

S. J. BAIRD.

Button-Holing Attachment for Sewing-Machines.

No. 159,740

Patented Feb. 16, 1875.

Fig. 1.

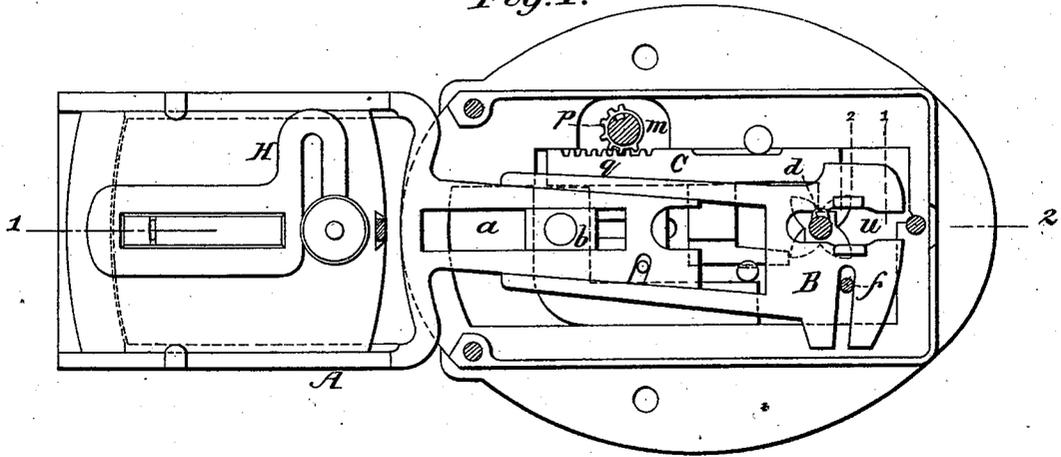


Fig. 2.

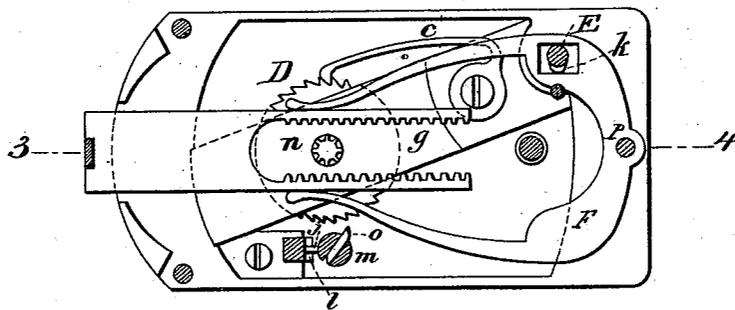
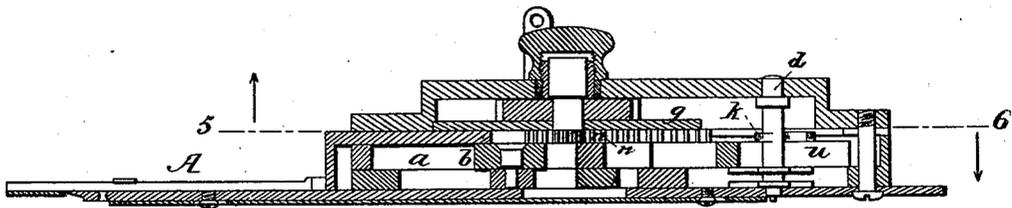


Fig. 3.



Witnesses.

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Fig. 4.

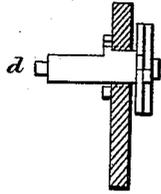


Fig. 5.

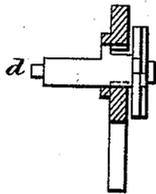


Fig. 6.

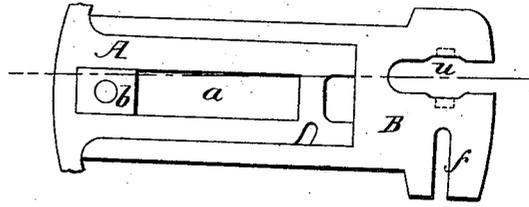


Fig. 7.

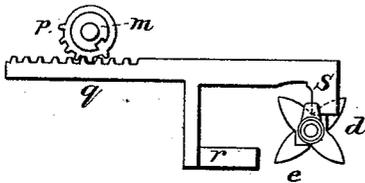


Fig. 8.

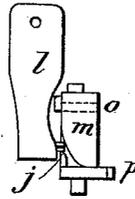


Fig. 9.

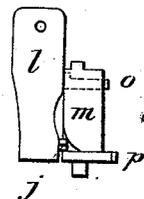


Fig. 10.

