(No Model.) 5 Sheets—Sheet 1.

J. H. WAY.

SEWING MACHINE.

No. 525,879. Patented Sept. 11, 1894.

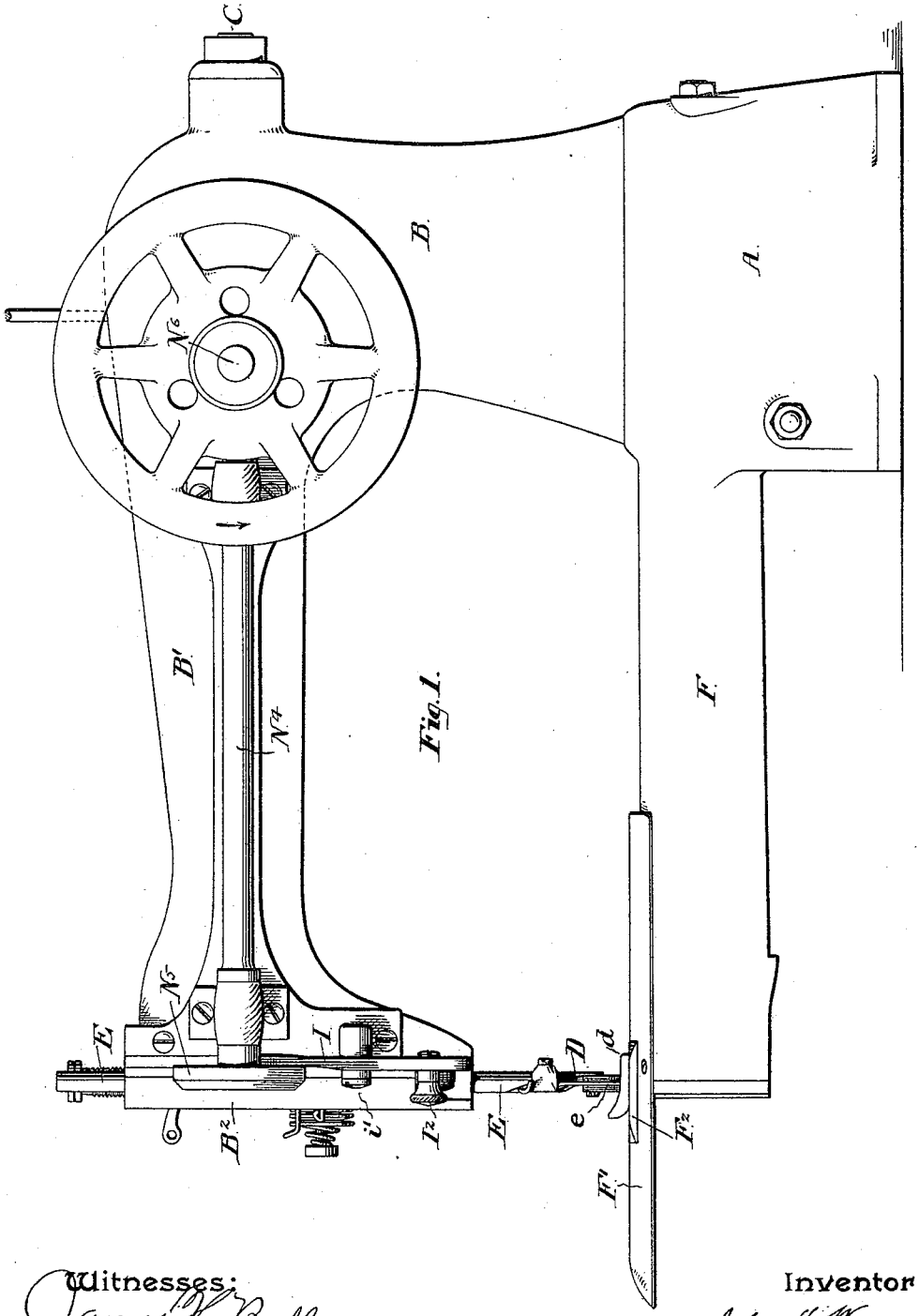

Fig. 1.

