(No Model.)

4 Sheets—Sheet 1.

J. W. LUFKIN.

BUTTON HOLE SEWING MACHINE.

No. 277,755. Patented May 15, 1883.

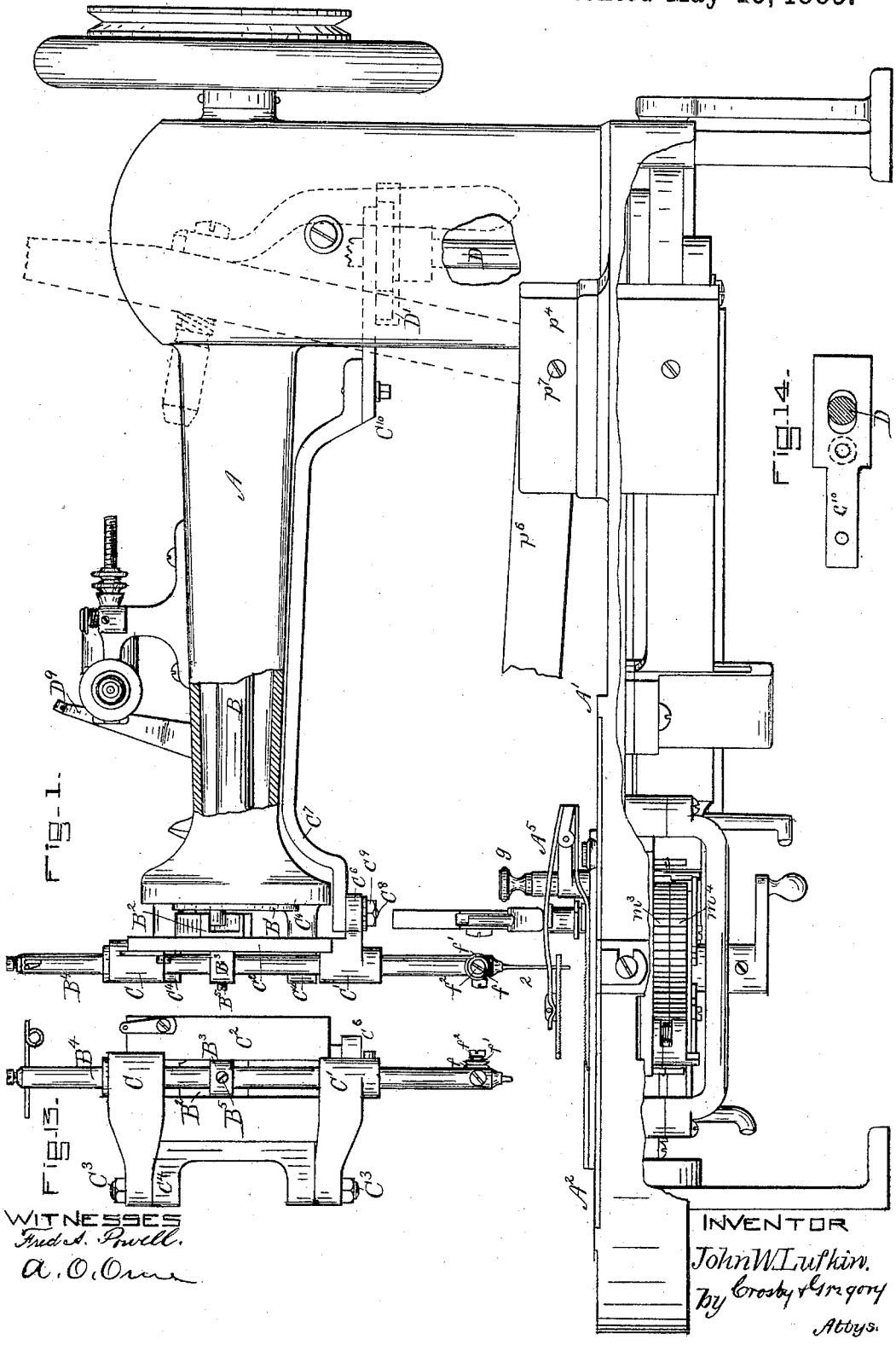

Fig. 1.

Fig. 13.

Fig. 14.

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(No Model.)

4 Sheets—Sheet 2.

J. W. LUFKIN.

BUTTON HOLE SEWING MACHINE.

No. 277,755. Patented May 15, 1883.

