(No Model.) 3 Sheets—Sheet 1.

W. RAEUCHLE.

BUTTONHOLE SEWING MACHINE.

No. 574,166. Patented Dec. 29, 1896.

Fig. 7.

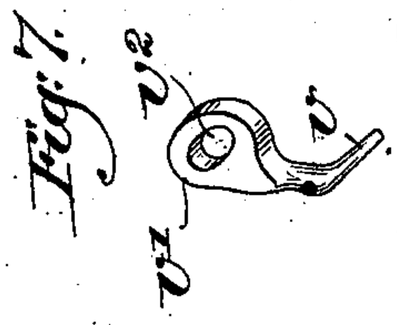
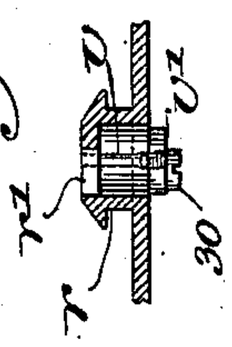
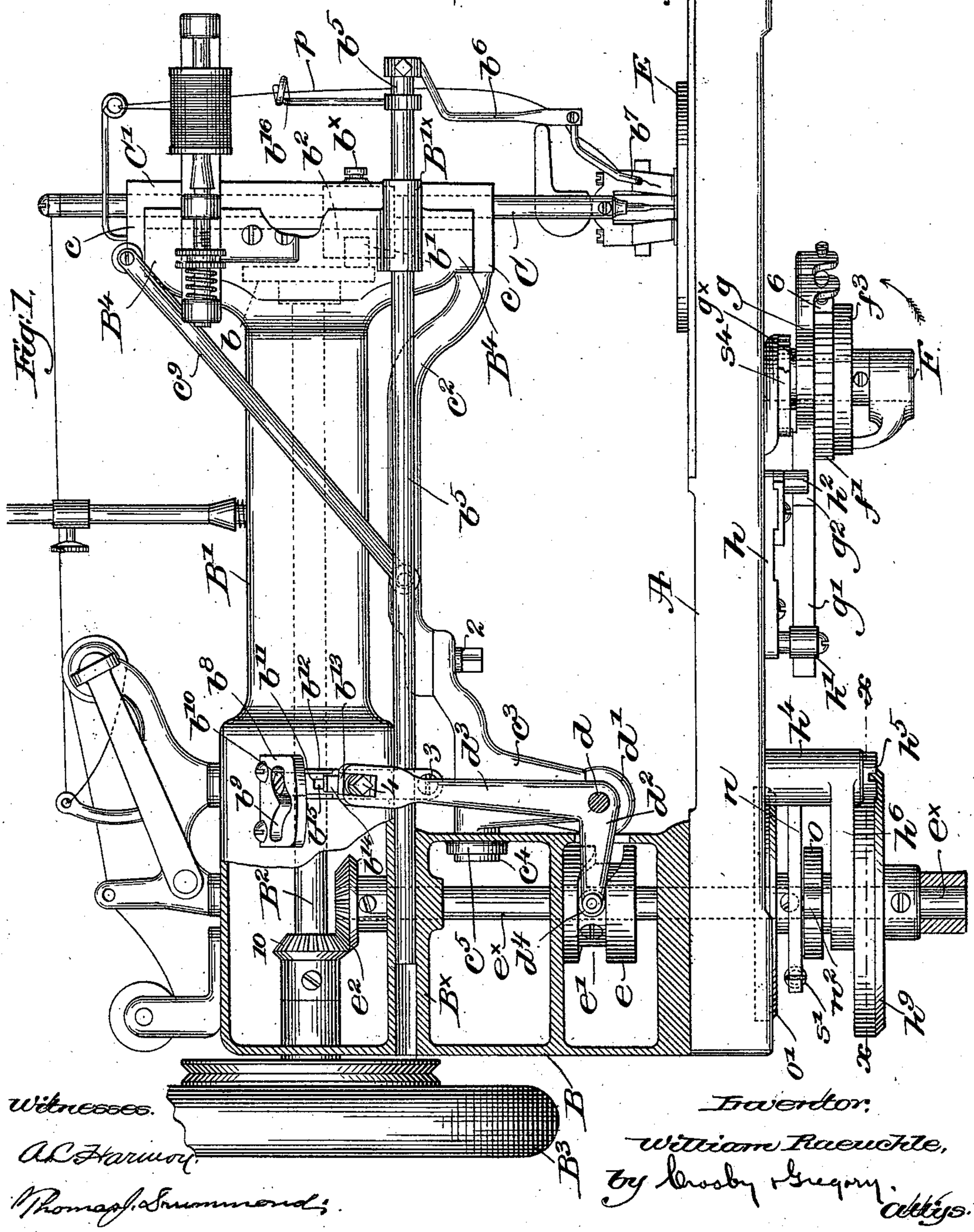


Fig. 8.





