

G. B. WOODRUFF & G. BROWNING  
BUTTON HOLE SEWING MACHINE.

No. 97,014.

Patented Nov. 16, 1869.

Fig. 1

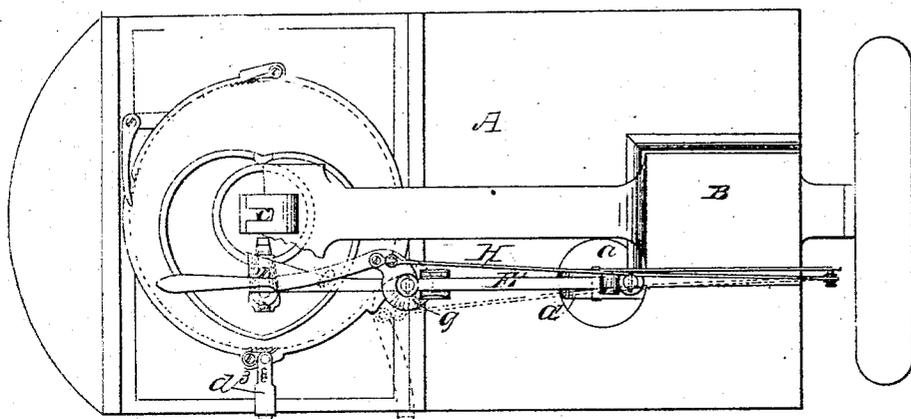
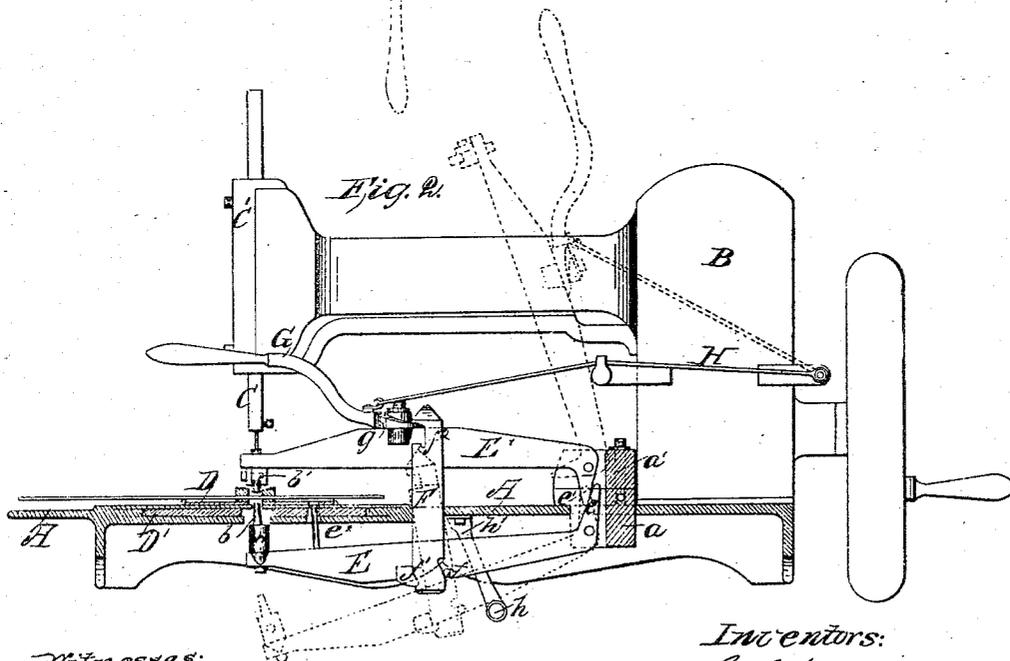


