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T. WELCH & G. CORBION, Jr.

BUTTON HOLE SEWING MACHINE.

No. 272,108. Patented Feb. 13, 1883.

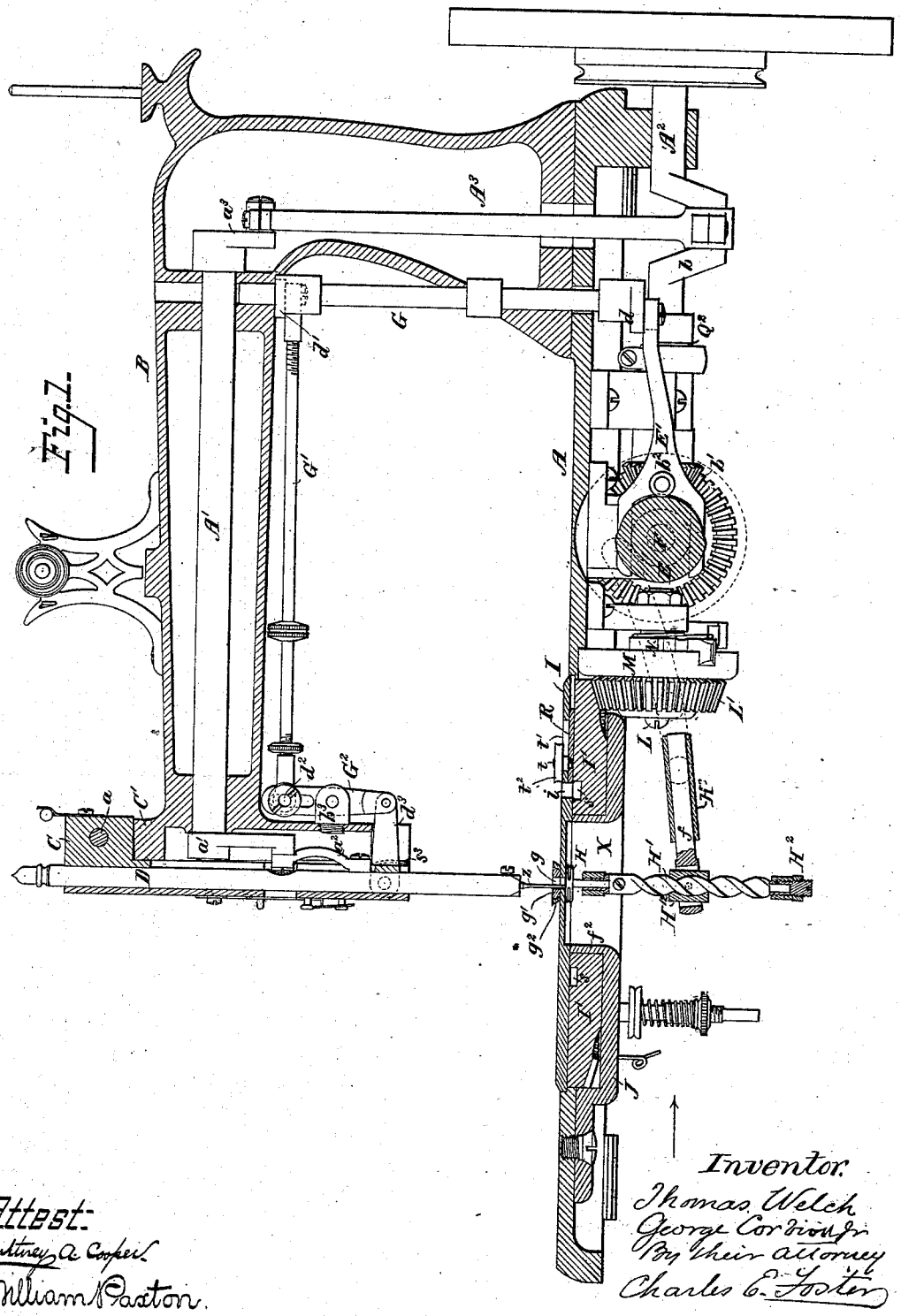

Fig. 1.

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(No Model.) 6 Sheets—Sheet 2.

