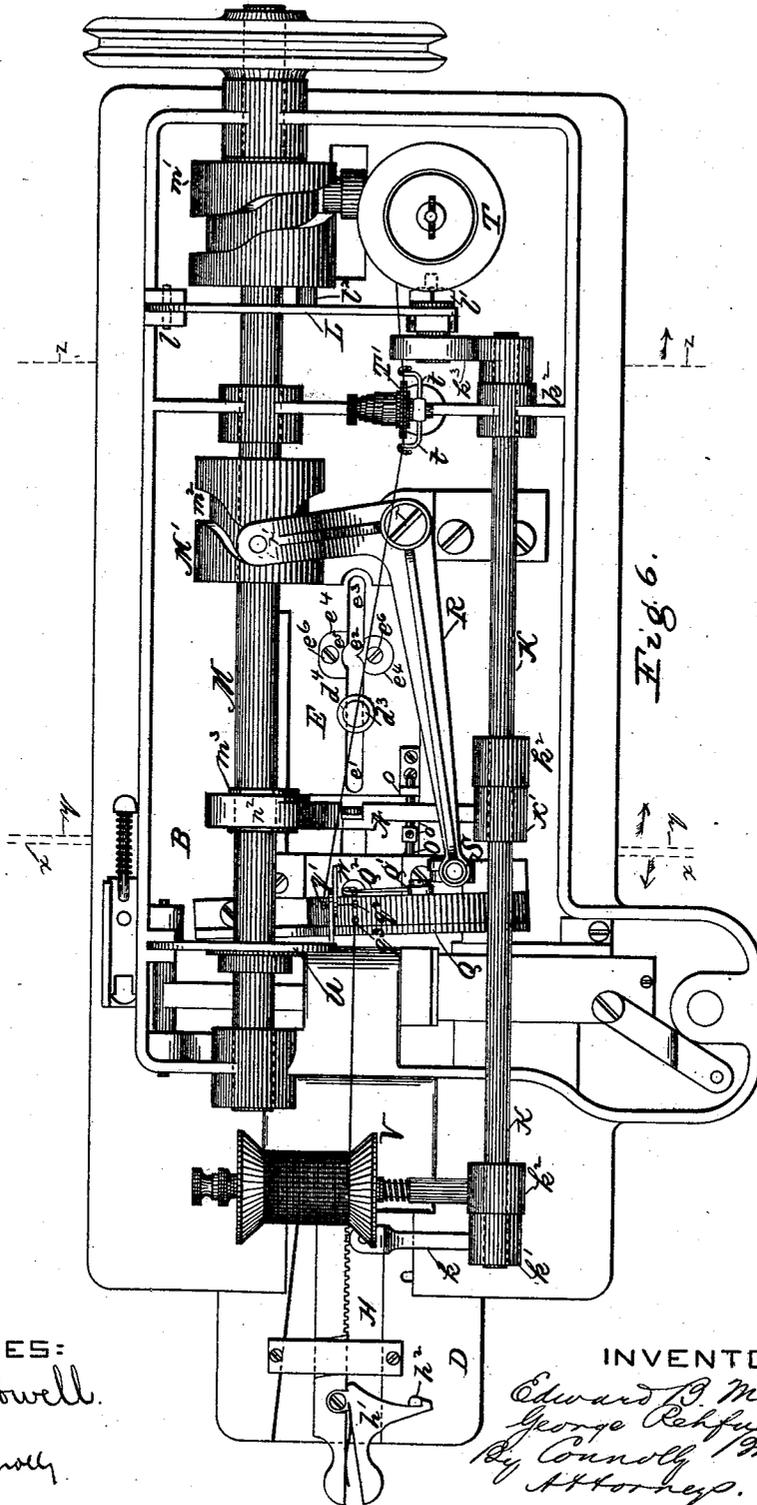


Fig. 6.

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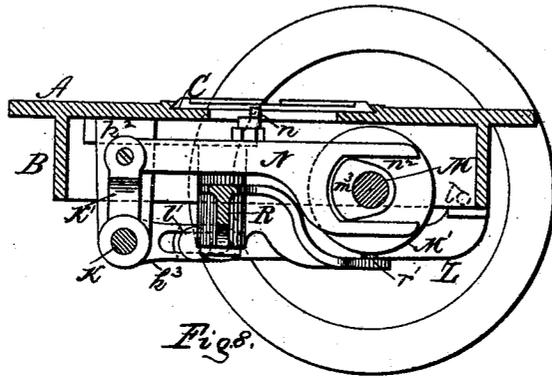


Fig. 8.

