No. 657,400. Patented Sept. 4, 1900.

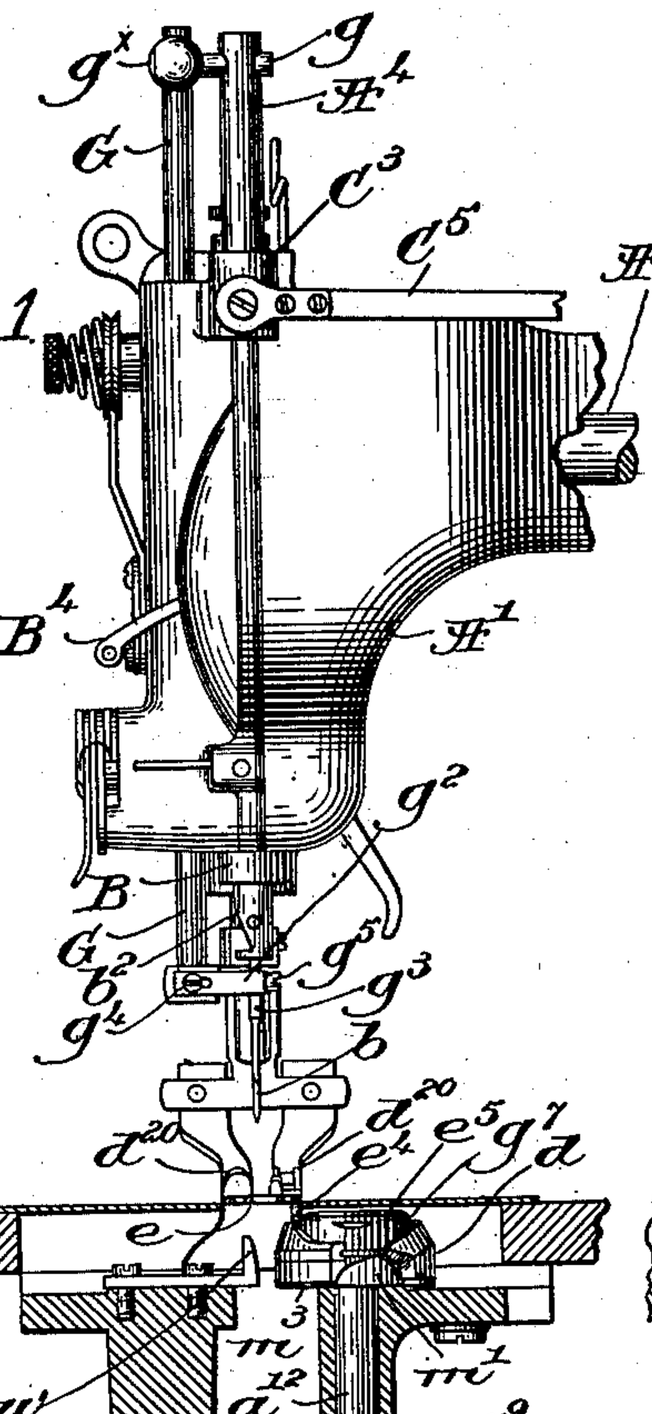
G. H. DIMOND & W. F. DIAL.

HEMSTITCHING SEWING MACHINE.

(Application filed Mar. 29, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig 1.



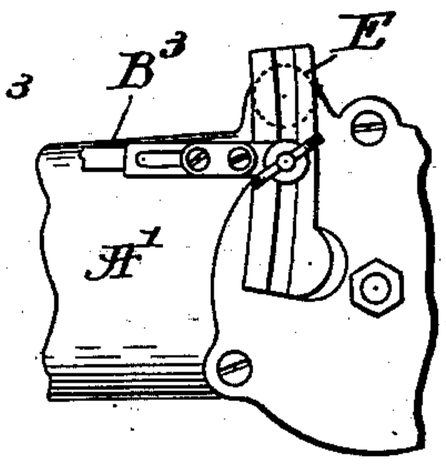


Fig: 3.

