

No. 729,005.

PATENTED MAY 26, 1903.

B. T. STEBER.
KNITTING MACHINE.
APPLICATION FILED FEB. 14, 1901.

NO MODEL.

Fig. 1.

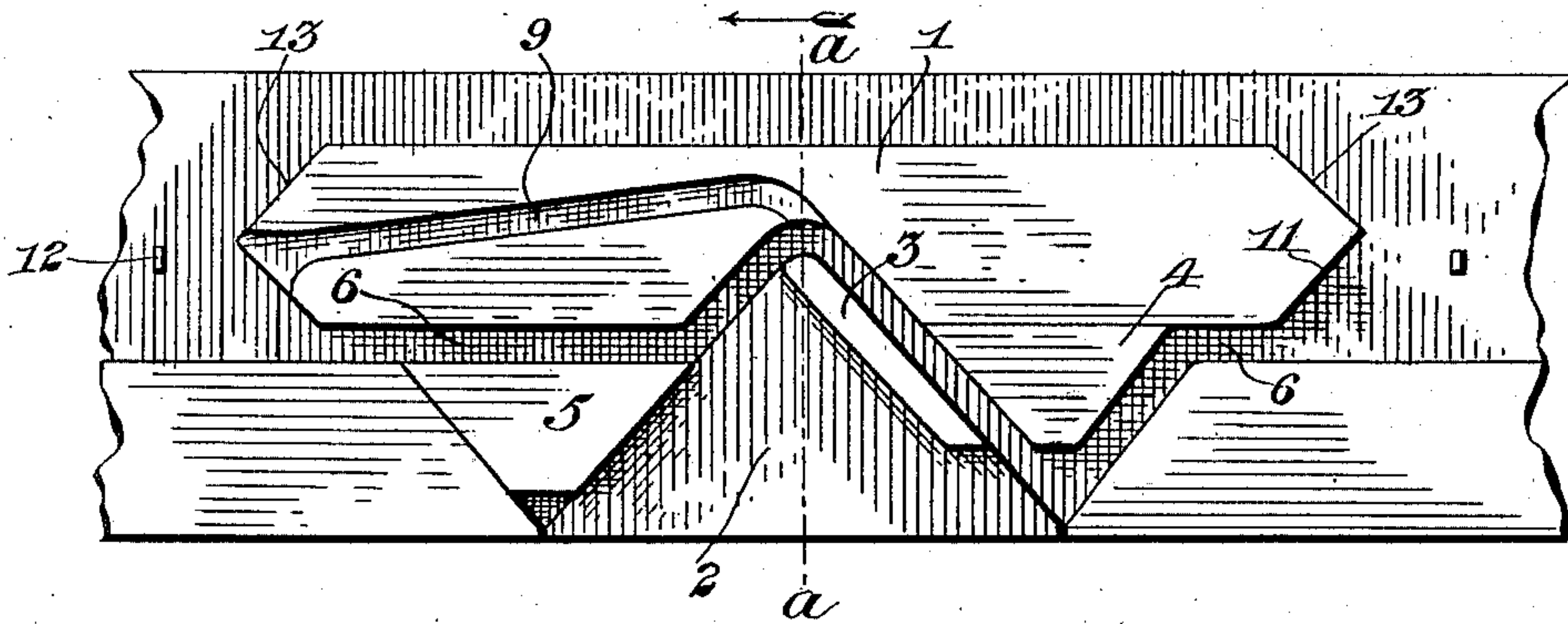


Fig. 2.

