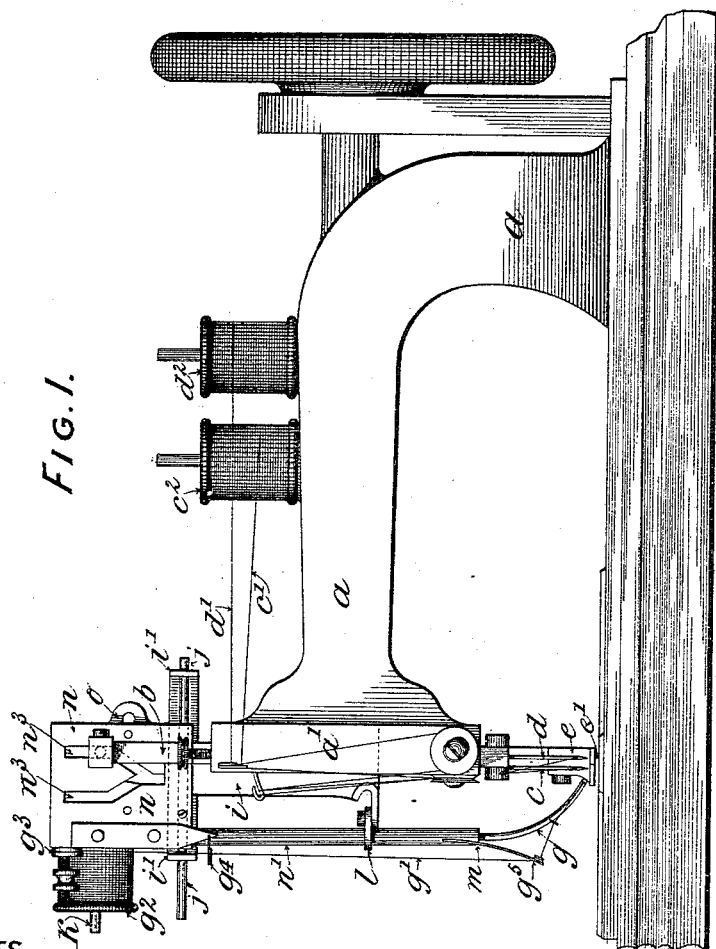
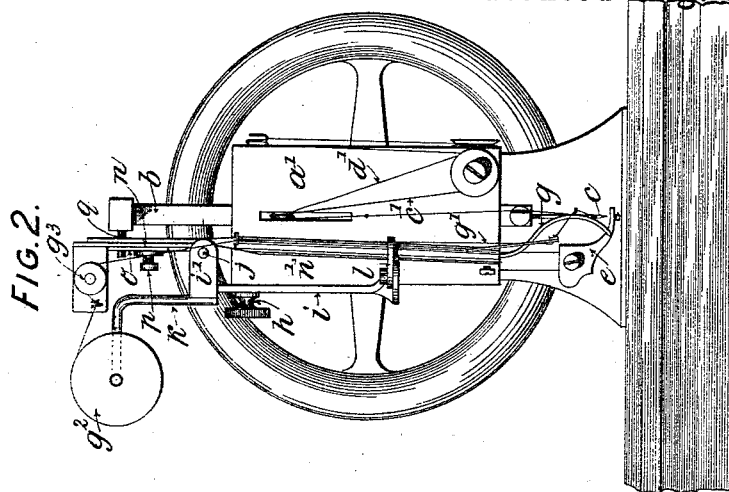


R. TODD.  
SEWING MACHINE.

No. 458,434.

Patented Aug. 25, 1891.



WITNESSES.

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SEWING MACHINE.

No. 458,434.

Patented Aug. 25, 1891.

FIG. 3.

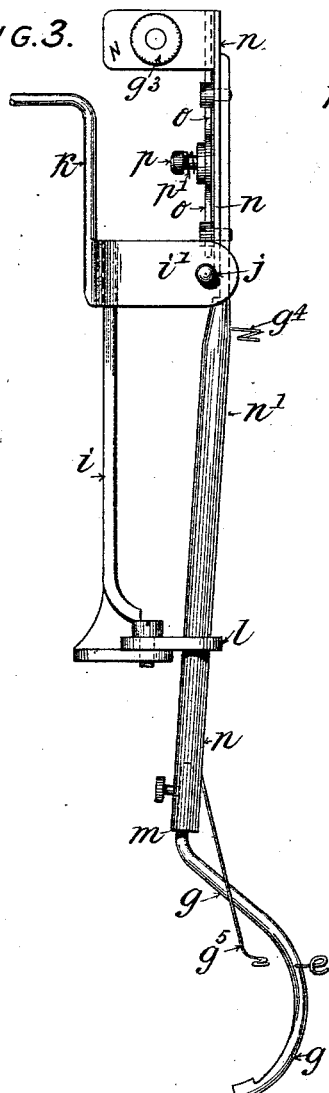


FIG. 4.

