

(Model.)

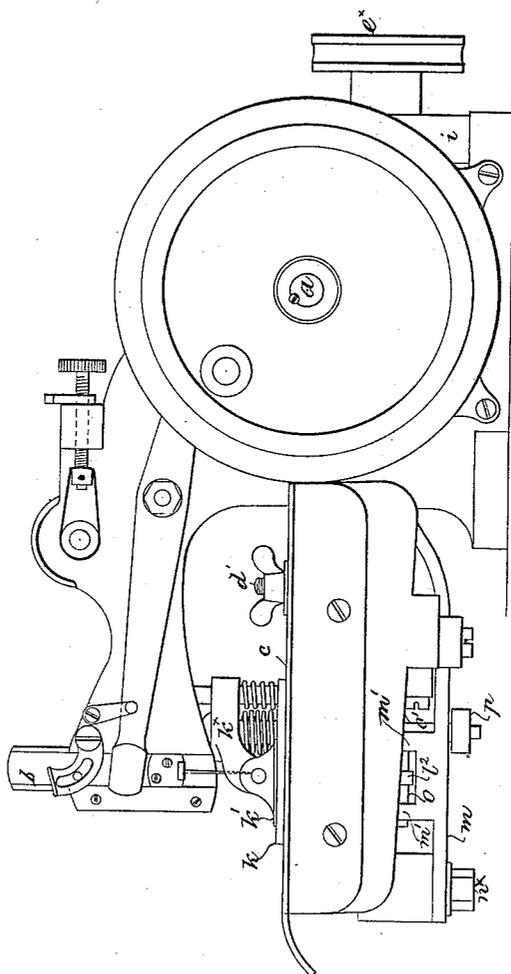
5 Sheets—Sheet 1.

F. H. BENNETT & J. DOWLING.
BUTTON HOLE SEWING MACHINE.

No. 409,728.

Patented Aug. 27, 1889.

Fig. 1.



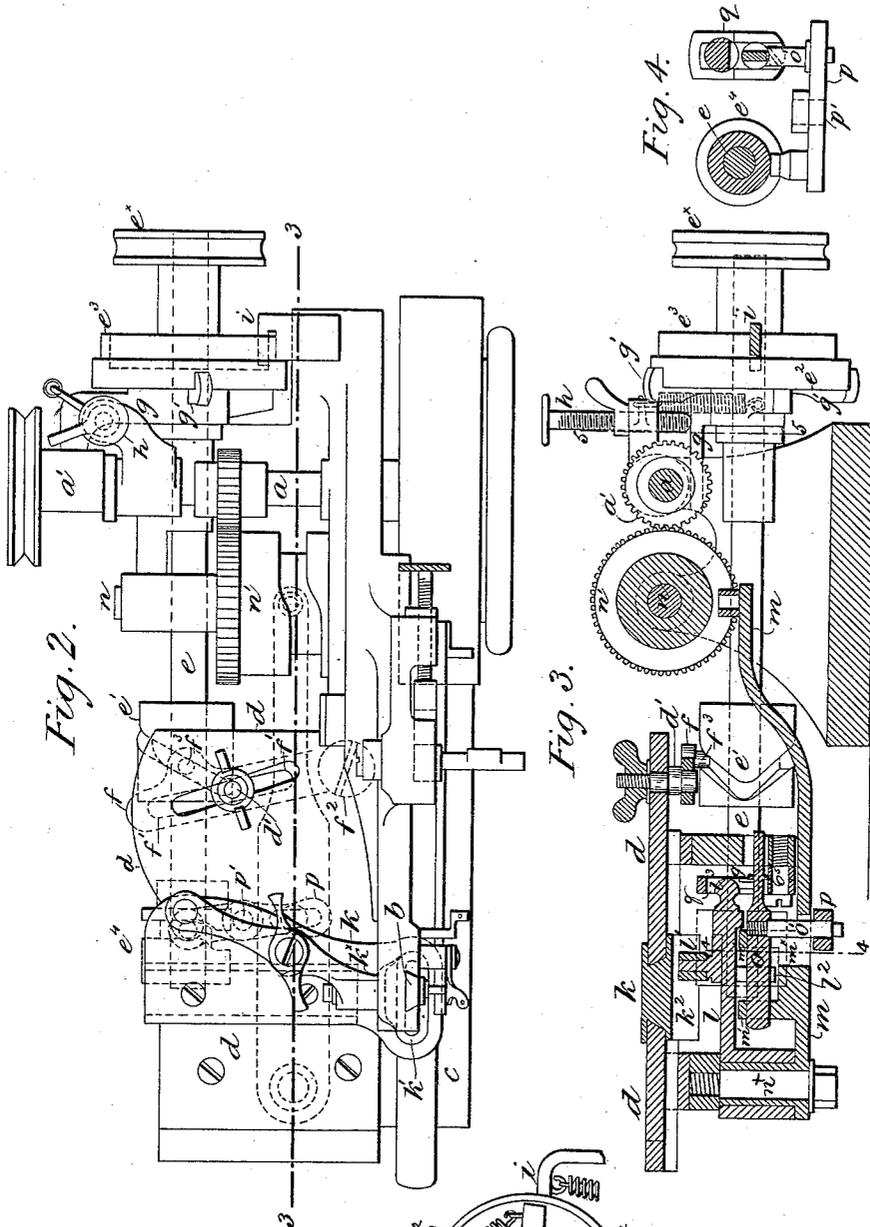
Witnesses.
Baltus D^r Long.
A. H. Smith.

