No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

APPLICATION FILED SEPT. 28, 1904.

6 SHEETS—SHEET 1.

Fig. 1.

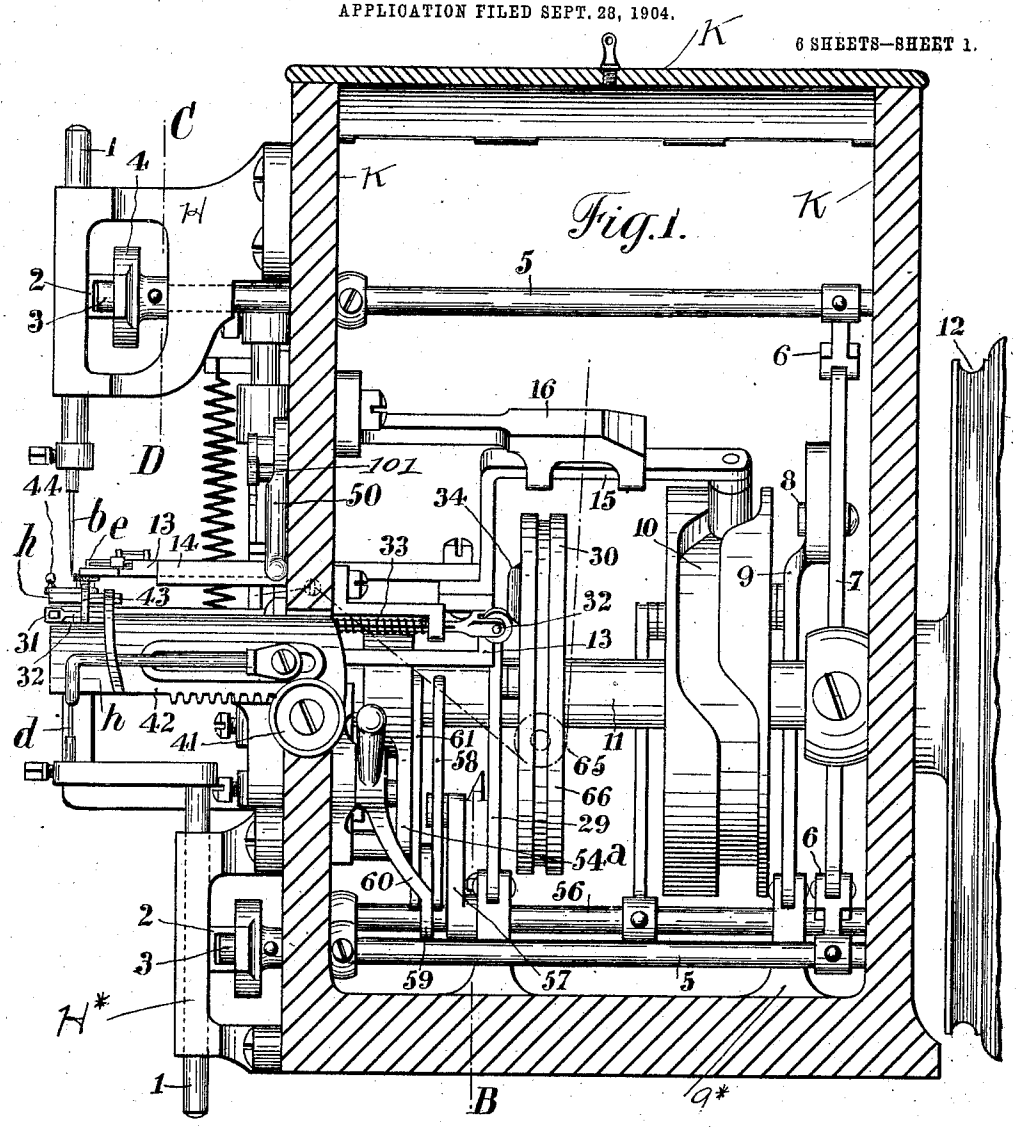

Fig. 23.

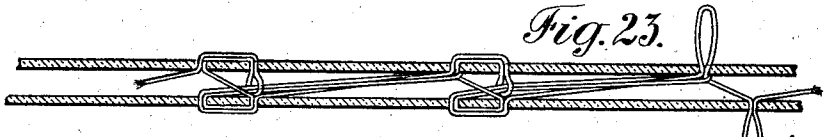

Fig. 18.

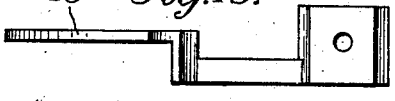

Fig. 17.

Witnesses:
G. L. Hamilton.
O. C. Deane

Inventor:
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by his attorney
James Hamilton

No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

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6 SHEETS—SHEET 2.

