

I. M. SINGER.
Sewing Machine.

No. 10,974.

Patented May 30, 1854.

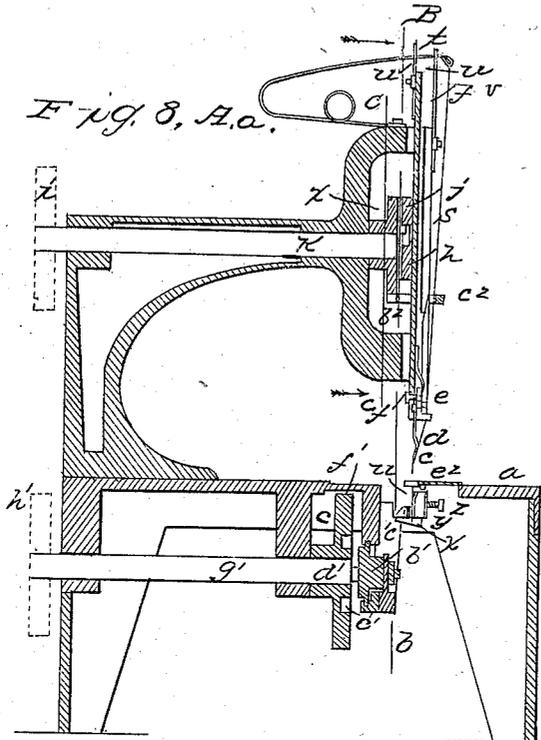


Fig. 8, A.a.

Fig. 4,

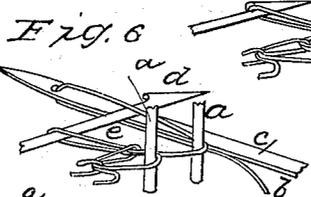


Fig. 6

Fig. 5,

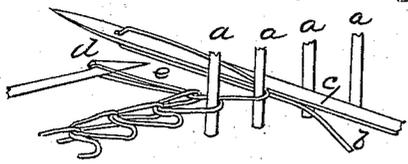


Fig. 3,

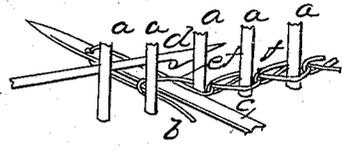


Fig. 1.

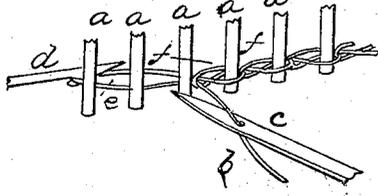
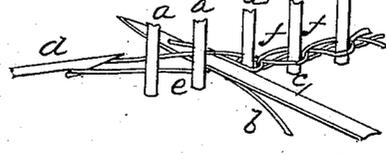