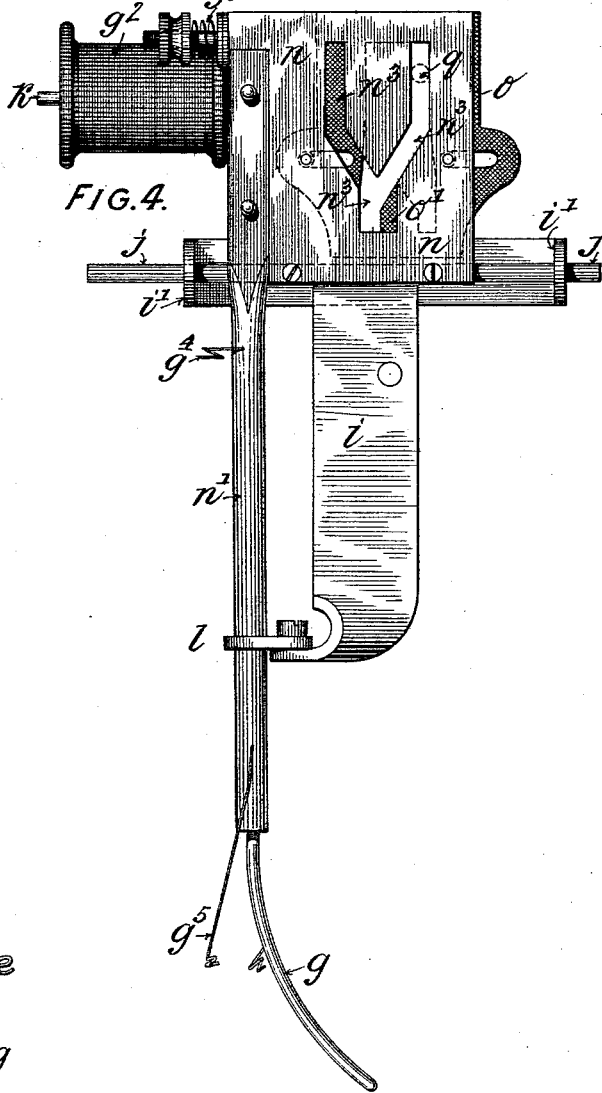


FIG. 6.

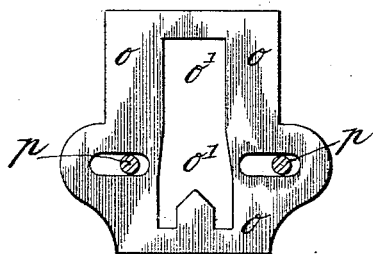
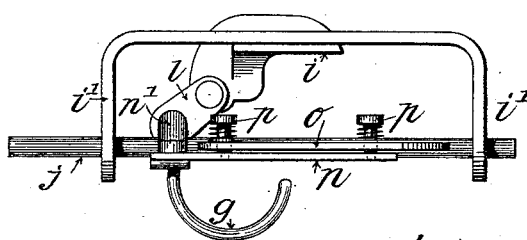


FIG. 5.



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FIG. 8.

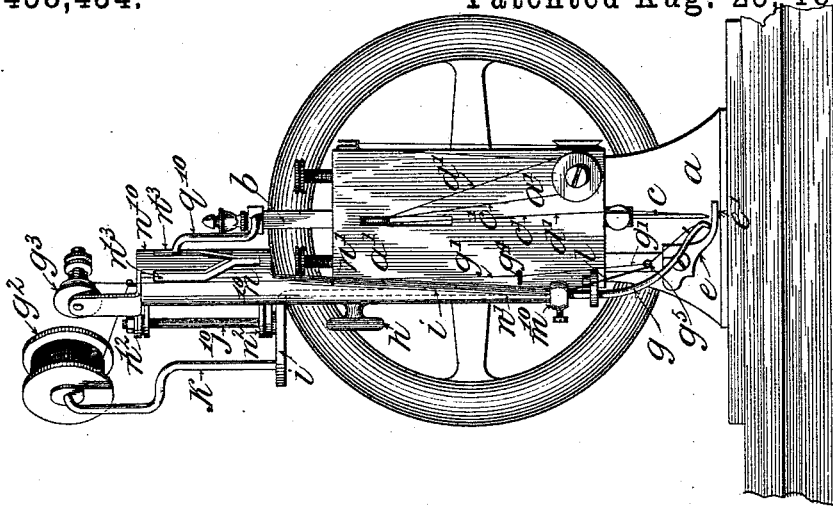
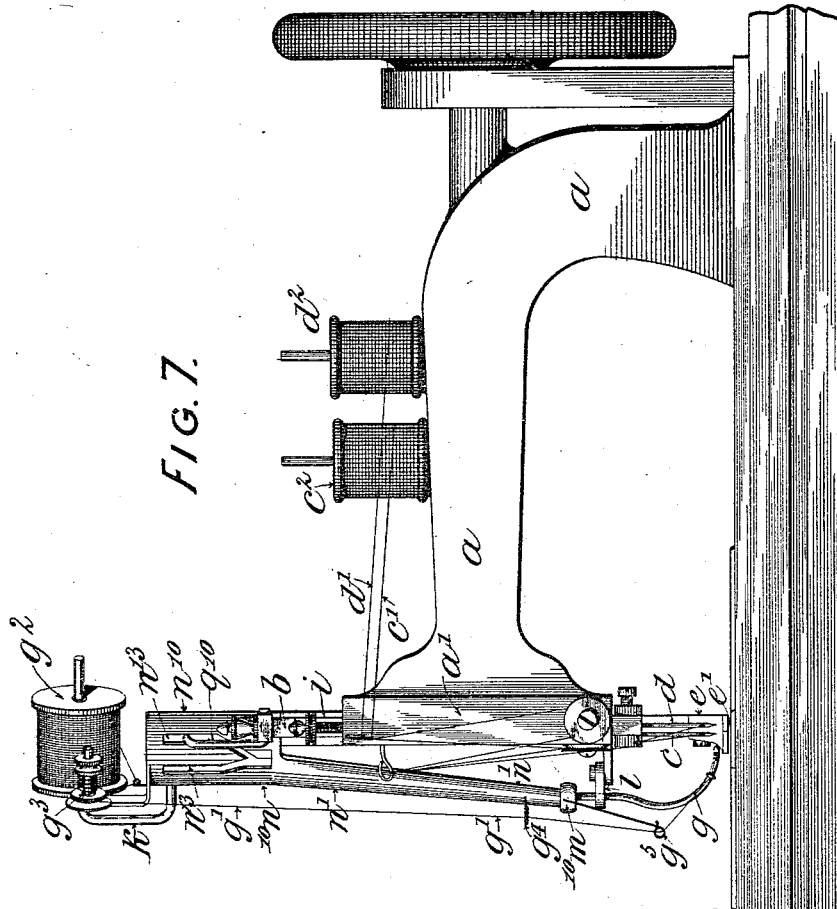


FIG. 7.