Witnesses.

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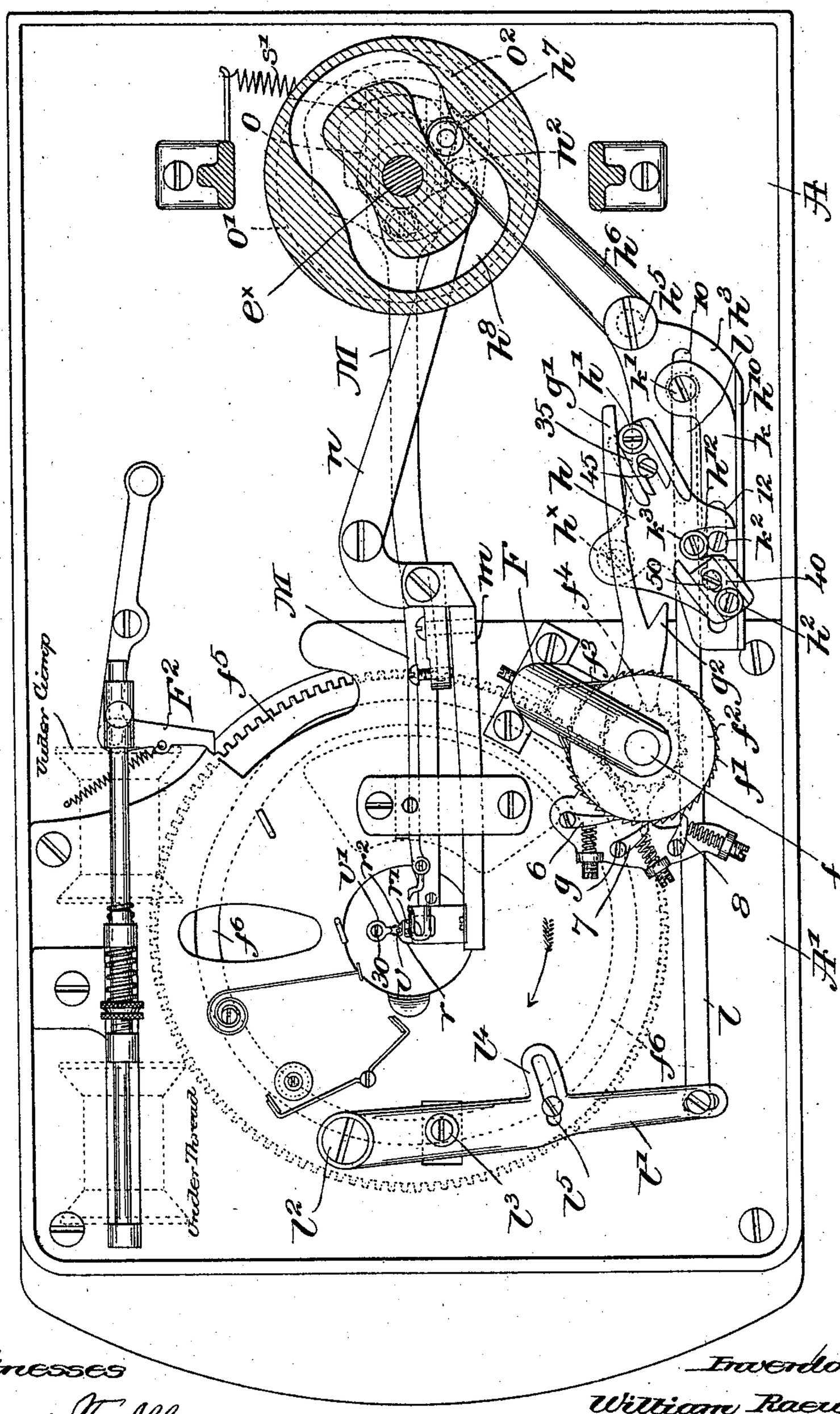
(No Model.) 3 Sheets—Sheet 2.

