E. DRAKE.

SEWING MACHINE.

APPLICATION FILED JAN. 21, 1911.

1,042,537.

Patented Oct. 29, 1912.

4 SHEETS—SHEET 1.

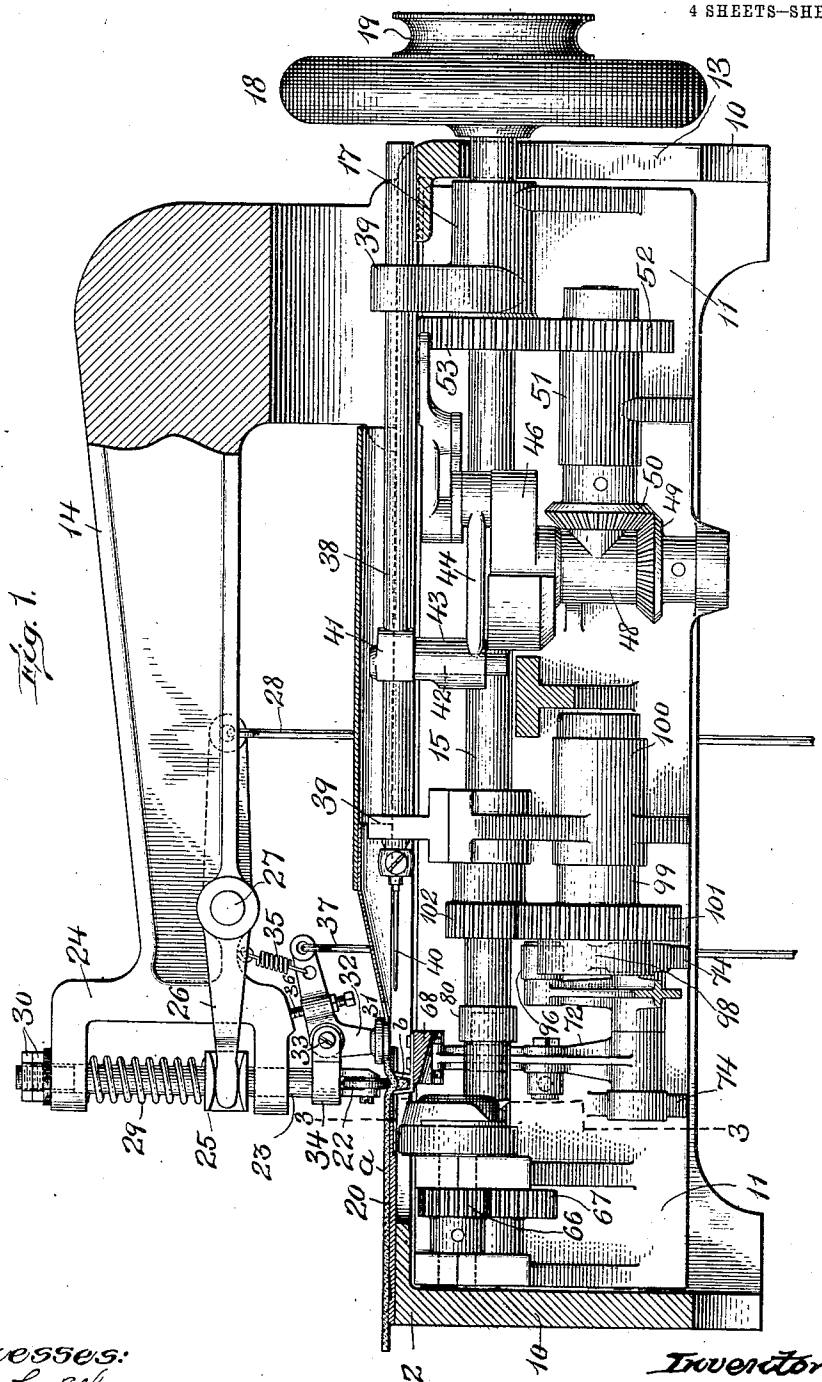

Fig. 1.

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4 SHEETS—SHEET 2.

