

(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.
NEEDLE FOR SEWING MACHINES.

No. 558,664.

Patented Apr. 21, 1896.

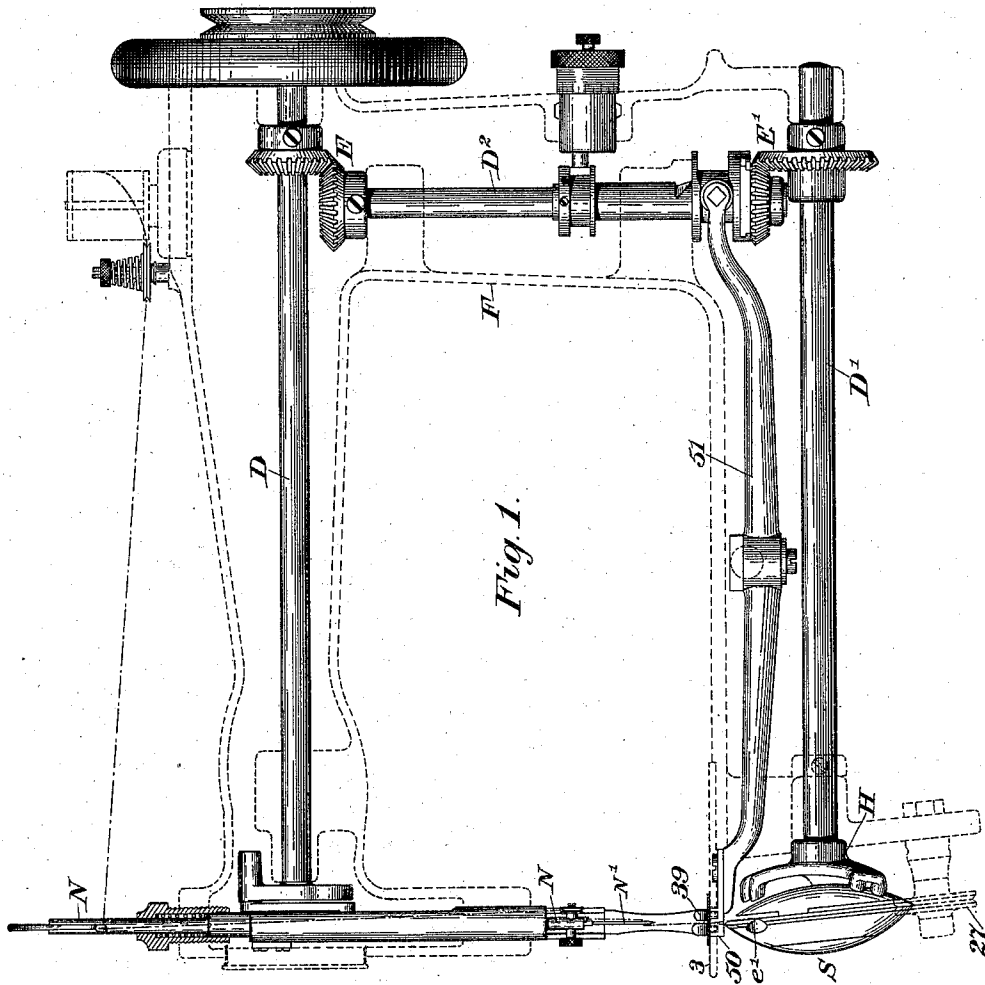


Fig. 1.

Fig. 2.

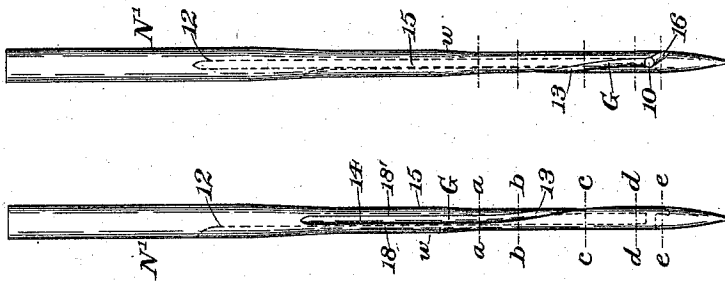


Fig. 3.

Witnesses:
J. L. Edwards, Jr.
Fred. J. Dole.