Inventors.
Frank Howard Bennett.
James Dowling.
By their attys,
Baldwin Sanderson & Wright.

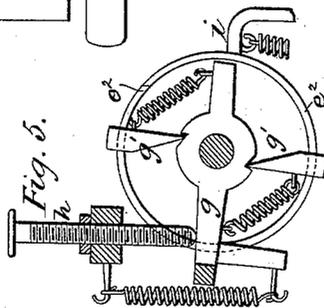
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Fig. 6.

Fig. 7.

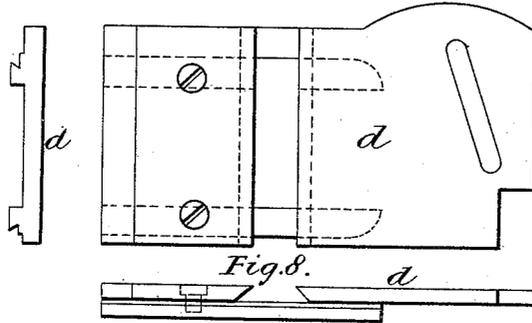
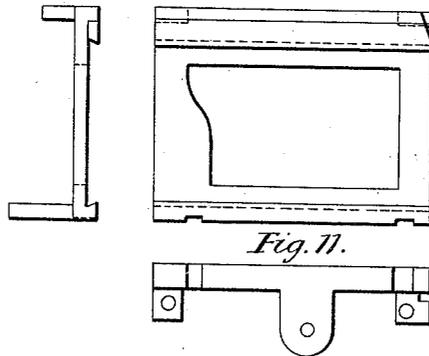


Fig. 9.

Fig. 10.



