

(No Model.)

2 Sheets—Sheet 1.

J. COOPER.

WARP KNITTING MACHINE FOR KNITTING ELASTIC FABRICS.

No. 471,350.

Patented Mar. 22, 1892.

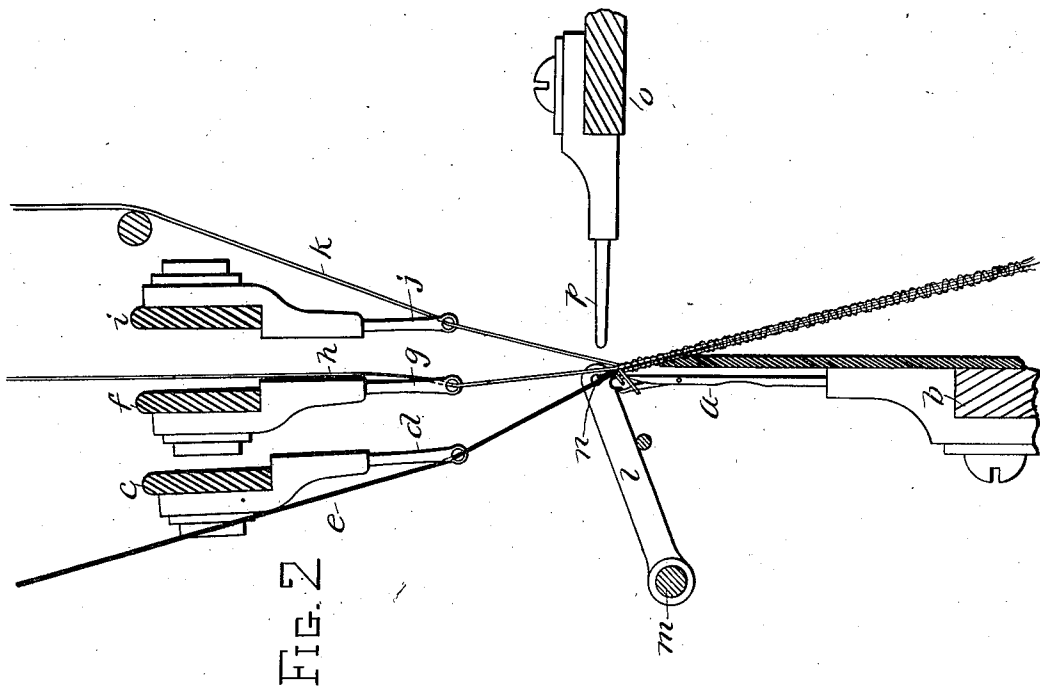


FIG. 2

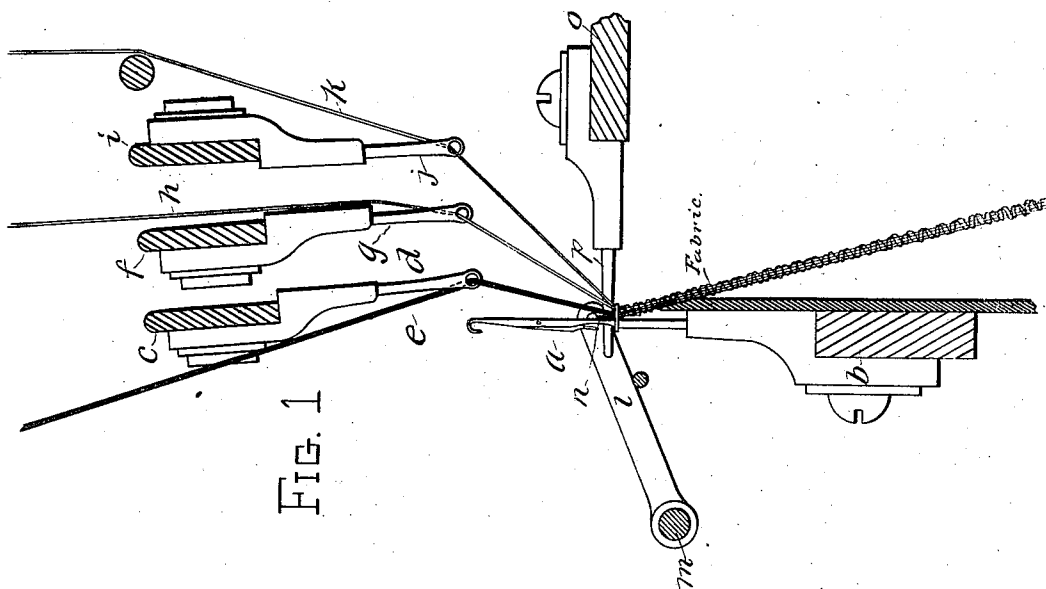