Fig. 4. N¹
12-20 G

Fig. 5. N¹
12-20 G

Fig. 6. N¹
12-20 G

Fig. 7. N¹
12-20 G

Fig. 8. N¹
12-20 G

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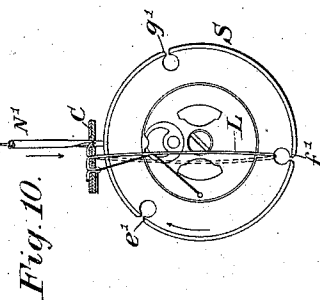
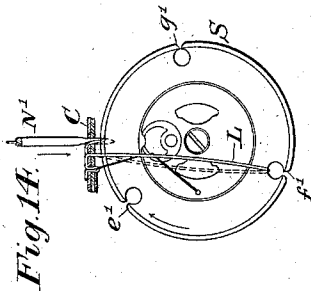
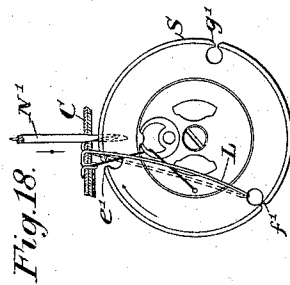
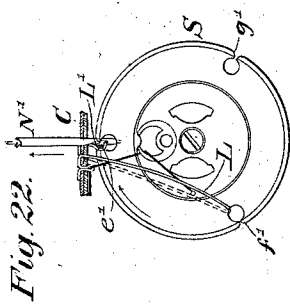
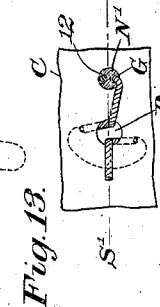
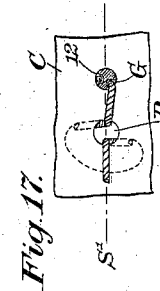
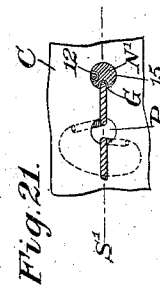
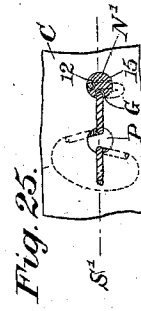
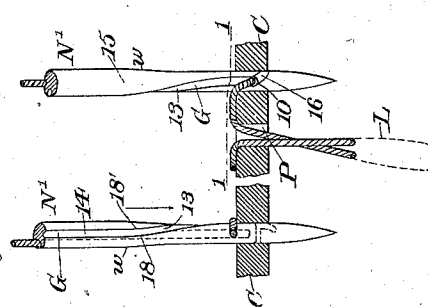
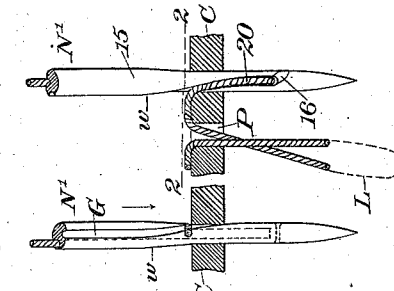
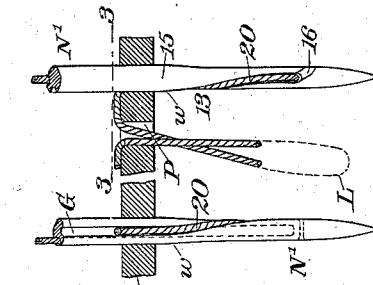
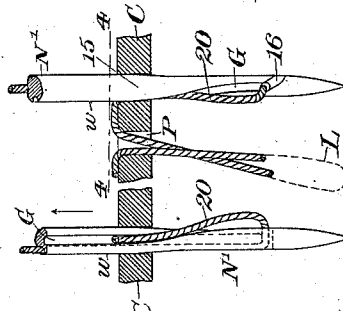


Fig. 24.

Fig. 20.

Fig. 16.

Fig. 12.



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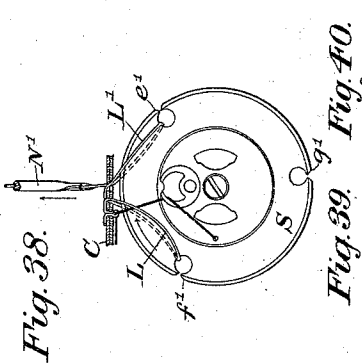


Fig. 38.

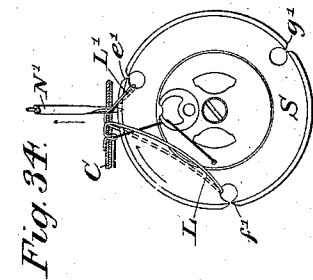


Fig. 34.

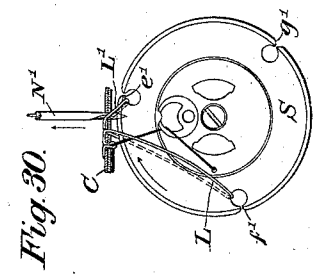


Fig. 30.

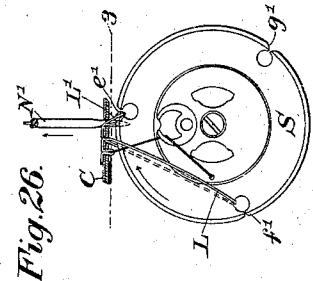


Fig. 26.

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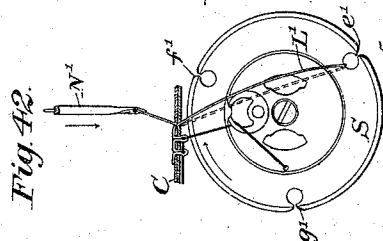


Fig. 42.

Fig. 39. Fig. 40.