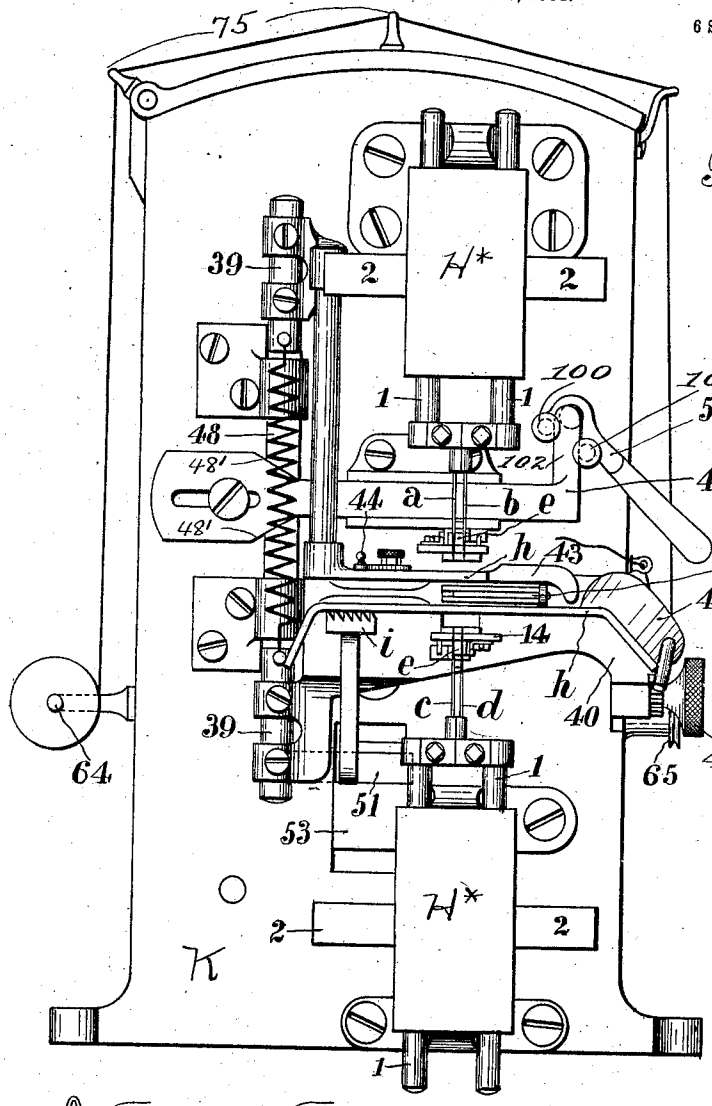
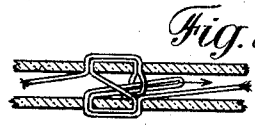


Fig. 2.

Fig. 20.

Fig. 21.



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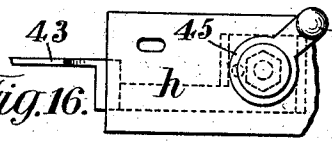

Fig. 16.

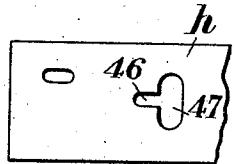

Fig. 19.

Witnesses:
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E. M. Deane

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James Hamilton

No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

APPLICATION FILED SEPT. 28, 1904.

6 SHEETS—SHEET 3.

Fig. 3.

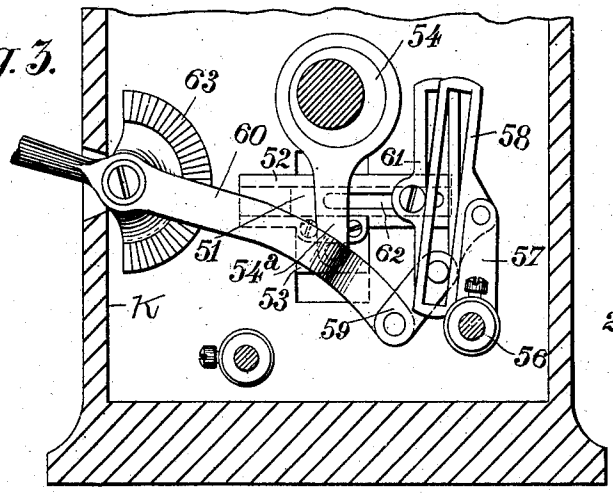


Fig. 14.

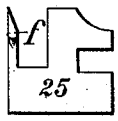


Fig. 15.

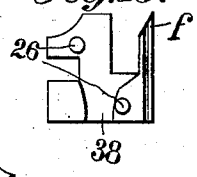
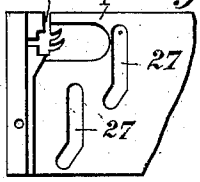


Fig. 11.



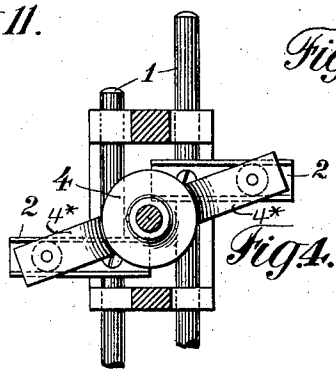


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 12.

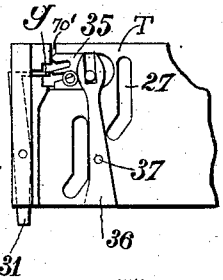
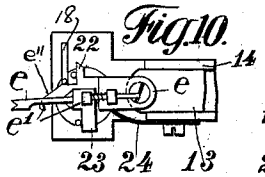


Fig. 10.



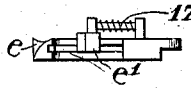


Fig. 7.

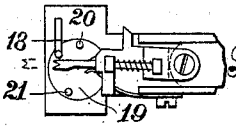
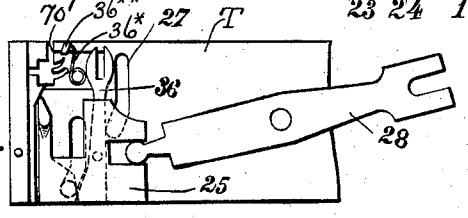


Fig. 8.

Fig. 13.



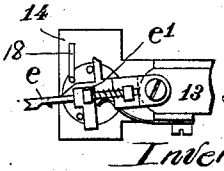


Fig. 9.

Inventor.

Witnesses:
H. L. Hamilton.
[illegible]

Guillaume Fischer
by his attorney
James Hamilton

No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

APPLICATION FILED SEPT. 28, 1904.

6 SHEETS—SHEET 4.

Fig. 24.

