

J. KIEWICZ.
 BUTTONHOLE SEWING MACHINE.
 APPLICATION FILED APR. 10, 1911.

1,030,589.

Patented June 25, 1912.

7 SHEETS—SHEET 1.

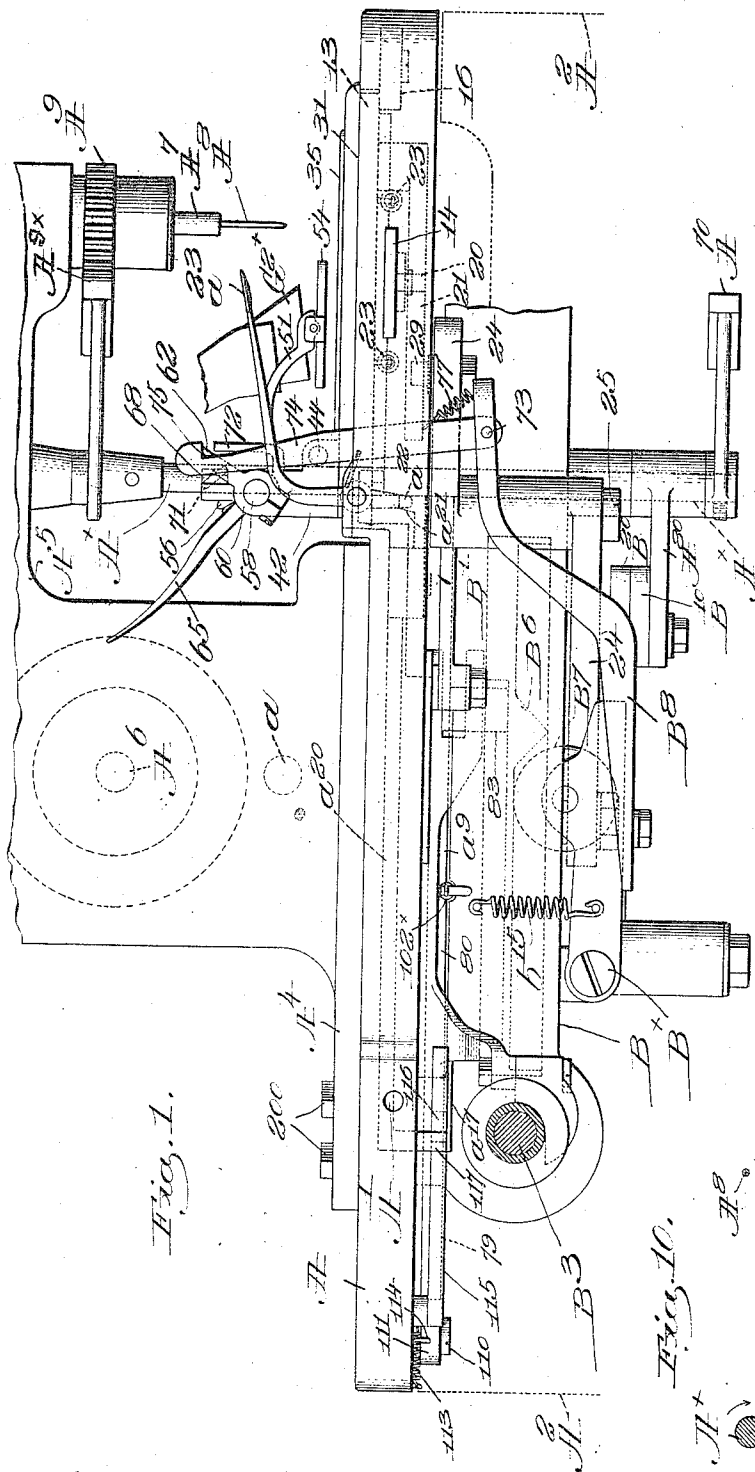


Fig. 1.

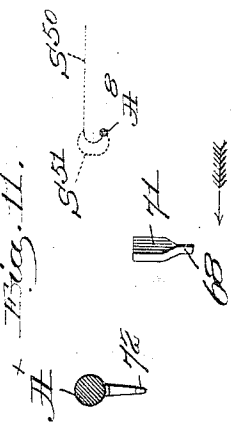
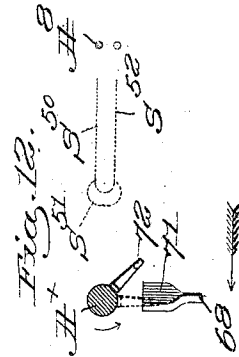
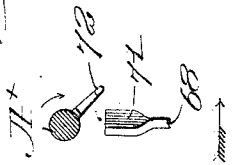


Fig. 10.