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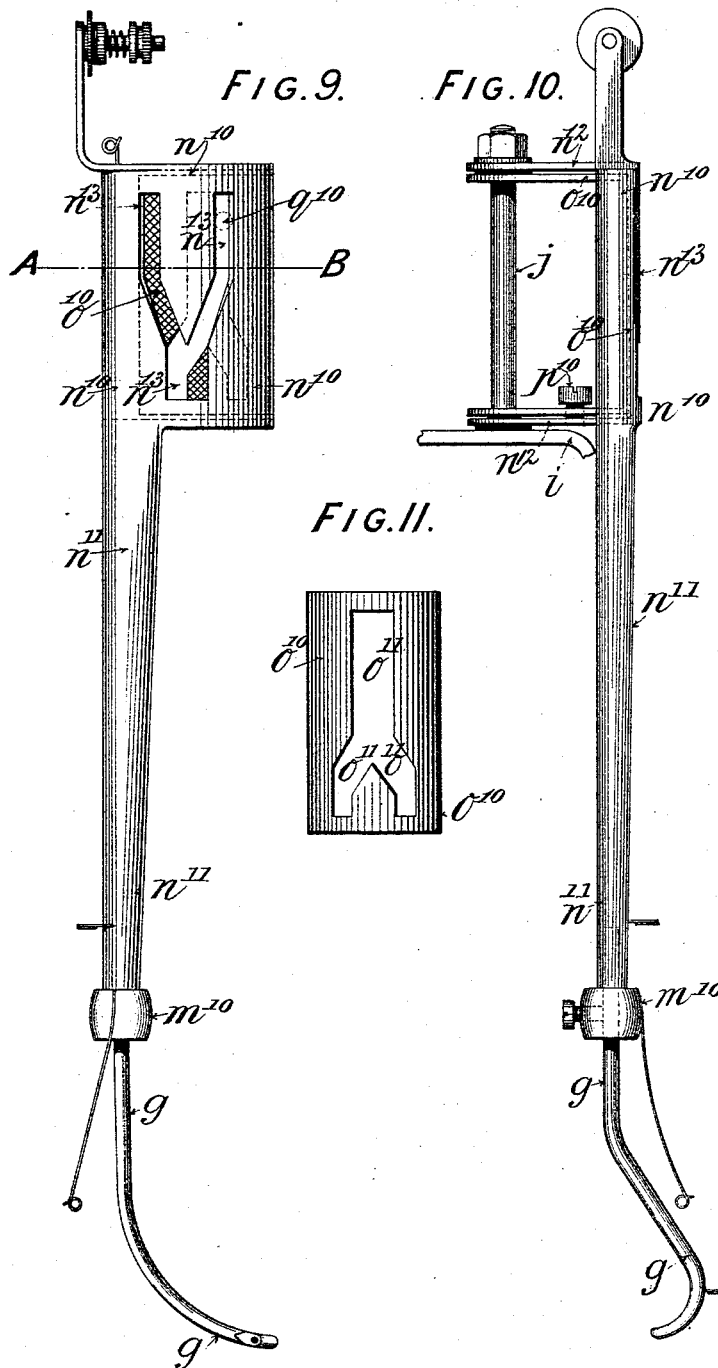
(No Model.)

6 Sheets—Sheet 4.

R. TODD.  
SEWING MACHINE.

No. 458,434.

Patented Aug. 25, 1891.



WITNESSES.

*A. C. Clark.*  
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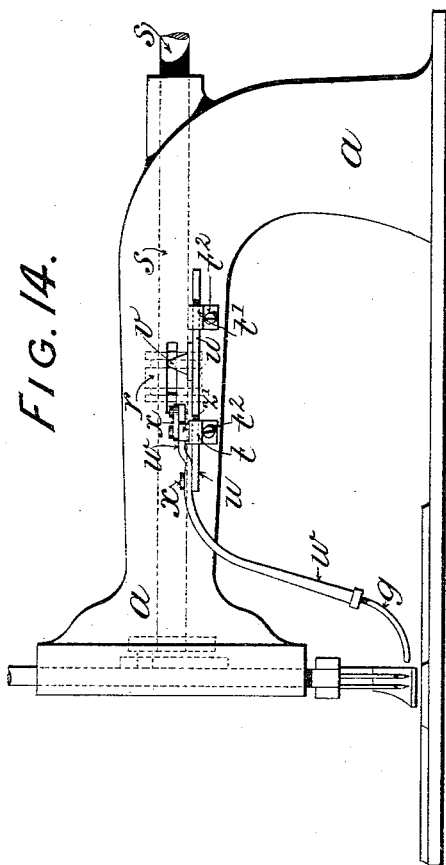
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R. TODD.  
SEWING MACHINE.

No. 458,434.

Patented Aug. 25, 1891.