Fig. 2



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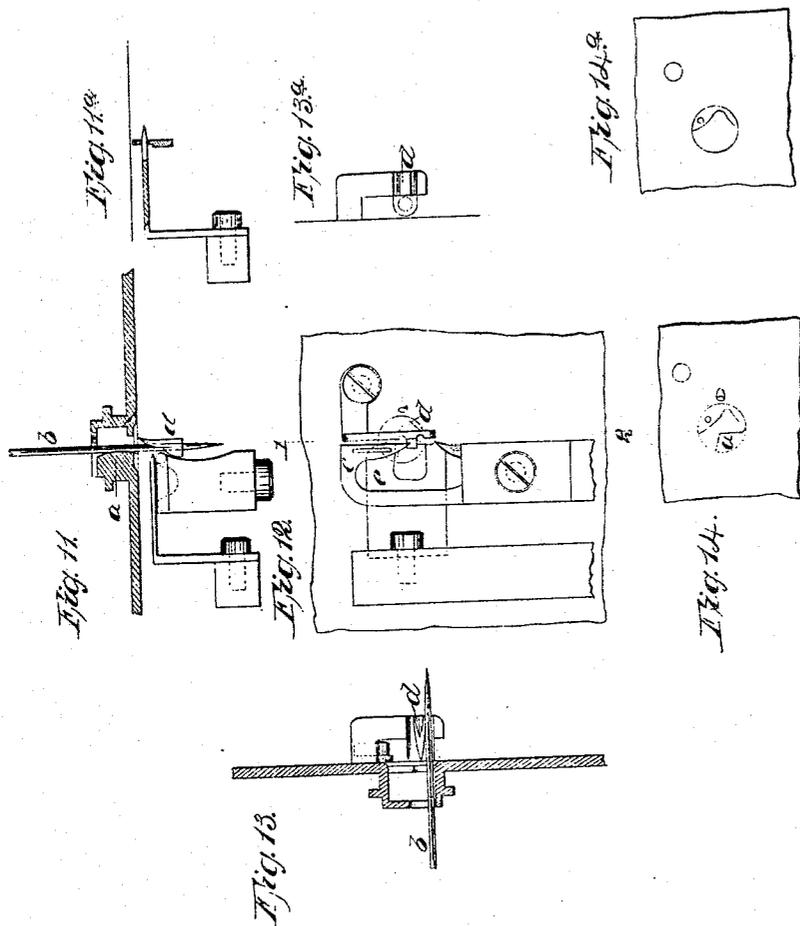




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# UNITED STATES PATENT OFFICE

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## IMPROVEMENT IN SEWING-MACHINE FOR BUTTON-HOLES.

Specification forming part of Letters Patent No. 97,014, dated November 16, 1869.

*To all whom it may concern:*

Be it known that we, GEORGE BALDWIN WOODRUFF and GEORGE BROWNING, both of Cheapside, in the city of London, England, engineers, have invented certain new and useful Improvements in the Construction of Button-Hole Sewing-Machines; and that the following is a full, clear, and exact description and specification of our said invention.

The chief object of this invention is to insure that the edges of the button-hole to be sewed shall, before the act of sewing commences, be in the exact position required relatively to the reciprocating movements of the needle. This end we propose to obtain by cutting the button-hole while the work is held firmly in the clamp which presents it to the action of the needle; and, when requisite, we propose to expand the cut hole by the lateral expansion of an upper and lower pair of clamping-jaws of peculiar construction, which, under all circumstances, will impart the requisite pressure to the work.

Hitherto the work has been prepared for this class of machines by cutting the button-holes required to be sewed, by a punch or otherwise, before placing the work on the table of the machine, and it was then required of the attendant of the sewing-machine to adjust the holes, and the several thicknesses of cut fabric composing the work, to a central position in the clamp. This adjustment requires great care and precision, as, if carelessly done, the stitching would be a failure and require unpicking. Moreover, the opening of the hole to allow of the free passage through it of the needle has hitherto, when attempted, been imperfectly performed, the upper layer of the cloth only moving with the laterally-expanding clamping-jaws, and the consequence was a defective edge on the face of the work.

The above-named improvement of cutting the button-holes while the work is clamped and in position for sewing, we should remark, applies to button-hole sewing-machines generally; but the improvement in the expanding-clamp has reference to the construction of clamp used in what is known as the "Union button-hole and embroidery machine."

In illustrating that part of our invention which relates to the cutting of the button-holes *in situ*, we will first explain the manner of carrying it out, by reference to the Union button-hole and embroidering machine, patented in England, March 20, 1865, No. 776, and we will then, as a further example, show the manner of adapting the cutting apparatus to the Woodruff button-hole sewing-machine, patented in England 25th of July, 1866, No. 1,936.

In Sheet I of the accompanying drawings, Figure 1 is a plan view, and Fig. 2 is a longitudinal vertical section, of so much of an improved Union button-hole and embroidering machine as will serve to explain the nature of our improvements in the cutting of button-holes. In Sheet II, Fig. 2<sup>a</sup> is a transverse section of the said machine. Fig. 3 is a side elevation, and Fig. 4 is a plan view, of the expanding-clamp, for opening out or expanding the cut button-hole. Fig. 5 is a cross-section taken in the line 3 4 of Fig. 4.

