

(No Model.)

9 Sheets—Sheet 1.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

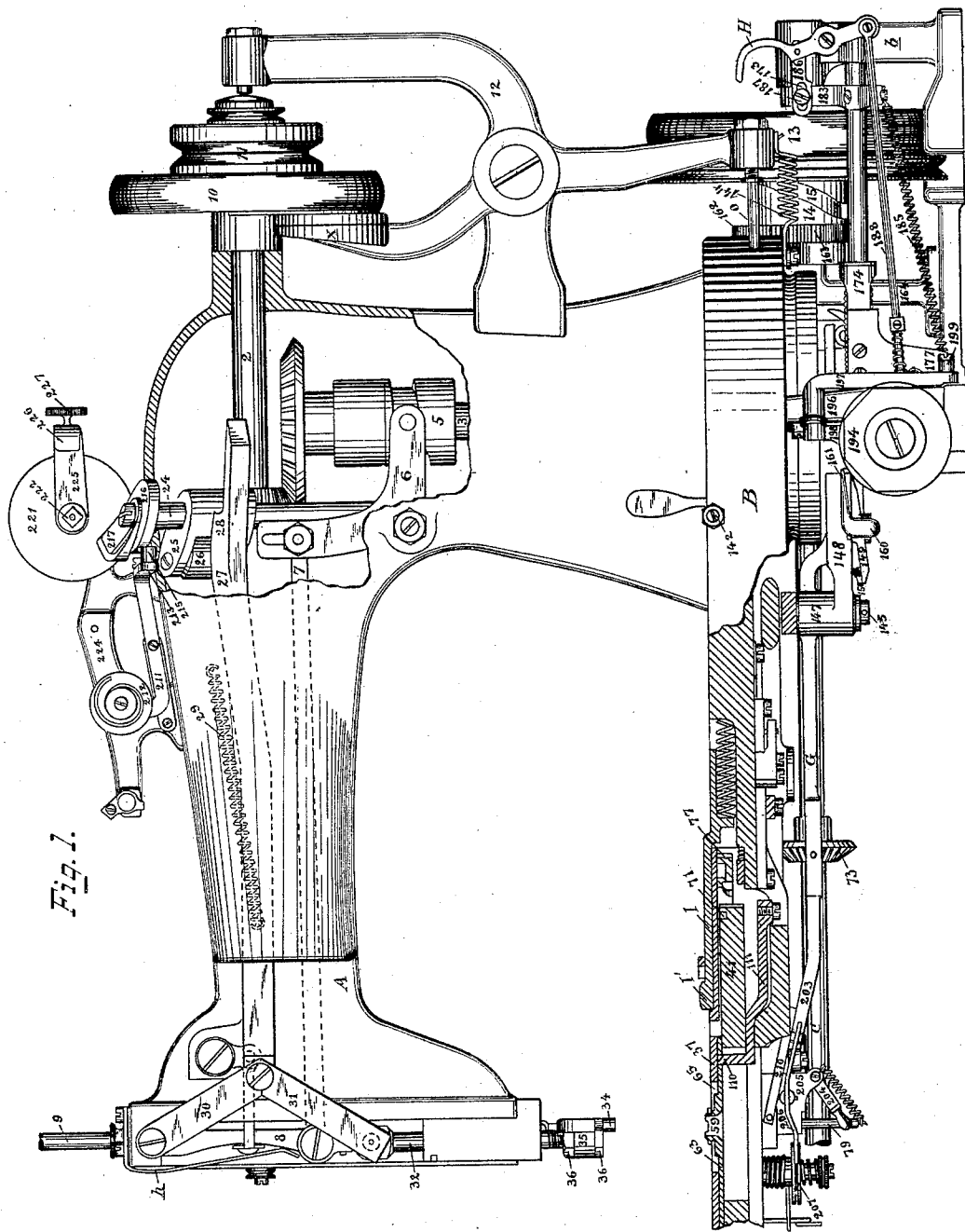


Fig. 1.

WITNESSES:

A. S. Cushman
C. M. Sweeney

INVENTOR:

Edward B. Allen

BY

Maclean, Calver & Randall
ATTORNEYS.

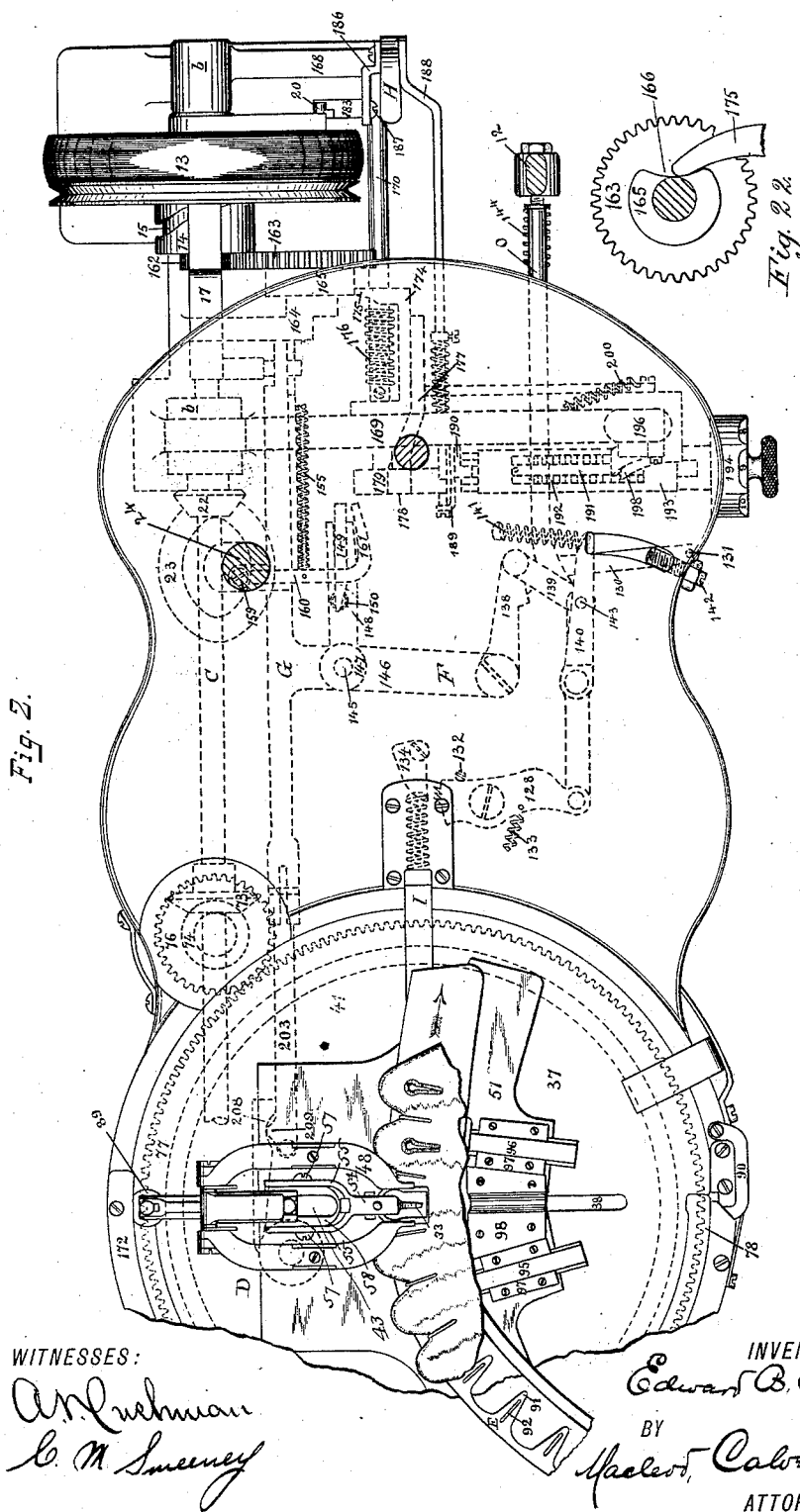
(No Model.)

9 Sheets—Sheet 2.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.



WITNESSES:

A. S. Friedman
C. M. Sweeney

INVENTOR:

Edward B. Allen

BY

Haskins, Calver & Randall,
ATTORNEYS.

(No Model.)

9 Sheets—Sheet 3.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

Fig. 4.

