

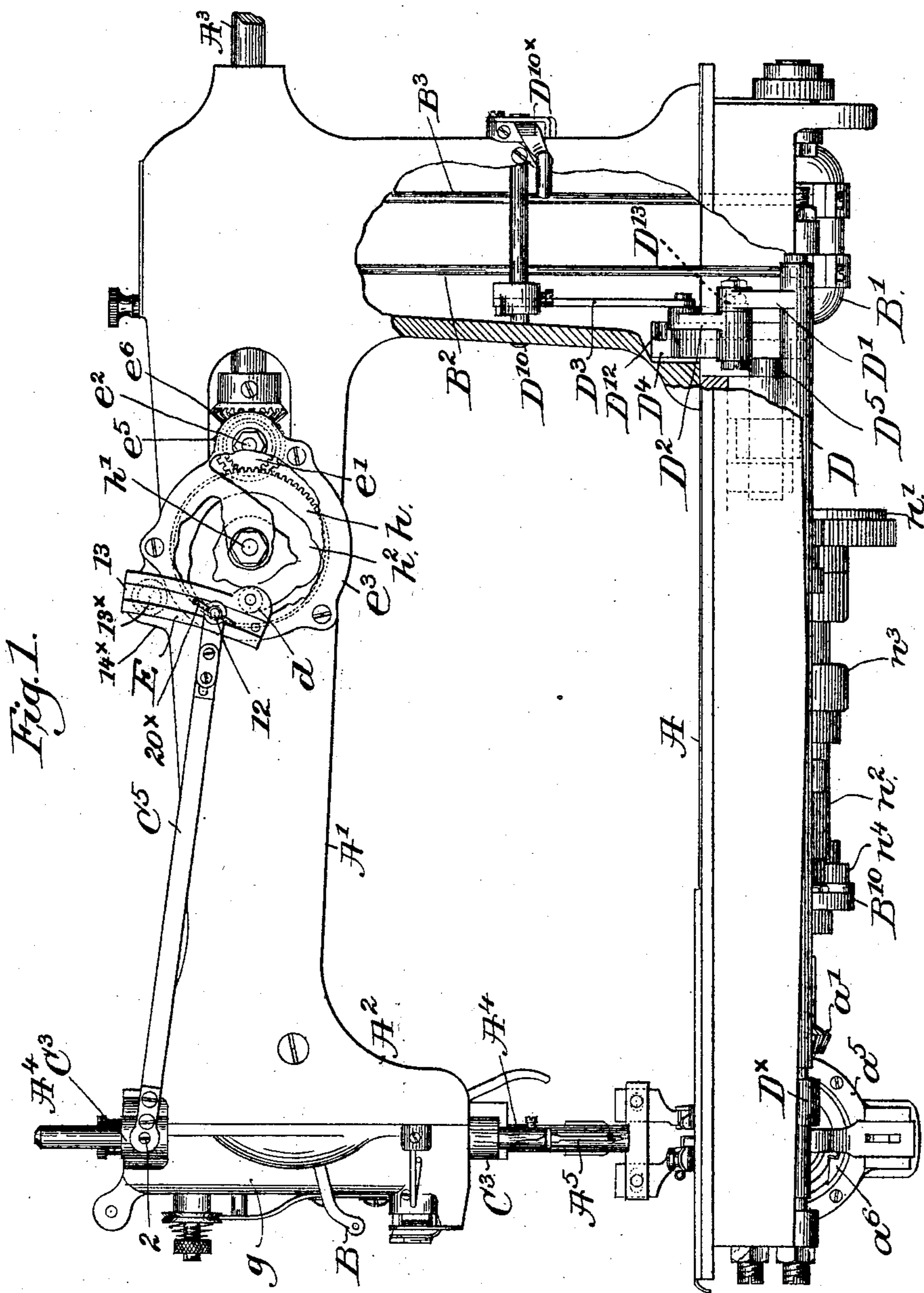
(No Model)

3 Sheets—Sheet 1.

G. H. DIMOND.
SEWING MACHINE FOR HEMSTITCHING.

No. 605,700.

Patented June 14, 1898.



Witnesses.
Samuel McGrawell
Edward F. Allen.