A is the table of the machine; B, the standard and bracket-arm, carrying at its front end the reciprocating guide-box C, in which the needle-bar C works, as usual. D is the throat-plate, which carries the work under the needle and turns it, by the aid of a feed-wheel and cam-grooves, so that a round end may be sewed, as will be well understood by all persons familiar with the Union button-hole machine. Upon this plate D (see Figs. 3, 4, and 5, the expanding-clamp for holding the work is mounted, and the plate is also provided with adjustable guides, for facilitating the adjustment of the work in the clamp.

Supposing it to be intended to adapt the cutting apparatus to a machine already constructed, we cut a hole in the table A to receive a block, *a*, which projects upward through the table, and is made fast thereto by screws. On the top of this block we mount a swivel-block, *a'*.

To the lower part of the block *a* we hinge a lever, E, which carries at its free end an adjustable punch or cutter, *b*, (see Fig. 2<sup>a</sup>), by preference corresponding in form and size to the largest button-hole desired to be cut. This lever, which constitutes the movable stock of

the cutter *b*, is formed with a tail-piece, *e*, at its hinged end. It carries at about the middle of its length a link, *F*, that projects up through a hole formed for that purpose in the table *A* of the machine. This link is slotted or forked at its upper end to receive a lever, *E'*, which is hinged to the upper or swivel part *a'* of the block or bracket *a*. This lever *E'* is fitted with a removable cutting-block, *b'*, (shown best at Fig. 2<sup>a</sup>.) and is intended to act in concert with the under lever, *E*, and take the pressure of the adjustable punch or cutter *b*.

In order that these levers may act in concert, the lever *E'* is also provided with a tail-piece, *e'*, which, as its lever is brought down to the depressed position of Fig. 2, will press against the tail-piece *e* of the lower lever, *E*, and thereby lift and force the punch or cutter *b* of that lever through the work.

By reference to Fig. 2 it will be seen that the table *A* is slotted, to allow the cutter to move up to the under side of the work, and, for the like reason, the feed-wheel *D'*, which imparts the transverse motion to the clamp carrying the work, is also slotted.

The object of mounting the lever *E'* on a swivel-block is to enable it to turn slightly as the lever descends, and thus enable the lever to bring its cutting-block *b'* down into the true position upon the work, or immediately above the part which is to be acted upon by the punch or cutter, the overhanging needle-guide box not admitting of the lever moving down in a direct vertical line onto the work.

The upper lever is depressed by means of a handle, *G*, and, by reason of the tail-pieces *e* and *e'* being brought into contact on the depression of the upper lever, they will act the one on the other, so that there will be a sympathetic action between the levers, the lower one rising with its cutter to punch the button-hole, while the upper one descends to take the pressure of the punch.

The forked link *F* is not secured rigidly to the lower lever, but it is held in position by stops *f* and *f'*, which leave it free to oscillate with the movements of the lower lever. This link *F* is notched at its upper end at *f''* to form a shoulder, against which bears a face-cam, *g*, forming part of the fulcrum end of the handle *G*. This handle is carried by and turns on a fulcrum-pin secured to the upper lever. By turning this handle on its fulcrum-pin, when the lever has been brought down to the position for the cam to engage in the notch of the link *F*, the cam will draw the two levers together until the requisite nip of the work is obtained between the punch or cutter and the cutting-block, to insure the cutting of the button-hole without any strain being put upon the sewing-machine proper.

When the nip is taken off, the button-hole will be found to be cut in the exact spot required. The upper lever is then to be raised out of the way, an elastic cord or spring, *H*, being employed for the purpose, and the lower lever, being released, will descend by its own

weight, and rest upon a stop, *h*, supported by an elastic bracket-arm, *h'*, affixed to the under side of the table, clear of the sewing mechanism, as shown by the dotted lines in Fig. 2.

The button-hole has now to be expanded by the means hereafter described; and, the sewing mechanism being set in action, the needle 1 will carry its thread down below the work, the looper 2, Fig. 2<sup>a</sup>, will seize the loop of the needle-thread, and the loop-opener will expand it, ready for the needle on its next descent to enter the expanded loop of its own thread, and thus form the well-known button-hole stitch.