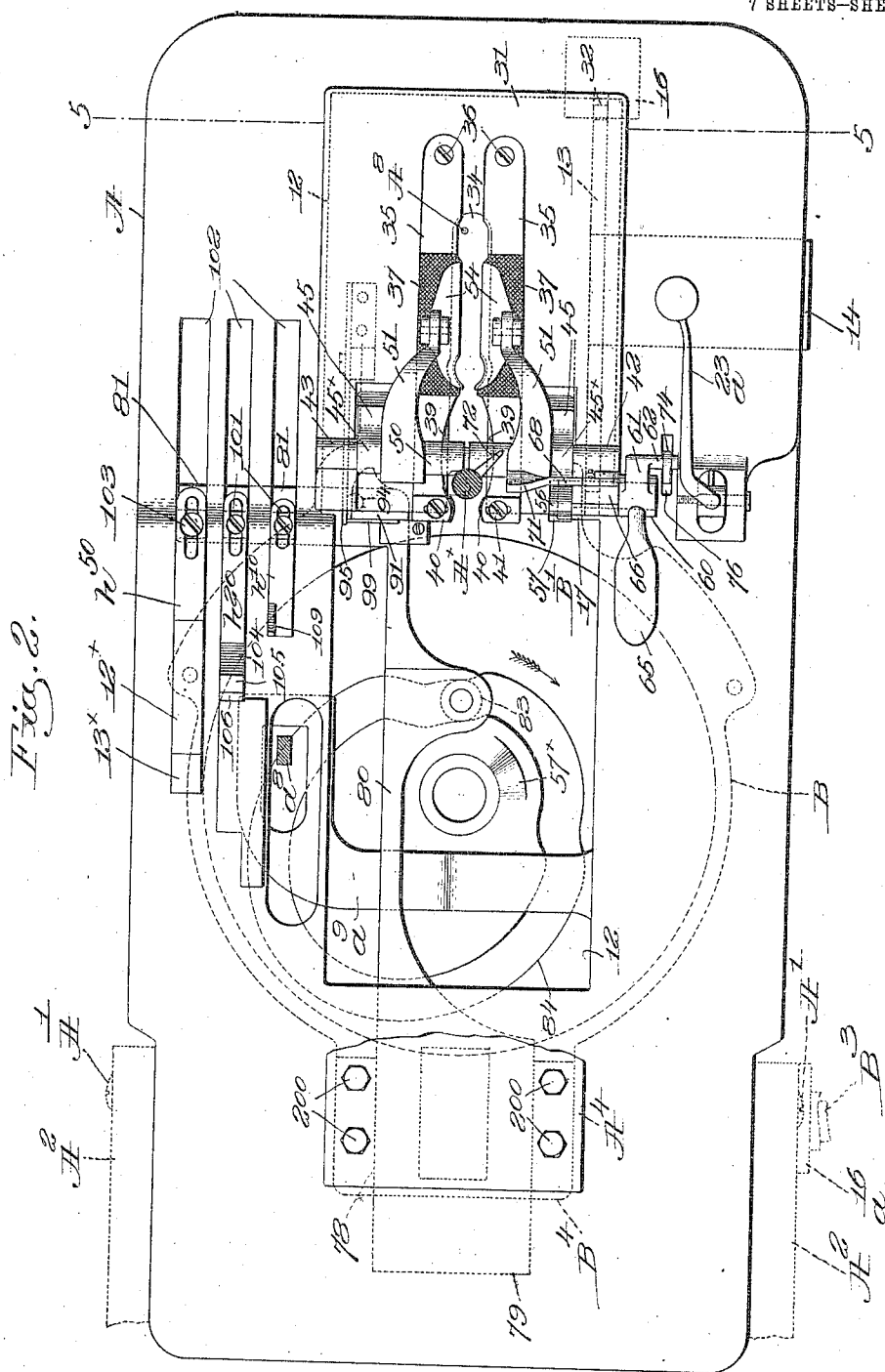


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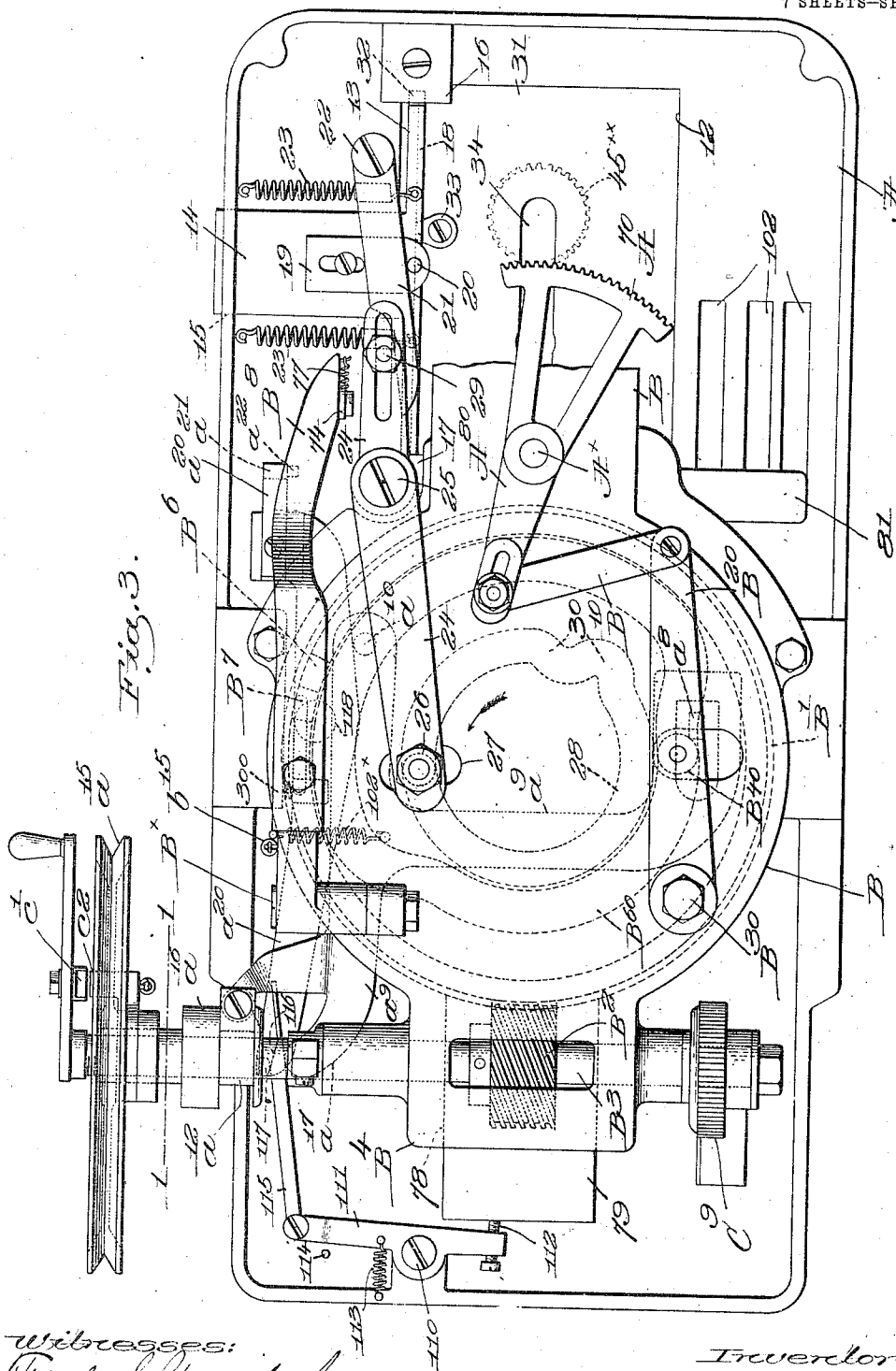


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7 SHEETS—SHEET 3.



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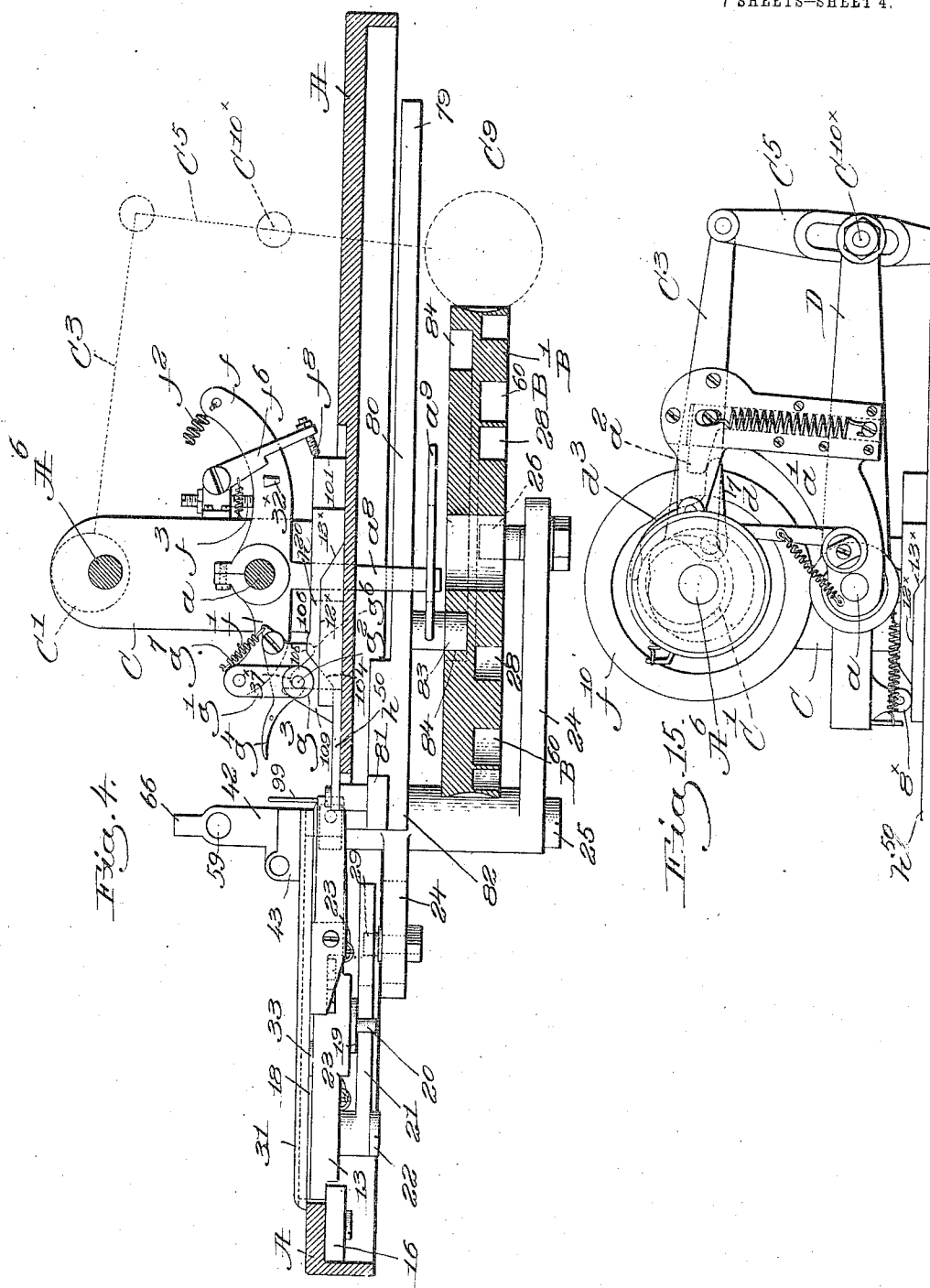
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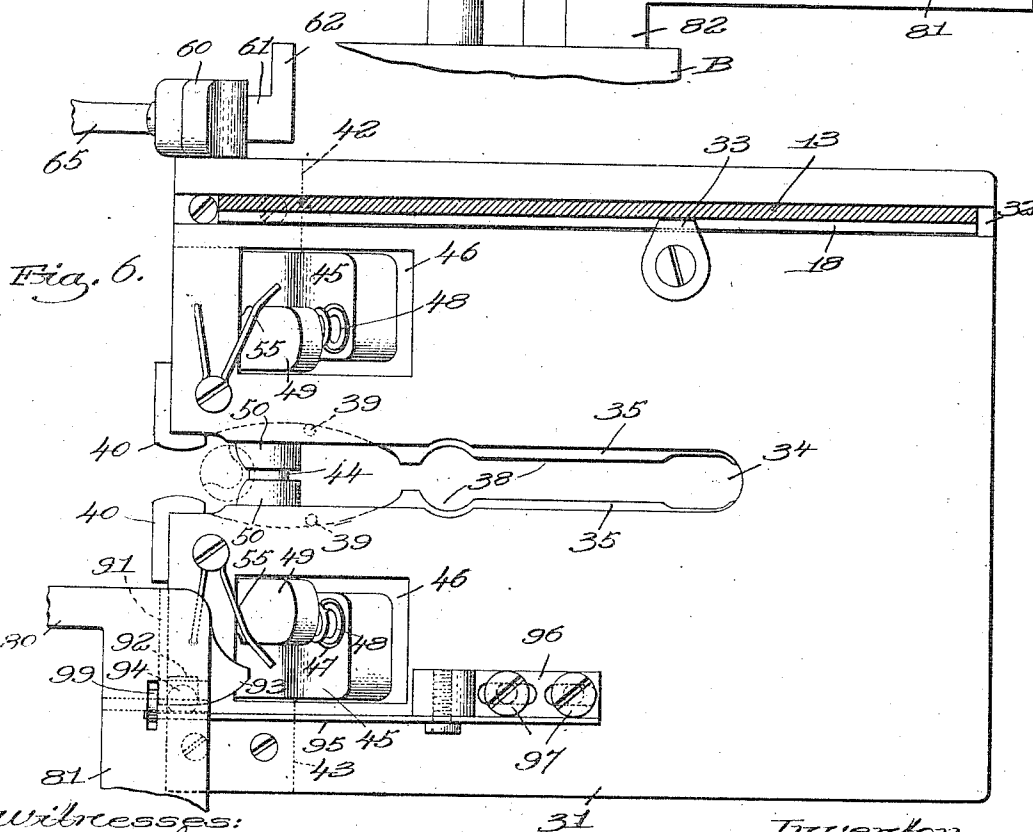
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7 SHEETS—SHEET 5.