WITNESSES.  
A. A. Erb  
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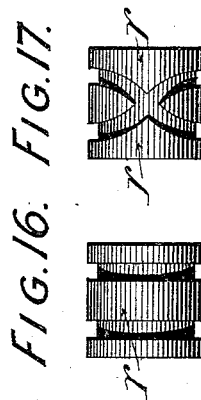


FIG. 15.

FIG. 16. FIG. 17.

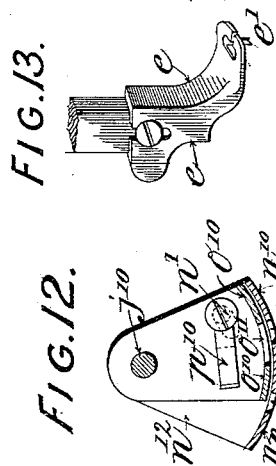
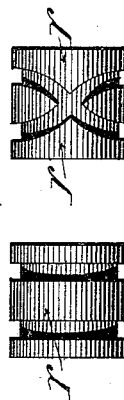


FIG. 13.

FIG. 12.

FIG. 13.

d-e'

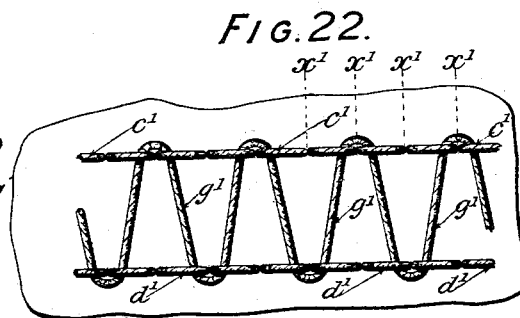
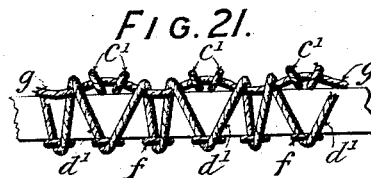
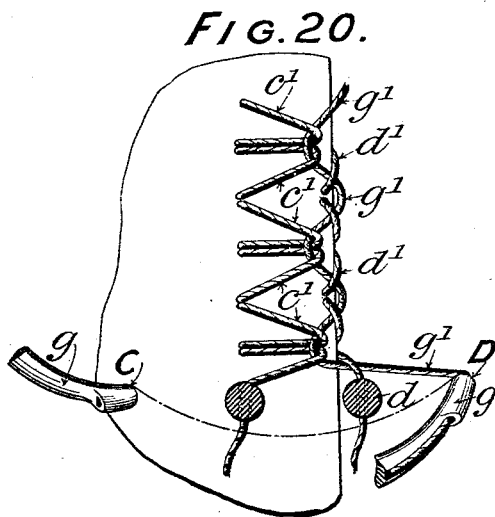
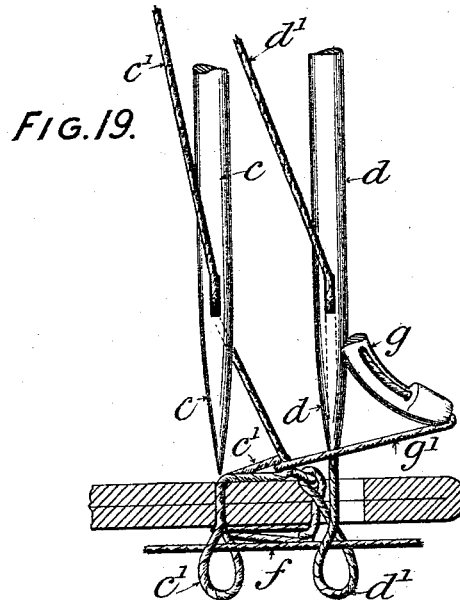
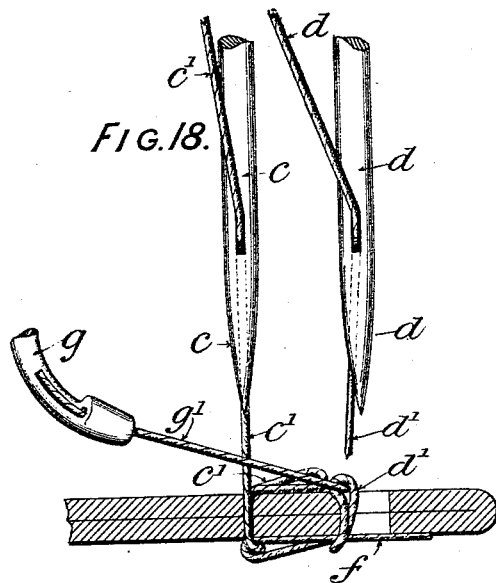
(No Model.)

6 Sheets—Sheet 6.

R. TODD.  
SEWING MACHINE.

No. 458,434.

Patented Aug. 25, 1891.



WITNESSES.

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Arthur C. Clarke.

INVENTOR.

Richard Todd  
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# UNITED STATES PATENT OFFICE.

RICHARD TODD, OF MANCHESTER, ENGLAND.

## SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 458,434, dated August 25, 1891.

Application filed May 21, 1891. Serial No. 393,613. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD TODD, embroiderer, a subject of the Queen of Great Britain and Ireland, and residing at 13 Mason Street, in the city of Manchester, county of Lancaster, England, have invented certain new and useful Improvements in Sewing-Machine Attachments for Facilitating the Stitching of Button-Holes and for other Purposes; and I do hereby declare that the following is such a full, clear, and exact description of the same as will enable others to make and use said invention.