Inventor.
George H. Dimond
by Crosby & Gregory attys

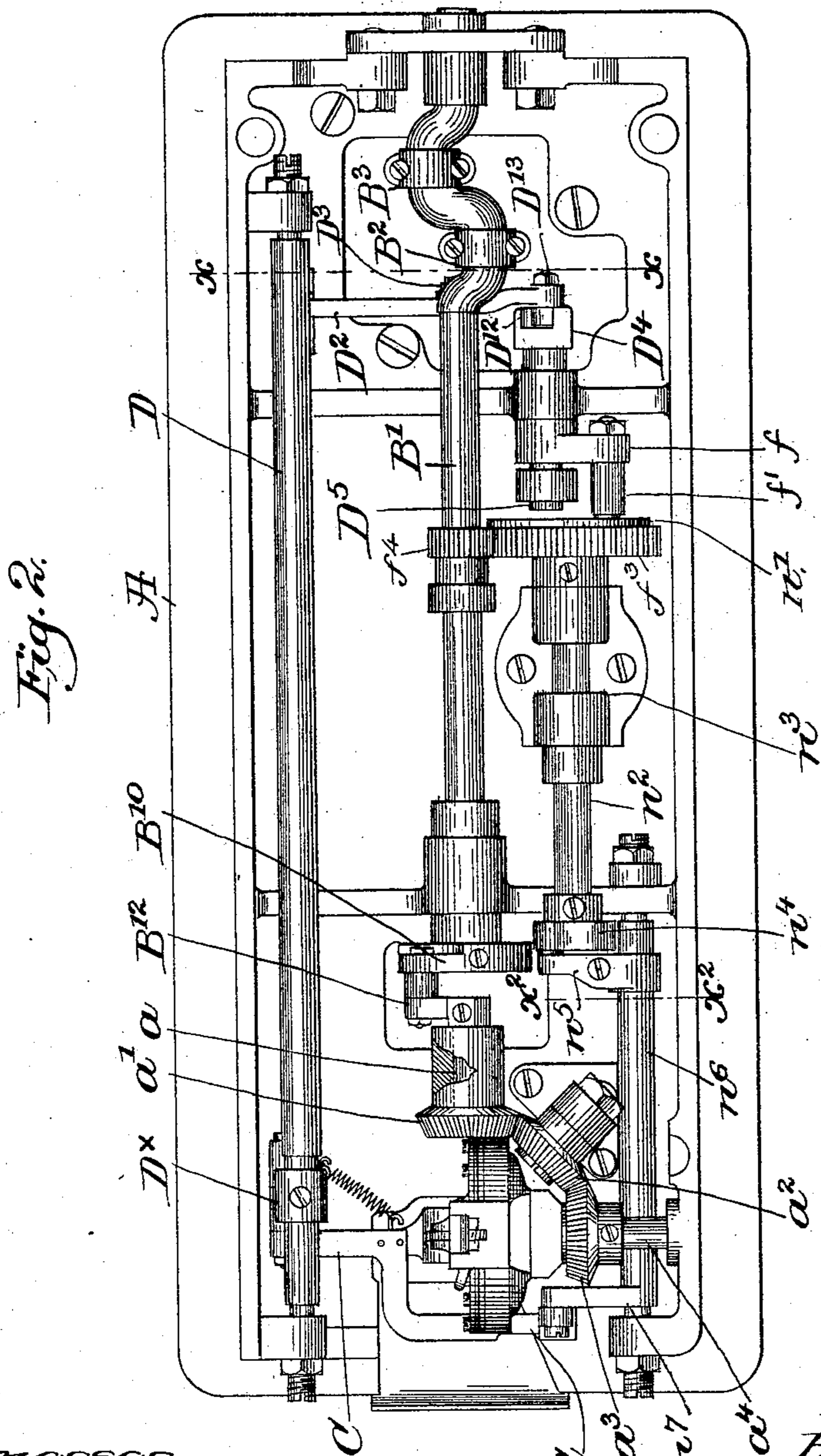
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Louis W. Howell