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SEWING MACHINE.

No. 525,879. Patented Sept. 11, 1894.

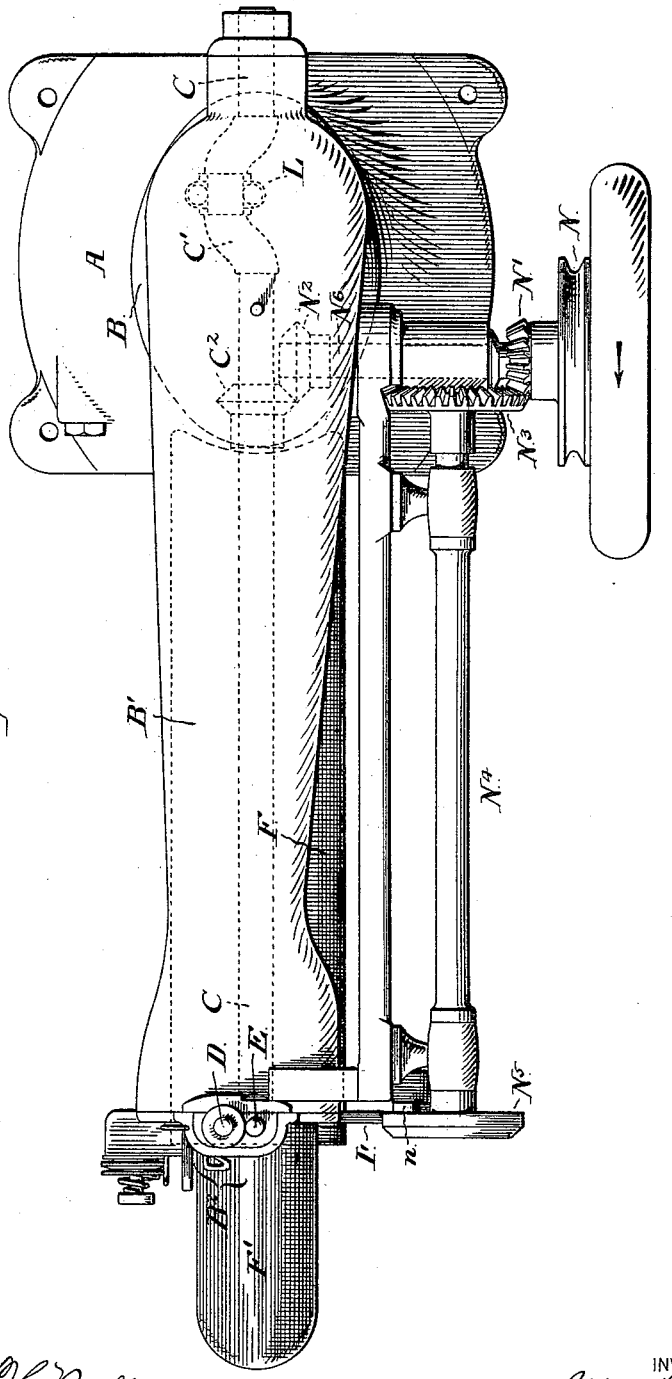

Fig. 2.