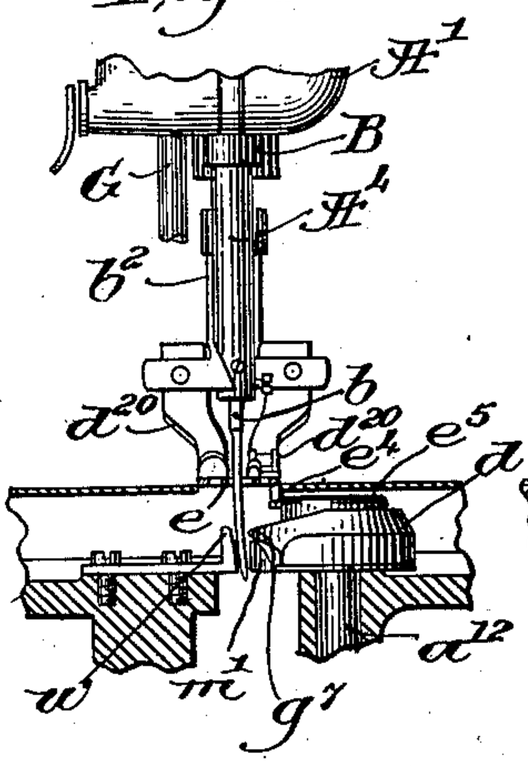


Fig: 2.

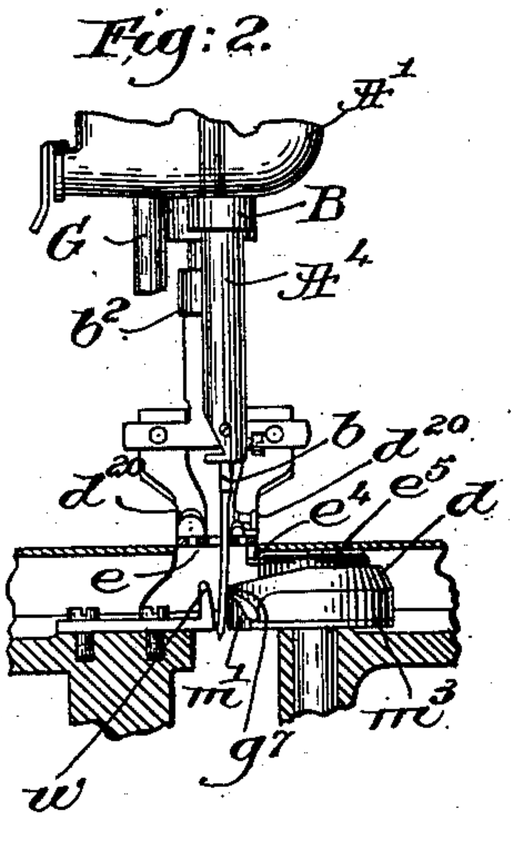


Fig: 4.

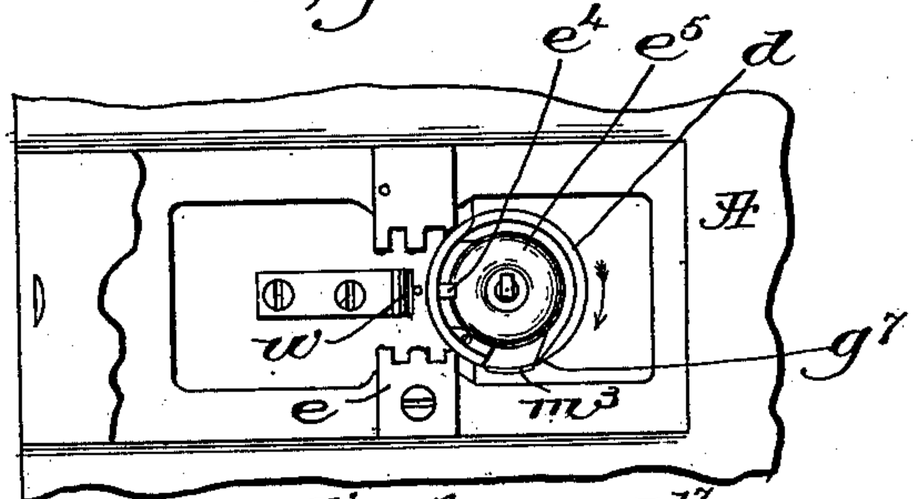
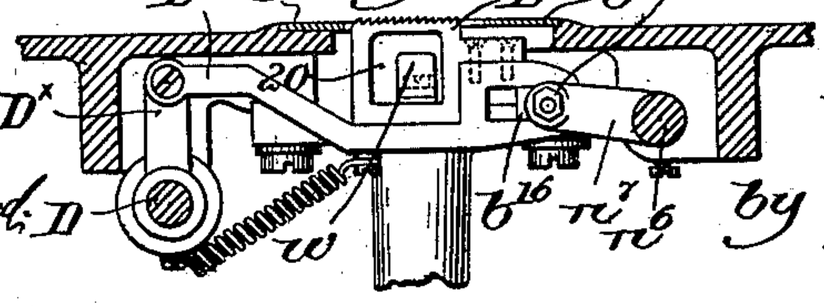


Fig: 5.