T. WELCH & G. CORBION, Jr.

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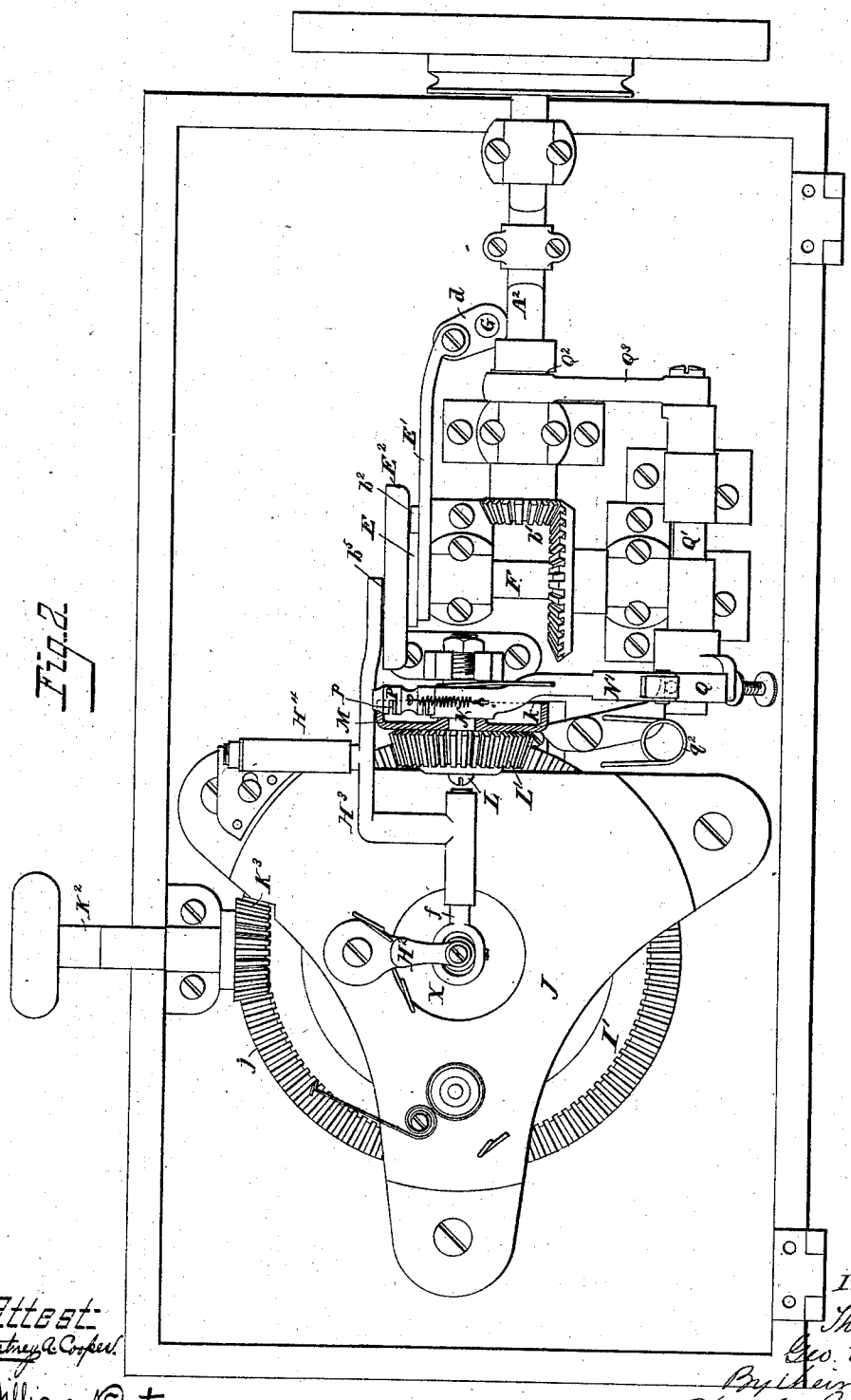
No. 272,108. Patented Feb. 13, 1883.

Fig. 2.



Attest:
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William Paton.

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Thos. Welch
Geo. Corbion Jr.
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Charles E. Foster

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(No Model.) 6 Sheets—Sheet 3.

T. WELCH & G. CORBION, Jr.

BUTTON HOLE SEWING MACHINE.

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Fig. 5.

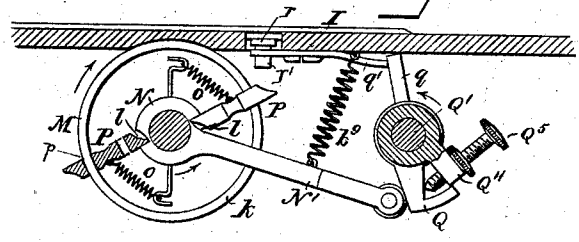


Fig. 3.

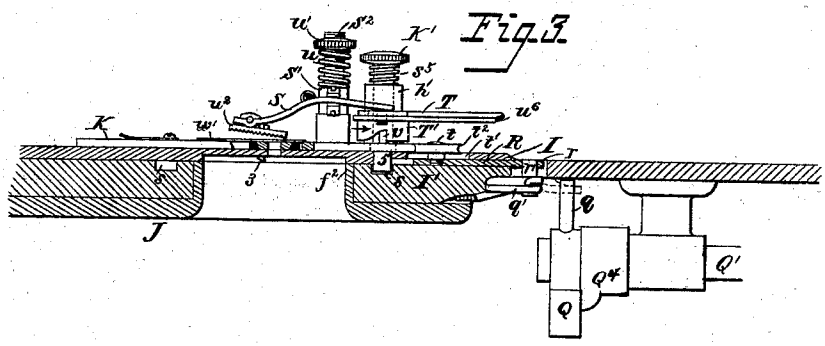
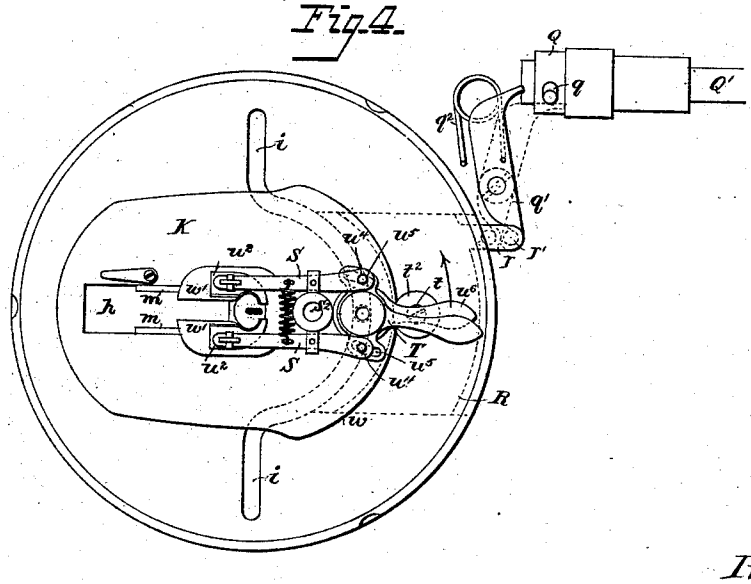


Fig. 4.



