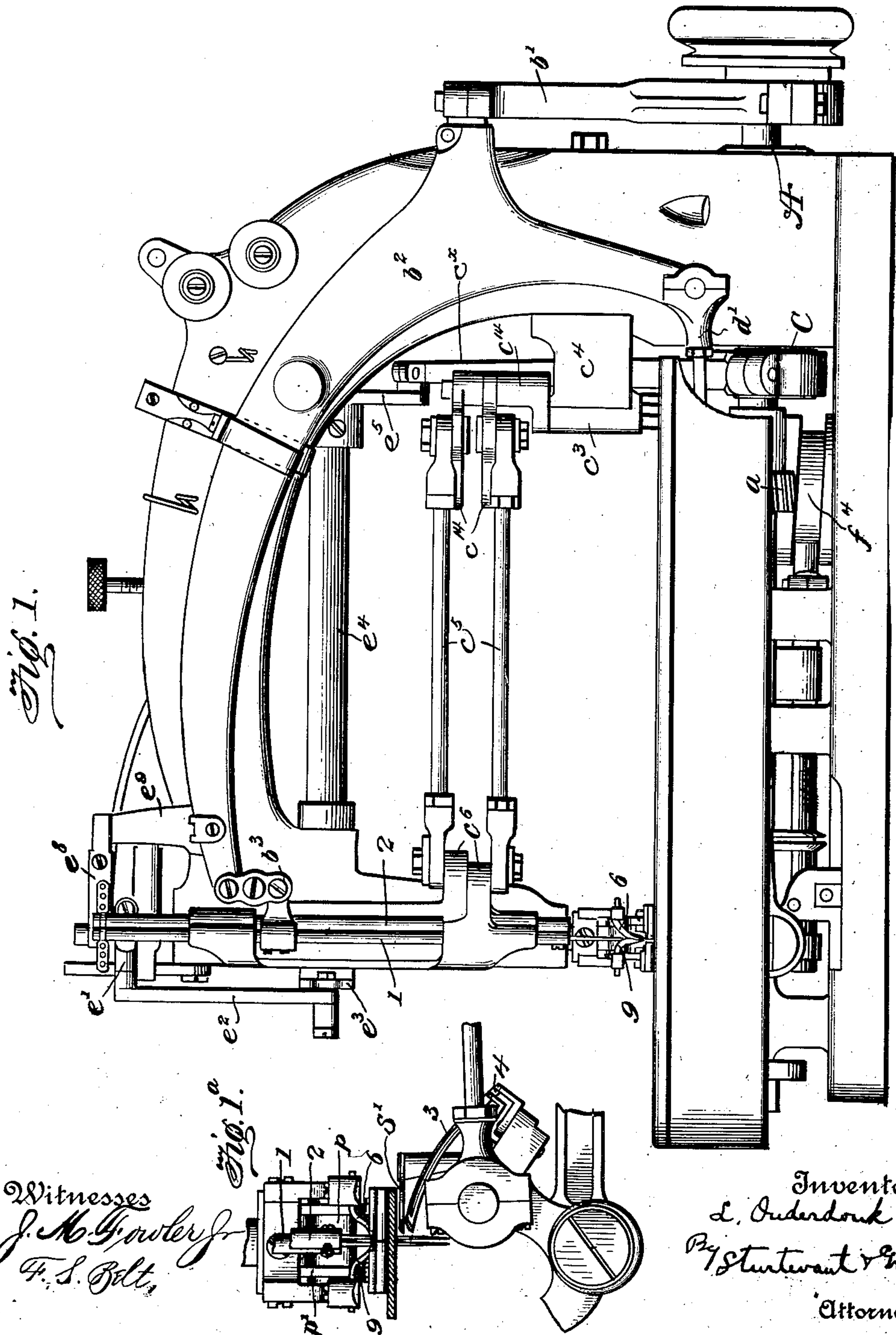


L. ONDERDONK.
HEMSTITCH SEWING MACHINE.
APPLICATION FILED FEB. 18, 1902.

962,973.

Patented June 28, 1910.