W. RAEUCHLE.

BUTTONHOLE SEWING MACHINE.

No. 574,166. Patented Dec. 29, 1896.

Fig. 2.



Witnesses
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(No Model.) 3 Sheets—Sheet 3.

W. RAEUCHLE.

BUTTONHOLE SEWING MACHINE.

No. 574,166. Patented Dec. 29, 1896.

Fig: 3.

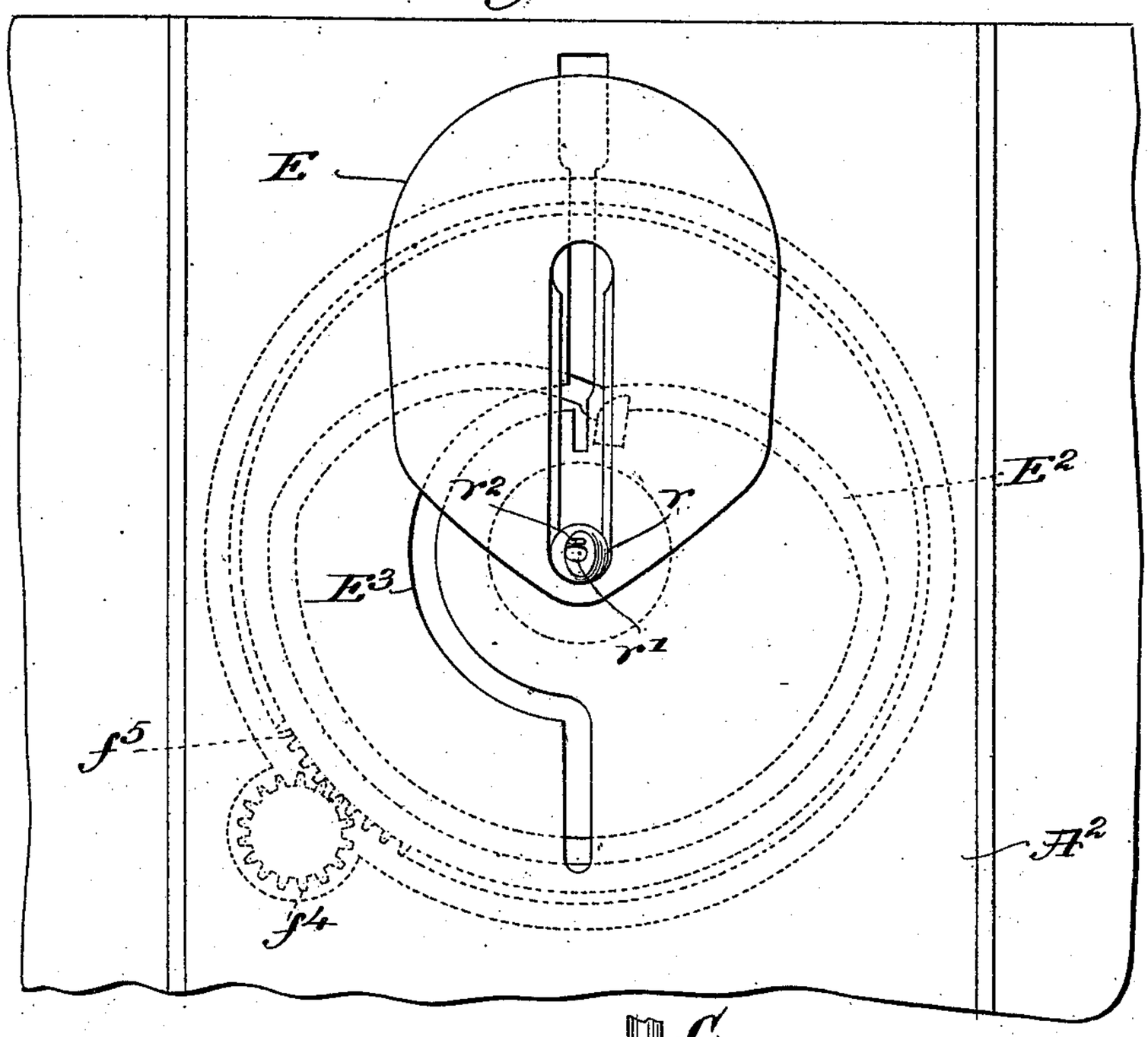


Fig: 4.