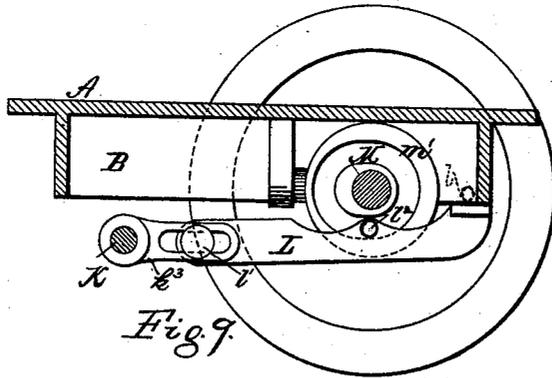


Fig. 9.

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5 Sheets—Sheet 5.

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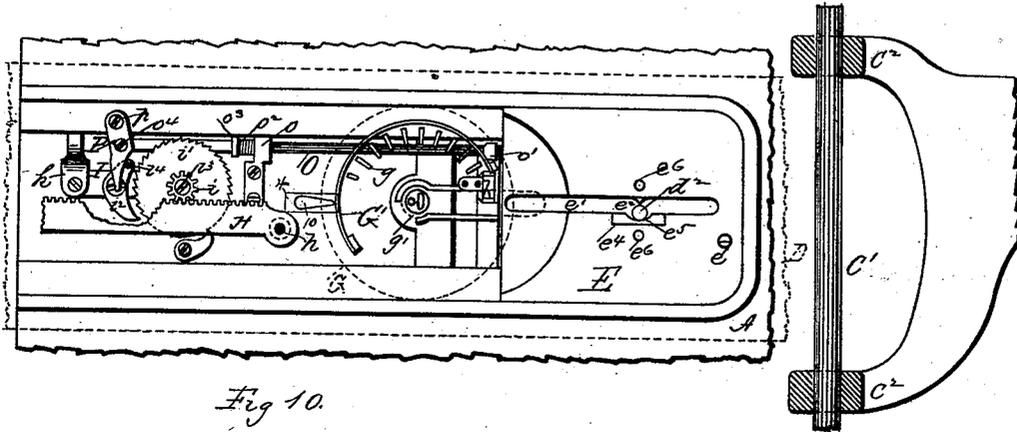


Fig. 10.