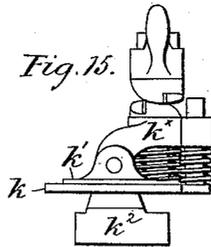
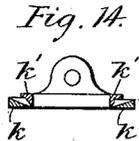
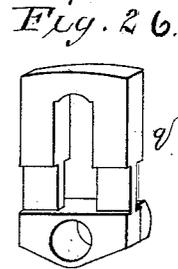
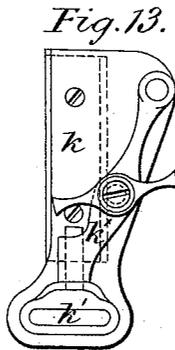
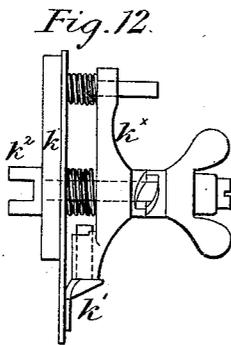
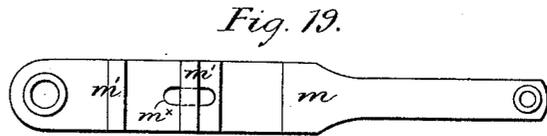
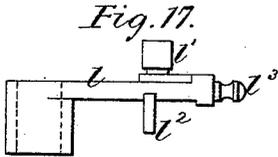
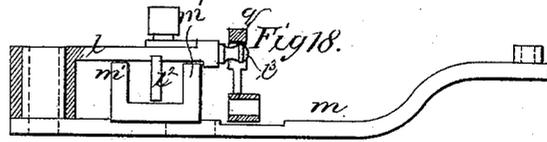
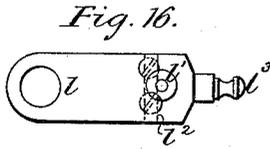
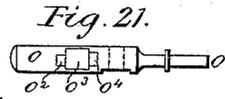
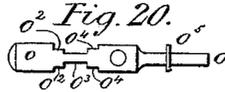
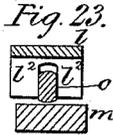
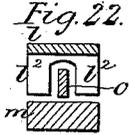
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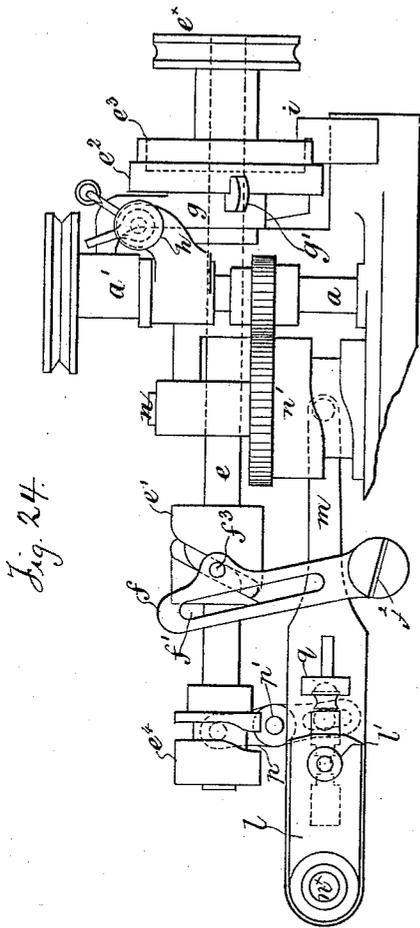


Fig. 24.

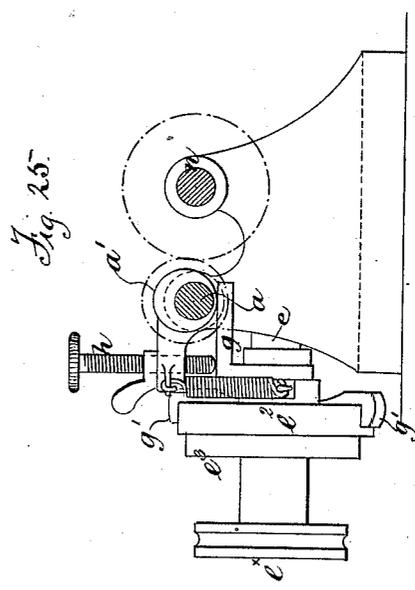


Fig. 25.

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UNITED STATES PATENT OFFICE.

FRANK HOWARD BENNETT, OF TWICKENHAM, COUNTY OF MIDDLESEX,
AND JAMES DOWLING, OF LONDON, ENGLAND.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 409,728, dated August 27, 1889.

Application filed September 10, 1888. Serial No. 285,045. (Model.) Patented in England August 10, 1886, No. 10,238.

To all whom it may concern:

Be it known that we, FRANK HOWARD BENNETT, civil engineer, residing at Netherton Road, St. Margarets, Twickenham, in the county of Middlesex, England, and JAMES DOWLING, mechanical engineer, residing at 35 Jewin Street, in the city of London, England, subjects of the Queen of Great Britain, have invented certain new and useful Improvements in Button-Hole Sewing-Machines, (for which we have received Letters Patent in Great Britain, No. 10,238, dated August 10, 1886,) of which the following is a specification.

In button-hole sewing-machines made in accordance with our invention a needle and shuttle actuated by ordinary mechanism produces the stitches while the fabric is suitably moved beneath the needle. The fabric is held down by a clamp upon a slide which receives a to-and-fro movement beneath the needle in a direction at right angles to the length of the button-hole. This first slide is carried upon a second slide, which a slowly-moving cam traverses lengthwise, and by a lever and slot the extent of this movement can be adjusted to the length of the button-hole it is desired to produce.