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No. 657,400. Patented Sept. 4, 1900.

G. H. DIMOND & W. F. DIAL.

HEMSTITCHING SEWING MACHINE.

(Application filed Mar. 29, 1898.)

(No Model.) 2 Sheets—Sheet 2.

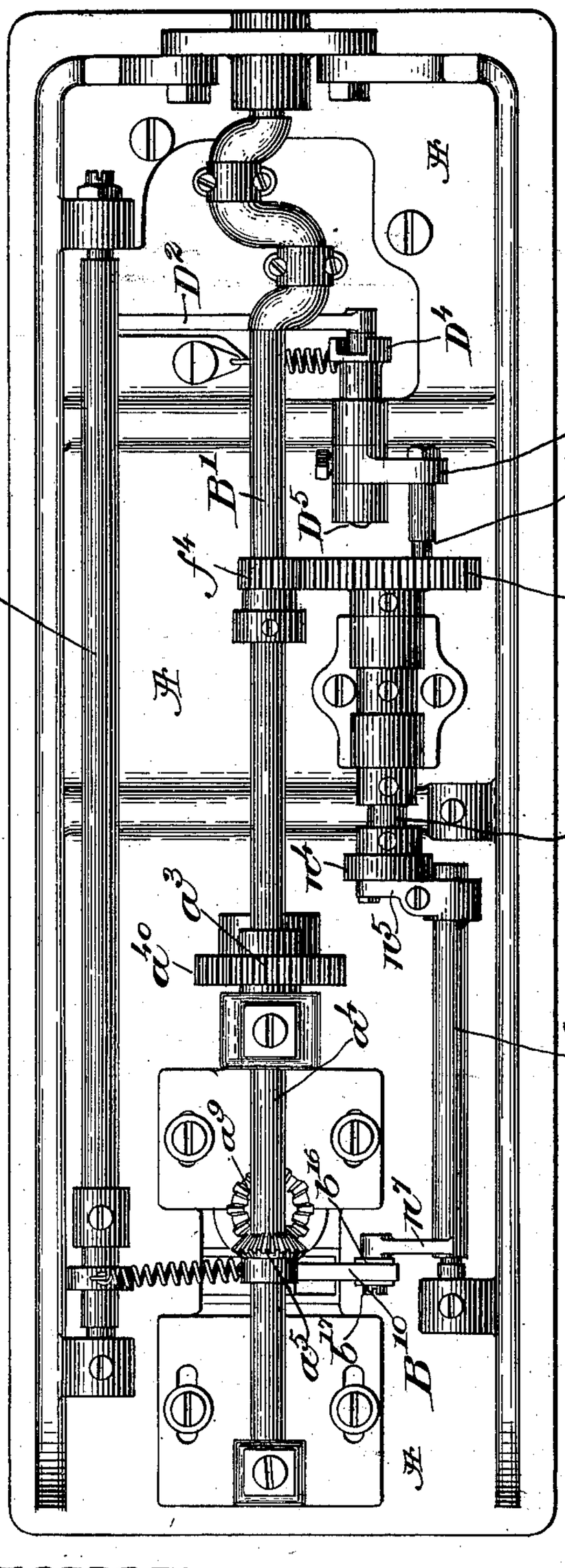

Fig. 6.

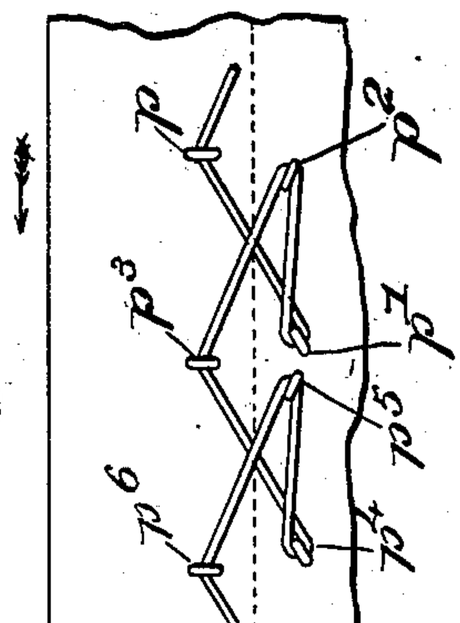

Fig. 9.

