H. SWINGLEHURST.

HOSIERY KNITTING MACHINE.

APPLICATION FILED MAR. 4, 1908.

995,304.

Patented June 13, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

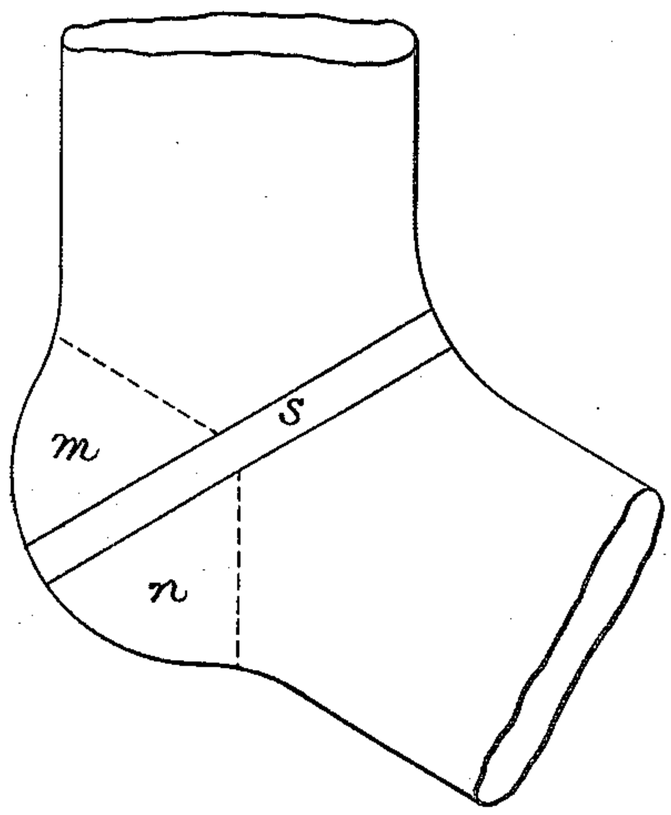


Fig. 2.

