

(No Model.)

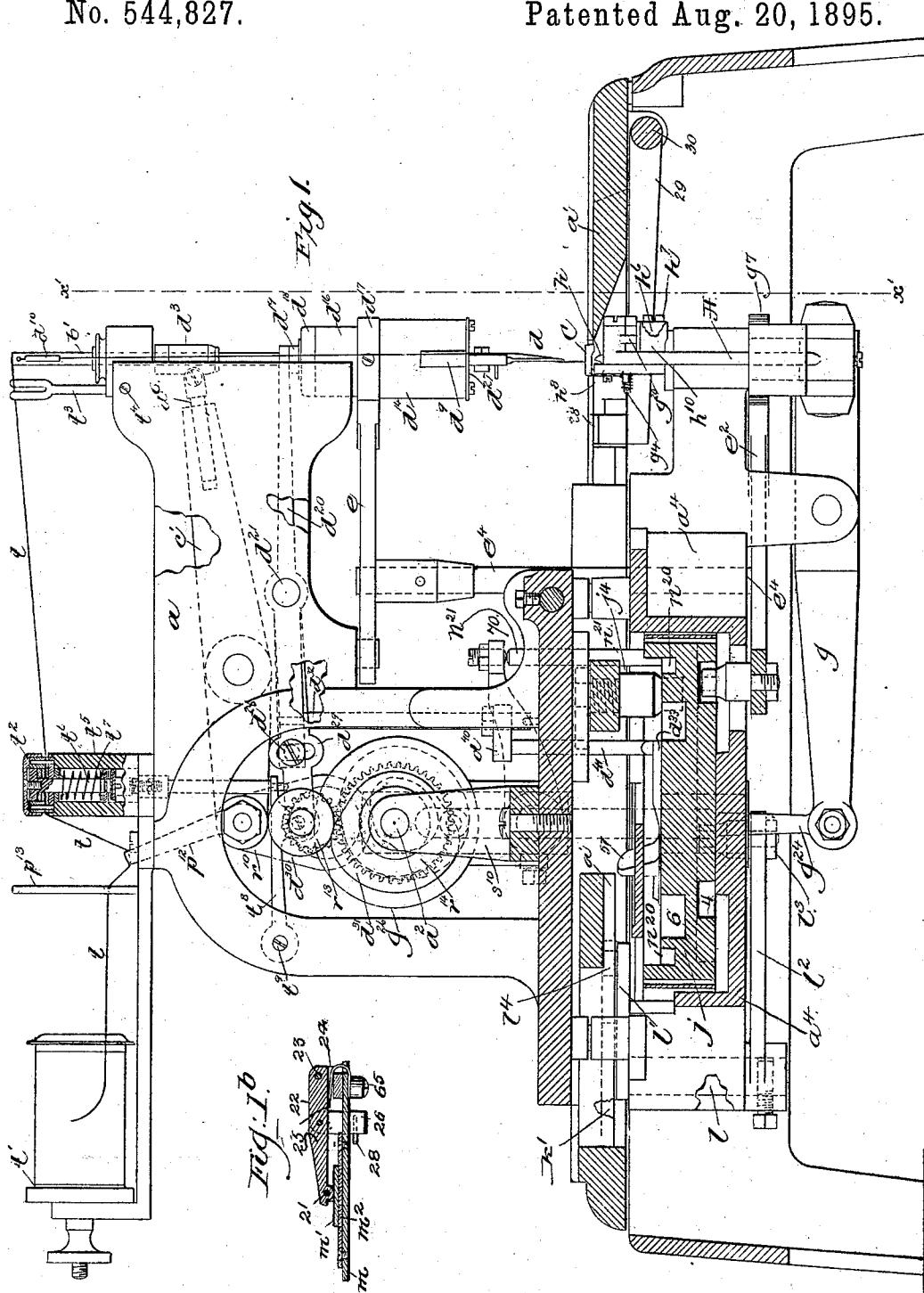
5 Sheets—Sheet 1.

J. REECE.

BUTTONHOLE STITCHING OR OVERSEAMING MACHINE.

No. 544,827.

Patented Aug. 20, 1895.



Witnesses
Fred L. Emery
John F. B. Pritchard

Inventor
John Reece.
By Crosby & Gregory Attys.

(No Model.)

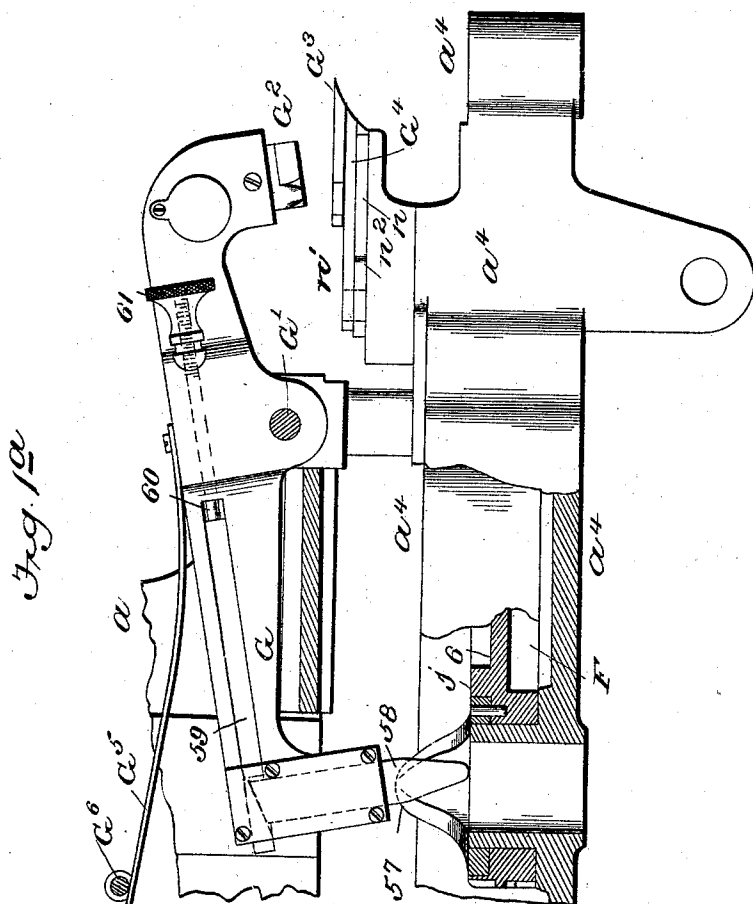
5 Sheets—Sheet 2.

J. REECE.

BUTTONHOLE STITCHING OR OVERSEAMING MACHINE.

No. 544,827.

Patented Aug. 20, 1895.