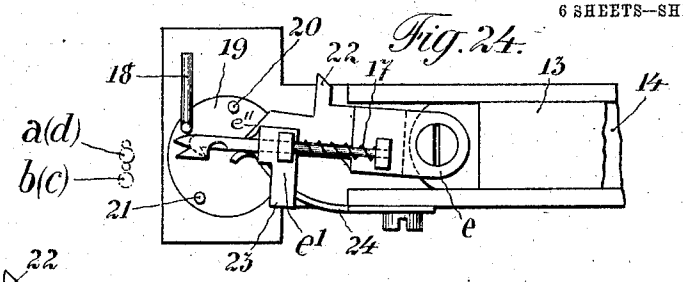


Fig. 29.

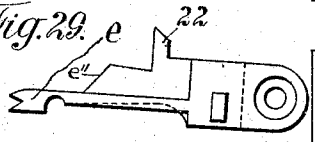


Fig. 25.

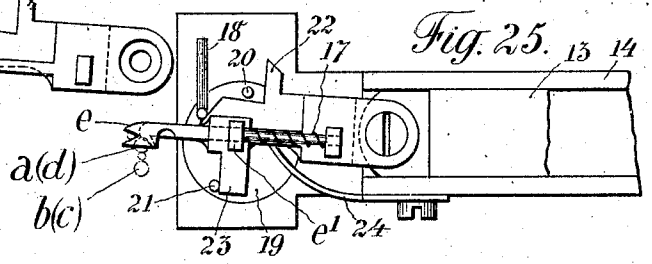


Fig. 30.

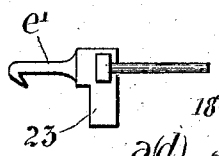


Fig. 26.

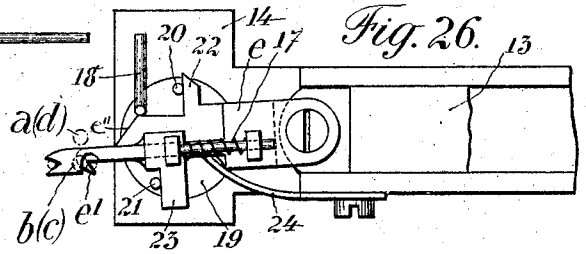
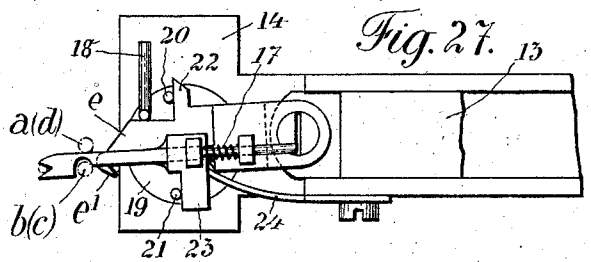


Fig. 27.



Witnesses.
William D. Deany.
Aloysius McCarthy.

Inventor
Guillaume Fischer.
By James Hamilton.
his Attorney.

No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

APPLICATION FILED SEPT. 28, 1904.

6 SHEETS—SHEET 5.

Fig. 31.

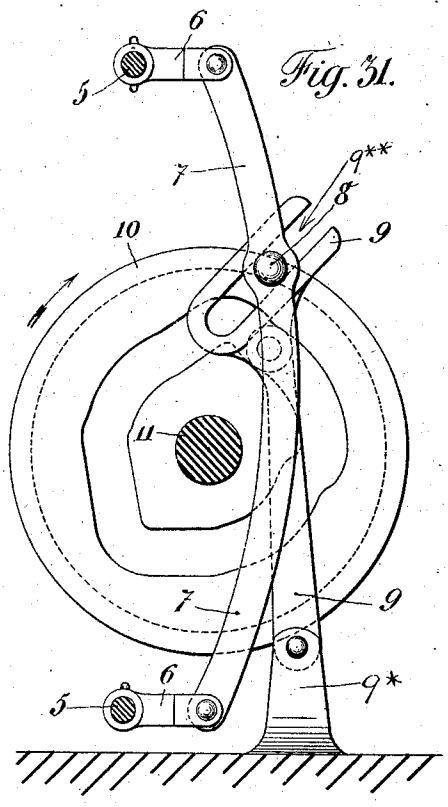


Fig. 32.

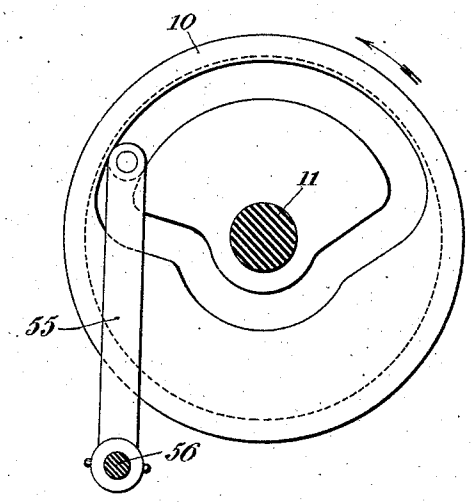


Fig. 33.