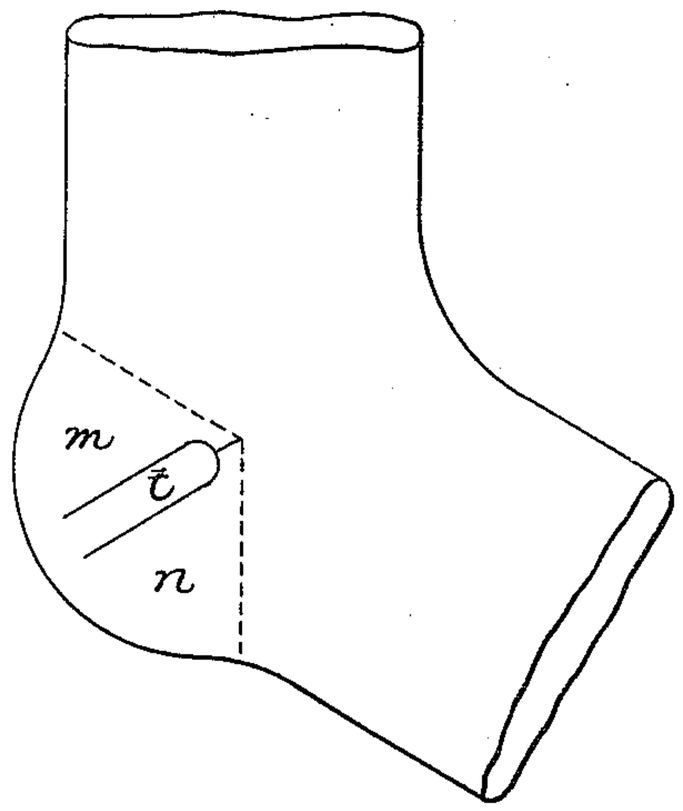
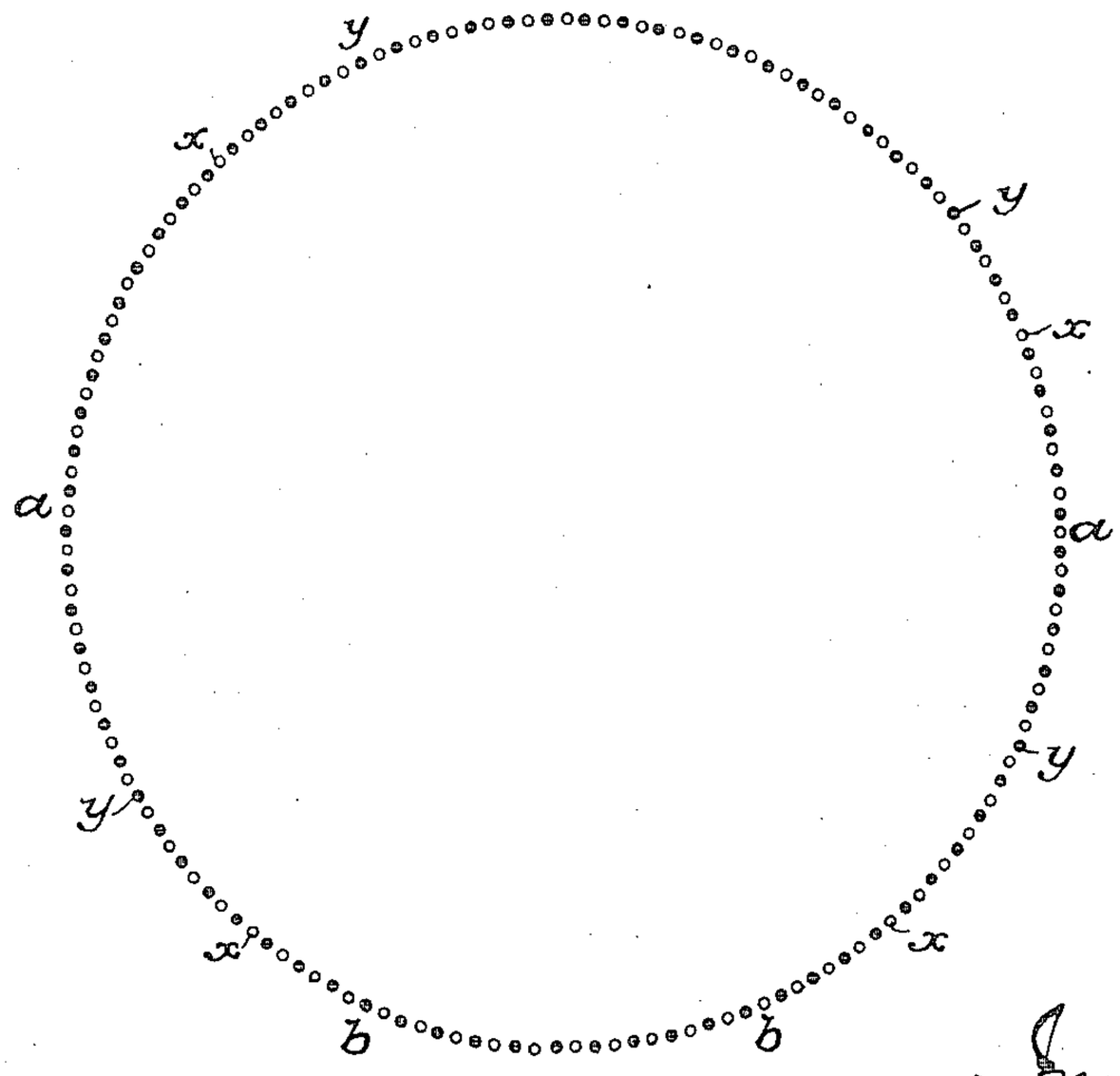


Fig. 3.