Witnesses

John L. Linn
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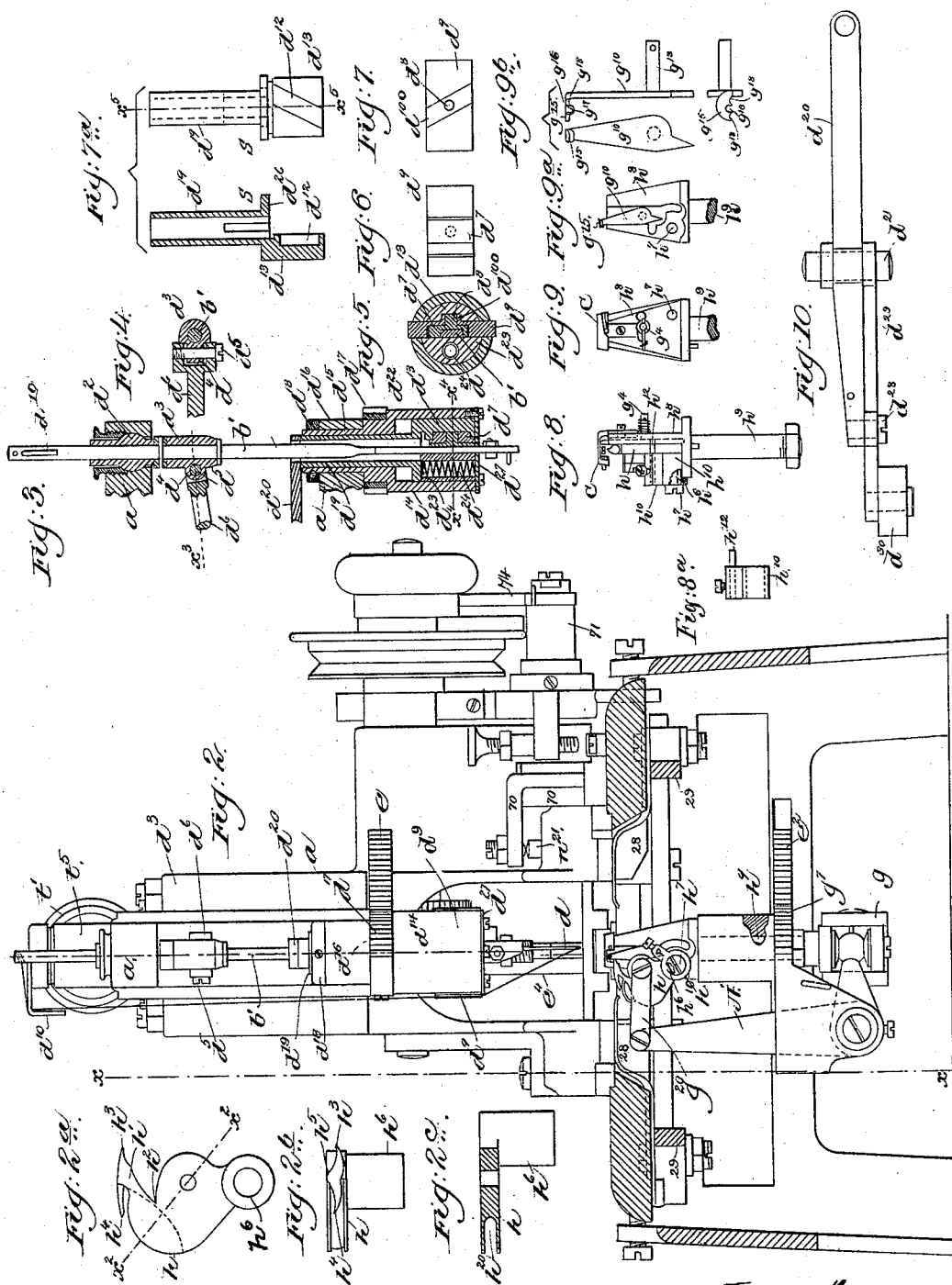
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5 Sheets—Sheet 3.

BUTTONHOLE STITCHING OR OVERSEAMING MACHINE.

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Inventor.

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J. REECE.

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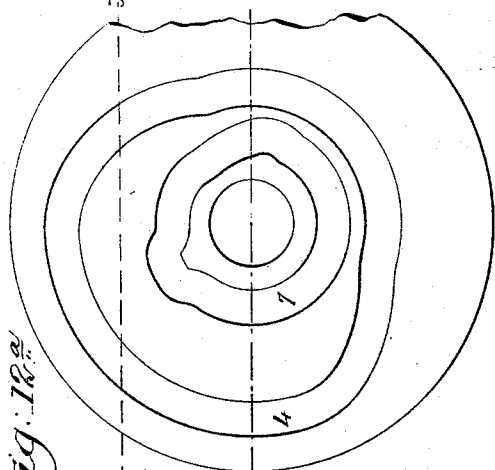


Fig. 12a

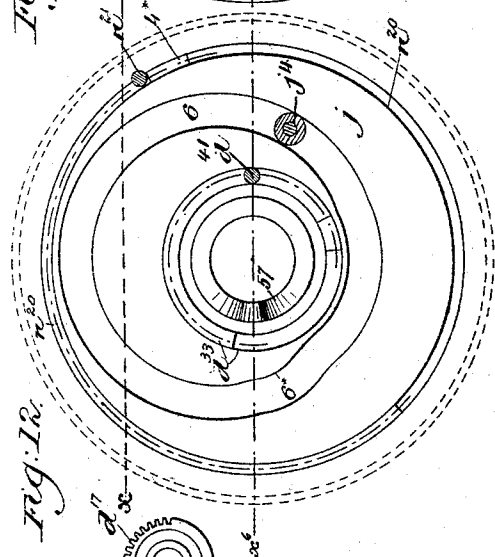


Fig. 12

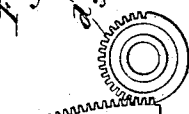


Fig. 11

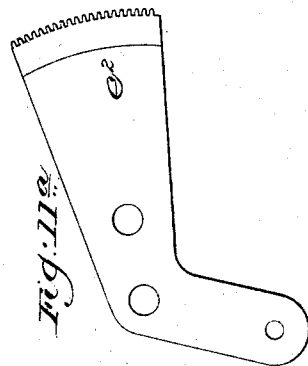


Fig. 11a

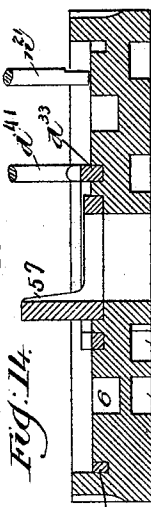


Fig. 14

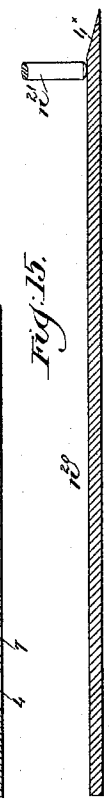


Fig. 15

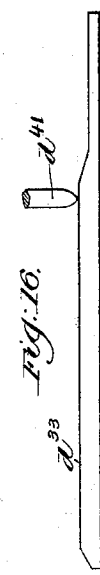


Fig. 16

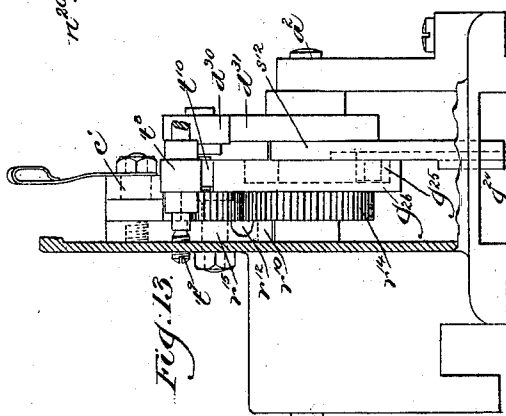


Fig. 13

Witnesses
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(No Model.)

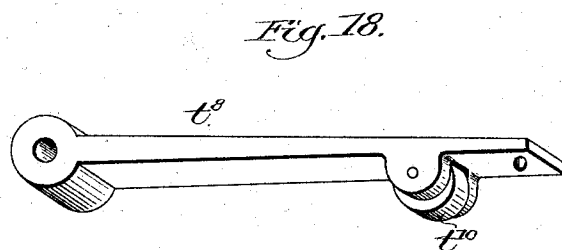
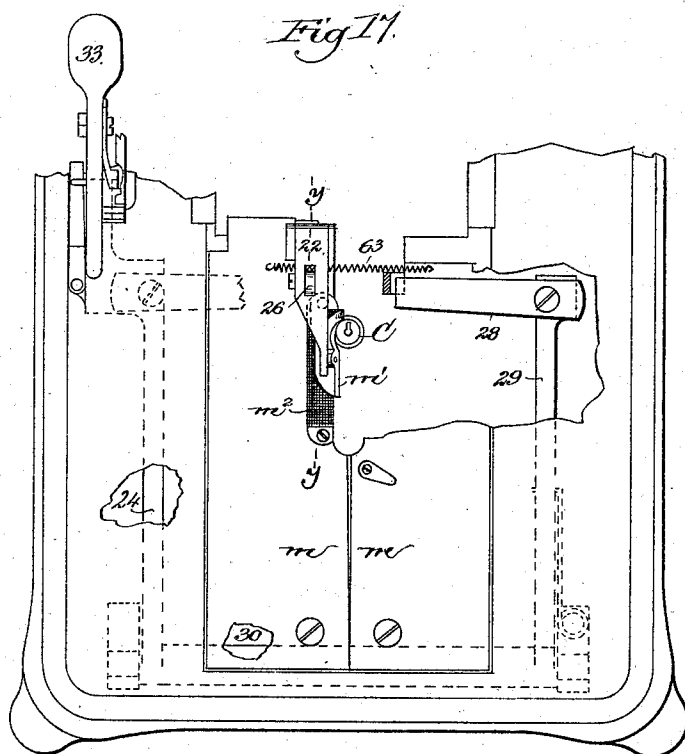
5 Sheets—Sheet 5.