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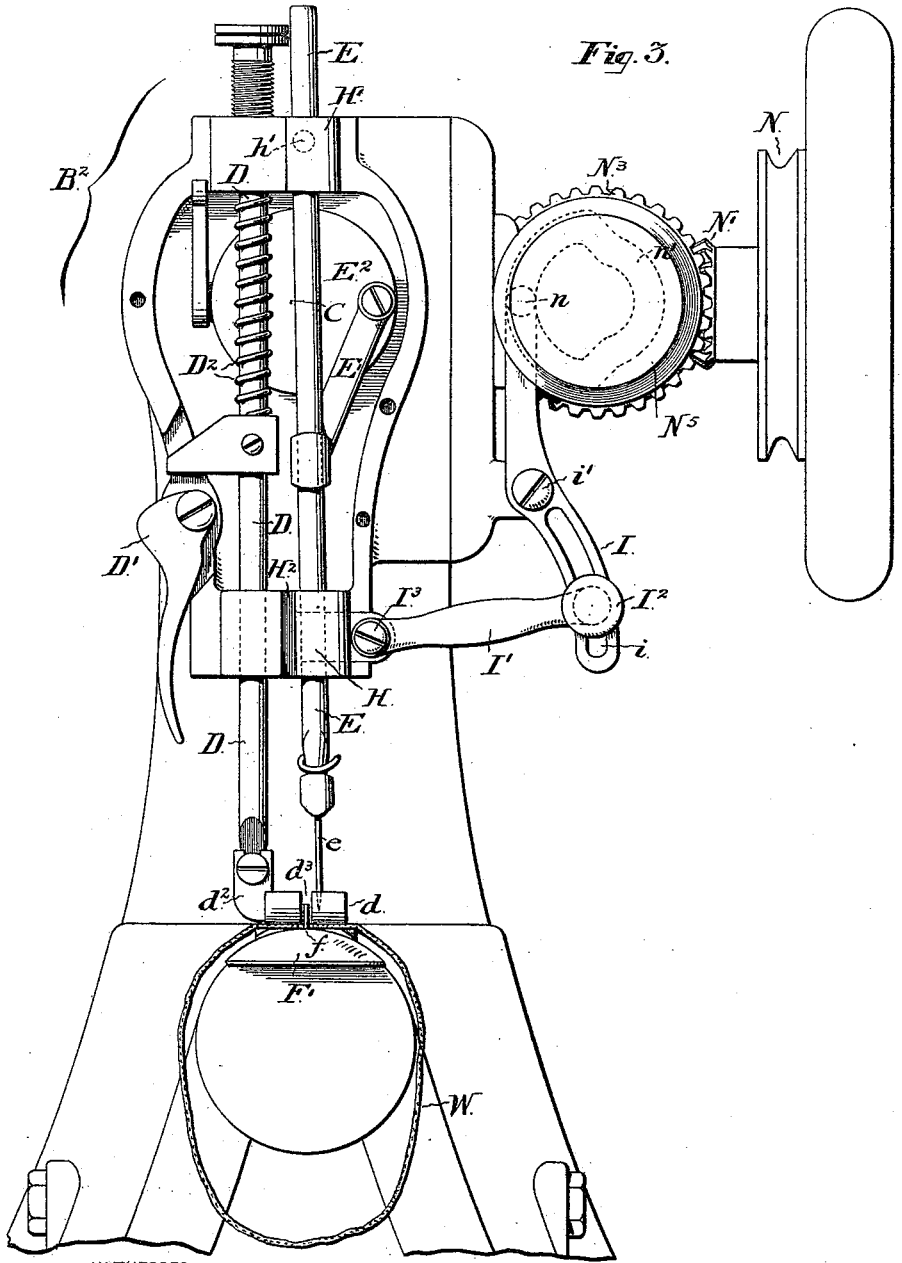
SEWING MACHINE.

No. 525,879. Patented Sept. 11, 1894.

Fig. 3.



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SEWING MACHINE.

No. 525,879. Patented Sept. 11, 1894.