5 SHEETS—SHEET 1.



Witnesses
J. M. Fowler
F. S. Bolt

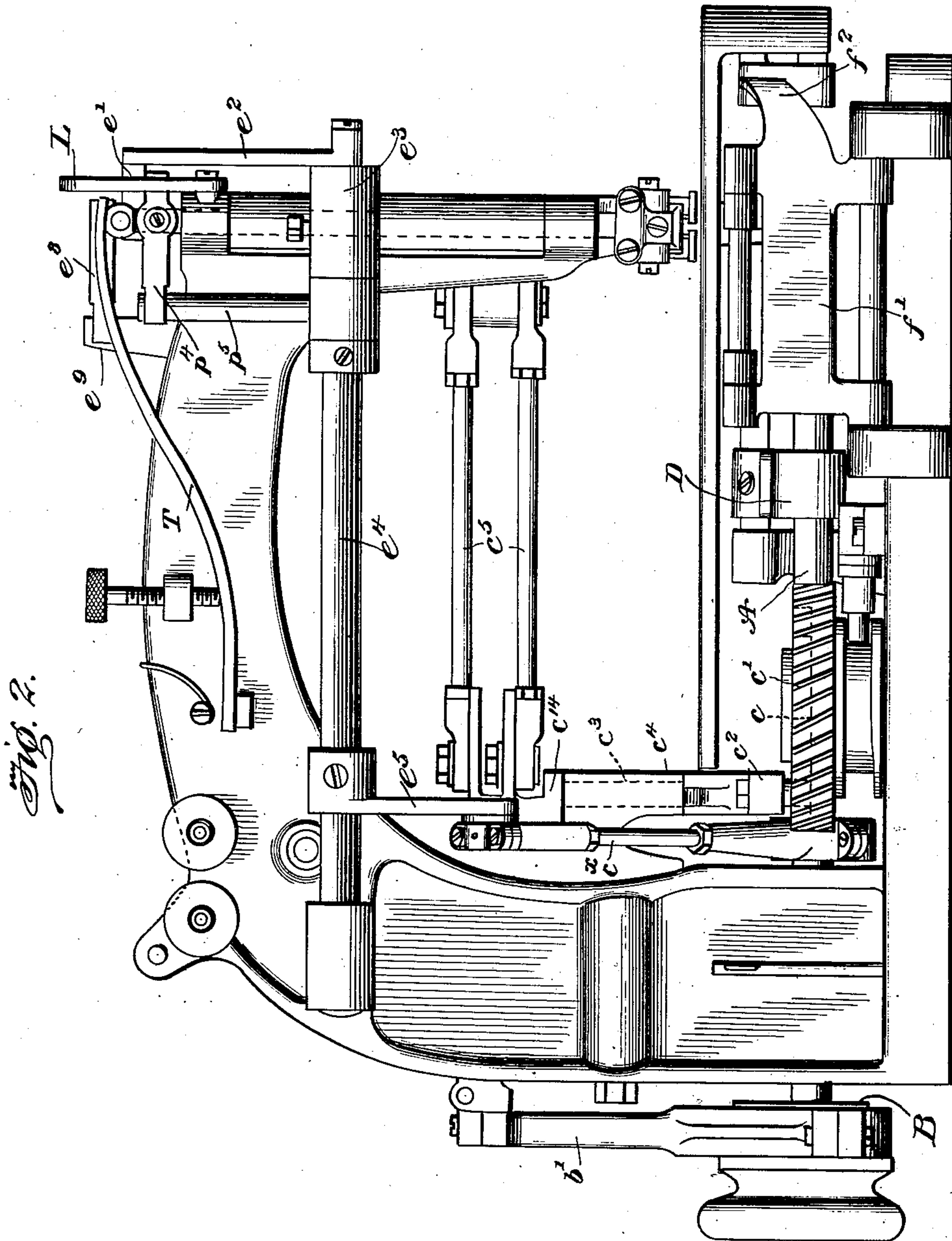
Inventor
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Witnesses
J. M. Fowler Jr.
G. S. Belt,