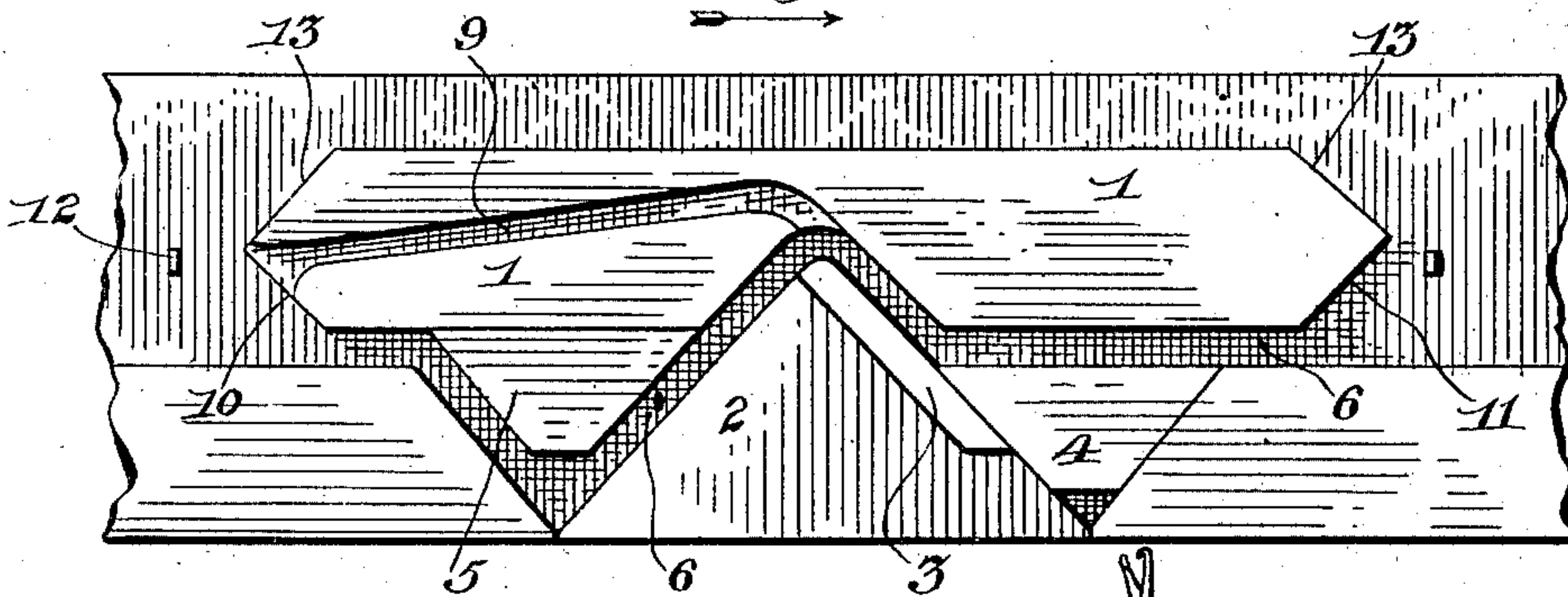


Fig. 3.