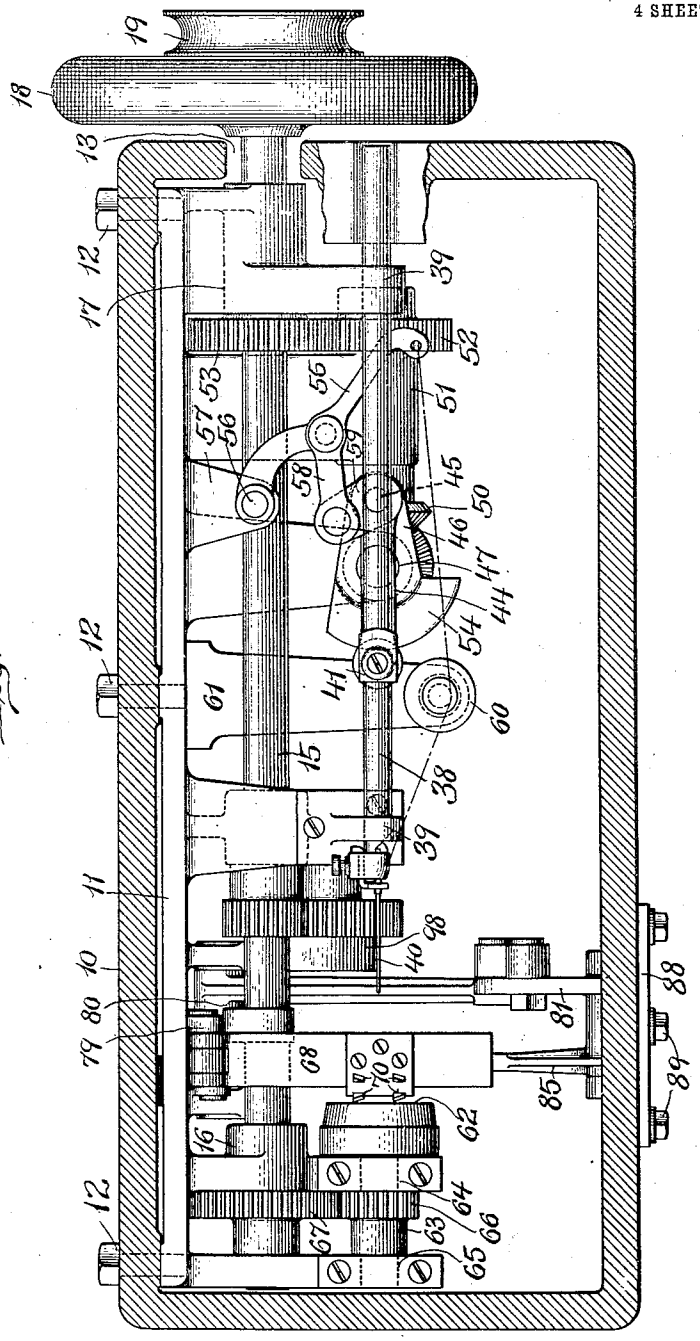

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 4.