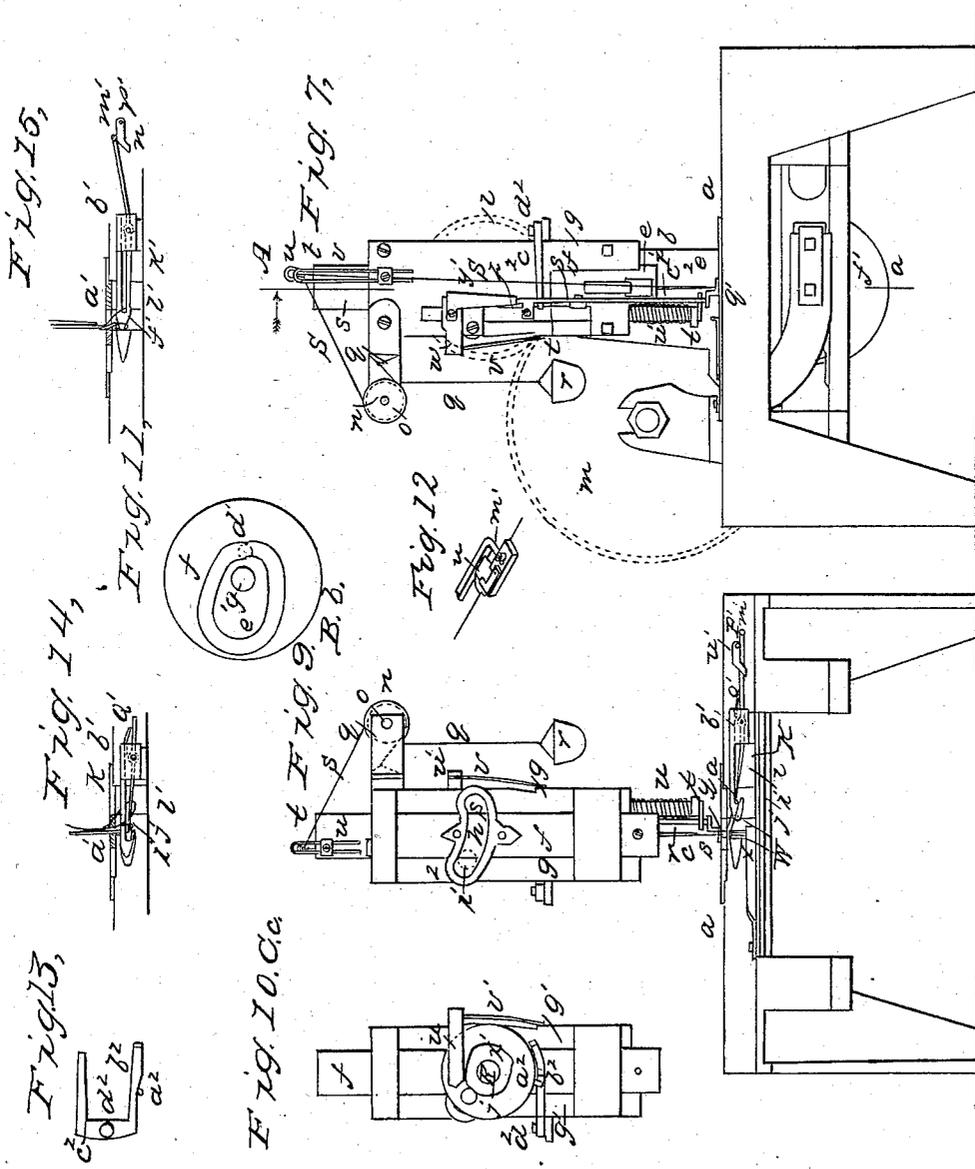
Fig. 2,



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UNITED STATES PATENT OFFICE.

ISAAC M. SINGER, OF NEW YORK, N. Y.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. 10,974, dated May 30, 1854.

To all whom it may concern:

Be it known that I, ISAAC M. SINGER, of the city, county, and State of New York, have invented certain new and useful Improvements in the Method of Forming Seams and in Machinery for Sewing, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figures 1, 2, and 3 represent the manner of forming a seam by what is known as the "tambour" stitch. Figs. 4, 5, and 6 represent the manner of forming my new and improved seam. Fig. 7 is a front elevation of the machine; Fig. 8, a vertical section taken at the line A *a* of Fig. 7; Fig. 9, a vertical section taken at the line B *b* of Fig. 8; Fig. 10, a section taken at the line C *c* of Fig. 8; Fig. 11, a face view of the cam-wheel for operating the looper; Fig. 12, a perspective view of part of the apparatus employed in operating the looping apparatus; Fig. 13, a separate view in plan of a lever employed in the feed-motion; and Figs. 14 and 15, sections taken in the same plane as Fig. 9, to represent the looping apparatus in different positions.

The same letters indicate like parts in all the figures.