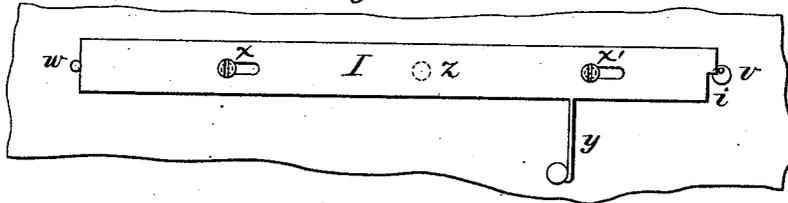
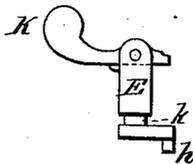


Fig. 11.



Witnesses.

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN BUTTON-HOLING ATTACHMENTS FOR SEWING-MACHINES.

Specification forming part of Letters Patent No. **159,740**, dated February 16, 1875; application filed October 23, 1874.

To all whom it may concern:

Be it known that I, SAMUEL J. BAIRD, of the city of Richmond and State of Virginia, have invented certain Improvements in Button-Holing Attachments for Sewing-Machines, of which the following is a specification:

They apply to that class of attachments in which a clamp or cloth-holder receives a combined lateral oscillation and longitudinal reciprocation, by which it is moved forward during the working of one side of the button-hole and backward during the working of the other.

In the accompanying drawings, Figure 3 is a longitudinal sectional view of my attachment, taken on the lines 1 and 2 and 3 and 4 of Figs. 1 and 2. Fig. 1 is a plan section of the same, taken on the line 5 and 6 of Fig. 3, looking in the direction of the arrow 6. Fig. 2 is a like plan section, taken on the same line, looking in the direction of the arrow 5. The other figures represent detached parts of the device, which will be sufficiently described in the following details.

A and B in Fig. 1 are the two parts of an extension-lever.

One end of A is so formed as to constitute a frame within which the clamp may slide longitudinally, while subjected to a lateral reciprocation by the oscillation of the lever. A longitudinal slot, *a*, is cut in the other extremity of this piece, to receive the block *b*, a pin or screw in which serves as a fulcrum to the lever. This fulcrum is mounted on a slide, which is fitted into a slot, groove, or other equivalent device in the frame of the attachment, so as to allow of a longitudinal adjustment of the fulcrum in the slot *a*. To enable the operator to make such adjustment at pleasure, a pin or projection from the slide passes through a slot in the side or bottom of the attachment. The other lever-piece B is formed with two limbs which fit accurately against the parallel sides of the piece A, or the two may be connected by a groove or bore in the one and a corresponding shaft in the other, or any equivalent device, so as to admit of extension in a direction parallel to the sides of the piece A, without lateral flexibility. In the end of the piece B is a slot, *u*, in which revolves the perpendicular shaft *d*. In the present example the slot is about one-fourth

of an inch wide at its two ends and nine thirty-seconds in the middle, where also the edges rise about one-sixteenth of an inch above the level of the rest of the piece. The following description will be better understood by reference to Figs. 4 and 5. The former is a section view of the lever on the dotted line 1, the cam-shaft *d* revolving in the narrower part of the slot. The latter is a section on the dotted line 2, the slide B being so adjusted as to bring the wider part of the slot in connection with the cam-shaft *d*. On this shaft are two cams, the lower of which has an eccentricity of one thirty-second of an inch, while that of the upper is one-sixteenth. The long diameter of the former is equal to the width of the narrower parts of the slot, and it is placed at such a height on the shaft *d* as to revolve within the slot, causing thus an oscillation of the lever of one thirty-second at each revolution of the shaft. The other cam is placed at such a height on the shaft as to be above the level of the narrower parts of the slot, but to be within the level of the lips or raised edges of the middle part of it, with the distance between which the long diameter of this cam corresponds. If, then, the slide B be so adjusted as to bring the wider part of the slot into juxtaposition with the cam, the oscillation caused by the revolution of the cam-shaft will be one-sixteenth of an inch.

The parallel sides of the piece A, upon which B slides, are not parallel to the axis of the lever, but deflect from it in a ratio which, in the present instance, is one in sixteen. On the other hand, the cam-slot *u* is parallel to the axis of the lever, so that the extension of the latter takes place in that direction, guided by the sides of the slot sliding upon the cam-shaft. The result is that, as the slide-piece B is drawn out, a lateral adjustment of the ends of the piece A takes place, swinging on the fulcrum *b*. This adjustment is proportioned to the deflection of the slide-lines from the parallel of the axis, which, in the present example, being one in sixteen, it results that an extension of half an inch causes a lateral adjustment of one thirty-second. This coincides with the throw of the shorter cam. If, therefore, one side of the button-hole be worked with the piece B drawn out to its utmost extension, a closing of it to the

extent of half an inch will cause such an adjustment as will bring the other side of the button-hole under the needle to be worked in turn, and so vice versa. The means of making these adjustments of the extension-lever is partly seen in Fig. 1, *E* and *f*, and more fully shown in Fig. 11, which is a view of a crank, of which the axle or shaft *E* passes up through the top of the machine, where it is furnished with a handle, *K*, to be used by the operator in making the adjustments. A pin, *h*, on the arm of the crank, enters the slot *f* in the end of the piece *B*, and carries it back and forth as the handle *K* is manipulated.