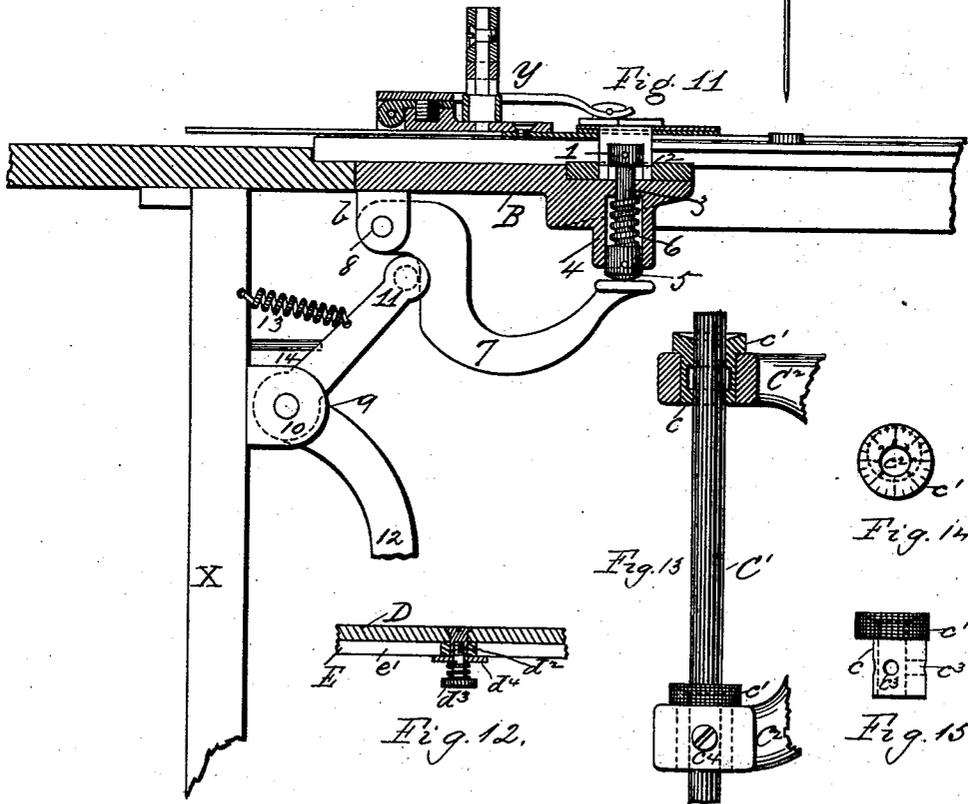


Fig. 11.

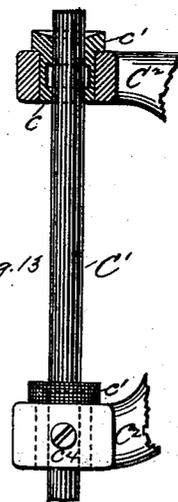


Fig. 13.



Fig. 14.

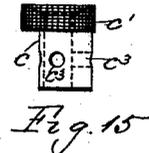


Fig. 15.

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# UNITED STATES PATENT OFFICE.

EDWARD BLACKFAN MOORE, OF WEST CHESTER, AND GEORGE REHFUSS,  
OF PHILADELPHIA, PA., ASSIGNORS TO SAID EDWARD B. MOORE.

## BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 349,445, dated September 21, 1886.

Application filed July 22, 1885. Serial No. 172,292. (No model.)

*To all whom it may concern:*

Be it known that we, EDWARD BLACKFAN MOORE, a citizen of the United States, residing at West Chester, in the county of Chester, State of Pennsylvania, and GEORGE REHFUSS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State aforesaid, have invented certain new and useful Improvements in Button-Hole Sewing-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a plan of under side of feed-slide, showing disk in the position it occupies when button-hole has been completed. Fig. 2 is a plan of same, showing position parts occupy in stitching first side of button-hole. Fig. 3 is a plan of mechanism and parts below the feed-slide, the latter being removed. Fig. 4 is a plan with feed-slide in position, the slide being represented in dotted lines and the mechanism beneath shown in full lines, as if said slide were transparent. Fig. 5 is a transverse section on line *x x*, Fig. 6. Fig. 6 is a plan of under side of bed-piece. Fig. 7 is a vertical section, on enlarged scale, of the joint between the looper-carrier and its retracting-lever. Figs. 8 and 9 are transverse vertical sections taken on lines *y y* and *z z*, respectively, of Fig. 6. Fig. 10 is a plan of feed-mechanism, the feed-slide being shown as if transparent, and the parts in position for the rotation of the disk. Fig. 11 is a vertical section showing clamp and button-hole locating device, and including needle-bar and head or fork. Fig. 12 is a vertical section of feed-slide. Fig. 13 is a vertical section showing needle-bar with adjustable bearings. Figs. 14 and 15 are respectively a plan and a side elevation of eccentric bearing for needle-bar.

Our invention has relation to that class of sewing-machines which are adapted to stitch a button-hole having a rounded end, and in which the cloth or fabric in which the button-hole is formed is moved by means of a feed-slide consisting of a plate carrying a rotary disk.

Our invention further relates to that class

of sewing-machines in which the button-hole stitch is formed by means of a needle and a looper, the former being secured in the usual manner to a needle-bar above the cloth-plate and the latter to a carrier that moves in a guide below said cloth-plate.

Our improvements consist in the peculiar construction and combinations of parts hereinafter fully described and specifically claimed.

Referring to the accompanying drawings, A (in Figs. 3, 4, 5, and 10) designates the cloth-plate of a sewing-machine, which is designed to be fitted in a suitable table, and preferably flush with the top of the latter.

B (in Figs. 3, 4, 5, 6, and 9) represents the bed-piece of the machine, which is a casting to which the cloth-plate is secured or with which it is made integral. Said cloth-plate is recessed on its upper side, as shown at C, to receive the feed-slide D, the longitudinal edges of said recess being inclined or beveled, and said slide being provided on its under side with a bevel-edged block, *d*, and a spring-slide, *d'*, which fits into or beneath said edges, holding the feed-slide down on the cloth-plate, but permitting its longitudinal movement thereon.