FIG. 1

WITNESSES.
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(No Model.)

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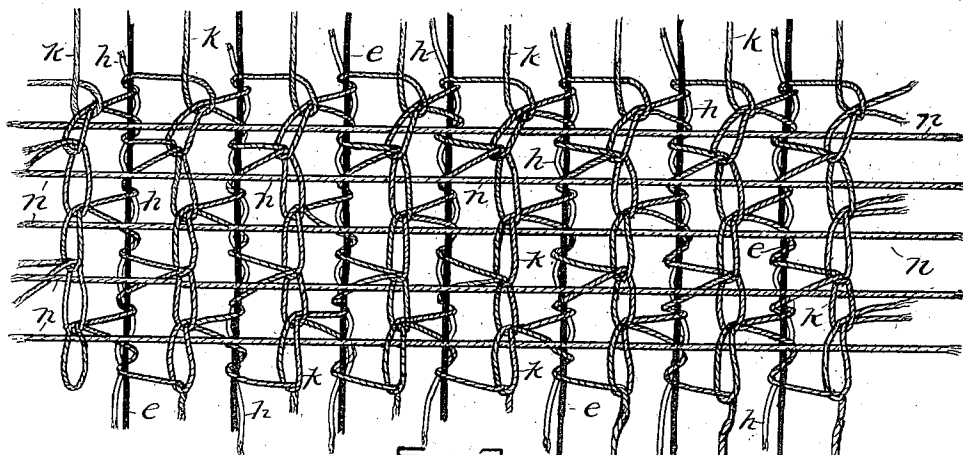


FIG. 3.

