

D. BICKFORD.

Improvement in Knit-Fabrics and Method of Knitting.

No. 131,387.

Patented Sep. 17, 1872.

Fig. 1.

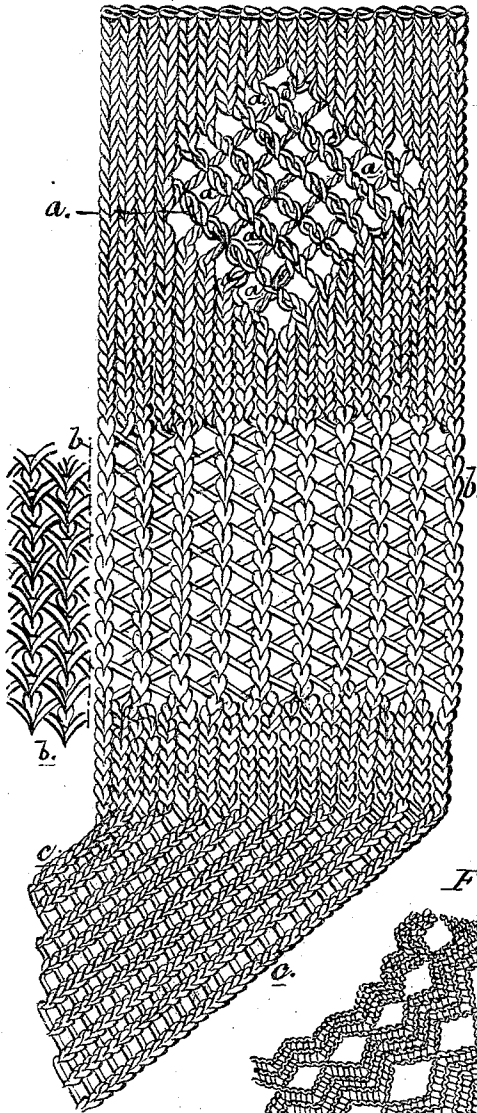


Fig. 2.

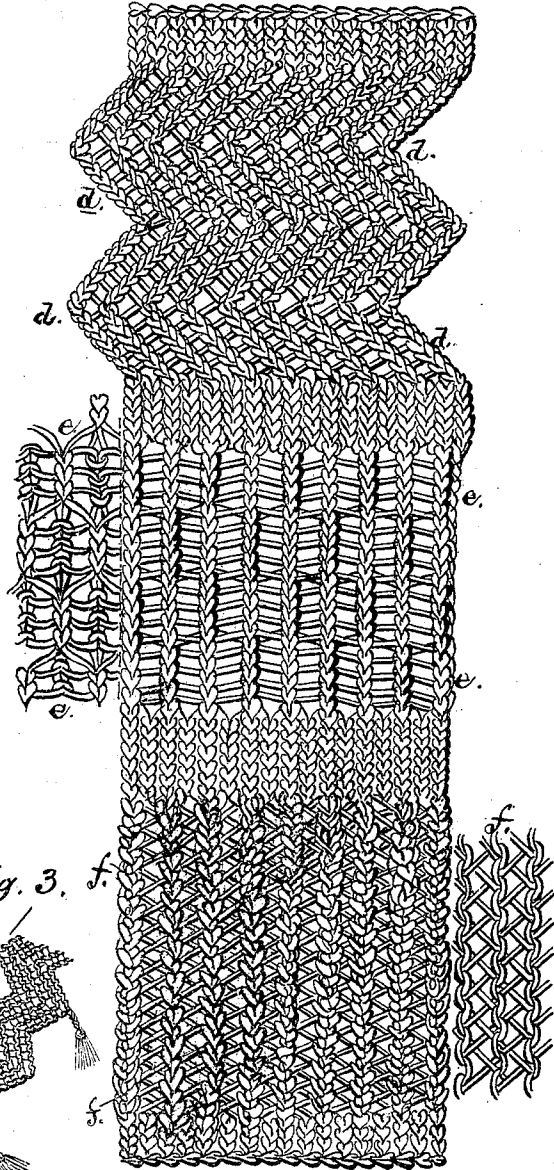
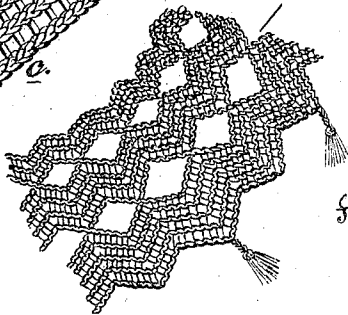


Fig. 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN KNIT FABRICS AND METHODS OF KNITTING.