Fig. 6 represents a modification of the extension-lever. In this modification the sides of the piece *A*, embraced by the limbs of *B*, are parallel to the axis of the lever. In this case the lateral adjustment, which in Fig. 1 is secured by the deflection of these parts from the parallel of the axis, is accomplished by giving the cam-slot *u* such a diagonal direction as serves the same purpose.

Fig. 7 represents the movement by which the requisite interrupted revolution is given to the cam-shaft *d*. In this figure, *d* is a plan view of the cam-shaft. On its lower end is a ratchet-wheel, *e*, of four teeth. Of them two opposite teeth revolve in one plane, and the other two in a different plane. The base of each of these teeth covers one-fourth of the circumference of the wheel, and the sides may be formed with any curve described from a center outside and adjacent to their base-line. This wheel is set in motion by the bars *r* and *s* on the slide *C*. One of these bars moves in the plane of one pair of teeth, and the other in that of the other pair. The slide *C* is reciprocated by a device to be presently described, and as one of the bars, say *r*, approaches the wheel it impinges against and drives before it the nearest tooth on the same plane until it has completed one-fourth of a revolution, the bar and next tooth escaping each other by reason of their being in different planes. In this movement the square corner of the bar enters an angle at the base of the tooth, and locks it in position until the bar is withdrawn by the return movement of the slide. As this return proceeds, the other bar, *s*, in like manner approaches the nearest tooth on the opposite side, which, being in the same plane with the bar, is carried forward as before. Thus with each reciprocation of the slide and bars the wheel, and with it the cam-shaft *d*, accomplishes a half-revolution.

The reciprocation of the slide *C* is effected by means of the rack *q* and the segment gear-wheel *p*, Fig. 1. The latter is on the end of the shaft *m*, Figs. 8 and 9, on which is cut a spiral groove, *j*. A pin in the lower end of the driving-piece *l* fits into this groove. The piece *l* projects through the top of the attachment, and is connected by a lever, hook, or other suitable device with the movements of the sewing-machine, so as to be reciprocated

perpendicularly in unison with the needle. The lower end is held in place by a groove or frame in the box in which it slides. As it reciprocates, the pin sliding in the spiral groove *j* causes the shaft *m* to perform a partial revolution and return with each ascent and return of the driving-shaft *l*. At the same time the segment-wheel *p*, engaging with the rack *q*, causes a reciprocation of the slide *C* with its bars. The twist-shaft may either be constructed, as here described, with a cylindrical shaft, spiral groove, and traversing pin, or with a flat auger-shaped shaft traversed by a slotted slide, in the manner of the circular needle-shaft of the Grover and Baker sewing-machine.

While, by the devices already described, an oscillatory motion is imparted through the extension-lever to the cloth-holder and the cloth, it receives a longitudinal or feed motion, by means of devices shown in Fig. 2. *G* is a double rack, between the links of which revolves a pinion, *n*. *F* is the rack-guide, which consists of two arms, between which the rack is embraced. This guide swings upon a fulcrum, at *P*, and is governed by a cam, *k*, which is cut on the crank-shaft *E*, Fig. 11, which has already been described. This cam operates in a slot in the rack-guide, and as it is revolved by means of the handle *K*, Fig. 11, the guide is laterally adjusted, swinging on its fulcrum, and thereby the one or other limb of the rack is engaged with the pinion *n*, or, as shown in the drawing, both are disengaged at the pleasure of the operator. The rack is thus caused to move backward or forward, or to remain stationary, as one or the other of its limbs is engaged with the pinion, or both are set free. The end of the rack-shaft is connected with the cloth-holder by a ball and socket, a dovetail, or other suitable device, by which the longitudinal movements of the rack are conveyed to the cloth-holder. In coincidence with these adjustments, the slide *B* is so controlled by the crank and pin *h* that the narrower parts of the slot *u* are brought in contact with the short cam at the same time that the limbs of the rack are engaged with the pinion *n*, and the wider part and long cam come together, when the rack is disengaged, and longitudinal movement is suspended. In this position the succession of long stitches, which are placed together, serve to bar the ends of the button-holes.