To insure the proper action of the parts, and to prevent the needle from striking the looper and loop-opener, (an occurrence which is not unfrequent in the Union button-hole machine,) we modify the form of the throat and the guide-bar, as shown in Sheet IV, and hereinafter described.

By turning aside the stop *h*, Fig. 2, the lever *E* will be free to drop down and bring the cutter to a position more accessible than the dotted position of Fig. 2, for removing and replacing it, when that is required.

It should be remarked that if the lever *E* is fitted with a punch or cutter suitable for cutting the largest button-holes required, as above intimated, the length of cut can be regulated to suit the work in hand by changing the cutting-block *b'* and inserting a longer or shorter one; for the punch or cutter will only act upon so much of the work as is subjected to the nip of the punch or cutter *b* and cutting-block *b'*.

To prevent the rise of the punch when the opening in the feed-wheel *D* for the passage of the cutter is not in position for the cutter to act, the lever *E* is fitted with a stop-pin, *e''*, which, when the opening in the feed-wheel is brought into coincidence with a similar opening in the table, or is in position for the cut to be made, will rise through a small hole made in the wheel to receive it; but when this wheel *D* is not in position the pin *e''* will, if the lever is raised, strike against the wheel and arrest the upward movement of the cutter.

A modification of the above-described cutting apparatus is shown in side elevation at Fig. 6, and in plan view at Fig. 7, Sheet III. In this arrangement we employ only one lever, *E*, which constitutes the movable stock for the cutter; and, in lieu of the second lever for bringing the cutting-block onto the work, we provide a stationary steel sliding block having a cutting-edge, which, acting with the cutter carried by the lever, will cut the button-hole after the manner of a pair of scissors.

The lever or cutter-stock *E* is hinged on a swivel-plate secured to the table *A* of the machine, to permit of its swinging laterally into position. In the plate *D* and across the middle of the plate for nearly its whole length we form a groove, with guides in its parallel sides to receive the steel sliding block *E'*, which, as the plate *D* is rotated in the working of the machine, is brought into contact with the sta-

tionary throat-plate, around which the plate D rotates, and through which the needle strikes. By thus being brought into contact with the throat the sliding block is pushed back, leaving the plate D free to be advanced to its rotating center. The readjustment of the sliding block E' is to be effected by hand.

By reference to Fig. 6 it will be seen that the cutting-edge on the block E' is formed by cutting a slanting longitudinal groove along the face of the block, and a cutter of the requisite length being fitted to the lever, the pressing down of the lever will insure a shearing cut of the length of the button-hole desired. This form of cutter will best suit the cutting of button-holes in linen, no rounded end being, in general, required in that class of work. For giving the pressure requisite to cut the hole, the cam *g*, operated by its hand-lever G, as before described, will be used. The notched slotted arm or link F, connected to the lower lever, and used to take the pressure of the cam *g*, is, in this case, bolted to the table A of the machine, and the depth of the vertical slot serves to determine the limit of depression of the lever E and its cutter. The pressure of the moving cutter will, in this case, be sustained by the table of the machine, which will require to be made proportionately strong to bear the pressure.

At Figs. 8, 9, and 10, Sheet III, a further modification of our button-hole-cutting apparatus is shown, the same being adapted to a Woodruff button-hole sewing-machine in illustration of its applicability to button-hole sewing-machines generally. Fig. 8 is a side elevation of so much of the machine as will serve to explain the improvement, the table being shown in section. Fig. 9 is an end view of the same, and Fig. 10 is a plan view of the part of the table where the feeding-plate is situated. In this adaptation the cutter *b* is carried by a lever, E, which constitutes the movable stock for the cutter, and is mounted on a fulcrum-pin above the table.

Pivoted to the lever or cutter-stock E is a hand-lever, G, having a forked cam-shaped termination, *g*, the curved prongs of which, when the lever is depressed, are intended to take onto a pair of howls, *g*<sup>1</sup>, carried by a standard, *g*<sup>2</sup>, that projects up through a hole made in the table A; and draw down the cutter onto and press it through the work. The standard *g*<sup>2</sup> is securely bolted to the under side of the table. A dovetail groove is cut in the table in a line with the feed-plate *i*, to receive a brass plate, *k*, which supports the work while the button-hole is being cut and takes the pressure of the cutter. *m* is the presser-foot, formed with a sufficiently wide slot to allow for the lateral motion of the needle, which motions are required, as is well known, to form the button-hole stitch. It may be here remarked that the operation of opening the button-hole preparatory to sewing, which is next to be described, is not required when light goods are being operated upon.