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BUTTON HOLE SEWING MACHINE.

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Fig. 6.

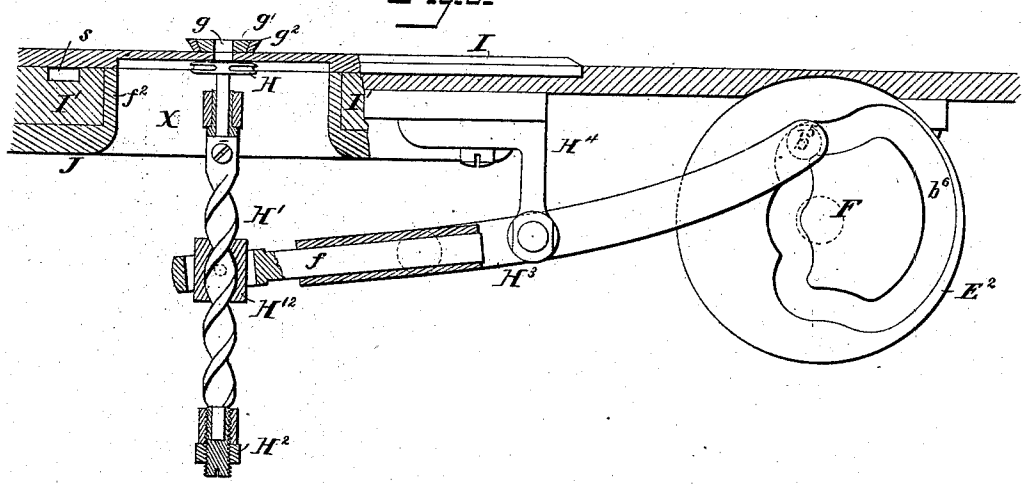
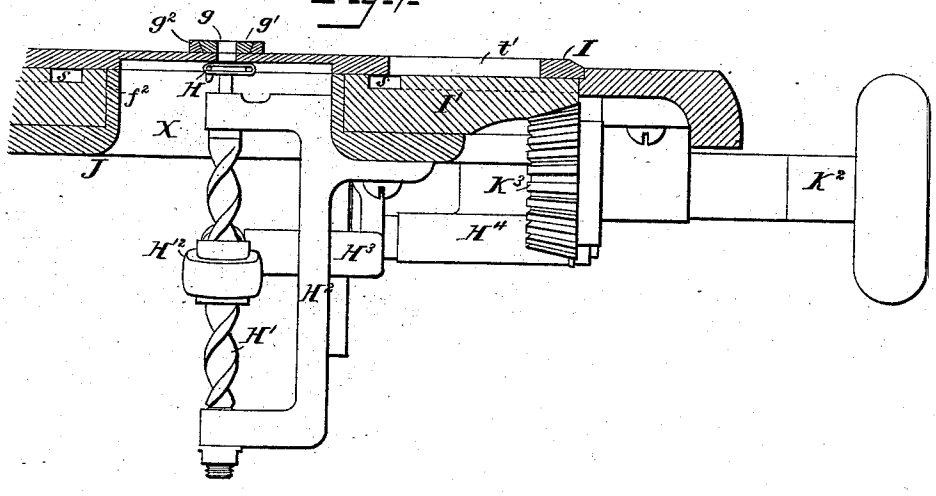


Fig. 7.



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BUTTON HOLE SEWING MACHINE.

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Fig. 8.

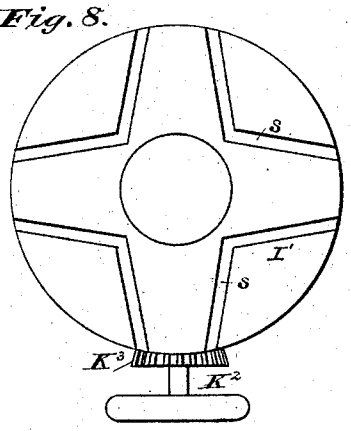


Fig. 9.

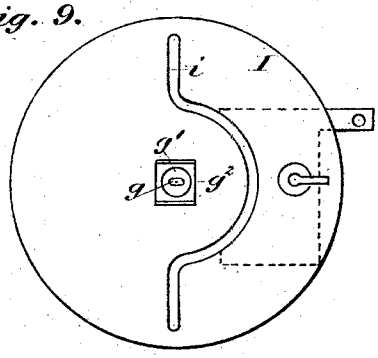


Fig. 10.

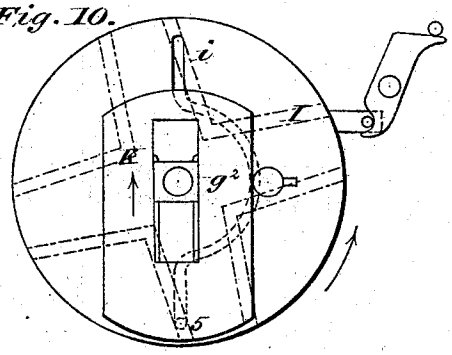


Fig. 11.