Machines have been made for sewing seams in cloth and other substances with one thread with what is known as the "tambour" stitch, formed as represented in Figs. 1, 2, and 3 of the accompanying drawings, in which the thread is worked around a series of pins, *a*, instead of being carried through the cloth, the better to illustrate the method of forming such stitches. The thread *b* passes through the eye of the needle *c*, back of the point. The needle is thrust through between two pins, as through the cloth, carrying the thread through the cloth, a hook, *d*, on the under side, and moving at right angles to the needle, being at the time in the position represented in Fig. 3. The hook is then drawn back, by which the thread is drawn off in the direction of the progress of the seam, to form a loop, as represented at *e*, Fig. 1. The needle is then drawn back and again thrust into the next place, and in entering passes through the loop *e*, formed and held by the hook, as represented in Fig. 2. In this condition the hook is again moved forward, to liberate the loop *e* to form the stitch,

and in its return or back movement again catches the thread lying between the cloth and the eye of the needle, to form another loop for the next stitch. In this way the stitches *f* are formed in succession into a seam by the needle passing each time through the cloth and the loop previously formed by the hook. The objections to this kind of stitch are numerous and serious. The stitch is drawn tight and into the cloth, technically termed "drawing in the stitch," by forcing in the needle for the next stitch, which must of necessity chafe and seriously injure it and reduce the strength of the seam. Drawing in the stitch by the next perforation pulls on the needle laterally to such an extent that to resist it the needle must be made too thick for sewing fine seams. The hook must catch the thread which lies against the surface of the needle by scraping across the surface of the needle, which not only tends to chafe and injure the thread, but is very liable to miss the thread; and if it does fail to catch the thread and form the loop, or if it does form the loop, and at the next operation the needle fails to enter the loop, not only will a false stitch be the result, but the strength of the seam back of the false stitch will be destroyed, because all the series of stitches are dependent upon any one loop, and if the thread carried through the cloth by the needle is not interlocked with itself by passing through the loop previously formed the concatenation is lost and all the stitches back of it are liberated.

The object of the first part of my invention is to form a seam with one thread, as in the tambour-stitch above described, but without the objections to seams formed by such stitches; and to this end the first part of my invention consists in forming a seam with one thread by first forming a loop with that portion of the thread which is carried through the cloth by the needle, and then forming another loop in like manner at the next perforation of the needle, which second loop is drawn through the first loop, and then liberated, to complete the stitch. By this means the stitch is drawn tight by the return or withdrawing motion of the needle, which avoids any injurious chafing of the thread, the seam is not weakened or destroyed by a miss-stitch or any number of them, for the reason that the concatenation is com-

pleted at every stitch, and the needle is not deflected by drawing in the stitch, so that it can be made as thin as desirable.

The second part of my invention consists in the employment of lateral pressure, whether by a cam, a lever, or other equivalent means, to act against and in combination with the needle at or near the end of its perforating motion, to insure the proper position of the needle, however flexible it may be, that the looping apparatus, or the equivalent thereof, may enter properly between the needle and its thread; and this part of my invention also consists in combining with a needle for perforating the substance to be sewed or stitched, and carrying the thread through it, a looping apparatus, which forms the thread into a loop at each perforation of the needle, and consecutively liberates the previously-formed loop over the one last formed, to effect the concatenation of the stitches made with a single thread; and this part of my invention also consists in forming the looping apparatus, which is suitably pointed to enter between the needle and thread, with a recess, into which the thread is drawn to form the loops, by drawing the thread therein by the needle or otherwise, when this is combined with a lever or its equivalent for alternately closing and opening the said recess, and discharging the previously-formed loop over the one last formed, and while it (the last-formed loop) is held or confined in the recess; and this part of my invention consists in giving a positive range of motion to a spring guide-arm, through which the thread passes from the apparatus for governing the tension to the needle by combining the said spring-arm with two guides or their equivalents, the one attached to some permanent part of the frame, to act as a stop to determine the extent of upward motion, and the other attached to the needle-carrier or some other part of the machine having an equivalent motion, to act on and force up the said spring-guide during the upward motion of the needle, and insure its upward range of motion, that the thread may be under the full effect of the tension apparatus, there to be held as the needle descends and slides on the thread until the point of the needle shall have made the perforation, and then to force down the said guide to give the required amount of slack for the formation of the loop, the upward motion being given by the carrier or its equivalent, and the downward motion by the bridle attached thereto; and, finally, this part of my invention consists in feeding the cloth or other substance to be sewed for the progress of the seam by means of the foot or pad which holds the said substance down to the table or platform, by giving to the said foot or pad an upward motion, to lift it from the cloth, &c., while the needle is in it, that the cloth, &c., may be turned on the needle as on a pivot, to give any desired direction to the seam, and then a back motion before it is let down onto the cloth, &c., that it may hold down the cloth

as the needle rises, and, after the needle is withdrawn, a forward feeding motion to the extent required for a stitch, the extent of the feed motion being adjustable.