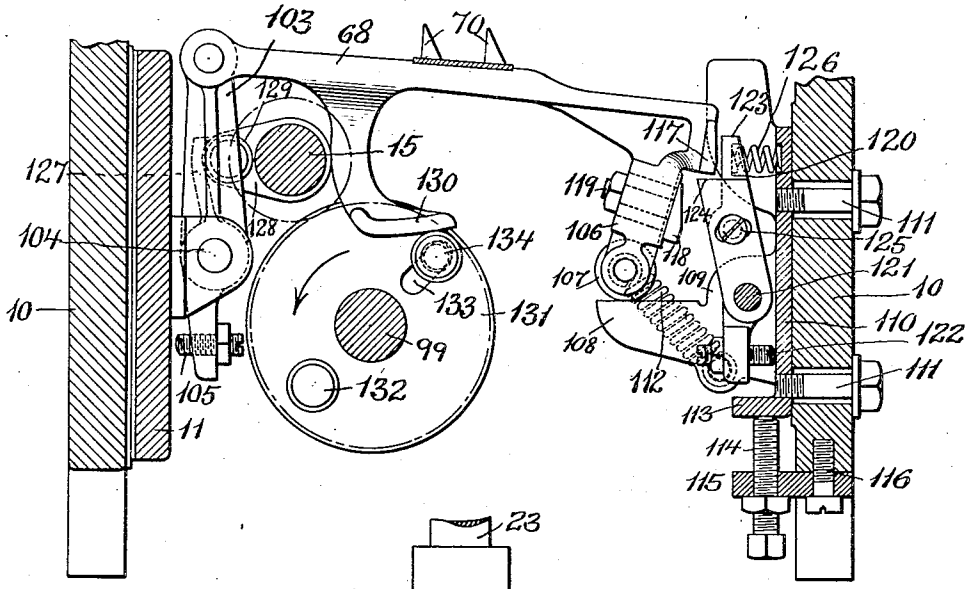
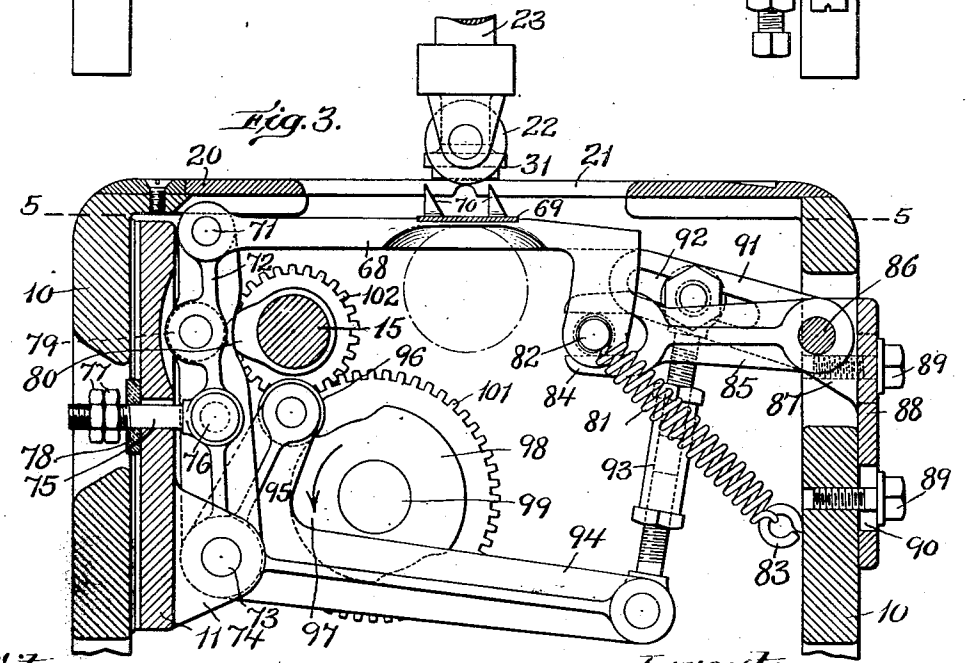


Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 8.

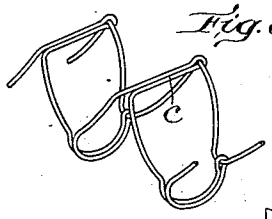


Fig. 7.

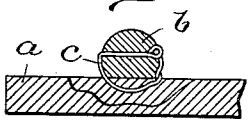


Fig. 6.

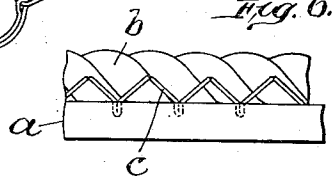
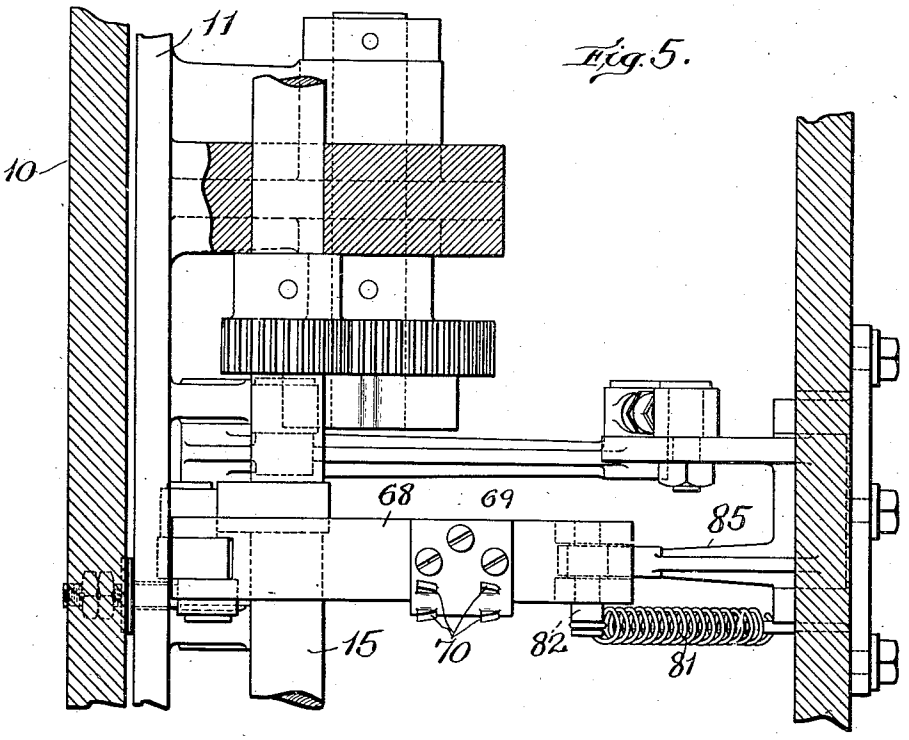


Fig. 5.