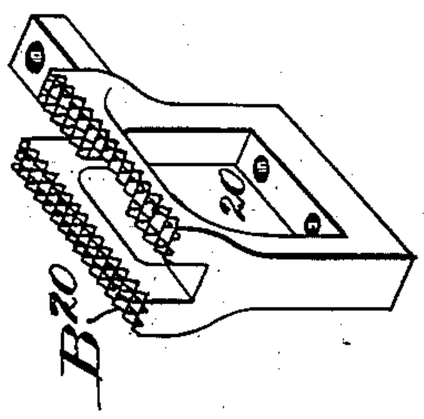

Fig. 8.

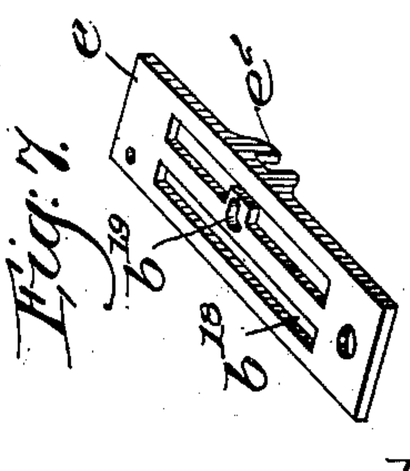

Fig. 7.

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UNITED STATES PATENT OFFICE.

GEORGE H. DIMOND AND WILBUR F. DIAL, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS TO THE WHEELER & WILSON MANUFACTURING COMPANY, OF SAME PLACE.

HEMSTITCHING SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 657,400, dated September 4, 1900.

Application filed March 29, 1898. Serial No. 675,533. (No model.)

To all whom it may concern:

Be it known that we, GEORGE H. DIMOND and WILBUR F. DIAL, of Bridgeport, county of Fairfield, State of Connecticut, have invented an Improvement in Sewing-Machines for Hem and Zigzag Stitching, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Hemstitching for handkerchiefs, pillows, sheets, and other work has been done by drawing out from the cloth some of the warp and weft to thus leave open spaces and the inturned edge of the hem has been laid at the edge of these spaces and stitched in place and the loose threads crossing these spaces have been tied together to thus open the spaces constituting the hemstitch. This class of hemstitch-work when done by hand is quite expensive, and hence sewing-machines have been devised for doing it automatically. These machines use an eye-pointed needle to carry an upper thread, and coöperating with said needle is an under thread, the latter carried by a looping mechanism. The eye-pointed needle has been carried by a needle-bar having not only a vertical movement but also a lateral movement, this movement being imparted to it by moving a gate in which the needle-bar reciprocates. In this class of machines the needle at each successive down thrust passes through the material in which the hemstitch is being made in different parallel planes in the direction of the length of the feed, the distance between these points at which the material is penetrated depending upon the width of the hemstitch, the width being from one to the other edge of the hemstitch-seam.

The looping mechanisms heretofore used have been of various different characters, and in their operation they have rotated, oscillated, and reciprocated, and usually the point of the looping mechanism has moved transversely with relation to and so as to cross the line of feed or the direction in which the goods are moved by the usual feeding device.

The hemstitch is composed of a repeated sequence of stitches to make a figure, the figures being composed of three, or it may be, more stitches, and these figures are repeated in sequence. As our invention is herein illustrated the line of hemstitches is represented as composed of repeated three-stitch figures; but this may be varied, if desired, and any other usual equivalent figure of three or more stitches might be made and yet be within the scope of our invention.

In this invention we have chosen for illustrating a preferred form of looping or underthread mechanism a circularly-movable hook of the Wheeler & Wilson type, it having a point which when it enters the loop of needle-thread is moving in the direction of the feed and the line of stitching instead of transversely with relation to said feed and line of stitching. The needle mechanism is of the variety commonly used in this class of machines—*i. e.*, the needle-bar has a vertically-reciprocating and a lateral movement, and the lateral movement is controlled by a cam. It will be understood that with this class of needle mechanism, the needle descending in different planes, as stated, more or less distant, according to the width of the hemstitch, the point of the looping mechanism, it at the time of taking the loop of needle-thread moving in the direction of the feed, could not enter the loops of needle thread in the various positions occupied by the needle in making a figure of three or more stitches. The looping mechanism herein shown is represented as located at one side of the feed-bar, and the feed-bar is a straight one and it moves in a right line or transverse the length of the machine-bed, the direction of movement being the direction of the feed. With the looping mechanism and the vibrating and reciprocating needle-bar and needle we have combined a deflector or deflectors of such construction and arrangement that whenever the needle in its descents in these two different lines to define the width of the hemstitch is not in the proper position with relation to the movement of the point of the looping mechanism said deflector or deflectors will act on the needle at a point below