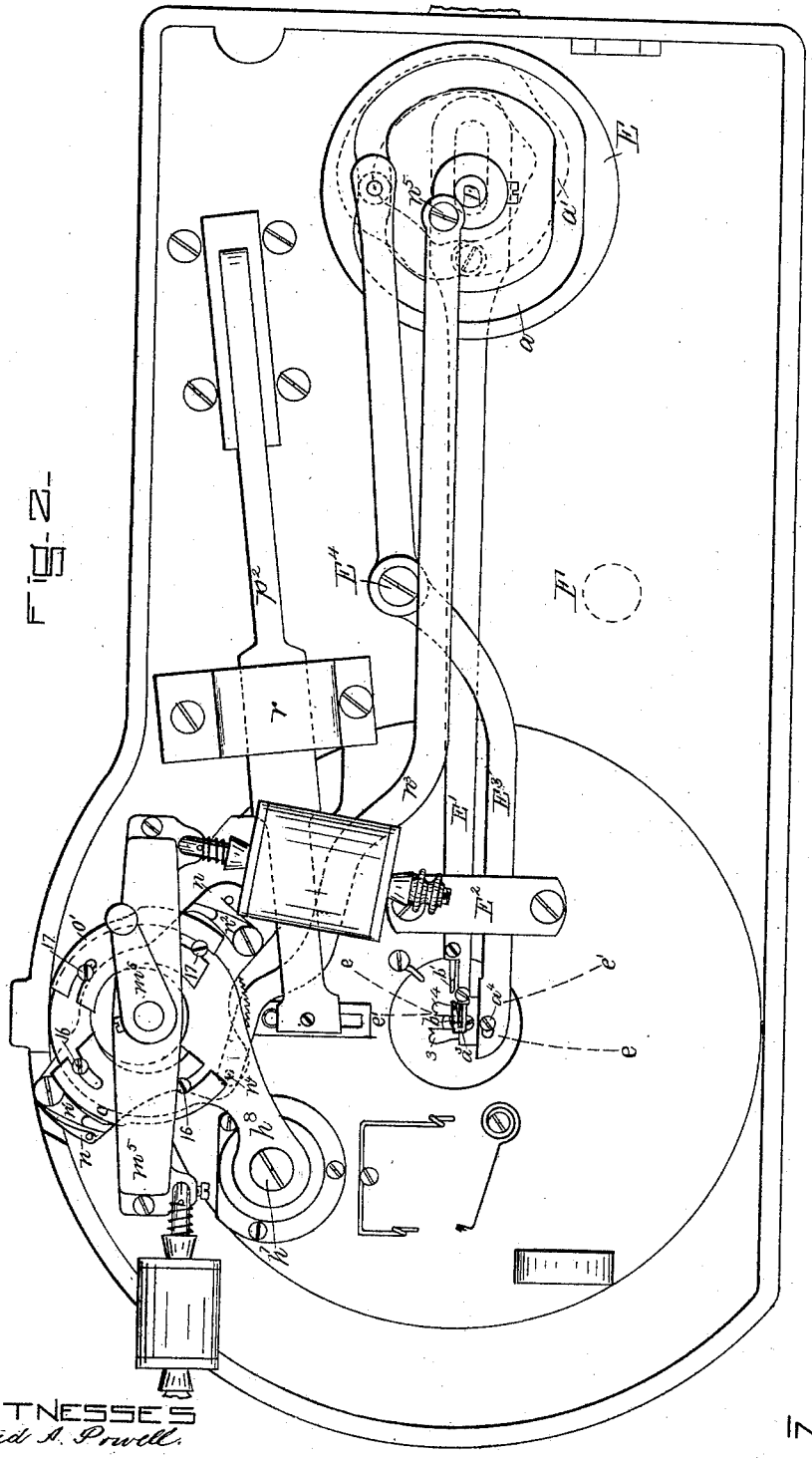

FIG. 2.

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4 Sheets—Sheet 3.

J. W. LUFKIN.

BUTTON HOLE SEWING MACHINE.

No. 277,755. Patented May 15, 1883.

Fig. 3.

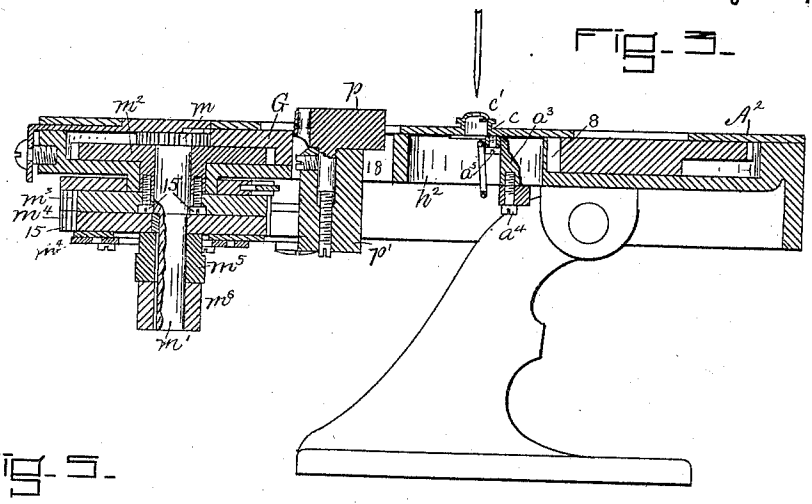


Fig. 5.