My said invention relates to attachments for application to ordinary lock-stitch sewing-machines, the said attachments enabling such ordinary machines to be used temporarily for stitching button-holes or for edging or line-stitching cloth and other materials, or for overcasting seams or the like.

One of the chief features of my invention is that the improved attachment in its most approved form can be easily and expeditiously applied to and removed from the machine by an unskilled person, so that an ordinary lock-stitch sewing-machine can in a moment be rendered capable of stitching button-holes or performing hem or line or overcast stitching, as required.

To render my invention perfectly clear, I will now proceed to describe the same with reference to the annexed six sheets of drawings.

On Sheet 1 Figure 1 is a side view of an ordinary lock-stitch "Singer" sewing-machine with my invention attached thereto. Fig. 2 is a front view of the same. On Sheet 2 Fig. 3 is an enlarged side view of the aforesaid improved attachment. Fig. 4 is a front view. Fig. 5 is a plan. Fig. 6 is a separate view of the shifting or shunting plate. On Sheet 3 Fig. 7 is a side view of a sewing-machine, similar to Fig. 1 and showing a modification of my improved attachment. Fig. 8 is a front view of Fig. 7. On Sheet 4 Fig. 9 is an enlarged detail front view of the aforesaid modified improved attachment. Fig. 10 is a side view. Fig. 11 is a detail view of the shunting-plate. On Sheet 5 Fig. 12 is a horizontal section of Fig. 9, Sheet 4, at the line A B. Fig. 13 is a separate view of the presser-foot and button-hole guide. Fig. 13<sup>a</sup> is a cross-

sectional view of said button-hole guide and one of the needles. Figs. 14, 15, 16, and 17 illustrate a modification in the attachment or mode of imparting motion to the arm for carrying the binding or plaiting thread backward and forward across the path of the needles. On Sheet 6 Figs. 18 and 19 illustrate a button-hole stitch on an enlarged scale during different periods of formation. Fig. 20 also illustrates in plan the formation of the stitch, a portion of the stitching being shown complete. Fig. 21 is an edge view of the stitch in Fig. 20. Fig. 22 illustrates in plan one of the several varieties of stitching which can be obtained by modifying the tension of the threads.

Referring to the aforesaid drawings, the ordinary frame or arm of the machine is marked *a*, and the needle-bar is marked *b*. To the needle-bar I affix two needles *c* *d*. Through the needle *c* I pass the thread *c'*, proceeding from the spool *c*<sup>2</sup>. Through the needle *d* I pass the thread *d'*, proceeding from the spool *d*<sup>2</sup>. The arm for moving the binding or plaiting thread to and fro across the path of the needles is marked *g*, and through an eye at the foot of the said arm I pass a thread *g'*, which proceeds from a spool *g*<sup>2</sup>, as shown in Figs. 1 and 2. The threads *c'* *d'* are passed through the ordinary or suitable tension drags and guides on their way to the needles *c* *d*, as clearly indicated in the drawings.

In sewing a button-hole or line stitch or edging in or upon cloth the material is held down in the usual manner by the presser-foot *e*, which is shown separately at Fig. 13, and a toe or shield *e'*, projecting downward from the lower side of the presser-foot, enters the button-hole or comes against the edge of the material, so as to act as a guide while the material is being fed. The shield or projection *e'* is shown in horizontal section at Fig. 13<sup>a</sup>. It partly incloses and protects the needle *d*. The presser-foot is slit opposite the needle-gate, as clearly seen in Fig. 13, so as to allow of easy threading and adjustment.

When the machine is working button-holes or hemming, one of the needles only penetrates the material. The other passes down through the button-hole slit in the cloth or past the edge of the material, as may be

clearly seen in Figs. 18 and 19. Otherwise the action of the needles and the behavior of the needle-threads are precisely the same as in ordinary lock-stitch sewing-machines. For example, referring to Fig. 19, where the needles are on the upstroke, it will be seen that the usual loops beneath have been formed and the usual binding-pick of the shuttle has just been effected, the shuttle-thread being marked *f*.

As it may expedite the description of my invention, I will here give a careful explanation of the stitch and the mode of effecting it, as illustrated in Sheet 6, and will afterward describe the form of mechanism by which the movements are effected.

The simplest and least confusing form of stitch is that illustrated at Fig. 22, and by taking this specimen first the others will be more easily understood.

Referring to Fig. 22, the distance between the letters *x' x' x'* represents the length of each feed of the sewing-machine. The needles operate in the usual way and form the parallel rows of stitches *c' d'*. As the stitching proceeds the so-called "binding" or "plaiting" thread *g'*, which appears in Fig. 22 as a continuous zigzag, is thrown across and in front of the needles *c d* during each downstroke and is pulled behind the needles at the end of the upstroke, so that on the next downstroke the needles strike in front of the binding-thread *g'* and of course throw the stitches *c' d'* over the binding-thread *g'* at each stroke. As has been said, the shuttle-thread *f* binds the stitches *c' d'* on the under side of the fabric.

The stitch shown in Fig. 22 is formed by placing considerable tension on the threads *c' d'* and very little tension on the binding-thread *g'*. The thread *g'* is thus merely laid zigzag in the path of the needles *c d* by the motion of the arm *g* and does not exert any pull on the stitches *c' d'*, the form of which is therefore not influenced by the binding-thread.