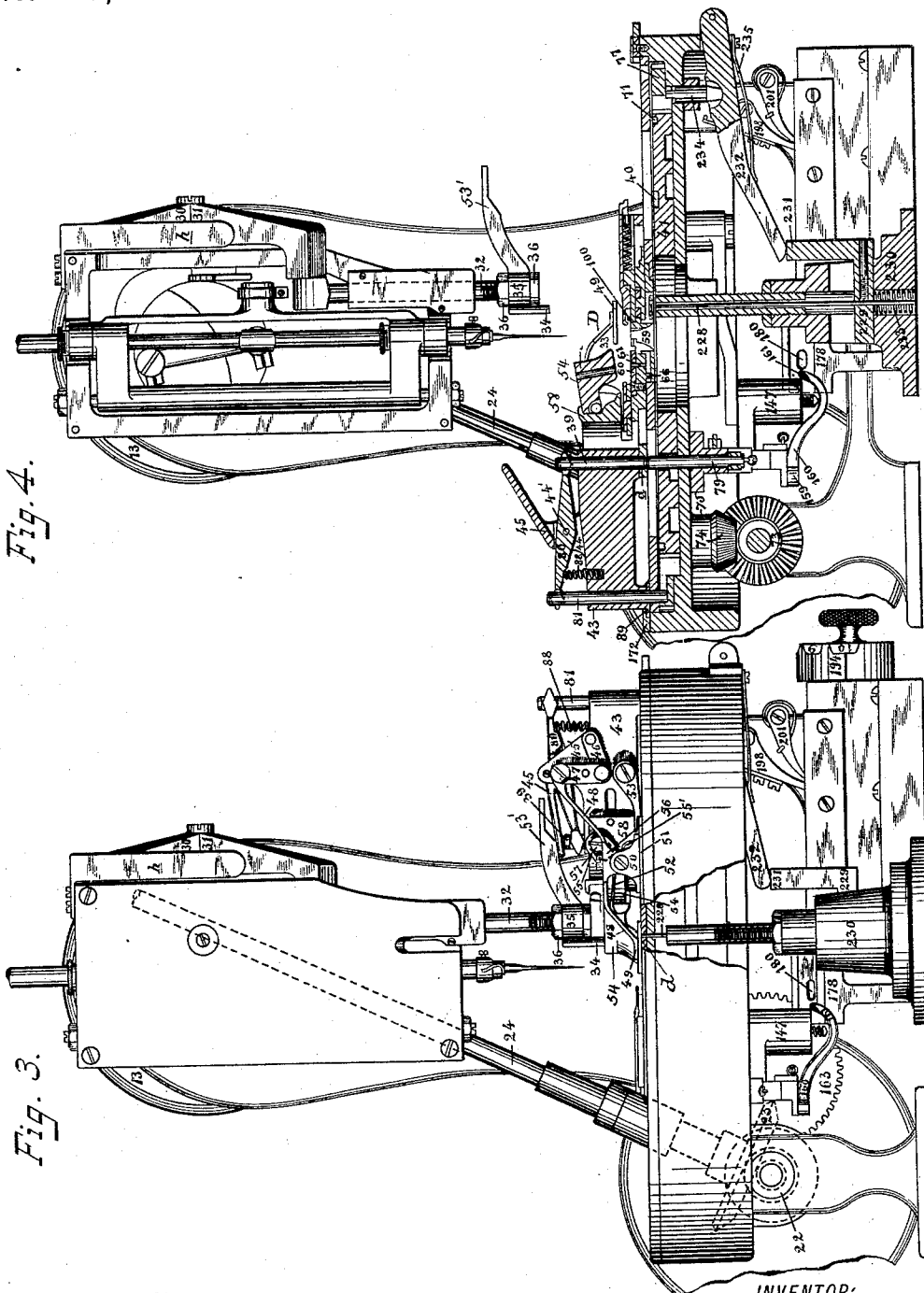


Fig. 3.

WITNESSES:

Artushman
C. M. Sweeney

INVENTOR:

Edward B. Allen

BY

Maclean, Calver & Randall,
ATTORNEYS.

(No Model.)

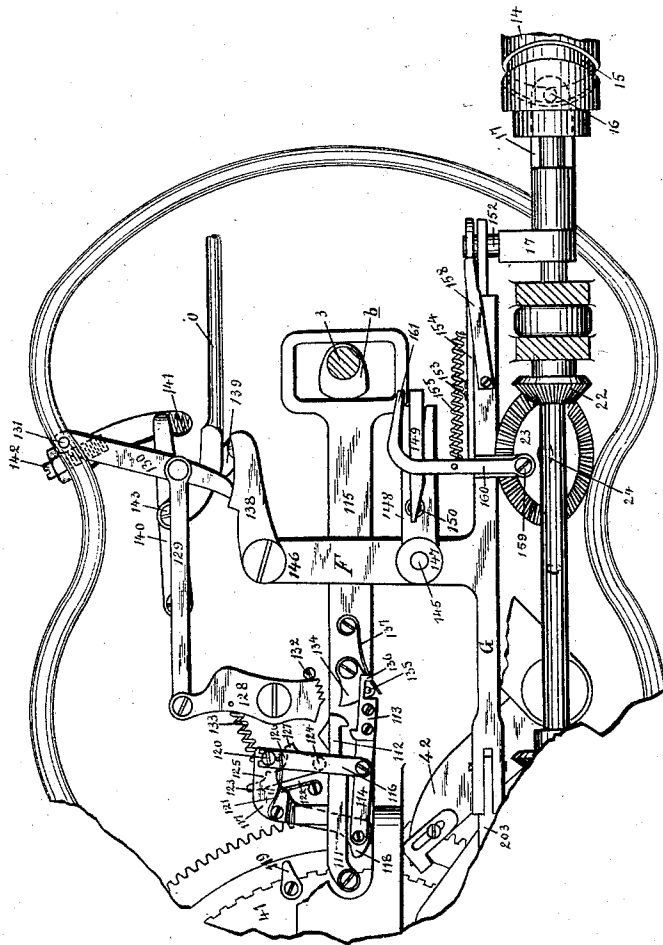
9 Sheets—Sheet 4.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

Fig. 5.



WITNESSES:

A. Lushman
C. M. Sweeney

INVENTOR:

Edward B. Allen

BY

Maclean, Calver & Randall
ATTORNEYS

(No Model.)

9 Sheets—Sheet 5.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

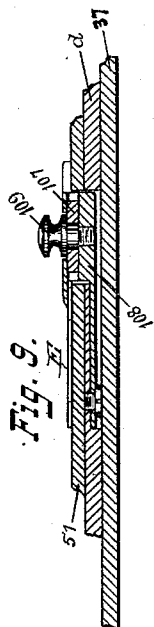


Fig. 9.

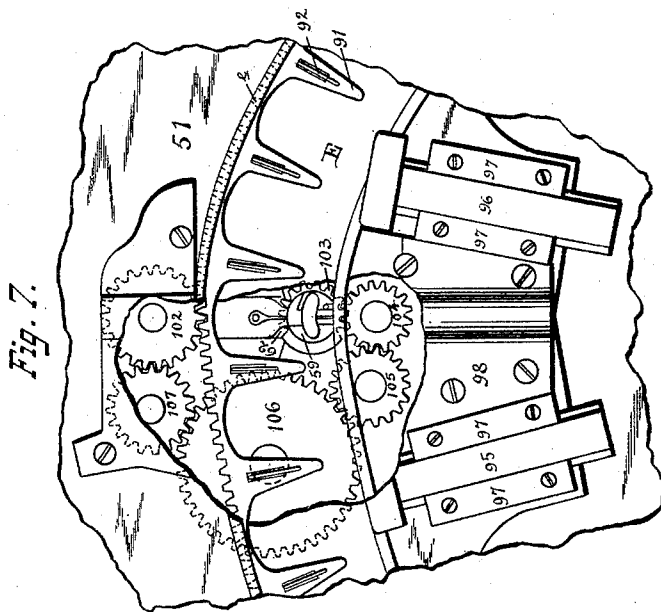
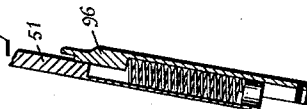


Fig. 7.

Fig. 8.



(No Model.)

9 Sheets—Sheet 6.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

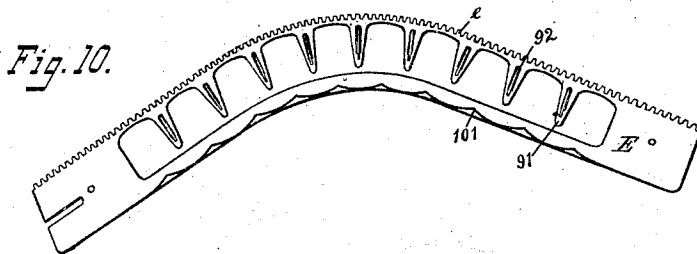


Fig. 11.

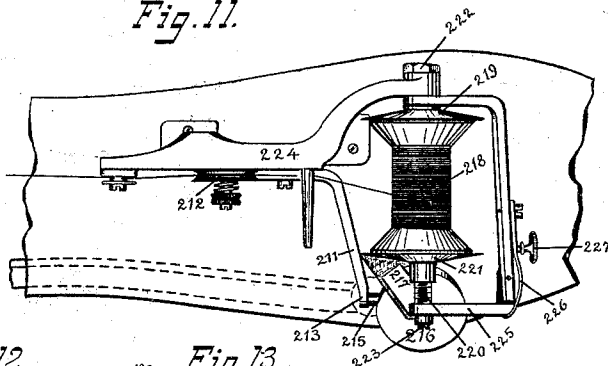


Fig. 12.

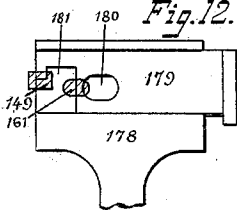


Fig. 13.

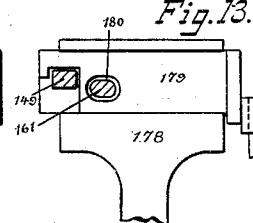
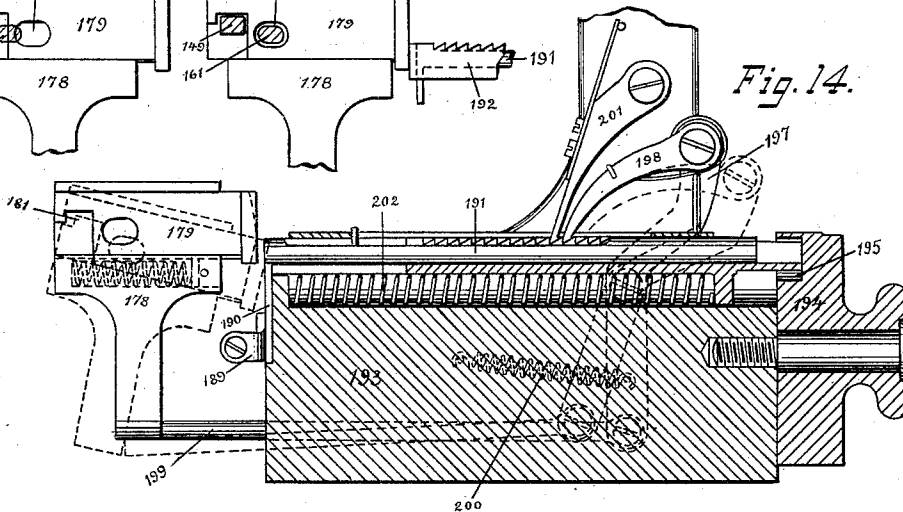


Fig. 14.



WITNESSES:

A. Lushman
L. M. Sweeney

INVENTOR:

Edward B. Allen

BY

Maclean, Calver & Randall,
ATTORNEYS.