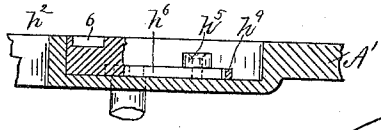
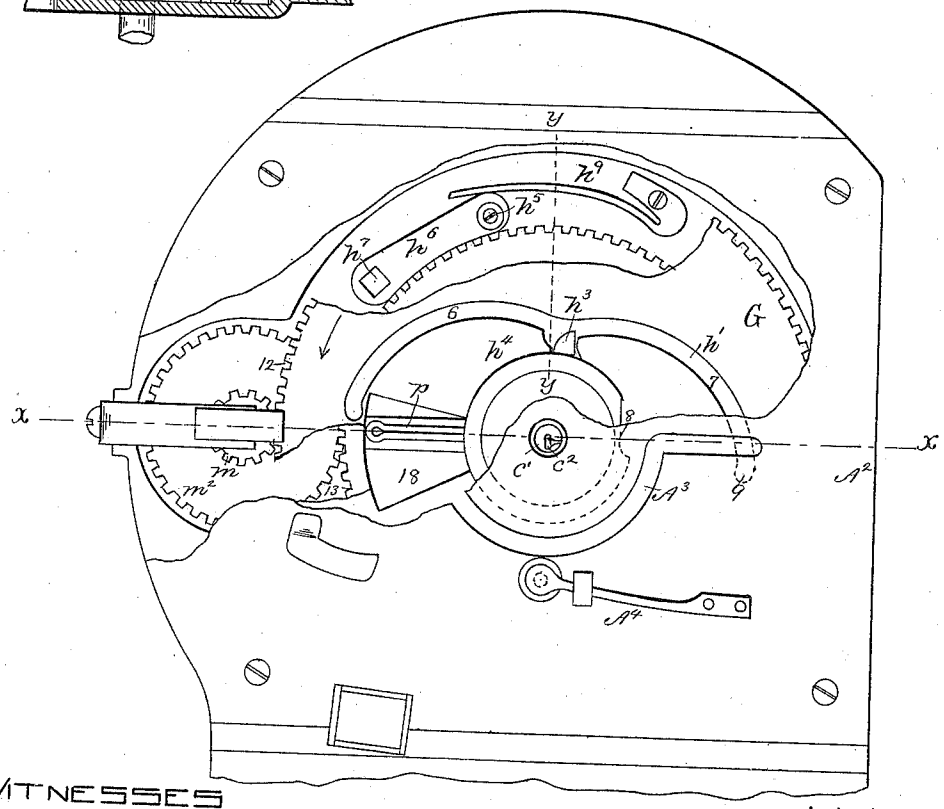


Fig. 4.



WITNESSES

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4 Sheets—Sheet 4.

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BUTTON HOLE SEWING MACHINE.

No. 277,755.

Patented May 15, 1883.

Fig. 6.

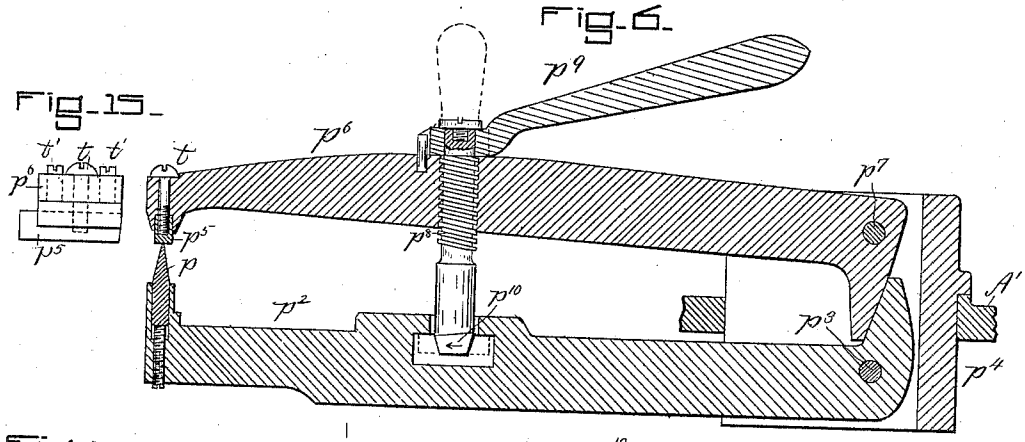


Fig. 15.