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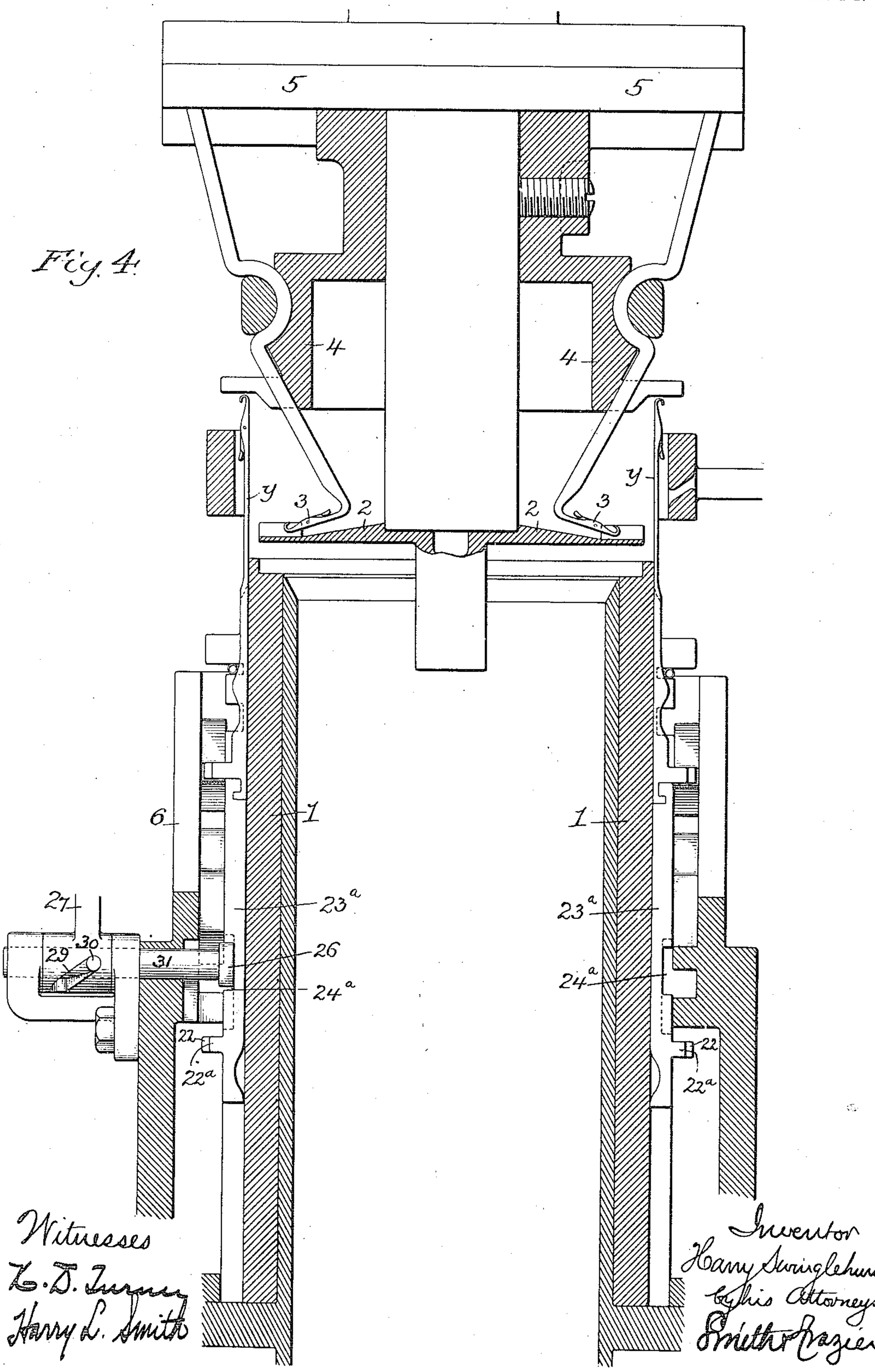
3 SHEETS—SHEET 2.

Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

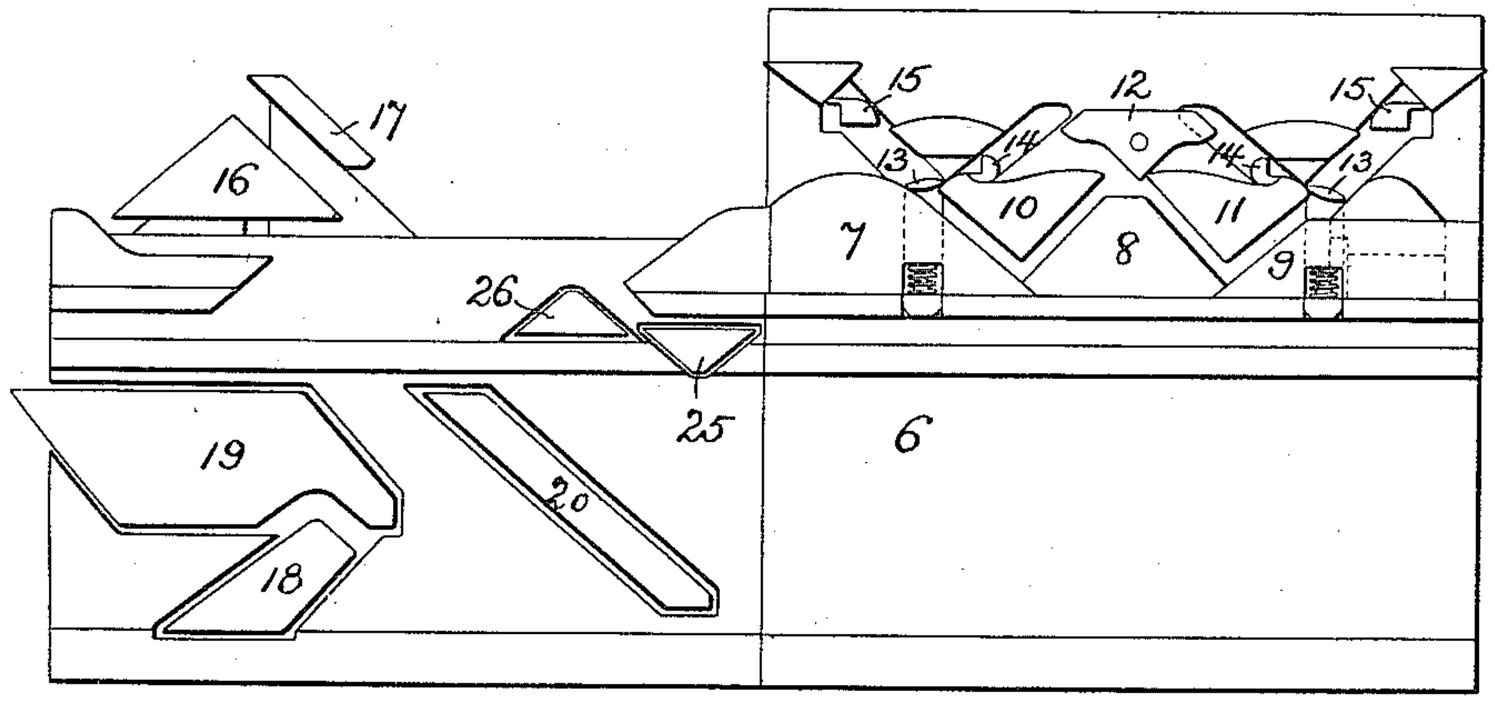
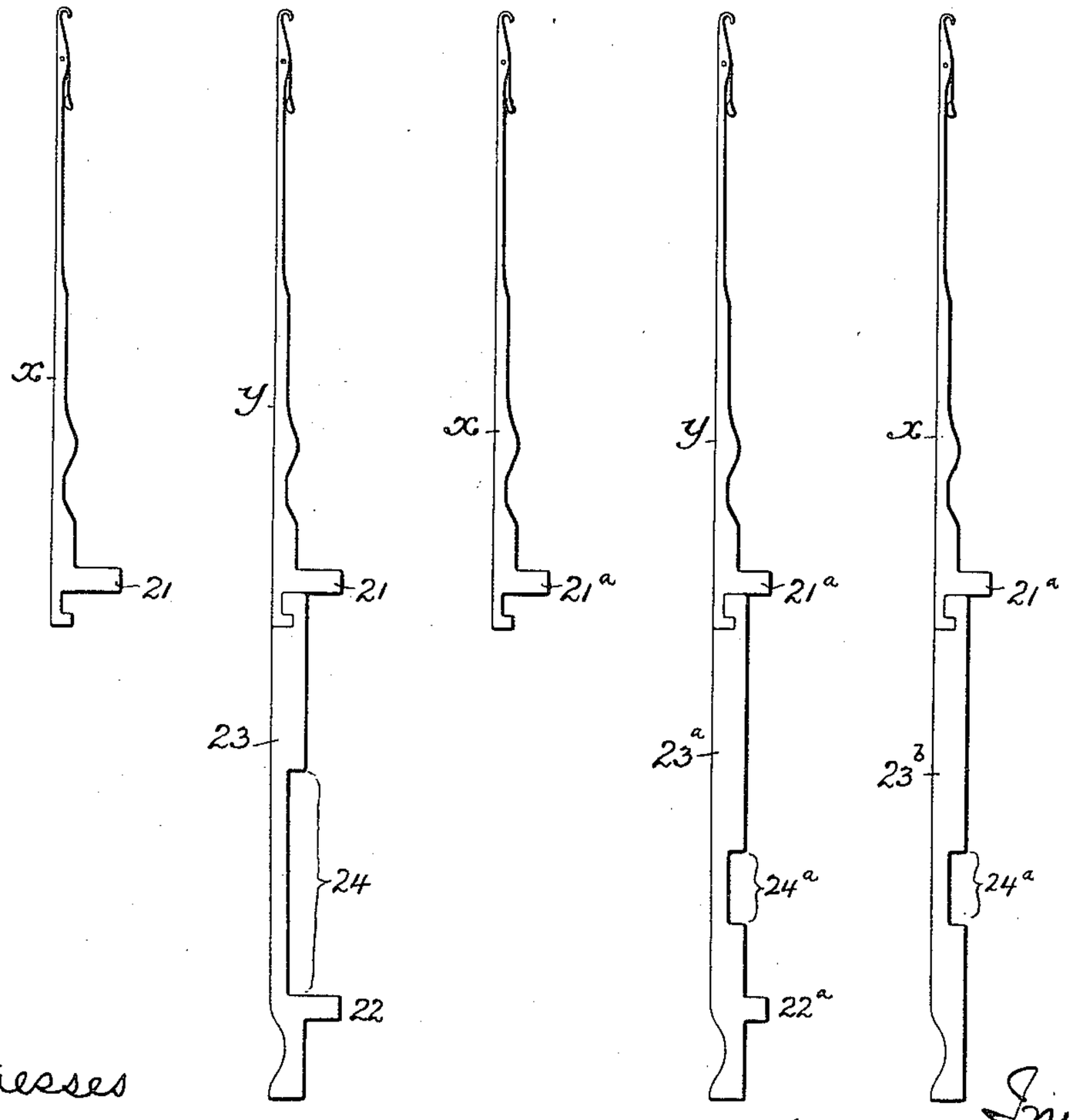


Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10.



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UNITED STATES PATENT OFFICE.

HARRY SWINGLEHURST, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SCOTT & WILLIAMS, INCORPORATED, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

HOSIERY-KNITTING MACHINE.

995,304. Specification of Letters Patent. Patented June 13, 1911.

Application filed March 4, 1908. Serial No. 419,225.

To all whom it may concern.

Be it known that I, HARRY SWINGLEHURST, a citizen of the United States, residing at Philadelphia, Pennsylvania, have invented certain Improvements in Hosiery-Knitting Machines, of which the following is a specification.

My invention relates to that class of knitting machines which are designed to produce a seamless heel pocket upon a knitted tube, one object of my invention being to provide for the introduction of a gusset between the shaped members of said heel pocket in order to increase the size of the heel pocket as compared with one produced in the ordinary way.

A further object is to attain the desired result without providing the needles or needle jacks with projecting butts of any greater length than those now employed, and a still further object is to adapt the invention to machines which are designed to effect an automatic change from rib to plain knitting.

These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is an outline view of part of a sock or stocking having one form of gusset produced in accordance with my invention; Fig. 2 is a similar view illustrating another form of the gusset; Fig. 3 is a needle diagram intended to aid in an understanding of the manner in which the needles are manipulated in order to produce gusseted heels such as shown in Figs. 1 and 2; Fig. 4 is a vertical sectional view of sufficient of a knitting machine of the type shown in Letters Patent 834,763, dated October 30, 1906, to illustrate the change which I have made therein in order to adapt it for carrying out my invention; Fig. 5 is a view of the inner face of the cam ring or cylinder of such machine constructed in accordance with my invention and developed in a flat plane, and Figs. 6 to 10, inclusive, are views illustrating various types of needles employed in the machine.

Referring in the first instance to Figs. 4 and 5 of the drawing, 1 represents the rotating needle cylinder of the machine, which has two sets of needles x and y alternating with each other around the cylinder, the machine also having a dial 2 with swinging dial needles 3, pivotally mounted upon a ring 4 and operated by cams in a ring 5, in order to coact with the needles x of the cylinder for the production of ribbed web or to transfer their stitches to the needles y of the cylinder in effecting change from ribbed to plain web, as fully set forth in Letters Patent 834,763, before referred to. The stationary cam cylinder 6 of the machine surrounds the needle cylinder and is provided with knitting cams 7, 8, 9, 10, 11, 12, and 13, lifting pickers 14, depressing pickers 15, and cams 16, 17, 18, 19, and 20, the cam 16 being intended for throwing out of action the needles around one half of the needle cylinder before commencing to knit the heel pocket upon the remaining needles, and the cam 17 being intended to restore these needles to action after the knitting of the heel pocket has been completed, the cams 18 and 19 being intended to adjust the previously inoperative needles y into position for receiving stitches from the dial needles and thereafter operating in connection with the needles x to produce plain web and the cam 20 being intended to restore these needles y to inoperative position again when the production of ribbed knitted web is to be resumed. All of these parts are the same and act in the same manner as the corresponding parts of the patented machine, but in the present machine the needle jacks employed are somewhat different from those of the patented machine and are operated upon at certain times by cams not present in said patented machine.

The diagram Fig. 3 represents the complete circle of needles contained in the cylinder of the machine, it being understood that all of these needles are in action in knitting the tubular plain web upon which the heel pocket is to be formed, the dial needles having transferred their stitches to the cylinder needles y at a time preceding the beginning of the formation of the heel pocket. The first step in the formation of such pocket is the throwing out of action of the needles around the instep portion of the cylinder, say those in the upper half of the circle of needles shown in Fig. 3, this operation being effected by the action of the cam 16 upon the long butts 21 with which this half of the circle of needles is provided, as shown in Figs. 6 and 7, the other half of

the circle of needles having the short butts 21^a as shown in Figs. 8, 9 and 10. Each of the needles thus thrown out of action retains the stitch last formed upon it. The lifting pickers 14 are then put into action and the cylinder is reciprocated so as to knit to-and-fro upon the remaining half of the circle of needles, which comprises two sets of fashioning needles, from *a* to *b*, and a set of ever-active needles from *b* to *b*. On each reciprocation a needle at the outer end first of one fashioning set and then of the other is picked up by its respective lifting picker so as to carry its butt 21^a out of the path of the knitting cams, the needle retaining the stitch last formed upon it, and this operation being continued until all of the needles from *a* to *b* have been successively put out of action, this operation producing the triangular webs *m* constituting the upper portion of the heel, as shown in Figs. 1 and 2, the needles from *b* to *b* being the only ones now remaining in action.

If it is desired to produce a gusset extending completely around the heel and instep portion of the stocking, as shown, for instance, at *s* in Fig. 1, all of the needles of each fashioning set, as well as the needles around the remaining half of the machine are brought into action again, and any desired number of complete circular courses is knitted, the lifting pickers 14 having been previously put out of action. The fashioning needles *a* to *b* and those around the other half of the cylinder are then again lifted out of operative position, but retain their stitches, the depressing pickers 15 are put into action and reciprocating movement of the cylinder is again resorted to, the result being that the fashioning needles are picked into action successively from *b* to *a*, first a needle in one set and then a needle in the other set, with the effect of producing the triangular lower portions *n* of the heel pocket, the depressing pickers 15 being then retired, the needles around the other half of the cylinder restored to action and the production of tubular web by round-and-round knitting resumed.