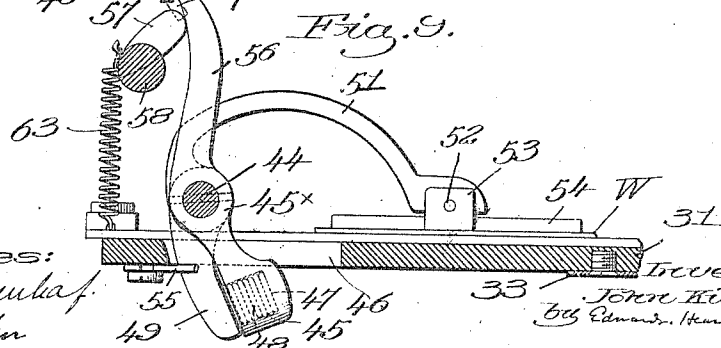
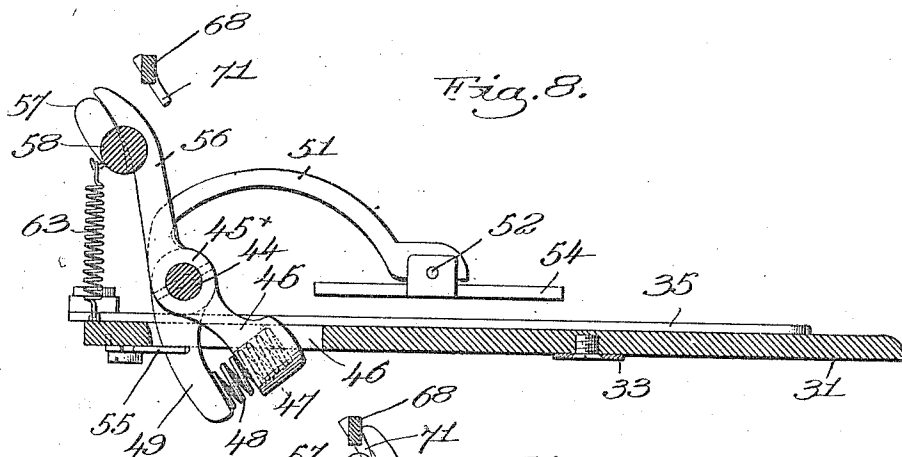
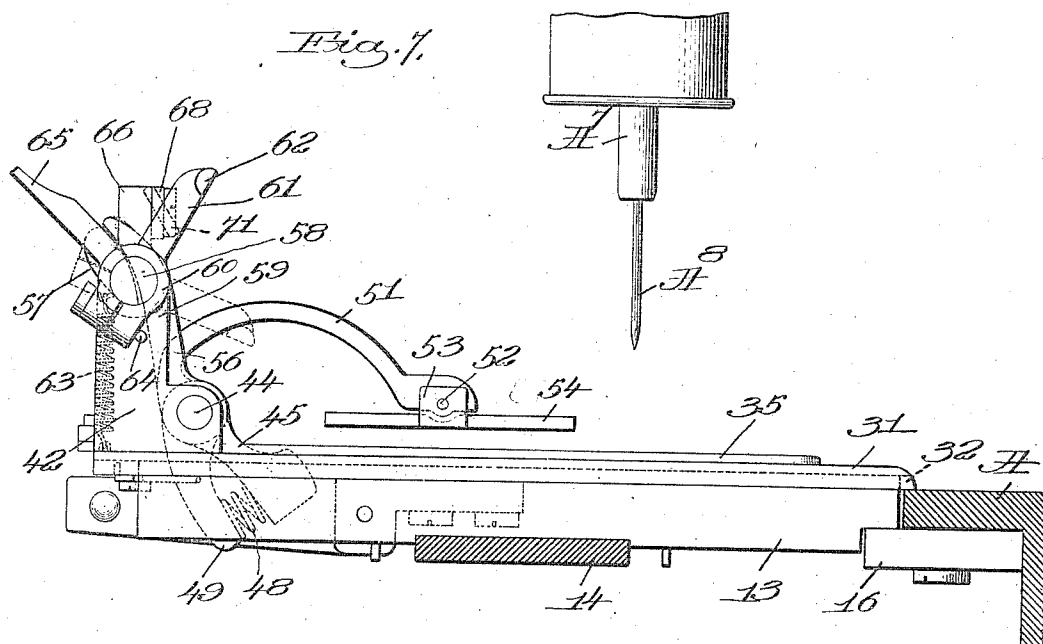
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7 SHEETS—SHEET 6.



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Fig. 13.

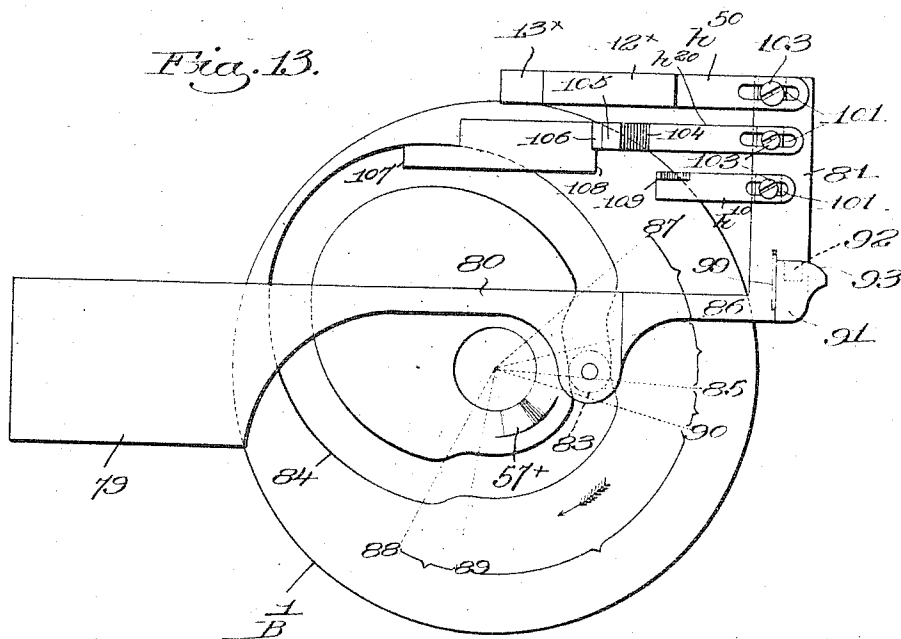
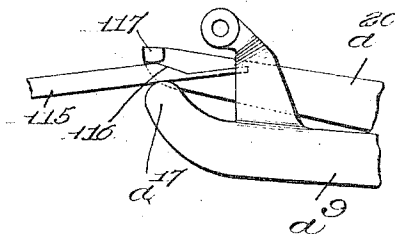


Fig. 14.



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UNITED STATES PATENT OFFICE.

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BUTTONHOLE-SEWING MACHINE.

1,030,589.

Specification of Letters Patent.

Patented June 25, 1912.

Application filed April 10, 1911. Serial No. 619,940.

To all whom it may concern:

Be it known that I, JOHN KIEWICZ, a citizen of the United States, and resident of Hyde Park, county of Norfolk, State of Massachusetts, have invented an Improvement in Buttonhole-Sewing Machines, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates more particularly to buttonhole sewing machines of the "Reece" type, and it has for its object the production of a machine of such general type embodying various novel features of construction and arrangement whereby the operation of the machine as a whole is improved, its running speed increased without objectionable vibration, and the adjustment of certain parts simplified.

In the Reece type of buttonhole sewing machine, exemplified in United States Patent No. 349,359 dated September 21, 1886, and No. 655,637, dated August 7, 1900, both granted to Reece, and also in the Hill Patent, No. 713,764, dated November 18, 1902, the working parts of the apparatus are mounted upon a heavy and stationary base, the stitch-forming instrumentality being carried by a frame which is moved automatically upon and with relation to the stationary bed-plate in the formation of the buttonhole, the work-clamp being held upon such bed-plate in fixed position. Of necessity the stitch-forming devices are heavy, and a strong and massive frame is requisite for their proper support, so that the weight of the moving parts in such a machine will be between 25 and 40 pounds, or more, according to the size of the machine as a whole. To effect the movement of the frame and the parts carried thereby requires a very considerable expenditure of power, and the momentum of this heavy movable mass of mechanism is also objectionable, for thereby the speed at which the machine can be run is limited. This is relative, however, for as a matter of fact these commercial machines are run at a high speed, but the demands for yet greater speed are insistent, and my present invention enables this desired increase of speed to be attained without detriment to the machine or to the work produced thereby.

It has been proposed heretofore to reduce the weight of the moving parts of a buttonhole sewing machine by mounting the stitch-forming instrumentality on a fixed frame, and moving the bed-plate; thus reducing somewhat the weight to be moved and decreasing the power required to operate the machine, but practical mechanical difficulties have more than offset the slight advantages secured, and so far as I am aware such machines have had a very limited use.

In my present invention the bed-plate and the frame carrying the stitch-forming instrumentality are rigidly connected and are held stationary upon the base of the machine, and the work-clamp alone is bodily movable, its movements being controlled automatically to effect the proper coöperation of the stitching and cutting devices therewith in the formation of a buttonhole. By this novel arrangement and construction I reduce the weight of the bodily movable part or parts to a minimum, whereby not only is less operating power required than heretofore but by the minimizing of the weight the momentum of the bodily movable work-clamp ceases to be a factor and the speed at which the machine can be run is limited only by the ability of the operator.

In the machine to be described herein I have made use of the stitch-forming instrumentality shown in the patents referred to, with practically the same general control of its operation, and I have herein utilized the high and low speed mechanism shown in said patents, so that in the drawings I have illustrated the old mechanisms only so far as they are necessary to a proper understanding of the novel features of my invention.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Hereinafter in describing the mechanism I have applied to old and well known parts, so far as possible, the reference characters employed in the prior patents above mentioned, in order that a clear understanding thereof may be had.

