

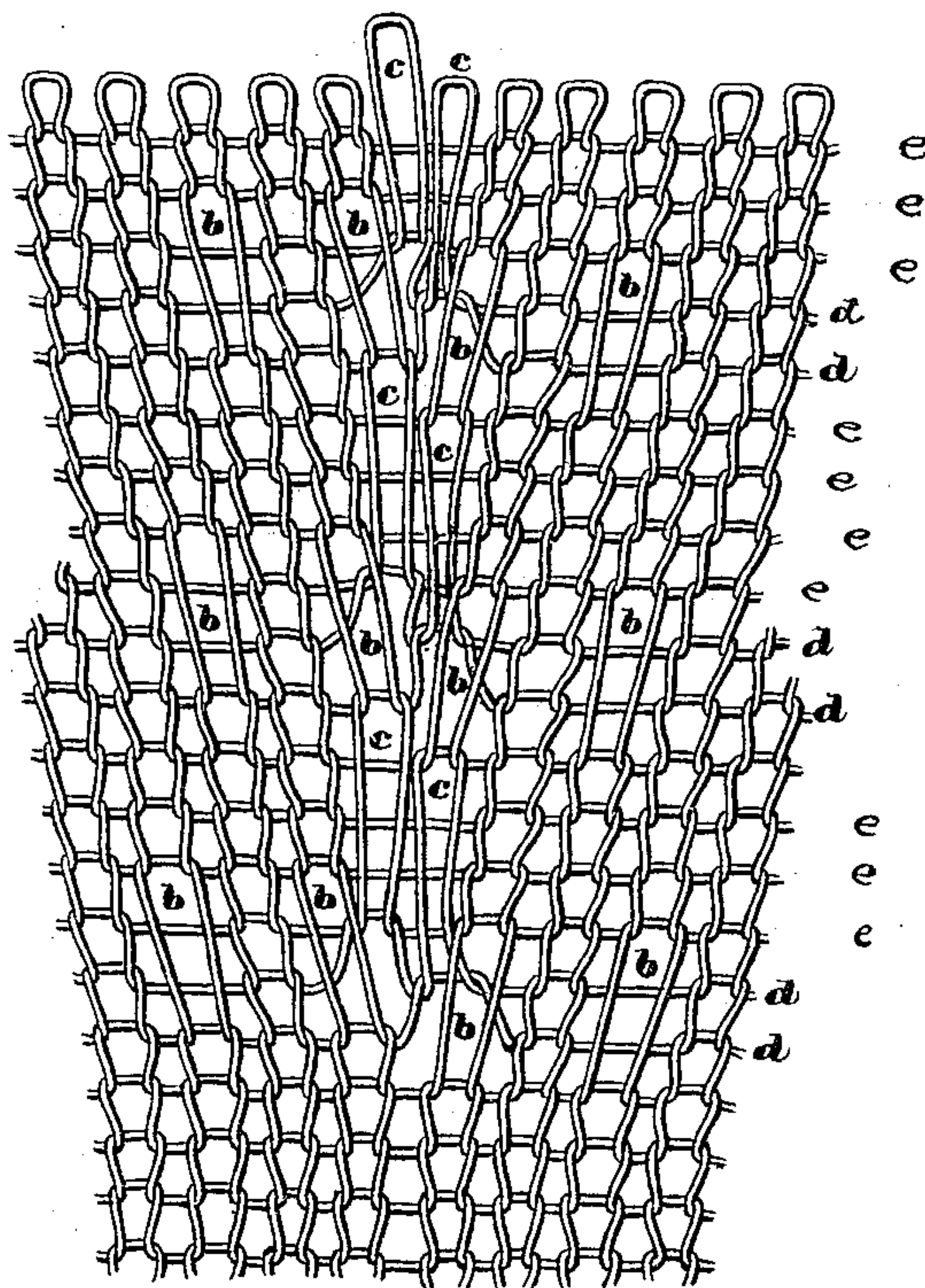