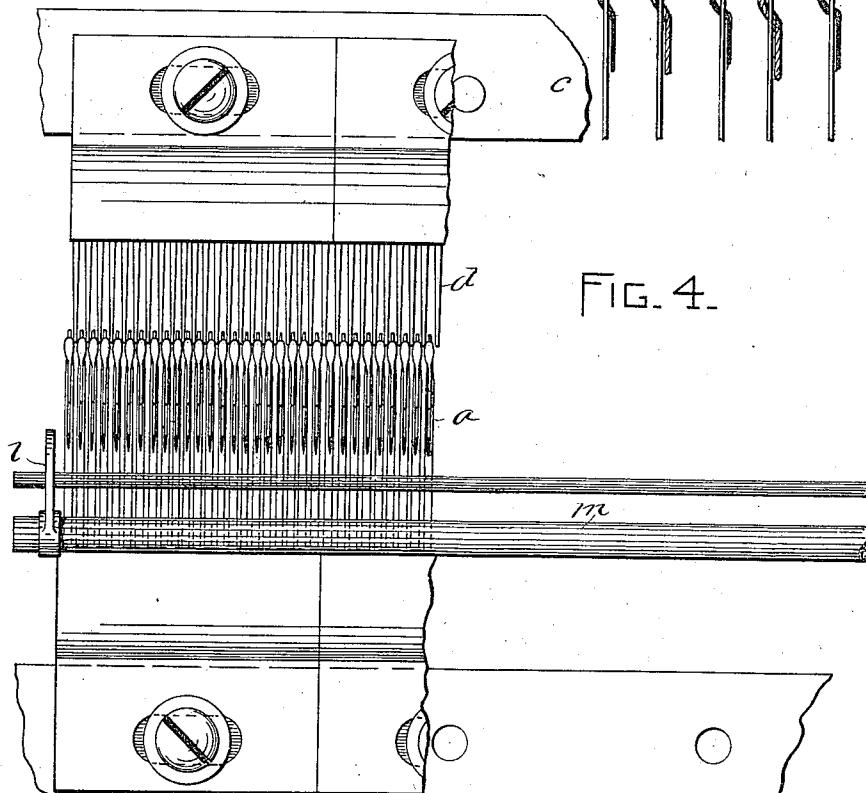


FIG. 4.

WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN COOPER, OF CANTON, MASSACHUSETTS.

WARP-KNITTING MACHINE FOR KNITTING ELASTIC FABRICS.

SPECIFICATION forming part of Letters Patent No. 471,350, dated March 22, 1892.

Application filed June 12, 1891. Serial No. 395,978. (No model.)

To all whom it may concern:

Be it known that I, JOHN COOPER, of Canton, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Warp-Knitting Machines for Knitting Elastic Fabrics, of which the following is a specification.

The invention has relation to means for producing elastic-warp knit fabrics suitable for use in the manufacture of gores for the ankle portions of certain kinds of shoes and also for suspenders and other garment-supporters, &c.

It is the object of the invention to provide such improvements in means of the kind mentioned as will enable elastic knit fabrics to be economically and expeditiously manufactured, as also to provide for the making of durable and serviceable goods.

The invention to the aforesaid ends consists in combining with a series of vertical needles a weft-guide movable along the series of needles, warp-guides for laying strands of rubber upon the backs of certain of the needles, warp-guides for laying covering or backing threads upon the backs of the needles, warp-guides for laying warp-body threads into the hooks of the needles, and points for entering between the needles to hold back the web as the needles rise to receive yarn for the formation of new loops, all as is hereinafter more fully described, and subsequently pointed out in the claim.

Reference is to be had to the annexed drawings and the letters marked thereon, forming a part of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 is a diagram, partially in section, illustrating my improvements, the needles (only one being seen) appearing in raised position. Fig. 2 is a diagram somewhat similar to Fig. 1, the needles being shown as depressed and about to form a new loop. Fig. 3 is a face view of the fabric produced by the improved means, the said fabric being represented as greatly stretched or distended and exaggerated as to length of loop and size of mesh. Fig. 4 is a diagram representing a front view of the improved means, Figs. 1 and 2 being side or end views.

In the construction of my machine I pro-

vide a row or rank of needles *a*, connected with a needle-bar *b*, adapted to be reciprocated vertically, or make provision of other suitable means whereby the needles may be raised and lowered. The needles here shown are self-acting or latch-needles, though it will appear obvious that bearded needles and pressers might be employed instead.

c is a bar provided with guides *d*, each for carrying and laying a strand of rubber or caoutchouc *e* on the backs of certain of the needles by moving from side to side over a pair of the same and then moving forward between pairs of needles, so as to be out of the way of the operation of the other guides, hereinafter described.

f is a bar provided with guides *g*, adapted to carry the covering or backing threads *h* and to be moved to lay the said threads upon the backs of pairs of the needles and then be moved forward between pairs of needles in a manner similar to that in which the guides for the rubber strands are operated.

i is a bar provided with guides *j*, adapted to carry the warp-threads *k* and lay the same into the hooks of the needles in a manner commonly practiced in the knitting of so-called "warp-knit fabrics," and knit the face fabric and at the same time the rubber and covering threads in and upon the face fabric.

l is a guide movable longitudinally on the rod *m* and adapted to carry a weft-thread *n* and lay the same in upon the loops on the back of the needles.

o designates a bar provided with points *p*, adapted to be projected between the needles as the latter are raised to receive thread for new stitches and hold the web or loops down on the stems of the needles and to be withdrawn when the needles descend in the act of forming a new loop.