Figure 1 is a left-hand side elevation of a sufficient portion of a buttonhole sewing ma-

chine of the Reece type, with my present invention embodied therein, the stationary frame or head on which the greater portion of the stitch-forming instrumentality is mounted being broken off at the top, and the base being partly indicated by dotted lines for clearness of illustration, the various parts being shown in the position assumed after a buttonhole has been stitched and cut, with the work-clamp open, and the feed-shaft is shown in section on the line 1—1, Fig. 3; Fig. 2 is a top plan view of the bed-plate with the greater part of the frame or head omitted, the parts shown being in the position illustrated in Fig. 1; Fig. 3 is an underside view of the bed-plate and the mechanism mounted thereon, including the feed-controlling means, the means for opening and closing the work-clamp automatically, and a portion of the stitch-forming instrumentality; Fig. 4 is a right-hand side elevation and partial longitudinal section of the bed-plate and some of the devices mounted thereon for controlling the operation of the work-clamp and the stitch-forming instrumentality, the curb or casing for the main or feed-cam being omitted; Fig. 5 is an enlarged detail in front elevation and partial section, on the line 5—5, Fig. 2, of the work-clamp and its adjuncts, omitting parts which would obscure the view; Fig. 6 is an underside view, enlarged, of the movable work-clamp, to show more particularly the construction of the lower or main member of the clamp and its detachable connection with the work-clamp slide; Fig. 7 is an enlarged detail in side elevation of upper and lower members of the work-clamp and a portion of the devices for opening and closing the clamp, the bed-plate being shown in section; Figs. 8 and 9 are vertical sectional details on the line 8—9, Fig. 5, looking toward the right, showing the clamp open in Fig. 8 and closed in Fig. 9; Figs. 10, 11 and 12 are details, partly diagrammatic, designed to illustrate more clearly the bodily movement of the work-clamp during the formation of a buttonhole, such movement being taken with relation to a permanently positioned member of the stitch-forming instrumentality, and also with relation to the path of the needle at different periods in the cycle of operations by which the buttonhole is made; Fig. 13 is a top plan view of the work-clamp slide and the controlling cams carried thereby, the main cam by which the slide is actuated being shown beneath it; Fig. 14 is a detail of the rear end of the starting lever and adjacent parts shown in Fig. 3, the feed-shaft being omitted; Fig. 15 is a right hand side elevation of the means for clutching and unclutching the stitch shaft from its driving pulley.

The bed-plate A pivoted at A' on the base A², (shown in dotted lines Fig. 1), the stitch-

frame or head having a foot A⁴ seated on the bed-plate and the overhanging arm A⁵ having bearings for the shaft A⁶ which actuates stitch-forming mechanism comprising a needle-bar A⁷ carrying an eye-pointed needle A⁸ and slidable in a gear A⁹ meshing with a sector gear A^{9x} fast on the vertical rock-shaft A^x, may be and are all of well known construction substantially as shown in one or more of the patents referred to, with the important exception that herein the foot A⁴ of the stitch-frame is rigidly secured, as by bolts 200, to the bed-plate A. The complemental parts of the stitch-forming instrumentality located below the bed-plate include an under-thread carrying needle and a looper, (not shown herein) all substantially as in the Reece Patent No. 655,637, said complemental parts being operated by the gear 45^{xx} and sector gear A⁷⁰ fast on the lower end of the rock-shaft A^x, Figs. 1 and 3.

The shaft A^x is rocked by its attached arm A⁸⁰, connected by link B¹⁰ with the lever B²⁰ fulcrumed at B³⁰ on the curb or casing B secured to or forming a part of the bed-plate A, the lever B²⁰ having a roll or other follower B⁴⁰ cooperating with the groove B⁶⁰ in the main cam B' within the casing, see Fig. 3, all substantially as in Patent No. 655,637. Inasmuch as the stitch-forming instrumentality herein has no bodily movement relatively to the bed-plate A it is to that extent dissimilar to the structure disclosed in said patent, but the specific construction and mode of operation of the stitch-forming instrumentality involve no novel features so far as my present invention is concerned and require no further description or illustration. Said cam B' has usual peripheral worm-teeth to be engaged by the worm B² on the transverse feed-shaft B³ sustained in bearings in the rearward extension B⁴ of the curb, and the upper side of the cam in practice has a suitable projection 57^x to actuate the buttonhole cutter at the proper time, the only part of the cutter herein shown being indicated at G^{2x}, Fig. 1, the cutting mechanism being fully shown in the patent last referred to. A projection B⁶ on the underside of the cam intermittently engages a roll B⁷ on the clamp-closing lever B⁸ and depresses the lever against the pull of the spring 6¹⁵, Fig. 1, the lever being fulcrumed at B^x on a lug depending from the curb.

The shaft A⁶ which by its rotation actuates certain stitch-forming mechanism in well known manner, is operatively connected with the feed-shaft B³ by means substantially such as shown in the Hill patent, such means including an eccentric C⁷, (see dotted lines Fig. 4) cooperating arm C³, to rock the upright lever C⁵, a shiftable fulcrum stud C^{10x} for said lever, and a clutch device C⁹ connected with and rotating the

feed-shaft intermittingly. A portion of the mechanism just referred to is shown in Fig. 15. This step-by-step rotation of the feed-shaft is effected throughout the period that the stitch-forming instrumentality is operating to stitch the buttonhole.

The fulcrum stud C^{10x} is carried by the rear end of the lever D pivoted concentrically with the rock-shaft a on the bearing hub C, as in the Hill patent, the front end of the lever carrying a roll 8^x , Fig. 15, which coöperates with a stitch-controlling cam to be referred to hereinafter.

Referring to Fig. 15, the clutch-dog actuating lever a' fast on the right hand end of rock-shaft a , the spring-controlled stop-lug a^2 slidable in the lever a' , the depending arm a^3 fast on the opposite end of said rock-shaft, to at times actuate the three-armed lever a^9 pivoted at a^{10} on the underside of the bed-plate, the finger a^{12} on said lever, coöperating with the grooved hub a^{16} of the continuously driven pulley a^{15} rotatably mounted on the feed-shaft B^3 , and the lugs c' , c^2 carried by said shaft and pulley, respectively, to couple or connect said parts when the feed-shaft is to be driven at the higher speed, are and may be all substantially as in the Hill patent. It will be understood that when the buttonhole is being stitched the feed-shaft B^3 is rotated intermittently at the lower speed by its connection with the stitch-shaft A^6 , but when the work-clamp is moved toward or away from the stitching position, the said feed-shaft will be operatively connected with and driven at the higher speed by means of the pulley a^{15} with which said shaft is then clutched.

Before describing the novel features of the machine the cycle of operations involved in making a buttonhole will be set forth, starting with the work in the open-work-clamp and with the parts in the position shown in Fig. 1.

The operator depresses the starting lever a^{23} and thereby the feed-shaft B^3 is set into operation at the higher speed, the clamp being closed immediately upon the work, whereupon the work-clamp is moved forward bodily from the cutting position into position for the stitching to begin. When this position is reached the control of the feed-shaft is shifted automatically from the pulley a^{15} to the pulley f^{10} , then clutched to the stitch-shaft A^6 , bringing into action the stitch-forming instrumentality, and the work-clamp is again moved forward bodily, or to the right, Fig. 1, step by step while one side of the buttonhole is stitched. The needle-bar is now turned, as in the patents referred to, and a bodily lateral movement of the work-clamp is effected while the eye-end of the buttonhole is stitched, and there-
after the work-clamp is fed rearward step

by step while the second side of the buttonhole is stitched, thereby completing the stitching. At this point in the cycle the stitch-forming instrumentality is thrown out of operation by the unclutching of the stitch-shaft A^6 , and the high-speed pulley a^{15} is clutched to the feed-shaft to rotate the latter at the higher speed, which causes a rapid bodily movement of the work-clamp rearward to place the work beneath the cutter G^{2x} and the cutting mechanism is operated to cut the stitched buttonhole. During the cutting operation the work-clamp is held stationary, after which an additional and final rearward movement is given to the clamp, bringing it into the position shown in Fig. 1. The pulley a^{15} is unclutched from the feed-shaft just after the clamp is opened automatically, such opening of the clamp being effected simultaneously with the final rotative movement of the needle-bar to starting position for stitching, and the cycle of operations involved in the formation of the buttonhole is completed.

In accordance with my present invention the bed-plate has a large centrally disposed longitudinal and substantially rectangular opening 12 therein, see Figs. 2 and 3, extending from a point near the feed-shaft B^3 well forward toward the front end of said bed-plate. At one side of said opening, at the forward end thereof, is mounted a longitudinally extended guideway 13 having a rigidly connected lateral shank 14 slidable in an opening 15, see dotted lines Fig. 3, in the depending side rim or flange of the bed-plate, the front end of the guideway resting upon an ear 16 on the underside of the bed-plate, and at its inner end said guideway rests upon, a lug 17 projecting into the opening 12. Said guideway has a longitudinal groove 18 in its inner face, Fig. 5, and to the underside of the shank 14 is adjustably secured a plate 19 having a depending stud 20, Fig. 3, which is held against the inner edge of a horizontally swinging lever 21 fulcrumed at 22 on the bed-plate. Strong springs 23 attached at their outer ends to the bed-plate and at their inner ends to the guideway 13 not only hold the stud 20 in engagement with the lever 21 but they also effect outward lateral movement of said guideway.

A shifting lever 24 having a fixed fulcrum 25 carries at its rear end a roller or other stud 26 which passes through a hole 27, Fig. 3, in the bottom of the curb B and enters a groove 28 in the underside of the cam B' , the front end of the lever being slotted longitudinally for the reception of an adjustable stud 29 which coöperates with the outer edge of the lever 21. The cam groove 28 is circular for the greater part of its length, with a quick-motion portion

substantially S-shaped, to impart to the front end of the shifting lever 24 an out and in movement at each revolution of the cam B', whereby the guideway 13 is moved laterally outward from its normal position and then inward past normal, and back to normal as the roller 26 again enters the circular part of the cam groove. This lateral shifting of the guideway is effected when the needle is stitching around the eye-end of the buttonhole, and effects at such time the requisite lateral bodily movement of the work-clamp to enable the stitching to be performed properly.