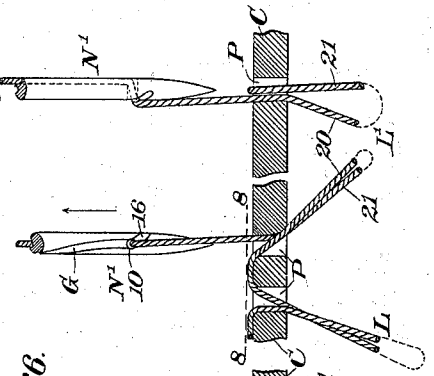


Fig. 35. Fig. 36.

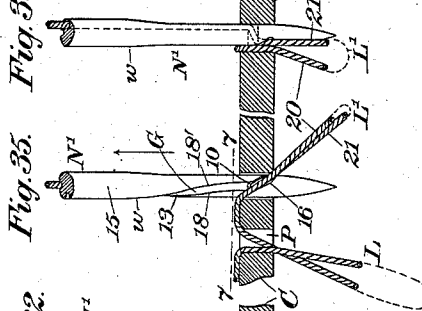


Fig. 31. Fig. 32.

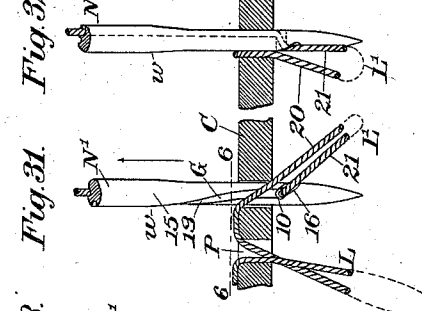


Fig. 27. Fig. 28.

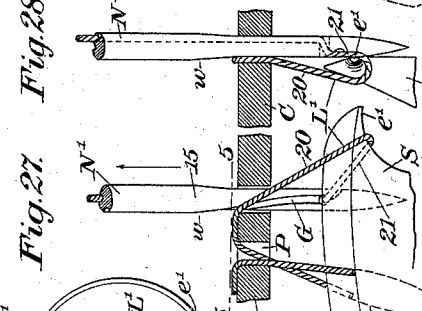


Fig. 23. Fig. 24.

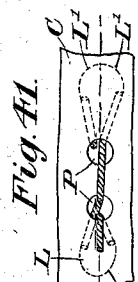
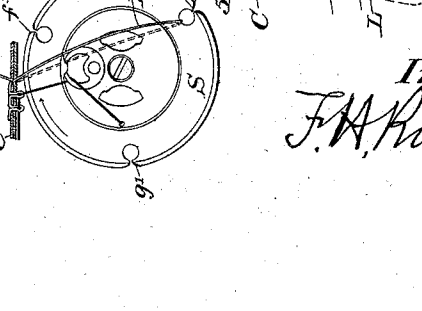


Fig. 41.

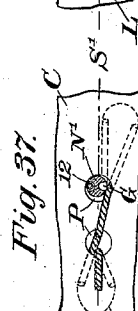


Fig. 37.

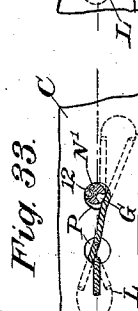


Fig. 33.

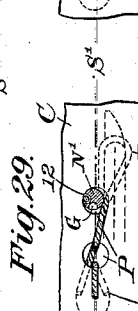


Fig. 29.

Inventor:
F. H. Richards.

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

NEEDLE FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 558,664, dated April 21, 1896.

Application filed June 10, 1895. Serial No. 552,196. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention appertains to sewing-machines of that class having means for actuating a reciprocatory needle and a revoluble loop-taker, and relates more particularly to improved means for effecting a peculiar manipulation of and for protecting the loop-forming thread during the operation of sewing.

The object of my present invention is, primarily, to provide, in a sewing-machine of the class specified, a revoluble loop-taker and a reciprocatory needle, constructed, combined, and coacting to form, draw out, and draw up successive loops without unnecessarily chafing the thread or subjecting the same to injurious strains, and especially to do this, first, by carrying the needle-thread or running-thread through the fabric and then below the fabric in a sinuous or spiral path, to form a first loop having the bight thereof at one side the perpendicular plane of and at right angles to the sewing-line; second, carrying this loop around to inclose a second or lower thread; third, advancing the forward or running end of this loop and carrying the same downward through the fabric and below said fabric in a sinuous path, to form a second loop having its bight at one side the perpendicular plane of and at right angles to the sewing-line; fourth, carrying the running end or forward portion of this second loop to one side and out of the path of movement of the rearward portion of said loop; fifth, carrying one portion of said loop upward and past the other portion of said loop with a minimum frictional resistance, and, sixth, drawing out this second loop, to thereby take up the first loop and complete the first stitch.