In the operation of my improvement after the needles have drawn a new loop and have slightly risen, or at other convenient time, the weft-guide *l* is moved along the row of needles to lay the weft-thread on the loops back of the needles, and after the latter have risen to their full height the guide-bar *c* will be shogged to lay the rubber strands on the backs of the needles, each guide *d* moving to the extent of two needles—that is, so as to lay each of the rubber strands *e* across the backs

of two or a pair of needles—when the said guide-bar will be rocked so as to move each guide forward between the pair of needles over which it operates and adjacent needles, in order that the said guides and rubber strands may be out of the way of the guides and threads to be subsequently operated, and the bar *f* will be actuated in like manner to also lay the covering-threads *h* on the backs of the needles and to get the guides connected therewith and the threads carried by the guides out of the way of the warp-guides and warp-threads. The bar *i* will next be operated to cause the guides *j* to lay the warp-threads *k* in the hooks of the needles in a manner common and well known in the art of knitting what are known as “warp-knit fabrics.” The next and final step will be the drawing or depression of the needles to form a new row of loops, as is shown in Fig. 2, where the needles are represented as about to draw the new loop through the old and cast off the latter. During the last-mentioned operation the guide-bars are rocked so as to move the guides back on the same line as that upon which they were moved forward to the position represented in Fig. 1. When the needles start to ascend after forming a series of new loops, the point-bar *o* will be moved forward, passing the points *p* between the needles, as represented in Fig. 1, and so hold the web or loops down upon the stems of the needles. The result of these operations will be to form a fabric like that represented in Fig. 3, where in the rubber strands *e* and the covering-strands *h* are bound upon the body or face fabric formed from the warp-threads *k* by the latter. The threads *h* form an inside facing for the fabric and cover the rubber strands and do not at any place appear on the right side or outer face of the goods.

It will be understood, of course, that the fabric shown in the drawings is represented as greatly distended in the direction of the rubber threads, so that the latter have the appearance of extending upon a straight line in the goods and as though the guides carrying the same had not been shogged at all, and the threads *h* appear to run on a waved line on the backs of the rubber strands *e*; but this somewhat peculiar position of the several threads is due to the distortion of the web incident to the stretching of the fabric.

When the fabric is distended, as shown, the rubber strands and covering-strands *h* will be drawn to position between the lines of loops formed by the warp-knitting threads *k* and the portions of the latter extending between the lines of loops will have the appearance of being wrapped around the strands *e* and *h*, though, in fact, in the process of knitting the strands *e* and *h* are lapped around or upon the threads *k*, all as will be understood by persons skilled in the knitting art without further description.

In the production of a fabric such as is represented in Fig. 3 of the drawings, the knitting will have been begun at the top and ended at the bottom—that is, the loops at the bottom represent those last formed.

The several bars may be moved to cause them to perform the functions ascribed to them by hand or any suitable instruments or contrivances properly arranged and actuated; but such means form no part of my present invention.

The fabric herein shown and described constitutes no part of the present invention, the said fabric forming the subject of a separate application for Letters Patent filed of even date herewith, Serial No. 395,977.

Having thus described the nature of my invention and explained a way of constructing and using the same, I declare that what I claim is—

A machine for knitting elastic-warp knit fabrics, comprising in its construction reciprocating needles, a weft-guide for laying a weft-thread on the loops back of the row of needles, a bar and guides for laying rubber strands on the backs of the needles, a bar and guides for laying covering or backing threads on the backs of the needles, a bar and guides for laying threads into the hooks of the needles to form a regular warp-stitch, and a point-bar and points for entering between the needles to hold the loop down on the stems thereof as the needles rise, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of June, A. D. 1891.

JOHN COOPER.

Witnesses:

ARTHUR W. CROSSLEY,
A. D. HARRISON.