The slide upon which the work is carried requires to be moved as follows: At one time the slide with the work upon it has to be moved to and fro beneath the needle to produce the transverse stitches along one side of the button-hole, and simultaneously the second slide imparts longitudinal movement to the first slide and to the work. When the end of the button-hole is reached, it has to be "barred," as it is termed—that is to say, transverse stitches of greater length have to be made extending across the button-hole, and these stitches have to be centrally placed in relation to it. While barring, therefore, the traverse of the slide which carries the work has to be lengthened, so that the stitches may now extend across from side to side of the button-hole. When the barring is completed, the other side of the button-hole has to be worked, and for this purpose the first slide again requires to be moved to and fro over the shorter distance required for the side stitches; but now its position cannot be the

same as before, but the slide must be shifted sidewise the distance requisite to separate the work on one side of the button-hole from that on the other. When the second side of the button-hole has been worked and the other end barred, the sewing is finished and the slit only has to be cut to complete the button-hole.

The requisite movements are imparted to the slide which carries the work in the following manner: This slide has on its under side two transverse jaws, and between these a die is able to slide. The die is mounted on a vertical pin fixed upon a short lever which can vibrate in a horizontal plane. About the same center or axis another longer lever is able to move in the like manner and a cam operates upon it at its farther end and causes it to play to and fro with a constant motion. A longitudinal bolt carried in guides on the longer lever passes between lugs or projections on the shorter lever, and also through a slotted link, which is pivoted to the frame at its lower end. This link at its upper end embraces the free end of the upper lever. The bolt is peculiarly shaped, and while the button-hole is being worked it receives a slow endwise movement from a cam provided for this purpose. When the needle is stitching at the side of the button-hole, the bolt completely fills the spaces between the lugs or projections of the shorter lever, and the two levers are consequently bolted together, so that they are compelled to move together as one piece, and however rapidly the machine may be driven the slide carrying the work cannot move otherwise than as it is controlled by the cam operating in connection with the levers. When the end of the button-hole is reached, the bolt has been moved by its cam to such a position that it no longer fills the spaces between the lugs or projections of the upper lever, a smaller part of the bolt having now come between the lugs or projections, but, on the other hand, an enlargement upon the bolt fills the slot in the link, which, as before mentioned, is pivoted to the frame and embraces the free end of the upper lever. This link, therefore, now moves as the bolt dictates, and the bolt is carried by the lower lever, which receives its movement direct

from the cam. The link in turn actuates the upper lever and it imparts to it a longer movement than before, because the connection between the lever and link is farther from the fulcrum of the latter than the point where the bolt is in contact with the link and imparts its motion. The long stitches for barring the end of the button-hole are now produced. During the barring of the button-hole the slide which governs the length of the hole is at rest and the bar-stiches are made over and over in the same place until a further movement of the bolt restores the former state of affairs, excepting only that another part of the bolt of different form is now in position to lock the two levers together, and in consequence the place of the upper lever on the lower is changed from what it previously was. The other side of the button-hole is now sewed.

In all the movements it will be seen that the slide which carries the work is positively driven, and it is absolutely under the control of the cam, so that whatever the speed at which the machine is driven the proper length and position of the stitches are uniformly maintained. The cam which actuates the longitudinal slide and the cam which actuates the bolt are on the same axis, and upon this axis there is a flanged disk. The flange is embraced by dogs carried upon a lever which receives movement from a cam on the rapidly-revolving main shaft of the machine. The throw of the lever is regulated by a screw, and the dogs are so connected with the lever that they nip the flange of the disk as the lever advances and release it as the lever retires. There is also a retaining-dog, which prevents the axis turning the wrong way. The work-holder consists of a jaw on the transverse slide and an upper jaw pivoted to a lever. The lever is movable to and from the transverse slide along guide-pins fixed in the latter. Coiled springs surrounding the pins tend to force the lever away from the slide. A turn-button acting by inclines presses the lever down and closes the jaws against the springs when the fabric has been placed between them. The upper jaw by this arrangement is able to adjust itself to press uniformly upon the fabric in every part of the nip. The jaws are perforated to expose the fabric at the part where the button-hole is to be worked. The nipping-surfaces are beveled, so that the fabric held between them may be able to lie flat upon the table of the machine.