Another object of my invention is to furnish a needle of improved construction adapted for use in connection with a revoluble multi-hook loop-taker in sewing-machines of the

class specified, and having means whereby the loop-forming portion of the running-thread is engaged and is carried downward through the fabric in a spiral path to form a loop, and whereby said portion is practically housed and protected during the operation of forming the loop, and also having means for holding one end of the loop out of the path of movement of the opposite end of said loop, to prevent rubbing contact between the loop ends when said ends pass each other in drawing out the loop.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation, partly in section, of a portion of the operative mechanism of a sewing-machine having a revoluble multihook loop-taker and a reciprocatory needle-bar and embodying my present improvements. Fig. 2 is a rear view, on an exaggerated scale, of the needle which constitutes one of the essential features of my present invention. Fig. 3 is a side view of said needle as seen from the right hand, Fig. 2. Fig. 4 is a cross-sectional view of the needle, taken in dotted line *a a*, Fig. 2, and looking downward in said figure. Fig. 5 is a similar cross-sectional view of the needle, taken in line *b b*, Fig. 2. Fig. 6 is a similar cross-sectional view of the needle, taken in dotted line *c c*, Fig. 2. Fig. 7 is a similar cross-sectional view of the needle, taken in dotted line *d d*, Fig. 2. Fig. 8 is a similar cross-sectional view of the needle, taken in dotted line *e e*, Fig. 2. Fig. 9 is an end view of the needle as seen from the under side in Fig. 3. Fig. 10 is a side elevation, on a relatively small scale, of that portion of a sewing-machine mechanism which directly controls the peculiar manipulation of the thread in forming, drawing out, and drawing up a loop during the operations of inaugurating and completing a stitch. This figure shows a revoluble multihook loop-taker, a portion of my improved reciprocatory needle on an exaggerated scale, a piece of fabric being operated upon, a portion of the throat-plate in dotted lines which supports the fabric, and the upper and lower threads, said figure being intended to illustrate the first step or the first positions of the above-named parts in the operation of forming a loop after

one or more loops have been formed and drawn up to complete one or more stitches. In this figure, which illustrates what will be hereinafter termed the "first" position of the thread-manipulating mechanism, the needle is shown with its eye just passing through the fabric and as carrying the forward or drawing end of the preceding loop through the fabric to form the next succeeding loop, the preceding loop being shown as having been carried about one-half way around the loop-taker and as having been fully drawn out and in position to be taken up by the drawing end of said loop, which constitutes the stitch-forming portion of the next succeeding loop. Fig. 11 is a sectional rear view of a portion of the needle, needle-thread, and fabric on an abnormally large scale, as seen from the left hand, Fig. 12, and shows said needle and needle-thread in the first positions thereof, illustrated in Fig. 10, the looped portion of the thread being broken away. Fig. 12 is a sectional side view of a portion of the needle, needle-thread, and fabric on the same scale as and as seen from the right-hand end in Fig. 11, said figure showing the parts in the first position, illustrated in Fig. 10, and also showing a portion of the drawn-out loop. Fig. 13 is a sectional plan view of the needle, needle-thread, and fabric, taken in dotted line 1 1, Fig. 11. Fig. 14 is a side view similar to Fig. 10, and shows the same parts in their "second" or slightly-advanced positions, the needle in this instance having advanced the drawing end of the preceding loop a short distance through the fabric. Fig. 15 is a sectional rear view similar to Fig. 11, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 14. Fig. 16 is a sectional side elevation similar to Fig. 12, and shows the same parts in positions corresponding to positions of like parts illustrated in Fig. 14. Fig. 17 is a sectional plan view of the parts illustrated in Fig. 16, said section being taken in dotted line 2 2, said Fig. 16. Fig. 18 is a side view similar to Figs. 10 and 14, and shows the same parts in their "third" or further advanced positions, the needle in this instance having completed its downward stroke and having carried the drawing end of the preceding loop in a sinuous path the required distance for forming the next succeeding loop, with the bight thereof at one side the perpendicular plane of the sewing-line. Fig. 19 is a rear view, similar to Figs. 11 and 15, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 18. Fig. 20 is a side view similar to Figs. 12 and 16, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 18. Fig. 21 is a sectional plan view of the parts illustrated in Fig. 20, said section being taken in dotted line 3 3, said Fig. 20. Fig. 22 is a side view, similar to Figs. 10, 14, and 18, and shows the same parts in their "fourth" positions, or in the positions which they occupy upon the in-