Now, having followed my description so far, the reader will easily understand that if the conditions of tension were reversed—that is to say, if but slight tension were placed on the threads *c' d'* and considerable tension on the binding-thread *g'*—it will be evident that this change would make the thread *g'* master of the situation, and instead of allowing itself to be laid and confined in a zigzag form by the stitches *c' d'* it would naturally be constrained to assume as near an approximation to a straight line as possible and would draw the stitches *c' d'* on each side toward itself, the two threads under the weaker tension being thus overcome by the thread subject to the stronger tension. Now in a button-hole stitch, as shown in Figs. 18 to 21, the upper edge of the button-hole is about in the position of the approximately straight line sought to be occupied by the binding-thread *g'*, and looking at Fig. 20 it will be

seen that under the conditions of tension which have produced this stitch the binding-thread *g'* is thrown as a waving line along the upper edge of the button-hole, (this waving line being the nearest approximation to a straight line which it has been permitted to assume,) while the stitches *c'* are drawn over toward the upper edge of the button-hole and the stitches *d'* (which in the case of a button-hole, it will be remembered, do not penetrate the cloth) are pulled up from the bottom edge of the button-hole, where they have been bound by the shuttle-thread to the top edge, so that the loops of the two stitches *c' d'* and the waving binding-thread *g'* present the usual or necessary plaited or woven ridge which should appear all round the upper edge of a properly-stitched button-hole.

In Fig. 18 the thread *d'*, proceeding from the needle *d* to the button-hole, is shown broken short off, so as to prevent it from coming in front of and thereby obscuring the last-formed stitch or loop *d'*, clearly appearing in the figure.

The manner in which the stitch is produced will be obvious from the views in Sheet 6. For example, in Fig. 18 the needles *c d* are at the top of their stroke and the arm *g* has swung to the outside, drawing up the stitch *d'* to the upper edge of the button-hole. In Fig. 19 the needles *c d* are executing their upstroke, and so forming the loops below, through which the shuttle-thread *f* has been shot. The arm *g* has now swung to the inside, drawing the last stitch *c'* over to the upper edge of the button-hole. The position of the arm *g* and binding-thread *g'* at the inside and outside of the needles, respectively, are further illustrated in plan at Fig. 20, the path of the arm *g* through which it swings from one side to the other of the needles being indicated by the curved dotted line in front of the needles.

The first or preferred form of the attachable and detachable mechanism, which I have devised for producing the hereinbefore-described vibration of the arm *g* across the path of the needles, is illustrated in Sheets 1 and 2 of the drawings. The bracket *i*, which carries the whole of the moving parts of the attachment, is secured to the side of the needle-bar box *a'* by means of a screw *h* or other suitable means.

To apply the complete attachment to the machine, all that is requisite is to place the bracket *i* against the side of the needle-bar box *a'* and secure it thereto by the screws *h*, while to remove the attachment it is only necessary to remove the screw *h* and thus detach the bracket *i*. These operations can be easily performed by an unskilled person, no exactitude of adjustment or manipulation being required.

When the machine is to be used for ordinary sewing, all that is requisite is to remove the bracket *i*, which carries the attachment, and also one of the needles *c d*—say, for example, the needle *c*. At the top of the bracket



if there are projections  $l'$ , in which slide the ends of a bar  $j$ , which bar  $j$  is secured to a flat plate  $n$ , so that the said flat plate  $n$  is pivotally connected to the bracket  $i$  by means of the bar  $j$ . The projections  $i'$  are sufficiently far apart to allow the plate  $n$  to slide to and fro for a certain distance, while the bar  $j$  permits the plate  $n$  to rock on its support. The top of the bracket  $i$  carries a wire  $k$ , which supports the spool  $g^2$ , from which the binding or plaiting thread  $g'$  is supplied.

At the foot of the bracket  $i$  is a projection upon which a link  $l$  is centered loosely, the said link engaging with an extension  $n'$ , projecting downward from the plate  $n$ . The consequence is that when the plate  $n$  is slid backward and forward between the supports  $i'$  the said link acts as a bridle to circumscribe the path through which the arm  $g$  swings, the plate  $n$  both sliding and rocking as it moves to and fro. The arm  $g$  is attached at  $m$  to the extension  $n'$  by a set-screw, as shown.

In the face of the flat plate  $n$  I form a Y-shaped slot  $n^3$ , and behind the plate  $n$  there is a second sliding shunting-plate  $o$ , having a slot  $o'$  in its face, of the form shown in Fig. 6, Sheet 2. The shunting-plate  $o$  is held to the back of the plate  $n$  by the screws  $p$ , which occupy horizontal slots in the plate  $o$ . Coiled springs  $p'$  hold the plate  $o$  with an elastic pressure against the back of the plate  $n$ , the horizontal slots limiting the sliding traverse of the plate  $o$  behind the plate  $n$ . A finger  $q$ , projecting from the top of the needle-bar  $b$ , passes through the slots of both the cam-plate  $n$  and the shunting-plate  $o$ , and by acting on the slots the said finger slides the cam-plate  $n$  to and fro as the needle-bar, and consequently the finger, rises and falls. It will be evident that unless means were provided to shunt the bar  $q$  from one arm of the Y-shaped slot in the cam-plate  $n$  opposite to the other arm at each downstroke the finger  $q$  would simply play up and down in one side or limb of the Y-shaped slot. The inner shunting-plate  $o$  provides the required shunting means—that is to say, at each downstroke of the bar  $q$  the inner shunting-plate  $o$  has been so previously moved as to present a continuation of the incline constituted by the Y-slot in the cam-plate  $n$  to the finger  $q$  sufficient to carry the cam-plate  $n$  past the center or dead-point, and thus bring the finger  $q$  opposite to the farther arm of the Y-shaped slot in the cam-plate, so that on the upstroke of the finger  $q$  it enters this farther arm and completes the movement of the plate  $n$  to one side or the other. At the same time, in making its upstroke, the finger  $q$  shifts the inner shunting-plate  $o$  relatively to the outer plate  $n$  in such a manner that on its return downstroke a similar continuation of the inclined slot on that side is presented to the finger  $q$ , and a corresponding continuation of the movement of the cam-plate past the center or dead-point is effected, so that on its upstroke the finger  $q$  enters the inclined slot on the

other side of the cam-plate  $n$ , and so completes the vibration of the cam-plate  $n$  back to its original starting-point. I will now explain these movements more fully relatively to the drawings.