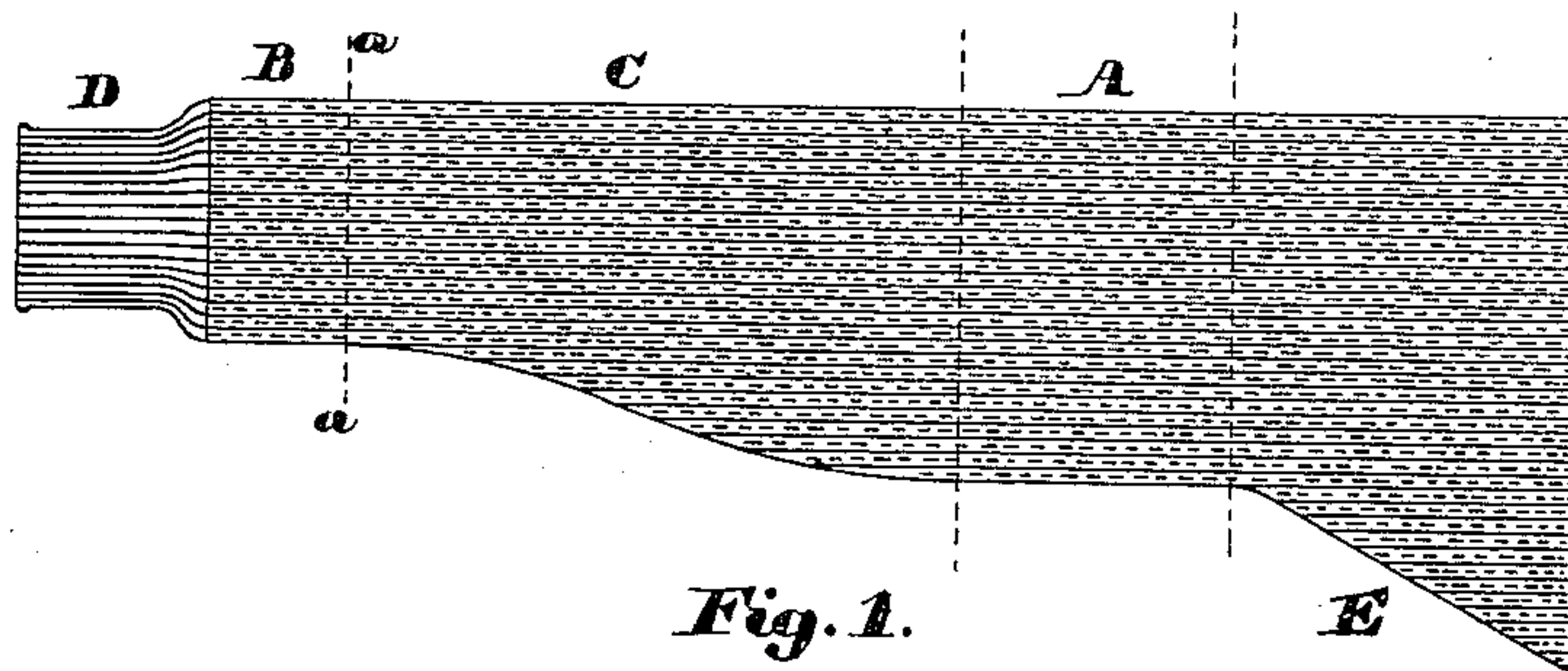
(No Model.)