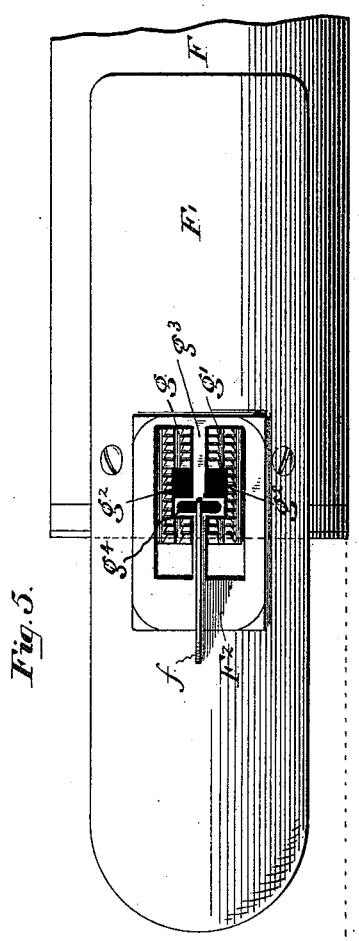

Fig. 5.

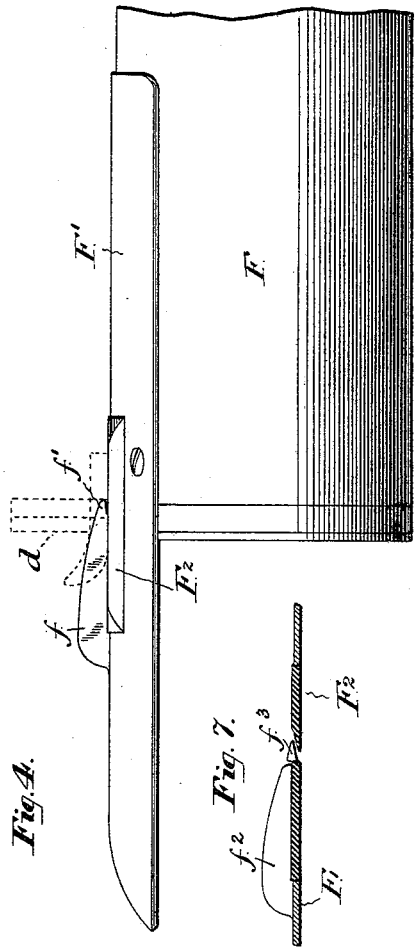

Fig. 4.

Fig. 7.

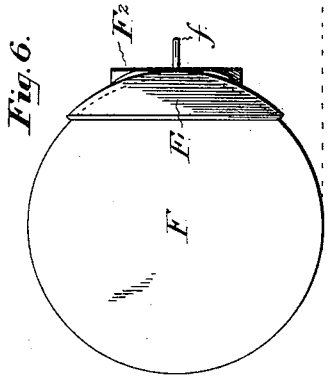

Fig. 6.

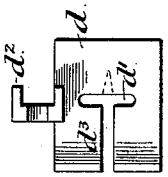

Fig. 9.

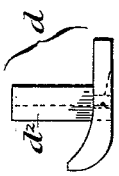

Fig. 8.

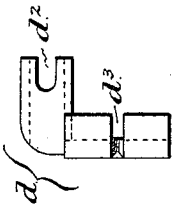

Fig. 10.

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J. H. WAY.

SEWING MACHINE.

No. 525,879. Patented Sept. 11, 1894.

Fig. 11.