J. REECE.

BUTTONHOLE STITCHING OR OVERSEAMING MACHINE.

No. 544,827.

Patented Aug. 20, 1895.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN REECE, OF BOSTON, MASSACHUSETTS.

BUTTONHOLE STITCHING OR OVERSEAMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 544,827, dated August 20, 1895.

Application filed February 11, 1887. Serial No. 227,269. (No model.)

To all whom it may concern:

Be it known that I, JOHN REECE, of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Buttonhole Stitching or Overseaming Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to sewing-machines for automatically over stitching the cut edges of a buttonhole while held in a clamp, the stitching covering not only the straight edges, but also the edges of the eyed end of the buttonhole. The stitch-forming mechanism herein to be described is carried by a stitch-frame; and the clamp for holding the work containing the slit for the buttonhole is connected to a clamp-frame, and to enable the stitching to be done in the proper lines in conformity with the shape of the eyed buttonhole the relative movements of the stitch-frame having the stitch-forming mechanism and the clamp-frame having the work-clamp are such as to enable the two straight sides of the slit to be stitched during relative longitudinal movements of the stitch-frame and clamp-frame in the direction of the length of the buttonhole-slit, the relative rotation of the stitch-forming mechanism and clamp enabling the stitching to be made about the eyed end of the buttonhole, the difference between the width of the eye and of the straight part of the slit being produced by combining the longitudinal and lateral movements. The material having the slit which is to be over stitched for the formation of a buttonhole, as herein provided for, will be held between the jaws of a work-clamp, substantially such as represented in United States Patent No. 349,359, heretofore granted to me, and the stitch-forming mechanism and the throat-plate employed to support the said material at the stitch-making point between the jaws of the clamp are made to operate along one straight side of the buttonhole to its eyed end, where the stitch-forming mechanism has given to it a rotary movement to radiate the stitches about the eyed end of the buttonhole-slit, and thereafter the stitch-forming mechanism is operated to stitch along the other straight side of the buttonhole, all as usual; but herein, as the opposite or small end of

the buttonhole is reached, the throat-plate, which up to this time has had a movement in a straight line, then a semicircular or rotative movement, and a return movement in a straight line for the opposite side of the slit, has given to it automatically a lateral movement, substantially at right angles to the straight-line movement referred to, to permit the small end of the slit to be barred, as will be described. During the barring operation the throat-plate is left in the position in which it was put by the lateral motion referred to, the stitch-forming mechanism having also been moved laterally with the throat-plate, and the lateral movement of the needle-bar is increased automatically in the direction opposite that in which the throat-plate was moved, thus making the barring-stitches longer than those along the side edges of the slit, and when the barring has been finished the movement of the stitch-forming mechanism is stopped automatically.

Automatically giving to the needle greater lateral throw or vibration during the barring or completion of the small end of the buttonhole and while the throat-plate is held in the position in which it was moved laterally, as described, is an important and essential feature of my present invention, for, prior to my invention, I am not aware that such automatic lateral movements were ever before effected to thereby enable the end of the buttonhole to be automatically barred on the machine employed to over stitch its edges and eyed end.

In the machine to be herein described the two operations of over stitching and barring are substantially continuous, and the barring having been completed the machine is made to come to rest automatically.

The stitch-forming mechanism represented herein consists, essentially, of an eye-pointed thread carrying needle located above the material and a looper located below the material, the edge to be over stitched being supported at the stitch-making point by a throat-plate, which progresses about the buttonhole-slit, the relative positions of the throat-plate and work-clamp being thus constantly changed during the over stitching of the buttonhole. The needle referred to, besides its motion of reciprocation vertically, is also

moved laterally to thus enable it to descend
 alternately through the fabric and then over
 the edge thereof. The needle-bar has co-op-
 erating with it, in the case in which the needle-
 bar reciprocates, devices by which the
 lateral movement of the needle-bar is auto-
 matically increased when the buttonhole is to
 be barred. The needle referred to has co-op-
 erating with it a peculiar looper and a loop-
 spreader, the looper having practically two
 points; but for the sake of simplicity of de-
 scription I shall designate one of the said
 points as the "heel." The point of the looper
 is that which takes the loop of needle-thread
 passed through the material, while the heel
 takes the loop of needle-thread which is
 formed by the descent of the needle over the
 edge of the material, the said looper having
 between its point and heel on the needle side
 a bulging surface, which acts to spread each
 loop entered by the point of the looper, holding
 the said loop spread so that the needle in its
 next descent over the edge of the material
 may enter the said loop without fail, the loop
 of thread taken from the needle as it descends
 over the edge of the material being entered
 and held by the heel of the looper until the
 said loop passes back upon the shank of the
 looper to the rear of the point, and while the
 loop of thread taken from the needle by the
 heel is so held the needle again descends
 through the material and between the said
 loop and the point of the looper, when the
 looper is caused to enter the loop then pro-
 jecting from the eye of the needle, drawing
 the said loop through the loop then held on
 the shank and previously taken from the
 needle by the heel of the looper. Between
 the time that the needle rises above the ma-
 terial and its lateral movement to descend
 over the edge of the material a loop-spreader
 located below the needle-throat is moved to-
 ward the edge of the material and is stopped
 with its needle-guide in line with the descend-
 ing needle, so that the loop previously taken
 by the point of the looper and spread, not
 only by the bulging surface of the looper, but
 also by the movement of the loop-spreader, is
 held open under the descending needle close
 to the edge of the material, so as to be entered
 by the said needle, and, the needle having de-
 scended through the loop of thread held by
 the looper, the loop of needle-thread is
 quickly entered by the heel of the looper, the
 heel of the looper passing through the said
 loop, causing the loop to surround the shank
 of the looper back of its point, where it is
 held, as described, while the needle completes
 its ascent and descends through the material,
 as before described. The needle at each as-
 cent aids in drawing up the loop made at its
 previous descent.

To properly over stitch the edge of the ma-
 terial to form a buttonhole or other over stitching
 by one thread carried by an eye-pointed
 needle requires that the needle-thread be ma-
 nipulated very carefully, so that it may be

given up and also held at the proper time,
 and, in accordance with my invention, I have
 provided means whereby the needle-thread,
 between the top of the needle-bar and the
 spool from which the needle-thread is taken,
 is substantially relieved from tension while
 the needle-bar descends, the needle-thread be-
 ing clamped and held by a clamping-tension
 located between the top of the needle-bar and
 the spool about as the needle completes its
 descent, the thread being held until the needle-
 bar has finished its ascent. By leaving
 the thread so that it may pass freely through
 the clamping-tension while the needle de-
 scends and clamping it while the needle as-
 cends, and by a peculiar arrangement of
 thread-guides to be described, through which
 the needle-thread is passed between the
 clamping-tension and the eye of the needle,
 I am enabled, during each descent of the needle,
 to draw off from the spool a sufficient
 amount of needle-thread for the stitch to be
 made, the amount of thread so drawn off be-
 ing variable, according to the thickness of the
 material and the width of the over stitching.

One part of my invention consists in a but-
 tonhole-sewing machine containing the fol-
 lowing instrumentalities—viz., a work-clamp,
 a throat-plate, stitch-forming mechanism con-
 taining as one member thereof a vertically-
 reciprocating and laterally-movable bar and
 needle, devices to automatically actuate said
 parts for the production of a series of over-
 edge stitches along the two sides and about
 one end of a buttonhole, and to relatively
 change the positions of the stitch-forming
 mechanism, throat-plate, and work-clamp to
 effect the automatic production of a series of
 stitches across the small end of a buttonhole
 exceeding in length the stitches along either
 side of said buttonhole and to constitute a bar
 therefor, substantially as will be described,
 and I have also combined with said instru-
 mentalities devices to automatically stop the
 machine at the completion of the barring op-
 eration.

My invention also consists in a buttonhole-
 sewing machine containing the following in-
 strumentalities—viz., a work-clamp stitch-
 forming mechanism, means to rotate said
 stitch-forming mechanism while stitching
 about the curved end of a buttonhole, and
 devices to automatically actuate said parts
 for the production of a series of overedge
 stitches along the two sides and about one
 end of a buttonhole and to relatively change
 the positions of the stitch-forming mechan-
 ism, throat, and work-clamp to effect the au-
 tomatic production of a series of stitches across
 the small end of a buttonhole, which stitches
 shall exceed in length the stitches along
 either side the said buttonhole, to thus con-
 stitute a bar therefor, substantially as will be
 described.