the usual feed or throat plate or work-support and will force said needle in the proper direction to place the loop of needle-thread extended from its eye in the path of movement of said point. We may for this purpose use one or two deflectors, and both or either may perform the work required or for which they were designed, according to the requirements of the machine and the conditions of the hemstitch-seam. If two deflectors are used, the point of the looping mechanism may be located to move in and meet the needle-loop in a line coincident substantially with the center line of the hemstitch-figure, and in such case it will be obvious that when the needle descends at one and then at the other side of said center line and when it meets the material it will be out of line with relation to the movement of the point of the looping mechanism, and consequently the needle when below the material and work-support must be sprung aside, the two deflectors when used operating first one and then the other to deflect the needle first in one and then in an opposite direction, but in each instance leaving the deflected needle at the same side of the path of movement of the point of the looping mechanism, so that the point of said mechanism may enter the loop of needle-thread and leave the under thread therein. In some instances the parts may be so timed and arranged that the point of the looping mechanism will move in a plane corresponding with a vertical line drawn through the material at one side of the hemstitch figure, and in such case when the needle descends in the line of the other side of said stitch it will be out of the range of the moving point of the looping mechanism, and in such case but one deflector is necessary, the deflector being arranged to operate against one or against the other side of the needle, according to the direction that the needle must be sprung in order that it at that descent out of the line of movement of the point may be put into correct position with relation to said point to have the loop of needle-thread correctly entered in order that a second thread may be laid in it. By the employment of the peculiar looping mechanism herein shown it will be readily apparent that it is impossible for either thread to be soiled by oil, for the reason that no oil is requisite in order that the looping mechanism may run smoothly and without objectionable friction. In the class of machines upon which our invention is an improvement, it will be obvious that when the under-thread-carrying mechanism moves in a plane transverse to the direction of movement of the feeding device the said looping mechanism must be located back of the needle, viewing it from the operative's position, and with the looping mechanism so located the space in which the feed may operate is limited, whereas in our invention, as herein illustrated, wherein the looping mechanism is located substantially at one side of the center line of the hemstitch-seam, there is left a clear open space at the opposite side of the center line of said hemstitch-seam in which may move and operate a feed-bar having feed-points that may engage the material all about the point where it is entered by the needle, both pushing and pulling the material and avoiding puckers, and at the same time the feeding device may have given to it the necessary strength to enable it to be run at a high speed.

We have chosen to illustrate our invention with that class of a Wheeler & Wilson looping mechanism wherein the point coöperating with the needle-thread makes two rotations at each complete reciprocation of the needle, and hence it is possible to run the machine at a higher speed than where the looping mechanism is of a variety wherein there was a to-and-fro motion or a variable speed, as heretofore common in this class of sewing-machines.

Figure 1 is a partial side elevation in section of a sewing-machine with our improvements added to illustrate one form of our invention, the overhanging arm being partially broken out to save space upon the drawings. Figs. 2 and 3 show different views illustrating the needle as having penetrated the material at one and then at the other side of the hemstitch, the deflectors being represented as in action and as having deflected the needle laterally. Fig. 4 is a top or plan view of a portion of the work-support with the usual slide-covers removed or broken off and with the throat-plate broken out centrally to thereby show the deflectors. Fig. 5 is a transverse section of the machine, the section being in the line of the feed looking toward the left-hand end of the machine, viewing the same from the position occupied by the looping mechanism. Fig. 6 is an under side view of a machine and the parts there located. Fig. 7 is a detail showing the throat-plate removed from the machine. Fig. 8 is an enlarged detail of the feed-point device removed from the feed-bar. Fig. 9 shows a hemstitch figure, the dotted lines indicating the center line of the hemstitch, the stitches being made equidistant therefrom.

Referring to the drawings, the bed-plate or work-support A, the overhanging arm A′, (partially shown,) it containing a needle-bar-actuating shaft A^3, the pivoted needle-bar gate C^3, the needle-bar A^4 in said gate and deriving its reciprocating movement from said shaft, the eye-pointed needle *b*, carried by said needle-bar, the link C^5, connected with said needle-bar gate and actuated by a pivoted vibrating arm E, controlled and moved by a gate-cam, (not shown,) said cam causing said gate to be vibrated laterally about usual pivots, the take-up B^4, the presser-bar b^2, having a double presser-foot d^{20}, the under shaft