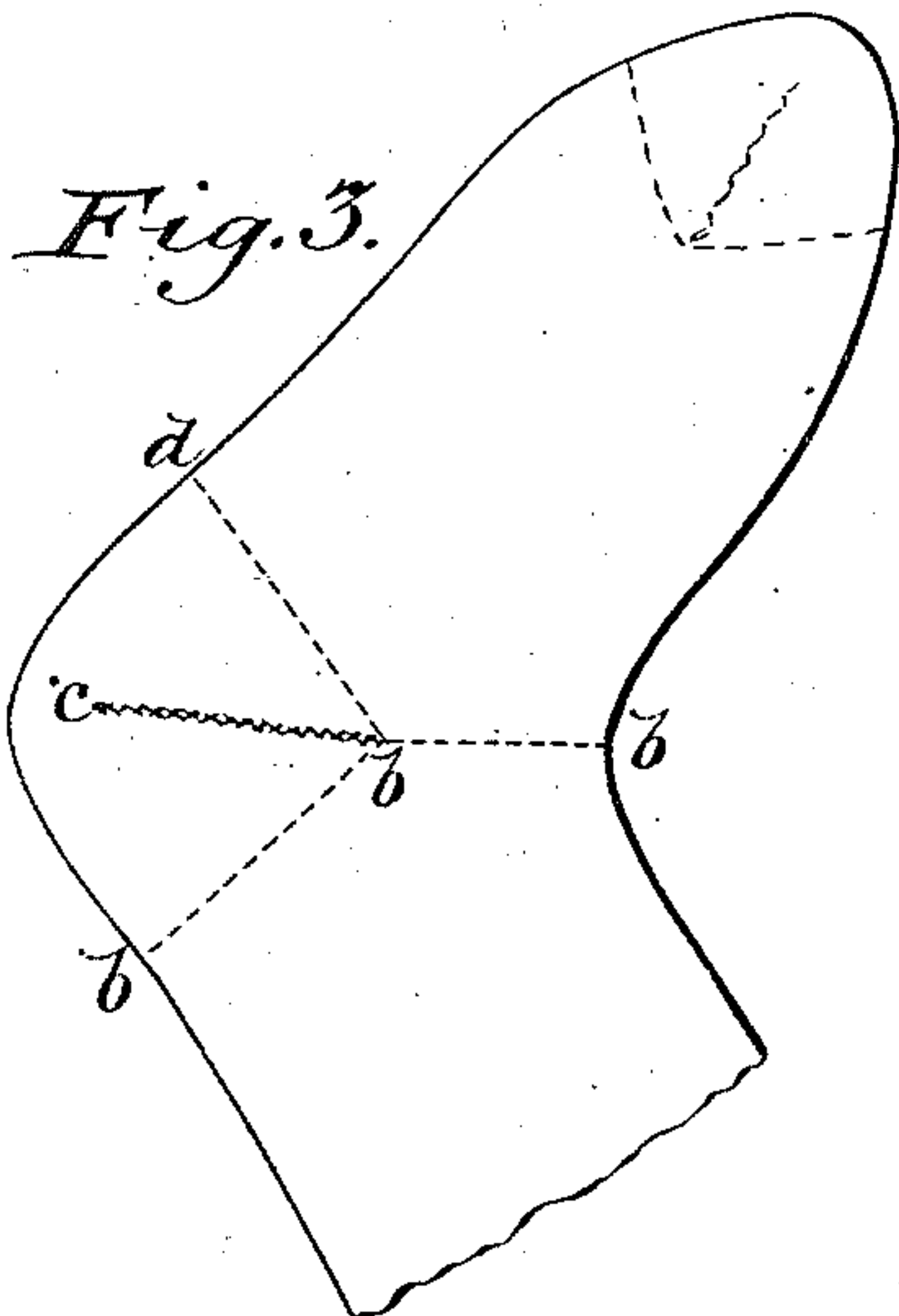
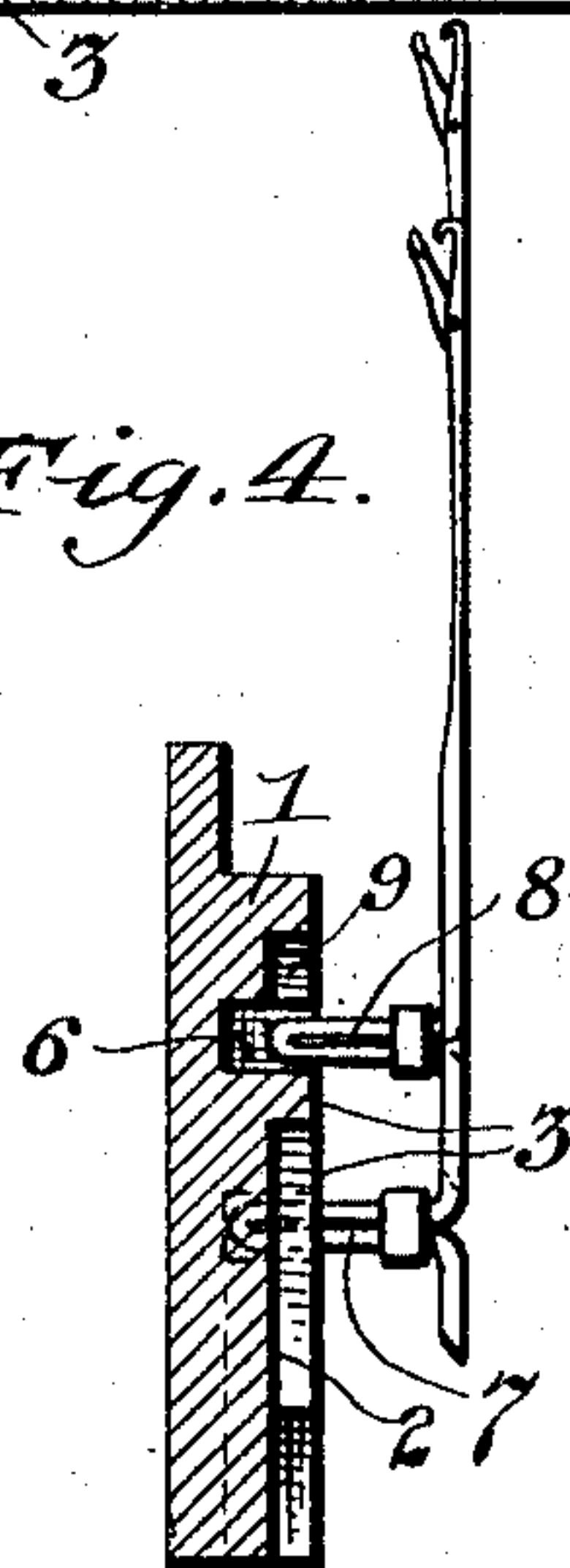