Referring to Fig. 4, which is a front view of the cam-plate  $n$  and attached parts, the Y-shaped slot  $n^3$  clearly appears. The inner shunting-plate  $o$  is also indicated partly in dotted lines behind the plate  $n$ , the parts of the plate  $o$ , which appear through and behind the slot  $n^3$  being cross-hatched to distinguish them from the plate  $n$ . In Fig. 6 a separate front view is given of this inner shunting-plate  $o$ . The plan view, Fig. 5, also shows the relative position of the inner shunting-plate  $o$  to the outer cam-plate  $n$ . Now when the finger  $q$ , which is indicated in dotted lines at Fig. 4, descends in the straight portion of the right-hand slot  $n^3$ , as soon as it occupies the lower inclined portion of the Y-slot  $n^3$  in the plate  $n$ , the whole attachment begins to slide on its bar or trunnions  $j$ . After leaving the inclined slot  $n^3$  the finger  $q$  continues to traverse on the cross-hatched portion  $o'$  of the shunt-plate  $o$ , thus carrying the attachment past the center or dead-point and bringing the foot of the left-hand limb of the slot opposite to the finger. The finger  $q$  then descends to the foot of the vertical slot, and on its upstroke it enters the left-hand slot  $n^3$ , and thus completes the vibration of the attachment. At the same time, in traversing the left-hand slot on the upstroke, the finger  $q$  comes against the side of the slot  $o'$  in the shunt-plate  $o$ , and thus shifts the shunt-plate  $o$  over to the left-hand side of the attachment, thus causing the shunt-plate  $o$  to present a continuation of the left-hand inclined slot  $n^3$  to the finger  $q$ , when it makes its return downward stroke, thus shifting the attachment past the dead-center to the left-hand side and so enabling the finger  $q$  on its upstroke to complete the vibration of the attachment and bringing the finger  $q$  back to its original starting-point. The sliding motion thus imparted to the cam-plate  $n$  and its extension  $n'$  will carry the arm  $g$  back and forth in front of the needles, and as the extension  $n'$  is confined by the link  $l$  the said link will be caused to swing like a pendulum back and forth. This link, as can be better understood from Fig. 5, will therefore cause the lower end of the extension to move back and forth in the path of a circle and the arm  $g$  will be moved likewise in front of the needles. The extension  $n'$  is allowed to partake of this curved movement by pivoting the plate  $n$  by means of the pins  $j$  in the extensions  $i'$  of the plate  $i$ . The effects of the swinging or vibratory movement of the arm  $g$  in forming the stitch have been already clearly explained. The thread  $g'$  is led from the spool  $g^2$  through a spring-tension  $g^3$  and through guides  $g^4$   $g^5$  to the eye at the end of the arm  $g$ . It will be observed that in conjunction with the said swinging motion imparted

to the arm  $g$  there is a dwell at the end of each vibration—that is to say, at the points C and D in Fig. 20. This dwell is an important and necessary part of the motion, as there-  
 5 by the needles are allowed to come down and enter the fabric before the arm  $g$  commences to carry thread  $g'$  in front of them. If this movement of the arm  $g$  were to take place too soon, the thread  $g'$  would probably escape  
 10 the needles, and stitches would be missed and work spoiled; but by the dwell imparted to the arm  $g$  the needles have sufficient time to descend and assume their proper position relatively to the thread  $g'$ .  
 15 A modification of the means for imparting the requisite motion to the arm  $g$  is shown in Figs. 7 to 12, Sheets 3, 4, and 5. In the modification I have now to describe the slotted cam-plate  $n^{10}$  is made curved instead of being  
 20 flat like the plate  $n$ , before referred to, and instead of sliding to and fro on a rod or on trunnions between supports, as in the case of the said plate  $n$ , the said plate  $n^{10}$  is pivoted by its radial arms  $n^{12}$   $n^{12}$  upon stud  $j^{10}$ , so as to be  
 25 capable of rocking freely upon this stud. In the face of the cam-plate  $n^{10}$  I form a Y-shaped slot  $n^{13}$ , as already described, and behind the cam-plate  $n^{10}$  and centered upon the same stud  $j^{10}$  there is a second concentric shunting-plate  
 30  $o^{10}$ , separately shown at Fig. 11, having also a Y-shaped slot  $o^{11}$ , but inverted with relation to the slot in the cam-plate  $n^{10}$ . The relative positions of the cam-plate  $n^{10}$  and shunting-plate  $o^{10}$  are clearly shown at Fig. 12, which  
 35 is a sectional view of Fig. 9 at the line A B. The said second inner slotted shunting-plate  $o^{10}$  has a flat spring  $p^{10}$ , secured to it by a screw-pin  $p^{11}$ . The tail of the spring  $p^{10}$  passes through a slit in the bottom arm of the inner  
 40 shunting-plate  $o^{10}$  and presses on the lower arm  $n^{12}$  of the outer cam-plate  $n^{10}$ . The object of the flat spring is the same as that of the coiled springs  $p'$  in Figs. 1 to 6—viz., to connect the inner shunting-plate  $o^{10}$  to the  
 45 outer cam-plate  $n^{10}$  by the elastic frictional contact due to the pressure of the spring—so as to cause the two plates to maintain their position relatively to each other when they  
 50 are relatively shifted by the up-and-down motion of the bar  $q^{10}$ , as already clearly described. The nose of the screw-pin  $p^{11}$  enters a curved slot in the said lower arm  $n^{12}$ , so that the play  
 55 of the inner shunting-plate  $o^{10}$ , relatively to the outer cam-plate  $n^{10}$ , is limited by the length of the said curved slot. A bar  $q^{10}$ , fastened to the top of the needle-bar, projects through the Y-slots of both cam and shunting-plate  $n^{10}$  and  $o$ , as in the former case, and  
 60 by acting in the slots vibrates the cam-plate  $n^{10}$  to and fro as the needle-bar rises and falls. The arm  $g$  is attached at  $m^{10}$  to the extension  $n^{11}$  from the plate  $n^{10}$ , and a loosely-pivoted link  $l$  connects the arm  $g$  to the foot of the  
 65 bracket  $i$  and thus circumscribes and guides the movements of the arm  $g$  in the manner already described with reference to the link  $l$  in the foregoing figures.