In order that our said invention may be fully understood and readily carried into effect, we will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a front elevation of the machine. Fig. 2 is a plan. Fig. 3 is a section on the line 3 3 in Fig. 2. Fig. 4 is a section on the line 4 4 in Fig. 3. Fig. 5 is a section on the line 5 5 in Fig. 3. Figs. 6, 7, and 8 are detail views of the longi-

nally-moving slide. Figs. 9, 10, and 11 are detail views of the fixed guide in which the slide moves. Figs. 12, 13, 14, and 15 are detail views of the cloth-clamping mechanism. Figs. 16 to 23, inclusive, are detail views of the mechanism for imparting motion to the transversely-moving slide. Fig. 24 is a plan view of the machine with the bed-plate removed. Fig. 25 is a rear view of the machine, showing particularly the arrangement of cams, pawls, and levers for giving a step-by-step motion to the cam-shaft; and Fig. 26 is a perspective view of a link forming a part of the mechanism for imparting motion to the transversely-moving slide.

a is the main axis. It has cams upon it by which a needle and shuttle are actuated in the usual manner.

b is the needle-slide, and the needle is carried at its lower end.

c is the table which supports the work. The needle, as usual, passes down through a perforation in the table, and when below the table the shuttle passes through the loop of the needle-thread, and so the stitch is made.

d is a slide which travels to and fro longitudinally the length of the button-hole. Figs. 6, 7, and 8 show this slide *d* separately; and Figs. 9, 10, and 11 show the guide fixed to the frame in which the slide traverses.

The slide *d* receives motion from a cam *e'* on the axis *e* in the following manner: *d'* is a stud passing through a slot in the slide *d* and capable of being clamped by a thumb-nut in any position along the slot. The stud at its lower end carries a small roller, and this is received into a corresponding slot *f'* in a lever *f*, which has its fulcrum at *f*², and at *f*³ carries a small roller, entering the groove in the cam *e'*. The axis *e* is driven at a slow speed from the axis *a*, as follows: At *a'* there is a cam upon the axis *a*, and this with the aid of a spring imparts a to-and-fro movement to a bent lever *g*. This lever is movable around the axis *e* and carries loosely two dogs *g'*. These in the forward motion of the lever embrace the flange *e*² of a disk fixed on the axis *e*, and so turn the axis. During the return movement of the lever, however, the dogs being only held up by springs yield slightly and release the flange *e*² and slide back along its surface. The extent of the movement imparted to the lever *g* can be regulated by a screw *h*. The axis *e* is prevented from turning backward by a dog *i* embracing the flange *e*³ on the disk. This dog is held down to the frame of the machine by a coiled spring. It yields to admit of the forward movement; but when there is any tendency to backward movement the dog resists it, and it is pressed thereby more strongly against the frame. The axis *e* makes one complete rotation while the button-hole is worked.

e^x is a hand-wheel on the axis *e*. It is used in setting the machine in position before commencing work.

k is a transverse slide carried by the longi-

tudinal slide d . On this slide k the work is clamped.

k' is the upper jaw of the work-clamp. It is pivoted to the lever k^x . The work is placed between the jaw k' and the face of the slide k , which forms the lower jaw. A turn-button binds the two jaws together and nips the cloth.

The slide k , lever k^x , and upper jaw k' are shown by Figs. 12, 13, 14, and 15. The lever k^x , as will be seen, slides upon guide-pins fixed into the slide k , and coiled springs around the guide-pins press it upward. The jaws are perforated with holes somewhat larger than the largest button-hole it is intended to work. The button-hole is worked on the part of the fabric exposed through the hole in the upper jaw. The nipping-surfaces are so inclined that the fabric held between them rests flat upon the table c .

The slide k receives the necessary movements to form the stitches, as follows: The main operating-lever m and a supplemental lever l are both movable around the same fixed stud or center n^x . The supplemental lever l is shown separately by Figs. 16 and 17, and the main operating-lever m separately by full lines in Fig. 18. The lever m is also shown in plan in Fig. 19. The lever l and the link q are shown in section in Fig. 18. The lever l carries a small die or roller l' , and this is received between parallel jaws k^3 on the slide k , so that the lever l in its movement always carries the slide k with it. The lever l (except when barring the ends of the button-hole) is bolted to the lever m and moves with it, the lever m receiving a regular movement from the cam n' on the axis n , which is driven from the axis a at half the speed by spur-wheels, as shown. When the levers l and m are bolted together, the cam n' imparts to the slide k a movement equal to the length of the stitch when working the side of the button-hole.

o is the bolt which locks the two levers together. It is shown separately by Figs. 20 and 21.