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UNITED STATES PATENT OFFICE.

ELLIS DRAKE, OF STOUGHTON, MASSACHUSETTS.

SEWING-MACHINE.

1,042,537. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed January 21, 1911. Serial No. 603,885.

To all whom it may concern:

Be it known that I, ELLIS DRAKE, of Stoughton, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention relates to machines for uniting layers of material, and has particular reference to machinery whereby a narrow layer may be united to a wider layer which is superimposed upon the narrow one.

In another application for patent for seam for sewed articles, filed October 20, 1910, Serial No. 588,070, I have described and claimed a seam for sewed articles comprising a relatively wide base layer, a relatively narrow layer, and stitches having portions which engage the base layer, other portions which engage the narrow layer, and intermediate connecting portions standing approximately perpendicular to the surfaces of the base layer.

The essential object of the present invention is to provide a machine which will produce the seam above described, and wherein the base or wider layer is temporarily and intermittently flexed or bent out of a flat plane to enable the seam thread to pass through the rib resulting from the flexure, the base or wider layer being then permitted to assume substantially its normal condition of lying in a flat plane so that the next operation of the needle will cause the seam thread to pass through the body of the narrow layer. In the application referred to, the seam is described as particularly adapted to secure a cord composed of twisted strands of fibrous material to the layer of material which is to comprise the inner sole of a welted shoe, said cord, when attached to the inner sole, forming a rib or wale on one side of the sole, adapted to receive the inseam stitches which unite the welt and upper of the shoe to the inner sole.

Of the accompanying drawings which form a part of this specification,—Figure 1 is a front elevation, partly in section, of a sewing machine embodying my present invention, the line of section of said figure passing behind the tension pulley shown in Fig. 2. Fig. 2 represents a horizontal section through the machine on substantially the line 2—2 of Fig. 1. Fig. 3 represents a section on line 3—3 of Fig. 1 but on a larger scale. Fig. 4 is a view similar to Fig. 3 but showing some modifications of details hereinafter described. Fig. 5 represents a section on line 5—5 of Fig. 3. Fig. 6 is a side elevation of a piece of work, enlarged, after the sewing has been formed by the machine. Fig. 7 represents a transverse section through Fig. 6. Fig. 8 is a detail perspective of the uniting threads showing the positions which the different strands or stretches occupy in the completed article of work produced by the machine.

Similar reference characters indicate the same or similar parts in all of the views.

The frame of the machine may comprise a casting 10 of substantially rectangular form, a suitable base or supporting plate for the lower parts of the mechanism being indicated at 11, said base being connected to a vertical side wall of the frame casting by means of suitable bolts or screws 12. The frame casting is formed with a slot 13 through which the main shaft of the mechanism passes, said slot extending to the lower edge of the casting so that, when the plate 11 is released, and the needle bar shifted to proper position, the principal elements of the sewing mechanism may be removed from the frame casting, the parts of said mechanism remaining in proper relative positions. Rising above the frame casting is an arm 14 over-hanging the sewing mechanism in somewhat the usual manner of a sewing machine.

The main shaft 15 is mounted in bearings 16, 17, supported by the plate 11, and the outer end of the main shaft is provided with a hand or fly wheel 18 and drive pulley 19.

As best shown in Figs. 1 and 3, a suitable detachable work plate 20 is provided, said plate having a longitudinal slot 21 to receive the flexed portion of the material of the wide layer of the work that is being operated upon, under the influence of a presser foot 22 which is preferably a roller carried by the lower end of a presser bar 23 mounted to reciprocate in bearings provided by a yoke 24 of the arm 14. Secured to or integral with the presser bar 23 is a block 25 transversely slotted or recessed to receive the front end of a lifter lever 26 which is pivoted at 27 to the arm 14 and is provided with a suitable connection 28 leading to a treadle (not shown) in order that by the operation of said lever 26, the bar 23 and presser foot may be raised from the work, against the pressure of a spring 29

coiled about the bar 23 and abutting at its ends against the block 25 and the under side of the upper member of the yoke 24. The upper end of the bar 23 is threaded and provided with nuts 30 by means of which the lower limit of movement for the presser foot may be adjustably determined.