The feed-slide comprises the plate D and the rotary or swiveled disk G, carried thereon.

E is the feed-plate guide, and consists of a plate rigidly fastened in the recess C, at the inner end of the latter, by means of a screw, *e*, which passes down into the bed-piece B, said guide having a slot, *e'*, which is traversed by a roller on a screw-pin, *d''*, projecting downwardly from the feed-slide D. Said pin *d''* receives a screw, *d'''*, holding a washer, *d'''*, and encircled by a spiral spring which fits between the head of the screw and said washer, this construction (shown in Fig. 12) holding the inner end of the feed-slide down on the guide and operating to guide said feed-slide, as hereinafter fully explained.

The feed-slide plate D carries a disk, G, swiveled therein so as to be capable of rotary motion on its vertical axis, to which disk there should be attached a cloth clamp and spreader of suitable construction—such as are ordinarily employed in button-hole sewing-machines of the class to which our improvements

relate—said clamp and spreader being illustrated in Fig. 11 of the drawings, (designated by the letter *y*.)

To impart a rectilinear motion to the feed-slide and a rotary motion to the disk the slide is provided with a straight rack and the disk with a segmental rack, said racks being on the under side of said feed-slide and disk, respectively. The straight rack is shown at H, and consists of a toothed bar, pivoted at *h* to the feed-slide in a recess formed on the under side of the latter, and having at its opposite end a spring-catch, *h'*, which engages with a stud, *h<sup>2</sup>*, on the under side of said feed-slide. When so engaged, the rack-bar H is held rigidly, parallel with the long sides of the feed-slide and aligned with the line of feed movement of said slide. Said rack then meshes with a pinion, *i*, fast on the same shaft with a ratchet-wheel, *i'*, said shaft having its bearings in the bed-piece B. The ratchet *i'* is given an intermittent rotation by means of a pawl, *i<sup>2</sup>*, carried on an arm, I, which is swiveled at one end on the ratchet-shaft *i<sup>2</sup>*, and pivotally connected at its other end to a link, *l*. Said link is secured by a hinge-joint to an arm, *l'*, fast on a rock-shaft, K, supported in bearings *l<sup>2</sup> l<sup>3</sup>*, on the under side of the bed-piece B. Said shaft K is caused to rock in its bearings by means of a lever, L, which is pivoted at *l* to the bed-piece B, and to an arm, *l<sup>2</sup>*, of shaft K, said arm being longitudinally slotted for the reception and adjustment of a screw, *l'*, which unites said lever L and arm *l<sup>2</sup>* pivotally together. The lever L is caused to oscillate in a vertical plane, when the main shaft M rotates, by reason of the fact that a pin, *l<sup>3</sup>*, which projects laterally from said lever, passes into a cam-groove in the end of a cam, *m'*, on said main shaft. By adjusting the screw *l'* in the slot in the arm *l<sup>2</sup>* the extent of rotation of the pinion *i* at each step or impulse, and consequently the space between the stitches, may be regulated and varied.

To impart rotary motion to the disk G the latter has formed on its under side a segmental rack, *g*, consisting of teeth radially disposed with reference to the eye *g'* or rounded end of the button-hole slot *g<sup>2</sup>* in said disk. With the teeth of this segmental rack there engages a tooth, *n*, on a lever, N, which is pivoted at one end to a rock-arm, K', on shaft K, its opposite end, *n<sup>2</sup>*, being forked and straddling a cam, *m<sup>2</sup>*, on the main shaft M, whereby a motion similar to that of a "four-motion" feed-bar is imparted to said tooth *n*, the latter during its upper horizontal movement engaging with the teeth of rack *g* successively, and during its other movements being out of contact with said teeth. The feed-slide must first slide lengthwise while the first straight side of the button-hole is being stitched, and then obliquely while the first part of the eye is being stitched, and these lengthwise and oblique movements must be imparted by the pinion *i* and rack H in conjunction with guide E. Then the slide should dwell or come to a state of rest while

the disk G makes a half-rotation or turns from the position shown in Figs. 2 and 4 to that shown in Fig. 1. The feed-slide should then be moved obliquely and afterward longitudinally, which movements are derived from the rack H and pinion *i* acting with guide E.