W. ESTY.

WIDENED TUBULAR KNIT FABRIC.

No. 371,566.

Patented Oct. 18, 1887.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM ESTY, OF LACONIA, NEW HAMPSHIRE.

WIDENED TUBULAR KNIT FABRIC.

SPECIFICATION forming part of Letters Patent No. 371,566, dated October 18, 1887.

Application filed July 2, 1887. Serial No. 243,260. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM ESTY, of Laconia, in the county of Belknap and State of New Hampshire, have invented a new and
5 useful Improvement in Widened Tubular Knit Fabrics, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to the manufacture of
10 widened tubular knit fabrics; and it consists in a novel arrangement of stitches formed from a single yarn extending continuously in the same direction and composing the seam in that part of the fabric where the widening
15 takes place, which will be readily understood by reference to the description of the drawings, and to the claim to be hereinafter given.

Figure 1 of the drawings is a side elevation of a shirt-sleeve illustrative of my invention;
20 and Fig. 2 is an enlarged elevation of a portion of the same, showing the form and arrangement of the stitches which constitute the seam in that part of the fabric where the widening takes place.

25 In the manufacture of my improved widened tubular fabric I use an automatic machine having two sets of needles arranged in rows parallel to each other upon fixed beds, said
30 beds being so inclined to each other that the needles in one row, when moved endwise by the action of the needle-cams thereon, will cross the plane of movement of the other row of needles, said needle-cams being constructed
35 to feed the needles in the front row endwise when said cams move from right to left while the needles in the rear row are at rest, and to
40 move the needles in the rear row endwise when said cams move from the left to the right while the needles in the front row are at rest,
45 or vice versa, the machine being provided with a pivoted or vibrating yarn-carrier constructed and arranged to feed a yarn first to one row of needles and then to the other row of needles, means for moving said carrier over
50 said rows of needles from end to end thereof, and vibrating said carrier at each end of the rows of needles, so that the yarn which is fed to one row of needles when the carrier is moving in one direction will be delivered to the
55 other row of needles when the carrier moves in the opposite direction, and a pattern-chain

for automatically throwing into and out of action the needles for forming the widening seam.

For an example of the arrangement and operation of the yarn-carrier see Letters Patent 55 No. 302,119, granted to me July 15, 1884. For an example of the needles and the pattern-chain for throwing said needles out of action see another application of mine, filed December 12, 1884, No. 150,160, and the Letters Patent 60 No. 247,325, granted to me September 20, 1881, in which one set of needles and the pattern-chain for operating the same are shown, the other set of needles and pattern-chain being placed opposite those shown, with the 65 angle of inclination of the needles and needle-bed reversed, and with the sinker-hooks of the two sets about one-sixteenth of an inch apart; and for an example of the needle-operating cams see Letters Patent No. 39,934, 70 granted to Isaac W. Lamb, September 15, 1863.

In the drawings, A and B represent portions of the fabric which are knit straight, or with a uniform number of stitches in each course of either section, but with a different number 75 of stitches in the courses of A from those in B, and C is a section located between and connecting A and B, and in which the widening to give the taper to the fabric takes place. This widened tubular fabric may be a stock- 80 ing, the sleeve of a shirt, the leg of a pair of drawers, or any other tapered tubular knit fabric, and is knit by commencing at the small end and at the proper times widening to increase its diameter and give the desired taper 85 thereto.

If a shirt-sleeve is to be knit, the wristband D is first knit and then a straight tubular portion, B, is knit, extending to the line *a*, when the widening begins. Up to this point a uni- 90 form number of needles have been in action, and each course knit contains the same number of stitches. When the point for beginning the widening is reached and the yarn-carrier is at the right-hand end of the rows of needles, 95 an additional needle at the opposite end of the front row of needles is thrown into action, and the end needle of said row previously in action and next to said new needle and the third needle from said new needle are thrown out of 100 action, and two courses, *d d*, are knit. The new needle catches the yarn of the first course