Fig. 4.



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KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 729,005, dated May 26, 1903.

Application filed February 14, 1901. Serial No. 47,335. (No model.)

To all whom it may concern:

Be it known that I, BERNARD T. STEBER, a citizen of the United States, residing at Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in knitting-machines, and has particular relation to the kind of cams which are employed in raising and depressing the needles of the machine.

It consists in certain novel constructions, combinations, and arrangements of parts, which will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of a cam as arranged upon the inner surface of a cam-cylinder, the said cylinder being straightened out for the sake of better illustration. Fig. 2 is a similar view, but showing some of the movable cams in a different position. Fig. 3 is a detail view showing the foot of a sock or stocking. Fig. 4 is a detail sectional view through the cam and cam-cylinder, taken on the line *a a*, Fig. 1, and showing long and short heeled needles in position with respect to the same.

My improved knitting-machine is designed to enable one with a machine of ordinary construction to produce a strong and fancy knitted heel or toe in a stocking, sock, or the like. The kind of stitch which I prefer to use is produced by allowing only a portion of the needles to rise high enough to release their latches from their loops and take yarn for one course of stitches, as in knitting a heel, while the cam-ring revolves in one direction and to allow all of the needles to take yarn and knit for the course of stitches immediately following, the cam-ring having been reversed and moved in the opposite direction to form the said latter course of stitches. I employ, however, needles having long and short heels and use guides or cams particularly adapted for actuating the same.

For the purposes of this invention I arrange the needles around the needle-cylinder of the

knitting-machine in such a manner that the long-heeled needles will alternate with the short-heeled needles. To produce the desired fabric, I so arrange my cams that they will make all of the needles knit while the cam-ring is revolving in one direction; but when it revolves in the opposite direction the long-heeled needles only will be raised, the short-heeled needles being lowered.

In developing this invention in a practical manner I arrange sectional cams, as 1 and 2, upon the inner face of a cam-cylinder of an ordinary knitting-machine. The cam is also provided with adjustable moving sections, as 4 and 5, which are adapted to be raised or lowered for varying the needle-path 6. The construction of the cam-section 2 forms an important feature of the invention, the main body portion of the said cam being made about one-half the thickness of the upper cam-section 1 and the movable cam-sections 4 and 5. Along one edge of the cam 2 is arranged a thickened portion 3, which is made the same thickness as the cam-section 1 and the movable section 4. This construction is peculiarly adapted for use in connection with long and short heeled needles, such as are illustrated in Fig. 4 at 7 and 8. It will be seen that the thin portion of the cam-section 2 will always be reached and engaged by the heels of the long needles 7, no matter in which direction the cam is traveling. The said thin portion of the cam-section 2, however, would not be reached by the heels of the short needles 8. The thickened portion 3 of the cam-section 2 will project far enough from the surface of the cam-cylinders to reach the heels of all the needles, whether long or short. It will thus be seen that when the cam-section 2 moves with the cam-cylinder in one direction—say in the direction indicated by the arrow in Fig. 2—all of the needles will be engaged by the thickened section 3 and be caused to rise and take yarn for the knitting operation. When, however, the cam is moved in the opposite direction, as indicated by the arrow in Fig. 1, the long-heeled needles only will be raised by the thin portion of the cam 2, the short-heeled needles remaining in their lowered position and passing beneath the lower end of the thickened part 3. The movable sections 4 and 5 are changed in their po-