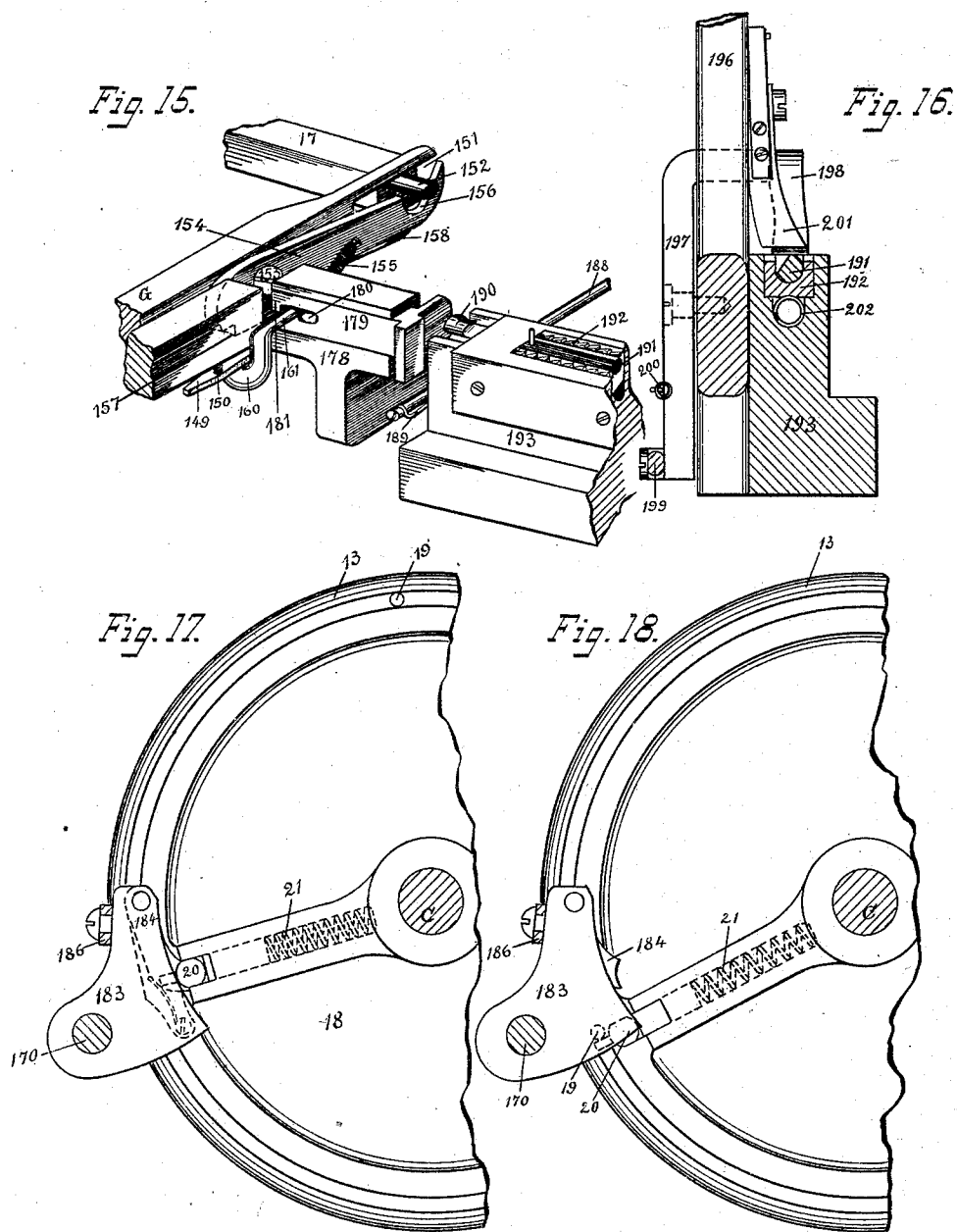
(No Model.)

9 Sheets—Sheet 7.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.



WITNESSES:

A. L. Lushman
C. M. Sweeney

INVENTOR:

Edward B. Allen

BY

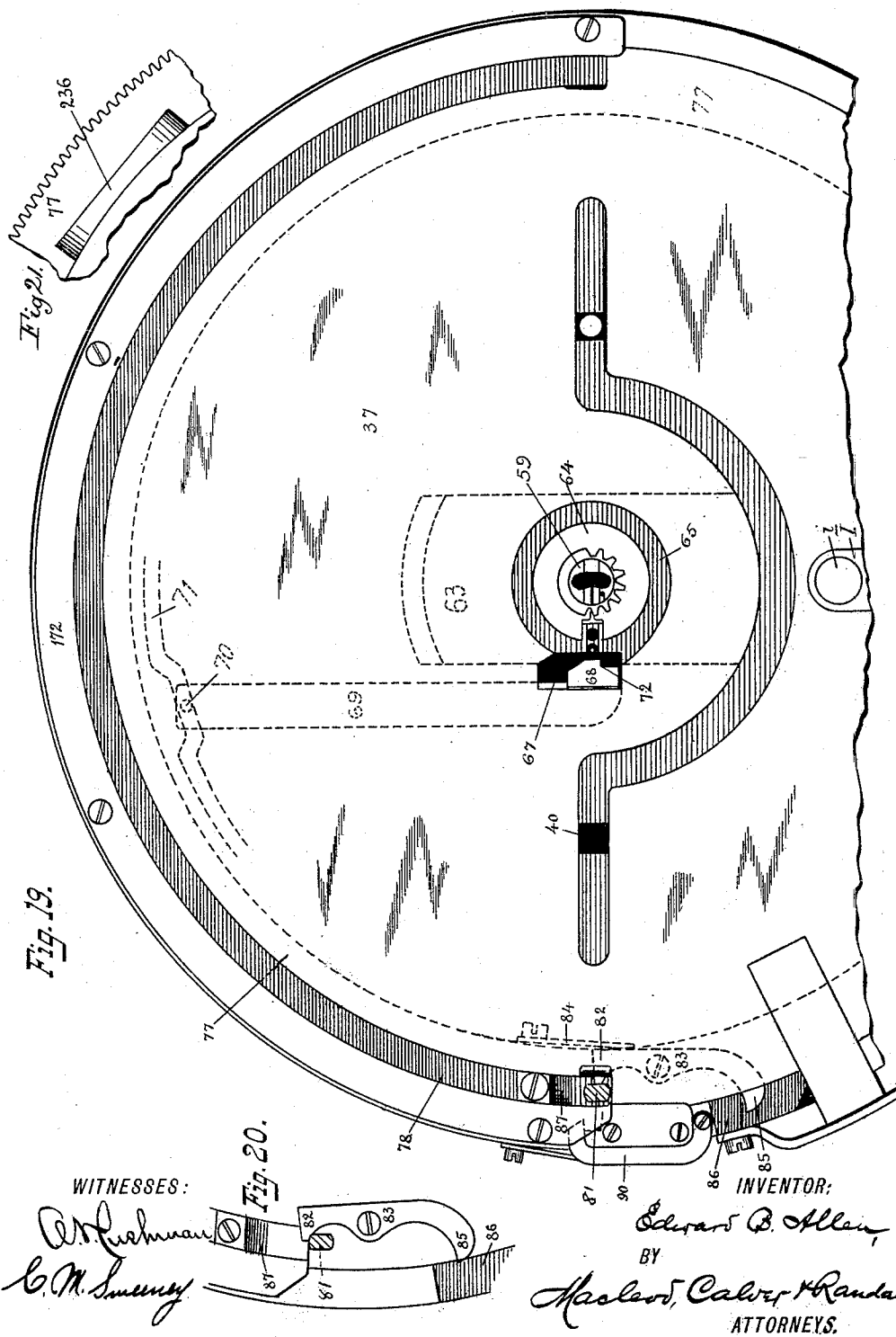
Maxwell, Calver & Randall

ATTORNEYS.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.



WITNESSES:

A. T. Kuchman
C. M. Lumsden

Fig. 20.

INVENTOR:

Edward B. Allen

BY

Maslow, Calver & Randall
ATTORNEYS.

E. B. ALLEN.
BUTTONHOLE SEWING MACHINE.

No. 473,564.

Patented Apr. 26, 1892.

Fig. 23

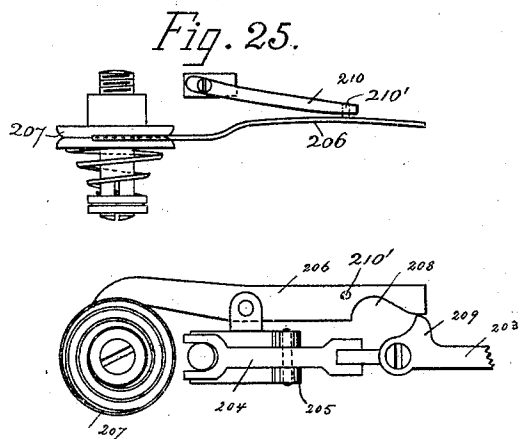
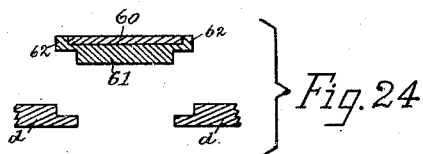
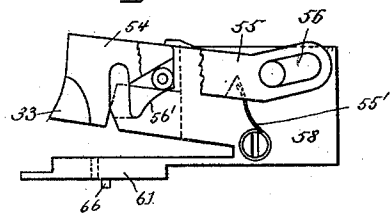


Fig. 26.

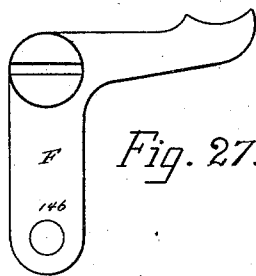
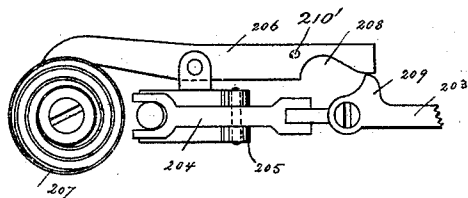


Fig. 27.