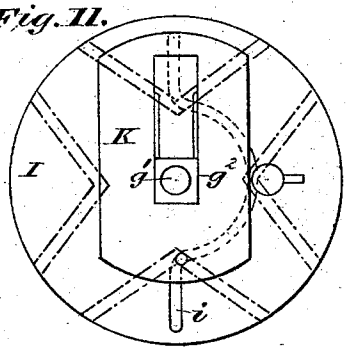


Fig. 12.

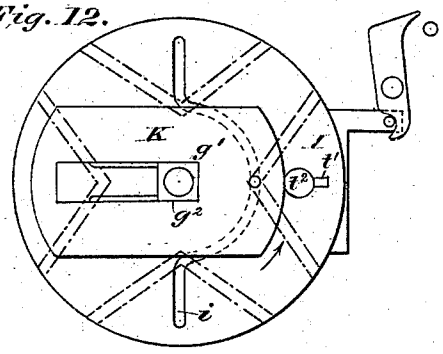


Fig. 14.

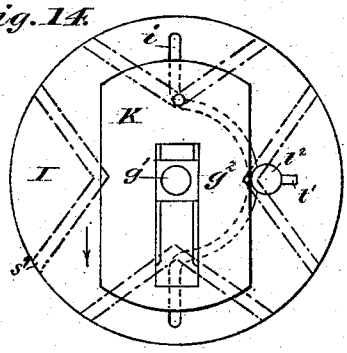


Fig. 13.

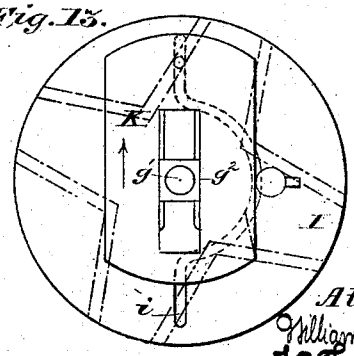
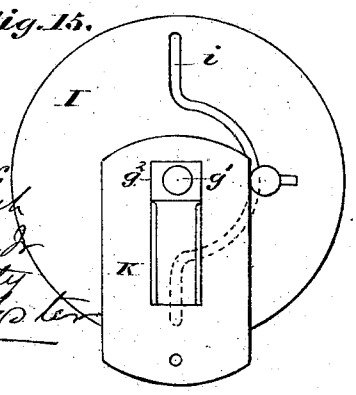


Fig. 15.



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T. WELCH & G. CORBION, Jr.

BUTTON HOLE SEWING MACHINE.

No. 272,108. Patented Feb. 13, 1883.

Fig. 16.

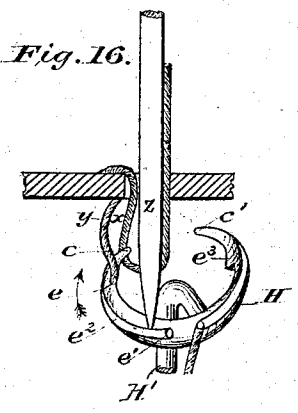


Fig. 17.

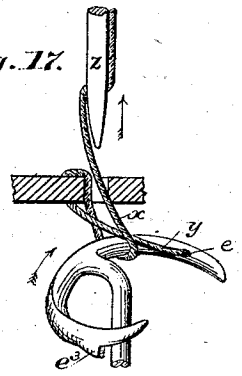


Fig. 18.

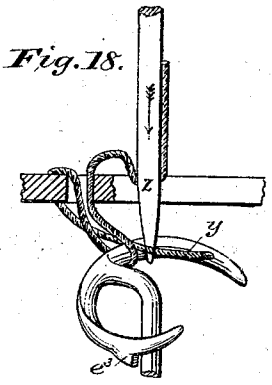


Fig. 19.

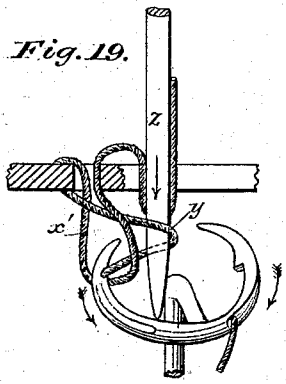


Fig. 20.

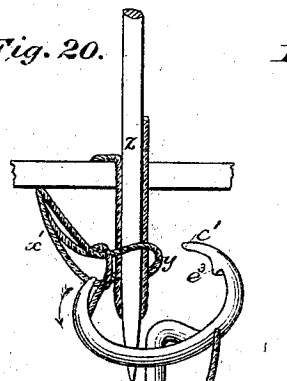


Fig. 21.

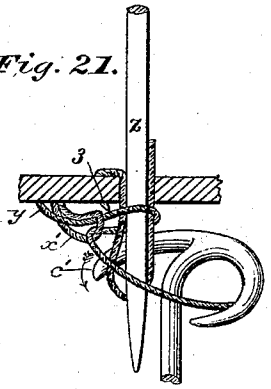


Fig. 22.

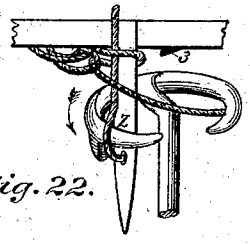


Fig. 23.