Figs. 4, 5, and 6, Plate 1, of the accompanying drawings represent my new method of forming a seam with a single thread on a series of pins, the better to exhibit the concatenation. The pins *a* represent the cloth between the punctures made by a needle. The needle *c*, with the eye just back of the point for the thread *b*, enters a space between two pins and carries the thread *b* through the cloth. The looper *d* then moves forward between the needle and the thread, and in its return motion catches the thread and forms a loop, *e*, as the needle is drawn out the loop being drawn back—that is, in the direction the reverse of the progress of the seam. The needle and thread is then forced in through the next space, as shown at Fig. 5, the looper, with the previous loop *e* on its shank, is moved forward and enters between the needle and the thread, as shown at Fig. 6, and in its back movement catches the thread, which lies between the eye of the needle, and as the needle is drawn back forms a second loop, which is drawn through the first loop, *e*, then liberated to complete the stitch. In this way the seam progresses stitch by stitch. If the thread should break, the end will be drawn through the loop *e*, and there held by the loop, as in the case of the last stitch of a seam. The needle can be rethreaded and the operation continued as if beginning a new seam, in which the beginning end of the thread is completely gripped and held by the first stitch; but if the looper in any part of the seam should fail to enter between the needle and thread, and should fail to make the next loop, the previous loop still remains on the shank of the looper, and when the looper does finally enter properly and form another loop, the concatenation is continued, and the only consequence to the seam will be one long stitch, instead of two or more short stitches. It will be seen that this seam entirely differs from the seam made with the tambour-stitch, for the reason that with the tambour-stitch seam the loop must be drawn in the direction of the progress of the seam, so that the needle shall enter the loop to form the concatenation, and that if it fails to enter, or the loop fails to be formed, the concatenation is broken and the thread back of the missed stitch liberated, whereas in the new seam the loop must be drawn away from the needle to prevent the needle from entering it, and the concatenation is formed by drawing the last-formed loop through the one previously formed, so that each stitch completes the concatenation, and, as a consequence, the failure at any time to catch the thread when carried through the cloth by the needle does not break the connection, but simply causes a longer stitch to be taken.

In the figures of Plate 2 of the accompanying drawings, *a* represents the table or plat-

form on which the articles to be sewed are placed, and constituting part of the framework, and *b* that part of the frame-work which carries the machinery for operating the needle. The needle *c* is formed with the eye near the point, as in other sewing-machines, and just above the eye it is crooked, as represented at *d*, for a purpose to be presently described, the point of the said needle being in the same line with the shank, which is secured by a screw-clamp, *e*, to the lower end of the needle-carrier *f*, that slides vertically in ways *g g*, secured to the forward end of the frame *b*. The needle-carrier is formed at the back with a cam-groove, *h*, in which works a crank-pin, *i*, on the face of a wheel, *j*, on the forward end of a horizontal shaft, *k*, that has its bearings in the frame *b*, the said shaft being rotated by a pinion, *l*, on its rear end, which engages the master-wheel *m*, operated by any suitable motive power. The form of the cam-groove *h*, as represented at Fig. 9, is such that as the crank-pin in its revolution moves from the point 1 to 2 the needle is carried down and the point forced through the substance to be sewed, and then, as the crank-pin returns in the said cam-groove from the point 2 to 3, which is in that direction concentric, or nearly so, with the path of the crank-pin, the needle remains stationary, or nearly so, to give time for the other operations, to be hereinafter described, and then, as the crank-pin continues its revolution, it raises the needle in passing back to the point of starting at 1. The thread with which the seam is formed is wound on a spool, *n*, fitted to turn freely on a spindle, *o*, attached to the frame *b*, and one head of the said spool is grooved, and a cord, *q*, attached by one end to the frame, is wrapped around this groove once, and to the other end of it is suspended a cup, *r*, in which small weights are placed, to regulate the friction on the said spool, and thus determine the tension of the thread as it is drawn off in the process of sewing. From this spool the thread *s* passes through an eye in the end of a spring, *t*, made of wire, and attached to the frame *b*, and passed through two staples or wire bridles, *u v*, one attached to the frame and the other to the needle-carrier. The object of this arrangement is the better to control the thread during the operations of the machine. As the needle is carried down through the cloth by the downward motion of the carrier, the thread is held up by the tension of the spring *t*, so that the needle slides on the thread, for if the thread were loose the point of the needle would be liable to catch and injure it, and would not properly lay the thread on the surface of the cloth; but after the eye of the needle has reached the substance to be sewed, the top of the staple or bridle *u* comes in contact with the spring, and carries it down faster than the needle, by reason of the projection of the spring forward of the carrier, thus producing a sufficient amount of slack in the thread that it may be