The wide layer of work is indicated at *a*, the narrow layer or cord being indicated at *b*, these two being united by threads comprising a lock-stitch *c*. In order to guide the layer *a* to determine the distance from the edge thereof at which the layer *b* is to be connected, I provide an edge guide 31 which preferably consists of a roller or wheel rotatively mounted on a vertical axis, the said roller having the lower portion of its periphery of less diameter than the adjacent portion above it, so as to form a shoulder which will ride along the upper edge or corner of the layer *a* and prevent the extreme outer edge of the layer *a* from being thrown upwardly by the pressure of the foot roller 22 when the latter is lowered and the work is progressing. This edge guide or wheel 31 is preferably adjustable relatively to the presser foot and the feed dogs in order to vary the distance of the sewing operation from the extreme edge of layer *a*, said adjustment being effected by providing an elbow lever 32, to the lower end of which the gage roll 31 is rotatively connected. The lever 32 is pivoted at 33 to a collar 34, or other suitable projection or member carried by the presser bar 23. A spring 35, connected to the longer arm of lever 32 and to a suitable fixed point, holds the gage roll 31 yieldingly in the position shown in Fig. 1. The limit of adjustment or movement of the roll 31 away from roll 22 is adjustably determined by means of a screw 36 carried by the longer arm of lever 32 and having its upper end adapted to contact with a surface portion of the over-hanging arm of the machine, said screw therefore serving the purpose of an adjustable stop to determine the normal position of roll 31 relatively to roll 22. By means of a suitable link connection 37 with a treadle (not shown) the operator can at any time carry the gage roll 31 toward the roll 22 so that the distance of the seam that is being made, from the edge of the layer *a*, can be reduced.

The needle bar 38 reciprocates horizontally in bearings 39 projecting from or attached to the plate 11. One of said bearings is shown in Fig. 2 as an extension of the bearing 17, the other bearing 39 being shown as an extension of a bearing casting for other mechanism hereinafter described. Said needle bar is provided with a suitable needle 40, and at an intermediate point of its length is provided with a block 41 from which a pin 42 (see Fig. 1) projects through a sleeve or hub 43 carried at one end of a link 44 which is pivotally connected at 45 to an arm 46 of a vertical stud shaft 47 (see Fig. 2) mounted in bearings 48. Said shaft 47 is provided with a bevel pinion 49 which meshes with and is driven by a bevel pinion 50 carried by a horizontal stud shaft mounted in bearing 51 and having a gear 52 meshing with a gear 53 on main shaft 15. The upper end of the shaft 47 is shown as carrying a suitable counterbalance 54 for the arm 46 and parts carried thereby.

A takeup lever 55 is pivoted at 56 to a lug or bracket 57 of plate 11, said takeup lever being connected by a link 58 with an arm 59 mounted above and secured to the rotating arm 46, so that as the shaft 47 rotates to reciprocate the needle bar, the takeup lever is swung in substantially the usual manner for such devices.

A suitable tension device 60 is shown as carried by a supporting arm 61, said tension device being located, as usual, between the takeup and needle.

The shuttle 62 is actuated by a stud shaft 63 mounted in a bearing 64 formed as an extension of bearing 16 and in another bearing 65 as shown in Figs. 1 and 2. Between these two bearings the stud 63 is provided with a pinion 66 which is in mesh with, so as to be driven by, a gear 67 on main shaft 15. Preferably the gear 67 has twice as many teeth as pinion 66 so as to rotate the shuttle twice for each reciprocation of the needle bar in order that the shuttle may have time to clear the loop of thread.

The feed mechanism, in the embodiment illustrated in Figs. 1, 2, 3 and 5, comprises a bar 68 having a plate 69 secured thereto as by suitable screws. The plate 69 is formed or provided with spurs 70 which project upwardly in laterally spaced positions relatively to each other so as to form a space between them for the narrow layer or cord *b*, the points of said spurs projecting upwardly far enough to engage the under surface of the layer *a*. The bar 68 is pivoted at 71 to the upper end of an upright lever or swinging support 72 which is pivotally mounted upon a pin 73 mounted in bearings or lugs 74 projecting from plate 11. At a suitable distance above the pivot 73, a pin 75 is pivoted at 76 to the lever or swinging support 72, the said pin 75 projecting through a slot in plate 11 and into or through a slot in the frame casting 10, the outer end of said pin 75 being threaded and provided with nuts 77. Between the nuts 77 and the plate 11 a buffer washer 78 of leather or other suitable material is mounted on the pin. The amount of swinging movement of the support 72 toward the right from the position shown in Fig. 3 is determined by the position of the nuts 77 which contact with the buffer washer 78 to limit such movement toward the right, which, in operation, is the

direction of movement during the return of the feed dog or spurs.