Fig. 7.

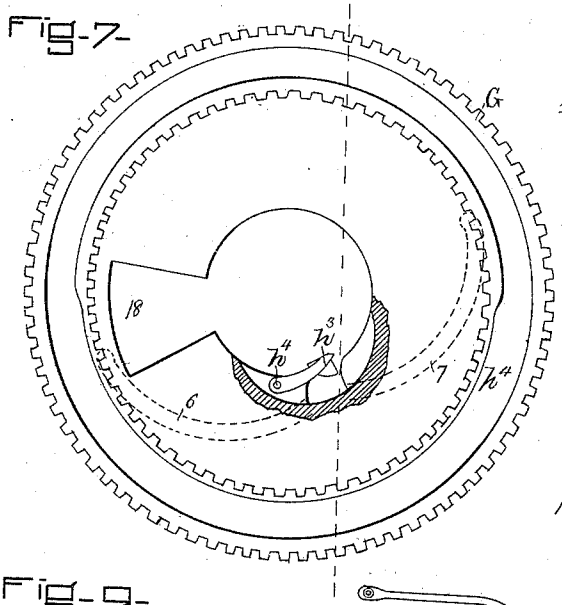


Fig. 8.

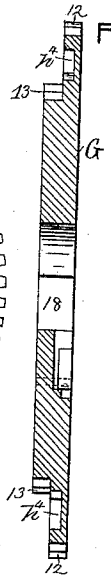


Fig. 11.

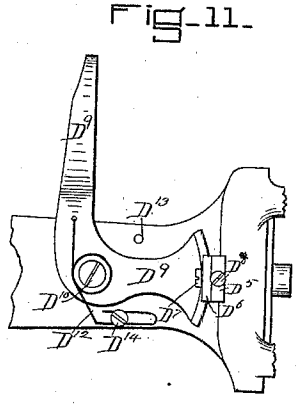


Fig. 9.

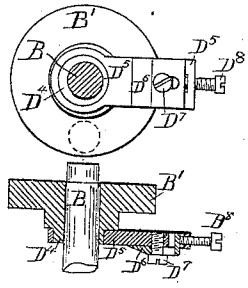


Fig. 10.

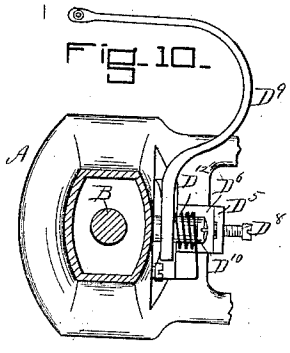
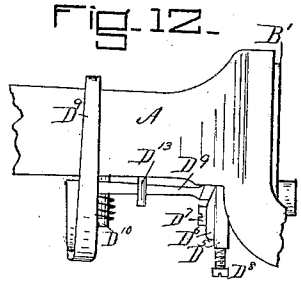


Fig. 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN W. LUFKIN, OF CHELSEA, MASSACHUSETTS.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 277,755, dated May 15, 1883.

Application filed January 22, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. LUFKIN, of Chelsea, county of Suffolk, State of Massachusetts, have invented an Improvement in Button-Hole Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object improvements in mechanism for operating the cloth holding and feeding clamp, in mechanism for vibrating the needle-bar, in take-up mechanism, in novel mechanism for operating the loop-spreader, and in mechanism for cutting the button-holes while held in the feeding-clamp, as will be hereinafter set forth.

Figure 1 represents in side elevation, partially broken out, a sewing-machine embodying my invention; Fig. 2, an under side view thereof; Fig. 3, a section on the line *x x*, Fig. 4; Fig. 4, a top view of the forward end of the bed-plate, the slotted guide-plate being partially broken away, the cloth holding and feeding clamp being removed; Fig. 5, a detail showing part of the feeding mechanism on the dotted line *y y*; Fig. 6, a separate sectional detail of the cutting mechanism closed; Figs. 7 and 8, details of the cam-wheel which moves the clamp; Figs. 9, 10, 11, and 12, details of the thread-nipping device and take-up; Fig. 13, a front view, showing the vibrating head and needle-bar; Fig. 14, a detail of the slotted end of the link c^{10}; Fig. 15, a detail of the upper member of the cutting mechanism.

This invention is an improvement on what is called the "Union Button-Hole Machine."

The arm A and bed A′, plate A^2, provided with slot A^3, spring A^4, and cloth holding and feeding clamp A^5 are all as usual.