To render the straight rack inoperative while the disk is rotating, and to bring said rack into operation again after the disk has made its half-rotation, the following construction is adopted: *G'* represents a segmental flange which depends from the under side of the disk G and stands outside the rack-teeth *g*. O is a rod fitted in bearings *o o* on the bed-piece B. Said rod is adapted to be moved longitudinally in said bearings, and carries near its inner end a stud or collar, *o'*, which lies in the path of the flange *G'*, so that when the feed-slide has made its first oblique movement, already referred to, said flange *G'* will meet and impinge against said collar *o'*, thereby imparting an inward longitudinal movement to rod O against the resistance of an encircling spiral spring, *o<sup>2</sup>*, which rests between a shoulder, *o<sup>3</sup>*, and one of the bearings *o*. The outer end of rod O is connected at *o<sup>4</sup>* to a lever, P, pivoted at *p* to the bed-piece B, and which rests in contact with a pin, *i<sup>2</sup>*, on the pawl *i<sup>2</sup>*, so that when the described lengthwise movement of the rod O takes place the pawl *i<sup>2</sup>* is thrown out of engagement with the ratchet *i'*, as shown in Fig. 10, so that no movement is then communicated to said ratchet or to the pinion *i*. When this occurs, the straight rack H comes to a state of rest and the feed-slide is stationary, and this takes place just after the feed-slide makes its first oblique movement, or when the pin *i<sup>2</sup>* attains the apex of the projection *e<sup>2</sup>* of the slot *e'* in the guide *e*. The tooth *n* now engages, as already described, with the teeth of the segmental rack of the disk G, and imparts by intermittent impulses, or by a step-by-step movement, a half-rotation to said disk, moving the latter from its initial position (shown in Figs. 2, 4, and 10) to its second position. (Shown in Fig. 1.) While said half-rotation is being effected the flange *G'*, impinging against the collar *o'*, moves the rod O longitudinally inward, as already described, and holds it so that the pawl *i<sup>2</sup>* is kept out of engagement with the ratchet *i'*; but the moment the half-rotation is accomplished, and when the disk is brought to the position shown in Fig. 1, the flange *G'* clears the collar *o'* or passes out of contact therewith, whereupon the spring *o<sup>2</sup>* restores the rod O to its first position, (shown in Fig. 3,) thus bringing the pawl *i<sup>2</sup>* into operative connection with the ratchet *i'*. The feed-slide is then moved obliquely, as the roller or pin *i<sup>2</sup>* moves down the incline of the projection *e<sup>2</sup>* into the part *e<sup>2</sup>* of slot *e'*, and then straight along until the stitching of the second straight side of the button-hole is accomplished.

Referring now particularly to Figs. 5 and 6, Q represents a block rigidly secured to the bed-piece B, transverse of the latter, but slightly oblique. This block has in its side a

segmental or curved groove, *g*, in which moves a carrier, *Q*, to which is attached the looper *Q*<sup>2</sup>, the latter being in the form of a curved eye-pointed needle. Said carrier is in the form of a curved slide, which moves annularly and has a curvilinear reciprocating movement in a vertical plane imparted to it by means of a crank-lever, *R*. Said lever is fulcrumed on a screw, *r*, that passes into the bed-piece *B*, and the short arm of said lever carries a pin, *r*<sup>1</sup>, on which is a roller that moves in a sinuous groove, *m*<sup>2</sup>, in a cam, *M*, on the main shaft *M*. The long arm of said lever *R* is connected with the carrier *Q* by a joint, *S*, of peculiar construction, which peculiar joint is necessary, owing to the fact that while the end of the lever oscillates in a horizontal plane the carrier has a curvilinear movement in a vertical plane through the plane of oscillation of said lever. This joint is constructed as follows: A rigid pin, *s*, projecting laterally from the carrier *Q* has fitted on it a sliding sleeve, *s*<sup>1</sup>, which is formed with a spherical swell or bulb, *s*<sup>2</sup>, that fits in a socket, *s*<sup>3</sup>, in the head *s*<sup>4</sup> of a swivel-pin, *s*<sup>5</sup>. This pin *s*<sup>5</sup> fits and has liberty of vertical and rotary movement in an opening or eye in the end of the long arm of lever *R*. When the lever *R* oscillates and communicates motion to carrier *Q*, the sleeve *s*<sup>1</sup> slides on pin *s*<sup>5</sup>, and pin *s*<sup>5</sup> swivels or turns back and forth and also slides longitudinally in its bearing.