If it is desired to produce gussets with tapering inner ends and located only in the opposite sides of the heel pocket, as shown, for instance, at *t* in Fig. 2, the procedure is somewhat different, and is as follows: After putting out of action the needles around the instep half of the cylinder, the lifting pickers are put into action and to-and-fro knitting upon the other half of the cylinder takes place, the web being fashioned by putting out of action needle after needle, first of one fashioning set and then of the other as before, until the needles from *b* to *b* only remain in action and the triangular webs *m* have been produced. The needles from *a* to *b* of each fashioning set are then restored to action with the exception, preferably, of the needle at the end *a* of each set, which is permitted to remain out of action for a purpose described hereafter. To-and-fro knitting is resumed, and needle after needle, first at one end of the acting set and then at the other end of the same, is put out of action, retaining its stitch, until the desired number of courses have been knitted, whereupon the lifting pickers are put out of action and the depressing pickers are put into action in order that the needles previously rendered inoperative shall become operative again in reverse order, thereby producing the gusset with tapered inner end. All of the needles from *a* to *b* are then put out of action and are restored to action successively by the depressing pickers 15, beginning at the end *b* of each fashioning set, and when all of the needles from *b* to *a* have thus been restored to action and the triangular webs *n* have been produced, the needles around the instep half of the cylinder are again put into action, the depressing pickers are retired and round-and-round knitting for the formation of tubular web is resumed.

The object of putting the end needle of the fashioning set out of operation before commencing to form the gusset is to avoid the duplication of selvage stitches upon the end needles, as the duplication of such stitches upon these needles would result in the formation of an eyelet hole at the inner corner of the heel on each side of the stocking.

The ever-active needles *x* (Fig. 6) around the instep half of the cylinder and the ever-active needles *x* (Fig. 8) contained in the group from *b* to *b* (Fig. 3) may be ordinary needles without depending jacks, but the stitch-receiving needles *y* (Figs. 7 and 9) around the entire cylinder have depending jacks 23 with long butts 22 or short butts 22^a for the action of the cams 18, 19 and 20. The jacks 23 of the needles *y* (Fig. 7) around the instep half of the cylinder also have in their outer faces relatively long slots 24, while the jacks 23^a of the needles *y* (Fig. 9) around the heel-forming portion of the cylinder have shorter slots 24^a formed in them, and similar jacks 23^b, (Fig. 10) without butts 22, are used in connection with the needles *x* from *a* to *b*, with the exception in some cases, of the end needles *a* of the set, which have the longer slots 24 for the purpose of permitting these needles to remain out of action while the taper-ended gusset is being formed, as before described.

Mounted so as to be free to slide in and out on the cam cylinder 6 of the machine are a pair of cams 25 and 26, the cam 25 being a depressing cam and the cam 26 a lifting cam, and these cams are so disposed in respect to the slotted portions of the jacks

23[a] and 23[b] that when the cam 25 is pushed inwardly, (the cam 26 being retracted) it will engage with the shoulders at the bottom of the slots 24[a] to depress the jacks 23[a] or 23[b] and the needles connected thereto, so as to move said needles from inoperative to operative relation to the knitting cams. When the depressing cam 25 is retracted and the lifting cam 26 is pushed in the latter cam will act upon the shoulders at the top of the slots 24[a] to raise the jacks 23[a] or 23[b] and the needles connected thereto, and thereby carry said needles from operative to inoperative relation to the knitting cams.

Any desired means for effecting projection and retraction of the cams 25 and 26 at the desired times may be employed, the means shown in Fig. 3 for this purpose being a swinging arm 27 having a hub with inclined slot 29 engaging a pin 30 which projects from one side of a sliding stem 31 carrying the cam and guided in a suitable bearing on the cam cylinder 6.