The main shaft B, at its front end, has a disk, B′, provided with a crank-pin to enter a curved slot in a cam-block, B^2, having a lug, B^3, through which is passed the needle-bar B^4, the latter being connected with the said lug by the set-screw B^5. The needle-bar B^4, above and below its point of connection with the said lug and cam-block, is passed through guides C C′, forming part of the vibrating head C^2, pivoted by suitable screws, C^3, on the bracket C^4, extended forward from arm A. The vibrating head is open at its center, as shown in Fig. 13, to permit a part of the cam-block to pass through it to be connected with the needle-bar, and the back of the said vibrating head is planed true to form a bearing or guide for the planed back of the cam-block B^2. The lower end of the head C^2 has an ear, C^6, which is connected with link C^7 by a bolt, C^8, and nut C^9, and the rear end of the link has a slotted piece, C^{10}, (see Fig. 14,) which straddles the usual upright shaft, D, and has a pin or roller to enter a cam-groove in a disk, D′, attached to the said shaft, it running at half the speed of shaft B, the said groove being of suitable shape to vibrate the head C^2 about its vertical pivots, so as to cause it to occupy such position that the needle 2 at one descent will penetrate the fabric and at its next descent pass over the edge of the fabric, as in my Patent No. 242,462, to which reference may be had, the extent of vibration of the head and the location of its pivotal points with relation to the needle-hole plate being as in the said patent. In the said patent the needle-bar was operated vertically by a link having a ball-joint, which required especial attention to keep it in working condition; but in this instance of my invention I have slotted the cam-block sufficiently deep and have made the crank-pin entering it of such length that a portion of it always remains in the said slot during all the positions of the vibrating head.

The disk B′, at its rear side, has an eccentric, D^4, (see Fig. 9,) which receives an eccentric strap, D^5, having attached to it a wedge-block or nipping device, D^6, made adjustable by a screw, D^8, and held in adjusted position by a set-screw, D^7. The eccentric moves the strap D^5, and causes the wedge D^6, according to its position thereon, to act sooner or later on the beveled edge of the take-up lever D^9, pivoted on the arm A at D^{10}, and engage and hold the take-up lever D^9 just as the needle-bar commences to rise to throw out its loop for the entrance therein of the looper or under-thread carrier.

I have discovered that the take-up, when some classes of thread are being used, is at times pulled forward by kinking of the thread, and it is this premature forward movement of the take-up to give up slack thread for the stitch next to be made that I desire to obviate

by the employment of the wedge-block. The wedge is retracted to release the take-up and permit it to move forward and give up its slack thread just as soon as the loop is formed in the needle-thread for the entrance of the under-thread carrier or looper to be described. This part of my invention is more especially valuable for use with cotton thread. The take-up, moved forward by the pull of the needle upon it, is moved backward by a suitable spring, D^{12}, and its extent of backward movement is limited by a stop, D^{13}, and the stress of the spring D^{12}, which operates the take-up lever, may be adjusted by the adjusting device D^{14}, (shown as a screw.)

At the lower end of the shaft D is a disk, E, having at its lower side a cam-groove, *a*, and at its upper side a cam-groove, *a'*, the latter being shaped as in dotted lines, Fig. 2, to enable the spreader-lever to be moved forward before the needle descends, and to be moved backward while the point of the needle is below the cloth-plate, the spreader having only one complete forward and backward movement after each descent of the needle. The looper-bar E', carrying the looper *b*, and short independent point *b'* are as in common use, and the said bar is moved by the cam *a'*, a suitable pin or roller-stud on the bar entering the said cam. The looper and the point are held in the said bar by set-screws acting directly upon them. The block E^2 serves as a guide for the said bar, and also as a guide to keep the spreader-lever E^3 up to its work. The spreader-lever has its fulcrum at E^4, and at its rear end has a roller-stud to enter the cam-groove *a*, and at its outer end the said lever has a block, a^3, adjustably attached to it by a screw, a^4, and upon this block is mounted adjustably the loop-spreader having two points, 3 and 4, for lifting the threads, the adjustment of the spreader and its retention in place being effected by a connected screw, a^5, the shank of which is smaller in diameter (see Fig. 3) than the slot in which the said screw is placed.

In the class of button-hole machine referred to, the spreader has commonly had three points, and the fulcrum of the spreader-lever has been located back of an imaginary line which, if drawn, would cut the center of the shaft D and the center of the needle-hole c^2 of the throat-plate *c'*, or located, as in United States Patent No. 49,627, well back on the under side of the bed-plate, away from the front of the machine and the operator. Such location of the fulcrum of the spreader-lever moves the spreader in such an arc with relation to that part of the throat-plate *c'* (see Fig. 3) through which the needle 2 is about to descend that the loop of under thread held by the point 4 of the spreader (when the said spreader carries the said loop farthest toward the front of the machine for the entrance of the said needle 2 through the edge of the fabric and through it) draws the said loop over to one side of the center of the hole in the throat-plate, so that the needle has opened under it but a very small part of the loop held by the said point, and the available area of the said loop is in a measure contracted, and the needle is apt to skip the loop of under thread.