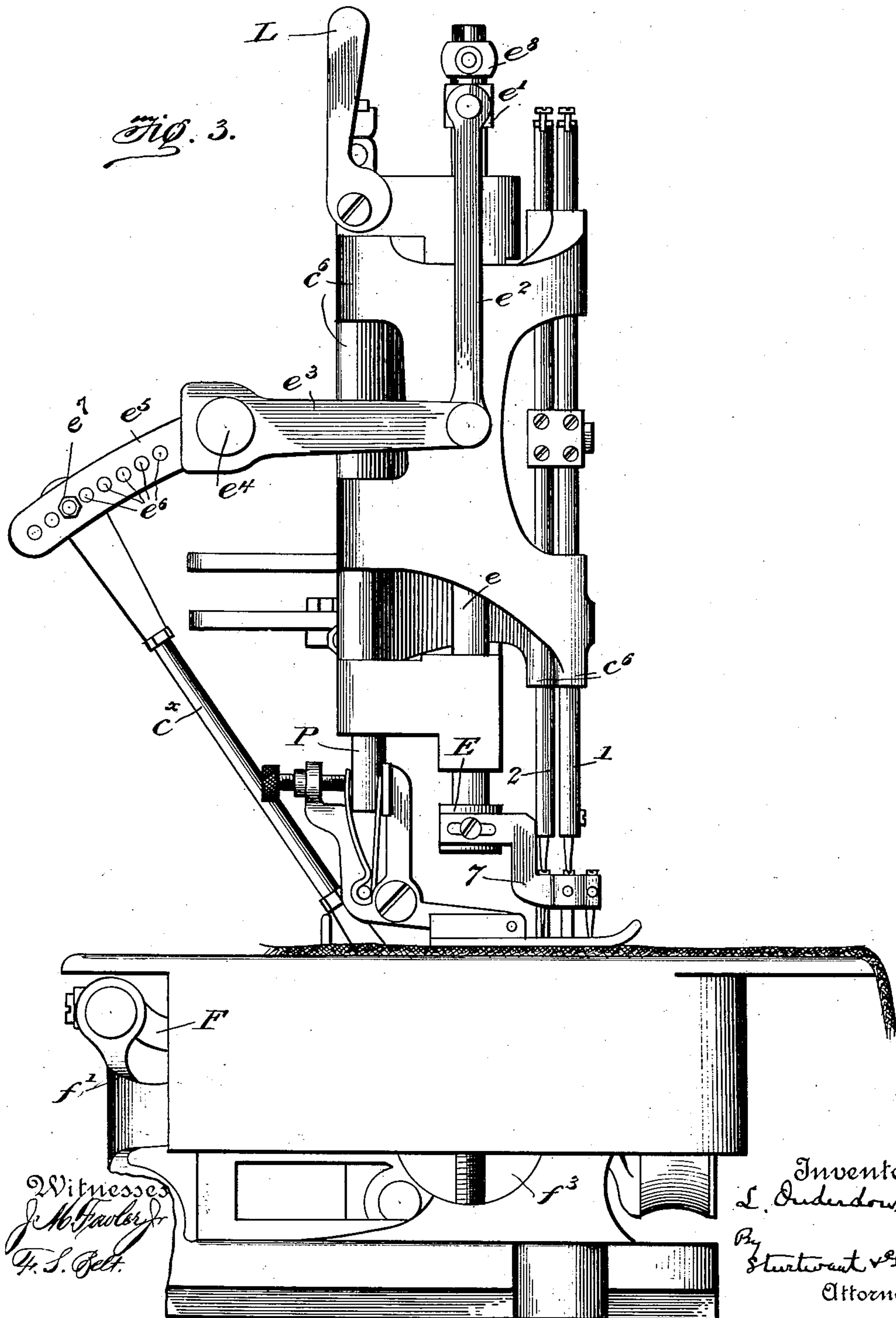
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6 SHEETS—SHEET 3.