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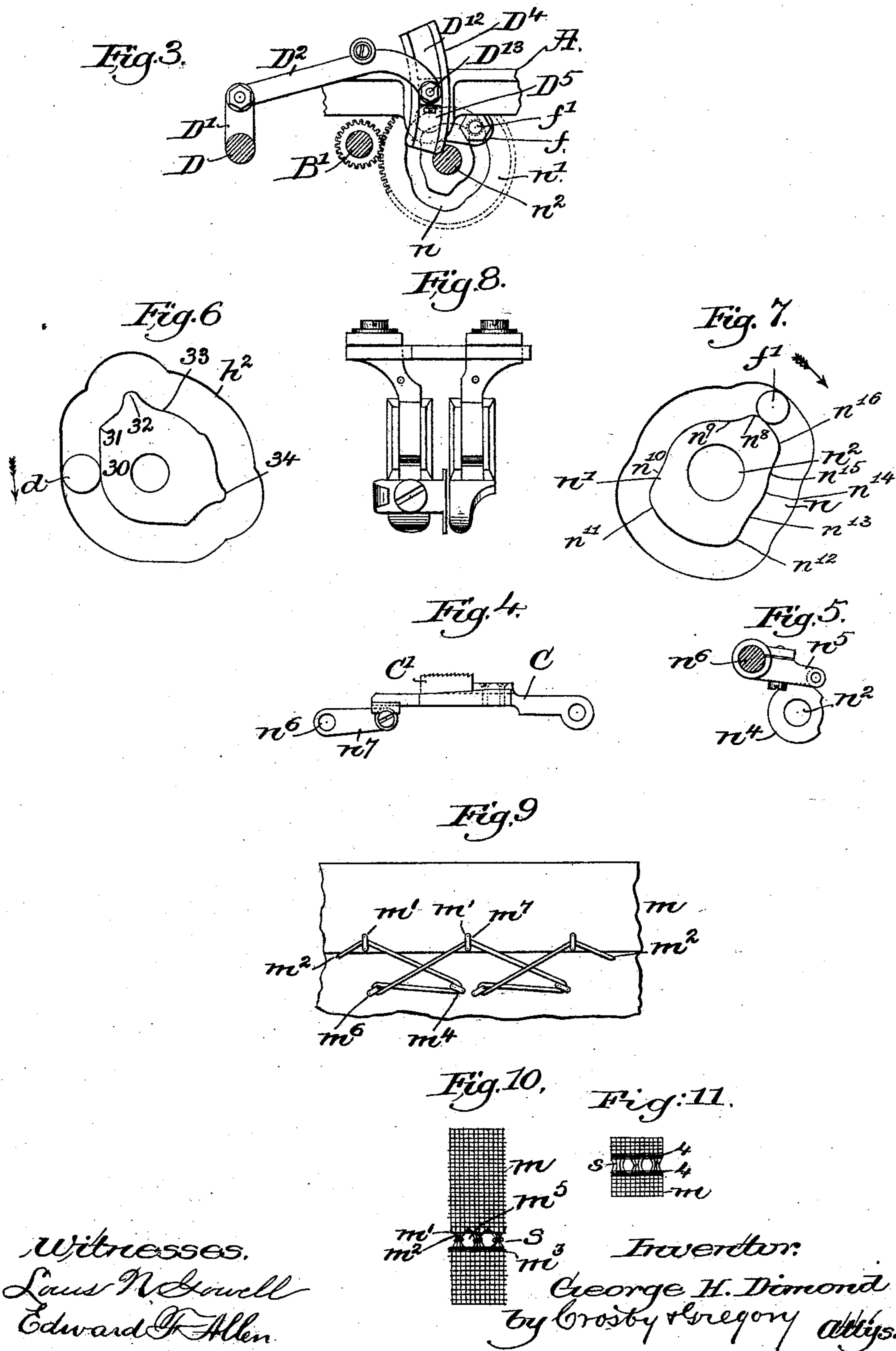
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Louis N. Howell
Edward F. Allen