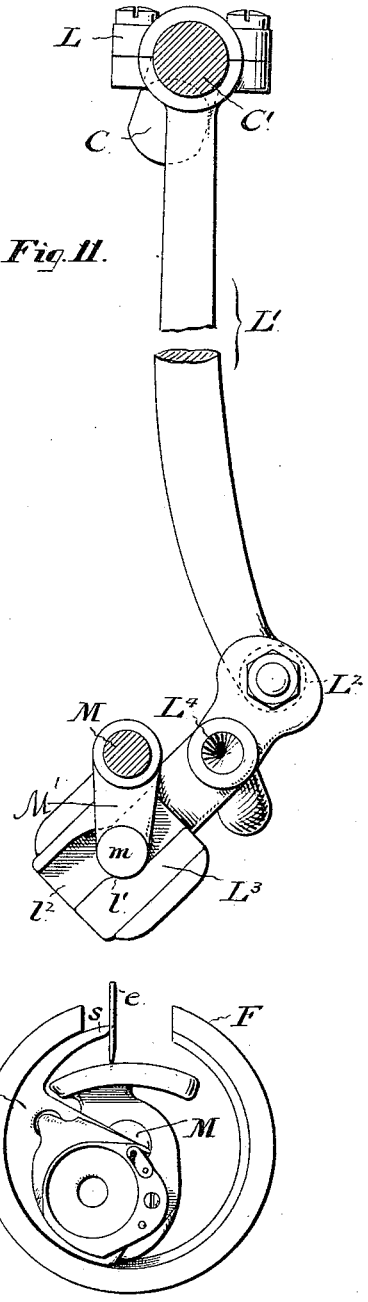
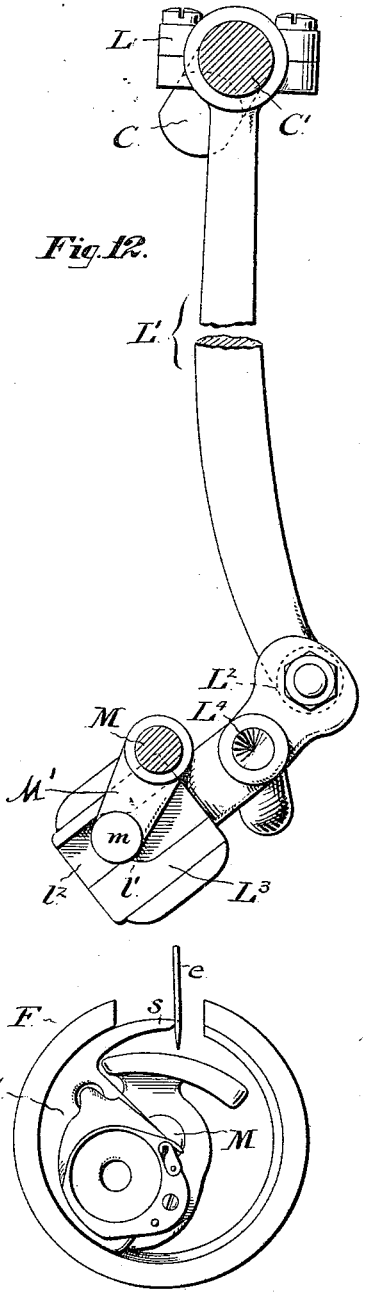


Fig. 12.



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UNITED STATES PATENT OFFICE.

JOHN H. WAY, OF PHILADELPHIA, PENNSYLVANIA.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 525,879, dated September 11, 1894.

Application filed February 27, 1890. Serial No. 341,926. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. WAY, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Sewing-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to accomplish the formation of a peculiar double thread seam for hosiery, or similar articles (usually of tubular shape) said seam being formed by zigzag stitches alternately taken in the opposite edges of the fabric, which edges abut without overlapping.

In the accompanying drawings I have illustrated the invention as applied to a double thread sewing machine having some of the features commonly recognized as of the "Singer" type, but obviously the invention need not be restricted to that particular variety of machine.

In the drawings Figure 1 represents a side view of a machine embodying my improvements. Fig. 2 is a top or plan view thereof, and Fig. 3 a front or end view thereof, looking toward the "head" of the machine. Figs. 4, 5 and 6, are respectively side, plan and end views, on an enlarged scale, of details of the work-plate and feed device, showing certain portions adjacent thereto. Fig. 7 is a sectional view of the throat plate, illustrating a modification of certain parts. Figs. 8, 9 and 10, are respectively side, plan and end views of the presser foot. Figs. 11 and 12 are detail views of the shuttle operating mechanism, shuttle, and needle, in two different positions illustrating the co-operation of the parts.