The work-clamp, in accordance with my present invention, comprises essentially a lower member, upon which the work rests, upper clamping members mounted upon and movable relatively to the lower member, to clamp the work thereupon, and laterally movable spreaders located on the lower member of the clamp beneath the upper members, the clamped portion of the work being held between said upper members and the spreaders. The lower member of the clamp is herein shown as a rectangular metal plate 31 having near one of its side edges a longitudinal groove 32 in its lower face, to receive the guideway 13, see Figs. 5 and 6. A thin ear 33 on said member 31 is arranged to slidably enter the groove 18 in the guideway when the work-clamp is in position, preventing any lifting of the clamp during the operation of the machine, the bottom of the clamp member 31 resting upon the top of the bed-plate A around the sides and front end of the forward portion of the opening 12, as shown in Figs. 2 and 5, and as shown in Fig. 2 the clamp is in its extreme rearward position. The member 31 has an elongated central opening 34 for the passage of the needle A' during the stitching of the buttonhole, and on the top of said member, at each side of the needle opening, opposite and like spreaders 35 are mounted, fulcrumed at their front ends at 36, said spreaders having roughened portions 37, Fig. 2, to insure a firm hold upon the underside of the work when clamped. As shown in Figs. 2 and 6 the inner edges of the rearwardly extended and laterally swinging spreaders are shaped substantially to accord with the outline of the buttonhole to be stitched, as at 38. Inward movement of said spreaders is limited by stop pins 39, and a slotted toe 40 is adjustably mounted on the rear end of each spreader by a set-screw 41.

Bearings 42, 43 on the top of the clamp member 31 at its rear end support a transverse clamping rock-shaft 44 having fixedly attached to it the hubs of depending toes 45, which extend through suitable openings 46 in the member 31. The lower end of each toe is intumed and socketed at 47 for

the reception of a strong spring 48, Figs. 5 to 9, the free end of each spring bearing against the opposed tail 49 depending from the hub 50 of a curved and frontwardly extended arm 51 overhanging the clamp member 31. As shown in Figs. 2 and 5 the free ends of the arms 51 are bent inward toward each other to lie above the spreaders 35, and each arm has pivoted to it at 52 the slotted ear 53 of one of the upper clamping members 54, and as shown by dotted lines Fig. 7 each of said members has a slight rocking movement on its pivot to enable it to rest squarely and firmly upon the work, as is usual in the Reece type of machine.

In Fig. 9 the clamping members 54 are shown in clamping position upon the work W. The hubs 45* of the toes 45 are fixed on the shaft 44 adjacent the inner ends of the bearings 42, 43, and the hubs 50 of the clamp-carrying arms 51 are loose on said shaft between the hubs 45*. Springs 55 attached to the bottom of the clamp member 31 act upon the tails 49 to elevate the arms 51 and unclamp the work whenever the clamp-closing toes 45 assume the position shown in Figs. 5 to 8 inclusive, and thus the springs 55 may be termed clamp-opening springs. Said springs also tend normally to move the hubs 50 inward on the rock-shaft 44 so that the inner edges of the tails act upon the spreaders 35 and hold them against the stop pins 39, the lateral separation of the spreaders, effected by means to be described, thus moving with them—against the stress of the springs 55—the arms 51 and the upper clamping members 54 which at that time are in clamping position. When the rock-shaft 44 is turned to depress the toes 45 the springs 48 are compressed more or less, depending upon the thickness of the work, and they act upon the tails 49 to depress the front ends of the arms 51 and thereby to force the upper clamping members 54 firmly upon the work W, Fig. 9, the work then being clamped between said members 54 and the spreaders 35.

As herein shown the hub of the toe 45 adjacent the bearing 42 has a rigidly attached upturned dog 56 provided with a slightly concaved rear face; Figs. 8 and 9, with which coöperates a clamping cam 57 secured to or forming part of a transverse shaft 58 mounted to rock in the upright extension 59 of the bearing 42. A split hub 60 is clamped on the outer end of said shaft and has rigidly connected with it an actuating arm 61 provided with an out-turned lug 62 at its free end, for a purpose to be described, the shaft and clamping cam 57 being held by a spring 63 in inoperative position, shown in Figs. 5, 7 and 8, with a part of the hub 60 against a stop pin 64.

The hub 60 is also provided with a finger-piece 65, by means of which the clamp mechanism can be operated by hand when desired.

5 An ear 66 on the top of the extension 59 has pivoted to it at 67 an inwardly extended, transverse latch 68 normally held down against a stop pin 69 by a light spring 70, the latch crossing the path of movement of 10 the dog 56 to close the work-clamp, and in such movement the dog 56 wipes under and temporarily lifts the latch, the spring 70 pulling the latch down behind the tip of said dog, see Fig. 9, when the clamp is 15 closed. It will be apparent that the dog is now locked by the latch, with the upper clamping members 54 closed upon the work, and the work-clamp cannot be opened until the latch is tripped to release the dog, such 20 release permitting the springs 48 and 55 to move the various movable parts of the work-clamp to the positions shown in Figs. 5 to 8, and also in Fig. 1.

The inner end of the locking latch 68 is 25 bent to present a cam 71 inclined to the general plane of said latch, and at the proper time in the buttonhole making cycle said cam is acted upon by a tripping or releasing finger 72 on the vertical rock-shaft A^x, so 30 that as said finger engages the rear or under face of the cam 71 the rotation of the shaft A^x will cause the finger to elevate the cam and latch, to thereby release the dog 56 and permit the work-clamp to open by the means 35 described.

Referring to Fig. 1, the front end of the clamp-closing lever B^s has jointed to it at 73 an upturned latch-lever 74 having a notch 75 adapted to at times engage the lateral lug 62 on the rocker arm 61, previously 40 referred to, the lever passing through a slot 76 in the bed-plate, Fig. 2, and a spring 77 acts to yieldingly hold the lever against the front end of the slot.

45 When the parts of the machine are positioned as in Fig. 1 in readiness to begin the cycle of operations the operator depresses the starting lever a²³, and the machine is started with the high speed mechanism in 50 action, as usual, and the clamp-closing lever B^s is depressed. This action draws down the latch-lever 74, and as the lug 62 is in the notch 75 the cam-shaft 58 is turned from the position shown in Figs. 7 and 8 to that 55 shown in Fig. 9, the cam 57 swings forward the dog 56, and by the means described the clamp is closed upon the work, said dog passing under the latch 68 and as the latter drops down behind the dog the clamp is 60 locked in closed position. Such closing and locking of the clamp is thus effected automatically as the cycle of operations begins, and before the lever B^s again rises to normal position, such rise disengaging the 65 latch-lever 74 from the lug 62, leaving the

work-clamp free to be moved bodily during the remainder of the cycle. Should it become necessary to open the clamp by hand during the stitching operation the latch 68 is tripped by hand, and thereafter said 70 clamp can be again closed by means of the finger-piece 65.

The means for effecting the fore and aft movement of the work-clamp bodily will now be described, particular reference being 75 had to Figs. 2, 3, 4 and 13. The part B⁴ of the curb casting B in which the feed-shaft B³ has its bearings is provided with a centrally located, longitudinal guideway 78 for the reception of the rear end or tail 79 80 of the work-clamp slide or carrier 80, the peculiar shape of said carrier in plan being clearly shown in Fig. 13. In practice said carrier is made as a strong and rigid metal plate, the tail being widened to provide a 85 firm guide portion for coöperation with guideway 78, the front end of the carrier having a laterally extended head 81. The front end 82 of the carrier is slidably supported on the top of the curb casting B 90 which extends beneath the front part of the opening 12 in the bed-plate. A depending roller or other stud 83 depends from the carrier and enters a groove 84 in the top face of the main cam B', whereby the rotation 95 of the cam governs the fore and aft sliding movement of the carrier. Inasmuch as the movement is very important I have indicated on Fig. 13 the movements effected by 100 specific portions of the cam groove 84. During the angular movement of the cam B' from 85 to 86 the work-clamp is closed, as has been described, and from 86 to 87 the work-clamp is moved forward bodily by the 105 carrier from cutting position into position for the stitching of the buttonhole to begin, and as the roll 83 then traverses the long oval portion of the cam groove, (the cam B' moving through the angle 87—88) the 110 work-clamp is moved forward step by step while one side of the buttonhole is stitched, and backward while the opposite side is stitched. During the angular movement 115 from 88 to 89 the work-clamp is moved rearward to place the work in the clamp in position to be operated upon by the cutter, and the dwell portion of the cam groove from 89 to 90 maintains the clamp stationary during the operation of the cutter. From 90 to 85 the work-clamp is given a slight and final rearward movement to initial position and the machine stops, the cycle having been completed. 120 It may be stated that while the cam is revolved through the angle between 85 and 87 the high speed mechanism is in action, driven through the pulley a¹⁵, and the low speed mechanism, driven through pulley f¹⁰, Fig. 15, is in action during the revolution of the cam through the angle 87—88, and then the 125 high speed mechanism is again thrown into 130

action and continues in control until the angle 88—90—85 is traversed and the machine comes to a stop.

At the inner end of the head 81 the clamp carrier is provided with an upright ear 91 having a socket 92 in its outer vertical face, see dotted lines Fig. 13, the said face being extended frontwardly by a cam 93, the socket being adapted to receive a ball-like lateral projection 94 on a stiff spring-finger 95 fixed at one end on a lug 96 depending from the bottom of the clamp member 31, see Figs. 5 and 6, and adjustably held thereon by set screws 97. When the said member 31 is seated on the bed-plate A, in proper coöperation with the laterally movable guide bar 13, as has been described, it is slid rearward until the projection 94 rides upon the cam 93 and then snaps into the socket 92, detachably but positively connecting the work-clamp and its sliding carrier 80. When said parts are so connected the work-clamp moves frontward or rearward in unison with its carrier, as will be apparent, and when the guide bar 13 is moved laterally by the described devices during the turning movement of the needle when stitching the eye-end of the buttonhole the projection 94 can move inward and outward in the socket 92 while the lateral movement of the work-clamp is effected by said guide bar 13, the spring-finger 95 at such time maintaining the connection between the work-clamp and its carrier.