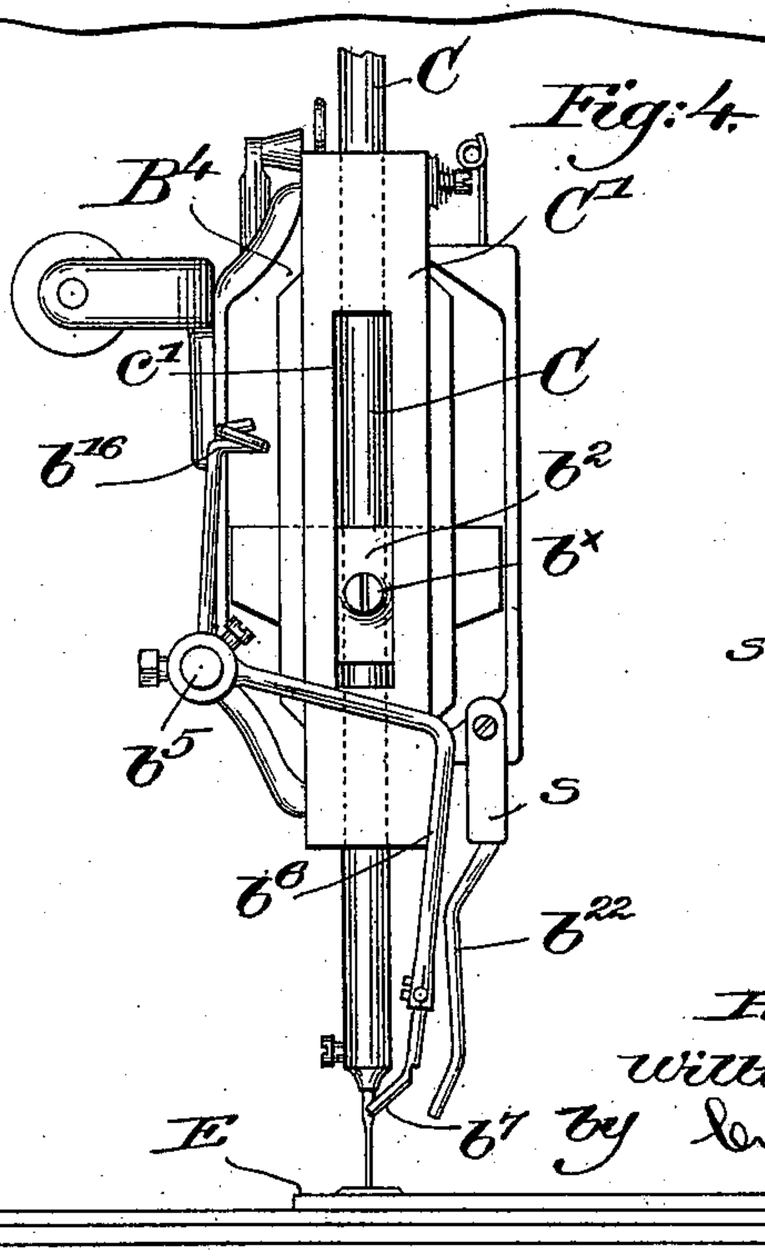


Fig: 6.

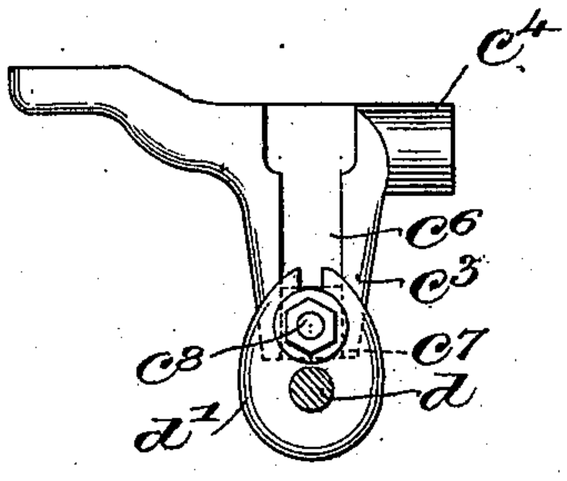
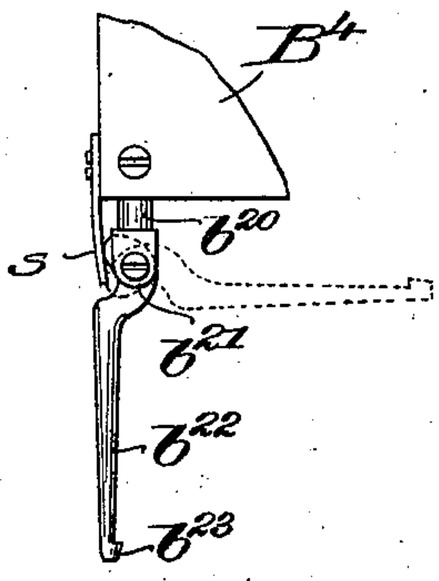


Fig: 5.