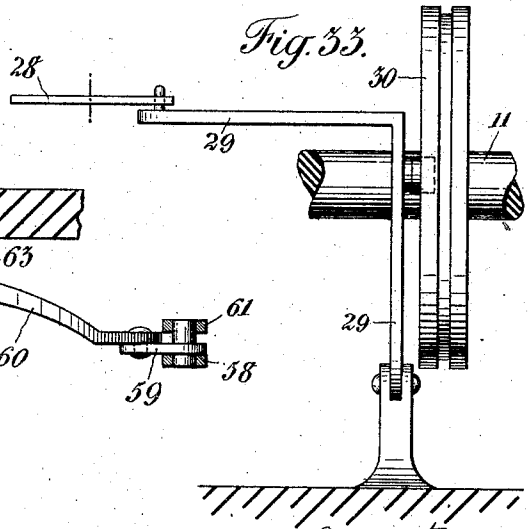
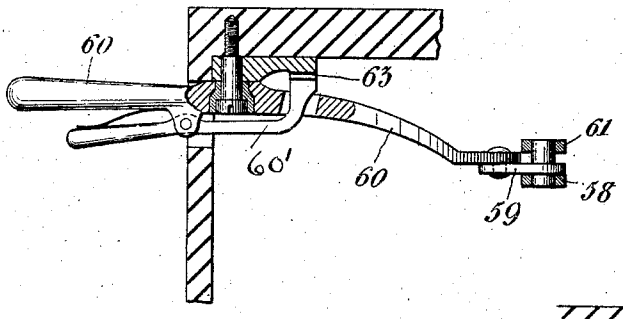


Fig. 34.



Witnesses:
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Aloysius McCarthy.

Inventor
Guillaume Fischer.
By James Hamilton,
his attorney.

No. 851,082. PATENTED APR. 23, 1907.

G. FISCHER.

SEWING MACHINE.

APPLICATION FILED SEPT. 28, 1904.

6 SHEETS—SHEET 6.

Fig. 28.

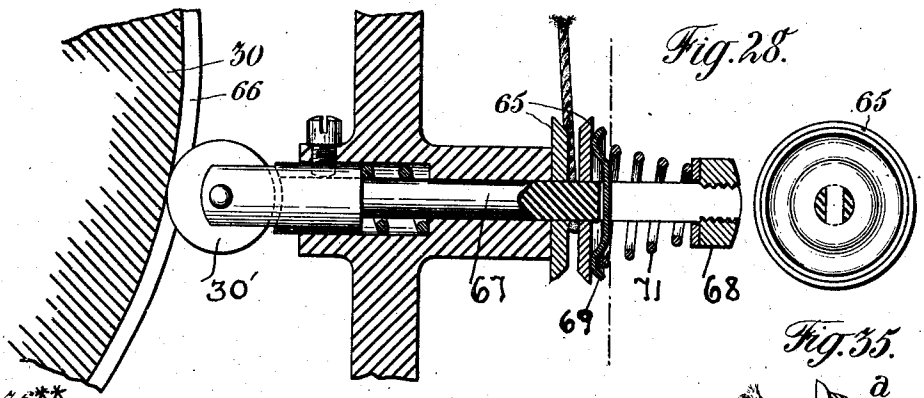


Fig. 35.

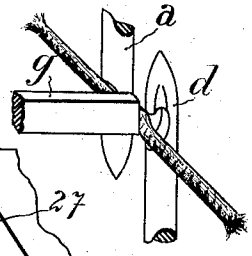


Fig. 37.

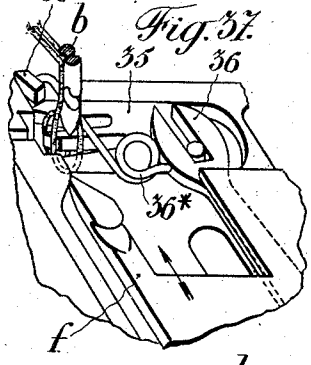


Fig. 36.

Fig. 38.

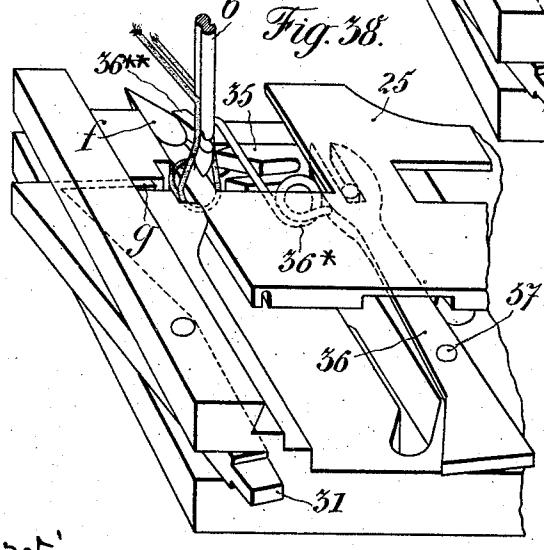
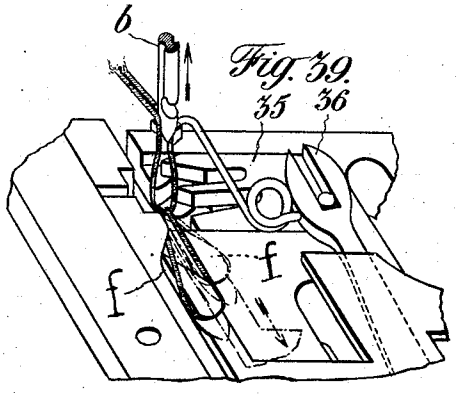


Fig. 39.



Witnesses:
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M. Hamilton.

Inventor:
Guillaume Fischer
by his Attorney
James Hamilton

UNITED STATES PATENT OFFICE.

GUILLAUME FISCHER, OF GENEVA, SWITZERLAND.

SEWING-MACHINE.

No. 851,082. Specification of Letters Patent. Patented April 23, 1907.

Application filed September 28, 1904. Serial No. 226,354.

To all whom it may concern:

Be it known that I, GUILLAUME FISCHER, of Geneva, Switzerland, mechanician, have invented certain new and useful Improvements in and Relating to Sewing-Machines, of which the following is a specification.

My invention relates to an improved sewing machine in which the loops by which the threads are locked together lie between the two parts of the work which are united by the line of stitches in such manner that the interlocked loops cannot be seen from either side of the work in its finished state.