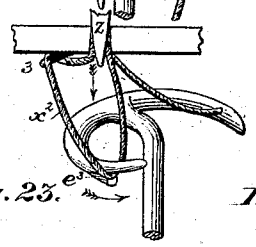


Fig. 24.

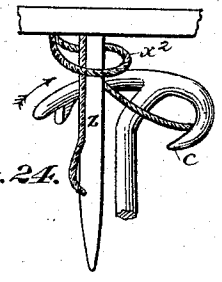
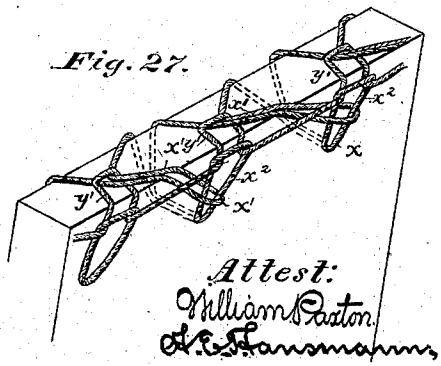


Fig. 27.



Attest:
William Paxton.
A. E. Hansmann.

Fig. 25.

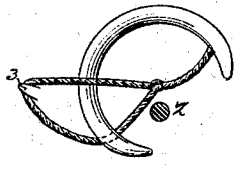
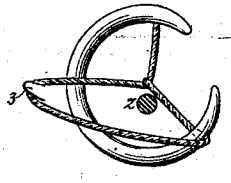


Fig. 26.



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By their attorney
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UNITED STATES PATENT OFFICE.

THOMAS WELCH AND GEORGE CORBION, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO CHARLES H. CRAWFORD, OF NEW YORK, N. Y.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 272,108, dated February 13, 1883.

Application filed May 17, 1882. (No model.)

To all whom it may concern:

Be it known that we, THOMAS WELCH and GEORGE CORBION, Jr., of the city and county of Philadelphia, State of Pennsylvania, have invented certain Improvements in Button-Hole Sewing-Machines, of which the following is a specification.

Our invention relates to that class of sewing-machines used for overseaming and cat-stitching; and it consists of a machine and certain details and appliances, some of which are adapted also for use with other machines, as fully described hereinafter, whereby to form the stitches rapidly, without noise and abrupt jarring movements, to secure a ready manipulation and adjustment of the parts, an automatic variation of the stitch, and an automatic presentation of the edges of a button-hole to the fabric.

In the drawings forming part of this specification, Figure 1 is a longitudinal sectional elevation of a button-hole sewing-machine with our improvements. Fig. 2 is an inverted plan in part section. Fig. 3 is a part longitudinal sectional elevation through the center of the work-plate. Fig. 4 is a plan of the work-plate and adjacent appliances. Fig. 5 is a detached sectional view, showing part of the feed-operating appliances. Fig 6 is an enlarged detached sectional view, showing the thread-carrier and part of the operating appliances. Fig. 7 is an enlarged transverse section through the center of the work-plate, looking in the direction of the arrow, Fig. 1. Fig. 8 is a view showing the face of the feed-disk cam. Fig. 9 is a view showing the face of the work-plate. Figs. 10 to 15 are diagrams illustrating the working of the feed devices. Figs. 16 to 26 are diagrams illustrating the operations of the stitch-forming devices in edge-binding. Fig. 27 is an enlarged edge view of the fabric, illustrating the stitch.

The general features of the machine are, first, a needle reciprocated vertically and horizontally; second, a double-pointed circular reciprocating thread-carrier rotated in a horizontal plane; third, a clamp-plate automatically fed and turned below the needle to present to the latter first one edge, then the eye, and then the other edge of the button-hole; fourth, devices whereby the stitch is graduated automatically, according to the part being sewed; fifth, a clamping device; sixth, certain details of the operating mechanism, whereby the parts are driven at a high speed, with but little noise and friction, without shocks, and, seventh, certain details of construction and arrangement.

We will now describe in detail the different features above alluded to and the appliances for operating the same.

The needle supporting and operating appliances.—The bed or base-plate A supports a hollow overhanging arm, B, in the head C′ of which, near the top, is pivoted, by a pin, *a*, a block, C, grooved to receive the needle-bar D, a vertical reciprocating motion being imparted to the latter from a rock-shaft, A′, turning in bearings in the arm B, and provided with an arm, a', connected to the bar D by a link, a^2. The shaft A′ is rocked directly from a driving-shaft, A^2, supported in bearings below the base-plate, parallel to the shaft A′, and having a crank, *b*, connected by a rod, A^3, to an arm, a^3, on the end of the shaft A′. A shaft, F, below the base-plate, at right angles to the shaft A^2, is driven from the latter by miter-gears b', so proportioned that there is one revolution of the shaft F to two of the shaft A^2. By driving the under-thread carrier and the devices for reciprocating the needle-arm horizontally from this shaft F we secure two complete vertical reciprocations of the needle to each of its complete horizontal movements and to each complete reciprocation of the thread-carrier. The horizontal reciprocation of the needle-bar is effected by a cam, E, on the shaft F, which cam bears on a stud, b^2, on a slotted bar, E′, embracing and guided by the shaft F, and connected to an arm, *d*, on a vertical shaft, G, supported in bearings on the arm B, and provided at the upper end with an arm, d'. The arm d' is connected by an extensible rod, G′, to a pin, d^2, secured adjustably in a slot in one arm of a lever, G^2, pivoted to a stud, b^3, on the head C′, and connected by a link, d^3, to the swinging block C. As the shaft F rotates, the cam E (in connection with a spring, S^3, that throws out the block C) imparts a reciprocating horizontal motion to the bar E′, and thereby rocks the shaft G and vibrates the lever G^2 and the block C. The needle-bar is thus carried to different positions, and is caused to descend alternately on different lines, with