auguration of the upward stroke of the needle, the needle in this instance being shown as having moved upward a short distance, and a loop having been formed thereby and left in position to be engaged by a hook of the loop-taker, and the hook of the loop-taker being shown in the position it occupies just preparatory to engaging said loop. Fig. 23 is a rear view, similar to Figs. 11, 15, and 19, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 22. Fig. 24 is a rear view, similar to Figs. 12, 16, and 20, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 22. Fig. 25 is a sectional plan view of the parts illustrated in Fig. 24, said section being taken in dotted line 4 4, said Fig. 24. Fig. 26 is a side view, similar to Figs. 10, 14, 18, and 22, and shows the same parts in their "fifth" positions, or in the positions they occupy during the ascending movement of the needle and when the newly-formed loop is engaged by a hook of the loop-taker, and the inauguration of the drawing up of the preceding loop is effected by the partial drawing out of the running end of said loop by the hook of the loop-taker. Fig. 27 is a sectional side view, similar to Figs. 12, 16, 20, and 24, and shows the same parts, together with a portion of the loop-taker, in positions corresponding to the positions of like parts illustrated in Fig. 26, said figure showing a portion of the newly-made loop as thrown into the threading-groove or protecting-groove of the needle by the advancing movement of the loop-taker and at one side and out of the path of movement of the other portion of said loop and in position to permit the free passage of said loop portions without relatively frictional contact. Fig. 28 is a front view showing the parts illustrated in Fig. 27, as seen from the right hand in said figure, and showing said parts in positions corresponding to the positions of like parts illustrated in Fig. 26. Fig. 29 is a sectional plan view of the parts illustrated in Fig. 27, said figure being taken in dotted line 5 5, Fig. 27. Fig. 30 is a side view, similar to Figs. 10, 14, 18, 22, and 26, showing the same parts in their "sixth" positions, or in the positions they occupy during the ascending movement of the needle, when the newly-formed loop has been carried by the hook of the loop-taker a short distance around said loop-taker and when the preceding loop has been partially drawn up and around the lower thread, the two end portions of the newly-formed loop in this instance being in the positions they occupy just preparatory to passing one another. Fig. 31 is a side view similar to Figs. 12, 16, 20, and 24, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 30. Fig. 32 is a front view similar to Fig. 28, and shows the same parts, with the exception of the loop-taker, in positions corresponding to the positions of like parts illustrated in Fig.

30. Fig. 33 is a sectional plan view of the parts illustrated in Fig. 31, said section being taken in dotted line 6 6, said Fig. 31. Fig. 34 is a side view similar to Figs. 10, 14, 18, 22, 26, and 30, showing the same parts in their "seventh" positions, or in the positions they occupy when the shuttle has further advanced and the needle has been elevated sufficiently to bring the two end portions of the newly-formed loop into alinement and in position to pass each other. Fig. 35 is a side view similar to Figs. 12, 16, 20, 24, and 31, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 34. Fig. 36 is a front view similar to Fig. 32, and shows the same parts in positions corresponding to the positions of like parts illustrated in Fig. 34. Fig. 37 is a sectional plan view of the parts illustrated in Fig. 35, said section being taken in dotted line 7 7, Fig. 35. Fig. 38 illustrates in side view the "eighth" or the next succeeding advanced positions of the parts shown in Figs. 10, 14, 18, 22, 26, 30, and 34, the needle in this instance having passed in its ascending movement through the fabric and out from juxtaposition with the newly-formed loop, said figure showing the opposite ends of the loop at their passing positions, the new loop having been carried farther around the loop-taker and the preceding loop having been drawn up correspondingly. Fig. 39 is a side view similar to Figs. 31 and 35, showing the same parts in positions corresponding to the positions of like parts illustrated in Fig. 38. Fig. 40 is a front view similar to Figs. 32 and 36, showing the same parts in positions corresponding to the positions of like parts illustrated in Fig. 38. Fig. 41 is a sectional plan view of the parts illustrated in Fig. 39, said section being taken in dotted line 8 8, Fig. 39; and Fig. 42 illustrates in side view the "ninth" or next succeeding position of the parts shown in Figs. 10, 14, 18, 22, 26, 30, 34, and 38, said figure showing the positions of said parts when the newly-formed loop is in its fully drawn-out position and when the succeeding loop has been drawn up taut around the lower thread to complete a stitch, the needle in this instance being on the descent.

Similar characters designate like parts in all the figures of the drawings.

In the drawings only so much of the operative mechanism of the sewing-machine is shown as is necessary to illustrate the application and mode of operation of my improvements, the mechanism shown being only that which is required for effecting the concert of action of the shuttle and needle necessary to the peculiar manipulation of the needle-thread during the operation of sewing, as will be hereinafter fully described.

Briefly stated, the sewing-machine illustrated in the drawings comprises the framework, (shown in dotted lines, Fig. 1, and designated by F, and which may be of any suitable

construction for carrying the operative mechanism of the machine;) a throat-plate 3 for supporting the fabric being stitched; a vertically-reciprocating needle-bar N, carrying the needle N' at the lower end thereof; a horizontally-disposed needle-bar-actuating shaft D, journaled in suitable bearings in the framework F, and operatively connected with the needle-bar; a revoluble multihook loop-taker S, peripherally supported at an inclination to the path of movement of and below the needle-bar, preferably by means of peripherally-disposed track-rolls 27, carried by suitable studs or carriers connected with a bracket constituting a part of the machine, (said track-rolls and bracket being shown in dotted lines;) a horizontally-disposed loop-taker-actuating shaft D', the axis of which is inclined relatively to the axis of the shuttle; a revoluble driver H, carried by the shaft D' in position and adapted for engaging and rotating the loop-taker; an intermediate or vertical shaft D², operatively connecting the needle-bar-actuating shaft D and loop-taker-actuating shaft D'; a train of gears E, operatively and directly connecting the intermediate shaft D² and needle-bar-actuating shaft D; a train of gears E', operatively and directly connecting the intermediate shaft D² and the loop-taker-actuating shaft D'; a feed-lever 51, pivotally supported for vertical and horizontal oscillations, and carrying a feed-dog 50 at one end thereof intermediate to the shuttle and needle-bar; a feed-lever-actuating cam carried by the intermediate shaft and in operative connection with said feed-lever, and a presser-foot 39, all of which elements, with the exception of the needle, which will be hereinafter described, may be substantially the same as the like elements shown and described in my prior application, Serial No. 531,931, filed December 15, 1894, to which reference may be had.