In the drawings illustrating the principle of my invention and the best mode now known to me of applying that principle, Figure 1 is a side elevation of the machine, part of the casing being shown removed to disclose the more clearly the working parts; Figure 2 is a front elevation of the machine; Figure 3 is a sectional view on line A—B of Figure 1; Figure 4 is a sectional view on line C—D, of Figure 1; Figures 5 and 6 show on an enlarged scale the two forms of needle used in the machine; Figure 7 illustrates the hook which passes a loop of the thread from one needle to the other; Figures 8, 9 and 10 show the hook of Figure 7 in plan in several of its working positions; Figure 11 is a plan view of the central plate of the sewing-table, while Figure 12 shows the same plate in plan together with several of the parts supported by it; Figure 13 shows the parts of Figure 12 in operative relation with the loop-guiding hook and its actuating lever; Figure 14 is a top plan view and Figure 15 a bottom plan view of the loop-guiding hook just referred to; Figure 16 is a plan view and Figure 17 a longitudinal sectional view of an adjustable guide for the upper straw braid, together with the upper presser-foot; Figure 18 shows the adjustable guide of Figure 16 separately, in plan, while Figure 19 shows the upper presser-foot also separately in plan; Figures 20, 21, 22 and 23 show different stages in the formation of the stitch; Figures 24 to 27 inclusive illustrate different positions of the loop-passing hooks in the formation of the stitch; Figure 28 shows in sectional view a tension device and its connected mechanism; Figure 29 shows the loop-passing hook *e* separately, while Figure 30 is a similar view of its co-operating hook *e'*; Figure 31 shows the needle-actuating mechanism in side elevation; Figure 32 shows the mechanism for actuating the feeding devices; Figure 33 is a detail showing the mechanism for actuating the hook *f* of Figures 14 and 15; Figure 34 is a detail showing means for adjusting the length of the stitch and Figures 35 to 39 inclusive are details hereinafter referred to.

The drawings illustrate my invention as embodied in a machine for sewing straw-braids, such as are used in the manufacture of hats.

The parts directly concerned in the making of the stitch comprise the four needles *a*, *b*, *c*, and *d*, two loop-passing hooks *e* and *e'* and a loop-pulling hook *f*, together with a thread-carrying finger *g*. The needles *a* and *d* are mates and are shown in detail and upon an enlarged scale in Fig. 5, from which it will be seen that the hook part of the needle is bent backwardly; (that is, the hook-opening is toward the butt-end) while the needles *b* and *c* are mates and are shown in detail in Figure 6 upon an enlarged scale, from which it will appear that the hook part thereof is bent to the front or the hook-opening is toward the point. The loop-passing hooks *e* and *e'* are shown in detail in Figures 29 and 30, respectively, while the loop-pulling hook *f* is similarly illustrated in Figures 14 and 15. The thread-carrying finger *g* is shown in operative relation to other parts in Figure 12. The machine is furthermore provided with presser-feet *h* adapted and designed to press the straw-braids against the work-holding table, said presser-feet being provided with suitable guides for guiding the straw-braids. The presser-foot *h* is shown in detail in Figure 19 and one of the movable guides is shown in Figure 18, while these two members are shown in operative relation in Figures 16 and 17.

The mechanism for actuating the needles comprises the driving pulley 12 mounted upon the main driving shaft 11 upon which is rigidly mounted the cam 10 in a slot in which engages a roller upon the swinging arm 9 (see Figures 1 and 31) pivoted at its lower end in a standard 9* projecting from the bottom of the casing K and formed at its upper end with an inclined slot 9**, which makes this upper end practically U-shaped. Mounted in the sides of the casing K and extending transversely thereof parallel to the main driving shaft 11 are two rock-shafts 5, from each of which project a crank-arm 6 (see Figures 1 and 31.) A curved bar 7 con-

nects the free ends of the crank-arms 6 and is provided with a roller 8 which engages in the slot 9**. From this description and an inspection of Figures 1 and 31, it will be clear that rotation of the cam 10 will cause the rock-shafts 5 to oscillate.

Upon the front end of each of the rock-shafts 5 is mounted a driving-head 4 from which extends arms 4* provided with rollers 3 which engage in grooves in the face of the arms 2 (see Figures 1 and 4) secured to needle-bars 1. There are four of these needle-bars mounted in pairs in the two stationary heads, an upper H and a lower H*, both being secured to the front side of the casing K (Figures 1 and 2). Each of these needle-bars carries one of the four needles, *a*, *b*, *c*, and *d*. From the foregoing description and a study of the arrangement of the parts as disclosed by Figures 1, 2, 4 and 31, it will appear that the needles of the same pair (*a* and *b* constituting one pair, and *c* and *d* the other pair) move in the opposite direction to each other, while the needles in line with each other (*a* and *c* being considered in line with each other, and *b* and *d* being likewise considered in line) move always in the same direction, their motion being due to the rocking of the shafts 5 through the arrangement of parts previously described.

In order to actuate the loop-passing hooks *e* and *e'* (of each of which there is a pair, one being above the work-holding table T and the other being below it) the following mechanism is provided: The cam 10 is provided with a slot in its peripheral face, as best shown in Figure 1, and in this slot engages a roller mounted on or projecting from the rear end of the slide 15 which is slidably supported in the bracket or hanger 16. In the front side of the casing K are mounted two channeled guides 14, one above the central work-holding table T and the other below it; and in each of these channeled guides is mounted a slide 13. The two slides 13 are connected at their rear end to the front end of the driving slide 15. From this description and an inspection of Figure 1, it will be obvious that rotation of the cam 10 will make the slide 15 and the slides 13 reciprocate from front to rear, one of the slides 13 below and the other above the work-holding table T and both in the guides 14 provided one for each of them.