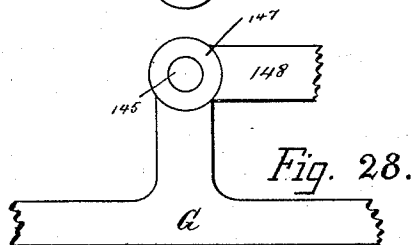


Fig. 28.

WITNESSES:

W. B. Hughes
C. M. Sweeney

INVENTOR:

Edward B. Allen
BY
Maclean, Calver & Randall
ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDWARD B. ALLEN, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY OF NEW JERSEY.

BUTTONHOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 473,564, dated April 26, 1892.

Application filed October 30, 1891. Serial No. 410,305. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. ALLEN, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Buttonhole Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object to produce a buttonhole sewing-machine by which a shoe buttonhole-flap or other piece of material to have a series of buttonholes worked therein may be presented to the stitch-forming mechanism of the machine and automatically fed from one buttonhole to another for any desired number of holes, the buttonhole-slits being preferably automatically cut and the machine being preferably automatically stopped when a predetermined number of buttonholes has been completed.

In carrying my invention into effect the buttonhole-flap or other piece of work in which the buttonholes are to be formed is preferably carried by a suitable work-holder, which, with the buttonhole-piece secured thereto, is automatically fed along to space the buttonholes, the work immediately adjacent to each buttonhole successively to be worked being held by clamping-feet, which are automatically lowered onto the material (this being done just as the buttonhole is cut when an automatic cutter is used) and which are automatically lifted from the material when the stitching of the buttonhole is completed to release the work to permit the latter to be fed along to bring it into position for the next succeeding buttonhole.

My invention is preferably applied to a buttonhole-machine provided with a barring mechanism, which finishes the end of each buttonhole when it has been otherwise completed, so that when the operator has placed a buttonhole-piece on the work-holder and has started the machine with the said work-holder in position the entire series of holes for the said buttonhole-piece may be cut, stitched, and barred, and thus the buttonhole work of the said piece be fully completed without further attention on the part of the operator, the machine being preferably automatically

stopped when a predetermined number of buttonholes has been worked, as hereinbefore stated. When a buttonhole has been completed and the buttonhole-piece is to be fed along for the next buttonhole, the tension on the buttonhole-threads is preferably automatically released to avoid danger of breaking the said threads or of springing the needle, and at the same time and for the same purpose the needle-thread is preferably slightly unwound or drawn from its spool.

In the accompanying drawings, Figure 1 is a sectional side view of a buttonhole sewing-machine embodying my invention. Fig. 2 is a plan view of the work-plate of same, the arm being removed to show the parts beneath it. Figs. 3 and 4 are front end views, partly in section, of my improved machine; and Fig. 5 is a partial bottom view thereof. Figs. 6 and 7 are partial detail views to show the work-holder guiding and feeding devices. Fig. 8 is a section on line 8 8; and Fig. 9, a section on line 9 9, Fig. 6. Fig. 10 is a detail plan view of the work-holder. Fig. 11 is a partial plan view of the arm of the machine, showing the spool-holder and tension device therefor. Figs. 12, 13, 14, 15, and 16 are detail views of the governing devices for the stopping mechanism. Figs. 17 and 18 are detail views of the stopping mechanism. Fig. 19 is a plan view of the work-plate and connected parts. Fig. 20 is a detail view showing the clamp-returning dog and adjacent parts. Fig. 21 shows a portion of the clamp-returning ring, and Fig. 22 is a detail of the gear and cam forming part of the stopping mechanism. Fig. 23 is a detail view of the cutter-carrying block and adjacent parts. Fig. 24 is a cross-sectional detail showing the support and bearings for the cutter-block. Figs. 25 and 26 are detail views of the lower tension and its releasing mechanism. Figs. 27 and 28 are detail views showing the pivotally-connected stopping-bar and setting-lever separated from each other.

In the drawings, A denotes the arm, and B the work-plate, of a well-known form of buttonhole sewing-machine having journaled in the upper part of said arm the driving-shaft 2, geared to a vertical shaft 3, which rotates once to two revolutions of said driv-

ing-shaft and which carries at its lower end beneath said work-plate the clamp feeding and looper-operating cam, and which is also provided inside of the vertical part of the said arm with a cam 5 to operate the lever 6, connected by rod 7 with the swinging frame 8, in which the needle-bar 9 reciprocates vertically, as fully shown and described in United States Patent No. 272,126, the to and fro or horizontal movements of the needle being utilized to form overedge or buttonhole-stitches in a well-known manner. The shaft 2 is provided with the usual fly-wheel 10, secured thereto, and with the pulley-wheel 11 loose on said shaft, but arranged to be frictionally pressed against said fly-wheel by the clutch-lever 12 when motion is to be imparted to said shaft, said clutch-lever having the usual brake α to arrest the motion of the said pulley-wheel and shaft when the said clutch-lever is released.

Journaled beneath the work-plate B, in suitable standards b , is a second driving or power shaft C, from which the buttonhole-cutting mechanism, the work-holder feeding mechanism, the tension-releasing and thread-slackening mechanism, and the mechanism for depressing and releasing the clamping-feet are operated, all as will be presently described.

Mounted loosely on the shaft C is a pulley 13, having a hub 14, provided with a cam-groove 15, entered by a pin 16, carried by a slide 17, movable freely back and forth on the said shaft C and serving to operate the stopping and starting mechanisms, as will presently appear, the said pulley 13 being connected with the wheel 18, fast on said shaft, by means of a pin or projection 19 on the inside of the pulley-rim and arranged to be engaged by a dog 20, carried by said wheel 18, and forced outward by a suitable spring 21, so as to engage said pin or projection when said shaft is to be rotated.

Secured to the shaft C is a bevel-gear 22, meshing with a larger bevel-gear 23 on the lower end of a cutter-operating shaft 24, provided near its upper end with an arm 25, preferably furnished with a roller 26. 27 is a sliding rod recessed at its rear end to form a shoulder 28 to be engaged by said arm 25, or the roller 26 carried thereby, said rod being normally held in the position shown in Fig. 1 by a spring 29, which serves to retract said rod after it has been forced forward by the said arm or roller to operate the cutter. To the forward end of the rod 27 are jointed two links 30 and 31, forming a toggle, the link 30 being pivoted at its upper end to a fixed part of the head at the forward end of the arm A, and the link 31 being jointed at its lower end to a vertically-sliding cutter-operating bar 32. A stiff plate-spring h bears against said toggle to assist the spring 29 in forcing the toggle-links out of vertical position when a buttonhole has been cut. The cutter 33 is preferably mounted on the work-clamp in a man-

ner to be hereinafter described, and the bar 32 is in such case provided with a suitable projection 34 to operate the said cutter, said projection being preferably adjustably attached to said bar by being formed on a collar 35, held between nuts 36, screwed onto the lower end of said bar.

The work-clamp D is mounted on the plate 37, provided with the usual guiding-slot 38, (see Fig. 6,) through which the feeding-pin 39 extends into the feeding-groove 40 in the feed-wheel 41, operated from the lever 42 in a well known manner and as fully described in United States Patent No. 272,126, hereinbefore referred to. To the clamp base-plate d is rigidly secured the block or standard 43, through which the feeding-pin 39 passes, said block or standard being provided at its top with ears 44, to which, by a pin 44', is pivoted a lever 45, having depending arms 45' straddling said block or standard and connected by links 46 and 47 with the rear ends of levers 48, carrying at their forward ends the clamping-feet 49. The clamping-levers 48 are pivoted to small standards 50, attached to the work-holder supporting-plate 51, suitable springs 52, arranged beneath the forward arms of the said levers, serving to lift the said clamping-feet when the work is to be released. The lever 45 is arranged beneath an arm 53', projecting from the collar 35, carried by the cutter-operating bar 32, so that when said bar descends to actuate the cutter 33 the said lever 45 will be depressed, thereby moving the lower ends of the links 47 rearward and up inclines formed on blocks 53, attached to the block or standard 43, and thus depressing the clamping-feet carried at the forward ends of the levers 48, this operation of the said levers 48 being due to the connection of the rear ends thereof with the arms 45' through the links 46 and 47, the latter links being pivoted at their upper ends to said clamping-levers, so that when said links 47 are drawn to the vertical position shown in Fig. 3 the clamping-feet 49 will be held against the work until released, as will be hereinafter described.

The cutter 33 is carried by a block 54, provided with rearwardly-extending arms 55, having guide-slots 56, entered by screws or pins 57, carried by a U-shaped block 58, embracing the forward portion of the clamp-block or standard 43, the said block or standard 43 and the other parts of the clamp, as well as the work-holder supporting-plate connected therewith, being thus movable relative to the block 58 and the cutter. The cutter-carrying block 54 is provided with a horizontal stud or roller 54', (see Figs. 4 and 23,) held in contact with an incline or cam edge 56', formed on the block 58 by springs 55', the free ends of which engage the said arms 55. From this construction it results that when the cutter-carrying block 54 is depressed the cutter will move forward, so that its point or forward end comes closely adja-

cent to the needle. In other words, the buttonhole-slit formed by the cutter will be in proper position for the commencement of the stitch-forming operation as soon as said slit is made without any forward feeding of the work, and thus there will be no time lost between the cutting and the stitching operations. When the cutter-operating bar rises, the cutter is lifted and returned to its first position by the springs 55', attached to the block 58 and engaging the arms 55 of the cutter-carrying block 54. The anvil or cutting-block is formed partly on the clamp-guiding button 59 and partly by a plate 60, attached to a forward extension 61 of the block 58, said extension fitting in a suitable steadying-slot formed in the clamp base-plate *d*, and being recessed at its sides beneath to form suitable supporting-shoulders 62, resting on corresponding shoulders formed on the clamp base-plate *d*. Thus the said base-plate *d* affords a suitable resistance for the cutting pressure without forcing any portion of the cutter-supporting block into contact with the clamp-guiding block 37. The forward end of the lower portion of the extension 61 is rounded to form a bearing against the rounded bearing-surface of the guiding-button 59 when the clamp is being turned to stitch the eyes of the buttonholes, said button being carried by a sliding plate 63, and being thus adapted to be moved laterally, as described in United States Patent No. 360,434, for the purpose of forming barring-stitches at the ends of the buttonholes. The clamp base-plate *d* is pressed against the guiding-button 59 in the usual manner by a guide-roll or guide *I'*, carried by a spring-pressed slide *I*, recessed in the work-plate *B*. Surrounding the guiding-button 59 on the sliding plate 63 is a circular raised portion or boss 64, the top of which is on a level with the upper surface of the clamp guiding-plate 37, in which latter is formed a circular opening 65, larger than said boss, leaving between the outer wall of the latter and the inner wall of the said opening an annular space, which loosely receives a pin 66, projecting below the bottom of the extension 61.