The partitions between the needle grooves of the cylinder are cut away for the entrance of the cams 25 and 26, as shown by dotted lines in Fig. 4, these cut away portions extending either entirely around the cylinder or throughout so much of the circumference of the same as may be necessary for the proper operation of said cams 25 and 26.

As the needles have already two different lengths of butts upon them and as the same is true also of the jacks of the receiving needles *y*, the formation of a still longer butt for the action of the cams 25 and 26 would be inadvisable, because of the distance from the needle shank at which the push of the cam would be exerted, hence the slotting of the jacks for the action of the cams 25 and 26, this construction having the effect of forming shoulders for the action of said cams at a point inwardly beyond the projecting butts 22 and 22[a] instead of outwardly beyond the same, whereby the power of the cams 25 and 26 is exerted almost directly in line with the stems of the needles and hence without any excessive side strain upon the latter or any tendency to cause the upper ends of the needles to move radially in their grooves.

The slots 24 in the jacks 23 are of such a length that said jacks can be carried past the cams 25 and 26 without risk of contact of said cams with any part of said jacks 23.

Although I have shown and described my invention as used in connection with a machine for changing from ribbed to plain fabric it will be evident that it is applicable to machines for knitting plain fabric only.

I claim:

1. The combination, in a knitting machine, of a set of fashioning needles having depending jacks, knitting cams acting upon said needles, pickers acting upon the fashioning needles to move them singly into and out of range of the knitting cams, and cams acting upon the jacks of the set of fashioning needles to move them all to operative or inoperative position in respect to the knitting cams.

2. The combination, in a knitting machine, of a set of fashioning needles having depending jacks, knitting cams acting upon said needles, pickers acting upon the fashioning needles to move them singly into and out of range of the knitting cams, cams acting upon the jacks of the set of fashioning needles to move them all to operative or inoperative position in respect to the knitting cams, and means for moving said cams into and out of operative relation to said jacks.

3. The combination, in a knitting machine, of a set of fashioning needles having depending jacks with slotted faces, knitting cams acting upon said needles, pickers acting upon the fashioning needles to move them singly into and out of range of the knitting cams, and cams acting upon the slotted portions of the jacks of the fashioning needles to move them all to operative or inoperative position in respect to the knitting cams.

4. The combination, in a knitting machine, of fashioning needles, knitting cams and pickers coöperating to produce a pocket in the knitted web, needle jacks having projecting butts and slotted faces, and cams some of which coöperate with the butts and others with the slotted faces of said jacks.

5. A knitting machine having two sets of needles for producing ribbed fabric, means for transferring stitches from the ribbing needles to plain web needles including the needles of the fashioning set, knitting cams, pickers coöperating with the needles of the fashioning set to move them singly into and out of range of the knitting cams, and cams acting upon the jacks of the set of fashioning needles to move them all to operative or inoperative position in respect to the knitting cams.

6. A knitting machine having two sets of needles, one set being ribbing needles, means for operating these ribbing needles intermittently, means for operating some of the needles of the other set continuously to produce both ribbed and plain web, means for operating the other needles of said set intermittently to produce plain web, means for transferring stitches from ribbing needles to theretofore inactive plain web needles, knitting cams and pickers coöperating with a fashioning set of plain web needles to produce a pocket upon the knitted web, slotted jacks upon the stitch-receiving needles and upon certain of the ever-active needles, and cams acting upon slotted jacks of the fashioning set of plain web needles to move said

needles to operative or inoperative position in respect to the knitting cams, the jacks of the stitch-receiving needles forming part of the non-fashioning set having longer slots than those of the jacks of the stitch-receiving needles which form part of the fashioning set.

7. The combination, in a knitting machine, of the fashioning needles, knitting cams and pickers coöperating to produce a pocket upon the knitted web, depending jacks on the needles having slotted faces, cams for acting upon said slotted jacks to move the needles to operative or inoperative position in respect to the knitting cams, and a needle cylinder having the ribs between the needle grooves cut away in line with the slotted portions of the jacks.

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

HARRY SWINGLEHURST.

Witnesses:
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WILBUR E. DUPRAY.