It is necessary at times to detach the work-clamp from the carrier, and to facilitate such detachment I have pivoted at 98 in the carrier head 81 a releasing lever 99, normally retracted by a spring 100, Fig. 5, and located just back of the ear 91. By swinging said lever to the right, Fig. 5, it presses against the free end of the spring-finger 95 and deflects it enough to withdraw the projection 94 from the socket 92, thereby disconnecting or uncoupling the work-clamp from the carrier.

The carrier head 81 has three upright posts 101 thereon, side by side, which project into three parallel fore and aft slots 102, Fig. 2, in the bed-plate A, and on each post is adjustably secured by a set-screw 103 a rearwardly extended cam bar, each of which performs a different function. The outermost cam bar h^{50} has a high part 12^x which is beveled at its rear end, at 13^x , and said bar coöperates with the roll 8^x , Fig. 15, serving as a stitch controller. During the stitching of one side of the buttonhole, when the work-clamp is moving frontward, the roll 8^x rests on the high part 12^x , and travels down the bevel 13^x when stitching around the eye begins, and when such stitching is completed the roll rides up the bevel, (the work-clamp then moving rearward) the roll resting on the high part 12^x when the other

side of the buttonhole is being stitched, the rise and fall of the roll 8^x shifting the fulcrum stud C^{10x} in a manner similar to that described in the Hill patent. As the stitch-controller cam bar h^{50} moves in unison with the work-clamp carrier the fore and aft adjustment of said bar by means of its set screw 103 provides for the stitching of buttonholes of different length.

In Fig. 15 the clutch-dog d^3 and its tail d^7 are as in the Hill patent, the engagement of the tail with the stop-lug a^2 operating to release or unclutch the pulley f^{10} from the stitch-shaft A^6 , and in Fig. 15 I have omitted parts shown in Fig. 4, to make the drawing clearer.

Referring now to Fig. 4 the oppositely extended arms f, f' on the hub of the depending arm a^8 ; the lug 32^x on arm f and the spring f^2 to lift said arm against the adjustable stop f^3 ; the pivoted latch f^6 shouldered to at times engage the lug 32^x , and the releasing projection f^8 on the latch, are all as in the Hill patent. So, too, the radius-bar g' pivoted on the arm f' and having a stud g^2 provided at the outer side of the bar with a roll g^3 ; the lever g^4 pivoted on the arm f' and having a toe g^6 and a notch 37^x to at times engage the inner end of stud g^2 , and the spring g^7 , are all as in the Hill patent, and operate as therein set forth.

The middle cam bar h^{2x} is the length-controlling bar, it also moving fore and aft in unison with the work-clamp, setting of said bar frontward by means of its set-screw 103 providing for a longer buttonhole, while rearward adjustment of the bar provides for the stitching of a shorter buttonhole, as will be obvious. Said cam bar has an incline 104 near its front end, an adjacent high part 105, and a short incline 106, Figs. 2 and 4, and the rear end 107 of the bar is adapted to coöperate at times with the projection f^8 .

The lever a' , Fig. 15, must be turned to disengage the stop lug a^2 from the tail of the clutch-dog d^3 in order to bring into action the stitch-forming mechanism by clutching the pulley f^{10} to the shaft A^6 , to rotate the latter.

Referring now to Fig. 4, when the frontward movement of the carrier 80 moves the work-clamp to the left to clamp the work and position it properly with relation to the stitch-forming devices, the roll g^3 (locked in the position shown in Fig. 4) will ride up the incline 104 as the cam bar h^{2x} moves frontward with the clamp carrier, and thereby the three-armed lever f, f', a^8 is turned to rock shaft a and lever a' is moved to release the clutch-dog, substantially as in the Hill patent while the arm a^8 swings the lever a^9 to unclutch the pulley a^{15} . As the arm f is depressed the latch f^6 is brought into engagement with the lug 32^x and there-

by the said three-armed lever is locked during the stitch-making period of the cycle. In order to release the radius-bar g' from the notched lever g^4 the toe g^6 of the latter engages the offset shoulder 108, Fig. 2, of the cam bar h^{20} as the clamp-carrier continues its movement to the left, Fig. 4, and lever g^4 is tilted out of engagement with the stud g^2 , so that the spring g^7 can swing upward the radius-bar and the notched lever, with the roll g^8 free from contact with the cam bar h^{20} , while the work-clamp moves frontward and then rearward during the stitch-forming period of the cycle. After the eye-end of the buttonhole has been stitched the work-clamp is moved rearward, or to the right, Fig. 4, while the second side of the buttonhole is stitched, and during this movement the projection f^3 is struck by the rear end 107 of the cam bar h^{20} , causing the latch f^6 to release the lug 32^x , permitting spring f^2 to turn the shaft a and lever a' into position to enable the stop-lug a^2 to engage the tail of the clutch-dog d^3 , Fig. 15, to unclutch the shaft A^6 from the pulley f^{10} . Simultaneously the arm a^8 is moved into position to permit the spring 102^x to operate the lever a^9 and again clutch the pulley a^{15} to the shaft B^3 . The stud g^2 is also brought into engagement with the upright re-setting abutment 109 on the innermost cam bar h^{10} , during the final rearward movement of the work-clamp carrier, to push the stud into operative engagement with the lever g^4 and thereby re-set the adjacent parts in the relative position shown in Fig. 4, in readiness for the commencement of the next cycle. As soon as the roll g^8 has reached the high part 105 of the cam the movement of the rock-shaft a and lever a' is completed, so far as release of the clutch-dog d^3 is concerned, hence the release of the radius-bar g' permits movement of the roll g^8 away from the cam-bar h^{20} , to avoid any interference with other parts of the mechanism as the cycle is continued and completed. I have made the bar h^{10} adjustable in order that the re-setting abutment 109 may be properly set, but ordinarily after the cam bars h^{10} and h^{50} are once set there is no occasion for re-adjustment. The set-screws 103 are at all times readily accessible at the top of the bed-plate A, and when it is necessary to make an adjustment it can be done rapidly and easily without any interference with the other parts of the mechanism. As the cam bars are all rigidly mounted on the carrier head 81 they move as a unit with the carrier and with the work-clamp in the frontward and rearward movements thereof, giving absolute positiveness to the relation of the parts at all times.

It will be seen that in their general functions the cam bars herein correspond to the

re-setting, length-controlling and stitch-controlling members shown in the Hill patent, but the manner in which they are mounted and actuated is of necessity materially different.

At the rear end of the bed-plate A, Fig. 3, I pivot upon its underside at 110 a lever 111 having at its inner end an adjustable stud 112 which lies in the path of the rear end of the carrier tail 79, a spring 113 operating to move the outer arm of the lever against a stop 114 when the carrier moves outward. The outer end of the lever has pivotally connected with it a link 115 having a cam face 116 adjacent its free and thin end, which link is interposed between the convexed end of the toe a^{17} on the rear end of the lever a^9 and a depending lug 117, see Fig. 14, on the underside of the lever a^{20} located on the underside of the bed-plate and pivoted thereon at 118, Fig. 3. The front end of lever a^{20} has a dog a^{21} thereon which is acted upon by the lower end a^{22} of the starting lever a^{23} , substantially as in the Hill patent, to hold the lever in the position shown in Fig. 3 when the machine is at rest. When the starting lever is moved to start the machine its lower end a^{22} is moved to the left, Fig. 3, away from the dog a^{21} , and immediately the strong spring 102^x operates to rock the lever a^9 , moving its rear end and the finger a^{12} outward, to thereby clutch together the pulley a^{15} and the feed-shaft B^3 , and at that time the thick part of the link 115 is in position between the lug 117 and the finger a^{17} . Consequently the clutching movement of lever a^9 causes its finger a^{17} to force outward the link and the lug 117, so that the lever a^{20} is rocked and the dog a^{21} moves inward in front of the end a^{22} of the starting lever, holding the latter temporarily in starting position. As the frontward movement of the work-clamp carrier is begun (under the influence of the high speed pulley a^{15}) the carrier tail 79 moves away from the stud 112 and the spring 113 rocks the lever 111 until its outer arm engages the stop 114, whereby the thick part of the link 115 is withdrawn from the finger a^{17} and lug 117, and then the lever a^{20} is free to be returned to its normal position by the action of the usual return spring 300, shown only in Fig. 3. When said lever is returned to normal position its dog releases the lower end a^{22} of the starting lever a^{23} , the latter, which is spring-controlled as in the patents referred to, then resuming its normal position, Fig. 1, and now the end a^{22} thereof is inside the dog a^{21} and the lever a^{20} is thereby held against any rocking movement. The clutch lever a^9 is rocked at the proper time to throw the pulley a^{15} out of action, and at the same time the low speed pulley f^{10} is thrown into action, all as has been described, to control the mechanism

while the stitching of the buttonhole is effected, and then the high speed pulley is again brought into action to effect the movement of the work-clamp into position for the cutter G^{2x} to operate. Thereafter the final rearward movement of the work-clamp carrier causes its tail 79 to engage the stud 112 and the lever 111 is rocked to force the thick part of the link 115 between the finger a^{17} and the lug 117. It will be remembered that as the lever a^{20} is now locked from swinging movement the lug 117 is held stationary and serves as an abutment past which the cam face 116 slides, so that the finger a^{17} is moved away from the lug 117 and thereby the clutch lever a^9 is returned to inactive position, Fig. 3, the finger a^{12} at such time effecting the unclutching of the pulley a^{15} , and the machine as a whole comes to rest, the cycle having been completed. Thus the stoppage of the machine is controlled by the movement of the work-clamp carrier to final position after the completion of the buttonhole, and the lever 111 and its connected link 115 constitutes a stopping device governed by the clamp carrier 80, and the link of such device is also made effective to impart the initial swinging movement to the lever a^{20} when the spring 102^x acts the first time to operate the clutch lever a^9 .