Other features of my invention will be here-
 inafter more fully described, and specified at
 the end of the specification.

Figure 1 is a longitudinal section of a buttonhole-machine embodying my invention, the section being taken in the line $x x$, (see Fig. 2,) a portion of the clamp-tension for the thread, parts of the framework, the work-clamp and some of its co-operating parts, and the cutting mechanism, with the exception of its operating-cam, being omitted to better show some of the working parts. Fig. 1^a is a sectional detail showing part of the casing a^4 with its projecting bracket, together with a part of the cam j and the cutting mechanism and supporting mechanism co-operating with the work-clamp, said parts being mostly omitted from Fig. 1. Fig. 1^b is a sectional detail in the line $y y$, Fig. 17. Fig. 2 is a front elevation and partial section of Fig. 1 in the line $x' x'$. Figs. 2^a, 2^b, and 2^c are respectively a side elevation, a top view of the looper, and a section thereof in the line x^2 . Fig. 3 is a sectional detail taken through the needle-bar guiding mechanism and the mechanism chiefly instrumental in giving to the needle-bar its lateral movement. Fig. 4 is a section of Fig. 3 in the dotted line x^3 . Fig. 5 is a section of Fig. 3 in the dotted line x^4 . Fig. 6 is an inner side view of the lower guide for the needle-bar and the slide-block in which it works. Fig. 7 is a rear side view of the slide-block d^2 . Fig. 7^a is an elevation showing the inner side of the lower end of the sleeve by which the slide-block is made to move and a section thereof in the line x^5 . Fig. 8 is a detail showing the needle, throat-plate, the looper, the upright or post on which it is carried, and the loop-spreader. Fig. 8^a shows the collar h^{10} separately. Fig. 9 is a view of Fig. 8, looking at it from the right, the shank h^9 being broken off. Fig. 9^a is a view of Fig. 8, looking at it from the left, but with the looper removed and the shank h^9 broken off. Fig. 9^b shows different views, enlarged, of the loop-spreader detached. Fig. 10 is a separate view showing the lever d^{20} , instrumental in moving the sleeve by which the increased lateral throw of the needle-bar is automatically effected. Fig. 11 is a detail of the sector and partial gear instrumental in rotating the needle-bar. Fig. 11^a shows the sector e^2 . Fig. 12 is a top view of the cam-wheel j , the said figure showing in cross-section the rest d^{32} and pin n^{21} , actuated by its rotating cam-surfaces. Fig. 12^a is a partial under side view of the said cam-wheel. Fig. 13 is a partial rear side elevation of the upper part of the machine, the framework being broken out. Fig. 14 is a section of Fig. 12 in the line x^6 . Fig. 15 shows the cam n^{20} developed and the pin n^{21} on it. Fig. 16 shows the cam d^{33} developed and the rest d^{32} , actuated by it; Fig. 17, a detail of the work-clamp omitted from Figs. 1 and 2. Fig. 18 is a detail showing the lever t^8 .

The stitch-frame a , adapted to support the stitch-forming mechanism; the stud j^4 , connected therewith; the cam-wheel j , having at its upper side the cam-groove 6, which is en-

tered by said stud and at its under side the cam-grooves 4 and 7; the casing a^4 ; the clamp-frame a' , provided with grooves h' ; the main shaft a^2 ; the needle-lever c' ; the needle-bar b' ; the needle d ; the thread-guide d^{10} ; the sectors $e e'$; the rod e^4 to connect them; the gear g' ; the rock-shaft l , having arms l^2 and l' ; the roller-studs $l^3 l^4$, (shown by dotted lines, Fig. 1;) the work-clamp composed of the under members or plates m , having attached serrated members or plates m^2 , and of upper serrated members m' , pivoted on the pivoted fingers 22, having depending L-shaped links 26, said fingers being normally kept elevated by springs 25, and roller-studs 65, carried by said plates m ; springs 63 to hold said roller-studs against the outer sides of the spreader n ; and the arms 29, attached to rock-shaft 30 and provided with springs 28 to engage the depending-links 26; the cam-lever 33, having the pin 35; the spring 36, co-operating with said pin; spring-latch 37; trigger-lever D; the lever g ; lever A' moved by it; the throat-plate C; the cam projection 57, rotated in unison with the cam j ; the cutter-lever G, pivoted at G' on the stitch-frame and provided with a cutter G²; the cutter-block G³, with which it co-operates to cut a slit in the material while held in the work-clamp, and the spreader n , carried by said casing a^4 , are all substantially as represented by like letters in United States Patent No. 349,359, granted to me September 21, 1886, with the exception that the shape of the cam-grooves in the cam disk or wheel j has been altered, as will be hereinafter described, to adapt them for the work to be done by the machine.

The machine to be herein described is adapted to stitch a buttonhole or do overedge stitching by means of a single thread, and, as my invention is herein illustrated, I have provided to hold the material in a stationary clamp while the stitch-frame carrying the stitch-forming mechanism is actuated, as provided for in said patent, to carry the throat-plate and stitch-forming mechanism along the straight side of the buttonhole-slit and about the eyed end and back along the second straight side thereof; and, this done, the machine herein to be described is further operated, whereby the lateral throw of the needle is automatically increased, and simultaneously with the first increased lateral throw of the needle-bar the throat-plate and frame carrying the stitch-forming mechanism are moved laterally in a direction opposite that in which the needle-bar is moved when its lateral throw is increased, and the said frame, carrying the throat-plate C which supports the material at the stitch-making point, is then held temporarily still, or substantially so, while from one to four or five stitches are made to bar the small end of the buttonhole and finish the same upon the machine.

The eye-pointed needle d , to carry the thread to be used in the formation of the stitch, is connected in usual manner to the lower end

of the needle-bar b' , which is flattened for part of its length, as best seen in Fig. 3.

The needle-bar near its upper end slides in a ball-and-socket bearing, as d^2 , and below the said bearing the needle-bar has attached to it, between suitable collars or projections thereon, a hub d^3 , having an ear d^4 , (see Fig. 4,) through which is extended a screw d^5 , by which the said hub is connected loosely to the forked front end of a slide-pin d^6 , having a round shank which enters loosely a hole in the front end of the needle-bar actuating-lever c' , common to my said patent, and which may be actuated by devices such as therein shown.

The flattened portion of the needle-bar has its lower bearing in a grooved swivel-block d^7 , (see Figs. 3, 5, and 6,) the said block having a projection d^8 to enter loosely a hole in an auxiliary slide-block d^9 , the said auxiliary slide-block having at its rear side a diagonal projection d^{10} , which enters a diagonal groove d^{12} , (see Fig. 7^a), made in the inner side of a zone-shaped projection d^{13} , (see Fig. 5.) forming part of a sleeve S, which is made to reciprocate vertically in the casing d^{14} , having a shouldered tubular shank d^{15} , fitted loosely into the lower bearing, as d^{16} , of the overhanging arm of the stitch-frame a , the said shank having fast to it below the said bearing the gear d^{17} , which is engaged and rotated by the sector e , common to my said patent, the said casing and its contained parts being rotated in one direction as the large end or eye of the buttonhole is being stitched, and being turned in the opposite direction by said sector after the completion of the barring of the buttonhole, to thus put the needle back into starting position or the position to commence stitching the straight side of a buttonhole. Above the bearing d^{16} the shank d^{15} referred to has fast to it a collar d^{18} , the latter preventing the casing from dropping down. The sleeve S referred to is inserted into this casing d^{14} from its lower end, the tubular shank d^{19} of the said sleeve being passed loosely upward through the shank d^{15} of the said casing where the upper end of the shank d^{19} is exposed to be acted upon by the sleeve-depressing lever d^{20} , having its fulcrum at d^{21} in the frame a . The length of the larger portion of the sleeve below the shoulder d^{22} is such as to permit the sleeve to be moved vertically in the casing d^{14} . (See Fig. 3.)