Fig. 10. Fig. 11.
Inventor:
George H. Dimond
by Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

GEORGE H. DIMOND, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
WHEELER & WILSON MANUFACTURING COMPANY, OF SAME PLACE.

SEWING-MACHINE FOR HEMSTITCHING.

SPECIFICATION forming part of Letters Patent No. 605,700, dated June 14, 1898.

Application filed October 8, 1892. Serial No. 448,193. (No model.)

To all whom it may concern:

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

It is customary in hemming handkerchiefs, doilies, towels, &c., and in the manufacture of personal wearing-apparel to finish the hemming in what is known as "hemstitching," or so as to leave open spaces in the body of the material next the inner edge of the hem.

The production of hemstitch handkerchiefs gives employment to a very large number of people, and this work is at present done mostly in foreign countries, and in such work some of the threads in the body of the fabric, both warp and weft, are drawn out for handkerchief-work near both sides and ends of the handkerchief where the hemstitch-openings are to appear, portions of the weft being left without warp to cross them and portions of the warp being left without weft to cross them, and these threads I shall hereinafter designate "tie-threads."

A hemstitch wherein the threads are drawn out presents an opening which is considerably elongated in a direction at right angles to the hem. Heretofore sewing-machines have been devised for hemstitching; but so far as I am aware they have operated to form the elongation in a direction parallel to the hem or in the direction of the length of the same, and so do not imitate handwork.

My machine is designed to imitate handwork; and to this end I have provided devices whereby the needle when in the material has given to it a lateral movement, substantially at right angles to the inner edge of the hem at the stitching-point, to thus displace some of the threads in the body of the material and form elongated openings, leaving between the adjacent openings only the tie-threads, the latter threads being caught together in groups by the needle-thread to leave well-defined open spaces.

Having thus stated the principle of my in-

vention, I will proceed now to describe a mode in which I have contemplated applying that principle, and then will particularly point out and distinctly claim the part, improvement, or combination which I claim as my invention.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1, in side elevation, partially broken out, shows a sewing-machine embodying my invention; Fig. 2, an under side view of the machine shown in Fig. 1; Fig. 3, a detail relating to the feed, said figure being a partial section in the line x , Fig. 2. Fig. 4 shows the feed-bar. Fig. 5 is a section in the line x^2 , Fig. 2, to show the shape of the cam for raising and lowering the feed-bar. Fig. 6 shows the shape of the pattern-cam for moving the needle-bar laterally both above the material and also while in the material. Fig. 7 shows the shape of the pattern-cam for controlling the feeding movement of the feeding device; Fig. 8, a plan view, enlarged, of the presser-feet carried by the presser-bar; Fig. 9, a much-enlarged diagrammatical view of the compound stitch, and Fig. 10 a detail showing part of a hemstitch handkerchief with several stitches. Fig. 11 is a detail showing the body of the fabric without the hem, with some of the threads compacted at both ends of the slots made by the needle while in the material.

A is the bed-plate, having an overhanging arm A' , provided with a head A^2 , provided at its front end with a face-plate g .

Between the head and face-plate is a gate C^3 , adapted to be vibrated horizontally about suitable vertical pivots for a limited distance, said gate deriving its vibrating movement from a link C^5 , (shown as of several pieces,) connected by a screw 2 to the said gate, the inner end of the said link being connected with a stud 12, having a block-like foot which enters a slot 13 of an arm E, having at its upper end a stud or pivot 13^x , (shown by dotted lines, Fig. 1,) entering loosely a bearing 14^x , the lower end of the arm having a roller or other stud d .

The gate C^3 has suitable bearings for the needle-bar A^4 , having an eye-pointed needle A^5 , and this needle-bar in practice will be re-

reciprocated vertically in its bearings in said gate by any usual or suitable devices at the end of the needle-bar-actuating shaft A^3 , preferably a crank-pin and link.

5 The needle-bar-actuating shaft A^3 has an attached bevel-gear e^6 , which engages a bevel-gear e^5 , mounted loosely on a stud e^2 , held in a cover-plate e^3 , (partially broken away in Fig. 1,) said gear e^5 having an attached pinion e^1 .
 10 The needle-bar shaft herein shown has, it will be supposed, two cranks, which actuate like connecting-rods $B^2 B^3$, engaging, respectively, two cranks on the under shaft B' , provided at its front end with a disk B^{10} , having
 15 a crank-pin B^{12} , which, through a short shaft a and suitable gearing $a' a^2 a^3$, rotates a shaft a^4 and causes it, by a suitable device at its inner end, to rotate a loop-taker or shuttle a^6 in a raceway a^5 , said loop-taker or shuttle
 20 cooperating with the needle to form a stitch.