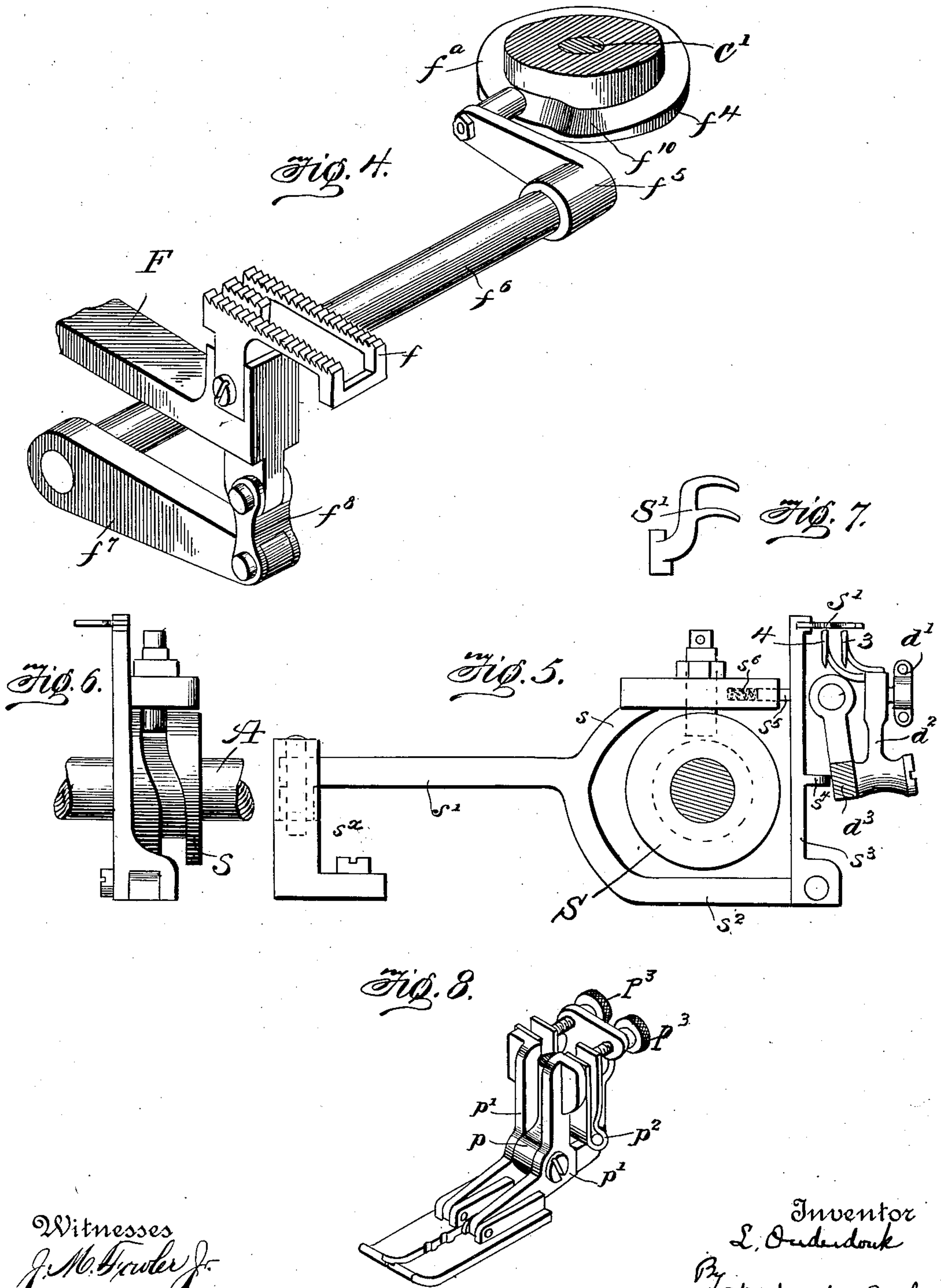


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Witnesses
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UNITED STATES PATENT OFFICE.

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HEMSTITCH SEWING-MACHINE.

962,973.

Specification of Letters Patent. Patented June 28, 1910.

Application filed February 18, 1902. Serial No. 94,589.

To all whom it may concern:

Be it known that I, LANSING ONDERDONK, a citizen of the United States, residing at New York city, in the county of New York, State of New York, have invented certain new and useful Improvements in Hemstitch Sewing Machines, of which the following is a description, reference being had to the accompanying drawing and to the letters and figures of reference marked thereon.

This invention relates to machines for producing hemstitching, or open-work stitching, such as is used on handkerchiefs, bed and table linen, etc.

The object of the invention is to provide a machine which can produce either a single or a double hemstitch, at the will of the operator; which may be operated at high speed; and whose structure is simple and durable.

The invention consists in the matters hereinafter described and claimed.

In the accompanying drawings which illustrate the invention Figure 1 is a front and Fig. 2 a rear elevation of the machine; Fig. 1^a is a detail enlarged view showing the relation of the needles, loopers and spreader; Fig. 3 is an elevation of the head end of the machine; Fig. 4 is a perspective detail of a portion of the feeding mechanism; Fig. 5 is a side and Fig. 6 an end view of the loop-spreading mechanism; Fig. 7 is a plan of the spreading fork; Fig. 8 is a perspective detail of the presser foot; Fig. 9 is a perspective view of the piercers, needles and the opening awl; Fig. 10 is a bottom view; and Fig. 11 a top view of the work, showing the stitch structure. Fig. 12 is a detail view showing the spreaders as engaging the looper threads to position the same for the passing of the needles.

The stitch-forming mechanism consists of two complete, but independent, sets of stitch-forming elements, the respective needles, loopers and spreaders of which are arranged one behind the other in the direction of feed. This arrangement of stitch-forming mechanism permits a double hemstitch effect to be produced, viz., a symmetrical stitch having the same appearance on opposite, or both, sides of a line marking the central portion of the hemstitch, or figure.

Details of the machine, not involved in my invention, will not be specifically referred to, only such reference being made thereto as will enable a clear understanding

to be obtained. It may here be noted, moreover, that this machine includes a take-up and tension mechanism of a character suitable for properly controlling the threads, setting the stitches and drawing the binding threads properly about the strands of the fabric or work, so as to produce the proper hemstitch effect.