Pivotally secured to the front end of each of the slides 13 is one of the hooks *e*, the function of which as above explained is to pass a loop from one needle into the path of the adjacent needle in order that the latter may drive the loop through the work. A spring 24 mounted upon the guide 14 tends to force the hook *e* toward the stud or abutment 18 mounted upon the front end of the channeled guide 14. The hook *e* is shown separately in Figure 29; and slidably mounted upon it is a co-operating hook *e'* which is urged to the front of the hook *e* by a spring 17. See Figures 24 to 27, inclusive.

Rotatably mounted in the front end of the guide 14 is a disk 19 from one face of which project the studs 20 and 21. The hook *e* is formed with a bevel *e''* and an ear 22, while the hook *e'* is formed with an ear 23. When the slide 13 starts forward, the forked end of the hook *e* is directed toward the point of the needle just leaving the work, and as the slide continues to move forward, it carries the beveled portion *e''* of the hook *e* against the stud 18, thereby forcing the hook *e* to swing on its pivot against the tension of the spring 24. As the hook *e* is moved still farther forward, the ear 22 strikes against the stud 20 and rotates the disk 19, bringing the stud 21 against the ear 23 and forcing finally the hook *e'* to the rear against the tension of the spring 17 and into the position shown in Figure 27.

Fast upon the driving shaft 11 is a cam 30 in a cam-slot in which engages a roller mounted upon an L-shaped swinging arm or lever 29 (see Figures 1 and 33) the free end of which is provided with a pin which engages a slot in one end of a lever 28 (Figure 13) pivoted in the work-holding table T, the other end of said lever 28 entering a slot in the plate 25 upon which is the loop-pulling hook *f* (see Figures 14 and 15). The studs 26 projecting from the plate 25 enter slots 27 in the central or work-holding table T, and as the cam 30 rotates, it drives the plate 25 through the levers 29, 28, the exact path of the plate and so of the hook *f* being determined by the cam-slots 27 in the work-holding table T (Figure 13).

The loop-pulling hook *f* is designed to enter the thread-loops which have been pressed into the work (Figure 21); and in order to insure that the hook *f* shall so enter the loops and not push them aside, the following means are provided: Pivoted at 37 is (Fig. 12) a lever 36 one end of which is forked and the other end of which engages in a cam-groove 38 in the plate 25 (Figure 15). Slidably mounted in the work-holding table T is a forked loop-holder 35 connected by a pin-and-slot connection with the forked end of the lever 36. As the plate 25 moves forward to carry the hook *f* into the thread-loops, its cam-groove 38 swings the lever 36 upon its pivot 37 in such manner and in such time that the loop-holder 35 moves ahead of the hook *f* and prevents the accidental displacement of the loops, thereby insuring that the hook *f* shall enter them. The construction and operation of this part of the mechanism will be understood by referring to Figures 36 to 39, inclusive, which will now be described. After the thread-loops have been drawn out by the needles *a*, *d*, conveyed to the needles *b*, *c* and by the lat-

ter have been again forced into the work (Figure 21), the needles *b*, *c* being at the limit of their inward stroke (Figure 36), the plate 25 is actuated by the lever 28. The pins 26 (Figure 15) which project from the plate 25 now travel in the slots 27 in the table T (Figures 11 to 13); and while these pins or studs 26 are moving in the inclined portion of the slots 27, the lever 36 (Figures 12, 13, 36) is swung by the action of the walls of the cam-groove 38 upon one of its ends (Figures 13, 15, 36). This swinging of the lever 36 upon its pivot 37 throws the loop-holder 35 from the position shown in Figure 36 to that shown in Figure 37. The needles *b*, *c* now withdraw slightly and take up the relative position shown in Figure 37. Still driven by the lever 28, the plate 25 now completes its forward movement; and during the last portion of this forward movement, the loop-pulling hook *f* is carried straight forward from its position shown in Figure 37 to its position shown in Figure 38. Near the end of its travel in a forward direction, the hook *f* presses upon a block 36** carried by a spring 36* (Figures 13, 37, 38) mounted on the lever 36. This pressure of the hook *f* upon the block 36** causes the lever 36 to swing upon its pivot 37 to its initial position, carrying with it the loop-holder 35. The latter, by taking up the position shown in Figure 37 as above described, serves to prevent the hook *f* from pushing the thread-loops aside instead of entering them, as the hook *f* moves forward (Figures 37, 38). Having served its purpose, the loop-holder 35 is returned to its initial position. The plate 25 is now returned to its initial position by the lever 28 and carries with it the hook *f*, which engages one of the loops and pulls it through the other (Figure 22), the needles *b*, *c* completing their backward stroke at the same time. During the first part of the backward movement of the plate 25, during which time the studs 26 travel in the straight portion of the slot 27, (Figures 13, 15), the loop of thread is carried straight back by the loop-pulling hook *f* and takes up the position shown by the dotted lines in Figure 39. During the latter part of the backward travel of the plate 25, the studs 26 travel in the inclined portion of the slots 27 and thereby carry the plate 25 and the hook *f* mounted thereon to one side into the position shown by the full lines in Figure 39. This movement of the hook *f* causes the loop to take up a position in which its opening lies just in line with the end of the needles. Upon the face of the cam 30 is a projection 34 and against said face is pressed by the spring 33 a roller mounted upon the inner end of the slidable rod 32 (Figure 1), the outer end of which engages one end of the pivoted finger 31 the other end *g* of which is designed to carry or bend the thread into the path of the needles *a* and *d* which pull thread-loops through the work (Figures 5, 12 and 20). By properly setting the cam 30, the projection 34 is made to force the slidable rod 32 to the front against the tension of the spring 33 and thereby to swing the thread-carrying finger 31 on its pivot in such manner as to cause the part *g* to carry the thread into the path of the needles *a* and *d*. As shown in Figure 35, this operation takes place after the needles *a*, *d* have been pressed into the work and before they are again withdrawn therefrom. When the needles *a*, *d* have reached the extreme limit of their travel on their inward stroke, the cam 30 is so timed that the projection 34 actuates the rod 32 to swing the lever 31 and thereby to cause the finger *g* to press the thread against the body of the needles. When the needles move backward, the hooks formed on the needles engage the thread and draw the thread into loops, as explained.