By experiment I have discovered that the loop of under thread held by the point 4 may be kept fully distended, and the central part thereof be kept or held more centrally with relation to the path of descent of the needle and the center of the needle-hole, provided the fulcrum of the said lever is changed to occupy a position at the front side of the said imaginary line.

In Fig. 2 I have shown by the dotted circle F the usual position of the fulcrum of the spreader-lever, and by the dotted curved line *e*, I have shown the arc in which the spreader-point is usually moved, and by the dotted curved line *e'* the arc in which the spreader-point is moved in accordance with my invention, this latter arc so intersecting the needle-hole that the spreader-point 4 in its forward position so holds the loop of under thread that its widest point is placed directly under the needle-hole, in order that the needle, when it descends through the cloth and the said hole, will penetrate the said loop at its widest point, and all liability of the needle passing outside of or skipping the loop of under thread is thus avoided. The point 3 operates, as usual, to take the loop of upper thread from the short point *b'* after the latter has carried the said loop forward past the edge of the button-hole, and spreads it for the entrance through it of the needle 2 and its thread as the said needle descends over the edge of the button-hole.

In the Union Button-Hole Machine referred to, the spreader, besides the two points 3 and 4, as herein shown, has a central point or "tongue," as it is called, located between the two points 3 and 4, the opposite sides of the said central point or tongue co-operating with the loop of thread furnished by the needle 2, so as to detain the same while the points *b b'* enter the said loops at alternate descents of the said needle. I have discovered that the so-called "tongue" may be dispensed with, and the needle 2 have a larger space to work in, provided the slack thread carried by the needle 2 is taken care of, and the loop, when being formed, is compelled to project from but one side of the eye of the needle. I have obviated the projection of the loop at the front side of the needle, or from that side of the eye of the needle at which the thread enters it, by adding to the needle-bar a frictional holding device for the needle-thread, it being composed, as herein shown, of two small disks, *f f'*, held by a screw, f^2, and of a suitable spiral spring, as best shown in Fig. 13, and in connection with the said disks the take-up before described acts to hold the said thread intermittingly in fixed position.

The cloth holding and feeding clamp A^5 has the usual spring-pressed guide-pin, *g*, the lower

end of which enters the groove A^3 in the usual thin covering-plate, A^2, and then into the groove h' of the feed-wheel G, toothed at its periphery and open at its center, as shown in Fig. 3, to fit over the usual annular hub, h^2, forming part of and extended above the bed to the plate A^2.

The groove h', (see Fig. 4,) instead of being heart-shaped, or substantially so, as heretofore employed, is composed of two short connected curves, 6 7, each in length about one-fourth of a circle, the two curves described from different arcs meeting at a point near the center of the feed-wheel, where the groove is provided with a latch, h^3, hinged to the feed-wheel at h^4, the rear side of the said latch bearing against the outside of the said hub, and being held out so that the latch partially intercepts the said grooves at their junction, as in Fig. 4, except when the said latch comes opposite that part of the hub which is cut away, as shown at 8.

Assuming that the button-hole has been cut in the fabric held by the clamp, as will be described, the lower end of the spring-held pin g will be passed through the groove A^3 and into the groove 6 at its outer end. After this the feed-wheel will be rotated in the direction of the arrow thereon, causing the groove 6 to act on the said pin and move the clamp forward while one straight side of the button-hole slit is being stitched; but when the stitching reaches the usual eye of the said slit the latch h^3, the feed-wheel having been rotated a quarter-turn, arrives in position to engage the lower end of the said pin g and carry the clamp in a circular path about the hub h^2 to its opposite side, when the stitching of the eye will have been completed, and as the eye is completed the said latch comes opposite the recess 8, referred to as being made in the hub, which permits the latch to fall back and disengage the said pin, which, with its lower end in the groove 7, is then carried along in the second straight part of slot A^3, and the second straight side of the button-hole slit is stitched, and as the said pin reaches the outer end of the groove 7 an incline at 9 in the bottom of the said groove lifts the said pin out of the groove of the feed-wheel, leaving the said clamp at rest.