The main power shaft is shown at A, and as having fixed thereto three eccentrics B, C and D, properly disposed to produce the desired operation of the mechanisms actuated thereby. The eccentric B reciprocates vertically the two needle-bars 1, 2, through the medium of the strap b' , lever b^2 , and link connection b^3 , the latter being made in two parts, each having pivotal connection with the lever b^2 , and, respectively, with the needle bars. This allows simultaneous vertical reciprocation of the needle bars and permits independent lateral vibration thereof, as in the machine of my application No. 81,763, filed November 9th, 1901. The loopers 3, 4, are also actuated from lever b^2 , by pitman d' , the loopers being carried by an arm d^2 , pivoted to a rocking frame d^3 , actuated by the eccentric D, this being a common construction.

The lateral vibration of the needle bars is imparted by a cam c , of suitable form, fixed to a short vertical shaft C' , adjacent the main shaft, and actuated from the latter by a small worm-gear a , meshing with a large worm-gear c' , formed upon the periphery of the disk having the cam c . The cam c is shown as a groove in which runs an anti-friction roll, carried by an arm c^2 , on a vertical shaft c^3 , sleeved in a bracket arm c^4 , supported by the frame of the machine in any suitable manner. The upper end of the shaft c^3 has a double armed extension c^{14} , said arms being slotted for the reception of bolts, to which are respectively pivotally connected the links c^5 , c^5 , which have a suitable adjustable connection with the respective needle bar carriers c^6 , c^6 , which are pivotally supported upon a vertical rod or bar, preferably the presser bar P, for compactness. It may be here noted, that, in size, the worm-gears a and c , have a ratio of one-to-three, for a purpose to be hereafter indicated.

The forward end of the main shaft has fixed thereto a cam-grooved disk S, in which runs an anti-friction roll carried by the

upper prong s , of a bifurcated bar s' , pivoted vertically at its rear end to a short standard s^x , projecting from the frame. The forward end of the other prong s^2 , has pivoted thereto a vertical bar or carrier, s^3 , for the spreaders, said carrier having two oppositely extending lugs or pins, s^4 , s^5 , the front one being operated upon by the looper rocking frame, and the back one entering, and being guided in, a socket in the prong s , where it is acted upon by an expansion spring s^6 , which normally throws the spreader-bar toward the rocking frame. The spreader consists of a bifurcated plate S' , secured to the upper end of the carrier-bar and disposed horizontally and slightly above the path of movement of the loopers and with its prongs extending in the same general direction as the loopers.

When the loopers move forward into the needle loops, the loop spreading fingers are at one side of the loopers. After the loopers have entered the needle loops, they are moved sidewise as is usual in this type of machine, to avoid the needle and in this side movement of the loopers, the looper frame d^3 engages the spreader supporting member, and rocks the same so that the spreaders are moved across the upper faces of the respective loopers and thus brought into contact with the looper threads. As shown in Fig. 12, the bifurcated plate S' forms two curved spaced spreader fingers S^6 , and these fingers engaging the respective looper threads 3^a , 4^a , which run from the eye of the loopers to the previous interlocking of the needle and looper threads, and carries said looper threads to one side as clearly shown in this figure. The spreader fingers S^6 may also engage the needle loops which at this time surround the shank of the loopers, and extend to the previous interlocking of the threads. It will readily be seen that these fingers operate to carry each looper thread away from the body of its looper and they will also tend to hold the needle loop on each looper well back on the shank thereof, so that the needle in its next descent, may pass into the usual triangle formed by the looper thread, the needle loop, and the body of the looper, thus making the interlocking of the threads. This arrangement of the spreader fingers is of great advantage in a machine of this kind, wherein the feed is idle while a certain number of stitches are being formed. It will be understood of course, that the spreader moves in an elliptical path, the same as the loopers.