The shaft B' has fast on it a pinion f^4 , which engages and rotates a toothed wheel f^3 , fixed to a shaft, (herein designated n^2), and carries a pattern surface or cam, to be described.

25 D is a rock-shaft mounted on suitable pivot-studs and provided near one end with an arm D^x , jointed to the rear end of the feed-bar C , having a serrated dog C' to engage the under side of and move the material. The rock-shaft at its rear end has an arm D' , which
 30 is jointed to a lever D^2 , provided at its free end (see Fig. 3) with a stud D^{12} , having a shoe or block to enter a groove D^{12} in an arc-shaped feed-rocker D^1 , fast on one end of a short
 35 shaft D^5 , said shaft having an attached arm f , provided with a stud or finger f' , which is engaged and operated by the said pattern surface or cam.

The lever D^2 has pivoted to it the lower end
 40 of a link D^3 , jointed to an arm of a short rock-shaft D^{10} , having a handle D^{10x} , by which to raise or lower the lever D^2 to vary the length of the stitch, the nearer the stud D^{12} to the center of oscillation of the shaft D^5 the shorter
 45 the stitch.

B is the take-up for the needle-thread, and in practice it may be actuated by any suitable cam (not shown) on the needle-bar-actuating shaft.

50 The stud 12 at one end of link C^5 has a thumb or clamping nut 20^x , by which the position of the foot of the stud may be varied in the groove 13 of the arm E to determine the extent of the lateral throw of the needle-bar gate.

The parts so far described in detail are now in use in sewing-machines of the Wheeler & Wilson type, the parts referred to being found substantially in United States Patent No.
 60 479,739, dated July 26, 1892.

The patent referred to contains a "pattern-surface" or a "pattern-cam," as I shall herein designate the same, to control the time of the feeding action of the feeding device in moving the material, and said patent shows in a
 65 separate figure several different kinds of stitches which might be made by simply a

change in the shape of the pattern surface or cam, and one of the stitches shown in said figure of said patent is the stitch herein shown. 70

The toothed wheel f^3 , which is rotated once for each three rotations of the shaft B' , has connected to or forming part of it a cam, (designated by the letter n' , Fig. 7,) said cam having a cam-groove n , in which enters the finger
 75 or stud f' , before referred to. The wheel f^3 and cam are fast on shaft n^2 , which rotates in bearings n^3 , said shaft having at its front end a second pattern surface or cam n^1 , (see Figs. 2 and 5,) which acts on an arm n^5 of a rock-shaft n^6 , having an attached arm n^7 , on which
 80 rests the free end of the feeding device or bar C , and it will be obvious that the said feeding device may be so actuated by this pattern surface or cam n^1 with relation to the cam-groove n as to lift the feeding device when it is being moved either forward or backward
 85 by the feed-rocker D^1 , and that consequently the said feeding device may be made to feed the material either forward or backward, as the figure comprising the stitch demands. 90

Referring to Fig. 7, the finger or stud f' rests on a high part n^8 of the pattern surface or cam n' for producing the longitudinal feeding movement, and the needle, with the parts
 95 in the position Fig. 7, is supposed to be up and out of the goods, said needle having just risen from the hem of the material, that stitch being the last stitch of the hemstitch, and in this position the high part of the pattern
 100 surface or cam n^1 is supposed to act on the arm n^5 and hold up the feeding device in contact with the material. Now as the cams n' and n^1 are rotated in the direction of the arrows on them in Figs. 7 and 5 the entrance
 105 of the finger or stud f' into the lower part n^9 of the cam (see Fig. 7) next behind the high part n^8 effects, through the feed-rocker D^1 , a longitudinal movement of the feeding device to effect a forward feed of the material, said
 110 forward-feed stroke terminating as the finger or stud f' reaches the bottom of the depression or incline n^9 , said feeding device remaining forward and at rest and raised until the said finger or stud reaches about the point
 115 n^{10} . Now if the next stitch be a forward stitch the feeding device would have to be dropped, so that it might be drawn back under the material, leaving it at rest; but as the second stitch is to be a backward stitch the
 120 pattern surface or cam n^1 continues to act on the arm n^5 to hold up the feeding device in contact with the material, while a high part of the cam-groove n , as between the points n^{10} and n^{11} , acts to turn the feed-rocker D^1 back-
 125 ward and draw the said feeding device in a direction to feed the material backward. This backward-feed stroke terminates at n^{11} , and the cam from n^{11} to n^{12} holds the feed device in its backward position. The cam n' in
 130 its further rotation brings the depression n^{13} against the finger or stud, which results in again moving the feed-rocker D^1 in a direction to move the feeding device forward a