The movements of the respective parts described are such that one stitch is formed for every progressive movement of the feed-slide and rotary disk.

*T* represents the spool for the looper-thread, which passes, as shown, around the tension *T*<sup>1</sup>, through the guides *t t*, thence through an eye, *q*<sup>1</sup>, in the block *Q*, thence through the eye of the take-up *U*, thence through another opening, *q*<sup>2</sup>, in block *Q*, and finally through the eye of the looper *Q*<sup>2</sup>.

*V* is a spool which carries the cording-thread, said thread passing from its spool through an opening, *q*<sup>3</sup>, in block *Q*, and thence upwardly through an opening, *w*, in the throat-plate *W*.

In conjunction with the foregoing-described parts there are provided a cutter and die for cutting the button-hole, said cutter and die being of the construction and operating in the manner shown and described in Letters Patent of the United States dated March 17, 1885, No. 314,046, and which need not, therefore, be herein particularly described. Instead, however, of using such patented cutter and die, we may, when operating in leather, cut the button-holes before placing the material in position to have such hole stitched. In such case we employ the device shown in Fig. 11, for the purpose of assisting the location of the fabric in its proper position. Such device consists of a block, 1, which is in plan of the shape and size of the button-hole, and normally occupies a position in a recess, 2, in the bed-plate directly below the position of the button-hole in the fabric when the latter is placed

in the clamp before said clamp is moved with the slide into position for stitching. The clamp is carried on the rotary disk and the latter moves with the slide, said slide being drawn partly out, as shown in Fig. 11, when locating an already-cut button-hole. This block 1 is carried upon a stem, 3, which fits and has liberty of vertical movement in an opening, 4, in the bed-piece *B*. Said stem has at its lower end a shoulder or head, 5, and between this latter and the bed-piece *B* a spiral spring, 6, encircles the stem 3. The tendency of this spring is to press the stem 3 down and hold the block 1 in the recess 2 and below the plane of the cloth-plate *A*. A curved arm, 7, which is pivoted at 8 to lugs *bb*, depending from the bed-piece *B*, has its outer extremity just below the lower end of stem 3. A lever, 9, which is pivoted at 10 to one of the legs *X* of the sewing-machine table, carries on the outer extremity of its short arm an anti-friction roller, 11, which bears against the under side of arm 7, the long arm 12 of said lever depending in such manner that it can be readily moved by the operator's pressing her knee laterally against it, such lateral movement elevating the block 1 above the upper surface of the cloth-plate. The button-hole to be stitched is now slipped over the block 1, and the machine-clamp duly turned down. The block 1 is then permitted to descend into the recess, the operator relieving the lever-arm 12 of pressure. The spiral spring 6 aids the descent of the block, a retracting-spring, 13, between the lever 9 and leg *X* acting to restore the lever to its normal position. A stud or pin, 14, on leg *X* limits the retractile movement of lever 9. It may be observed that when the bed-piece *B* is raised on its hinges or thrown back on these sewing-machine table in the usual manner when oiling, &c., it will not carry with it the lever 9, the latter being pivoted to the table-leg *X* and not fastened to the arm 7, although impinging against the latter.

To graduate the length of the stitch or distance from the edge of the button-hole at which the needle enters the fabric, the needle-bar *C*, Fig. 11, is arranged to slide vertically in two boxes or bearings, *c c*, which are fitted in the forks *C*<sup>2</sup>, Fig. 13, of the head of the machine. The openings *c*<sup>2</sup> in these boxes in which the needle-bar fits and moves are eccentric to the longitudinal vertical axes of said boxes, so that by turning the latter around in the forks *C*<sup>2</sup>, Fig. 13, the plane of movement of the needle-bar will be altered or said bar moved to one side or another, so as to cause the needle to enter the fabric being stitched at a greater or at a less distance from the edge of the button-hole. To facilitate this adjustment the boxes *c c* are formed with milled heads *c'* *c'*, which are provided each with a scale on their upper sides to register with marks on the forks *C*<sup>2</sup>, Fig. 13, so that both boxes may be moved uniformly in order to keep the needle-bar vertical and truly aligned with the openings in the boxes *c c*.