drawn freely through the cloth or other substance in forming the stitch, as will be hereinafter described; and as the needle is drawn out of the cloth, &c., the spring is permitted to rise to draw out the thread until it is stopped by the other staple or bridle, *v*, which gages the extent of the upward motion of the spring. If, however, anything should hold or check its upward motion, the top of the needle-carrier will strike and carry it up with a positive but elastic motion, the elasticity being due to that portion of the spring which projects beyond the carrier. The amount of slack can be regulated by the position of the bridle upon the needle-carrier. As the needle is carried down and toward the end of its downward motion, the bulge formed by the crook at *d* comes in contact with a fixed cam, *w*, which forces the needle inward until the part below the crook is brought into contact with a gage-plate, *x*. The face of this cam *w*, on which the needle acts, is grooved to hold the needle in its position laterally. By these means the needle, however flexible, at the end of its down motion is always brought to and firmly held in place during its next succeeding operation in the process of forming the stitch. The cam *w* is fitted to and passes through a mortise in the side of the groove in which the looper works, and is attached to a spring, *y*, one end of which is attached to the frame, and the other provided with an adjusting-screw, *z*, by means of which the position of the cam can be adjusted.

Instead of the cam and gage-plate above described for determining the position of the needle with reference to the line of motion of the looping apparatus, any equivalent means may be substituted—as, for instance, I contemplate substituting a vibrating lever to push the needle to the required position, whether the needle employed be crooked or straight. In the use of such lever it should work on a fulcrum-pin and have its face act on that side of the needle on which the looper or its equivalent passes, and it should be provided with a spring, the tension of which will tend to force it from the needle, and it should be so formed that just before the looping-instrument reaches the needle a cam attached to the carrier of the looper shall act on the said lever to cause it to act against and force the needle to its required position to insure the catching of the thread. As the said lever acts on the needle on the same side as the looping apparatus, the same adjustment of the lever will answer for any and all sizes of needles that may be used. The needle having passed through the cloth and carried with it the thread which is thus stretched across the crook or bend, a space is thus left between the thread and the body of the needle at the crook, to insure the entrance of the point or nose of the looper *a'*. This looper is of a peculiar construction, as represented at Figs. 9, 14, and 15, and is attached to a carrier, *b'*, which slides horizontally between ways *c' c'* below the bench or table *a*, the carrier being provided at the back with a