By reference to Figs. 3 and 4, sheet II, it will be seen that there is fixed to the top face of the plate D a casting, D', which is T-shaped in plan view, and to which are connected the expanding-jaws I I' of the clamp for holding the work while being operated upon. The forward part of this casting, or that which connects with the plate D, is made hollow and of a cylindrical form, to receive a vertical plug or pin, *d*. This pin projects through a hole in the plate D and enters the cam-groove which governs the motions of the plate as it is driven and caused to rotate around or to slide over the throat-plate before mentioned. The pin *d* is kept down by the pressure of a coiled spring, which surrounds the pin in the cylindrical box, and it is raised for the purpose of readjusting or shifting the position of the plate on the table of the machine by applying the hand to the knob *d*<sup>2</sup>, affixed to the upper end of said pin; or the pin may be raised by applying a rock-lever to the under side of said knob, as represented at *d*<sup>1</sup> in the drawings, Figs. 3 and 4. The jaws I I' are carried by arms I<sup>2</sup>, made of steel, and of such form as will enable them to yield to pressure put on their inner edges, and open or expand laterally, and close again when the pressure is removed. The jaws I I' are hung loosely on these arms, to allow of the jaws adjusting themselves to inequalities in the thickness of the work. A raised rib on the back of the jaws enters a slot made in the extremities of the arms, and a cross-pin secures the connection of the parts. The arms are formed of one piece of metal, and they embrace a vertical cam, K. For connecting the arms to the casting D' there is affixed to the under side of the cross or coupling piece I<sup>3</sup> a block, which enters a recess in the casting, and is secured in place by a transverse pin, *e*<sup>2</sup>. This coupling is so arranged that the arms will be free to rock vertically, in order to bring down the jaws, which they carry, upon the work. They are held up in the position shown at Fig. 3 by means of a spring, *i*<sup>\*</sup>. The lower or fixed jaws, I<sup>1</sup>, form part of the elastic arms I<sup>2</sup>, which bear upon the plate D, and, like the arms I<sup>2</sup>, also embrace the cam K, and, extending back to the rear of the casting D', are secured thereto by screws.

The cam K is supported in a vertical position by a cylindrical pin, *k*, riveted to the plate D, and it receives an axial motion from a short lever attached thereto. The upper end of the cylindrical pin is flattened, and it is embraced by a split snail-cam, L, which is formed with a hand-lever, as shown at Fig. 5. This cam bears upon a saddle-piece, *l*, which is slotted to enable the flattened extension of the pin *k* to pass through it, and it rests upon the upper elastic arms, I<sup>2</sup>.

When, therefore, the cam L is turned so as to bring its increasing radius to bear on the saddle-piece *l* the upper clamping-jaws will be depressed and caused to bear upon the work. The work being thus properly clamped, the

cutting of the button-hole is to be effected as before explained.

The cam K is now to be turned, so as to give the upper and under jaws a lateral-diverging motion simultaneously, and the button-hole cut through the several thicknesses composing the work will thus be properly expanded or opened, ready for the vertical needle to enter it and work a line of stitches around the edges of the hole.

In order to insure the proper adjustment of the clamp on the table of the machine for submitting the work to the action of the cutter an adjustable plate, *d*<sup>3</sup>, Fig. 1, is fitted to the table of the machine, and a hole is made in this plate to receive the pin *d*. When, therefore, the pin is inserted in the hole of the plate *d*<sup>3</sup>, and the plate is adjusted to its proper position, the clamp will be properly situated to insure the cutter acting on the work at the precise spot required.

To prevent the clamp from shifting, guides such as shown at Figs. 4 and 5 may be provided, and these will hold the clamp, when brought to the cutting position, firmly down upon the table.

The last part of our invention relates to means for preventing the needle of the Union button-hole machine from striking upon the loopers and breaking them or snapping the needle; also, for insuring the taking up of the loop of the needle-thread by the looper, and the entrance of the needle into its own expanded loop, to complete and lock the stitch. The means for effecting these improvements are shown considerably enlarged at Figs. 11, 12, 13, and 14, Sheet IV.