The sleeve near its lower end at one side is cut away, leaving an open space, into which is fitted a zone-shaped bearing-block d^{23} , bored in the direction of its length, (see Figs. 3 and 5,) to receive a spiral spring d^{24} , the upper end of which rests against the shoulder d^{26} (see Fig. 7^a) of the sleeve, while its lower end rests against a plate d^{27} , attached to the lower end of the said casing d^{14} , the spring thus held normally acting to lift the sleeve when the latter is depressed by the lever d^{20} .

The length of the block d^9 is in excess of the diameter of the casing and is guided in

slots in the said casing, as shown in Figs. 1 and 5, and the said block is reciprocated longitudinally in the said casing by the inclined projection d^{10} , as the sleeve S is made to ascend and descend, the ascent of the sleeve causing the slide d^9 to be moved in such direction as to carry the needle-bar guide d^7 and the lower end of the needle-bar back away from the edge of the material to be stitched, the descent of the sleeve moving the block d^9 in the opposite direction. The movement of the block d^9 is made to take place at such time, with relation to the reciprocations of the needle-bar in the needle-bar guide d^7 , as to cause the needle d at one descent to enter material to be overstitched and at the next descent to pass over the edge of the material. The lever d^{20} at its rear end, as herein shown, has a binding-screw d^{28} , (see Fig. 10,) which is extended through a slot (see Fig. 1) of a lever d^{29} , having its fulcrum on the stud d^{21} .

The rear end of the lever d^{29} carries a roll d^{30} , which is adapted to be struck by a cam d^{31} , (see Figs. 1 and 13,) fast on the shaft a^2 , the said shaft being located substantially the same as in my said patent. The lever d^{29} is so adjusted with relation to the lever d^{20} and the sleeve S, which by its rise and fall causes the lateral movement of the needle-bar, that the said roll d^{30} , when on that part of the said cam of greatest radius, will place the needle d concentric with the center of the casing d^{14} .

To provide for an increased throw of the needle-bar laterally for one or more stitches at the small end of the buttonhole, to thus bar it, I have provided a rest d^{32} , which acts as a stop for the inner end of the lever d^{20} so long as the stitching is being done along the sides of the buttonhole-slit and about the large eye or where the over stitching is to be of uniform width; the roll d^{30} at such time not being acted upon by the entire periphery of the cam d^{31} , for the rest arrests the movement of the said roll toward the center of the said cam so that the cam fails to move the lever for a distance equal to the full throw which may be given by the said cam; but when the stitching arrives at the end of the second straight side of the buttonhole-slit the rest d^{32} is lowered through a cam-ring d^{33} at the upper side of the cam-wheel j , so that the roll d^{30} is permitted to come in contact with the periphery of the cam at a point nearer its center, which enables the sleeve, acted upon by the spring d^{24} , to rise to a higher point than when the stitching was being done along the straight side of the buttonhole, such increase in the ascent of the sleeve moving the slide-block d^9 over a greater distance, which causes the needle-bar to move laterally for a greater distance. The shape of the cam-ring d^{33} is such that the rest remains depressed long enough to enable one or more, preferably four, stitches to be made for barring, when the machine is stopped automatically by mechanism substantially such as described in my said patent, the said stopping mechanism

ism differing, however, therefrom, as will be described, to properly co-operate with this present machine.

The extra longitudinal throw of the slide-block d^9 , to effect an increase in the lateral movement of the needle-bar, takes place preferably as the sleeve referred to rises under the spring d^{24} ; but when this increased lateral throw of the needle-bar takes place as the needle-bar in its ascent leaves the slit at the end of the second straight side of the slit it is obvious, without other provision than has been made, that the needle, at its next descent, would pass through the material back of the edge thereof last to be stitched for the excess of its throw, which is not desired. On the contrary, it is desired that the needle, at its next descent, should penetrate the material at the same distance back from what would be the edge of the buttonhole if the slit was prolonged.

To counteract the difficulty referred to, I have so shaped the cam-groove 7 (see Fig. 12^a) at the lower side of the cam-wheel j as to cause the stitch-frame a and throat-plate C to be moved in a direction opposite that in which the block d^9 was moved when the stroke was increased, such change of position of the stitch-frame and throat-plate at just the time that the first bar-stitch is to be made resulting in causing the needle to descend at its first thrust, after the lateral throw of the needle-bar has been increased, at just the same distance back from the line of the edge of the slit as it descended at its previous down-thrust through the material; but at its next down-thrust, instead of penetrating the material in the line of the slit, the needle penetrates the material preferably at a distance beyond the slit equal to the distance of the over stitching at the first side of the buttonhole back from its edge.

Having shown one way of automatically effecting an increased lateral throw for the needle-bar for barring or finishing the end of a buttonhole, I wish to state that I do not desire to limit my invention to the exact devices shown for effecting such barring movement, as instead thereof I may employ any other well-known mechanical devices capable of operating in like manner; nor do I desire to limit my invention to giving to the needle-bar its increased lateral throw as it rises from the slit or over the edge, for the said increased lateral throw might be made to take place as the needle rises from the material back from the edge, and in such event the lateral movement given to the arm a , as just stated, might be omitted. The cam-wheel j in its rotation, acting through the cam-groove 6 and stud j^1 , effects intermittingly the relative changes of position of the stitch-frame a and throat-plate and clamp-frame a' to enable the stitching to be done along one side of the buttonhole-slit, and then about the eyed end thereof, and then back along the other side of the buttonhole-slit, and this is effected without rotating the

work-clamp holding the material to be stitched. Herein the cam-groove 6 is somewhat altered in shape, viz: It has a rest, as 6^x , (see Fig. 12,) so that as the buttonhole is to be barred, as hereinbefore described, the frame carrying the stitching mechanism may be stopped for a sufficient time to make the necessary number of bar-stitches, one being above the other.

The cam-ring d^{33} , as herein shown, is arranged outside the cam 57 common to my said patent, which cam in operation actuates the cutting mechanism.

The rest d^{32} , as herein shown, consists essentially of a rod supported by a cross-head d^{40} , the cross-head having a toe-piece d^{41} , which rests on the cam-ring d^{33} .

The looper h (shown best in Figs. 2^a and 2^b, where it is enlarged) is composed essentially of an arm, cut or shaped substantially as described, to form a shank with a tapering beak h' , the beak starting from the point h^2 , the sharp end of the beak constituting the heel h^3 of the looper, the point h^4 of the looper being extended in a direction opposite the heel, there being between the heel and the point (see Fig. 2^b) a bulging portion h^5 , which, as the point of the looper enters the loop extended from the side of the needle which has just penetrated the material back from its edge preparatory to drawing the said loop out and holding it extended across the buttonhole-slit substantially at a right angle to the edge, spreads the said loop and holds it open for the passage through it of the needle d in its next descent over the edge, the said needle at such time descending close to the edge.

After the needle has descended over the edge and passed through the loop taken from the needle when it last descended through the material and through the loop, spread as described, the movement of the looper is reversed, so that the heel h^3 thereof is made to enter the loop of thread at the eye of the needle, the latter being in the slit and below the material, and the throw of the looper is continued in the same direction until the said loop reaches the base of the beak, and while the loop taken from the needle in the slit is so held the needle again descends, but this time through the material. At this descent the needle does not enter the loop held by the looper, but descends into the hollow interior h^{2c} of the looper-shank at a point between the point h^4 of the looper and the loop of needle-thread then held on its shank, and thereafter the motion of the looper is reversed and the point h^4 thereof first enters the loop of needle-thread just formed back from the edge and draws the said loop across the slit at right angles and through the loop then held on the looper.

The looper-shank has at its lower end a hollow hub h^6 , which receives through it a fulcrum-screw h^7 , the latter entering the standard h^8 , erected upon the oscillating post h^9 , which post is substantially the same as the

post A⁸ in my said patent, the post entering the long sleeve-like hub of the gear g^7 , engaged and actuated by the sector e^2 , the said gear and sector being common to my said patent, so they need not be herein further described.

The hollow hub h^6 of the looper receives upon it a collar h^{10} , having a pin or projection h^{12} , (see Figs. 8 and 8^a), which pin, during the latter part of the movement of the looper when the point h^4 is drawing the loop just taken by it from the needle through the loop then held in the beak and on the shank of the looper, as before described, acts against the lower end of the loop-spreader g^{10} , pivoted on the standard h^8 , (see Figs. 9^a and 9^b), the said loop-spreader having a stud-like shank g^{13} attached to it, which is extended through the said standard, where it is surrounded by a spiral spring g^4 , fast at one end to the said standard and at its other end in the said shank.