The under side of the feed-wheel G (see Figs. 7 and 8) has a cam-groove, h^4, which receives the roll h^5 on the arm h^6 of the shipper-lever, the said arm being connected to the upper end of a rock-shaft, h^7, having at its lower end an arm, h^8, the shipper-lever, composed of the parts h^6, h^7, and h^8, being held against the inner side wall of the cam-groove h^4 of the feed-wheel by a spring, h^9. The feed-wheel has two series of gear-teeth, 12 13. The teeth 12 are engaged by a pinion, m, on a shaft, m'. (See Figs. 3 and 4.) The shaft m' is extended down through the center of a larger toothed gear, m^2, which meshes with the teeth 13 of the feed-wheel G. The hub of the toothed wheel m^2 takes bearing in a recessed part of the bed of the machine, and has connected with it by screws 15 a ratchet-wheel, m^3.

Below the ratchet-wheel m^3 is placed a second ratchet-wheel, m^4, which is attached directly to the shaft m' of the pinion m, and below the said ratchet-wheel m^4 the said shaft m' has a bearing in a yoke, m^5, and below the said yoke the said shaft has attached to it a crank, m^6, by which to operate the feed-wheel by hand when desired.

Immediately above the ratchet-wheel m^3 is the pawl-carrier n, having at its opposite ends the spring-pressed pawls n' n^2, the former engaging and moving the ratchet-wheel m^3, and the pawl n^2 the ratchet-wheel m^4. The pawl-carrier is vibrated by the link n^3, connected therewith at n^4, and attached at its other end to the crank-pin n^5 on the disk E, as in Fig. 2. The spacing of the stitches longitudinally with relation to the button-hole slit, or the length of feed about the eye and along the sides or straight parts of the button-hole slit, is controlled by the movement of the ratchets m^3 and m^4, and by the said ratchets and gears to operate the feed-wheel I am enabled to space the stitches differently about the eye and straight sides of the button-hole, the greatest distance between the stitches being about the eye. If the pawls operated for their whole throw upon the ratchets, the latter would be moved for a distance equal to fourteen of their teeth; but this greatest movement of the said pawl is lessened or controlled, according to the demands of the button-hole being worked, by shields interposed between the said ratchets and the pawls. The shields o o'—one for each pawl—are adjustably attached to the arm h^8 of the shipper-lever by screws 16 17, as in Fig. 2. The shields having been adjusted to enable the pawls to turn the ratchets the desired distances, and the machine set in operation, the wall of the cam-groove h^4 will act on the roll h^5 and turn the shipper-lever and automatically change the positions of the shields o o' to alter the effective stroke of the pawls n' n^2. When the roll h^5 bears against the wall of the groove h^4 nearest the center of the hub, as when the straight part of the slit is being stitched, the shipper-arm will be placed in position to cause the shield o to be so interposed between the pawl n' and ratchet m^3 as to prevent the said pawl from moving the said ratchet and its toothed wheel m^2, and the feed-wheel will at such time derive its movement solely from the pawl n^2, ratchet m^4, and pinion m; but at such time it will be observed that the toothed wheel m^2, freed from its pawl and loose on the shaft m', will be turned by the teeth 13 of the feed-wheel. When the roll h^5 is against that part of the inner wall of the groove h^4 most remote from the hub h^2, the eye of the button-hole then being stitched, the shipper-lever will so move the shields as to cause shild o' to prevent the engagement of pawl n^2 with ratchet m^4, but permit pawl n' to engage the ratchet m^3, and turn it so that the toothed

gear m^2, of greater diameter than the pinion m, then becomes the driver of the feed-wheel, and at such time the said pinion m, loose with relation to the said toothed gear, is driven by the feed-wheel.

The feed-wheel G has an opening, 18, (see Figs. 3 and 4,) through which the under member, p, of the button-hole cutter may pass, to place it in proper position to meet the under side of the cloth held in the usual clamp, A^5. This cutter member, of usual shape, has its shank p' inserted into a suitable hole in the lever p^2, pivoted at p^3 on a bracket, p^4, supported by the bed of the machine. The upper member, p^5, of the cutter is adjustably connected with the lever p^6, pivoted at p^7 on the said block. (See Figs. 1 and 6.) The upper lever, p^6, carries a screw, p^8, having a hand-lever, p^9, and a beveled cross-head, p^{10}, the latter being adapted to enter a T-shaped groove in the lever p^2, as in full lines, and to be turned by the handle into the dotted-line position, Fig. 6, to cause the two levers to be connected and drawn together by the said screw with sufficient force to enable the cutters to cut the button-hole slit in the fabric held in the said clamp. After cutting the button-hole the cross-head of the screw is disconnected from the lever p^2, and the lever p^6 is lifted, as in dotted lines, Fig. 1, and the bottom lever drops down by gravity until the member p is below the feed-wheel, its downward position being determined by the bracket r.