B′, having two cranks which receive two links actuated by said shaft A^3, the pinion f^4 on the shaft B′, it engaging a toothed wheel n', fast on a shaft n^2, having at its front end a feed-lifting cam n^4 to act on an arm n^5 of a rock-shaft n^6, having an arm n^7 to act on and lift the feed-bar to be described, the rock-shaft D, having an upwardly-extended arm $D^\times$, jointed to one end of the feed-bar to reciprocate it to and fro, the link D^2, connected to an upright arm at the other end of said rock-shaft, said link carrying a loose block or follower which enters a groove in a feed-controller D^4, fast on one end of a shaft D^5, said shaft having an arm f, provided with a finger or stud f', entering a groove cut in the face of said toothed wheel n', are and may be all substantially as represented in patent to Dimond, No. 605,700, and also United States Patent No. 520,977. In practice the needle-bar gate will be vibrated as provided for in Patent No. 605,700. The Patent No. 605,700, as well as the patent referred to, shows the looping mechanism arranged to move transversely to the feed.

In the embodiment of our invention herein represented the shaft B′ has at one end a pinion a^{40}, which engages a pinion a^3, one-half its size, on a shaft a^4, said shaft having a bevel-gear a^5, which engages a bevel-gear a^9, fast on the driving-shaft a^{12}, which actuates the looping mechanism, said looping mechanism being herein represented as a hook d, having a point g^7, said point when entering the loop of needle-thread moving in the direction of the length of the seam and in the direction of the feeding movement of the material, the relative sizes of the gearing referred to being such as to impart two rotations to the looping mechanism during each complete stroke of the needle-bar. This looping mechanism has attached to and made movable with it a plate m^3, provided with an upturned lip or deflector m', shaped to meet in this embodiment of our invention the right-hand side of the needle after the same has passed below the usual throat-plate and spring or deflect it laterally to the left in order that the needle at that descent may be put in proper position with relation to the point of the approaching looping mechanism to have its loop entered by the said point. Close to the left-hand side of the path of movement of said hook (viewing Fig. 1) there is a space, and this space receives (see Fig. 6) a feed-bar B^{10}, (see also Fig. 5,) said feed-bar having suitable feed-point blocks B^{20}, the feed-bar being jointed at one end, as stated, to the arm $D^\times$; but at its opposite end said bar is slotted to receive a block b^{16}, mounted loosely on a stud b^{17} of the arm n^7, before described as attached to the rock-shaft n^6, and said feed-bar is moved up and down at proper times and in proper order to effect the feeding of the material in a forward and then for a less distance in a backward direction during each stitch of the figure, substantially as provided for in said Patent No. 605,700, the three-stitch figure being represented in Fig. 9. The throat-plate e has an elongated needle-hole b^{19}, through which the needle passes in each of its descents at the edges of the hemstitch-figure, and said throat-plate also has a notched ear e^2, which receives a projection e^4, extended from the thread-case e^5 to thus prevent its rotation with the looping mechanism, as in United States Patent No. 578,136, dated March 2, 1897.

The machine herein described has a piercer-carrying bar G, provided at its upper end with an adjustable stud g, extended from a collar fast on said bar by a set-screw $g^\times$, said pin being extended loosely through a hole in the upper end of the needle-bar A^4. This piercer-carrying bar works in suitable bearings in the head of the machine, and at its lower end it has a block against which rests an arm g^2, said arm being slotted to receive a set-screw g^4, which confines said arm adjustably to the block at the lower end of the piercer-carrying bar, said arm having attached to it by a suitable screw, as g^5, a piercer g^3. This piercer-carrying bar, arm, and piercer and the means of adjusting it laterally on or with relation to the said bar are and may be all substantially as represented in our Patent No. 608,152, dated July 26, 1898. This piercer-carrying bar has only a motion of reciprocation, and it always works up and down at one and the same side or edge of the hemstitch seam or figure—*i. e.*, it always enters the material off of the hem—the material at such point being of a single thickness, said piercer working after the manner of a stiletto and making a hole to be entered by the needle b. The needle-bar, however, rises and falls, as stated, in different vertical planes, according to the position of the needle-bar gate, said needle descending at times at one edge and at other times at the opposite edge of the hemstitch-figure, or it descends at times at one side of the center-line figure h and at other times at the opposite side thereof.