The swinging support 72 is provided with a roll 79 which is engaged by a cam 80 secured on main shaft 15, said cam serving to always swing the support 72 to a definite position which is that indicated in Fig. 3. By means of a spring 81 connected at one end to a pin 82 carried by a depending portion of the bar 68 and connected to a fixed point, as a hook 83, the roll 79 is kept in contact with the cam 80 so far as the stop nuts 77 permit, said spring imparting the return movement to the feed dog bar 68, while the cam 80 causes the positive advance movement of said bar. The nuts 77 provide for the adjustment of the length of feed because the cam 80 only advances the bar 68 just so much as said bar had been previously permitted by the nuts to be retracted or withdrawn by the spring 81. The pin 82, as best shown by comparing Figs. 3 and 5, extends through a yoke 84 having upper and lower substantially horizontal parallel faces to guide the pin 82 in its reciprocating movements. Said yoke is carried at the outer end of an arm 85 projecting from a rock shaft 86 that is mounted in bearings 87 carried by a plate 88, the latter being secured to the outer face of one of the walls of the frame casting by screws 89, said plate being shown as formed with slots 90 through which said screws pass, so that said plate can be vertically adjusted, to adjust the plane of reciprocations of the feed dogs or spurs.

With the structure so far described, the work would always occupy the same position or plane. But since there are two pieces of work to be united, it is essential either that the work be shifted relatively to the plane of movement of the needle, or that the needle shall reciprocate first in one plane and then in another. To shift the plane of movement of the needle and needle bar would require more complicated mechanism, and cause more friction of parts, than the following described mechanism which simply periodically lifts the work so that the layer *a* will assume a substantially uniform plane, without any depressed or flexed portion, whereby after the needle has first penetrated the flexed portion of the layer *a*, the next penetration will take place through the narrow layer or cord *b*. This mechanism, in the embodiment illustrated in Figs. 1, 2, 3 and 5 of the drawings, includes means for alternately raising and lowering the arm 85 which carries the guide yoke 84 for the feed bar 68. The rock shaft 86 has a second arm 91 that is slotted as at 92, said arm being connected by an adjustable link 93 with the long arm 94 of an elbow lever pivoted on the pin 73 and having a short arm 95 provided with a roll 96 which is acted upon by the cams 97, 98 carried by a stud shaft 99 supported in a bearing 100 (see Figs. 1 and 3). Said stud shaft has a gear 101 in mesh with and driven by a pinion 102 on main shaft 15, the teeth of said gear and pinion being such in number, relatively, as to rotate the shaft 99 once for each two rotations of shaft 15. The cam 98 is higher than the cam 97 but each has an extended peripheral surface that is concentric with shaft 99 so that the cam 98 will actuate the elbow lever 94 95 to a greater extent than the cam 97. The rotation of the cams is in the direction of the arrow indicated in Fig. 3, in which figure it will be seen that the roll 96 is just about to drop into the recess between the two cams, under the influence of spring 81. As the elbow lever oscillates, the rock shaft 86 is actuated, through the link 93 and arm 91, so as to raise or lower the guide yoke 84 for the pin 82 and consequently vary the elevation of the plane in which the feed bar 68 operates. Since the roll 96, when in the position shown in Fig. 3, is still bearing upon a portion of cam 97, the feed bar 68 is in the lower one of the two planes in which it is actuated, and this is the plane indicated in Fig. 1, the narrow layer or cord *b* being lowered, and a portion of the wider layer *a* being flexed or in other words pressed downwardly, under the influence of spring 29 actuating the presser bar and foot roller. When in this position, it is to be assumed that the needle has already penetrated the flexed portion of the layer *a* at a point that does not extend through the upper side of said layer, so that the thread passes through a portion of the layer *a* as indicated in Fig. 7, in which figure however the work is reversed from the position shown in Fig. 1. As the shaft 99 continues to rotate, the roll 96 passes into the depression between the two cams (see Fig. 3) and the feed bar 68 is lowered. At the same time the cam 80 on shaft 15 passes from the roll 79 so that the spring 81 is permitted to actuate the feed bar toward the right in Fig. 3. Then the cam 98 passes under the roll 96 and results in forcibly raising the feed bar 68 to a higher plane than that represented in Fig. 3, the plate 69 so pressing upwardly on the work as to restore the flexed portion of the layer *a* to substantially its normal plane, so that the next penetration of the needle is through the narrow layer *b*, the needle passing between the front and rear pairs of spurs 70. Upon retreat of the needle, the feed bar is advanced by the cam 80, and then the feed bar 68 is lowered by reason of the cam 98 passing away from under the roll 96, the cam 80 permitting the feed bar to be returned. Then the cam 97 again passes under the roll 96 and causes the feed bar to be lifted to the plane shown by Fig. 3. The timing of the parts is such