The piercers are carried by a suitable head, or block, E , fixed to the vertical bar e , supported in the head of the machine so as to slide therein. The bar e , has fixed thereto, near the upper end, a cross-head e' , of any suitable form, to which is loosely connected at one end a link e^2 , the other end of which is

pivotally connected to a crank-arm e^3 , carried on the outer end of a rock-shaft e^4 , properly journaled in the frame of the machine. Said shaft e^4 , has another arm e^5 , fixed thereto, which in turn is pivotally connected to the strap c^x , which is actuated by the eccentric C . The connection between the strap c^x , and arm e^5 , is made adjustable in any suitable manner,—that shown being a series of apertures e^6 , in the arm receiving a screw e^7 , with a rounded head affording a pivoted connection with the strap c^x ,—so as to regulate and adjust the vertical movement of the bar e , carrying the piercers. The bar e , at its upper end, is provided with a fixed arm e^8 , which coöperates with a bracket arm e^9 , in any suitable manner to prevent rotary movement of said bar in its bearings. The coöperation here shown, between the fixed arm e^8 , and bracket-arm e^9 , is afforded by a sliding connection, provided by a bifurcation in the former receiving the latter. The block E , supports the piercers in any suitable manner and number. As shown in the drawings, the piercers consist of arms, or blades, 5, 6, adjustably supported in bracket pieces of any suitable form, the means of adjustment being by screws binding the arms, or blades, in sockets of the bracket pieces. There may be several bracket pieces, as shown, or, obviously, a single bracket piece may be provided to support all the arms or blades. As shown, two bracket pieces 7, 8, are provided, one at each end or side of the block E , and suitably slotted to provide for longitudinal adjustment thereof by screws. The shape of the pieces 7, 8, is immaterial, the object being to so shape and dispose them as to enable them to support the piercers in proper position in the path of movement of the co-operating needles and, relatively, one behind the other in the line of feed. Each piercer is properly grooved on the side adjacent the needle which coöperates with it, so that the point of each may penetrate the fabric in substantially the same place during certain of the operations of the machine.

It has been found advantageous to provide a piercer in the nature of an awl, viz., sharp pointed and quite small, to make a preliminary penetration in the fabric, the hole made thereby being subsequently easily entered and enlarged by the piercers proper. Such an implement is shown at 9, located in advance of the piercers and in line therewith in the direction of feed. It has also been found advantageous to provide an additional implement for the purpose of rounding, or nicely shaping, the holes after the stitches have been completed. Such implement should be of proper shape and size to give the desired effect, and should also be in line with the piercers in the direction of feed, but in rear thereof and of the needles.

An implement of this character is shown at 10 in Fig. 9, and may be termed a "rounder" or "shaper." The shaper or rounder will have a conformation suitable to the effect desired, and may be round, triangular, rectangular, or polygonal; in fact, may have a shape to produce any desired appearance in the open work, or hemstitch structure, which should be neat and uniform.

In machines of this character, the feed does not, ordinarily, operate at the end of every stitch; and in this machine feeding mechanism is provided for securing a feed of the work only after every third stitch. Such feed mechanism consists of a bar F , supporting the dog f , at or near one end, and being journaled in a rocking frame f' , at or near its other end. The frame f' , is suitably journaled on the main frame, has a curved arm f^2 , extending toward the end of the main shaft, where it is pivotally connected, in any suitable manner, to an actuating crank disk f^3 carried by said main shaft. This mechanism provides for the longitudinal movement of the feed bar, which movement amounts to a reciprocation for each rotation of the main shaft. All of these reciprocations are not, however, effective feed movements, only one in every three having a feeding function, as hereafter noted.

On the vertical shaft C' , is also fixed a cam f^4 , shown as a groove, in which runs an anti-friction roll carried by the end of a crank-arm f^5 , on one end of a horizontal shaft f^6 , which has at its other end an oppositely extending crank-arm f^7 , pivotally connected,—as by a link f^8 , to the outer end of the feed-bar. The cam f^4 , is provided with two levels, the more extensive one f^9 , being higher than the shorter one f^{10} . This arrangement, coupled with the three-to-one ratio of operation between shaft C' and main shaft A , provided by the difference in size of the worm-gears, secures a depression of the feed-dog,—below the throat-plate,—during two complete reciprocations thereof, and provides for the elevation and maintenance of the feed-dog in contact with the work at the proper time and during the necessary interval for advancing the same. The ratio of operation above noted, coupled with the form of cam c , also secures the proper timing for the vibrations and reciprocations of the needle-bars, the effect being two vertical reciprocations for one lateral vibration.

The presser-bar P , carries at its lower end a head p , to which are pivoted, side by side, two angle-levers p' , the horizontal portion of each of which carries a foot pivoted thereto by vertically extending lugs or ribs. The vertical portions of the levers have springs p^2 , shown as blades looped about supporting pins,—bearing thereagainst, the

pressure of which is adjustable by screws p^3 , which pass through an extension of the head and impinge each upon a branch of a spring. The bar P may be lifted by any suitable means, as a lever L , and depressed by a suitable spring, as T , and prevented from turning axially by any suitable means, as a cross bar p^4 , coöperating with the bracket post p^5 .