Referring now to the main views, A, represents the base of the machine, on which is mounted the usual vertical standard B, having a horizontal arm or extension B′, terminating in a head B^2. The shaft C, from which the movements of the needle-bar E, and rod L′, for the shuttle operating mechanism are derived, is suitably journaled in a horizontal extension B′.

N is the driving pulley, which transmits motion to said shaft C, by means of bevel-gears N^2, C^2, the former mounted upon the shaft N^6. The machine is provided with a tubular work-plate or horn F, parallel with the arm B′, and said horn has the top of its outer end covered by a removable curved plate F′, which preferably overhangs the front end of the horn for a short distance, as indicated in Figs. 1 and 4. The throat-plate F^2, is secured in said plate F′, in the usual manner, and contains two parallel feed slots g^2, g^2, separated by a strip g^3, in the enlarged central portion of which is the needle slot g^4. The feed movement is in a direction longitudinal with the horn, (to the right in Figs. 1, 2, 4 and 5,) and the feed operating device may be of any ordinary construction used in this class of machines. The feed-dog is formed with two distinct feed surfaces $g\,g'$, (see Fig. 5,) rising through the slots in the throat-plate, and the proximate sides of the two parts are slotted at g^2, in order to permit the descent of the needle in its extreme positions of lateral oscillation. The presser-foot d, has, for a similar purpose, a transverse slot d', instead of the ordinary needle hole, and the upwardly curved front portion of the foot is provided with a central slot d^3, extending to the needle slot d'. A lateral extension d^3, at one side of the presser-foot affords a means for adjustably securing the same to the presser-bar D, which is provided with the usual spring D^2, and lifter D′.

Mounted upon the removable plate F′, is a fin or tapered vertical web f, one end of which enters the front slot d^3, of the presser-foot and terminates in a pointed finger f', extending over the needle slot d'.

The under side of the presser-foot rear of the needle slot, should be slightly grooved, to receive the finger f'. The needle-bar E, works vertically in bearing pieces H, H′, the upper one of which (H′) is pivoted so as to swing in the upper part of the head, while the lower one (H) moves freely laterally, so that the motion of the lower bearing is considerably greater than that of the upper one.

The vertical reciprocation of the needle-bar is effected by means of a link E′, connected with a wrist-pin upon the disk E^2, which is attached to the front end of the shaft C. The lower sliding bearing-piece H, for the needle-arm, extends outwardly through the side of the head B^2, and is pivoted at I^3, to a link I′, which in turn is connected by a clamp screw I^2, with a lever I, pivoted upon the head at i'. A curved slot i, in the lower

end of the lever I, permits the adjustment of the link I′, toward and from the fulcrum of the lever in order to obtain such range of movement as may be desired. The upper end of the lever I, is provided with a stud *n*, which engages with a cam-slot (see dotted lines in Fig. 3) formed upon the inner face of the disk N^5, which is carried by the front end of the shaft N^4, suitably mounted in bearings upon the side of the horizontal arm B′. Said shaft N^4, is actuated by means of bevel-gears N′ N^3, the former of which is mounted upon the shaft N^6, at a point adjacent to the driving pulley N. It will thus be seen that as said driving pulley is rotated and actuates the shafts C and N^4, the needle-bar E, will receive a compound motion of vertical reciprocation and lateral oscillation in a plane at right angles to the axis of the horn F, the extent of the lateral oscillation being determined by the position of the point of attachment of the link I′, to the lever arm I. The direction of the feed movement being at right angles to the plane of lateral oscillation of the needle-bar, the needle *e*, will of course form a series of zigzag stitches in material properly subjected to its action.