The upper end of the loop-spreader is provided with a finger g^{15} , which has at its front edge a notch, as g^{16} , through which the needle d passes at each descent through the buttonhole-slit, the lower side of the finger having about the said notch a teat g^{17} , (see Fig. 9^b), at each side of which teat lies one bight or half of the loop of thread coming from the material and held by the point of the looper in order that the needle d in its descent through the buttonhole-slit or over the edge may enter the said loop unerringly, the said teat constituting a spreader located in the said loop. The edge of the finger g^{15} , at each side the notch g^{16} , has notches g^{18} , one for each bight or half of the loop held by the point of the looper, and spread as described.

After the point h^4 of the looper has taken the loop of needle-thread from the needle and the needle is drawn up through the material and the looper has nearly finished its movement toward that edge of the material then being overstitched, the loop-spreader referred to comes into operation, its function being to act upon both sides or halves of the said loop between the loop and the material, so that the teat g^{17} of the looper shall enter between the two halves of the loop and spread it close up to the material in order that the loop may be presented wide open close to the edge of the slit and in such condition that the needle d may enter the said loop close to the edge of the material, the loop-spreader, constructed and operating as described, enabling the slit to be very narrow and yet insure the needle always entering the said loop. This loop-spreader also obviates the necessity of spreading the buttonhole-slit so widely. The looper is connected by link g^{20} with an elbow-lever, herein marked A', it being substantially the same as the lever marked by like letter in my said patent, and in practice it will be operated by a lever g common to the said patent. Herein the link g^{24} , connected to the inner end of the lever g , instead of being actu-

ated by an eccentric in an eccentric-strap, such as in my said patent, is provided at its upper end with a roller-stud, as g^{25} , (shown in dotted lines, Figs. 1 and 13,) which enters a cam-groove, also shown by dotted lines in the said figures, the said groove being made in a cam-wheel g^{26} , fast to the shaft a^2 , which occupies substantially the same position as the like shaft in my said patent and constitutes the main shaft of the machine.

In practice the material to be stitched will be held in a clamp, preferably such as shown in my said patent and in Figs. 17 and 1^b, wherein like parts are designated by like letters and figures, the said clamp being herein shown separately to avoid confusion of the drawings, and for like reason I have omitted from Fig. 1 the mechanism for cutting the buttonhole-slit, but in practice it will, as has been before stated, be the same as in the said patent.

The thread t , preferably taken from a spool t' , is led through a guide p^{13} , through an eye in a slack-forming arm p^{12} , then through a clamping-tension t^2 , thence through a vertically-adjustable fork-shaped shelf t^3 , thence through an eye at the top of the needle-bar, out through a guide d^{10} , and down through other guides to the eye of the needle d , as in my said patent. The shelf t^3 may be held in adjusted position by the screw t^4 . (See Fig. 1.)

The clamping-tension herein shown consist essentially of two disks, one of which is supported on the tube-like standard t^5 , while the other is secured to a rod t^6 , having a collar which is acted upon by a spring t^7 to normally keep the two disks pressed on the thread passing between them, the spring being made to exert such pressure as to produce the proper tension for stitching. The rod t^6 is, however, extended downward, and its lower end rests upon a lever t^8 pivoted at t^9 on the frame a , the said lever during each descent of the needle-bar being acted upon by the cam-shaped periphery of the cam g^{26} , the said lever t^8 , shown separately, (see Fig. 18,) having a roller t^{10} held on a pivot between ears forming part of it.

When the lever t^8 is lifted the needle-thread is left free from tension, so that the operator, whenever the machine is stopped, which always happens when the needle-bar is descending, may find the thread free from tension, thus permitting the work to be readily removed. This absence of tension on the needle-thread during its descent is also of especial advantage, as I will now describe. In practice I adjust the shelf t^3 vertically until it is in such position that the length of needle-thread between the tension device and the top of the throat-plate C, the needle being at its lowest point with its eye below the throat-plate and the needle-thread resting on the shelf t^3 , is just equal to the length of the thread from the said tension device to the top of the throat-plate when the eye of the needle with the thread in it is in its highest position. This

done, it will be seen that in the descent of the needle and in the absence of material, such as cloth or leather, on the throat-plate C, the eye of the needle in the descent of the latter will not pull thread from the spool. Supposing the free end of the thread beyond the eye of the needle to be held at the throat-plate by the material, as it will be in sewing, it will be seen that when the needle is at its lowest point a loop of thread will be distended or formed below the surface of the throat-plate.

In all operations of stitching or sewing by my machine the length of the loop so formed below the top of the throat-plate will be substantially as stated; but it will be obvious that when material, such as cloth or leather, is laid upon the throat-plate under the needle, the latter in its descent and after the eye has passed substantially through the material will and must act to draw from the spool a length of thread equal to substantially twice the thickness of the material at the point where the needle is then in it.

The length of loop formed in the manner described will, it will be seen, be varied automatically according to varying thicknesses of material, and just enough extra thread for each stitch will be drawn off from the spool, as required.

The method herein described of pulling off the proper amount of thread for each stitch may be practiced to advantage in any ordinary sewing-machine.

In order that the thread may rend freely from the spool and tension, which latter is open when the loop is being formed below the material, the slack-forming arm p^{12} will be drawn down during each ascent of the needle-bar while the clamping-tension is closed, and as a result thereof a quantity of thread sufficient for the maximum length of loop to be made will be drawn from the spool between it and the clamping-tension, where it will be left slack until wanted. This arm p^{12} is attached to the rear end of the lever c' .

The lever c' , at its rear end, has joined to it an eccentric link r^{10} , which embraces an eccentric r^{12} , having fast to it a pinion r^{13} , which is engaged by a toothed gear r^{14} , fast on the main shaft a^3 , the eccentric being free to rotate on a stud r^{15} .

The base of the frame a has erected upon it a bearing s^{10} (see Fig. 1) for the end of a shaft a^2 , and within the machine the said shaft has placed upon it a guide-block s^{12} , (see Fig. 13), in which is planed a slot to receive the link g^{24} , such block insuring proper vertical motion to the said link as its roll is acted upon by the cam which actuates the said link.

The machine described in the patent referred to, as well as the machine shown in the accompanying drawings, has a stopping-arm 74 attached to a rock-shaft 71, having secured to it an arm 70. In the said patent the arm 70 is provided with a toe which runs upon a "controller-bar," which is adjustable longi-

tudinally on the bed-plate or clamp-frame a' to, by its position, effect the stopping of the machine when stitching along the last straight side of the buttonhole has been finished. Herein I have dispensed with the controller-bar, and in place of it I have provided the cam-wheel j at its upper side with a cam-ring n^{20} , and I have provided the base of the stitch-frame a with a hole to receive a pin n^{21} , which is placed immediately below the end of the arm 70, so that the cam-ring n^{20} in its rotation may be made to let the pin drop and permit the arm 70 to descend under the action of a spring at just the time that it is desired to move the arm 74 to enable it to co-operate with a friction or clutch pulley, substantially such as described in my United States Patent No. 367,063, dated July 26, 1887, to effect the stopping of the stitch-forming mechanism. A portion of the said cam-ring n^{20} , as shown at 4^x , is so shaped as to lift the pin n^{21} to start the movement of the stitching mechanism at the proper time.

The stitching operation will be just the same whether the clamp-frame be held in fixed position and the stitch-frame travel, or whether the stitch-frame be held at rest, for in the latter event the rotation of the cam-wheel j would effect the reciprocation of the clamp-frame longitudinally.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A button-hole sewing machine containing the following instrumentalities, viz:—a work-clamp; a throat-plate; stitch-forming mechanism, containing as one member thereof a vertically reciprocating and laterally movable needle bar and needle; and devices to automatically actuate said parts for the production of a series of overedge stitches along the two sides and about one end of a button-hole and to relatively change the positions of the stitch-forming mechanism, throat, and work-clamp, to effect the automatic production of a series of stitches across the small end of the button-hole exceeding in length the stitches along either side of said button-hole, and to constitute a bar therefor, substantially as described.