As has been hereinbefore stated, the point g^7 of the looping mechanism when taking a loop of thread from the needle may move in a path coinciding at the time of the taking of the loop either with the center line of the hemstitch or with the line at either edge of the hemstitch viewed with relation to its width. When the point g^7 moves in a circular horizontal plane which coincides with the center line of the hemstitch and then the needle, when it descends at the edges of the hemstitch and at opposite sides of said center line, is at each descent out of line with relation to the path of movement of the point g^7 at the time of the taking of the loop of needle-thread, and in such arrangement of our invention we employ two deflectors, the deflector m', which has been hereinbefore described, acting upon the needle passing through the material at one edge of the hem-

stitch and pushing upon said needle below the cloth-plate, forcing said needle into proper position with relation to the movement of said point, and when the needle descends at the opposite side of the hemstitch it, when it arrives under the throat-plate, meets the stationary deflector w and is forced to the right, viewing Fig. 3, sufficiently far to enable the point g^7 to enter the loop of needle-thread extended from the needle. Figs. 2 and 3 represent the needle as acted upon by these two deflectors. After the point of the looping mechanism has entered the loop of needle-thread and the needle-bar and needle rise the needle retires from the control of said deflectors and immediately resumes its usual straight position. If the point g^7 of the looping mechanism be arranged to meet the needle when it penetrates the material at that edge of the hemstitch containing the stitches p, p^3, and p^6, viewing Fig. 9, then the said needle when it meets the material at the opposite edge of the hemstitch-seam to make the stitches p^2, p', and p^4 will have to be deflected when below the material to the left, so as to put said needle in proper relation to the point g^7 of the looping mechanism, and in that case the deflector m' will be made operative; but should the point of the looper be so located as to take the loop of needle-thread in a vertical plane immediately below that edge of the hemstitch having the stitches p^2, p', and p^4 then said needle when it meets the material at the opposite edge of the hemstitch to make stitches p^3 and p^6 must be acted upon by the deflector and moved to the right in order that the said needle may be in position to have its loop entered by the point of the looping mechanism, and in such instance the deflector w will be operative. It will thus be understood that but one deflector may be used, if desired, and the needle be sprung aside only when it penetrates the material at one edge of the hemstitch-seam; but in such place the needle will have to be forced farther aside at each operation or to a greater extent than when both deflectors act to force or spring the needle aside in one direction at one descent and in the opposite direction at the next descent. It will consequently be understood in this construction that the needle will be deflected or forced aside at each descent, it being forced to the right in one descent and to the left at a subsequent descent, thus putting the needle in proper position to have its loop entered by the point of the looping mechanism, and that in other modifications the needle may at one thrust or descent come properly into relation with the point of the looping mechanism to have its loop entered and taken by the said point without springing or forcing the needle aside, but at a subsequent descent the needle must be sprung or forced to one side, either to the right or to the left, as the case may be, to enable the loop of thread extended from the needle to be entered by the point of the looping mechanism.

Referring to Fig. 9, it showing one form of hemstitch-figure—viz., a three-stitch figure—it will be supposed that the stitch p is the first stitch of said figure. This stitch will be made, let it be supposed, in the hem, say, of a handkerchief or other article to show the open-hemstitch seam. This hem is, it will be supposed, composed of two or more thicknesses. The next stitch at p' is made off the hem in the material of one thickness, the material for that stitch having had given to it a forward feed movement in the direction of the arrow, and the following stitch at p^2 is also made off the hem in the material of one thickness, the feed of the material from the stitch p' to p^2 being, however, in a backward direction. This stitch is repeated again, and from p^2 the stitch goes again to p^3 in the hem, the feed being in a forward direction. From the stitch p^3 to the stitch p^4 off the hem the feed is a forward one, and from p^4 to p^5 off the hem the feed is again backward, and from p^5 to p^6 in the hem the feed is forward. This figure shows two repeats of the three-stitch figure. This invention is not limited to the exact number of stitches in each figure, as more than three stitches for each figure might be used and not depart from our invention.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a sewing-machine for making a hemstitch, the following instrumentalities, viz: a circularly-moving looping mechanism for manipulating a second or under thread, the point of said looping mechanism in its movement in the direction of the line of stitching and of the feed entering the loop of needle-thread; a needle-bar provided with an eye-pointed needle to contain a needle-thread; means to move said needle-bar laterally and to reciprocate said needle-bar vertically in two or more defined vertical planes, and a plurality of deflectors, said needle at one downward thrust being met by one of said deflectors to force the same when below the material into proper position to have its loop entered by the point of the looping mechanism, and at another descent of said needle through the material being met by the other deflector, forcing the needle then below the material in the opposite direction, putting the same in position properly with relation to the point of the looping mechanism to have the loop of needle-thread entered by the point of said looping mechanism, substantially as described.

2. A needle-bar having an attached needle; means to vibrate said needle-bar, placing it at times at one and then at the opposite edge of the hemstitch-seam to be made; means to reciprocate said needle-bar and needle; a throat-plate; two deflectors located below said throat-plate and adapted each to act at

predetermined times against and to move the point of said needle while below said throat-plate toward the center line of said hemstitch figure or seam, combined with looping mechanism to control an under or second thread, said looping mechanism having a point which moves in the direction of the length of the seam and the stitch when the point thereof takes the loop of thread from the needle, substantially as described.

