(No Model.)

R. WARD.

KNIT FABRIC.

No. 283,047. Patented Aug. 14, 1883.

Fig. 2.

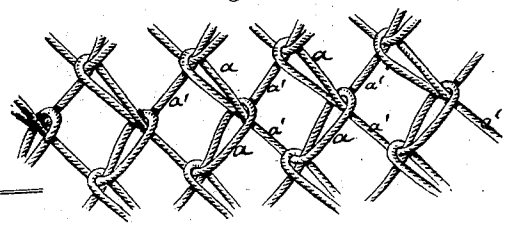


Fig. 4.

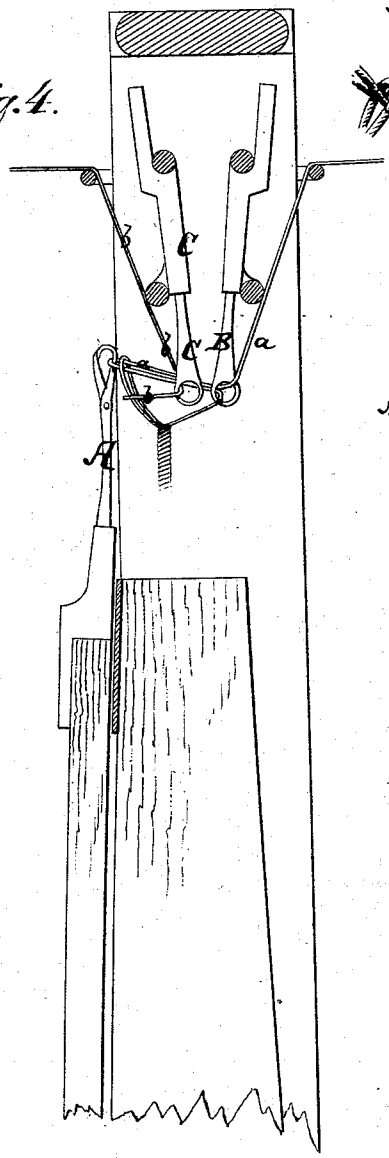


Fig. 3.

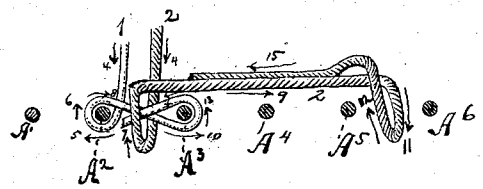
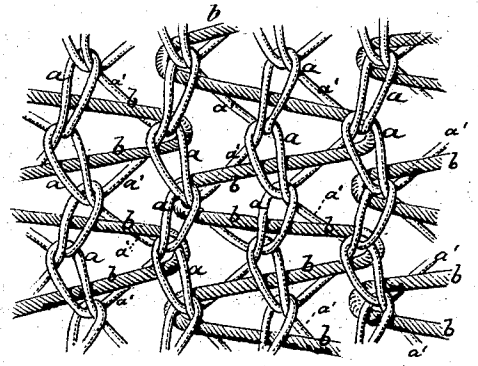


Fig. 1.



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KNIT FABRIC.

SPECIFICATION forming part of Letters Patent No. 283,047, dated August 14, 1883.

Application filed February 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, ROBERT WARD, of South Orange, in the county of Essex and State of New Jersey, have invented an Improved Knit Fabric, of which the following is a specification.

Figure 1 is an enlarged face view of my improved knit fabric. Fig. 2 is a face view, on an enlarged scale, of the ground fabric by which the figure-thread is held in my structure. Fig. 3 is a diagram showing the manner of laying the threads in the machine, and Fig. 4 is a sectional elevation of a knitting-machine on which my fabric can be made.

This invention relates to knit fabrics; and it consists in a new fabric composed of ground-threads forming interlocking loops that are connected by strands, and of figure-threads held solely between said loops and said strands, and laid in zigzag form, all as hereinafter more fully described.

In the accompanying drawings, with more particular reference to Fig. 1, the letters *a* represent the upwardly-extending loops of the body-threads of my new fabric, which loops, if the body-threads alone are considered, as appears by the diagram, Fig. 2, are of the usual arrangement of knit fabrics as made on the knitting-machines known as a "rotary warp-knitting machine" of ordinary kind.

b b are the figure-threads, which, as appears clearly from Fig. 1, are each laid in zigzag line beneath the several loops *a*, but above the several strands *a'* of the ground fabric that connect these loops. In other words, the bend of each figure-thread *b* at each angle of the zigzag line which it describes embraces two strands, *a'*, as they pass through one loop, *a*, to become the next loop above. Thence the thread *b* extends under another loop *a*, and then reaches another pair of interlocking loops *a*, in line with the junction of which it makes the return-bend of the zigzag line. The figure-thread, being placed beneath these several loops *a a*, but over the connecting-strands *a'*, is firmly held in place, and at the same time, by its tension, tends to distort the meshes of the foundation fabric to a certain extent, as will appear from a comparison of the foundation fabric, as shown in Fig. 2, with its condition when holding the figure-thread, as shown in Fig. 1.