Slidably mounted in the front face of the casing (see Figures 1 and 2) are two presser-bars, an upper and a lower, both marked 39 in the drawings. They are connected by the spring 48 which tends to draw them together. Slidably mounted upon the face of the machine is a spreader-bar 49 which passes between the opposed ends of the presser-bars 39 and is formed with the inclines 48′. A shifting lever 50 pivoted upon the casing serves to move the spreader-bar 49 across the face of the machine, and thereby to adjust the position of the presser-bars 39, as will be obvious from an inspection of Figure 2. Hand-lever 50 is provided with a pair of headed pins 100 and 101, which engage opposite sides of an arm 102, extending upwardly from bar 49. If handle 50 is depressed, pin 101 will shift bar 49 to the left, while, if the handle is raised, pin 100 will shift the bar to the right.

Mounted upon the lower presser-bar 39 is a cross-head 40 which carries the lower presser-foot *h* and at its free end a pinion 41 which meshes with a rack formed upon a work-shifter 42. By the arrangement of parts just described, the rotation of the pinion 41 will shift the work along the lower presser-foot *h*.

Secured to the upper presser-bar 39 is the upper presser-foot *h* in a transverse groove in which is slidably mounted an adjustable guide 43 (see Figures 1, 2, 16, 17, 18 and 19). A screw 45′ passes through the upper presser-foot *h* into the adjustable guide 43 and secures to said guide a lever 45 provided with an operating-stud 44 and with a pin which projects from its lower face into the slot 46 in the upper presser-foot *h* (Figure 19). The lever 45 is free to turn upon said pin as a pivot while the pin itself may be moved along the slot 46. The lower end of the screw 45′ enters a slot 47 in the upper presser-

foot *h*. By moving the lever 45 through its operating-stud 44, the guide 43 is adjusted. The guides 42, 43, are similar to those of machines already well-known and no novelty is claimed therefor herein.

Projecting through an opening in the lower presser-foot *h* is the feeder *i* which is actuated by the following mechanism (see Figures 1, 2, 3, 32 and 34): To give the feeder *i* motion in a transverse direction, the cam-wheel 10 is formed with a slot upon its front face in which engages a roller upon the free end of a rocker-arm 55 fast upon the transverse rock-shaft 56 (Figures 32 and 1) to which is rigidly secured the crank-arm 57 having rigidly secured (Figure 3) to its free or upper end a slotted bar 58 in the slot in which engages a pin projecting from one face of the lever 59 pivotally mounted in one end of the adjusting lever 60 (Figures 3 and 34). Projecting from the opposite face of the lever 59 is another pin which engages in a slot in the slotted arm 61 secured to the slide 51 (Figure 2) by a screw which traverses the slot 62 in the cross-bar 52 which is secured to the slidable block 53 and in a groove in which (Figure 3) the slide 31 reciprocates. The slide 51 carries the feeder *i;* and from the foregoing description and an examination of Figures 1, 2, 3 and 32, it will be apparent that rotation of the cam-wheel 10 will through the arm 55 rock the shaft 56 and thereby the arms 57 and 58, which through the lever 59 and slotted arm 61 (Figure 3) transform their oscillatory motion into rectilinear reciprocating motion of the slide 51 and its connected feeder *i*. To adjust the length of the feed, there is rigidly secured to the casing a toothed segment 63 (Figures 3 and 34) with which co-operates a spring-controlled latch 60′ (Figure 34) mounted upon the adjusting lever 60 in the inner end of which is fulcrumed the lever 59 (Fig. 3). By moving the adjusting lever 60 the position of the link 59 may be varied in such manner as to vary the distance through which the slide 51 is made by the oscillations of the arms 57 and 58 to travel in the bar 52, and, hence, to vary the travel of the feeder *i*, or the "feed," which determines the length of the stitch. The lever 60 is held in its adjusted position by the engagement of the inner end of the spring-controlled latch 60′ with the teeth of the segment 63. To give the feeder *i* motion in a vertical direction, an eccentric 54 is mounted upon the driving shaft 11, and its eccentric strap 54ª (Figure 3) is secured to the block 53 which carries the grooved bar 52 in which reciprocates the feeder-carrying slide 51. As shown in Figure 3, the block 53 travels in a slot formed in the casing. From the bobbin mounted upon the bobbin-support 64 (Figure 2) the thread passes through eyes 75 and thence through a tension device made up as follows (Figure 28): The cam-wheel 30 is formed with a peripheral groove 66′ in which engages a roller 30′ mounted upon one end of a spring-controlled rod 67 upon which are loosely mounted two tension disks 65 having flaring edges and which carries at its outer end a nut 68 between which and the presser-disk 69 is interposed a coil spring 71 which tends to force the tension disks 65 together.

