



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN SEWING-MACHINES FOR WORKING BUTTON-HOLES, &c.

Specification forming part of Letters Patent No. 50,989, dated November 14, 1865.

### *To all whom it may concern:*

Be it known that I, JAMES EMERSON, of Lowell, county of Middlesex, and State of Massachusetts, have invented a new and useful Machine for Sewing or Working Button-Holes, the nature of which consists in so constructing a machine that it passes the needle and thread through the cloth in the same manner and making the same stitch as made by hand for that purpose, using a short thread long enough for one button-hole only, the needle being straight, pointed at one end, and two eyes near the middle of it; and I hereby declare the following to be a full, clear, and exact description of the machine, reference being had to the annexed drawings, making a part of this specification.

Figure 1 is a longitudinal vertical section of the machine. Fig. 2 is a plan as it would appear if looking down upon it, supposing the circular table B and feed-plate C to be transparent. Figs. 3, 4, 5, 6, 7, and 8 are sections necessary to the explanation.

The table A and the legs 9 are made of cast-iron, the braces 11 and 14 being cast to the legs, the parts 10, 12, and 13 being cast to the table, 15 and 16 being secured to the table by screws. The driving-wheel U at the right is keyed to the end of the shaft T, which has its bearings in the legs. On this shaft the cams A, B, C, D, and E are firmly secured in the positions shown in Fig. 1. The full lines show the front, the dotted lines the back, of these cams. Where there are no dotted lines the opposite sides of the cams are alike. Cam A operates the lever S, the upper end of which is connected to the circular table B, giving it a reciprocating motion from left to right.

Cam B operates the T-shaped lever F, the end of the longer arm of which is connected to the needle-carrier E by the connecting-rod R.

Cam C operates the lever I, which is forked at the top, the fork being placed astride of the looper G in an annular recess, the looper being moved by the lever endwise from and toward the needle, according to the position of the cam.

Cam D operates the lever H, whose right-angled arm raises or pulls down the rod K, which is connected to the segment-gear a, on the right of its center instead of the left, as shown in Fig.

5. As the right of this gear is raised it moves to the left the bottom of the small gear b, which is placed upon the rear end of the looper G, rotating the looper from its position shown in Fig. 1 to the position shown in Fig. 4. Reverse the movement, and the looper returns to its first position. These gears a and b are shown in Fig. 1 in transverse sections, and are inclosed within the upright case marked 15. The gear b has a hub on its right side, on which it rotates, and a square hole through its center, in which the rear end of the looper G slides freely.

Cam E operates the lever M, giving its horizontal arm extending to the left an up-and-down motion. This arm, as shown in Fig. 1, is curved in the arc of a circle, whose radius is equal to the length of the connecting-rod L. There is a slot of the same curvature in this lever extending from its extreme left two-thirds of its length. The lower end of the rod L is connected to the lever M by a pin through the slot.

On the side of the lever M, in permanent bearings, is placed the screw N, which has a ratchet-head, into which works the pawl Q. This pawl is fastened to the under side of the table, and as the lever M rises, as hereinafter stated, the teeth of the ratchet, coming into contact therewith, are acted upon by it, causing the ratchet to rotate intermittently. On this screw is placed the half-nut P, working in bearings on the lower end of the sliding rod O, which is arranged to slide in the loops or guides r r on the side of the connecting-rod L, as shown in Fig. 1. On the rod O, between the guides, there is placed a spiral spring, the upper end of which presses against the upper guide, the lower end against a shoulder on the rod O above the lower guide, thus holding the nut P onto the screw N, but allowing it to be raised when necessary.

The top of the rod L is connected to the carrier-arm D, as shown in Fig. 1. As the screw N is rotated it carries the nut P and the lower end of the rod L to the right, or nearer the fulcrum of the lever M, thus shortening the movement of the arm D each stitch as the thread is used up.