When a buttonhole is to be cut, it is necessary that the plate 61, forming part of the cutting-block, should be in close contact with that part of the guiding-button 59 which forms the other part of said cutting-block; but a certain looseness between the bearing afforded by the rounded forward end of the extension 61 and the bearing portion of the guiding-button is necessary at the times of the beginning and ending of the stitching of the eye of a buttonhole to permit of the slight lateral or free movement of the clamp necessary to form a properly-rounded eye. To provide means for holding the extension 61 forward against the guiding-button to bring the two parts of the cutting-block together when a buttonhole is to be cut, an opening 67 is formed at one side of the circular opening 65, said opening receiving a block 68, carried at the forward or

inner end of sliding plate 69, guided in a groove formed on the under side of the plate 37, said block being formed with an inclined side arranged to be engaged by the pin 66, and the said pin riding up said inclined side as the clamp is being returned to its starting-point after the completion of the buttonhole, as will be described presently. As the said pin rides up said inclined side of said block it serves to press the extension 61 and the plate 60 carried thereby forward against the guiding-button at the moment of the cutting operation. The sliding plate 69 is provided on its under side, near its outer end, with a pin 70, received in a cam-groove 71, formed in the upper face of the feeding-wheel 41, the cam portion of the said groove being so arranged as to move the said sliding plate inward just before a buttonhole is completed, said plate being then so placed that when the clamp has been returned to its starting-point the pin 66 will have reached the top of the incline and is there held while the cutter is operated and while the stitching mechanism is at rest, as will be described farther on. As soon as the stitching mechanism is again started and the feed-wheel 41 begins to rotate the cam-groove 71 draws the sliding plate 69 outward and permits the pin 66 to drop into the notch 72, formed in the block 68 beyond the incline, thus loosening the extension 61 from close contact with the guiding-button, so that when the clamp is to be turned for stitching the eye of a buttonhole proper free movement of the parts will be afforded, as above stated.

To the shaft *C* is secured the bevel-gear 73, meshing with a bevel-gear 74, formed on a sleeve 75, the upper end of which is provided with a gear-wheel 76, (see Fig. 2,) meshing with a toothed clamp-returning ring 77, surrounding the feed-wheel 41 and suitably mounted in a circular recess in the work-plate. As will presently be further described, the shaft *C* is in rotation only when the driving-shaft 2, which operates the stitching mechanism and the feeding-wheel, is at rest, and when a buttonhole has been stitched and barred the work-clamp will be in the position shown in Fig. 2. The clamp-guiding plate 37 is provided near its outer edge with a semicircular slot 78, and as soon as the stitching and barring of a buttonhole are completed and the stitching mechanism and feeding-wheel are stopped a pin 79, beneath the work-plate and operated by mechanism to be presently described, is forced upward, and as the clamp feeding-pin 39 is at this moment directly above the said pin 79 said feeding-pin is lifted from the cam-groove 40 of the feeding-wheel 41, thus leaving the clamp free to be returned to its stitch-forming starting position.

The pin 39 engages the forked inner end of a lever 80, pivoted on the pin 44' on the clamp-block or standard 43, said lever at its outer end being forked to engage a clamp-returning pin 81, so that as the said feeding-pin 39 is lifted the said pin 81 will be depressed through

the slot 78 and into the path of movement of the tail 82 of a dog or lever 83, pivoted to the clamp-returning ring 77, said tail being held in position to engage said pin by a spring 84.

5 As the said ring starts forward to return the clamp the tendency of the tail of the dog to move inward against the pressure of said spring is resisted by the inner circular wall of the recess, in which the ring revolves, said

10 wall being engaged by the forward end 85 of the said dog, which forward end extends through a recess formed in the upper face of the periphery of said ring when the pin 81 is engaged by the tail of the dog. When the

15 ring 77 has performed a half-revolution, the forward end 85 of the dog will be opposite a recess 86, formed in work-plate, and as the pin 81 strikes the end of the semicircular slot 78 in the plate 37 the tail 82 of the dog is

20 forced inward, thus permitting the said pin to be disengaged therefrom, said pin being then immediately lifted from the clamp-returning ring, and the slot 78, by the incline 87, formed on said ring, and by the spring 88, acting on the lever 80 and serving now to depress

25 the clamp feeding-pin into the cam-groove of the feeding-wheel.

As the clamp is approaching its stitch-forming starting position and just before the pin 81 is lifted from the clamp-returning ring, a

30 projection 89 at the outer or rear end of the clamp strikes a pivoted spring-catch 90, attached to the work-plate, said catch yielding and then immediately springing back to engage said projection and hold the clamp in

35 position for the commencement of the stitching operation.

When the clamp feeding-pin 39 is lifted, as above described, any tendency of the rear

40 part of the clamp to rise is resisted by the engagement of the projection 89 with the under surface of the curved plate 172, overlying said projection, the clamp being held down forward of its feeding-pin by the flanged guiding-button 59, in the usual manner. Should

45 the spring 88 fail to fully depress the clamp feeding-pin 39 and lift the clamp-returning pin 81 from the slot 78, the clamping-lever 45, when depressed by the arm 52 by the cutter-operating bar 32, will positively force said

50 pin 39 down into the groove of the feeding-wheel, and, acting through the lever 80, will also positively lift the pin 81, so that the clamp will be free to be moved by the feeding-wheel.

55 The leading feature of my invention is an automatic feeding mechanism by which a shoe-flap or other piece of work in which a series of buttonholes are to be formed is automatically fed forward to bring the work into

60 position to form a new buttonhole while the clamp is being returned to its first or starting position after the completion of the preceding buttonhole, and this feature of my invention will now be described.

65 E denotes a work-holder consisting, as herein shown, of a skeleton templet-plate curved to conform to the general shape of the button

shoe-flap in which buttonholes are to be worked, the said plate having a series of teeth e on one edge thereof. From the outer portion of the work-holder a series of fingers 91 project inwardly but not entirely across the space between the inner and outer rim portions of the holder, these fingers being each provided with a clamping device, consisting,

75 as herein shown, of a spring-hook 92, beneath which the work is held, as shown in Fig. 2. As the curvature of the particular form of buttonhole-flap for which this holder is intended is not in the true arc of a circle, the curvature of the holder is correspondingly irregular, and it is therefore necessary to hold and guide the said holder in such a manner that the buttonholes may be symmetrically placed,

80 so as to radiate approximately from a common center. The work-holder supporting-plate 51, attached to (and thus movable with) the clamp base-plate d, is provided with guides, consisting, as herein shown, of a plate 93, having a small lip 94, slightly overhanging the

90 outer edge of the work-holder, to guide said holder at its outer edge.

To hold and guide the inner edge of the work-holder, I provide two spring-pressed slides 95 and 96, movable in suitable ways 97,

95 attached to the plate 51 and having lips slightly overhanging the said inner edge of the holder, and between said slides 95 and 96 is a plate 98, also attached to the plate 51 and provided with a lip 99 to engage the inner rim of the holder, and with the spring-pressed centering-pin 100, (see Fig. 4,) which is to engage with the notches 101, formed in the under portion of the inner edge of the holder and at points with which the button-

105 holes should be in alignment.

The work-holder is fed forward in the direction denoted by the arrow in Fig. 2, and to insure a proper turning movement of the work-holder to secure a correct radial arrangement of the buttonholes, or, in other words, to cause the notch for each buttonhole to be properly entered by the centering-pin 100, the spring for the slide 95 has a stronger tension than the spring for the slide

110 96. As a result of the difference of pressure of the slides 95 and 96 against the inner edge of the work-holder, the latter, on being moved forward by the gear 102, meshing with the teeth e, formed in the outer edge of said holder,

120 is caused to progress in such a manner that its inner shorter edge will travel nearly or quite as fast as its outer longer edge, thus bringing a notch 101 opposite the centering-pin 100 slightly before the feeding movement

125 of the gear 102 is arrested. As the feeding movements of the gear 102 are positive and uniform, the outer or eye end of each buttonhole will in every instance be properly brought into position, and the correct positions for the inner ends of the buttonholes, to give the latter a proper radial arrangement on the buttonhole piece, is reliably secured by the above-

130 described differentially spring-pressed guid-

ing-slides 95 and 96, acting in co-operation with the notches 101 on the inner edge of the work-holder, and with the feeding-teeth and intermeshing gear-wheel at the outer edge of said holder.

As hereinbefore stated, the feeding movements of the work-holder E and of the buttonhole-piece clamped or otherwise suitably secured thereto are effected during the time when the clamp is being returned to its starting-point by the returning ring 77 after the buttonhole has been completed. To effect these feeding movements, I have in the present instance provided the guiding-button 59 with teeth 103, which are connected by a train of gears 104, 105, 106, and 107 with the gear 102, which meshes with the teeth *e* on the said work-holder, the semi-rotary return movement of the work-holder and the clamp base-plate *d*, by which the work-holder supporting-plate 51 is carried, causing a proper rotation of these work-holder feeding-gears from the stationary gear on the sliding button.

To permit the work-holder to be entered into its guides after a buttonhole-piece has been secured thereto, it is necessary that the gear 102 should be disconnected from the train of gears having connection with the stationary gear on the guiding-button 59, and for this purpose I have mounted the gear 107 on a spring 108 and provided said gear with a button 109. The spring 108 normally holds said gear 107 up, so that it is in mesh with the gear 102; but when the work-holder is to be entered into its guides and it is desired that the latter gear should rotate freely the operator presses on said button 109, thereby depressing the gear 107 out of engagement with the gear 102. To provide for the variable feeding movement of the work-holder for spacing the buttonholes different distances apart, the gears 104 and 105 are what may be termed "change-gears"—that is, they may be removed and interchangeable gears of different sizes may be substituted therefor to give a greater or less progressive or feeding movement to the work-holder from the stationary gear on the guiding-button.