The moving parts of Figs. 7 to 12 and the motions of the parts are all similar to those already described with reference to the fore-  
 70 going figures and need not be again described.

Fig. 14 is a side view, and Fig. 15 a plan, of a sewing-machine with another modified form of my improved attachment. In this case I obtain the motion of the arm  $g$  from  
 75 an ordinary cross-groove cam  $r$ , fixed upon the shaft  $s$  of the machine. The cam  $r$  is shown separately in Figs. 16 and 17. I secure slide-supports  $t$   $t'$  to the arm  $a$  of the machine by means of screws  $t^2$ , the said sup-  
 80 ports carrying a sliding bar  $u$ . Instead of constituting two separate brackets, as shown, the slide-supports might be parts of a single bracket secured to the arm  $a$  by a single  
 85 screw, as in the case of the bracket  $i$ , described with reference to the foregoing figures. A finger  $v$ , extending from the bar  $u$ , enters the groove in the cam  $r$  with the result  
 90 that when the cam revolves the bar  $u$  is reciprocated to and fro. Upon the end of the bar  $u$  I pivot the bent double lever  $w$  at  $x$ , and to the lever  $w$  I secure the arm  $g$ . The  
 95 said arm  $g$  is thus reciprocated to and fro in front of the needles, and by connecting the inner arm  $w'$  of the lever  $w$  by a link  $z$  to a fixed pivot  $z'$ , projecting from an extension  
 100 of the slide-support  $t$ , a sidelong rocking motion is also imparted to the lever  $w$  and arm  $g$ . The result of this compound sliding and rocking movement of the lever  $w$  is that the  
 105 eye at the foot of the arm  $g$  describes the requisite curved path across the front of the needles, which has been already described and is illustrated in Fig. 20, Sheet 4. The  
 110 parallel portions of the cross-grooves in the cam  $r$  cause the required dwell of the arm  $g$  on each side of the needles, as already described.

The attachment shown in Figs. 14 and 15 is capable of being expeditiously and easily  
 115 attached and removed by an unskilled person by means of the screws  $t^2$ , or instead of the screws  $t^2$  clamps or other ordinary and easily-manipulated means of attachment  
 120 might be used.

By using threads of different colors and by varying the tensions of the respective threads  
 125 button-hole stitching, line-stitching, and edging can be produced with varying ornamental effect.

The complete attachment for manipulating the binding or plaiting thread  $g'$  is exceed-  
 130 ingly simple, and can be attached and removed in a moment and by an unskilled person.

The parts do not require any nice adjustment, and are not liable to get out of order while the whole attachment can be produced  
 135 at a low cost.

What I claim is—

1. An attachment for sewing-machines, for the purpose mentioned, consisting of a curved  
 140 auxiliary arm carrying a thread  $g'$ , mechanism connecting with the unthreaded end of

said arm for reciprocating the lower end of said arm back and forth in front of the needles, and a horizontally-swinging link connecting said auxiliary arm with a stationary part of the sewing-machine, so as to cause the auxiliary arm to move back and forth in front of the needles in the path of a circle, substantially as set forth.

2. An attachment for sewing-machines, consisting of an auxiliary arm *g*, carrying a thread *g'*, in combination with a reciprocating plate connected with and operated by the needle-arm *b* of the sewing-machine and connected with and operating said auxiliary arm *g*, so as to reciprocate the said arm *g* back and forth in front of the needles, and a horizontally-swinging link connecting said auxiliary arm with a stationary part of the sewing-machine, so as to cause said auxiliary arm *g* to move back and forth in front of the needles in the path of a circle, substantially as set forth.

3. An attachment for sewing-machines, consisting of an auxiliary arm *g*, carrying a thread *g'*, in combination with a reciprocating

plate provided with a Y-shaped slot therein, into which a stud or extension on the needle-arm *b* engages, said reciprocating plate being connected to and operating said auxiliary arm, so as to reciprocate the said auxiliary arm back and forth in front of the needles, a shunt-plate behind said reciprocating plate and provided with a A-shaped slot therein, into which the said stud or extension on the needle-arm *b* also engages, frictional connections between said reciprocating plate and said shunt-plate, and a horizontally-swinging link *l*, connecting said auxiliary arm *g* with a stationary part of the sewing-machine, so as to cause the said auxiliary arm to move back and forth in front of the needles in the path of a circle, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

RICHARD TODD.

Witnesses:

J. ENTWISLE,

R. W. IBBERTSON.