3. In a machine for making a zigzag or hem stitch, a needle-bar gate; a needle-bar therein provided with an eye-pointed needle; a throat-plate; a looping mechanism composed of a rotating hook containing an under thread and located to turn in a horizontal plane the point of the hook in each rotation coinciding with the center line of said hemstitch-figure; means to rotate said hook continuously at a uniform speed; means to move said needle-bar gate to place said needle prior to its descent first at one and then at the other side of the center line of said hemstitch-figure; and means located below said throat-plate and coöperating with said needle to force it laterally at times in one and then in the opposite direction, into substantially the center line of said figure, that the loop of thread carried by said needle may be entered by the point of said hook, substantially as described.

4. The needle-bar gate, its needle-bar and needle; means to vibrate said gate to place the needle at times at one and then at the opposite side of the center line of a hemstitch-figure; a throat-plate; a stationary and a movable deflector located below said throat-plate and adapted each to act at predetermined times against and to force the point of said needle while below said throat-plate into substantially the center line of said figure; and a complemental under looping mechanism carrying an under thread, said looping mechanism having a point to enter the loop of needle-thread while the needle is forced into position at the center line of said figure, substantially as described.

5. In a machine for hemstitching, the following instrumentalities, viz: a piercer-carrying bar; a piercer carried thereby; means to reciprocate said piercer-bar to enable the piercer to penetrate the material always at one side of the center line of the hemstitch-figure, the needle-bar, its needle; a gate carrying said needle, means to vibrate said gate to place the needle at times at one and then at times at the other side of the center line of said hemstitch-figure; a throat-plate; two deflectors located below said throat-plate and adapted each to act at predetermined times against and to move the point of said needle while below said throat-plate into substantially the center line of said figure; and a complemental looping mechanism carrying an under thread, said looping mechanism having a hook to enter the loop of needle-thread while the needle is in position at the center line of said figure, substantially as described.

6. In a sewing-machine for sewing a hemstitch, the following instrumentalities, viz: a piercer-carrying bar, a piercer carried thereby, means to reciprocate said piercer-carrying bar to enable the piercer to penetrate the material always at one side of the center line of the hemstitch-figure; looping mechanism for manipulating a second or under thread, said looping mechanism having a point moving in the direction of the feed of the material, the point of said looping mechanism coinciding once during each complete movement with the center line of the hemstitch-figure; a needle-bar provided with an eye-pointed needle to contain a needle-thread, means to move said needle-bar laterally and to reciprocate it vertically in two or more defined vertical planes; and suitable deflectors coöperating with the point of said needle below the material, forcing it aside and putting the needle in proper position with relation to the point of the looping mechanism to enable the loop of needle-thread to be entered by the point of the looping mechanism, substantially as described.

7. In a hemstitch-sewing machine, a rotary looping mechanism, means to move it in a horizontal plane, a deflector stationary with relation to said looping mechanism, a feed-bar located between said looping mechanism and the support for said deflector, said feed-bar having an opening in which stands the acting end of the deflector, and actuating means for said feed-bar, substantially as described.

8. In a sewing-machine for sewing a hemstitch, the following instrumentalities, viz: a needle-bar carrying an eye-pointed needle, a rotary looping mechanism having a point; means for causing the coöperation of the needle and the looping mechanism comprising a deflector rotating with said looping mechanism and acting in advance of the point of the looping mechanism, means to rotate said looping mechanism in a horizontal plane; devices to move said needle-bar vertically and to vibrate it laterally whereby said needle may pass for a plurality of times in succession through the material of single thickness, and then through the material of double thickness, the said needle thus passing through the material in two vertical planes in the direction of the length of the same, one of which descents of the needle would leave it below the material in an inoperative position with relation to the point of the looping mechanism, said deflector coöperating with the needle only at such descents thereof where the needle would occupy its inoperative position with relation to the point of the looping mechanism; said deflector forcing the point of the needle laterally below the material into its operative po-

sition with relation to the advancing point of the looping mechanism, that said point may enter the loop of needle-thread; a piercer-carrying bar having a piercer, and means to actuate said piercer at successive descents of the needle, said piercer in its descents penetrating only the material of single thickness at one side of the edge of the material of double thickness, said piercer in its passage always descending through the said material at one side of the center line of the hemstitch-figure, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGE H. DIMOND.
WILBUR F. DIAL.

Witnesses:
ISAAC HOLDEN,
GEO. CORNWELL.