2. A button-hole sewing machine containing the following instrumentalities, viz:—a work-clamp; a throat-plate; stitch-forming mechanism containing as one member thereof a vertically reciprocating and laterally movable needle-bar and needle; devices to automatically actuate said parts for the production of a series of overedge stitches along the two sides and about one end of a button-hole and to relatively change the positions of the stitch-forming mechanism, throat, and work-clamp, to effect the automatic production of a series of stitches across the small end of the button-hole exceeding in length the stitches along either side of said button-hole, and to constitute a bar therefor; and devices to automatically stop the machine at the comple-

tion of the barring operation, substantially as described.

3. A button-hole sewing machine containing the following instrumentalities, viz:—a work-clamp; stitch-forming mechanism; means to rotate said stitch-forming mechanism while stitching about the curved end of a button-hole; and devices to automatically actuate said parts for the production of a series of overedge stitches along the two sides and about one end of a button-hole and to relatively change the positions of the stitch-forming mechanism, throat, and work-clamp, to effect the automatic production of a series of stitches across the small end of the button-hole which shall exceed in length the stitches along either side the said button-hole, to thus constitute a bar therefor, substantially as described.

4. In a machine for sewing button-holes, the following instrumentalities, viz:—a work-clamp; a stitch-forming mechanism; a throat-plate; devices to relatively actuate the work-clamp and stitch-forming mechanism and to rotate the stitch-forming mechanism and throat-plate to effect the production of a series of overedge stitches, those about the eye radiating; a clutch co-operating with the actuating shaft of the stitch-forming mechanism; a rotating cam; and devices intermediate said cam and clutch, and acted upon by said cam in its rotation to automatically effect the stopping of the stitch-forming mechanism at the completion of the stitching of the button-hole, substantially as described.

5. In a sewing machine, the following instrumentalities, viz:—an eye-pointed needle above the work-plate; complemental stitch-forming mechanism below the work-plate, both mounted in a frame containing mechanism for actuating the same to form stitches; a throat-plate; a bed-plate or frame; its attached work-clamp; devices to relatively move the said stitch-forming mechanism and work-clamp to stitch the straight sides and about the end of a button-hole; and devices to impart to the needle-bar and needle increased lateral throw and at the same time move the throat-plate laterally during the barring of a button-hole, substantially as described.

6. In a machine for sewing button-holes, stitch-forming devices including a laterally movable needle-bar and needle; a work-clamp and a throat-plate; combined with devices to change the relative positions of the said throat-plate, needle and clamp in the direction of the length of the button-hole, and to automatically move the said throat-plate transversely to the length of the button-hole when at the small end of the said hole and during the barring of the same, substantially as described.

7. In a machine for sewing button-holes, stitch-forming mechanism; a clutch co-operating with the shaft for actuating the stitch-forming mechanism; and a rotating cam sur-

face and intermediate devices between said cam surface and clutch, said intermediate devices being directly actuated by said cam surface to automatically effect the operative engagement of the clutch and start the stitch-forming mechanism for the commencement of a button-hole; and a device to actuate said intermediate devices in the opposite direction at the completion of a button-hole, substantially as described.

8. A button-hole sewing machine, containing the following instrumentalities, viz:—a work-clamp; a throat; stitch-forming mechanism; means to rotate the said stitch-forming mechanism while stitching about the curved end of a button-hole; and devices to automatically actuate said parts for the production of a series of overedge stitches along the two sides and about one end of a button-hole, and to relatively change the positions of the stitch-forming mechanism, throat, and work-clamp, to effect the automatic production of a series of stitches across the small end of the button-hole exceeding in length the stitches along either side the said button-hole, and to constitute a bar therefor; and devices to automatically stop the machine at the completion of the barring operation, substantially as described.

9. In a machine for sewing button-holes, a work-clamp, a needle throat-plate; a needle-bar, a connected eye-pointed needle, complemental stitch-forming mechanism, devices to reciprocate said needle in the direction of its length, and to also move it laterally with relation to the needle throat whereby the needle at one descent enters the button-hole slit and at the next descent enters the material for the depth stitch, and to rotate the same to stitch radiating stitches about the eye, combined with devices to automatically increase the relative lateral change of position between the said throat-plate and needle as the barring stitches are being made at the small end of the button-hole, for the purposes set forth.

10. In a sewing machine, the following instrumentalities, viz:—an eye-pointed needle above the work-plate; and complemental stitch-forming mechanism below the work-plate both mounted in a frame containing mechanism for actuating the same to form stitches; a bed-plate or frame; its attached work-clamp; devices to change the relative positions of the said stitch-forming mechanism and work-clamp to stitch the straight sides and about the end of a button-hole, devices to impart to the needle-bar and needle increased lateral throw, and at the same time move the throat-plate laterally during the barring of a button-hole; a clutch to determine the starting and stopping of the sliding action of the stitch-forming mechanism; a lever to control said clutch; a rotating cam, and devices between said cam and said lever to enable the latter to effect the stopping of the stitching action of the stitch-forming mechanism at the

completion of the last end of a button-hole, substantially as described.

11. In a button-hole sewing machine, a rotating case; a needle-bar therein having a needle; means to reciprocate the needle-bar longitudinally; and means co-operating with the said needle-bar and case to move the needle-bar laterally within the said case, substantially as described.

12. In a button-hole sewing machine, a bed-plate; a movable frame thereon; means to move it; the needle-bar carried by the said frame; means to move the needle-bar longitudinally and also laterally with relation to said frame during the over stitching along the straight sides of the button-hole and about its eye; a looper carried by the said frame, and means to move the looper, combined with a throat-plate and cloth clamp, to operate, substantially as described.

13. In a button-hole sewing or over-seaming machine, a throat-plate; a reciprocating needle-bar having an attached needle; and means to vibrate the needle-bar laterally, combined with a looper having a point h^4 and heel h^3 ; and with means to move the said looper, to operate, substantially as described.

14. The combination, in a single-thread button-hole sewing machine, of the following instrumentalities, viz:—a reciprocating needle-bar provided with an eye-pointed needle; a throat-plate; a non-thread carrying looper having a point h^4 and heel h^3 ; and a loop-spreader g^{10} , substantially as described, to act upon a loop of thread and spread it between the looper and the under side of the throat-plate for the entrance of the needle, substantially as described.

15. In a button-hole or over-seaming machine, a needle; a needle-bar; and means to reciprocate the said bar longitudinally and move it laterally as described; and feeding mechanism, combined with the herein described double-acting looper having a point h^4 at one end and a pointed heel h^3 at its opposite end, the said point and heel being directed away from each other; and means to actuate the said looper, whereby the point h^4 takes the loop of needle thread when the looper is moving forward, and the heel h^3 takes the second loop of needle thread when the looper makes the return stroke, the loop of needle thread taken by the said point being drawn through the last previous loop taken by the heel and held thereon until the point takes a second loop of thread from the needle, substantially as described.

16. In a button-hole stitching machine, a bed-plate; the frame a thereon having a throat-plate; means to move the said frame longitudinally; and a stitch-forming mechanism carried by the said frame, it including a needle-bar having not only a motion of reciprocation but also a lateral movement, which is automatically increased immediately after the last side of the button-hole has been stitched,

combined with means whereby the said frame carrying the said stitch-forming mechanism is moved laterally in a direction opposite that in which the lateral throw of the needle-bar is increased, to thus enable the small end of the button-hole slit to be barred by stitches extending from the outer side to the outer side of the over-seaming stitch at both sides of the button-hole slit, substantially as described.

17. In a button-hole stitching machine, the shaft 71 having an arm 70; the frame a ; base a' ; stitch-forming mechanism and a cam wheel j provided with a cam-ring n^{20} , combined with a pin n^{21} under the control of the said cam-ring, whereby, by the descent and ascent of the said pin acted upon by the said cam ring, the said rock-shaft is permitted to turn to effect the stopping and starting of the stitch-forming mechanism at the proper times, substantially as described.

18. In a button-hole sewing machine, the rock-shaft 71 having two arms as described; the frame a ; the base a' ; the stitch-forming mechanism; and a cam-wheel j provided with a cam-ring n^{20} and a pin n^{21} , combined with a spring to hold one of the said arms against that end of the said pin most distant from the cam-ring, whereby the said cam-ring is enabled to operate the said rock-shaft at the proper time for the purpose set forth, substantially as described.