that the needle penetrates the work of course while stationary, one penetration occuring when the portion *a* of the work is flexed, and the other penetration occurring when the portion *a* of the work is not subjected to flexure so that said penetration can occur in the portion *b* of the work, the utilization of the invention illustrated being in connection with work which includes two pieces or members, viz., the wide layer *a* and a narrow layer *b*. Practically the presser foot roll 22 and the plate 69 of the feed bar constitute a work clamp which moves transverse of the path of the needle so as to cause a zig-zag stitch to be made without laterally shifting the position of the needle, and with the needle moving in a plane parallel with the plane of the wide layer *a*. The stitch formed is illustrated in Figs. 6, 7, and 8 and does not need further description herein. For a further description however, reference might be had to my application hereinbefore referred to.

Referring to the modification illustrated in Fig 4, the feed bar 68 is supported at one end upon a moving support similar to the lever 72 hereinbefore described, but in said Fig. 4 the support 103 is pivoted at 104 and extends below said pivot and carries an adjustable stop 105 adapted to contact with the plate 11 to adjustably limit the distance to which the upper end of said support 103 can be shifted to the right. The bar 68 at its other end is provided or formed with a downwardly extending arm 106 having a roll 107 adapted to ride upon a horizontal shoulder or rail 108 carried by a bracket 109 projecting from a plate 110 which is secured to the frame casting 10 by screws 111, said screws passing through slots in said frame casting to permit the plate 110 to be vertically adjusted. The feed bar 68 is held downwardly and toward the right by a spring 112. The lower end of the plate 110 is provided with a foot 113 which is engaged by a screw 114 tapped through a bracket 115 which is secured to frame casting 10 by a screw 116. By loosening the screws 111, the height of the plate 110 may be finely adjusted by means of the screw 114, and the adjustment then made secure by tightening up the screws 111. The arm 106 is provided with two shoulders which for convenience are hereinafter referred to as teeth 117, 118. Preferably the lower one is made vertically adjustable as by means of a screw 119 passing through a vertical slot in the arm 106 as indicated by dotted lines in Fig. 4. A lever or latch 120 is pivoted at 121 to the bracket 109, the lower end of said lever having an adjustable stop screw 122 which bears against the plate 110 to adjustably limit the outermost position of the upper end of the lever 120. The tip 123 of said lever coacts with tooth 117, as presently described, while a shoulder 124 presented by the upper end of a plate or member adjustably connected with lever 120 by a screw 125, coacts with the tooth 118 as presently described. Said lever is held normally in the position shown in Fig. 4 by a single spring 126. The lever 103 is formed or provided with a rib 127 indicated by dotted lines in Fig. 4, and the shaft 15 has an arm 128 provided with a roll 129 which, as the shaft 15 rotates, acts upon the rib 127 to swing the support 103 in opposition to spring 112. At a point intermediate its ends, the bar 68 is formed or provided with a foot or depending arm having a rib 130, while the shaft 99 is provided with a disk 131 carrying two pins each preferably having a roll upon it. The pin 132 may be, as illustrated, a fixed one, the disk 131 being formed with a slot 133 diametrically opposite the pin 132. The pin 134 having a roll is adjustable along said slot so as to vary its distance from the axis of shaft 99.

The operation of the structure shown in Fig. 4 is similar to that in Fig. 3, but with the following described differences. The longitudinal or feed movement of the bar 68 is effected by the roll 129 acting on the rib 127 of the movable support 103, in opposition to spring 112. With the pin 134 fixed, as illustrated, at a greater distance from the axis of shaft 99 than pin 132, the said pin 134 will act upon the foot rib 130 to raise the feed bar to a higher plane than that effected by pin 132. Since this structure however would not hold the feed bar 68 elevated long enough to secure the best results in sewing, the devices shown at the right in Fig. 4 are employed. With the parts in the position shown in Fig 4, and the disk 131 rotating in the direction of the arrow, the pin 134 will elevate the feed bar until the tooth 118 passes above the shoulder 124, the spring 126 permitting the lever 120 to yield to enable said tooth to pass the tip of said shoulder. Then the bar 68 will be held in the higher plane long enough to permit the needle to pass through the narrow layer *b* of the work. As soon as the advance feed movement occurs, by the action of the roll 129 against rib 127, the tooth 118 is drawn off from the shoulder 124 and the spring 112 pulls the feed bar downwardly until the roll 107 contacts with guide rail 108. The return movement of the feed bar occurs while the parts are in the position shown in Fig. 4, the lever 120 yielding to permit this to be done. When the pin 132 arrives under foot rib 130 and raises the feed bar, the tooth 117 slips over the tip or upper end 123 of the lever 120 and is held there, but with the feed bar in a lower plane than before, so that the penetration of the needle will occur thro gh a downwardly flexed portion of the layer *a* of the work. It will be understood of course that while I have referred to the