The fabric thus constructed is by preference made entirely of wool, and is closely knit for ordinary uses, and then teaseled or napped on both sides, producing thus a woolly nap, which nap can be very close, thereby producing a knit and consequently elastic fabric which, when used for articles of underwear, will bring the woolen nap in contact with the body. Nevertheless this new fabric invented by me can also be used with advantage when made entirely of cotton threads, or partly of cotton and of woolen threads, or of silk, or of any desired mixture of these or other substances in the threads that are employed in its make.

The manner of producing this fabric upon an ordinary knitting-machine is very simple. Thus in Fig. 4 is illustrated a vertical section of an ordinary knitting-machine having needles A, that are placed in a row, as indicated in horizontal section, Fig. 3. These needles are usually spaced so that they are about twelve to an inch in one row; but of course the distances between them may be varied according to the quality of work to be produced or the thickness of yarn employed. The threads *a* for the groundwork are passed through guides B, there being one such guide to every needle A. The threads *b* for the figure are passed through guides C, which are also spaced in harmony with the spacing between the needles. The guides B and C are capable of longitudinal motion—that is to say, horizontal motion parallel with the row of needles—and also transverse motion—that is to say, motion at right angles to the line of needles—and the motions are substantially as follows: The ground-thread 1 is by its guide B first moved laterally from the position which that guide is shown to occupy in Fig. 4 into the space between two needles—say A^2 and A^3, Fig. 3—the arrow 4 in Fig. 3 showing the direction of this movement. Then this thread is carried around the needle A^2, (see arrows 5 and 6,) and then in the direction of the arrows 8 and 10, from the inner side of the needle A^2 to the outer side of the needle A^3, then half-way around said needle A^3, as by arrow 13, and then from the inner side of the needle A^3 to the outer side of the needle A^2, (see arrow 14,) and so forth, describing the figure 8 about these two needles. The figure-thread 2 is car-

ried by its guide C at first in the same direction as the thread 1 into the space between the needles A^2 and A^3—that is, in the direction of the arrow 4—and then remains at rest for a while, to enable the thread 1 to be laid in the space between the two needles A^2 and A^3, as shown in Fig. 3. Then the figure-thread is moved in the direction of the arrow 7 above said 8-shaped part of the ground-thread 1, and then the figure-thread is carried in the direction of the arrow 9 past the needles A^3 A^4 A^5 (more or less) into line with the space between the needles A^5 and A^6, is then carried into said space, as shown by the arrow 11, remains at rest again for a while to allow an 8-shaped portion of another ground-thread to be formed between the needles A^5 A^6, and is then carried in the direction of the arrow 12; thence in the direction of the arrow 15 into line with the space between needles A^2 and A^3, and so forth. Thus the figure-thread will, whenever it loops around an 8-shaped part of the ground-thread, engage with said ground-thread in the manner indicated in Fig. 1.

It is understood that whenever the thread 1 is laid around a needle it is placed there to form a mesh, the needle being moved vertically at intervals and actuated in connection with sinkers in manner usual with knitting-machines. In fact there is nothing new in the machine invented by me. The needles may be the common latch-needles—such as are shown in Fig. 4—or may be barbed needles. Their motion may be controlled by any of the well-known mechanism. The guides B and C are attached to guide-bars in the usual manner, and motion is imparted to them in the required direction either by hand, if the operation is to be done on a small scale, or by suitable cams in the machinery usual in such cases.

From the description of the manner of producing the fabric hereinabove given it will be clear that the thread 2, which in the completed fabric is the thread *b*, is brought in between two needles in such a way as to engage upon the two interlocking loops at the bend of the zigzag, and is then carried behind three needles, behind which the longer parts of the zigzag strands extend until it again engages the crossing of two loops, and then returns behind three needles, and so on. Of course, instead of extending the figure-threads behind three needles, it may extend only behind one needle, or two, or more than three needles, the substantial effect being the same—namely, that of placing the figure-thread behind the loops *a* and in front of the strands *a'* of the knit ground-work. After the fabric is finished it may be napped or teaseled in suitable manner, to produce the surface effect desired, either on one side only or on both sides.

The diagram Fig. 3 shows only one ground-thread and one figure-thread, it being clear that a ground-thread is entered between every pair of needles and a figure-thread between every other pair, or at larger intervals, if desired.

I claim—

The knit fabric composed of ground-threads forming interlocking loops *a a*, that are connected by strands *a'*, and of the figure-threads *b*, that are held solely by and between said loops *a* and said strands *a'*, and laid in zigzag form, substantially as described.

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