second time, the said feeding device through these three movements not having released its hold upon the material.

At the end of the second forward movement of the feeding device the said device is stopped in its forward position, while the part of the cam from n^{13} to n^{14} acts on the finger or stud f' , and then preparatory to the part n^{15} of the cam again operating to move the feed-rocker the feeding device must be dropped from its engagement with the work, and this is done by the cam-depression of the pattern surface or cam n^4 arriving under the roller or other stud carried by the arm n^5 , letting it drop away from and release the material, while the part n^{15} of said pattern surface or cam operates, and said feeding device is held depressed until the high part n^{16} of said cam again comes under the finger or stud f' , and as soon as the said high part acts on said finger or stud the high part of the cam n^4 has again acted on the arm n^5 to again raise the feeding device on the under side of the material, where it remains ready for the next forward stitch. In this way it will be seen that the feeding device rises, engages the material, moves it forward, remains holding the material while the feeding device is moved backwardly, and while yet in engagement with the material the feeding device is for a second time moved forward, and thereafter it releases the material and comes back into its starting position, all these movements being necessary to make the hemstitch.

The gear e' engages and rotates a gear h about a stud h' , carried by the cap e^3 . This gear has a peculiar cam-path h^2 , (best shown in Figs. 1 and 6,) which is entered by the stud d , said cam-path giving to the needle-bar peculiar to-and-fro motions to effect the vibrations of the needle while in the material, substantially as hereinafter more particularly set forth and claimed.

The cam-gear h is rotated once to every three rotations of the needle-bar-actuating shaft, so that a three-stitch figure is made for each rotation of the cam-gear.

When the roll d stands at the point 30, (see Fig. 6,) the needle-bar will be in substantially its highest position, it having, it will be supposed, just risen from the hem m near its edge, and having left the needle-thread m' locked at that point by the under thread m^2 . (See the diagram, Fig. 9.) Now as the cam h is turned in the direction of the arrow, Fig. 6, the roll d is moved to the left to swing the needle-gate in the same direction, and at the same time the needle descends and penetrates the body of the material just outside the edge of the hem, as at m^4 , a feed of the material away from the operator or in the forward direction having taken place while the needle is up and out of the material, the needle entering the material, as described, about as the part 31 of the cam meets the roll d . In the further movement of the cam the projection 32, the needle being then in the ma-

terial, causes the needle-gate to be vibrated, so that the said needle then in the material is caused to displace the threads of the material parallel with the hem, moving them bodily away from the edge of the hem, thus leaving an opening the length of which is substantially at right angles to the line of feed and leaving an elongated space m^5 , (see Fig. 10,) the needle rising from the material about as the part 33 of the cam gets to the roll d , and while the needle is again out of the material the feeding device is lifted by the pattern surface or cam n^4 , (see Figs. 2 and 5,) and then the cam-groove n of the wheel n' , by acting on the finger f' referred to, operates the feeding device, as will be described, while on its backward stroke or toward the operator, and as a result thereof the material is fed backwardly for one stitch, as from m^4 to m^6 , when the needle again descends through the material, and while in the material the toe 34 acts to vibrate again the needle to and fro with relation to the edge of the hem, packing the threads in the single-thickness fabric parallel with the hem to make another elongated opening, the length of which is in a direction at right angles to the inner edge of the hem, the two loops of needle-thread at the two points of the needle's descent being caught and locked by the under thread m^2 . After the needle has made its second descent and it has been vibrated, as described, in the material the needle-bar is elevated, and the needle-gate is swung by the cam h^2 to the right, viewing Fig. 1, until the needle again is over the hem near its edge, and while the needle is up and out of the material the forward feed of the material takes place, the feeding device being raised to engage the material and feed it backwardly, not having yet released the material, and the needle again descends through the hem, as at m^7 , and has its loop of thread locked by the under thread m^2 . At this descent of the needle-bar and while the needle is in the folded part of the hem the gate is not moved laterally, and when the needle rises from the stitch m^7 the three-stitch or hemstitch figure is completed, leaving the needle again in its starting position, the gate carrying the needle being thereafter vibrated, so that the needle at its next descent may again enter the material of single thickness, as has been hereinbefore described. This operation is repeated stitch after stitch.