Witnesses.
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Inventor.
William Raeuchle.
by Crosby & Gregory.
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM RAEUCHLE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE CHAMPION BUTTON-HOLE MACHINE COMPANY, OF SAME PLACE.

BUTTONHOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 574,166, dated December 29, 1896.

Application filed May 3, 1895. Serial No. 548,013. (No model.)

To all whom it may concern:

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

This invention relates to buttonhole-sewing machines, and has for its object more particularly the improvement of the feed mechanism and the adaptation of the machine for the formation of the overseam forming the subject-matter of United States Patent No. 480,783, granted to me August 16, 1892, means being herein provided for laying the upper purl-thread about the needle-thread and for adjusting the lower gimp toward or away from the edge of the buttonhole.

In accordance therewith my invention consists in the construction, arrangement, and operation of mechanism to be hereinafter fully described, and particularly pointed out in the claims.

Figure 1 is a rear side elevation, partly broken out, of a buttonhole-sewing machine embodying my invention. Fig. 2 is an under side view of the bed-plate of the machine, viewing it from the front side, and showing the feeding mechanism forming a part of my invention, the actuating-cam being in section, taken on the line $x\,x$, Fig. 1. Fig. 3 is a plan view of a portion of the top of the bed-plate at the right-hand end thereof, viewing Fig. 1. Fig. 4 is an end elevation of the head of the machine shown in Fig. 1, looking toward the left. Fig. 5 is a detail view of the upper gimp-guide, to be described. Fig. 6 is a detail, to be described, of a portion of the connections between the actuator for the needle-bar carrier and the said carrier. Fig. 7 is an enlarged perspective view of the lower gimp-guide; and Fig. 8 is also an enlarged view, partly in section, showing the said guide in place.

Referring to Fig. 1, the work-supporting table or bed-plate A, the overhanging arm B B′, and the horizontal shaft B^2, mounted in suitable bearings in the part B′ and provided with the usual balance or driving wheel B^3, may be and are of usual and well-known construction.

The shaft B^2 has on its outer end a disk b, (see dotted lines, Fig. 1,) having thereon a wrist-pin b' to enter a cam-slot in a block b^2, secured to the needle-bar C, to reciprocate the needle-bar in the usual manner, the wrist-pin b' being long enough to permit the needle-bar to be vibrated forward and back without being disengaged from the block b^2.

As shown in Figs. 1 and 4, the needle-bar carrier C′ is mounted in the head B^4 to slide forward and back therein, ears c, coöperating with the head, preventing any vertical movement of the carrier, which latter is preferably slotted at c', (see Fig. 4,) into which extends the set-screw $b^\times$ and its seat on the block b^2. A bar c^2, secured to or forming a part of the carrier C′, is extended therefrom toward the upright portion B of the overhanging arm and is connected by a bolt 2 to a casting c^3, having a journal c^4, fitted to slide in a bearing c^5 in the upright. (Clearly shown in Fig. 1.)

Referring to Fig. 6, the outer side of the casting c^3 is grooved vertically at c^6 to receive therein a block c^7, pivotally mounted and adjustably held by a suitable bolt c^8 on a forked arm d', fast on a rock-shaft d, supported in bearings on the upright B, such bearings not being shown. An elbow-lever $d^2\,d^3$ is also secured to the rock-shaft, the arm d^2 being extended through an opening in the upright and having thereon a roll or other stud d^4 to enter a groove e' in a cam e, fast on a vertical shaft $e^\times$, mounted in bearings in the upright B, said shaft having thereon at its upper end a bevel-gear e^2 in mesh with a bevel-gear 10 on the driving-shaft B^2. Rotation is thus imparted to the shaft $e^\times$ and cam e to rock the lever $d^2\,d^3$ and shaft d, and by the connections described the casting c^3 is moved forward and back to impart similar vibrating movement to the needle-bar carrier C′ to thus make the depth and overedge stitches when sewing a buttonhole. A rod c^9 is connected to the bar c^2 and to the top of the needle-bar carrier C′ to impart a steady movement thereto at top and bottom. Bearings $B^\times$ and $B'^\times$ in the upright and on the head, respectively, support a longitudinally-movable and partially-rota-