In addition to the foregoing detailed description of the mechanisms of my machine, and their mode of operation, it remains only necessary to describe generally, the coöperation of the several parts.

It is first to be noted that a single hemstitch effect may be produced on one or the other side of a line marking the center of a double hemstitch, by throwing out of operation one of the stitch-forming mechanisms, as by adjusting the end of a link c^5 along the slotted head c^{14} until it becomes coincident with the axis of oscillation thereof, and then removing the needle thread.

The fabric having been placed in the machine under the needles, and the machine started, the first punctures will be made by the piercers and needles substantially at the same time, though this is not essential, and thereafter the piercers and needles will enter and enlarge holes which have been previously made by the preliminary awl. Before a feed of the work takes place, the needles will enter the fabric, probably single-thick, then move aside in opposite directions and enter the fabric again, probably a hem or double-thick, and then move back and enter the first puncture in the fabric. The feed then takes place to advance the fabric and the same operations are repeated. When the stitches are drawn and set the threads will be caused to draw together the strands or fiber of the work between punctures or openings, and the shaper or rounder, entering in succession each opening, will properly shape and form the latter, so as to produce a uniform appearance or hem.

It is desired to lay particular stress upon the character of stitch made by this machine, for, though it is not in itself new, it has a peculiar function or effect in connection with the material operated upon and the elements employed which go to make up a hem stitch machine. That is to say, the two-thread looped stitch, or the concatenated loops of the stitch, when properly set or drawn in, will shirr, or gather in the strands or fiber of the work, at the sides of the opening, and be drawn down quite close to said sides of the openings, giving a finished corded appearance quite similar to a button-hole purl. This is an appearance, function and effect which cannot be produced by hemstitch machines of the lock-stitch or single chain-stitch types, and the advantageous results will be apparent when the light and flimsy

character of the material operated upon and the peculiar nature of the work done are taken into consideration. It will thus be clear that a hemstitch is produced which
 5 is uniform, neat and durable. The hemstitch will be either right or left according to which stitch forming mechanism is employed, or will be double if both are used. Moreover, the width of the hemstitch considered as a whole, may be regulated according to taste or desire, by adjusting the links
 10 5 relative to the axis of oscillation of the head c^{14} . In thus increasing or decreasing the width of the hemstitch, piercers, shapers, etc., varying accordingly in size, may or may not be employed, this depending upon whether enlarged open-work is desired, or merely an appearance of increased or decreased breadth in the hemstitch is desired,
 20 by changing the lateral throw of the needle.

Having thus described my invention, and pointed out the best form in which I have contemplated using the same, what I claim and desire to secure by Letters Patent is:—

25 1. In a chain stitch hemstitch machine, suitable stitch-forming mechanism including a thread-carrying needle, means for vibrating it laterally, and a thread-carrying looper cooperating with said needle, and means for
 30 vibrating said looper into and out of the needle loop, whereby a double thread chain stitch is formed, a feeding mechanism, with means for imparting to it its various movements, including mechanism to allow it to remain idle while certain stitches are being
 35 formed, said needle-vibrating means operating to vibrate said needle laterally while the feed is idle; substantially as described.

40 2. In a chain stitch hemstitch machine, suitable stitch-forming mechanism including a thread-carrying needle, means for vibrating it laterally, and a thread-carrying looper cooperating with said needle, a feeding mechanism, with means for imparting to
 45 it its various movements, including mechanism to allow it to remain idle while certain stitches are being formed, said needle-vibrating means operating to vibrate said needle laterally while the feed is idle, and a spreader
 50 cooperating with the looper; substantially as described.

55 3. In a chain stitch hemstitch machine, suitable stitch forming mechanism including a thread carrying needle, means for vibrating it laterally, a piercer cooperating therewith, a thread carrying looper cooperating with said needle, a feeding mechanism with means for imparting to it its various movements including mechanism to allow it to remain idle while certain stitches are being
 60 formed and a spreader cooperating with the looper; substantially as described.

65 4. A hemstitch sewing machine, comprising two independent vertically and laterally

independent lateral movement thereto, means for simultaneously reciprocating the needle bars vertically, and a suitable piercer cooperating with the needle of each bar, a thread-carrying looper cooperating with
 70 each needle, and spreaders cooperating with said loopers; substantially as described.

5. A hemstitch sewing machine, comprising two independent vertically and laterally movable needle bars, means for imparting
 75 independent lateral movement thereto, means for simultaneously reciprocating the needle bars vertically, a suitable piercer cooperating with the needle of each bar, a shaping instrument in rear of said piercers,
 80 and an awl in front of the piercers; substantially as described.