The diagram Fig. 9 shows the stitches laid out to indicate the same clearly, and in Fig. 10 the thread is shown drawn up to set the stitch, and the openings made by the needle are shown clearly, with the tie-threads surrounded by the threads of the stitch between the openings made by the needle.

The needle in its vibrations in the material moves some of the threads of the material parallel to the inner edge of the hem closer together, as shown on Fig. 10, at the ends of the openings m^5 .

In Fig. 10 I have at m^3 shown some of the

threads compacted together at one end of the series of elongated spaces m^5 , made by the needle when in the material and while the relative positions of the needle and material are changed laterally to the length of the seam.

The cam device h^2 , as herein shown, is of such shape as to vibrate or move the needle laterally while in the material in one and then in a reverse direction, and such movement of the needle while in the material would result in sliding some of the threads laterally along what I, for lack of a better term, designate as "tie-threads," and in compacting said threads, as at 4, at each end of the series of openings m^5 , as in Fig. 11; but in the drawings, Fig. 10, I have shown the threads as compacted only at the inner ends of the said openings m^5 , for the compacted threads at the outer ends of said openings are covered and concealed by the inner edge of the hem.

This invention is not limited to the exact devices shown for imparting to the needle a lateral movement while in the material nor to the exact devices shown for imparting to the needle-bar its vertical movements, as instead I may employ any other equivalent mechanical devices; nor is this invention limited to the use of mechanical devices adapted for the production of only a three-stitch figure, such as specifically shown, for it will be obvious to those skilled in the art that figures of four, six, or other numbers of stitches, such as may be made in the machine described in United States Patent No. 479,739, might be used to advantage.

What I claim is—

1. A hemstitch-sewing machine, comprising a work-support, a needle-bar, an eye-pointed needle, complementary stitch-forming mechanism, means to reciprocate said needle and needle-bar vertically, a gate in which said needle-bar is arranged to slide vertically,

means to vibrate said gate horizontally about vertical pivots, which means include a cam-path h^2 , a pivoted arm and a link, the cam-path being shaped substantially as described to impart to the gate, needle-bar and needle while the needle is in the fabric, a movement at right angles to the edge of the hem being stitched, to thereby displace laterally from the edge of the hem some of the threads of the material being acted upon, combined with a presser-foot and a feed-dog to engage the fabric and hold it during the lateral movement of the needle, and means for actuating said feed-dog comprising pattern-cams to impart to the fabric forward and backward movements of different lengths while the needle is out of the fabric, said forward and backward movements given to the fabric being transverse to the vibratory movements of the needle, substantially as described.

2. A machine for hemstitching, containing the following instrumentalities, namely: suitable stitch-forming mechanism, including a needle and means to reciprocate it, a gate in which the needle-bar carrying the needle is reciprocated, a rotary cam having a plurality of acting surfaces, and connections actuated by said acting surfaces and located between the said cam and said gate, for imparting to said gate a plurality of movements at each rotation of said cam, whereby the needle when in the fabric will be moved to displace the threads of the fabric parallel to the line of stitching and to form openings in said fabric at right angles to the line of stitching, thereby to simulate drawn or hand work, substantially as described.

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

GEORGE H. DIMOND.

Witnesses:

ISAAC HOLDEN,
A. E. PORTER.