To the top of the T-shaped lever F is connected the right end of the rod J, the left end

of the rod being connected to the slide X, all as shown in Fig. 1. On the back side of the slide X is secured the pawl *m*, (seen in Fig. 2,) which acts in the teeth of the ratchet-wheel Z on the lower end of the shaft Y as the slide X is moved forward, but slipping over the teeth as the slide returns, giving the shaft Y an intermittent rotation. This shaft has an upper bearing in the plate of table B and a lower bearing in a thin plate attached to the lower part of the said table under the ratchet Z, (shown by dotted lines through the slide X in Fig. 1,) so that the ratchet Z, shaft Y, with their connections above, all move with the table.

On the shaft Y, under the plate of the table B, is secured the gear *b*, which connects with the gear *c* by the intermediate gear, *d*. The gear *c* is coupled to the pinion-gear *f* above the table by the shaft *n*, as shown in Fig. 1. Pinion *f* operates the irregular gear *g*. A section of this gear can be seen each side of the hollow stud *o* in Fig. 1, and a plan in Fig. 2. This gear is a thin piece of metal, made in the shape of a button-hole, having teeth upon its edge, except at the smaller end, and it works around the hollow stud *o* on the center of the table B. As the top arm of the lever F gives motion to the rod J, the latter, through the slide X, operates the pawl *m* and rotates the ratchet Z, giving motion to the pinion *f* through the gears *b d c*, moving the irregular gear *g* in a line or circle, according to its position at the time. Fast to this gear is the plate C, on which the work is secured by the plate shown in Fig. 6. This plate is secured by placing it above the plate C, putting the hole *k* in plate 6 down on the button *k* in plate C, (shown in Fig. 7,) and turning the button at right angles with the hole in plate 6. The top of the pin *i* in plate C will enter the hole *i* in plate 6 and keep the plate from turning. The lower end of the pin *i* projects down below the plate C. (See Fig. 7.) This projection enters the channel *j* in table B, and as the plate C is moved by the gears the pin follows the channel across the table. As it arrives at the edge to the right the inside of the round end of the gear *g* comes to the stud *o*, around which it turns, the pin *i* passing half-way around the outer edge of the table until it comes to the channel *j* on the left side of the table, where it enters and follows the channel toward the center. The plates C and 6 have an opening the form of a button-hole, the size shown in plate 6, (marked 9.) The hole in the cloth is placed over this hole in the plates, the cloth projecting sufficient for the depth of the stitch. To change the length of stitch, shift the rear end of the rod J to either of the series of holes shown in the upper arm of the T-shaped lever F. The same arrangement may be applied to the lever S to change the depth of stitch.

The lower carrier, E, is a cylindrical piece of steel sliding vertically in the tubular way 13.

This way projects both above and below the table A. In the upper end of the carrier there is a socket for the lower end of the needle. The spring *y* on the right sinks even with the surface of the carrier as it moves down, the point of the spring pressing on the needle, thus holding it in place. As the carrier returns to its point of rest the back of the spring enters a recess in the tubular way 13, releasing the needle, that the upper carrier, D, may take it, all as shown in Fig. 1.

The upper carrier is the outer end of the arm D, made like the lower carrier reversed; but the spring *t* holds the needle at all times unless released by raising the end of the lever *w*. This lever is formed as shown by the dotted lines in Fig. 1. It has a right-angled arm extending across the carrier D under the spring *t*, the part under the spring being square, so that when the lever is raised it turns the outside upper corner against the inside of the spring, withdrawing its point from the needle, so that the lower carrier may take it. The lever is raised by striking down on the supporting-piece 18; but the moment the arm D rises sufficiently to clear the end of the lever from the piece 18 the point of the spring catches the needle and holds it until the arm makes its movement and returns to the position shown in Fig. 1. In this arrangement an attempt is made to imitate the movements of the human arm while sewing, the arrangement of the half-nut P and the screw N shortening the movement of the arm D each stitch as the thread is used up, as the movement of the arm is shortened in hand-sewing; but the movement of the arm D is only to be shortened one-half the length of thread used each stitch, so that the thread slips through the eyes of the needle the other half, thus using nearly the whole length of the thread, as in hand-sewing. The pawl *q* may be thrown out of the ratchet-head of the screw N if the movement of the arm is shortened too fast.