As a means for manipulating the thread in the peculiar manner hereinbefore noted to form, draw out, and draw up the loop without chafing or subjecting the thread to injurious strains I have provided a revoluble multihook loop-taker S, a reciprocating needle N' of peculiar construction, and means for imparting to said loop-taker and needle comparative movements of predetermined velocities; and for the purposes of my present invention I have shown the loop-taker and needle so organized as to have comparative movements of relatively-varying velocities, the ratio of which is as two is to three.

My improved needle N', which may be of any suitable size, is not only constructed to positively carry the needle-thread or the drawing end of a preceding loop, as the case may be, through the fabric in a spiral path without practically any motion of the needle-thread through the eye of the needle, but is also constructed to act in concert with the loop-taker S at predetermined points in the

rotation of said loop-taker or at a certain stage in the operation of drawing up a first loop L and drawing out a second loop, as L', to cause the two ends of the second loop to
5 freely pass each other with the minimum frictional resistance during the ascent of the needle, as will be hereinafter more fully described.

For the purpose of effecting the peculiar
10 manipulation of the thread whereby the results hereinbefore set forth are attained the needle N', which has the usual needle-eye 10, and which also has the usual needle-thread groove 12, extending from the needle-eye up-
15 ward in parallelism with and at one side the axis of the needle, has formed in the periphery thereof a spiral groove, (designated in a general way by G,) which for convenience will be hereinafter termed the "traverse-groove"
20 or "thread-carrying" groove. This traverse-groove G is herein shown extending from the upper part of the needle-eye 10, at that side of said eye opposite that into which the needle-thread groove 12 is merged, upward and
25 transversely of the needle in a spiral direction, as shown at 13, and terminates at its upper end, preferably, in a relatively short straight portion 14 at the rearward side of the needle and in substantial parallelism with
30 the axis of the needle, and also in a vertical plane relatively to the sewing-line S' of the fabric. (Shown most clearly in Figs. 21 and 25.) This spiral traverse-groove G positively controls the movement and position of the
35 thread in its passage through the fabric and during the operation of forming the loop. The curvature and degree of spirality of the spiral groove G will of course be proportionate to the size and length of the needle and
40 to the length of its stroke relatively to the fabric and to the loop-taker of the machine.

As will be seen by reference to the operative views 12, 13, 16, 17, 20, 21, 24, and 25, which are a series of successive groups of
45 figures illustrating successive positions of the needle N' in forming a loop, the loop-forming portion 20 of the thread, which portion in these figures is shown as the drawing-thread of the so-called "first" loop L, is engaged by
50 the walls 18 and 18' of the spiral traverse-groove as the needle descends through the fabric C, is carried downward thereby through the fabric and in a path coinciding with a spiral plane of said groove without any material motion through the eye of the needle,
55 and is protected during said downward movement by the walls of said groove, which practically incase said drawing-thread, this portion 20 of the thread during the formation
60 of the so-called "second" loop L' therefrom lying between the outer edges of the walls of the spiral groove and the axis of the needle, so that said thread will meet with but little resistance in passing through the fabric, owing
65 to the fact that a space is provided for the movement of the thread within the bound-

ary-lines of the perforation (designated by P) made in the fabric by the needle, as will be readily understood by a comparison of the several figures referred to in this paragraph. 70

For the purpose of enlarging the perforation P just preceding the withdrawing or the upward movement of the needle, to furnish space to accommodate and facilitate the free movement of the opposite ends of the so-called
75 "second" loop after the loop has been engaged by the loop-taker and the needle is on its return or upward movement, the needle N' has, near the upper end of the spiral portion 13 of the groove G and between the upper and
80 lower ends of said groove and in juxtaposition to the straight portion 14 of said groove, an expanding-wedge, (designated in a general way by W,) which wedge is, for convenience, shown as an enlargement concentric to the
85 axis of the needle, and having a conically-tapered lower end, which merges into the lower portion of said needle, as will be readily understood by reference to Figs. 2 and 3 of the drawings. 90

The wedge or expander 15 is so located as to enter and just pass through the fabric when the needle is in its lowest position, as illustrated in Figs. 19 and 20 of the drawings, and said wedge will, in practice, have its full
95 working face 15, which constitutes the wedge proper, in alinement with the lower end of the spiral groove, as shown in Fig. 3 of the drawings, so that when the needle is withdrawn there shall be a full space formed in
100 the fabric on the outer side of the needle, through which the thread may be readily drawn. This operation of withdrawing the wedge 15 from the fabric takes place after the needle has descended to its lowest position,
105 as shown in Fig. 20, and has been moved through a short distance of its upward stroke, or to the position shown in Figs. 27, 28, and 29. This movement of the needle draws the wedge, as before stated, out of the fabric,
110 forms a perforation of relatively large area in said fabric to provide a space for the free movement of the thread at the side of the point of the needle, and at the same time forms the so-called "second," loop which is at
115 this stage in the operation engaged by the hook e' of the loop-taker S, this loop-taker having, usually, three equidistantly-disposed peripheral hooks, which are designated by e', f', and g', respectively. 120

It will be understood that the working face 15 of the wedge w might be concentric to the axis of the needle and extend over the front face only of said needle.