6. A hemstitch sewing machine, comprising two independent vertically and laterally movable needle bars, adjusting devices to
 85 adjust the needle bars into and out of line, means for imparting independent lateral movement to the needle bars, means for adjusting the length of stroke of such lateral movement, means for simultaneously reciprocating the needle bars vertically, piercers
 90 cooperating with the needles carried by the needle bars; substantially as described.

7. A hemstitch sewing machine, having stitch-forming mechanism including two independent needle bars, means for imparting
 95 independent lateral bodily movement to said needle bars, means for imparting simultaneous vertical movement to said needle bars, a feeding mechanism with means for causing it to feed the fabric after a series of stitches has been made, a piercer cooperating with each needle, and thread carrying
 100 loopers cooperating with each needle spreaders cooperating with said loopers
 105 whereby a multiplex double loop hemstitch is made, having a purl edge finish; substantially as described.

8. A hemstitch sewing machine, comprising a vertically reciprocating piercer, means
 110 for giving such movement including a horizontal shaft provided with a plurality of crank-arms, one of which has means to provide for regulating the reciprocations of the piercer; substantially as described.
 115

9. A hemstitch sewing machine, comprising a vertically reciprocating piercer, and means for actuating the same, comprising an eccentric and strap, a rock-shaft, and means between said strap and shaft for regulating the reciprocation of the piercer; substantially as described.
 120

10. A hemstitch sewing machine, comprising a plurality of complete and independent stitch-forming mechanisms, a plurality of
 125 vertically reciprocating cooperating piercers, means for adjusting the movements of said piercers, a puncturing awl in advance of the piercers, with means for reciprocating it, and means for adjusting the positions of
 130

the awl and piercers transversely to the reciprocating movement; substantially as described.

11. A hemstitch sewing machine, comprising a plurality of vertically reciprocating and laterally vibrating needles, with means for simultaneously reciprocating them and independently vibrating them laterally, a feeding mechanism with means for actuating the feeding mechanism after every third stitch-forming operation, a plurality of piercers, and means for vertically reciprocating the piercers in unison with the movements of the stitch-forming mechanisms, each of said piercers being provided with a groove for the passage of the needle, substantially as described.

12. A hemstitch sewing machine, comprising a plurality of vertically reciprocating and laterally vibrating needle bars, means for imparting thereto simultaneous vertical reciprocation and independent lateral vibration, and a feeding mechanism comprising a feed bar, a rock shaft for actuating the same vertically, and a cam for actuating said rock shaft having operating surfaces in different horizontal planes; substantially as described.

13. The combination with a needle, a thread carrying looper cooperating therewith, and means for vibrating said looper into and out of the needle loop, whereby a double thread chain stitch is formed, a feeding mechanism with means for imparting to it various movements including mechanism allowing it to remain idle while certain stitches are being formed and a spreader, with means for operating said spreader so that the same is brought into engagement with the looper thread, and the looper thread properly positioned for the entrance of the needle between said looper thread and the body of the looper.

14. The combination with a needle, a thread carrying looper cooperating therewith, and means for vibrating said looper into and out of the needle loop, whereby a double thread chain stitch is formed, a feed-

ing mechanism with means for imparting to it various movements including mechanism allowing it to remain idle while certain stitches are being formed, and a spreader with means for moving said spreader back and forth and laterally across the upper face of the looper, whereby the looper thread is engaged and properly positioned for the entrance of the needle between the looper thread and the looper body.

15. A chain stitch hemstitch machine, including in combination means for supporting the work, a needle, means for producing a relative lateral movement of the needle and work supporting means, a looper cooperating with said needle, means for vibrating said looper into and out of the needle loop, whereby a chain of stitches is formed, a feeding mechanism with means for imparting to it various movements including mechanism allowing it to remain idle when certain stitches are being formed, and a spreader operating so that the same is brought into engagement with the thread carried by the looper and the same properly positioned for the entrance of the needle between the thread and the body of the looper.

16. The combination with a needle, a looper cooperating therewith, means for vibrating said needle into and out of the needle loop, whereby a chain of stitches is formed, a feeding mechanism with means for imparting to it various movements including mechanism allowing it to remain idle when certain stitches are being formed, and a spreader operating so that the same is brought into engagement with the thread carried by the looper, and the same properly positioned for the entrance of the needle between said thread and the body of the looper.

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

LANSING ONDERDONK.

Witnesses:

J. H. HOWELL,
C. D. CHURCHILL.