Figs. 22 and 23 show sections through the levers l and m and the bolt o , the bolt being in different positions in the two figures. The bolt o can slide in guides $m' m'$ on the lever m , and when in position for locking it fills the interval between the lugs or projections $l^2 l^2$ on the lever l . The bolt o has an arm o' , and this projects down from the bolt through the hole m^x in the lever m and into an elongated hole in the lever p . The lever p has its fulcrum at p' , and its other end carries a roller running in the groove of the cam e^4 on the axis e . By these means the bolt is caused to make a movement to and fro. While one side of the button-hole is being worked the bolt stands with the shoulders $o^2 o^2$ upon it between the lugs $l^2 l^2$. When the end of the button-hole is reached, the bolt is moved along until the reduced portion o^3 is between the lugs l^2 . At this time the cam e'

ceases to impart longitudinal motion to the slide d . Directly the shoulders o^2 are clear of the lugs l^2 the enlargement o^5 on the bolt enters a slot in the link q . The head l^3 of the lever l is also lodged in the same slot, so that the lever l and the link q always move together; but the link is inoperative, except when the enlargement o^5 is in the slot of the link, and this coincides with the time when the levers l and m are not directly connected by the bolt o .

It will be noted that when the enlargement o^5 is within the link q the two levers l and m move together, the link q moving on its pivot at its lower end. The two levers are therefore locked together and move simultaneously. The lower lever receives movement directly from the cam n' , and the upper lever l is moved simultaneously and coincidentally with the lever m when the enlargement o^5 is within the link. By this organization it will be seen that when the two levers are thus locked together the upper lever has a longer movement imparted to it than before. When the upper lever has its longer movement, the long stitches for barring the end of the button-hole are produced. The barring at the end of the button-hole is now worked, and this being done, the travel of the bolt takes the enlargement o^3 clear of the link and brings the shoulders o^4 between the lugs l^2 . Then the other side of the button-hole is worked, and when it is completed the bolt turns, bringing the enlargement o^5 again into the link and the reduced portion o^3 of the bolt again opposite to the lugs l^2 .

The number of stitches in the barring can be varied by making the enlargement o^5 broader or narrower; but the reduced portion o^3 of the bolt must be adjusted to correspond, its width always being equal to that of the part o^5 plus that of the surface in the link q , against which o^3 operates.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. The combination, substantially as hereinbefore set forth, of stitch-forming mechanism, cloth-clamping devices, the longitudinally-moving slide, means for actuating it, the transversely-moving slide, the bed-plate of the machine, a main operating-lever pivoted at one end of the bed-plate of the machine, a cam with which the opposite end of the lever engages, the main driving-shaft, gearing between the main driving-shaft and the cam, a continuously-driven cam, a lever connecting said cam with the main operating-lever m , a supplemental lever and a bolt connecting the supplemental lever to the main operating-lever, said bolt being formed with a reduced portion, and shoulders at each end of the reduced portion and on both sides thereof, and lugs on the supplemental lever engaging with the shoulders on the bolt.

2. The combination, substantially as here-

inbefore set forth, of stitch-forming mechanism, cloth-clamping devices, a longitudinally-moving slide, means for operating it, a transversely-moving slide, the main operating-lever and a supplemental lever pivoted together, means for oscillating said levers, guide-lugs on the levers, a locking-bolt moving in said guide-lugs, said bolt being formed with a reduced portion and shoulders at each end and on both sides of the reduced portion, means for sliding the bolt back and forth in the guide-lugs, and connections between the levers and the transversely-moving slide.

3. The combination, substantially as here- inbefore set forth, of stitch-forming mechanism, cloth-clamping devices, the longitudinally-moving slide, means for operating it, transversely-moving slide, means for operating it, the main operating-lever, means for operating said lever, the supplemental lever, the locking-bolt, the guide-lugs on the levers within which the bolt moves, and the pivoted link into which the locking-bolt projects.

4. The combination, substantially as here- inbefore set forth, of stitch-forming mechanism, cloth-clamping devices, the longitudinally-moving slide, means for operating it,

the transversely-moving slide, means for operating it, the main operating-lever, means for operating said supplemental lever, the lever, the locking-bolt formed with an enlargement at one end, the guide-lugs on the levers within which the bolt moves, and the pivoted link into which the locking-bolt projects and into which also projects the end of the supplemental lever.

5. The combination, substantially as here- inbefore set forth, with the bed-plate, of stitch-forming mechanism, cloth-clamping devices, the longitudinally-moving slide, means for operating it, the transversely-moving slide, the main operating-lever connected with the transversely-moving slide, a supplemental lever, a bolt for locking the two levers together, and a link pivoted to the bed-plate into which the supplemental lever projects and into which also projects the reduced outer end of the locking-bolt.

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