In sewing by the peculiar method carried
125 out by the sewing-machine mechanism herein described the inner end portion 21 of the new or second loop L' or that portion of the loop contiguous to that end of the loop which extends through the eye of the needle, which
130 portion will, for convenience, be hereinafter referred to as the "needle side" of the loop,

will, during the ascending movement of the needle, be necessarily drawn under the opposite or outer end portion 20 of said loop, or that portion of the loop contiguous to that end of the loop which passes over from the first loop L through the perforation P in the fabric, to form said second loop L', and which "impinges" the fabric, which portion 20 will be hereinafter referred to as the "fabric side" of the loop. Consequently if means are not provided for the protection of the needle side 21 of the loop during this operation said needle side 21 will be tightly impinged between the outer face of the needle and the fabric side of said loop, said fabric side 20 of the loop being forcibly drawn against the needle side 21 of the loop, which would in consequence subject the fabric side and needle side of the loop to relatively great frictional resistance, thereby increasing the tensile strain upon the thread, and, in practice, frequently causing a breaking of said thread.

For the purpose of protecting the needle side of the loop and the fabric side of the loop against injurious frictional contact during the operation of drawing the needle side 21 of the loop L upward and past the fabric side 20 of said loop the needle is provided at one side thereof with an inclined channel or threadway 16, which extends from the needle-eye 10 downward and sidewise to the front face of said needle, and in a direction corresponding to the plane of the needle side 21 of the loop when said loop has been engaged by and carried partly around the loop-taker—that is, when said loop has arrived at the position illustrated in Figs. 27, 31, and 35. This inclined channel or threadway 16 is made of suitable depth and proportion for receiving and for practically incasing the needle side 21 of the loop L', which is in juxtaposition to the eye of the needle, and for protecting that portion 21 as the same is drawn upward past the fabric side 20 of said loop during the upward stroke of the needle, so that the portion 20, in passing downward over the needle-eye, as the loop L' is drawn out by the loop-taker, is not obstructed by the portion 21, which lies in the channel 16 of the needle, as most clearly illustrated in Figs. 27, 31, and 35, but, on the contrary, rides over the needle side 21 of the loop upon the outside face of the needle without injurious contact with said needle side 21 of said loop.

As will be understood by a comparison of the figures above referred to, this peculiar manipulation of the needle-side portion 21 and fabric-side portion 20 of the loop is directly dependent upon a concert of action for a definite length of time between the revolving loop-taker S and the reciprocating needle N', as the drawing up of the so-called "first" loop L, the drawing out of the so-called "second" loop L', and the peculiar manipulation of the two portions 20 and 21 of the so-called "second" loop relatively to each other to facili-

tate the passage of one portion by the other portion without injurious frictional resistance are due to the conjoint action of the loop-taker and the needle.

As will be understood by a comparison of Figs. 22 to 41, inclusive, of the drawings, the cooperation of the loop-taker S and the needle N' takes place in the following manner: During the ascending movement of the needle, and when the needle has reached the position relatively to the loop-taker illustrated in Fig. 22, the hook e' engages the bight of the loop which has been formed and carries the bight of said loop downward and forward from the position shown in Fig. 22 to the position shown in Fig. 27. At this point in the advancing movement of the hook e' the loop is, owing to the intersecting relation between the path of movement of the needle and the path of movement of the loop-taker, carried inward relatively to the path of movement of the needle, which forces the needle-side portion 21 of the loop into the channel or threadway 16 of said needle and out of the path of movement of the fabric-side portion 20 of said loop. A continued upward movement of the needle from the position shown in Fig. 27 to the position shown in Fig. 39 and a continued advancing movement of the hook e' from the position shown in Fig. 26 to the position shown in Fig. 38 carries these two portions 20 and 21 past each other with a minimum frictional resistance and without the locking of one portion of the loop from the other.

In practice the loop-taker S will be supported so that the path of movement of the hooks thereof will intersect the path of movement of the needle, as before stated, and the needle N' will be fixed in the needle-bar with the threadway 16 at the outer side of said needle and adjoining the inner face of a loop-engaging hook when said hook is in a position to engage a loop of the needle-thread. Thus it will be seen that during the rotation of a hook from the position shown in Fig. 32 to the position shown in Fig. 42 the bight of the loop will be carried downward by the hook, and simultaneously carried sidewise from a point at the outer side to a point at the inner side of the path of movement of the needle. This necessarily causes the needle-side portion 21 of the loop to be carried laterally into the threadway 16 of the needle, which at this period in the advancing of the hook is in position for receiving said needle-side portion 21 of said loop.