The looper G, as shown in Fig. 1, is forked more than half its length, one prong being a spring. It also has a transverse forked recess, as shown in Fig. 4, which figure shows the inside of one prong. Around the forked recess there is a projection in form of a C reversed. This projecting part comes in contact with the other prong when the looper is closed, leaving an open space back of the projection between the prongs of the looper for the thread to pass freely. On the outside of the other prong of the looper there is a hump that fits into a recess on the inside of the holder V. This recess is on the right-hand side of the holder, but is shown above the looper in Fig. 1, and the hump before named is shown on the under side of the looper below the recess. It will be seen, if the looper was rotated one-half turn, the hump on the looper would enter the recess in the holder and the prongs of the looper would open. The recess only goes part the length of the holder, so that if the hump on the looper is pushed for-

ward of the recess the looper remains closed while it is rotated.

The braces 17 and 18 support the segment W. This segment is made of wood, with a plate of brass on one side, which acts as a guide for the arm D, as seen in Fig. 8. In the top of the segment there is a V-shaped groove, the bottom of which should be smooth. Each side of this groove should be lined with soft cloth touching together at the bottom; but the cloth should not quite touch the bottom of the groove. As the arm D pulls up the needle and thread the thread is drawn down to the bottom of the groove, and as the needle returns the cloth sides of the groove hold the thread sufficiently to prevent it from kinking.

Operation: Place the button-hole on plate C and secure the cloth by the plate S, as before described; place the gear *g* over the hollow stud *o*; bring the narrow end of the button-hole abreast of the needle, the round end of the button-hole toward the operator, the pin *i* in the channel *j*; thread the needle through both eyes, and knot the end of the thread the same as for hand-sewing; put the needle in the carrier D, the point up; turn the wheel U. The needle will go down through the bottom-hole, cam A will move the table B to the left, bringing the edge of the cloth over the point of the needle, which will pass up through it into carrier D, which will catch and draw up the needle and thread the same as would be done by hand. As the thread is drawn up the looper springs forward astride of the thread, the C-shaped projection passing the thread, as shown in Fig. 4. The prongs of the looper then close, the looper is then drawn backward, leaving the thread in the form of the letter U around the C-shaped projection of the looper. As the carrier D returns the looper makes three-fourths of a revolution, the U-shaped loop of the thread being changed to the form of the letter O around the C-shaped projection of the looper, the looper then being in the position shown in Fig. 1, the needle going down past the end of the looper through the button-hole, as at first. Table B and the point of the looper move to

the left. The needle then comes up through the cloth and the end of the looper, as seen in Fig. 3, the O-shaped loop of the thread being still around the projection of the looper, as represented in Fig. 1. The needle, of course, comes up through that. This loop, when the thread is drawn up, forms the same stitch as is made by hand to make button-holes. As the carrier E goes down with the needle the vibration of the short upper arm of the lever F operates the ratchet Z, feeding the irregular gear *g* to the rear the proper length for the next stitch. After working around the button-hole, take the needle from the upper carrier and secure the end of the thread and button-hole by hand-sewing. When commencing a button-hole have the half-nut P at the extreme left of the lever M, to give the arm D a full-length movement.

What I claim as new and useful, and desire to secure by Letters Patent, is—

1. The arrangement of the screw N and half-nut P on the lever M, when constructed substantially as described, for the purpose of equalizing the movement of the arm D with the loss of thread each stitch.
2. The looper G, when constructed substantially as described, for making a loop in the thread, so that by passing the needle through it, as described, the hand button-hole stitch is produced.
3. The method of feeding the work to the needle by the irregular gear *g*, made in the form of a button-hole, in combination with suitable device for passing the needle entirely through the cloth and then through the button-hole, as in hand-sewing.
4. The lateral motion of the table B, in combination with the arrangement of the needle-carrier E and D and looper G, when constructed substantially as described.
5. The segment W, when made with a V-shaped groove the sides of which are lined with cloth to prevent the thread from kinking.

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Witnesses:

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