It will be noticed that the opening 18, through which the cutters work, is in position to permit the cutters to pass through it just as the cam part 9 of the groove 7 of the feed-wheel disengages the pin g from the said groove, the button-hole having just been finished, as before stated. In other machines employing a heart-shaped cam the opening for the cutters was so located with relation to the feed-wheel and the said cam as to necessitate a semi-rotation of the said feed-wheel by hand, after stitching each button-hole, to bring the said opening into operative position with relation to the cutters.

The member p^5 is attached to the lever p^6 by a screw, t, (see detail, Fig. 15,) and at each side of the said screw are screws t' to adjust the face of the said member p^5 to the face of the under cutter.

The T-shaped head p^{10} is beveled, as shown at Fig. 6, so that as it is turned in the direction of the arrow into the T-shaped slot the said incline will co-operate with the screw to quicken the movement of the cutting members.

I claim—

1. The pivoted slotted head containing guides for the needle-bar and planed to guide the cam-block, the needle-bar, the cam-block adapted to travel against the head, and the lug B^3 of the said block to receive the needle-bar, combined with the shaft B and its crank-pin, and with means to vibrate the said head, substantially as described.

2. The take-up lever to control the needle-thread, combined with the nipping device, and suitable means to operate it to engage and hold the take-up lever, whereby it is prevented from giving up slack thread to the needle until after the formation of the loop in the needle-thread, substantially as described.

3. The vertical shaft D and disk E, having cam-grooves a a' and looper to carry the under thread, the throat-plate, and the reciprocating needle-bar and needle, combined with the spreader having but two points, 3 4, and its carrying-lever having its fulcrum located, as described, at the front of a line intersecting the needle-hole and shaft D, whereby the spreader is enabled to spread and hold the loop of under thread with its widest part under the needle-hole, substantially as described.

4. The needle and needle-bar and its attached frictional holding device for the needle-thread, combined with the spreader-lever, and spreader having but two points, 3 4, substantially as described.

5. The spreader-lever, its adjustable block a^3, and the attached spreader having but two points, leaving an unobstructed open space between them, combined with a cam for operating the said lever, substantially as described.

6. The feed-wheel provided with the double groove h', each short curved part 6 7 of which has a different center, and the pivoted latch h^3, combined with a cloth holding and feeding clamp, and a slotted plate, A^3, to operate substantially as described.

7. The feed-wheel provided with the double groove h', composed of short curved parts 6 7, and the pivoted latch, combined with the hub h^2, cut away, as described, to permit the latch to fall back, as stated.

8. The feed-wheel provided with two sets of teeth at different distances from its center, combined with a pinion and a separately and independently actuated toothed gear of larger diameter, the said pinion and gear being each adapted to at times engage and rotate the said feed-wheel and to be rotated by the said feed-wheel, as and for the purposes described.

9. The pawl-carrier, its two pawls, the ratchet-wheel m^4 and its connected pinion, the ratchet-wheel m^3 and its connected toothed gear, and the feed-wheel having two sets of teeth, 12 and 13, and a groove, h^4, combined with a shipper-lever, and shields to automatically disengage one and then the other of the said pawls to rotate the feed-wheel at different speeds, substantially as described.

10. The shipper-lever and means to operate it and its attached independent shields, combined with the two ratchets, and the pawl-carrier and its two pawls, the shields being adapted by the movement of the shipper-lever to suspend the operation of either pawl, substantially as described.

11. The cloth holding and feeding clamp and slotted plate below it, and the toothed feed-wheel provided with a groove, h', having the

two curved portions 6 7, connected at but one end, and the pivoted latch at the intersection of the said grooves, combined with a shaft, m', its pinion m, and crank m^2, substantially as and for the purpose described.

12. The feed-wheel provided with the opening 18 and the double groove h', shaped as described, and adapted to lift the pin of the cloth-holding clamp, and the cloth-holding clamp, combined with the cutting mechanism, substantially as set forth.

13. The lever p^6, its connected screw having the cross-head p^{10}, and the lever p^2, slotted to receive and retain the said cross-head, combined with the cutter members p p^5, substantially as described

14. The lever p^6 and its cutting member p^5 and holding-screw t, combined with the two adjusting-screws t', to operate substantially as described.

15. The two levers p^2 p^6 of the cutting mechanism, and a screw fitted to turn in one of the said levers and having a head to enter a slot in the other lever, combined with a handle connected with the said screw to turn it and force the cutting members of the said levers together, substantially as described.

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

JOHN W. LUFKIN.

Witnesses:
G. W. GREGORY,
BERNICE J. NOYES.