Having thus described my invention, I claim—

1. In a sewing-machine, a loop-forming mechanism comprehending a reciprocating eye-pointed needle having an expanding-wedge; combined with loop-taker mechanism comprehending a revoluble loop-taker having a peripheral loop-engaging hook; and needle and loop-taker actuating mechanism for effecting a downward passage of the needle-

wedge into, and an upward passage of the needle-wedge out of, the fabric, immediately preceding the engagement of the loop of the needle-thread by the hook of the loop-taker, and timed to effect an engagement of the hook of the loop-taker with the loop immediately succeeding the withdrawal of the wedge from the fabric, whereby the needle-opening in the fabric is expanded immediately preceding the drawing out of the loop by the loop-taker, and the free movement of the needle-thread is facilitated.

2. In a sewing-machine, loop-forming mechanism comprehending a reciprocatory eye-pointed needle having a traverse-groove extending upward from the eye of the needle in a spiral path, and adapted, during the descent of the needle, for receiving and carrying the fabric side of the needle-thread laterally of the sewing-line and downward in a spiral path through the fabric to inaugurate the formation of the loop; also having a thread-receiving channel at one side thereof which extends downward from the needle-eye in an inclined path, and is adapted for receiving and holding the needle side of the loop out of the path of movement of the fabric side of said loop during the ascent of the needle; and also having a laterally-projecting wedge located between the upper and lower ends of the traverse-groove, and adapted for expanding the needle-opening in the fabric during the descent of the needle; in combination with coöperating loop-taker mechanism comprehending a revoluble loop-taker supported with the plane of its periphery intersecting the path of movement of the needle, and having a hook for engaging the loop, and for so carrying the same laterally of the path of movement of the needle as to draw the needle side of said loop out of the path of movement of the fabric side of said loop and into the thread-receiving channel of the needle, while the needle-eye is below the fabric side of the loop; and needle and loop-taker actuating mechanism for effecting such timing in the relative movements of the needle and loop-taker as to carry the wedge portion of the needle into and out of the fabric immediately preceding the engagement of the loop by the hook of the loop-taker, and so as to effect an engagement of said hook with the loop immediately succeeding the withdrawal of the wedge from the fabric and immediately after the needle side of the loop has been carried into the thread-receiving channel, whereby the needle-opening in the fabric is expanded immediately preceding the drawing out of the loop by the loop-taker, to facilitate the free drawing-out movement of the needle-thread, and the needle side of the loop is protected during the ascent of the needle.

3. In a sewing-machine, loop-forming mechanism comprehending a reciprocatory eye-pointed needle having a traverse-groove extending upward from the eye of the needle in a spiral path, and adapted, during the de-

scend of the needle through the fabric, for receiving and carrying the needle-thread laterally of the sewing-line and downward in a spiral path through the fabric, and also having a thread-receiving channel at one side thereof, which extends downward from the needle-eye in an inclined path, and is adapted for receiving and holding the needle side of the loop out of the path of movement of the fabric side of said loop; in combination with coöperating loop-taker mechanism comprehending a revoluble loop-taker supported with its periphery in a plane intersecting the path of movement of the needle, and having means for engaging the loop, and for so carrying the same laterally of the path of movement of the needle, as to draw the needle side of said loop out of the path of movement of the outer portion of said loop, and into the thread-receiving channel of the needle, while the needle-eye is below the fabric side of the loop, whereby said needle side of the loop is carried upward past the fabric side of said loop, substantially as described, and for the purpose set forth.

4. A sewing-machine needle having an eye therethrough; a needle-thread groove formed in one face of the needle and extending upward from one end of the needle-eye in substantial parallelism with the axis of the needle; a traverse-groove formed in the periphery of the needle, and extending upward from the opposite end of said needle-eye in a spiral path; and a thread-receiving channel extending downward from the needle-eye in an inclined path, substantially as described.

5. A sewing-machine needle having a transverse eye therethrough; a traverse-groove communicating with and extending upward from said eye in a spiral path; and an inclined channel in communication with said eye, and extending downward and sidewise therefrom, substantially as described, and for the purpose set forth.

6. An eye-pointed sewing-machine needle having a traverse-groove in communication with, and extending upward from, the eye of the needle in a spiral path; and also having a laterally-projecting wedge located between the upper and lower ends of the traverse-groove, and having its working face above, and in alinement with, the lower end of the traverse-groove, substantially as described, and for the purpose set forth.

7. A sewing-machine needle having a transverse eye therethrough; a needle-thread groove in communication with, and extending upward from, one end of the eye in substantial parallelism with the axis of the needle; a traverse-groove in communication with, and extending upward from, the opposite end of said eye in a spiral path; a groove communicating with and extending downward from the eye of the needle in an inclined path; and a wedge located above, and with its working face in alinement with, the lower end of the traverse-groove, and extending

laterally beyond the side walls of the lower end of said groove, substantially as described, and for the purpose set forth.

5 8. A sewing-machine needle having a transverse eye therethrough, a traverse-groove communicating with, and extending upward from, said eye in a spiral path; an inclined channel in communication with said eye, and

extending downward and sidewise therefrom; and a laterally-projecting wedge located between the downwardly-extending channel and the upper end of the traverse-groove. 10

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Witnesses:

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