To hold the bearings in any adjustable position they are formed with adjusting-holes  $e^3$ , into any one of which is entered a set-screw,  $e^4$ , which passes through an opening in the machine-head.

To adapt the machine to sew button-holes with various sizes of eyes the guide E is provided with detachable shoes  $e^1 e^4$ , which have formed on them the projection  $e^2$  and the depression  $e^5$  opposed thereto. By varying the sizes and shapes of these projections and depressions on different shoes, the latter being interchangeable, button-holes having eyes of various sizes and shapes may be stitched on the same machine. These interchangeable shoes are fastened in position by screws  $e^6$ , which pass into the bed-piece of the machine.

In operation the fabric is placed in position on the feed-slide, the clamp turned down thereon, and the spreader, which is usually provided with such clamp, caused to distend the button-hole, the latter being cut either before the fabric is placed on the feed-slide or afterward, as may be desired. The fabric being clamped and the hole spread, the feed-slide is moved into position to bring the clamp below the needle, and the machine is started by rotating the main shaft. The rotation of the said shaft communicates, through the medium of the intermediate parts described, a progressive intermittent movement to the feed-slide, a stitch being formed in such fabric and over the edge of the button-hole between every impulse or step of said feed-slide. When or after one straight side of the button-hole is stitched, the feed-slide has advanced so far that the roller on pin  $d^2$  meets the projection  $e^2$  in the guide E. The movement being continued, the pin  $d^2$  and its roller move along the forward or opposing side of said projection, which causes the feed-slide to swing or travel obliquely, and while it is so traveling the first quarter of the eye of the button-hole is stitched. By the time the pin  $d^2$  and its roller reach the point or apex of the projection  $e^2$  the flange  $G'$  meets and pushes against the collar  $o'$ , moving the rod O lengthwise. This, as already described, brings the feed-slide to a state of rest or arrests its progressive movement by moving the pawl  $i^2$  out of engagement with ratchet  $i'$ . The disk G is now caused to make a half-rotation, carrying with it the fabric clamped thereon, during which time, the needle and looper continuing their operation, the second and third quarters of the eye of the button-hole are stitched. As soon as the disk has completed its half-rotation and arrived at the position shown in Fig. 1, the flange  $G'$  on said disk clears the collar  $o'$ . The spring  $o^2$  now moves back rod O to its normal position, as seen in Figs. 3 and 4, and so restores the pawl  $i^2$  to engagement with the ratchet  $i'$ , whereupon the feed-slide resumes its onward march. In such onward march it is first swung obliquely, while the pin  $d^2$ , with its roller, is traveling down the incline on the inner side of projection  $e^2$ , during which period the fourth quarter of the

eye is stitched, and it then travels straight ahead, during which straight travel the second straight side of the button-hole is stitched. The clamp being then raised, the fabric is removed therefrom. The latch  $h$  is now released from engagement with the stud  $h^2$ , and the rack H thrown back out of engagement with the pinion  $i$ . The feed-slide is then moved back to its normal position, the disk G being also rotated backwardly for a half-revolution when the slide has been moved half-way back—that is, when the stud  $w'$ , through which the loop ascends, is in the eye of the button-hole slot in said disk. The parts are then in position to stitch another button-hole.

What we claim as our invention is as follows:

1. In a button-hole sewing-machine feed-slide comprising a sliding plate carrying a rotary disk having a flange or annular rib,  $G'$ , the combination, with said plate and flanged disk, of ratchet  $i'$ , pawl  $i^2$ , and intermediate connecting means, whereby the pawl is intermittently disengaged from the ratchet, substantially as shown and described.

2. In a button-hole sewing-machine feed mechanism, the combination, with feed-slide D, having straight rack H, and rotary disk G, having flange  $G'$ , of ratchet  $i'$ , pawl  $i^2$ , lever P, and rod O, said parts being arranged substantially as described, whereby a rotary movement of said disk will produce a longitudinal movement of said rod, which will throw said pawl out of engagement with said ratchet, substantially as shown and described.