The operation of the machine is as follows: The handle end of the lever 50 (Figure 2) is thrown up thereby drawing the bar 49 to the right and forcing the presser-bars 39 apart. One of the two straw-braids is now put between the upper presser-foot *h* and the work-holding table T, and the other straw-braid is placed between the lower presser-foot *h* and said table T. The straw-braids are now secured in place by throwing the handle of the lever 50 down, thereby bringing the presser-feet *h* to bear under the tension of the spring 48 upon the work. From the bobbin upon the bobbin-support 64 (Figure 2) the thread is led through the eyes 75 to the tension-device 65 (Figure 28) and thence to the work-holding table T. Here the thread is worked to and fro over the edge of the top surface of table T until it enters the groove 70′ (Figure 13) in the thick portion of said table and also enters a groove in line with the groove 70′ and beneath the hook *f*, when the latter is in its forward position. The driving wheel or pulley 12 is next started, causing the needles *a*, *b*, *c* and *d* to reciprocate through the mechanism shown in Figures 1, 2, 4 and 31 and already explained. The needles *a* and *d* have their hook-openings toward their shank or butt end (Figure 5); and these needles draw each a loop through one of the straw-braids (Figure 20), the thread-carrier *g* having through the mechanism shown in Figures 12, and 1 previously pressed the thread into the paths of said needles. The needles *a* and *d* having cleared the loop-carrying hooks *e* *e′* (Figures 29 and 30), the latter are pushed forward by the slides 15 and 13, the movement of the hook *e* being such that one of the points of its forked end is directed to the point of the loop-forming needle *a* (or *d* in case of the lower). This position of the respective parts is best shown in Figure 24. As the hooks *e*, *e′* continue to move forward, one thread of the loop enters the fork in the end of the hook *e* and the other thread of the loop enters the hook in the end of *e′*. The needles *a* and *d* now approach the work, thereby allowing the loops to escape from their hooks; and the beveled face *e″* of the hook *e* strikes the stud 18 (Figure 25). As the hooks *e*, *e′* advance, the stud 18 acting upon the beveled face *e″* swings the hook *e* upon its pivot against the tension of the spring 24 so as to bring the parts into the position shown in Figures 26, in which the hook *e′* is in line with the direction of motion or

path of travel of the loop forcing needle *b* (or that of the needle *c* in case of the lower set) (Figure 6). Further forward movement of the slide 13 results in the rotation of the disk 19 due to the pressure of the ear 22 upon the stud 20; and this rotation of the disk 19 causes the stud 21 to press against the ear 23 of the hook *e'* in such manner as to force the hook *e'* to the rear against the tension of the spring 17. The thread of the loop is thus tightened between the forked end of the hook *e* and the hook of the coöperating member *e'* then in the position shown in Figure 27. The needle *b* now descends and the needle *c* ascends, both approaching the work, their points passing between the thread of the upper and lower loops, respectively, and the hooks *e*, and their hooks, which have their openings toward the points of the needles (Figure 6), catching the thread and forcing the loop through the braid (Figure 21), and the slides 15 and 13 beginning their return movement so as to cause the coöperating hooks *e*, *e'*, of each set to approach each other and thereby to release the thread. The needles *b* and *c* continue their movement into the work to such a distance that upon their withdrawal the loops carried into the work by them will be slightly relaxed and not drawn taut as might otherwise be the case. The needles *b* and *c* now withdraw from the work and the hook *f* is forced through the loops now lying between the braids (see Figures 13, 14, 15 21 and 33). The hook *f* is now withdrawn, pulling with it and through one of the loops the other loop. Thus are the loops interlaced and the stitch completed (Figure 22). The second stitch now begins to be made. The loop-forming needles *a* and *d* enter the work from their respective sides and each pulls a loop of thread on its return stroke through the long loop pulled out by hook *f*, which hook moves slightly forward now and allows the thread to escape from the hook. The result is that the pulling of the thread by the loop-pulling needles *a* and *d* causes the long loop pulled out by hook *f* to take the position shown on the right of (or at the third stitch of) Figure 23. The hooks *e*, *e'* and the needles *b* and *c*, together with the hook *f* complete the stitch as before.

What I claim is:

1. In a sewing machine, work-holding means for supporting two spaced layers of material; means for directing a thread between said layers; means for penetrating the upper layer, pulling a loop of thread through said layer, conveying said loop sidewise and passing the same back through said layer; means for penetrating the lower layer, pulling a loop of thread through said lower layer, conveying said last-named loop sidewise and passing the same back through said lower layer; and means for drawing one of said loops through the other of said loops.

2. In a sewing machine, the combination of work-holding means for supporting two spaced layers of material; means for directing a thread between said layers; a pair of loop-pulling needles, one of which draws a loop of the thread through the upper layer and the other of which draws a loop of the thread through the lower layer; loop-passing hooks for passing the loops so formed into the path of loop-forcing needles; a pair of loop-forcing needles, one of which forces one of said loops back through the upper layer and the other of which forces the other loop back through the lower layer; and means for pulling one of the loops through the other of the loops.

3. In a sewing machine, the combination of work-holding means for supporting two spaced layers of material; means for directing a thread between said layers; means for pulling a loop of the thread through the upper layer; devices for transferring said loop sidewise into the path of loop-forcing means; said loop-forcing means for forcing said loop back again through said upper layer; means for pulling a loop of the thread through the lower layer; devices for transferring said last-named loop sidewise into the path of loop-forcing means; said loop-forcing means for forcing said last-named loop back again through said lower layer; and means for pulling one of the loops through the other of the loops.

4. In a sewing machine, the combination of work-holding means for supporting two spaced layers of material; means for directing a thread between said layers; means for feeding said material; means for forming a loop in the thread and drawing the same to the outside, of one of said layers; means for forming a loop upon the outside of the other of said layers; means for transferring the loop from the outside of the first-named layer to between the layers; means for transferring the loop from the outside of the other layer to between the layers; and means for pulling one loop through the other.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUILLAUME FISCHER. [L.S.]

Witnesses:
L. H. MUNIER,
E. IMER.