the usual result in button-hole stitching, cat-stitching, &c. It will be noted that as the shaft G and rod G′ occupy positions close to the arm we avoid any obstruction of the work-plate. The extent of the swinging motion of the needle-bar is regulated by adjusting the pin d^2 in the slot in the lever G^2, and the point at which the needle enters the cloth may be determined by turning the rod G′, which has the right-and-left-hand screw connections with the arm d' and pin d^2, as in other machines of this kind. Other means than those described for oscillating the shaft G may be adopted.

The thread-carrier and operating appliances.—The thread-carrier H, Fig. 16, is curved, double-pointed, and carried by a vertical rock-shaft, H′, turning in bearings of a bracket, H^2, secured to the base of the machine, the carrier being so arranged that its pointed ends will enter loops of the needle-thread below the cloth at the side of the needle, as fully described hereinafter. The carrier has an eye, *e*, near one end or point, *c*, and an external groove, e^2, leading to a central guide-eye, *e′*, and on the under side, near the opposite end, *c′*, is a lip, e^3. Upon the shaft H′, Figs. 1 and 6, is a worm having a steep pitch, to which is adapted a nut, H^{12}, pivoted in the yoke of a bar, *f*, sliding in a lever, H^3, which is hung to a bracket, H^4, and carries at the inner end a stud, b^5, which enters a groove, b^6, in the face of a cam-wheel, E^2, on the shaft F. The rotation of the cam-wheel E^2 vibrates the lever H^3, moves the nut H^{12} up and down upon the worm-shaft H′, and rocks the latter, the groove b^6 being so formed as to impart to the thread-carrier H the proper movements and dwells, and the "time" requisite to effect the operations hereinafter described.

The clamp-plate and operating appliances.—The work is supported by a work-plate, I, secured detachably in or above a circular recess in the bed-plate, and in the recess below the work plate turns a feed-cam disk, I′, supported by a bracket-plate, J, Figs. 1, 2, and 3, bolted to the under side of the base-plate, and provided with an annular flange, f^2, surrounding a central opening, X, and centering the disk I′. In the work-plate is a groove, *i*, Fig. 9, the terminal portions of which are radial and the intermediate part curved to coincide with a circle having the needle-hole *g* as its center, the said needle-hole being in a circular beveled-edged projection, *g′*, round which turns freely a square block, g^2, having opposite edges beveled, as shown. (See Figs. 6 and 7.) A clamp-plate, K, lies detachably upon the work-plate, and has a longitudinal slot, *h*, Fig. 4, extending from one end to the center of the plate, wide enough to receive the block g^2, and with beveled-edged side flanges, *m*, which extend for part of the length of the slot and catch under the edges of the block g^2, and confine the clamp-plate upon the work-plate, while permitting it to slide freely. By sliding the clamp-plate to bring the block into the extreme end of the slot the flanges *m* are carried away from beneath the edges of the block, and the clamp-plate can then be lifted from the work-plate. In a stud, *h′*, on the plate K slides a pin, K′, depressed by a spring, S^5, the lower end, 5, of which pin extends through the slot *i* in the work-plate into a cam-groove, *s*, of the cam-disk I′. The cam-groove *s* is of such form that after the clamp-plate is set in the position shown in Diagram 10, with the ends of the pin K′ in the end of the groove *s*, the revolution of the cam-disk in the direction of the arrow will cause the clamp-plate to slide radially in the direction of its arrow until the pin reaches the position shown in Diagram 11, the right-hand side of the button-hole being thus submitted to the operations of the sewing devices and bound. The continued revolution of the disk now carries the pin into and along the curved portion of the groove *i*, and the clamp-plate around to the position shown in Diagrams 12 and 14, the curved end of the button-hole being thus bound, after which the further revolution of the disk will carry the clamp-plate in the direction of the arrow, Diagram 13, thus binding the opposite edge of the button-hole until the plate reaches the limit of its motion. The work can then be removed. As it would be tedious and consume valuable time to feed the disk I′ step by step back to its first position, we form on the face of the cam-disk a series of grooves, *s*, at equal distances apart, (see Fig. 8,) and all of the same character, so that the above-described operations will ensue, whichever groove the end of the pin K′ may enter, and we combine with the cam-disk means for revolving it quickly. Thus a shaft, K^2, turning in a bracket secured to the bed-plate, may carry a bevel-pinion, K^3, gearing with a miter-rack, *j*, on the cam-disk, so that by turning the shaft K^2 by hand the disk may be quickly brought to any required position. A lever and pawl catching the teeth of the miter-rack or other device may be used to effect the rapid rotation of the disk. After the work is completed and the parts are in the position shown by the Diagram 13 the pin K′ is raised and the disk I′ turned by hand until the next groove (marked s^7, Diagram 14) is below the groove *i* in the position shown in Diagram 10, when the above operations are repeated. The slow feeding of the disk for half a revolution is thus avoided.