3. In a button-hole sewing-machine feed mechanism, the combination, with a feed-slide carrying a rotary disk, said slide having a straight rack, H, and said disk having a segmental or annular rack,  $g$ , and a flange,  $G'$ , of pinion  $i$ , ratchet  $i'$ , pawl  $i^2$ , having pin  $i^1$ , lever N, having tooth  $n$ , lever P, and rod O, having collar or stud  $o'$  and spring  $o^2$ , said rod O and lever P being connected, and the latter operating on the pawl, which engages with said ratchet, whereby the ratchet receives motion from the pawl and communicates it to the pinion to move the rack and feed-slide, said pawl being moved out of engagement with said ratchet when the disk-flange comes in contact with the collar or stud on rod O and moves the latter and lever P, the toothed lever N then imparting motion to the rotary disk, substantially as shown and described.

4. The combination, with feed-slide D, having straight rack H, and rotary disk G, having segmental or annular rack  $g$  and flange  $G'$ , of pawl  $i^2$ , ratchet  $i'$ , pinion  $i$ , rod O, having collar or stud  $o'$  and retracting-spring  $o^2$ , lever P, and lever N, having tooth  $n$ , engaging with said rack  $g$ , said pawl having a stud on its tail-piece against which said lever impinges, and said spring operating to restore the engagement of said pawl and ratchet when the disk-flange moves clear of the collar or stud  $o'$  on said rod, as set forth.

5. In a button-hole sewing-machine, the com-

5 combination, with the guide-plate E, of the detach-  
able interchangeable shoes e', having, respect-  
ively, a projection and a depression, substan-  
tially as set forth.

10 6. In a button-hole sewing-machine, the com-  
bination, with the needle-bar, of two eccentric  
boxes or bearings in the head or needle-arm,  
by the adjustment of which the length of stitch  
may be varied, substantially as shown and de-  
scribed.

15 7. In a button-hole sewing-machine, the com-  
bination, with the block Q, having curvilinear  
groove q, of looper-carrier Q', lever R, and  
joint S, composed of pin s, sleeve with ball or  
bulb s', and pin s'', having socket in its head  
s'', substantially as shown and described, where-  
by said lever reciprocating in a horizontal  
plane transmits a curvilinear movement in a  
20 vertical plane to said looper-carrier, substan-  
tially as set forth.

25 8. In a button-hole sewing-machine, the com-  
bination, with the feed-slide and stitch-form-  
ing mechanism, of means for locating a cut  
button-hole in position, said means consisting  
of block 1, stem 3, having head 5 and spring  
6, arm 7, and lever 9, said parts being con-  
structed and combined for operation substan-  
tially as set forth.

30 9. The combination, with the bed-piece,  
clamp, and stitch-forming mechanism of a sew-  
ing-machine, of a device for locating already-  
cut button-holes accurately in such clamp for  
the action of the stitch-forming mechanism,  
said device consisting, essentially, of a mov-  
35 able button-hole block, 1, fitted in a recess in  
the bed-piece, and having mechanism connect-

ed therewith and located below the bed-piece,  
substantially as described, for elevating it into  
position by leg motion to receive and locate a  
button-hole, substantially as shown and de- 40  
scribed.

10. The combination, with an organized sew-  
ing-machine, of a device or apparatus for lo-  
cating an already-cut button-hole with refer-  
ence to the stitching mechanism, said device 45  
comprising a block constructed and adapted  
to enter an already-cut button-hole, said block  
being fitted and normally resting in a recess  
in the bed-piece or below the cloth-plate of the  
machine, and a lever for elevating said block 50  
so as to cause it to project above the cloth-  
plate, substantially as shown and described.

11. The combination, with the bed-piece and  
stitch-forming mechanism of a sewing-ma-  
chine, said bed-piece having a recess or slot, 55  
of a device for locating an already-cut button-  
hole, said device comprising a block construct-  
ed and adapted to enter an already-cut but-  
ton-hole, which block fits in said recess or slot  
in the bed-piece, and is provided with mech- 60  
anism for producing its projection above the  
plane of the surface of the bed-piece and its  
automatic retirement or descent in the recess,  
substantially as shown and described.

In testimony that we claim the foregoing we 65  
have hereunto set our hands this 15th day of  
July, 1885.

EDWARD BLACKFAN MOORE.  
GEORGE REHFUSS.

Witnesses:

J. W. HAMPTON, Jr.,  
CHAS. KILLER.