table slide-rod b^5, having secured thereto beyond the head a bent depending arm b^6, to which is attached a guide b^7 for the upper purl-thread p, preferably made tubular at its delivery end, and which is adapted to move from one to the other side of the needle-thread and between it and the operator to lay the purl-thread around the needle-thread above the material, as described in my said patent referred to, such movement of the guide being effected by means now to be described.

As shown in Fig. 1, a plate b^8 is secured to the arm B′, and it has therein a substantially V-shaped cam-slot b^9 to receive a stud b^{10} in the end of an arm b^{12}, clamped on the slide-rod b^5 by a screw 3, so that when the rod is moved back and forward in its bearings it will be rocked.

The upper end of the arm d^3 of the elbow-lever is forked to receive therein a slide b^{13}, having pivoted on its inner side by a suitable bolt 4 a block b^{14}, provided with a deep fin b^{15} to enter a slot b^{11} in the arm b^{12}, whereby the movement of the lever d^2 d^3 will reciprocate the slide-rod b^5, while the latter is also rocked by the cam-slot b^9. The fin b^{15} is of such depth that it will not be withdrawn from the slot b^{11} when the arm b^{12} is farthest removed from the end of the lever-arm d^3, but will remain in constant operative connection therewith.

By means of the reciprocating and rocking movement of the slide-rod b^5 the upper purl-thread is properly laid around the needle-thread, as desired, and I preferably secure to the outer end of said rod b^5 a wire or other suitable guide b^{16} for the purl-thread on its way to the guide b^7.

The vibration of the needle-bar carrier C′ can be adjusted by raising or lowering the block c^7 on the forked rocker-arm d' to thereby alter the stroke of the casting c^3.

As shown in Figs. 4 and 5, I have secured to the head B⁴ at one side of the needle-bar carrier a headed post b^{20}, to which is pivoted at b^{21} a leg b^{22}, having at its extremity a tubular guide b^{23} for the upper gimp, a flat spring s bearing against the upper end of the leg b^{22} and maintaining it in operative position shown, and when the gimp is not used holding the leg in substantially horizontal position, into which it may be swung by the operator.

The spreader-bar m n and the means for adjusting longitudinally the part m are and may be as in United States Patent No. 341,168, granted to me May 4, 1886, and need not be further described herein, as they form no part of this present invention, the cam o shown herein being fast on the vertical shaft $e^\times$ beneath the bed or base plate A, a spring s' maintaining a roll n^2 on the member n in operative contact with the cam, while the looper-bar M (shown only in Fig. 2) is actuated by a cam o', having a groove o^2 therein. (See dotted lines, Fig. 2.)

The feed mechanism is best shown in Fig. 2, wherein a bracket F, attached to a cover-plate A′ beneath the bed-plate, supports a short shaft f, to which is secured a ratchet-wheel f', a disk f^2, surrounded by a brake-band f^3, and a pinion f^4 in mesh with the usual toothed feed cam-disk f^5. A pawl-carrier g is pivoted loosely on the shaft f adjacent the ratchet-wheel f', and a series of pawls (herein shown as three) 6, 7, and 8 are pivoted on the carrier and spring-pressed into the teeth of the ratchet-wheel, and they are of such relative lengths that as one rests fully in one of the teeth of the ratchet the others lie on the inclines of other teeth, limiting the forward movement of the ratchet, which advances by intervals of one-third of a tooth, the same effect being produced as if the ratchet had three times the number of teeth. The pawl-carrier g is rearwardly extended at g' and has an offset toe g^2 thereon nearer the center of oscillation of the pawl-carrier, the parts g' and g^2 being adapted to be acted upon, respectively, the one or the other, by rolls h' h^2, adjustably mounted on a swinging plate h, the roll h' being shown in the drawings in operative position. The swinging plate h is pivoted at $h^\times$ to the under side of an enlarged flattened arm h^3, secured to or forming a part of a hub h^4 on a headed stud h^5, screwed into the bed-plate, a lever-arm h^6, also fast on the hub, being provided with a roll or other suitable stud h^7, held in a groove h^8 (see Fig. 2) in the upper side of a cam h^9, fast on the vertical shaft $e^\times$. One edge of the arm h^3 is provided with a longitudinal rib h^{10}, in parallelism with two slots 10 and 12 in the arm, to receive the shanks of headed screws k' and k^2, mounted on a shifter-bar k, one edge thereof being guided by the rib h^{10}, a roll k^3 being mounted on the under side of the shifter-bar to enter a curved slot h^{12} in the swinging plate h, whereby movement of the shifter in one or the other direction will swing the plate h to bring one of the rolls h' or h^2 into position to actuate the pawl-carrier g.