sitions in these two operations, so as to alter the course of the needle-paths 6. When the cylinder is traveling from right to left, as indicated by the arrow in Fig. 1, the cam 4 will be raised, so as to cause the needles to pass beneath it, while the cam 5 will be lowered, so that the needles will pass over it. When the cylinder is moved in the opposite direction, as indicated by the arrow in Fig. 2, the cam-section 4 is lowered, while the section 5 is raised. These cams 4 and 5 may be raised or lowered by any suitable means. (Not shown.)

In knitting a heel or toe of a sock or stocking when the position indicated by the dotted line *b b* is reached I raise about one-half of the needles up out of action and then continue the operation of the machine, turning the cam-ring around once in one direction and then reversing it and turning it completely around once in the other direction, at each turn raising one of the active needles out of action until the required number have been raised for completing the knitting of the first section of the heel or toe—say to the line indicated from *b* to *c* in Fig. 3. It is then necessary to proceed with the knitting of the other triangular section of the heel—namely, that indicated by the letters *b c d*. This is accomplished by continuing the back-and-forth movement of the cam-cylinder and lowering the needles one at a time at each movement of the cam-ring until all of them but the first half, which were originally raised, have been lowered into action. This mode of knitting the heel of a stocking is commonly used in the operation of knitting-machines and is well known to the art. To produce the desired change in the stitch in forming the sections of the heel, however, the present invention affords a simple and novel means by raising all of the needles in one course of stitches and every other needle in the next course of stitches, and so on alternately I am enabled to produce what is known as a "lock" or "fancy" stitch, which makes a strong fabric of the heel portion.

In knitting the second section of the heel, however, it is necessary to guard against the loss of connecting-stitches where the two heel-sections are joined together. This loss would occur if the needles which happened to end the course of each stroke were not caused to take yarn. There of course will be no trouble with the long-heeled needles; but when the short-heeled needles happen to come in play at the turning-point between each stroke of the cam they would fail to receive yarn unless suitable means were employed to accomplish this result, and holes would be left in the fabric at intervals along the line *b c*, where the two triangular sections of the heels are united. I prevent such a difficulty in a simple manner—namely, by the use of an auxiliary needle-path, as 9, formed in the cam-section 1. This needle-path 9 should be made of sufficient depth to

accommodate the short-heeled needles and may, if desired, be made of sufficient depth to accommodate the long-heeled needles as well, although this is not necessary, since the long-heeled needles will be carried into the needle-path 6 by means of the beveled faces 10 and 11 at the ends of the cam-section 1. With the construction just described it will be seen that by depressing the short-heeled needles as they are brought back into action one by one in the knitting of the second section of the heel sufficiently to bring their heels opposite the flaring mouth of the auxiliary path 9, as indicated at 12, the said short-heeled needles will be raised a sufficient height to take yarn and proceed with the knitting operation in the usual manner. It is only necessary to employ such an auxiliary needle-path at the end of the cam-section 1 which is opposite the thin portion of the cam-section 2, since needles which enter the path 6 at the opposite end of the cam will all be raised to take yarn by the thickened part 3.

I form the cam-section 1 with downwardly-facing beveled end surfaces, as at 10 and 11, for returning all the depressed needles to the cam-path 6. I also preferably form the said ends of the cam-section 1 with upwardly-facing beveled end surfaces 13 13, so that if any of the raised needles become accidentally lowered by the jarring or shaking of the machine they will be lifted again above the cam. It will be evident that with a cam of this character all of the needles may be made to perform the knitting operation when the cam is traveling in one direction and that only every other needle will perform the knitting operation when the cam is moving in the reverse direction. Of course the needle-cylinder might be turned with respect to a cam of this construction which was held stationary and the same result be obtained without departing in the least from the spirit of the invention. The fancy stitch thus produced is what is called a "lock-stitch."