The shuttle S may be of any approved form of the general class of oscillating shuttles, but it is necessary that the motion thereof shall be quickened at the time it is about to seize the loop when the needle is in the position shown in Fig. 12, which I shall call the "second position" to distinguish it from that shown in Fig. 11, which may be called the "first," as it is nearest the starting point of the shuttle's forward motion. If the shuttle had a uniform motion, the point of it would be likely to be too late in arriving at the point where it would catch the loop when the needle was in the "second position," and it is therefore necessary that the shuttle should have an accelerated motion at the time it is taking the loop from the needle when in that (the second) position. To give it this accelerated motion, I use the device shown more particularly in Figs. 11 and 12, which show the two extreme positions of the needle *e* at the moment of the engagement of the shuttle point *s* therewith.

Near the end of the shaft C is formed the crank C′ having a pitman L′ connected therewith by means of the strap L, which pitman is also pivotally connected at the lower end L^2 to an oscillating cam-piece L^3 journaled at L^4 within the base of the standard B. This cam-piece is provided with a longitudinal cam slot l^2, in which engages a stud *m* mounted upon the end of a crank or rock-arm M′ rigidly connected with the shuttle shaft M, and giving motion to the same, which, in its turn, gives motion to the shuttle. It will be seen that the cam-piece L^3 is, in effect, a lever having L^4 for a fulcrum, and that as the stud *m* moves outward toward the free end of the cam-piece, its motion is accelerated, so that this mode of giving motion to the shuttle is peculiarly adapted to be used with an oscillating needle descending in different positions, but to make sure that the shuttle shall take the loop, in either position of the needle, I make the slot l^2 with an abrupt incline l' which will hasten the acceleration of the motion of the shuttle, so that no matter how far, within reasonable limits, the needle may descend to one side of the central line, the shuttle will always be sure to take the loop from the needle.

By reference to Fig. 2 it will be seen that the travel of the stud *m*, in the straight portion of the slot *l*, corresponds with an extent of oscillation of the shuttle just sufficient to bring the point *s*, of the latter into co-operation with the needle *e*, when the latter descends to make the stitch in its left hand oscillation, as shown in Fig. 11. The configuration of the abrupt rise l', is such that a very slight further travel of the stud *m*, produces a very quick throw of the shuttle shaft, so that when the needle descends in its right hand oscillation, as shown in Fig. 12, the shuttle point *s*, will have traveled the distance across to this extreme position of the needle in an almost inappreciable moment of time, so that practically the engagement of the shuttle point with the thread takes place at the same relative instant of stitch formation, whether the needle be in one position or the other. The object of this accelerated oscillation of the shuttle is of course only to bring the parts into proper relation at the moment of engagement, and hence although it occurs also during the formation of the left hand stitch, the acceleration does not commence in that case until the point of the shuttle has passed by the needle, and has no effect upon the remainder of the stitch forming operation.

Having thus described the construction of the main features of the machine, I will now proceed to set forth its mode of operation to obtain the peculiar seam upon the abutting edges of a fabric, such as hosiery or other knit goods for which it is chiefly designed. The fabric W, is placed upon the plate F′, with the edges in close contact with the fin *f*, on each side, and on being brought beneath the presser-foot, the sewing operation proceeds. The purpose of the fin *f*, is to keep the edges of the fabric apart and guide them in the proper relation, until the moment of formation of the stitch is reached, and in this way to prevent said edges from overlapping or being twisted out of line by the drawing action of the feed. The pointed finger *f′*, plays an important part in the operation of the machine. By reference to the drawings it will be seen that its relation to the needle is such that the stitches are formed over said finger and do not leave it until they are completed, when they slip off as the forward movement of the goods carries the same beyond the presser-foot. One of the chief difficulties in forming a seam of this character upon the abutting edges of hosiery, lies in the fact that if

the tension upon the thread be sufficiently great to insure the uniformity of the seam, the stitches will draw the edges of the fabric into a ridge or cord, which, of course, is highly objectionable.