wrist-pin, d' , fitted to a cam-groove, e' , in the face of a wheel, f' , on the end of a horizontal shaft, g' , mounted in suitable bearings under the table a , and receiving motion from the master-wheel m by a pinion, h' , on its rear end. The form of the cam-groove is represented in the separate Fig. 11, and is such that the moment the needle has completed its downward motion the looper is carried toward and past the needle, and then immediately back as the needle rises; but before being entirely drawn back it is arrested for a short time, while the needle is completing its upward movement, to draw out the slack of the thread and to draw the stitch in one direction, and as the needle begins to descend, and simultaneously therewith, the looper is restarted and completes its back movement to draw the stitch back to its proper place. The rest of the cam-groove is then concentric, to keep the looper in a fixed position until the next operation. The said looper works in a groove in the table or platform a , and at right angles, or nearly so, to the motion of the needle. That face of the looper toward the needle is slightly convex in its vertical section, to fit the concavity in the crook of the needle, and the side of the groove against which it works is of corresponding form. The point of the looper is lancet-shaped, so as to enter freely between the needle and the thread when stretched across the crook. The upper surface is curved and the under surface recessed with a barb, as seen at i' , so that it shall enter freely between the thread and the needle. The moment the barb passes the needle it (the needle) begins to rise, which draws the thread into the recess of the looper within the barb, and then, as it moves back, draws out the thread to form a loop. The looper then stops for a short time, while the needle completes its upward movement, the thread being drawn tight by the tension of the spring t , which draws the previous loop tight, this being aided by the needle-carrier coming in contact with the spring to force it up to a positive but elastic motion, due to the elasticity of that part of the spring which projects beyond the carrier, and the moment the needle has completed its upward movement the looper is restarted to complete its back movement, which draws out the thread to complete the size of the loop j' , and as the thread which passes around the looper is held above by the tension of the thread, and also in the cloth, forming the previous stitch, this back movement draws the thread tight in the cloth, and is equivalent to pulling on the single thread which forms the stitch on the face of the cloth, because the thread on the other side yields to the down motion of the needle. In this condition the feed-motion operates, which advances the cloth the distance of one stitch, in the manner to be presently described. The needle again descends to take another stitch, and when it has completed its downward motion the looper makes its next movement, as before, toward and past

the needle, entering between the needle and the thread, preparatory to the formation of another loop, which is to be drawn through the previously-formed loop still on the body of the looper, which is effected in the following manner: A small lever, k' , is connected by a fulcrum-pin with the body of the looper. When the forward end of this lever is pushed down in the position represented in Fig. 15, the looper is entirely closed and has an eye instead of a recess, the end of the lever being made to fit in a suitable recess inside of the barb i' , to leave the lower edge smooth and even, so as not to catch on the thread; but when the end of the lever is thrown up to the top of the recess, then the barb is open and free to receive the thread to form a loop. When the looper is in its back position, the thread forming the loop lies in the hollow of the looper, and extends thence diagonally on each side to the cloth, and as the looper is drawn back the thread forming the loop is drawn between the inner face of the looper and a piece of cloth, l' , or its equivalent, attached to the side of a groove, so that when the looper is pushed forward to form another loop the previously-formed loop is held back by the friction of the cloth, so that the lever k' slides into the loop j' , and as the looper is drawn back with the thread forming a second loop in the forward part of the recess the forward end of the lever k' , which is then within the previous loop j' , is pushed down onto the barb to close the recess, that the previously-formed loop may be liberated and drawn off from the looper by its continued back motion and the tension on the thread as the needle continues its upward movement. From this it follows that as the previously-formed loop is liberated over the loop last formed the concatenation of the stitches is effected with the previous stitches. The opening and closing of the recess of the looper by the lever is effected by a wrist-pin, m' , on the back end of the lever, which on the back movement of the looper rides up the inclined face of a latch, n' , which elevates its rear end and forces down its forward end. Toward the end of the back motion of the looper the wrist-pin m' passes off the latch, to permit the looper to be opened by the tension of a spring, o' . The latch n' turns on a stud-pin, p' , so that it can rise to permit the wrist-pin of the lever k' to pass under it as the looper makes its movement toward the needle. The cloth or other substance to be sewed or stitched is placed on the table or platform, and there held on by a pad or foot, q' , whose under surface may be made with one or more teeth, but slightly projecting from its under surface, simply to have a hold on the cloth or other substance. This pad or foot is attached to the lower end of a lever, r' , jointed at s' to a bar, t' , adapted to slide on the standard of the frame b , with a helical spring, u' , interposed, the tension of which presses the pad or foot onto the cloth lying on the table. To the upper end of the bar t' is attached a spring-dog, v' , which, when the bar