It will be noted that by the use of my improved cam mechanism I can produce a beautiful, strong, and durable heel without using any extra strands of yarn. By using this mechanism supplied with the channel or needle-path 9 and by arranging the depressors which are to lower the needles during the process of knitting a heel or toe so they will not depress them any lower than as indicated at 12 in the drawings each and every depressed needle will enter the needle-path 9 at its beveled entrance and will be caused to knit. All of the needles which are depressed on the right-hand side will be guided downwardly by the inclined surface 11, the stitch-cam 4 being down at that time, so as to allow the depressed needles to strike the cam-surface 3. Thus all the needles will rise to take yarn and knit. Whether the needles are depressed by hand or by automatic means before each movement of the cam-cylinder in knitting a heel or toe they will always be in position to

take yarn when the machine is reversed again, provided they are not depressed lower in relation to the needle-path 9 than indicated at 12 in the drawings. It will be noted that by this simple device, requiring no extra adjustment by the operator of the machine, I am enabled to knit a perfect lock-stitch heel, either in a stocking having a plain leg or foot or a leg or foot of fancy stitches, and that the two sections of the fabric comprising the heel or toe will be joined together at every stitch.

Instead of using needles having long or short heels I may of course employ needle-jacks having long and short heels, all of which is within the spirit of the invention. This mechanism can also be applied to flat machines as well as to cylinder machines and will operate equally as well with one as with the other and that needles having either latches or beards may be used. A mechanism of this sort can be used on the simplest hand-machine as well as on the most complicated automatic device, as there are no parts requiring additional adjustment in order to make a machine equipped with this mechanism perform its functions.

It will be noted that the thickened portion 3 is permanently located along the edge or side of cam 2, toward which the machine revolves in regularly knitting the foot portion of a stocking, and also that I use a cam-path, as 6, whose bottom or rear wall is unbroken by any crack or opening, the entire bottom of the cam-path being one continuous uninterrupted smooth surface, whereby is obviated all danger of the heels of needles being caught, as often occurs where a movable piece is fitted in the bottom of the cam-path.

What I claim is—

1. In a machine for knitting the heel or toe of stockings, the combination with a cam-support, of a sectional cam made up of thick and thin sections, the thin section having a thickened needle-engaging portion on one edge, movable thick cam-sections adapted to vary the needle-path, and an auxiliary cam-path for causing all the needles as they are brought into action for knitting the second section of said heel or toe to take yarn in readiness for knitting, substantially as set forth.

2. In a knitting-machine for producing tri-

angular sections of fabric adapted to be joined together to form the heel or toe of stockings, the combination of a fixed cam-section of one thickness, a second fixed cam-section of another thickness, movable cam-sections adapted to operate in conjunction therewith, the said fixed cam-section first mentioned having an auxiliary path formed therein, a thickened portion formed along one edge of the thin cam-section, the structure being such that when employing needles having long and short heels all the needles may be caused to knit in one direction and only every other needle be caused to knit in the other direction, whereby a fabric with a fancy or lock stitch may be produced, substantially as set forth.

3. In a machine for knitting the heel or toe of stockings the combination with needles having long heels and needles having short heels, of means for guiding the said needles in their action comprising a cam having thickened and thin portions, means for guiding some of the short-heeled needles used in knitting the narrowed part of the heel or toe to the widened part of the same into operative action, and means for guiding the short-heeled needles otherwise employed out of action while the cam of the knitting-machine is moving in one direction, substantially as set forth.

4. In a knitting-machine for knitting the heels or toes of stockings, the combination with knitting-needles having heels of different lengths, of a cam having thick and thin portions for raising some of the needles into activity while others are not raised but remain inactive, when parts of the triangular sections for forming said heels or toes are being knitted, and an auxiliary cam-path for returning needles to action, the structure being such that all the needles will be returned to action when knitting the remainder of the said triangular sections and when joining the two sections at their edges, substantially as described.

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

BERNARD T. STEBER.

Witnesses:

FRANK STEBER,
TREVOR D. JONES.