It will be obvious that the throw of the arm h^3 is constant, governed by the cam-groove h^8, and that when the roll h' is in position to engage the part g' of the pawl-carrier g the latter will be oscillated through a certain arc twice at each rotation of the vertical shaft $e^\times$ to intermittingly rotate the feed-plate f^5 while the side of the buttonhole is being stitched.

When the eye of the buttonhole is to be stitched, the feed must be more rapid as the work is turned beneath the needle, and for this purpose the shifter-bar k is moved to the left, Fig. 2, the roll k^3 acting on the plate h to swing it on its pivot $h^\times$ and move the roll h^2 into position to coöperate with the offset portion or toe g^2 on the pawl-carrier. As this roll h^2 is so much nearer the axis of the pawl-carrier and so much farther from the stud h^5 the throw of the pawl-carrier g will be greatly increased, and thereby the feed-plate will be moved through a greater arc,

feeding the work more rapidly beneath the needle at and about the eye of the buttonhole, and thereafter the shifter-bar k is moved back into the position shown in Fig. 2 while the other side of the buttonhole is stitched.

The shifter-bar k is moved automatically back and forth on the arm h^3 by a link l, pivoted at one end to the retaining-screw k' at the upper side of the arm and at its other end to a lever l', pivoted to the cover-plate A' at l^2, said arm having a roll or stud l^3, which enters a cam-groove f^6 in the feed-disk f^5. (Shown by dotted lines in Fig. 2.) An ear l^4 on the lever l' has a curved slot therein through which a guide-screw l^5 is extended into the cover-plate, and the cam-groove f^6 is so shaped that at the proper times the shifter-bar k will be moved as described.

The pawl-carrier g is kept against its actuating-roll h' or h^2, as the case may be, by a coiled spring s^4, (see Fig. 1,) one end of which is secured to the hub $g^\times$ of the pawl-carrier, the other end of the spring being attached to the bracket F.

In shifting the clamp-plate into proper position to start the work the feed-disk f^5 may be rotated by hand by means of a hand-pawl F^2. (Shown in Fig. 2.)

The clamp-plate E (shown in Figs. 1 and 3) is of usual construction, and it is moved beneath the needle by the operation of the feed-disk f^5, which has on its upper side the usual cam-groove E^2, (see dotted lines, Fig. 3,) which directs the movement of the clamp-plate and the work held thereon, the clamp guide-plate A^2 also having the usual guide-slot E^3 therein, and as the clamp-plate, the mechanism for holding the work thereon, and the connections between the clamp-plate and feed-disk are all of well-known and usual construction it is unnecessary to herein describe them in detail.

Referring now to Figs. 2, 3, 7, and 8, the usual button r on the clamp guide-plate A^2 is provided with the needle-hole r', and also with an elongated slot r^2, into which the upturned nose v of the lower gimp-guide projects, the said guide being shown separately in Fig. 7, wherein the nose v is represented as tubular to receive the gimp, and said nose is provided with a hub v', having a hole v^2 therein through which a suitable screw 30 is extended into the button or into the clamp guide-plate, as may be most convenient. The slot r^2 is parallel to the needle-hole r' in the button, and by loosening the screw 30 the gimp-guide may be adjusted to bring the delivery end of its nose v nearer to or farther from the edge of the buttonhole, according to the depth of the stitching. Preferably the lower gimp is laid at the under side of the work as far away from the edge of the buttonhole as possible to thereby obtain a smooth and finished appearance of the stitching.