is elevated, catches in a notch to hold up the pad or foot when desired to remove or put in the cloth, &c., to be sewed. An arm, w' , at the upper end of the bar t' passes to the back of the standard of the frame, and is acted upon by the periphery of a cam, x' , on the shaft k to lift the pad or foot from the cloth after the point of the needle has entered the cloth, so that it (the cloth) may yield to the crook of the needle during its downward motion, and to admit of changing the direction of the cloth to give the required direction to the seam while the needle is in the cloth, and before it begins to rise, so that the cloth can turn on the needle as its center, which greatly facilitates the making of a seam in any line or direction desired. While the pad is thus held up from the face of the cloth, it is pushed back the distance of a stitch by the tension of a spring, y' , acting against the upper end of the lever v' , to which the pad or foot is attached, the said lever being provided with a set-screw, z' , by which the range of feed can be regulated with the greatest accuracy. The cam x' then permits the foot or pad to be forced down onto the cloth by the tension of the spring w' , and there it remains until the needle is drawn out. The feed motion is given to make the foot or pad push the cloth the distance of one stitch by a pin, a' , on the periphery of the wheel j , which strikes the face of the arm b' of a curved lever, c' , that turns on a stud-pin, d' , the other arm acting against the lever v' , which carries the pad or foot. The needle with its crook can make its upward movement while the pad or foot is down on the cloth, because at that time the foot is at its greatest distance from the needle, and the flexibility of the cloth and of the needle will permit the requisite play for the passage of the crook. The groove in the table in which the looper works is covered with plates e' , to protect the mechanism below, and to give access to it when required.

Having thus pointed out the character or principle of my invention which distinguishes it from all other things before known, and the manner of making, constructing, and using the same, I wish it to be understood that I do not limit myself to the precise mode of construction so long as the same ends are attained by means substantially the same; nor do I wish to be understood as limiting myself to the use of all the parts of my invention in connection, as some parts may be used without the others—as, for instance, my improved seam may be formed by some other machine or by hand, and in the machine the crooked needle and the manner of guiding and holding it may be advantageously employed in connection with a shuttle or other means for carrying a second thread through loops formed by the needle-thread, or with some other method of concatenating the series of stitches formed with one thread. So with the apparatus for giving the slack and tension to the thread and for feeding the cloth, for it will be

obvious that either or both of these improvements may be advantageously employed in connection with other machines for stitching and sewing in which an eye-pointed needle is used; but I have described all these in connection, because, in my judgment, the best results will be attained when they are all employed in connection.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method, substantially as described, of forming a seam with one thread by carrying the thread through the cloth or other substance with the needle and forming the thread into a loop, and at the next passage of the needle forming another loop, which is drawn through the first or previously-formed loop, as described.

2. The employment of lateral pressure, whether by a cam, a lever, or their equivalent, to act against and in combination with the needle at or near the end of its perforating motion, substantially as described, and to insure the proper position of the needle, as described.

3. In combination with a needle for perforating the substance to be sewed or stitched and carrying the thread through it, a looping apparatus to form a loop at each perforation of the needle, and consecutively liberating the previously-formed loop over the one last formed to effect the concatenation of the stitches, substantially as described.

4. The looping apparatus with a recess into which the thread is drawn to form a loop or its equivalent, substantially as specified, in combination with the lever or its equivalent for alternately opening the recess to receive the thread to form the loop and closing it to shut in the last-formed loop, and discharging the previously-formed loop over the one last formed, as set forth.

5. Giving a positive motion to the spring-arm guide through which the thread passes from the tension apparatus to the needle by combining therewith the two bridles or their equivalents, and the needle-carrier or some equivalent moving part of the machine, substantially as specified, the carrier forcing up the said spring-arm guide to the limit governed by the fixed bridle, and the movable bridle forcing it down to make the slack, as described.

6. The method of feeding the cloth or other substance to the needle for the progress of the seam by means of the foot or pad which holds it to the table, substantially as specified, by means of which the cloth or other substance can be turned on the needle as its axis while the needle is in it, and the foot or pad is lifted up preparatory to the feed motion, as set forth.

ISAAC M. SINGER.

Witnesses:

WM. H. BISHOP,
ALEX. PORTER BROWN.