Fig. 2 is an inverted view of the top of the attachment, showing the devices for revolving the pinion *n*, which drives the double rack. *D* is a ratchet-wheel, in which is the pinion *n*, with bearings in the top of this machine and the plate *g*. A pawl, *o*, in the twist-shaft *m*, Figs. 8 and 9, engages the teeth of the ratchet in succession, one of them being carried forward at each partial revolution of the twist-shaft. The spring *c* prevents the ratchet being dragged back by the return of the pawl. Figs. 8 and 9 show the action of the pawl. It consists of a pin or slide, which fits into a hole

through the upper end of the twist-shaft. It is so made that when its point is in position to engage the ratchet, its head is even with the opposite surface of the twist-shaft. When the driving-shaft *l* is in its lowest position, the several parts will be as represented in Fig. 9, the point of the pawl projecting, and held in that position by the contact of the driving-shaft with its head. As, now, this shaft rises, its pin, traversing the spiral groove, causes a revolving of the shaft *m*, carrying with it the pawl, which takes hold of a tooth of the ratchet, as represented in Fig. 2, *o*, which it carries forward. On the return, the pawl slips back out of the way of the projecting teeth of the ratchet. Its head having been, by the revolving movement, carried out of the path of the driving-shaft *l*, is thrust out at the back of the twist-shaft. As the driving-shaft again descends, the twist-shaft returns upon its revolution until the head of the pawl enters the concave cut in the side of the driving-shaft, and is presented immediately in the path of the latter, as seen in Fig. 8. As the driving-shaft continues to descend, the returning curve of its side acts as a wedge to drive home the pawl to its position, as seen in Fig. 9.

In order to increase or diminish the rapidity of movement of the double rack, and thereby to regulate the feed of the cloth-clamp, the parts may be so constructed as to admit of the removal of the pinion *n*, so as to replace it by another, of a greater or less number of teeth, as may be required. While this is done, the rack-guide is so adjusted as to disengage both limbs of the rack. To compensate for the variable diameters of the pinions thus used, the arms of the guide are made flexible.

Fig. 10 represents a device to be used in connection with such sewing-machines as partly rely on the forward feed of the sewing-machines for forming the stitch. As my attachment supersedes the machine feed, and its movements are alternate in opposite directions, a compensation is requisite, for which the following provision is made:

I is a thin strip or bar, held by screws or pins in the slots *x x'* in its position on the bottom of the attachment. *w* is the needle-hole, at which the feed end of the bar *I* presents itself. *b* is the lower end of the cam-shaft *d*, Figs. 4 and 5. Projecting from it is a small pin, arranged eccentrically to its axis, which pin, as the cam-shaft revolves, engages with the end of the feed-bar *I* and drives it forward, so as to carry the thread with it in the direction of the superseded feed. As the shaft continues to revolve the small pin passes the projecting corner of the bar, and drops into the angle *i*, when the spring *y* carries the bar back to its original position ready for a new movement.

As thus described the movement is adapted to the assumption that the attachment is so connected with the sewing-machine that the

axis of the former is parallel to the feed movement of the latter.

As different cases may require, the device may be modified so that the bar *I* shall hang upon a fulcrum, represented by the dotted circle at *z*, the position of the driving-pin at *v*, and of the spring and the shape of the end of the bar being so modified that the movement shall be lateral instead of longitudinal, the slots and pins *x x'* being superseded, and the forward end of the bar being elongated on one side of the needle-hole, so as to constitute a lateral feed.

In Fig. 1, *H* represents a modified form of cloth-clamp. In this device the curved arm of the upper jaw allows the fulcrum-post and thumb-nut to be on a line coinciding with the axis of the button-hole, while the form of the curve admits of the cloth being introduced either longitudinally or transversely, as may be desired.

The manner of operation of the devices here set forth sufficiently appears in the foregoing specification without further description.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An extension-lever, consisting of the two pieces *A* and *B*, the latter having a slot diagonal to the line of its movement upon *A* and of unequal diameter, with lips or projections at the wider part, substantially as and for the purposes described.

2. A perpendicular cam-shaft, *d*, having two cams of different diameter and throw, in combination with the slat and its projecting lips, substantially as and for the purposes described, whereby the proper vibration and adjustment are accomplished for the successive forming of the sides and barring of the ends of the button-hole.

3. The double rack *G* and rack-guide *F*, in combination with the adjustment-cam *k*, substantially as and for the purposes described.

4. A reciprocating driving-shaft and twist-shaft, in combination with the automatic pawl *o* and ratchet-wheel *D*, substantially as and for the purposes described.

5. The driving-shaft and twist-shaft, in combination with a segment gear, rack, and sliding bars, substantially as and for the purposes described.

6. A four-toothed ratchet, having the two opposite teeth in one plane, and the alternate teeth in another plane, and reciprocating bars, one of which moves in the plane of each pair of teeth, in combination with the cam-shaft and extension-lever, substantially as and for the purposes described.

7. The feed-bar *I*, in combination with the pin or cam on the end of a revolving shaft, *v*, to act upon the thread under the cloth, substantially as and for the purposes described.

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Witnesses:

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