As hereinbefore stated, the clamp base-plate guiding-button 59 is carried by a plate 63, which is stationary while the sides and eye of a buttonhole are being stitched, but which is given a reciprocating sliding movement back and forth in the direction of the length of the machine when the stitching of the last side of a buttonhole is completed for the purpose of forming three or four barring stitches across the end of the buttonhole, and at the completion of the barring stitches the driving-shaft 2, from which the stitch-forming and clamp feeding mechanisms are operated, is automatically stopped, the barring mechanism and the stopping mechanism for the said driving-shaft, and which will now be described, being essentially the same in principle (although varying somewhat in detail)

as the corresponding mechanisms shown and described in United States Patent No. 360,434, hereinbefore referred to.

The sliding plate 63, which rests on the clamp feeding-wheel 41 and which is guided back and forth in a suitable recess formed in the under side of the plate 37, is engaged by an upwardly-extending projection 110 of a bar 111, provided at its rear end with a hook 112, arranged to be engaged by a second hook 113, carried by a lever 114, pivotally secured to a sliding bar 115, provided at its rear end with a yoke embracing a cam *b* on the lower part of the vertical shaft 3, the said sliding bar 115 being thus given a constant movement back and forth while the said shaft is in operation. The lever 114, carrying the hook 113, is connected by a link 116 with the lower arm of a bell-crank tripping-lever 117, the upper arm of which is provided with a toe portion 118, arranged in the path of movement of a projection 119, carried by the feeding-wheel 41. The link 116 at its point of connection with the lower arm of the lever 117 is forked or slotted to embrace the screw 120, tapped through said arm, said link being yieldingly pressed against said screw by the spring 121. The screw 120 extends through and above the lower arm of the lever 117 to form a pin or stop, against which, by a spring 122, is pressed a holding dog 123, pivoted at 124 to the under side of the work-plate B, and provided with notches 125 126 and with a toe-piece or projection 127.

To the under side of the work-plate B is pivoted the lever 128, connected by a link 129 with a holding-lever 130, pivoted at 131. The lever 128 is normally held against a stop-screw 132 by a spring 133, and the said lever is provided with a series of teeth to be engaged by a pawl 134, carried by the sliding bar 115, said pawl being provided with a pin 135, engaged by the tail-piece 136 of the hook 113, carried by the lever 114. A spring 137 forces said pawl into engagement with the teeth of the lever 128 when the position of the tail-piece is such as to permit it to do so.

Pivoted to the under side of the work-plate B is a bell-crank automatic setting-lever F, the shorter arm 138 of which is engaged by the holding-lever 130, said arm being connected by a link 139 with a setting-lever 140, having a vertical portion or arm projecting upward through a slot in the work-plate to serve as an operating-handle. A spring 141, arranged in said slot, serves to force said lever toward a stop-screw 142.

O is a rod jointed to the setting-lever 140 by the screw 143, by which the link 139 is connected to said lever, said rod extending rearward to engage the lower end of the clutch-lever 12 to cause said lever to force the loose pulley-wheel 11 into frictional engagement with the fast fly-wheel 10 when the driving-shaft 2 is to be operated. A spring 144 serves to retract the said clutch-lever when the rod

O is released therefrom and to apply the brake α to the fly-wheel to arrest the rotation of the shaft 2.

The operation of the barring mechanism 5 and of the stopping mechanism for the driving-shaft 2, connected therewith, is as follows: The parts being in the position shown in Fig. 5 and the sewing and clamp feeding mechanisms being in operation, (this feeding mechanism being that by which the buttonhole stitches are spaced,) the projection 119 will, when the stitching of the last side of a buttonhole is completed, engage the toe portion 118 of the tripping-lever 117, causing said lever, through the link 116, to draw the lever 114, carried by the sliding bar 115, into such position that the hook 113 will engage the hook 112 to impart motion to the plate 63 and the guiding-button carried thereby, thus reciprocating the work-clamp beneath the needle and in opposition to the horizontal movements of the latter to form barring stitches. At the first movement of the tripping-lever 117 the holding-dog 123 immediately springs forward, so that the pin or screw 120, the upwardly-projecting part of which had been resting in the notch 126, is now received into the notch 125, so that said dog will now hold the tripping-lever in the position in which the projection 119 has placed it after the said projection moves away from the toe portion of the said tripping-lever, thus holding the hook 113 in engagement with the hook 112. The movement of the hook 113, with its tail-piece 136, toward the hook 112 permits the pawl 134 to engage the teeth of the lever 128 and turn said lever on its pivot to the extent of one tooth at each forward movement of the pawl, thus causing said lever, acting through the link 129, to move the holding-lever 130 rearward until it is freed from the arm 128 of the lever F, when the spring 141 will move the setting-lever 140 toward the side of the work-plate and draw the rod O, connected therewith, forward out of contact with the clutch-lever 12, when the spring 144 will retract said clutch-lever to release the driving-pulley 11 from the fly-wheel and apply the brake α to said fly-wheel and stop the shaft 2 and the stitching and clamp feeding mechanisms operated therefrom. At the moment when the driving-shaft and the stitching and clamp feeding mechanisms are stopped, as just described, the driving-shaft C and the clamp returning and work-holder feeding and buttonhole-cutting mechanisms operated from said shaft C are set in motion by the mechanism which will now be described, and when the clamp has been returned to its stitch-forming starting position, the work-holder fed along to bring the work into position for a new buttonhole, and the slit for said hole has been cut the shaft C is automatically stopped and at the same moment the driving-shaft 2 is started to again set the stitch-forming and clamp feeding mechanisms into operation. Thus the stopping mechanism for the driving-shaft 2 serves as a start-

ing mechanism for the driving-shaft C, while the stopping mechanism for the latter shaft acts to start the former shaft, so that the trains of mechanisms operated from said shafts will be automatically but alternately stopped and started (one or the other being in constant operation) until a buttonhole-piece or any desired number of buttonholes shall have been worked, when the entire machine is thrown out of operation, as will presently appear.

G is a stopping-bar pivotally attached at 145 to the longer arm 146 of the automatic setting-lever F, said bar having formed integral therewith a hub 147, having a rigid rearwardly-extending arm 148, to which is pivoted the lever 149, the forward arm of which is depressed by the spring 150. In the rear end of the bar G is formed a slot 151, which receives a roller-pin 152, carried by the reciprocating slide 17, operated by the cam-grooved hub 14 of the constantly-rotating pulley 13, running loose on the shaft C. Pivoted at 153 to the rear arm of the bar G is a lever 154, provided at its rear end with a notch 156 and at its forward end with a notch 157, the rear end of said lever being pressed against by the plate-spring 158, attached to the bar G. To a laterally-extending projection on the bar G is pivoted at 159 a latch 160, having a rearwardly-extending finger 161, said latch when in its rearward position engaging the notch 157 of the lever 154 to hold the rear end of the said lever depressed out of the path of the constantly-reciprocating roller-pin 152, a spring 155 serving to hold said latch rearward in engagement with said notch.

The shaft C is provided near its rear end with a pinion 162, meshing with a gear-wheel 163, mounted on a small standard 164, and provided with a hub 165, having a notched or cut-away portion 166. Mounted in suitable arms or standards 168 169 is a longitudinally movable or sliding rod 170, on which is loosely mounted a rocker 174, having an arm 175, held in contact with the notched hub or cam 165 of the gear-wheel 163 by a torsional spring 176, surrounding said rod, said rocker having an arm 177 extending forward and provided with a head 178, in which is mounted a spring-pressed slide 179, provided with a hole 180 and a notch or rectangular recess 181.

183 is an arm rigidly secured to the rod 170, near the rear end of the latter, and preferably having a spring-catch 184, said arm serving at the proper time to release the dog 20, carried by the wheel 18, fast on the shaft C, from the pin or projection 19 on the loose driving-pulley 13, and the said spring-catch serving to prevent backward movement of said wheel 18 when unclutched from said pulley. The rod 170 is drawn forward to bring the releasing-arm 183 into the path of rotation of the dog 20 at the proper time by a spring 185.

H is a starting hand-lever loosely connected by a link 186 with a screw or pin 187 on the arm 183, the slot 173 in said link, through

which said screw passes, permitting a limited movement of the said arm 183 and of the rod 170, which carries the same, without moving said lever. To the lower arm of the lever H is jointed a rod 188, the forward end of which is connected by a link 189 to an arm 190 on the inner end of a rocking bar 191, resting in a buttonhole-governing ratchet bar or slide 192, arranged to slide in a block or support 193, attached to the work-table on which the machine stands. To the outer end of the block 193 is pivotally secured an index-wheel 194, provided on its inner face with a series of holes 195 of different depths, said holes being so arranged that any one of them may be brought opposite the outer rounded end of the ratchet-bar 192, said bar being arranged in line with the slide 179, carried by the head 178 of the rocker 174, so that when said bar is fed forward a desired distance, determined by the number of buttonholes to be worked, it will engage said slide to automatically effect the stopping of the machine, as will be fully described farther on.

Pivoted to the post 196 is a pawl-carrier 197, provided with a feeding-pawl 198, which is in engagement with the teeth of the ratchet-bar 192, said pawl-carrier being operated by the rod 199, attached to the lower end thereof, and the spring 200, which holds the inner end of said rod in contact with the arm 177 of the rocker 174. A detent-pawl 201 prevents the ratchet-bar from moving backward when the pawl 198 is retracted.