members 132, 134 as pins, they are, in effect, cams.

It will now be understood that, with either the structure shown in Fig. 3 or that shown in Fig 4, in connection with the mechanism shown in the other figures of the drawings, I have provided a sewing machine which includes with the needle and coöperating stitch-forming mechanism, a work clamp which is formed to engage and hold relatively wide and narrow layers of work material, and means for intermittently raising and lowering the position of the clamp so as to cause the needle to alternately penetrate the wide and narrow layers so as to produce the article illustrated in Figs. 6 and 7, and further illustrated and described in my application hereinabove referred to.

As best shown by comparing Figs. 1 and 3 it will be seen that the work is clamped between upper and lower members which not only change the positions of the work relatively to the needle, intermittently, but also serve to feed the work. The upper member of this combined work clamp and feed comprises the roll 22 and its carrying rod and the spring 29, the lower member comprising the plate 69 with its spurs, carried by the bar 68. Since the bar 68 is given an up and down motion as well as one in the direction of its length, the spring 29 permitting the upper member of the clamp to yield so that it will respond to the vertical movements of the bar 68, these members constitute a combined work clamp and feed device, while the spurs 70 at the same time form what might be termed a guide for the cord *b*, in that they prevent lateral displacement of said cord by the stitch-forming mechanism.

I claim:—

1. A sewing machine comprising stitch-forming mechanism including a needle, a work clamp formed to engage and hold relatively wide and narrow layers of work material, said clamp including a movable member and having means for holding the narrow layer against lateral displacement by the stitch forming mechanism, and means for alternately imparting to said movable clamp member a feeding movement first in one plane and then in another plane to cause the needle to alternately penetrate the wide and narrow layers.

2. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a bar below said slot, means for holding said bar periodically in either one of a plurality of planes, feed dogs carried by said bar, and means for imparting a feeding movement to said bar while in each of said planes.

3. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a feed bar below said slot, and means for alternately imparting to said bar a feeding movement first in one plane and then in another plane.

4. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a feed bar below said slot, a movable support to which said feed bar is pivotally connected at one end, two cams of different height, connections whereby said cams raise the feed bar to different planes controlled by said cams, and means for imparting a feeding movement to said bar while in each of said planes.

5. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a feed bar below said slot, a swinging support to which said feed bar is pivotally connected at one end, means for swinging said support to impart feed movement to said bar, and cam-controlled mechanism independent of the swinging means for varying the elevation of the plane of reciprocation of said bar, the operations of the said swinging means and cam-controlled mechanism alternating to impart to said bar a feeding movement first in one plane and then in another plane.

6. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a feed bar below said slot, said bar having spurs with a space between them, said space extending in the direction of the line of the feed to admit a narrow piece of work, and means for reciprocating said bar and changing its elevation.

7. A sewing machine comprising stitch-forming mechanism including a needle mounted to reciprocate in a horizontal path, a work plate having a slot, means for flexing a portion of the work through said slot, a bar below said slot, said bar having spaced spurs to engage an upper layer of fabric and receive between them a lower layer of fabric, the spaces between the spurs being open and continuous in the direction of the line of feed, means for reciprocating said bar, and means for varying the plane of the bar to alternate the plane of the work.

8. A sewing machine comprising stitch-forming mechanism including a needle, a

work clamp formed to engage and hold relatively wide and narrow layers of work material, said clamp including a movable member and having means for holding the narrow layer against lateral displacement by the stitch forming mechanism, means for alternately imparting to said movable clamp member a feeding movement first in one plane and then in another plane, and means for varying the distance of the narrow layer from the edge of the wide layer.

In testimony whereof I have affixed my signature, in presence of two witnesses.

ELLIS DRAKE.

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P. W. PEZZETTI.