d and draws it into a loop; but as there is no stitch upon said new needle to draw the new loop through said yarn is held by the hook of said needle till said needle is again advanced to seize the yarn of the second course *d*, when the latch of the needle is carried through the loop held by said needle, and as the needle again recedes the loop *c* of yarn seized from the second course *d* is drawn through the loop first seized and the latter is cast off. Previous, however, to said second course *d* being knit, and while the carrier is at the right-hand end of the rows of needles, or when one-half of said second course has been knit and the carrier is at the left-hand end of the rows of needles, a new needle at the left-hand end of the rear row of needles is thrown into action, and the needle next to said new needle and the third needle therefrom, and previously in action, are thrown out of action, and as the carrier is again moved to the right the new needle of the rear row last thrown into action catches the yarn and draws it to the rear side of the machine and holds it until the carrier returns to the left-hand end of the row of needles, when said new needle is again projected forward, carrying the latch of the needle through the loop previously seized, and as the carrier again moves toward the right said new needle seizes the yarn delivered therefrom and then recedes and draws the loop *c* of said yarn through the loop previously seized by said needle and casts the latter off. When the carrier has reached the right-hand end of its reciprocation, after having delivered the yarn of the second course *d* to the new needle last thrown into action from the front row of needles, said needle is again thrown out of action, still holding the loop *c* of yarn last seized thereby, and at the same time the two needles in the same row last previously thrown out of action are again thrown into action, another course, *e*, is knit, the new needle last thrown into action from the rear row of needles is again thrown out of action, still holding the loop *c* last seized thereby, and at the same time the two needles in the same row previously thrown out of action are again thrown into action and the loops *b b* held thereby are knit in the next succeeding course. Two or more courses *e e* are knit upon the original number of needles in each row after the new needles which were thrown in have been thrown out of action again, and then the new needles are again thrown into action and the loops *c c* carried thereby are knit into succeeding courses, the throwing into and out of action of the needles in the rear row taking place one course later than the same actions take place in the front row of needles. These operations are repeated as often as it is desired to widen, and are continued until the point is reached where it is desired to discontinue the widening, the widening upon one side of the seam occurring in each case one course later than upon the other side thereof.

When the widening is completed, any de-

sired number of courses are knit upon the needles then in action without adding to or subtracting from said number to complete the straight portion A, and then the gusset E is knit by widening, as before.

When completed, the seam of that portion of the fabric where the widening is done will consist of a series of repetitions of the following features—viz., one or more courses of yarn extending continuously in one direction, as *d d*, a plurality of loops, *b c*, upon each side of the widening seam drawn from a lower course over said first-mentioned course or courses and knit into a course above, one of said loops upon each side of the center of the seam being carried up by a new needle being thrown into action, as heretofore described, thus increasing the number of stitches in the course and widening the fabric.

My present invention may be made upon the same machine as the fabric described in another application of mine, filed May 5, 1887, Serial No. 237,205, by threading only one end of the yarn-carrier and so setting the pattern-chains relative to each other that the throwing into and out of action of the needles in one row of needles shall take place one course later than the same movements take place in the other row of needles, and modifying the needle-operating cams so that the needles in one row will be moved endwise while the cams are moving in one direction and the other row of needles are at rest, and when the cams move in the opposite direction the needles previously at rest will be moved endwise and the needles in the other row will remain at rest.

This invention is an improvement upon the invention described in said prior application, No. 237,205, in that the seam or rib upon the side of the tube opposite to the widening seam, caused, in said prior patent by the crossing of the yarns, is entirely eliminated from the fabric when formed from a single yarn, as herein described, and the openings in the widening seam will be reduced in size, thus making a more desirable article.

The object of forming the portion of the seam where the widening takes place in the manner hereinbefore described is to more tightly close up the openings which would be formed were only one loop upon each side of the seam drawn from a course over one or more courses and knit into a succeeding course, and at the same time to render said seam more elastic than it otherwise would be.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

A widened tubular knit fabric having the seam in that portion where the widening is done composed of a series of repetitions of one or more courses of a yarn extending continuously in one direction, as *d d*, and a plurality of loops upon each side of the center of said seam drawn from a course below over and above said first-mentioned courses and knit

into a course above the same at each widening, one of said loops upon each side of the seam increasing the number of stitches in the course into which it is knit and widening the
5 fabric.

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

subscribing witnesses, on this 27th day of June, A. D. 1887.

WILLIAM ESTY.

Witnesses:

N. C. LOMBARD,

WALTER E. LOMBARD.