Referring to Fig. 2, the rolls h' and h^2 are shown as mounted on slide-blocks 35 and 40, respectively, held in adjusted position on the plate h by set-screws 45 and 50, passed through suitable slots in the slide-blocks, and by loosening the set-screws the rolls can be adjusted to swing through a larger or smaller arc as they are moved away from or toward the pivotal point h^5 of the arm h^3. In this manner I am enabled to regulate the length of the stitches with great nicety and fineness of adjustment, according to the size of the thread being used and the nature of the work, and the feed mechanism can be operated at very high speed without causing variation in the stitches. These advantages are not possible with the mechanisms heretofore invented for this kind of work.

I am aware that devices have been patented in which a cramping-block slides back and forth in an annular groove, being moved by a cam-operated shifting lever which is bodily reciprocated by an arm from the driving-shaft, and the devices in which a similar cramping-block and lever, reciprocable bodily in a groove, are provided with an auxiliary shipper to wedge a roller into and out of engagement with a rotating cam, as shown in United States Patents Nos. 272,126 and 464,287, which constructions I entirely disclaim.

It is one main object of my invention to secure positive definite feed without any possibility of slipping or of either underfeeding or overfeeding, no matter at what speed the machine is operated; also, to provide an accuracy of adjustment that is perfect and unyielding and with minimum friction of parts.

So far as I am aware it is broadly new to provide an adjustable guide for the lower gimp.

I claim—

1. In a buttonhole-sewing machine, feed mechanism, including a pawl-carrier, an oscillating support, projections movable therewith, one or the other of which is adapted to coöperate with and actuate the pawl-carrier at different distances from its axis, and means independent of said pawl-carrier and of said support, to automatically move said projections relatively to said support and to said pawl-carrier to bring the said projections singly into operative position, substantially as described.

2. In a buttonhole-sewing machine, feed mechanism, including a ratchet-wheel, a pawl, and a pawl-carrier, the latter having an extended arm, an oscillating support, projections movable therewith to coöperate one at a time with said arm, to give the pawl-carrier a different stroke, and means to automatically move one projection into operative, and the other projection into inoperative position, substantially as described.

3. In a buttonhole-sewing machine, a ratchet-wheel, and a pawl-carrier provided with a pawl to engage the teeth of and move said ratchet-wheel intermittingly, and an actuating-arm therefor, a swinging plate pivoted on said arm and provided with projections

to engage said pawl-carrier, and means to automatically move said plate to bring one or the other of said projections into operative position to give said pawl-carrier a greater or less movement thereby, substantially as described.

4. In a buttonhole-sewing machine, an oscillating support having a constant throw, a roll-carrier thereon, adjustable rolls on the carrier, a ratchet-wheel, a pawl-carrier provided with a pawl to actuate the ratchet-wheel, and extended into the path of movement of one or the other of said rolls, a cam-disk rotated by the ratchet-wheel, and means controlled by said disk to automatically shift the roll-carrier and thereby alter the throw of the pawl-carrier at predetermined times, substantially as described.

5. In a buttonhole-sewing machine, a clamp guide-plate, a button thereon having an elongated slot, and an adjustable lower gimp-guide having its delivery end extended into the elongated slot of the button, substantially as described.

6. In a buttonhole-sewing machine, a lower gimp-guide having an upturned tubular extension through which the gimp is led and delivered, and means to adjust the position of said extension, substantially as described.

7. In a buttonhole-sewing machine, an upper purl-thread guide, and mechanism to move said guide from one to the other side of the needle-path, to lay the purl-thread around the needle-thread at the upper side of the work, said mechanism consisting of a reciprocating rocking rod carrying said guide, said rod being provided with a laterally-extending arm rigid therewith, a fixed V-shaped cam-slot to receive the free end of said arm to thereby positively rock said rod in either direction, and a vibrating bell-crank in loose engagement at one end with said rod to reciprocate the same, and connected at its other end to a moving part of the machine to be properly vibrated thereby, substantially as described.

8. In a buttonhole-sewing machine, a vertically-reciprocating needle, a vibrating needle-bar carrier, an upper purl-thread guide arranged to vibrate beyond and about said needle, a reciprocating rocking rod carrying said guide, means to vibrate said carrier and guide together at different speeds in the same direction, and a V-shaped cam-slot to engage an arm projecting from said rod, to rock the said rod as it is reciprocated to thereby carry the purl-thread around the needle-thread at the upper side of the work, substantially as described.

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

WILLIAM RAEUCHLE.

Witnesses:
JOHN C. EDWARDS,
AUGUSTA E. DEAN.