As above stated, the index-wheel has a series of holes of different depths, into any one of which, brought opposite its end, the ratchet-bar will enter when it is retracted, these different holes being indicated by suitable marks or figures placed opposite them on the index-wheel. Thus if nine buttonholes are to be worked before the machine is to be automatically stopped the index-wheel will be set accordingly; but if a less number of holes are to be made a shallower hole (denoted by a lower figure) will be set for the ratchet-bar to fall into when it is retracted, the said wheel, it being understood, serving as a variable back-stop for the ratchet-bar, as the machine will always be stopped when said bar arrives at a particular point in its forward movement, and a forward movement of each tooth of the ratchet-bar will correspond to a buttonhole worked. A spring 202, arranged in the block or support 193, serves to return the sliding ratchet-bar to its starting position when the pawls 198 and 201 are released therefrom after a buttonhole-piece has been finished. To provide for releasing these pawls, the rocking bar 191 is made semicircular in cross-section or is provided with a flattened side at that portion thereof which comes beneath said pawls, said flattened portion being at the upper side of said bar when the latter is in its normal position, so that the upper surface of that part of said rocking bar beneath the said pawls will be below the tops of the teeth of the ratchet-

bar, thus permitting said pawls to engage the ratchet-teeth; but when the said rocking or pawl-releasing bar is partially turned by the above-described connection with the hand-lever H a corner of said bar will be brought above the tops of the ratchet-teeth, and will thus disengage the pawls therefrom and permit the spring 202 to retract the sliding ratchet-bar until its outer end engages the wall at the bottom of that hole in the index-wheel which may be set to come opposite said bar.

The machine is started, after having been entirely stopped, by the hand-lever H, which retracts the rod 170 to release the arm 183 thereof from the dog 20, and said lever, through the rod 188, link 189, and arm 190, also operates the rocking bar 191 to release the pawls 198 and 201 from the ratchet-bar 192; but said pawls may be released from said bar without retracting said rod 170, owing to the loose connection of the lever H with the pin 187 on said bar afforded by the slot 173 in the link 186.

To the forward end of the stopping-bar G is jointed a link 203, which in turn is jointed at its forward end to the rear arm of a small bell-crank lever 204, pivoted to a bracket 205 and forked at its forward end to engage the pin 79, which serves to lift the clamp feeding-pin 39 from the groove of the clamp feeding-wheel when the work-clamp is to be returned to its starting position after a buttonhole has been stitched and barred, said lever 204 being so connected with said pin 79 that the latter will be positively raised and lowered.

When the work-holder is to be fed forward after the completion of a buttonhole to bring the buttonhole-piece into position for forming a new buttonhole, it is desirable that the tension on the threads should be released, so that all danger of breaking the threads or of bending or breaking the needle or thread-carrying looper or loopers will be avoided. To automatically release the tension on the lower thread during the work-holder feeding operation, I have pivoted to the bracket 205 a tension-releasing lever 206, the forward end of which is arranged to be forced between the disks of a tension device 207, said lever having near its rear end a notch 208 to receive a cam projection 209 on the link 203, said projection being so placed that when said link is in its forward position and the stitch-forming mechanism is at work it will be in the said notch of said lever; but when the stopping-bar G moves rearwardly and the stitch-forming mechanism is stopped and the clamp-returning and work-holder feeding mechanism is started said projection will engage the full portion of said tension-releasing lever rearward of said notch and force the forward end of the lever between the tension-disks to separate the latter, and thus release the tension. The lever 206 is held against the projection 209 by a suitable spring 210, pressing against a pin 210', carried by said lever. (See Figs. 25 and 26.) The tension on the upper thread is similarly released by a lever 211, the for-

ward end of which is arranged to enter between the disks of the upper tension device 212, said lever having at its rear end a laterally-extending arm 213, provided with a pin or roller 215, engaged by a cam-disk 216 at the upper end of the cutter-operating shaft 24, said cam-disk having in its lower face a notched or cut-away portion which receives said pin or roller when said shaft is stationary and the stitch-forming mechanism is in operation; but when said shaft is started simultaneously with the starting of the clamp-returning and work-holder feeding mechanisms the full portion of said cam-disk causes the forward end of the lever 211 to enter between the tension-disks, and thus release the tension. When the work-holder is being fed forward to bring the work into position for the formation of a new buttonhole, it is also desirable that a length of upper or needle thread approximately equal to the distance between one buttonhole and another should be drawn off or unwound from the spool to avoid springing the needle, and this is effected in the present instance by a friction-pad 217, consisting of a block of rubber or other suitable elastic material, carried by the disk 216 and arranged to engage one head of the spool 218 or of a disk 221, clamped against the said spool. The spool 218 is preferably carried by a pin or holder 220, having a disk 221 permanently fixed thereto, and between which and the disk 219, having an internally-screw-threaded hole or sleeve entered by a threaded portion of the said pin, said spool is tightly clamped by screwing up said disk 219. To permit the spool-holder and the spool carried thereby to turn easily, the ends of the said holder are provided with countersunk recesses entered by center points formed at the ends of pins or screws 222 223, the former of which is fixed to the spool-holder supporting-frame 224, and the latter of which is carried by a movable arm 225, pivoted to said frame and pressed toward the disk 219 by a spring 226, the stress of which latter to regulate the tension may be varied by an adjusting-screw 227.

In cutting an eyed buttonhole a small oval disk is punched from the leather or other material by the cutter, and it is desirable that this disk or cut-out piece of material should be entirely and reliably removed from the work, as otherwise imperfections in the buttonholes formed are liable to result. In working buttonholes in cloth the disks cut from the eyes of said holes are usually left in the holes by the cutter and have to be removed with tweezers by the operator, and with leather more or less difficulty is also caused by these disks, which get into the stitching or occasion more or less roughness of work at the eyes of the buttonholes. To obviate this difficulty, I have provided an automatic eye-piece or disk-remover consisting of a pin 228, arranged beneath the work-plate in vertical line with the eye of the cutter, and a small hole is formed in the eye portion of the cutting block or plate

61 for the upward passage of said pin, the latter being attached to a vertically-sliding block 229, arranged in a standard 230 on the work-table and provided with an upwardly-extending arm 231, arranged to be engaged by a lever 232, pivoted to the work-plate B, to depress the pin-carrying sliding block 229 against the stress of the lifting-spring 233, placed beneath it. Resting on the lever 232, near the outer end thereof, is a pin 234, which comes beneath the inner edge of the clamp-returning ring 77, the latter thus normally serving to hold said pin and lever depressed against the stress of the lifting-spring 235. The clamp returning-ring is, however, provided with a notch or recess 236, which, in the rotation of said ring and just before the cutter rises, comes above the pin 234, and thus permits the spring 235 to lift the lever 232 from the arm 231, thereby releasing the sliding block 229, so that the spring 233 instantly forces the said block and the pin 228, carried thereby, upward, thus shooting or ejecting the cut-out disk of material out through the hole in the punch portion of the cutter, and the said pin is then depressed out of the way.

The operations of the different mechanisms constituting my machine have already been mostly set forth in connection with their structural descriptions; but the general operation of my machine may be stated as follows: The driving-pulleys 11 and 13 on the shafts 2 and C, respectively, being set into operation by suitable power-driven belts, (not shown,) the work-holder E, with a buttonhole-piece secured thereto, being placed in proper position on the supporting-plate 51, carried by the clamp base-plate *d*, and the clamp being in the position shown in Fig. 4, ready to be returned to its stitch-forming starting-point, or the position which it occupies when a buttonhole is cut and the stitching operation commenced, the machine is started by the outward or rearward movement of the upper or handle end of the hand-lever H, which, through the link 186, acting on the screw or pin 187 on the arm 183, draws the sliding rod 170 rearward, thereby disengaging the said arm 183 from the dog 20, carried by the wheel 18, fast on the shaft C, and permitting said dog to spring outward into the path of rotation of the pin or projection 19, carried by the loose driving-pulley 13, thus setting said shaft C into motion to operate the clamp-returning, work-holder feeding, buttonhole-cutting, tension-releasing, and thread-unwinding mechanisms connected therewith. The clamp-returning ring 77 now swings the clamp and the work-holder mounted thereon around in a half-circle to the stitch-forming starting position shown by Fig. 3, and in so doing feeds the work-holder along, as hereinbefore described, to bring the work or buttonhole-piece attached thereto into position for the formation of the first buttonhole, and the clamp-returning pin 81 is then released from the dog 83 on the said clamp-

returning ring, the latter continuing its revolution around to its first position. During the last half of the rotation of the clamp-returning ring the buttonhole-cutter, operated from the shaft 24, descends and cuts the buttonhole. Before the sliding rod 170 has been moved rearward by the hand-lever H, as above described, the rear end of the lever 149 was received in the rectangular recess 181 in the slide 179, carried by the head 178 of the rocker 174, and the rear end of the finger 161 of the latch 160 was in the hole 180 of the said slide, said latch thus resting in the notch 157 at the forward end of the lever 154 to hold the rear end of said lever depressed out of the path of the constantly-reciprocating roller-pin 152. As the said rocker and its head are longitudinally movable with the rod 170, the said lever 149 is released from the recess 181 when the rod 170 is moved rearward, and the spring 150 then lifts the rear end of said lever, so that it will engage the forward face of said slide 179 above said recess, and thus hold the arm 183 out of the path of revolution of the dog 20 for the time being. The rearward movement of the rod 170 also disengages the finger 161 of the latch 160 from the hole 180 of said slide. The pinion 162 on the shaft C, now in rotation, turns the gear-wheel 163 during the clamp returning and buttonhole-cutting operations, so that by the time a buttonhole has been cut the notched or cut-away portion 166 of the cam-hub 165 of said gear comes opposite the arm 175 of the rocker 174, thus permitting the torsional spring 176 to turn said rocker slightly to bring the recess 181 opposite the rear end of the lever 149, so that the spring 185 may return the rod 170 and bring the arm 183 into the path of rotation of the dog 20 to unclutch the pulley 13 from the shaft C to stop the latter. At the moment when the rod 170 and the parts connected therewith are thus moved forward by the spring 185 the finger 161 of the latch 160 is opposite the web between the holes or recesses 180 and 181 in the slide 179, and as the spring 185 is much stronger than the spring 155 the latter will yield, releasing the said latch from the lever 154, when the spring 157 will lift the rear end of said lever to permit the roller-pin 152 to enter the notch 156, and as the said pin strikes the wall at the left or forward end of said notch it will move the bar G forward, turning the lever F on its pivot, thus causing the rod O, connected to said lever through the link 139, to move rearward and engage the clutch-lever 12 to remove the brake α from the fly-wheel 10 and force the pulley-wheel 11 into contact with said fly-wheel to start the shaft 2, and the stitching and clamp feeding mechanisms operated thereby.