The interposition of the rigid finger during the process of forming the stitches obviates the injurious effect of the tension, and thus produces a perfectly flat elastic seam. Moreover, I am thus enabled to take the stitches in very close proximity to the edges of the fabric, and dispense with "anchoring stitches," such as have heretofore been deemed necessary in this class of work. The finger is conveniently formed, as shown, in one piece with the fin or web, but it must be observed that it is in operation a distinct part therefrom, and may in practice be so constructed. Such a modification is shown in Fig. 7, where the web or fin f^2, terminates in front of the needle hole, while the finger f^3, over which the stitches are to be formed, is attached to the strip of throat-plate between feed slots, and performs its function in the same manner as before. Hence it is to be understood that I do not limit myself to any particular point of attachment for said finger, provided the characteristic mode of operation be present. I have also shown the fin or web as a continuous strip from end to end, but it might be constructed in short sections, or even a series of vertical pins or studs might be substituted for it without affecting its mode of operation.

I am, of course, aware that numerous machines have been used having a horn for the formation of the tubular articles fed lengthwise thereon, and I am also aware that it has been proposed to make zigzag-stitch sewing machines, in which the needle descended in two different positions, with a shuttle arranged to have a uniform motion given by a shaft oscillating in unison with the needle, and therefore make no claim covering either of these constructions.

Some features of my invention, such for instance, as the fin or web, and the finger around which the stitch is formed, might be advantageously used with single thread machines, and hence I do not limit my claim to those parts to their present embodiment, but

I claim in a sewing-machine the following combinations of parts:

1. The combination of a tubular work-plate, a needle-bar and needle, means substantially as set forth for vertically reciprocating said needle-bar and needle, means substantially as set forth for oscillating said needle-bar and needle transversely to the axis of said work-plate, a feed-dog working longitudinally with the axis of said work-plate, a presser-foot, said feed-dog and presser-foot being transversely slotted to receive the needle in its positions of lateral oscillation, an oscillating shuttle arranged within said tubular work-plate and adapted to engage with the needle in each of its said positions of lateral oscillation, an oscillating shuttle-shaft carrying said shuttle, said shaft being axially stationary with relation to said work-plate, and means actuating the same to give the shuttle an accelerated motion when the loop is being taken at the second position of the needle, substantially as set forth.

2. In a zigzag-stitch sewing machine, embracing a vertically-reciprocating and oscillating needle, a tubular horn, having its axis at right angles to the plane of lateral oscillation of the needle, feed devices working longitudinally within said horn, a presser-foot, the feed-surface and presser-foot being transversely slotted to permit the lateral oscillation of the needle, an oscillating shuttle, a shaft for driving the same, and means actuating the shaft for giving the shuttle an accelerated motion when passing into the loop in the second position of the needle, substantially as set forth.

3. The combination, with the laterally oscillating needle, a double feed surface and a presser-foot, said parts being adapted to permit the lateral oscillation of the needle, of a fin mounted upon and projecting above the work-plate in proximity to the front of the presser-foot and in a line centrally between the feed surfaces and extending across the path of the oscillating needle, substantially as set forth.

4. The combination, with the laterally oscillating needle and the double feed surface, of a centrally slotted presser-foot, a fin mounted upon the work-plate and extending into the slot of said presser-foot, and a finger integral with said fin and extending across the range of oscillation of the needle, substantially as set forth.

5. The combination with the laterally oscillating and vertically reciprocating needle, the presser-foot and the feed-surface, said parts being adapted to permit the lateral oscillation of the needle, of an oscillating shuttle, a shaft for driving the same and means for giving said shaft an accelerated motion when the shuttle is taking the loop at the second position of the needle, substantially as described.

6. The combination, with the laterally oscillating and vertically reciprocating needle and its actuating mechanism, of an oscillating shuttle, a shuttle shaft carrying the same, and a crank arm connected with said shaft, a pin mounted on said crank arm, a pivoted cam link having a slot in which said pin engages, said slot being formed with an abrupt incline in the described relation to its movement, and actuating mechanism for said link whereby a suddenly accelerated throw of the shuttle shaft is produced in relation to the stitch forming operation.

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