Referring to Fig. 2 it will be seen that when the clamp is closed upon the work the toes 40 of the spreaders are behind the vertical rock-shaft A^x , and as the closed work-clamp is moved frontward to position for the buttonhole to be stitched the toes pass on opposite sides of said rock-shaft and are thereby separated, to swing the spreaders 35 outward and thereby stretch the work. As the upper clamp members 54 are now clamping the work upon the spreaders the lateral movement of the latter causes the members 54 to move with them, the hubs 50 of the arms 51 sliding outward upon the shaft 44. The pressure of the clamp members 54 upon the spreaders holds them against the lower clamp member 31 in spread position during the stitching and cutting of the buttonhole, so that the portion of the work in which the buttonhole is to be made is held taut and stretched during such operation.

Referring to Fig. 10 the position of the rock-shaft A^x and its tripping finger 72 with relation to the latch cam 71 is shown at the commencement of the cycle of operations, and corresponds to the position of such parts shown in Figs. 1, 2 and 3. Now the work-clamp is moved frontward to stitching position, and the stitch-forming instrumentality is thrown into action while the frontward movement of the work-clamp is continued step by step and one side of the buttonhole is stitched as at S^{50} , Fig. 11, and then the rock-shaft A^x is turned to the position therein shown, with its tripping finger 72 in the

path of the latch cam 71, the turning of said rock-shaft causing the needle-bar to travel in an arc to stitch the eye-end S^{51} of the buttonhole, as in the patents referred to. During the stitching of the eye-end the work-clamp is moved laterally by or through the operation of the laterally movable guideway or bar 13, previously described, and now the second side of the buttonhole is to be stitched. Beginning with the parts in the relative position shown in Fig. 11 the work-clamp is moved rearward step by step and the second side S^{52} of the buttonhole is stitched, see Fig. 12, and the stitching is completed, so that the stitch-forming instrumentality is thrown out of action and the high speed pulley a^{15} is thrown into action to continue at a rapid rate the rearward movement of the work-clamp. As the latter is about to attain its final rearward position the rock-shaft A^x is turned to restore the needle-bar and needle to starting position in readiness for the next cycle, and as the finger 72 turns from dotted to full line position, Fig. 12, it wipes under the cam 71 and raises the latch 68 to release the dog 56, and thereupon the work-clamp is opened to release the work.

In Fig. 2 I have not lettered the different portions of the cam groove 84, as the said portions are fully and clearly indicated in Fig. 13.

From the foregoing description, taken in connection with the drawings, it will be seen that while various portions of the mechanism are substantially the same as are shown in the Reece and Hill patents to which reference has been made the general arrangement and operation of the machine as a whole is materially different, rendered necessary by making the stitch-forming instrumentality stationary as a whole, and mounting it upon the bed-plate, while the work-clamp and its adjuncts, (having very little weight) are made to move bodily upon and with relation to the bed-plate. This construction reduces the operating power necessary to run the machine as a whole, and enables me to operate it at a very much higher rate of speed without any improper and objectionable vibration or jar.

While I have herein referred to high speed and low speed mechanisms for controlling the operation of the machine in alternation these terms are used relatively, for purposes of distinction, and have no connection with the speed of operation of the machine as a whole.

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

1. In a buttonhole sewing machine, a stationary bed-plate having a fixed guideway on its underside, a stitch-forming instrumentality supported by the bed-plate, a

work-clamp movable upon the upper side of the bed-plate into and out of position with relation to said stitch-forming instrumentality, actuating means for said work-clamp, including a reciprocating carrier slidably mounted on the underside of the bed-plate and movable longitudinally in said guideway in a fixed path in the direction of the length of a buttonhole, separate means to impart a lateral movement to said work-clamp during the stitching of the eye-end of a buttonhole, and a positive connection between the carrier and work-clamp permitting lateral movement of the latter relatively to the carrier, said connection comprising a laterally yielding member on one of said parts to enter a lateral socket in the other of said parts.

2. In a buttonhole sewing machine, a stationary bed-plate having an opening therein, a stitch-forming instrumentality, supporting means therefor fixedly attached to the bed-plate, a work-clamp movable inward and outward on said bed-plate over the opening therein, said opening providing for the operation of the complementary parts of the stitch-forming instrumentality above and below the bed-plate, a clamp-carrier, means to reciprocate it to effect the fore and aft movement of the work-clamp during the formation of a buttonhole, a fixed guideway on the bed-plate, in which said carrier is reciprocated, a detachable connection between the work-clamp and said carrier, said connection comprising a spring-controlled member on one of said parts to enter a lateral socket in the other part, and means independent of the carrier-reciprocating means to effect periodical lateral movement of the work-clamp relatively to the clamp-carrier.

3. In a buttonhole sewing machine, a stationary bed-plate having an elongated opening, a stitch-forming instrumentality mounted on said bed-plate and adapted to form stitches at a substantially fixed point relatively thereto, a laterally movable guideway mounted on and beneath the bed-plate within the opening thereof and parallel to the length of the buttonhole to be stitched, mechanism to move the guideway laterally and periodically, a work-clamp having a lower member grooved longitudinally on its underside to slidably engage the guideway, a device to prevent accidental disconnection of the latter and the work-clamp, and mechanism positively connected directly with the lower member of the work-clamp to move it bodily upon and lengthwise of the guideway, to position the work with respect to the stitch-making point during the stitching of the opposite sides of the buttonhole, the lateral movement of the guideway causing bodily lateral movement of the work-clamp in unison therewith.

4. In a buttonhole sewing machine provided with a stitch-forming instrumentality adapted to make overedge stitches, a stationary bed-plate on which said instrumentality is supported, a work-clamp comprising upper and lower members, the lower member being slidably upon the bed-plate in the direction of the length of a buttonhole and also at right angles thereto, a reciprocating carrier slidably mounted on the bed-plate and connected with the work-clamp, a fixed guideway on the underside of said bed-plate in which the carrier is movable longitudinally and by which the carrier is held from lateral movement, an actuating cam for the carrier, a guide-bar movably mounted in the bed-plate and parallel to the length of the buttonhole to be stitched, and in direct and continuous sliding engagement with the lower member of the work-clamp adjacent one side thereof, and means to move said guide-bar, and through it the work-clamp, in a lateral direction bodily when the eye-end of the buttonhole is being stitched, the connection between the carrier and the work-clamp comprising a lateral member on one of said parts to enter freely a lateral socket in the other part, thereby permitting lateral movement of the work-clamp relatively to the carrier.

5. In a buttonhole sewing machine provided with a stitch-forming instrumentality adapted to make overedge stitches, a stationary bed-plate on which said instrumentality is supported, a work-clamp movable upon said bed-plate longitudinally and laterally with respect to the stitch-making point, said clamp having a lower member provided with a longitudinal groove in its under side, a guide-bar mounted on the bed-plate and laterally movable thereon, to enter the groove in said clamp member, means to lock said member and the guide-bar in sliding engagement, mechanism to effect periodical lateral movement of the guide-bar, a longitudinally reciprocating carrier slidably mounted on the bed-plate, a separable, laterally yielding connection between said carrier and the lower member of the work-clamp, whereby the latter is moved longitudinally by the carrier when the sides of the buttonhole are being stitched, the said connection permitting lateral movement of the clamp when the eye-end of the buttonhole is being stitched, and a manually operated device to separate said carrier and the work-clamp.

6. In a buttonhole sewing machine provided with a stitch-forming instrumentality adapted to stitch a buttonhole, a work-clamp comprising a centrally slotted lower member and cooperating upper clamping members at the sides of the slot, a transverse rock-shaft mounted on the lower member, overhanging arms fulcrumed on said rock-shaft and supporting the upper clamping

members, each arm having an extension depending below the lower member of the clamp, downturned toes fast on the rock-shaft and opposite said extensions, a spring interposed between each extension and its cooperating toe; means to rock said shaft and thereby cause the toes to compress the springs and cause the upper clamping members to descend upon the work, the springs permitting work of varying thickness to be clamped, and means to lock the rock-shaft when the upper clamping members are depressed, combined with mechanism to move the work-clamp bodily with relation to the stitch-forming instrumentality during the stitching of a buttonhole, and a device to release the rock-shaft after the completion of a buttonhole.

7. In a buttonhole sewing machine, a work-clamp comprising a lower member centrally slotted for a portion of its length, cooperating upper clamping members at the sides of the slot, supporting arms for and connected with said upper members, a common fulcrum for said arms, mounted on the lower member and on which fulcrum said arms are movable laterally toward and from each other, laterally movable spreaders on the lower member, beneath the upper clamping members, yielding means to normally move said arms inward on the fulcrum and thereby move the upper clamping members and the spreaders toward the longitudinal axis of the slot in the lower member of the clamp, each arm having a depending part engaging the adjacent spreader, and means to swing the supporting arms on said fulcrum and cause the upper clamping members to clamp the work between them and the spreaders, combined with a stitch-forming instrumentality to stitch a buttonhole, mechanism connected with the lower member of the clamp to move said work-clamp bodily with relation to the said instrumentality during the stitching of a buttonhole, and a relatively fixed device to cooperate directly with and separate the spreaders before the stitching begins and thereby stretch the clamped work above the slot in the lower clamp member.

8. In a buttonhole sewing machine provided with a stitch-forming instrumentality including a vertical rock-shaft rotated at predetermined intervals, a stationary bed-plate on which said instrumentality is mounted and having an opening through which the rock-shaft extends, a work-clamp bodily movable upon the bed-plate and over the opening therein to present the clamped work to said stitch-forming instrumentality, said clamp including a lower member and upper clamping members carried thereby, a dog movable into operative position when the clamp is closed, and a transversely extended latch to engage said dog and hold

it from movement, to lock said members in closed position, the dog passing under and momentarily lifting the latch as the clamp is closed, means to effect bodily movement of the work-clamp during the stitching of a buttonhole, means to close the clamp prior to the stitching operation and thereby effect movement of the dog into locking engagement with the latch, and a latch-releasing device on said rock-shaft brought into position by rotation of the rock-shaft to engage and lift the latch out of engagement with and thereby release the dog, to permit the opening of the work-clamp when the latter is returned to normal position after the completion of a buttonhole.