When the hand-lever H is operated to start the machine, the bar 191 is rocked slightly, releasing the pawls 198 and 201, as has been described, and the ratchet-bar is then retracted by its spring 202, thus freeing the slide 179, which is returned by its spring into

such position as to be engaged by the lever 149, and the finger of the latch 160, which, striking the inner face of said slide, moves the rod 170 rearward to start the shaft C, when the lever F is next operated at the automatic stopping of the stitching and clamp feeding mechanisms; but when the last buttonhole in the piece of work in the work-holder is finished the ratchet-bar is fed forward, so as to engage said slide 179 and force the latter inward or forward, so that when shaft 2 is next stopped and the lever F next moves to carry the stopping-bar G rearward the rear end of the lever 149 is opposite the recess 181 of said slide and the rear end of the finger 161 of the latch 160 is opposite the hole 180 in said slide, so that now, instead of engaging any part of the face of said slide, the rear end of the lever 149 will enter said recess and the rear end of the said finger will enter said hole, and thus these parts, which at prior rearward movements of the bar G engaged said slide to force the rod 170 rearward to start the shaft C, will now fail to engage said slide, and the said shaft will therefore remain at rest and the entire machine will be stopped.

I do not wish to be understood as limiting my invention to the particular details of the mechanism hereinbefore described, as the constructions of the parts of my machine may be varied widely without departing from my invention, and as I believe that I am the first to provide a buttonhole sewing-machine with an automatic mechanism for advancing the work from one buttonhole to another, I wish to be understood as claiming this feature broadly, as also, in connection therewith, the feature of an automatic mechanism for stopping the machine when any desired number of buttonholes has been worked.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a feeding mechanism for spacing the stitches along the edges of the buttonholes, of a work-holding device and a feeding device for advancing the work from one buttonhole-stitching position to another.

2. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a feeding mechanism for spacing the stitches along the edges of the buttonholes, of a work-holding device and an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another.

3. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a work-clamping device, of an automatic feeding mechanism for advancing the buttonhole-piece relative to said clamping device to feed the work from one buttonhole-stitching position to another.

4. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and an automatic barring mechanism, of an automatic feeding mechanism for

advancing the buttonhole-piece relative to said work-clamp to feed the work from one buttonhole-stitching position to another.

5 5. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a work-clamp, of a traveling work-holder, to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder relative to the said
10 clamp to feed the buttonhole-piece from one buttonhole-stitching position to another.

6. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and a feeding mechanism for the
15 latter, of a work-holder to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder relative to said clamp to feed the buttonhole-piece from one buttonhole-stitching
20 position to another.

7. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and a feeding mechanism for the
25 latter, of an automatic clamping and releasing mechanism, a work-holder to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder relative to said clamp when the latter is released to feed the buttonhole-piece
30 from one buttonhole-stitching position to another.

8. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a feeding mechanism for spacing the
35 stitches along the edges of the buttonholes, of an automatic buttonhole-cutting mechanism, a work-holder to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder
40 to feed the work from one buttonhole-stitching position to another.

9. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and feeding mechanism for the
45 latter, of an automatic buttonhole-cutting mechanism, a work-holder to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder to feed the work from one buttonhole-
50 stitching position to another.

10. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and feeding mechanism for the
55 latter, of an automatic clamp-returning mechanism, a work-holder to which a buttonhole-piece may be secured, and an automatic feeding mechanism for advancing said work-holder to feed the work from one buttonhole-
stitching position to another.

60 11. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a work-holding device, of an automatic feeding mechanism for advancing the work from one buttonhole-stitching position
65 to another, a starting and stopping mechanism for said stitch-forming mechanism, and a

second starting and stopping mechanism for said automatic work-feeding mechanism.

12. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a work-holding device, of an automatic feeding mechanism for advancing the
70 work from one buttonhole-stitching position to another, a starting and stopping mechanism for said stitch-forming mechanism, 75 and a second starting and stopping mechanism to start and stop the said automatic work-feeding mechanism, said starting and stopping mechanisms being reciprocally connected so that each throws the other into and
80 out of action to alternately start and stop the mechanisms with which they are connected.

13. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, an automatic buttonhole-cutting mechanism, and means for throwing said mechanisms
85 into and out of action alternately, of an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another and means by which said
90 feeding and cutting mechanisms are automatically and successively thrown into action when the stitch-forming mechanism is stopped.

14. In a buttonhole sewing-machine, the
95 combination, with a stitch-forming mechanism, a feeding mechanism for advancing the work beneath the needle, and an automatic feeding mechanism serving to advance the work from one buttonhole-stitching position
100 to another, of an automatically-operating buttonhole-cutter extending close up to the vertical plane of the needle, so that a buttonhole-slit formed thereby will be in position for the commencement of the sewing operation as
105 soon as made, and thus no time will be required between the cutting and stitching operations to feed the buttonhole-slit up to the needle.

15. In a buttonhole sewing-machine, the
110 combination, with a stitch-forming mechanism, of a work-holding device, an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, tension devices for the buttonhole-
115 threads, and automatic tension-releasing devices for removing the tension from said threads when the work is to be moved along to form a new buttonhole.

16. In a buttonhole sewing-machine, the
120 combination, with a stitch-forming mechanism, of a work-holding device, an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, tension devices for the buttonhole-
125 threads, automatic tension-releasing devices for removing the tension from said threads when the work is to be moved along to form a new buttonhole, and an automatic pull-off or thread-unwinding mechanism to draw slack
130 needle-thread from its spool when the work is thus automatically advanced.

17. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, a work-clamp, and an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, of an automatic releasing and clamping mechanism for releasing the clamping-feet from the work when the latter is to be fed along to bring it into position for a new buttonhole and for returning said feet to their clamping positions when the buttonhole-piece advancing or feeding operation has been effected.

18. In a buttonhole sewing-machine, the combination, with the stitch-forming mechanism thereof, of a work-clamp, an automatic feeding mechanism for advancing the buttonhole-piece from one buttonhole-stitching position to another, an automatic buttonhole-cutting mechanism, an automatic clamping and clamp-releasing mechanism, and alternately-acting automatic starting and stopping mechanism for said stitch-forming mechanism and for the said automatic feeding, cutting, and clamping and clamp-releasing mechanisms, whereby when a buttonhole-piece has been placed in position by the operator a series of buttonholes may be automatically cut and stitched, the work being automatically clamped and unclamped and automatically fed from one buttonhole-stitching position to another when unclamped, the stitch-forming mechanism being stopped when the automatic feeding and cutting mechanisms are operating, and vice versa.

19. In a buttonhole sewing-machine, the combination, with the stitch-forming mechanism thereof, of a work-clamp, an automatic barring mechanism, an automatic feeding mechanism for advancing the buttonhole-piece from one buttonhole-stitching position to another, an automatic buttonhole-cutting mechanism, an automatic clamping and clamp-releasing mechanism, an alternately-acting automatic starting and stopping mechanism for said stitch-forming and barring mechanisms and for the said automatic feeding, cutting, and clamping and clamp-releasing mechanisms, whereby when a buttonhole-piece has been placed in position by the operator a series of buttonholes may be automatically cut, stitched, and barred, the work being automatically clamped and unclamped and automatically fed from one buttonhole-stitching position to another when unclamped, the stitch-forming mechanism being stopped when the automatic feeding and cutting mechanisms are operating, and vice versa.

20. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, of a work-holding device, an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, an automatic stopping mechanism, and an adjustable automatic governing device acting on said stopping mechanism to effect a stoppage of the machine when a pre-

termined number of buttonholes has been worked.

21. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, of a work-clamp, an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, an automatic buttonhole-cutting mechanism, an automatic clamping and clamp-releasing mechanism, and alternately and reciprocally acting starting and stopping mechanisms for the said stitch-forming mechanism and for said automatic feeding, cutting, and clamping and clamp-releasing mechanisms, a tripping mechanism for disconnecting the said starting and stopping mechanisms from each other, and an adjustable governing device for the said tripping mechanism, whereby the latter may be thrown into action to suspend the operation of the machine when a predetermined number of successively-worked buttonholes has been completed.

22. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, of a work-clamp, an automatic barring mechanism, an automatic feeding mechanism for advancing the work from one buttonhole-stitching position to another, an automatic buttonhole-cutting mechanism, an automatic clamping and clamp-releasing mechanism, and alternately and reciprocally acting starting and stopping mechanisms for the said stitch-forming and barring mechanisms and for the said automatic feeding, cutting, and clamping and clamp-releasing mechanisms, a tripping mechanism for disconnecting the said starting and stopping mechanisms from each other, and an adjustable governing device for the said tripping mechanism, whereby the latter may be thrown into action to suspend the operation of the machine when a predetermined number of successively-worked buttonholes has been completed.

23. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a work-clamp, of an automatically-operating buttonhole-cutter having an eyelet-forming portion and an automatically-operating pin for ejecting from the said clamp the eye-pieces or disks of material cut from the work by the eyelet portion of said cutter.

24. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism and a feeding mechanism for spacing the stitches along the edges of the buttonholes, of a work-holder formed to correspond, approximately, to the shape of the buttonhole-piece and means for guiding said work-holder on the work-plate of the machine and for feeding it along from one buttonhole-stitching position to another.

25. In a buttonhole sewing-machine, a stitch-forming mechanism and a work-holder provided with a series of fingers to come between the buttonholes, said fingers having work-holding clamping devices, combined with

means for guiding said work-holder on the work-plate of the machine and for feeding it along from one buttonhole-stitching position to another.

- 5 26. In a buttonhole sewing-machine, the combination, with a stitch-forming mechanism, of a work-holder having a series of fingers to come between the buttonholes, said fingers extending partly but not entirely across
10 said holder, and means for guiding said work-

holder on the work-plate of the machine and for feeding it along from one buttonhole-stitching position to another.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD B. ALLEN.

Witnesses:

CHAS. ELKIN,
J. G. GREENE.