It is obvious that the similar grooves *s* may be of any desired form, pitch, and number, provided each diverges from the center to the outer edge.

The slot *h* in the clamp-plate is of such length that during the above-described operations the flanges *m* are never carried beyond the block g^2. When, however, it is necessary to remove the clamp-plate, the pin K′ is raised and the plate drawn back until the block is in the widest part of the slot, (see Diagram Fig. 15,) when the plate can be lifted away from the work-plate.

The motion imparted to the cam-disk is of course a step-by-step motion, and it is desir-

able that it be automatically regulated so that the stitches will not be crowded too closely together at the eye of the hole during the time when the plate is being turned. To effect this we use a suitable feed mechanism and a regulating device, as we will now describe.

The cam-disk is moved by the rotation of a miter-wheel, L′, mounted on a shaft, L, and gearing with the miter-rack *j*. On the shaft L, and secured to the wheel L′, is a disk, M, Figs. 2 and 5, with a peripheral flange, *k*, and on the shaft also rocks the hub N of a rock-lever, N′, with sockets *l* to receive the ends of dogs P, each with a recess, *p*, receiving the edge of the flange *k*. A spring, *o*, connecting each dog to the hub, draws back the dog, so that when the hub turns in the direction of the arrow the dog will slide upon the flange; but when the hub is rocked in the opposite direction the dog will be canted and will bite the flange, carrying the disk M a certain extent in the direction of its arrow and feeding the clamp-plate proportionately.

The rock-lever may be operated by any suitable mechanism. As shown, an inclined arm, Q, on a rock-shaft, Q′, Figs. 2 and 5, bears upon a roller at the end of the lever N′, and vibrates the latter and its hub, the shaft Q′ being rocked from an eccentric, Q^2, on the driving-shaft A^2, through a connecting-rod, Q^3, attached to a crank-arm of the shaft Q′, as shown. A spring, b^9, holds the lever against the arm Q. To permit such variation of the motion as is necessary to vary the distance between the stitches, the arm Q, instead of being secured to the shaft, is hung loosely to the same, and an arm, Q^4, permanently attached to the shaft, carries a screw-pin, Q^5, which may be set so that it will strike the arm Q and move the latter during a part or the whole of the movement of the shaft, as may be desired. The rock motion of the loose arm Q in the direction of its arrow, Fig. 5, is limited by the contact of a rod, *q*, projecting from the hub of the arm, with a pivoted stop-plate, *q′*, and in order that the throw of the arm Q may be varied to regulate automatically the distance of the stitches apart we use devices whereby the stop-plate *q′* is shifted automatically. These we will now describe.

Between guides at the under side of the plate I, Figs. 1, 3, and 4, lies a slide, R, an arm, *r*, of which carries a pin, *r′*, which bears against the stop-plate *q′*, the latter being pressed against the pin by a spring, q^2. A stud, *t*, on the slide R projects through a slot, *t′*, in the plate I, and carries a wheel, t^2, that bears against the edge of the clamp-plate K. The clamp-plate K is of such external form that the pin *t* will not be moved materially from its inward position during the time that the side edges of the button-hole are being bound; but when the clamp-plate is turned to stitch the eye of the button-hole the edge *w* of the plate will press against the wheel t^2, throw out the stud and slide, and the latter will turn the stop-plate *q′* to the position shown in full lines, Fig. 4, away from the pin *q*, so as to permit the arm Q to move nearer to the arm Q^4, and thus increase the motion imparted to the arm Q and the extent of the feed movement. We not do limit ourselves to this mode of regulating the stitch from the clamp-plate, as appliances operating on the regulating device Q^5 or other regulating device may be used.

The clamp device.—For stitching button-holes it is necessary to clamp the work to a feed-plate, for which purpose we employ the devices shown specially in Figs. 3 and 4. The plate K is the base of the clamp, each of the upper jaws, S S, of which is pivoted to swing freely between lugs at the side of a sleeve, S′, upon a standard, S^2, arranged on the clamp-plate between the slot *h* and the stud *h′*. A spring, *u*, is pressed against the sleeve S′ by a nut, *u′*, and tends to hold down the sleeve, but permits it to yield to excessive strains. To the inner end of each jaw S is pivoted or hung loosely a foot, u^2, having a roughened lower surface, and a pin, u^4, at the outer end of the jaw enters a curved or angular slot, u^5, in a T-headed lever, T, hung to the stud *h′*. By turning the lever the jaws may be spread apart, after their lower ends have been brought upon the fabric, so as to open the button-hole. These features we do not claim. To lift and lower the jaws we use a cam-sleeve, T′, provided with a handle, u^6, and turning on the stud *h′*, and bearing with its inclined lower edges on lugs *v*, so that the sleeve will be raised and the inner ends of the jaws depressed on turning the handle and sleeve in the direction of the arrow, Fig. 4, the reverse movement of the handle lowering the sleeve and raising the jaws from the fabric. To afford a wide bearing of the jaws on the fabric close to the needle, we extend thin side plates, *w′ w′*, from the plate K, inside of the edges of the slot *h* below the jaws.

Most of the above-described appliances are driven from the crank-shaft A^2 by positive movements and through intermediate devices of such a character that all abrupt changes of motion are avoided, thus preventing jolts and noise, and permitting the machine to be operated effectually at a high rate of speed.