9. In a buttonhole sewing machine provided with a stitch-forming instrumentality including a vertical rock-shaft rotated at predetermined intervals, a stationary bed-plate on which said instrumentality is mounted and having an opening through which the rock-shaft extends, a work-clamp bodily movable upon the bed-plate to present the work to the stitch-forming instrumentality, said clamp embodying upper and lower clamping members to receive the work between them, the lower member having a central slot into which the rock-shaft can pass, clamp-closing devices, and a transversely extended latch to retain the clamp closed, said latch being pivotally mounted on the lower clamp member and having at its inner end a cam, means independent of the clamp to actuate said closing devices prior to the stitching operation and bring them under the control of the latch, mechanism to effect bodily movement of the work-clamp during the formation of a buttonhole and to thereafter return the clamp to normal position, and means mounted on and operatively positioned by rotative movement of the said rock-shaft to engage the cam of and rock the latch to release the clamp-closing devices from control of said latch and permit opening of the work-clamp after the completion of a buttonhole.

10. In a buttonhole sewing machine provided with a buttonhole-cutting device and a stitch-forming instrumentality fixedly positioned as a whole with relation to said cutting device, in combination, a stationary bed-plate by which said instrumentality is supported, a work-clamp bodily movable upon the bed-plate to present the work to said stitch-forming instrumentality and thereafter to the cutting device, to effect first the stitching and then the cutting of a buttonhole, means beneath the bed-plate and operatively connected with the work-clamp to effect the bodily movement thereof, a high speed mechanism to actuate said means when the work-clamp is moved to stitching position and thereafter to cutting position, a low speed mechanism to actuate said

means during the stitching of the buttonhole, and devices moving with the work-clamp to throw said high and low speed mechanisms into and out of action, at the proper times.

11. In a buttonhole sewing machine provided with a buttonhole-cutting device and a stitch-forming instrumentality fixedly positioned as a whole with relation to said cutting device, in combination, a stationary bed-plate by which said instrumentality is supported, a work-clamp bodily movable upon the bed-plate to present the work to said stitch-forming instrumentality and to the cutting device, in alternation, means, including a carrier longitudinally slidable beneath the bed-plate and connected with the work-clamp, to effect bodily movement of the latter from stitching to cutting position, and vice versa, and during the stitching operation, high speed mechanism to actuate said means when the stitch-forming instrumentality is inoperative, low speed mechanism to actuate said means during the stitching operation and also operating said stitch-forming instrumentality, controlling members mounted on the carrier to govern the action of said high and low speed mechanism, and means mounted on the bed-plate and actuated by said carrier upon its return to initial position to effect stoppage of the machine as a whole when the buttonhole has been stitched and cut.

12. In a buttonhole sewing machine, a stitch-forming instrumentality, a stationary bed-plate having a fixed longitudinal guideway on its underside, a work-clamp, means, including a reciprocating carrier slidably mounted in said guideway at the underside of the bed-plate, to move the clamp bodily in the direction of the length of a buttonhole, said clamp comprising lower and upper members, the lower member having a longitudinal groove in its underside adjacent one of its side edges, separate means, including a laterally movable and elongated guide member in said groove and in sliding engagement throughout its length with the said lower member of the work-clamp, to move the latter periodically and bodily at right angles to the path of movement of the carrier, said carrier and guide member being maintained in parallelism at all times, high and low speed mechanisms, and means to throw said mechanisms into action in alternation to effect the reciprocating movement of the clamp carrier.

13. In a buttonhole sewing machine, a stitch-forming instrumentality, a stationary bed-plate, a work-clamp, means, including a reciprocating carrier slidably mounted at the underside of the bed-plate, to move the clamp bodily in the direction of the length of a buttonhole, separate means, including a member in sliding engagement with the

work-clamp, to move the latter periodically at right angles to the path of movement of the carrier, and a detachable socket and lug connection between said carrier and the work-clamp, whereby the latter may be moved laterally with relation to its carrier while positively connected therewith.

14. In a buttonhole sewing machine, a stitch-forming instrumentality, a stationary bed-plate, a work-clamp, means, including a reciprocating carrier slidably mounted at the underside of the bed-plate, to move the clamp bodily in the direction of the length of a buttonhole, separate means, including a member in sliding engagement with the work-clamp, to move the latter periodically at right angles to the path of movement of the carrier, said carrier having a lateral socket in one side thereof, and a yieldingly sustained lug attached to the work-clamp and adapted to snap into the socket, to thereby detachably and positively connect the work-clamp and the carrier.

15. In a buttonhole sewing machine, a stationary bed-plate, a work-clamp longitudinally movable thereon, a reciprocating carrier on said bed-plate and positively connected at one end with the work-clamp, a fixed guideway on the bed-plate to cooperate with the other end of the carrier, a rotating cam cooperating with the carrier to move it and the work-clamp in one direction and then in the opposite direction for the stitching of first one and then the other side of the buttonhole, said cam having a dwell portion to retain the carrier temporarily at rest between such movements thereof, and separate means cooperating with and to move the work-clamp laterally relatively to said carrier while the carrier is at rest and the end of the buttonhole is being stitched, combined with a stitch-forming instrumentality to effect the stitching of the buttonhole, low speed mechanism to effect the rotation of said cam when the stitch-forming instrumentality is in action, and high speed mechanism to effect rotation of the cam when said instrumentality is out of action.

16. In a buttonhole sewing machine, a bed-plate, a work-clamp movable thereon longitudinally and laterally, said clamp including a lower member, means, including a sliding carrier longitudinally movable in a fixed path beneath the bed-plate, to effect longitudinal bodily movement of the work-clamp, an ear on the carrier provided with a lateral socket, a positive, laterally movable connection between the carrier and the clamp, comprising a spring finger on the lower member of the work-clamp, and a lateral projection on the finger to enter the socket in the ear of the carrier, and periodically acting means to move the work-clamp bodily and laterally on the bed-plate and relatively to the carrier.

17. In a buttonhole sewing machine provided with a stitch-forming instrumentality and a cutting device, a work-clamp, stopping means for the machine, a reciprocating carrier positively connected with the work-clamp to move the latter frontward and backward during the stitching of the sides of a buttonhole and then into position for the cutting device to cut the material in the work-clamp, said carrier thereafter effecting an additional and final backward movement of the work-clamp, an actuating device for said stopping means, set in operation by such additional and final movement of the carrier after the cutting device has operated, and means mounted upon and grooved as to its operation by a member of the stitch-forming instrumentality to open simultaneously the clamp for the release of the material.

18. In a buttonhole sewing machine having a cutting device and a stitch-forming instrumentality actuated in alternation and relatively fixed with relation to each other, a bodily movable work-clamp, means to move it to position the work first with relation to the stitch-forming instrumentality while it is in action and then with relation to the cutting device while said instrumentality is at rest, said means including a reciprocating carrier positively connected with the work-clamp, mechanism to actuate the stitch-forming instrumentality, and a controlling member adjustably mounted on the carrier to govern the period during which said actuating mechanism shall operate.

19. In a buttonhole sewing machine, a bed-plate, a stitch-forming instrumentality thereon, including an operating shaft fixedly positioned with relation to the bed-plate, driving means to rotate said shaft, controlling mechanism to throw the driving means into and out of action, a work-clamp bodily movable on the bed-plate and with relation to the stitch-forming instrumentality, means, including a carrier operatively connected with the work-clamp, to effect bodily movement of the latter, and a length-controlling member adjustably mounted on said carrier to cooperate with said controlling mechanism and determine the time when the driving means shall be thrown into

and out of action, adjustment of said length-controlling member varying the length of the buttonhole to be stitched.

20. In a buttonhole sewing machine, a bed-plate, a stitch-forming instrumentality fixedly mounted thereon, driving means for said instrumentality, controlling mechanism to throw the driving means into and out of action, to thereby start and stop the stitching operation, a work-clamp bodily movable on the bed-plate relatively to the stitch-forming instrumentality, a positively reciprocated carrier to effect bodily movement of the work-clamp, and a member adjustably connected with said carrier and accessible at the top of the bed-plate, to cooperate with said controlling mechanism and cause the driving means to be thrown into and out of action, adjustment of said member determining the length of the buttonhole to be stitched.

21. In a buttonhole sewing machine, a bed-plate, a stitch-forming instrumentality fixedly mounted thereon and adapted to stitch the opposite sides and the eye-end of a buttonhole, mechanism to throw said instrumentality into and out of action, mechanism to govern the spacing of the stitches for the sides and eye-end of the buttonhole, a work-clamp, means including a carrier slidably mounted on the bed-plate, to move said work-clamp bodily lengthwise of the buttonhole during the stitching of the opposite sides thereof, other means to move the work-clamp laterally when the eye-end is being stitched, and independent controlling members adjustably mounted on said carrier, one of said members cooperating with and controlling the mechanism which throws the stitch-forming instrumentality into and out of action, to govern the length of the buttonhole, the other of said controlling members cooperating with and controlling the operation of the mechanism which governs the spacing of the stitches.

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

JOHN KIEWICZ.

Witnesses:

HAROLD J. WOOD,
E. PAUL SCHOLZ.

It is hereby certified that in Letters Patent No. 1,030,589, granted June 25, 1912, upon the application of John Kiewicz, of Hyde Park, Massachusetts, for an improvement in "Buttonhole-Sewing Machines," an error appears in the printed specification requiring correction as follows: Page 12, line 16, for the word "grooved" read *governed*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of July, A. D., 1912.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.