19. A needle-bar; means to operate it; the carriage d^{14} ; means to rotate it; and a slide block or guide for the needle-bar made movable therein transversely to the direction of movement of the needle-bar, combined with means to automatically alter the length of the stroke of the said slide block, to thus vary the lateral throw of the slide block and of the needle-bar, substantially as described.

20. In a button-hole sewing machine, the stitch frame a ; a needle-bar; a needle carried by it; the casing d^{14} ; the slide d^{13} ; and the slide block therein, in which the needle-bar reciprocates, combined with means, substantially as described, to operate the said casing and slide, for the purpose set forth.

21. In a button-hole sewing machine the following instrumentalities, viz:—a stitch-frame; a clamp-frame; stitch-forming mechanism consisting of an eye-pointed needle located at one side of the horizontal plane occupied by the clamp-frame; and a complemental mechanism co-operating with the said needle to form stitches and located at the opposite side of the horizontal plane occupied by the clamp frame; devices to rotate the stitch-forming devices and the throat-plate co-operating therewith with relation to the clamp-frame, and to move the needle-bar laterally with relation to the length of the button-hole slit, while barring the small end thereof, and devices to change the relative positions of said stitch-frame and clamp-frame with relation not only to the length of the button-hole slit but to change the relative positions of the

clamp-frame and throat of the stitch-forming mechanism laterally with relation to the longitudinal center of the button-hole to provide for stitching the enlarged eye end thereof, substantially as described.

22. In a button-hole stitching and barring machine, the combination of the following instrumentalities, viz:—a needle, and complementary stitch-forming mechanism; means for operating said stitch-forming mechanism; a work-clamp; actuating devices for changing the relative positions of the work-clamp and the stitch-forming mechanism, whereby the two straight sides and the eye of a button-hole are overstitched, the eye by radiating stitches, and automatic stitch-adjusting mechanism for increasing the length of the stitches upon the completion of the over-stitching, whereby the button-hole is overstitched and the end of the button-hole is barred by stitches of greater length than the over-edge stitches extending at right angles to the length of the button-hole, and by one continuous automatic operation, as set forth.

23. In a machine for sewing button-holes, a clamp-frame; a work-clamp; a stitch-frame; stitch-forming mechanism carried thereby; actuating mechanism for said stitch-forming mechanism; two cams to produce relative longitudinal and lateral, and combined longitudinal and lateral movement of said frame; one of said cams controlling said relative longitudinal movement according to the length of the button-hole, and the other of said cams the lateral movement according to the width of the eye end of the button-hole, both cams together controlling the curve of the eye, the longitudinal movement for the length of the button-hole being in one and then in a reverse direction; a clutch co-operating with said actuating mechanism; a third rotating cam, and devices intermediate said third cam and clutch and acted upon by said third cam in its rotation to automatically effect the stopping of the stitch-forming mechanism at a predetermined period, substantially as described.

24. In a machine for sewing button-holes, a clamp-frame; a work-clamp; a cutting mechanism to automatically cut the work held in said clamp; a stitch-frame; a stitch-forming mechanism supported therein; actuating mechanism for said stitch-forming mechanism; two cams to produce relative longitudinal and lateral, and combined longitudinal and lateral movement between said frames, one of said cams controlling the said relative longitudinal movement according to the length of the button-hole, and the other the lateral movement according to the width of the eye end of the button-hole, both cams together controlling the curve of the eye, the longitudinal movement for the length of the button-hole being in one and then in a reverse direction; a clutch co-operating with the actuating mechanism for the said stitch-forming mechanism; a third rotating cam,

and devices intermediate said third cam and clutch, and acted upon by said third cam in its rotation to automatically effect the stopping of the stitch-forming mechanism at a predetermined period, substantially as described.

25. In a button-hole sewing machine, the combination with a work-clamp and button-hole stitching mechanism, the latter being adapted to work the sides and eye of a button-hole, the eye by radiating stitches; of automatic button-hole barring mechanism serving to form across the end of a button-hole just worked and while yet held in the clamp, barring stitches exceeding in length the stitches along either side of the worked button-hole, and automatic devices to stop the relative longitudinal movement between the work-clamp and stitch-forming mechanism prior to the barring operation, and automatic devices to thereafter stop the stitching at the completion of the barring operation, to operate, substantially as described.

26. An organized button-hole stitching machine containing the following instrumentalities, viz:—a stitch-frame; stitch-forming mechanism carried thereby; a clamp-frame; a work-clamp; button-hole cutting mechanism, and devices under the control of the machine shaft to automatically actuate the said parts in the following order after closing the work-clamp, viz:—close the cutting mechanism to cut a slit in the material held in the work-clamp, spread the button-hole slit, change the relative positions of the work clamp and stitch-forming mechanism to enable the needle thereof to penetrate the material close to the cut edge of the button-hole; start into stitching operation the stitch-forming mechanism; change the relative positions of the stitch-forming mechanism and work-clamp to enable the stitch-forming mechanism to overstitch the sides and enlarged eye of the button-hole slit with radiating stitches, bar the small end of the button-hole slit while yet held in the work-clamp, and devices to effect the stopping of the stitching operation immediately after completion of the said bar, substantially as described.

27. An organized button-hole stitching machine, containing the following instrumentalities, viz:—a stitch-frame; stitch-forming mechanism carried thereby; a clamp-frame; a work-clamp; button-hole cutting mechanism, and devices under the control of the machine shaft to automatically actuate the said parts in the following order after closing the work-clamp, viz:—close the cutting mechanism to cut a slit in the material held in the work-clamp; spread the button-hole slit, change the relative positions of the work-clamp and stitch-forming mechanism to enable the needle thereof to penetrate the material close to the cut edge of the button-hole; start into stitching operation the stitch-forming mechanism; change the relative positions of the stitch-forming mechanism and work-

clamp to enable the stitch-forming mechanism to over-stitch the sides and enlarged eye of the button-hole slit with radiating stitches, bar the small end of the button-hole slit while yet held in the work-clamp; devices to effect the stopping of the stitching operation immediately after completion of the said bar, and devices to automatically open the work-clamp after the completion of said bar, substantially as described.

28. In a machine for sewing button-holes, a work-clamp, cutting mechanism to automatically cut the work held in said clamp; automatic spreading mechanism to spread said cut button-hole; a stitch-forming mechanism, and actuating devices including two cams to effect a combined longitudinal and lateral movement between said work-clamp and stitch-forming mechanism for the production of a series of over-edge stitches along the sides and about the eyed end of the button-hole, a clutch co-operating with said actuating devices; a third rotating cam, and devices intermediate said third cam and clutch, and acted upon by said third cam in its rotation to automatically effect the stopping of the stitch-forming mechanism at a predetermined period, substantially as described.

29. In a button-hole stitching and barring machine the combination of the following instrumentalities, viz:—a needle, and complementary stitch-forming mechanism; means for operating said stitch-forming mechanism; a work-clamp; actuating devices for changing the relative positions of the work-clamp and the stitch-forming mechanism, whereby the two straight sides and the eye of a button-hole are over-stitched, the eye by radiating stitches; devices to suspend the relative longitudinal movements of said parts when the

last side of the button-hole has been over-stitched, and automatic stitch adjusting mechanism for increasing the length of the stitches upon the completion of the over-stitching, whereby the button-hole is over-stitched and the end of the button-hole is barred by stitches of greater length than the over-edge stitches extending at right angles to the length of the button-hole, and by one continuous automatic operation, as set forth.

30. In a machine for sewing button-holes, a clamp-frame; a work-clamp; a stitch-frame; stitch-forming mechanism carried thereby; actuating mechanism for said stitch-forming mechanism; two cams to produce relative longitudinal and lateral, and combined longitudinal and lateral movement of said frame, one of said cams controlling said relative longitudinal movement according to the length of the button-hole, and the other of said cams the lateral movement according to the width of the eye end of the button-hole, both cams together controlling the curve of the eye, the longitudinal movement for the length of the button-hole being in one and then in a reverse direction; a clutch co-operating with said actuating mechanism; a third rotating cam, and devices intermediate said third cam and clutch and acted upon by said third cam in its rotation to automatically effect the starting and stopping of the stitch forming mechanism at a predetermined period, substantially as described.

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

JOHN REECE.

Witnesses:

G. W. GREGORY,
F. CUTTER.