The stitch.—The stitch is formed by the joint operation of the needle *z*, thread-carrier H, and a lip or spreader, 3, Figs. 3, 22, 23, 25, and 26, on the under side of the work-plate, near the needle-opening. When the needle first penetrates the cloth the carrier H is in the position shown in Diagram 16, and when the needle slightly rises, so as to loop its thread *x*, the point *c* of the carrier enters between the thread *x* and the needle, and carries the thread *y* to the position shown in Diagram 17. The needle then rises. On the next descent of the needle, which is opposite the edge of the cloth, it passes between the thread *y*, Diagram 18, and the carrier, so that as the latter is turned in the direction of its arrow to the position shown in Diagram 19 the carrier-thread *y* is lapped

round the needle and finally drawn through the loop x', as shown in Diagrams 19, 20, and 21. The needle then rises slightly to spread its thread, so that the end e', Diagram 21, of the carrier (which continues its revolution in the direction of the arrow) will pass between the needle and the thread, catching the latter, as in Diagrams 22 and 23, forming a new loop, x^2, of needle-thread, which is left upon the carrier as the needle rises. The lip e^3 prevents the loop x^2 of thread from slipping back, and the continued revolution of the carrier brings one side of the loop against the hook or spreader 3, Diagrams 23 and 25, which catches and opens the loop, until by the continued revolution of the looper it is spread, as shown in the plan Diagram 26, below the needle z, so that the latter at its next descent will enter the loop. (See Diagram 26.) The motion of the carrier is then reversed, and as it turns in the direction of the arrow, Diagram 24, the loop x^2 slips off upon the needle and is drawn up by the take-up devices, while another loop is formed at the side of the needle and penetrated by the point c of the carrier, and the above operations are then repeated. By these means and operations we produce a stitch peculiarly adapted for button-hole and edge seaming, both threads being formed into surface loops, which, by properly regulating the tension, may be thrown to the edge of the fabric to form a heavy bead thereon. (See Fig. 27.) This results from throwing a loop, x', of needle-thread through a loop, y', of carrier-thread, and then locking the needle-thread loop by another loop, x^2, of the same thread, and locking the latter loop by a loop, y', of carrier-thread, and so on, the alternate stitches in edge-binding crossing the edge of the fabric. In edge-binding we also use an edge-thread, which is caught in and secured by the over-edge stitches in the usual manner.

We do not here claim the binding of the fabric by the stitch shown, as this may form the subject of a separate application for Letters Patent.

We claim—

1. The block C′, pivoted to the head C and carrying the needle-bar, in combination with the vertical crank-shaft G and lever G^2, connected at one end to the block and at the other to the crank d' of the shaft G, substantially as set forth.

2. The combination of the shaft A^2, and devices connected therewith to impart a vertical motion to the needle-bar, and devices to operate the feed appliances, and a shaft, F, geared with the shaft A^2, to revolve at half the speed of the latter, and appliances connected with the shaft F to operate the thread-carrier and impart the horizontal motion to the needle-bar, substantially as specified.

3. The combination, with a reciprocating eye-pointed needle, of a needle-plate provided with a projection, 3, and a curved double-pointed thread-carrier having an eye near one end and a lip near the other, and devices for operating the needle and carrier, respectively, as set forth.

4. The combination, with the thread-carrier, shaft and nut H^{12}, and with the shaft F and cam-disk E^2, of a lever, H^3, and rod f, sliding in the lever and connected to the nut, substantially as set forth.

5. The combination, with the feed-cam disk I′, of a miter-wheel, L′, gearing with a miter-rack on the disk, a shaft, L, supporting the said wheel, and a flanged disk, M, and a hub, N, forming part of a rock-lever, and dogs P, biting the flange of the disk M and fitting sockets in the hub, substantially as set forth.

6. The combination, with the clamp-plate and with the arm Q, hung to the rock-shaft Q′, and carrying a rod, q, of a stop-plate, q', and devices for shifting it from the clamp-plate, substantially as set forth.

7. The combination of the clamp-plate revolving and sliding on the work-plate, a slide, R, having a bearing on the edge of the clamp-plate, and the stop-plate q', bearing on the slide, and arranged to be thrown into and out of action by the movements of the slide, substantially as specified.

8. The combination of the clamp-plate, feed devices, and intermediate appliances constructed to be operated by said plate, whereby the feed is increased as the plate is turned to present the eye of the button-hole to the needle, as set forth.

9. The combination of the clamp-plate provided with a pin, K′, the stationary work-plate I, having a slot, i, and a cam-disk, I′, revolving below the work-plate, and provided with a series of similar separate cam-grooves, s, at equal distances apart in the face of the disk, and adapted to receive the end of the pin K′, substantially as set forth.

10. The combination of the cam-disk I′, having a series of similar separate grooves, s, each diverging from the center toward the edge of the disk, the work and clamp plates, feed devices for revolving the disk intermittently, and a supplemental device for rotating the disk by hand, as specified.

11. The combination of the stud S^2, sleeve S′, pivoted jaws S S, carried by the sleeve, spring u, bearing on the sleeve, and nut u', substantially as set forth.

12. The combination, with the clamp-plate, of jaws S S, hung to a stud, S^2, a stud, h', a cam-lever, T, having slots receiving pins on the jaws, and a cam-sleeve, T′, bearing with its lower cam-edge on lugs v and supporting the lever T, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS WELCH.
GEORGE CORBION, JR.

Witnesses:
S. J. VAN STAVOREN,
CHAS. F. VAN HORN.