Fig. 11 shows, in sectional elevation, the throat or hollow projection of the table through which the needle strikes, and the needle-guide, looper, and loop-opener in position. Fig. 12 is a plan view of the same. Fig. 13 is a cross-section taken in the line 1 2 of Fig. 12; and Fig. 14 is an inverted plan of the pierced portion of the table.

In order that our improvements may be the better understood, we have shown the present form of the parts in the Union machine, to which our improvements refer, and a comparison of these with the new construction of the corresponding parts will explain the means whereby we are enabled to secure the advantages above indicated.

Fig. 14<sup>a</sup> shows the cavity in the throat, as constructed previous to our invention. This form of cavity allows the needle, when deflected from its true vertical position by reason of its striking through some hard or thick fabric, to pass down, and if bent toward the loopers it will strike and break them, or will itself be broken.

By filling up the cavity with hard metal to the extent indicated at *a*, Fig. 14, and inclining the wall of the filling, as shown at Fig. 11, the needle *b* cannot strike the looper *c* or looper-carrier *e*, for, if bent, it will be deflect-

ed by the hard-metal filling, and compelled to clear the looper in its descent.

As a further security for the needle maintaining its proper vertical position, the grooved guide-bar *d*, which the needle passes in its descent, instead of being made of the form shown at Figs. 11<sup>a</sup> and 13<sup>a</sup>, has its grooves extended up to a line with the under face of the table, together with the wall which divides the grooves. This wall projects within the line of motion of the looper *c*, and, being chamfered on both sides, serves as a guide to guide down the needle, and prevent it from deflecting laterally.

The increased projection and extension of the wall-guide will prevent the deflection of the loops formed by the needle-thread, and insure their taking up a proper position for the looper *c* to act upon them.

The needle, as it is moved to and fro by the reciprocation of the guide-box *C*, to make its descent alternately past and through the edge of the fabric, strikes alternately on opposite sides of the wall-guide *d*, and in doing so it will enter the loop held open by the opener *e*, and, the loop last formed by the needle being received by the looper, the open loop will be caught by the needle-thread, and the stitch will be completed with certainty.

Having thus described a machine embodying all our improvements, we claim, as our invention, and desire to secure by Letters Patent, the following combinations of instrumentalities, viz:

1. The combination, in a sewing-machine, of the table thereof, with a cutting-blade, to cut the slit for the button-hole, substantially as before set forth.

2. The combination of the table, cutting-blade, and cutting-block with mechanism by which the blade and block are caused to approach each other simultaneously from opposite sides of the table, substantially as before set forth.

3. The combination of the cutting-blade and cutting-block by a link, in such manner that the strain of cutting and holding for cutting are made to counteract each other, so that the machine is relieved of the strain, substantially as before set forth.

4. The combination of the cutting-blade and the movable stock thereof with a handle, by means of which the said stock may be brought rapidly into position for cutting, and moved comparatively slowly, but with great force, during cutting, substantially as before set forth.

5. The combination of the under jaw of a forked cloth-clamp with oscillating movable jaws, which adapt themselves to variations in the thickness of the fabric, substantially as before set forth.

6. The combination of the forks of the jaws of the cloth-clamp with mechanism for moving said forks apart laterally after the cloth is clamped, so as to spread the button-hole for sewing, substantially as before set forth.

7. The combination of the forked cloth-clamp with the blade for cutting the cloth, so that the cloth may be cut while it is clamped, substantially as before set forth.

8. The combination of the table-plate of the sewing-machine, the forked clamp for holding the material, and the blade for cutting it, so that the work may be cut in the same clamp in which it is sewed, substantially as before set forth.

9. The combination of the clamp with the feeding mechanism, (for moving it during sewing,) and with a cutting-blade arranged at one side of such mechanism by means of a pin, by which the clamp may be secured reciprocally in the proper position relatively to the cutting-blade, and in the proper position relatively to the feeding mechanism, substantially as before set forth.

10. The combination of the needle, carried

in the reciprocating guide-box of the sewing-machine, with a filling in the throat of the table-plate, to prevent the deflection of the needle, substantially as before set forth.

11. The combination of the table of the sewing-machine with an inclined wall-guide for the needle beneath the table, so as to guide the point of the needle out of the path of the looper, the whole constructed to operate substantially as before set forth.

In testimony whereof we have hereto set our hands this 19th day of December, A. D. 1868.

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