Specification forming part of Letters Patent No. 131,387, dated September 17, 1872.

To all whom it may concern:

Be it known that I, DANA BICKFORD, of the city, county, and State of New York, have invented a novel Method of Knitting by Machinery, and novel stitches, fabrics, and products made by such method; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My novel stitches and fabrics and method of knitting, herein described, are made and practiced on the Bickford family knitting-machine, having a rotary motion in either direction, and having a circular cylinder with vertically-reciprocating needles. The essential conditions for the successful and economical practice of these improvements are that the needle-cylinder or cam-cylinder may be instantly reversed to operate the needles and supply them with yarn without obstruction from the cams, switches, yarn, yarn-carrier, or from any latch-opener or other impediment, and without any detriment from a sudden change from tight to slack yarn, or vice versa, or from any material variation in the tension of the yarn. The operations are, however, facilitated by having the yarn-spool revolve about the machine and shift position coincidently with the yarn-carrier or delivering-guide, so that they shall always preserve the same relative position to each other, whereby no yarn can be drawn from the spool except as it is needed for each successive stitch, and no tension device or take-up is needed; such construction being shown in a machine for which I made application for a patent on March 19, 1872.

In the drawing are illustrated a representative group or series of novel fancy stitches and fabrics made on my machines, and the method of making which on reversible machines I will now proceed to describe.

Figure 1, at its upper part, represents, at *a*, what I have designated as the "diamond stitch," which I make as follows: "Set up" the work on the number of needles desired, which, for this stitch, should be an odd number. Now, knit plain, back and forth, as many rows as desired; then, for the first diamond, take the loop from the center needle and pass it to the next needle, either to the right or left—say, to the left—then knit a row, and this forms a loop or gap, but not a stitch; then reverse—that is, knit back again—and this forms the

perfect diamond-stitch. Now, to make the next two diamonds, transfer a loop from the needles on each side of the center one, placing them on the needle to the right; now knit as before, making a half-loop for the two diamonds, and reverse, to complete such two diamonds; then, to make the next row (of three diamonds) transfer from three to two, from one to four, and from five to six, and knit one way and back; this will complete the next row of diamonds—that is, three diamonds—and so on, until the widest range of diamonds is made. Now, to lessen the number of diamonds in each row take the loops from the needles between, and not, as before, from those opposite the open spaces or gaps of the diamond, and transfer to the right, &c. When increasing, always transfer in the direction outside the outer diamond. To decrease, always transfer in the direction inside the outer diamond. To make letters—say, L—make a row of diamonds commencing at the top, and then a row at the bottom. Squares, monograms, or any letters or figures can be made by this method. The combination of these small diamonds may be varied *ad libitum*.

The zigzag-stitch, shown in Fig. 1 at *b*, is made as follows: Commence by removing the loop of each and all of the needles to the next adjacent needle for as many needles as are wanted for the breadth of zigzag to be made; then knit across and see that the loops are on the needles, the loops being apt to slip off; but a loop will not, however, if slipped off, cause the goods to ravel as if it were a full stitch dropped. Now, remove all the loops to their next adjacent needle, but in the direction opposite that to which they were before changed or passed in transferring; then knit across again, forming loops as before, and then transferring as before, but in the opposite direction, and then reverse, and continue this. No complete stitches are made by the loops, the loops forming the open-work. This open-work may be alternated with regular knitting at option.

In the same piece the diamond, the zigzag, and the various other stitches, hereinafter described, may be all made in the same row across, so that each style would be formed in a longitudinal row in the same strip. So also they may be made to succeed each other to form a tippet, a stripe for an Affghan, quilt, &c.

The spiral rib, shown in Fig. 1 at *c*, is made by the same process as in the zigzag, except that the transfer of the loops is always made

in one or the same direction, giving in flat goods diagonal ribs, and which, in the tubular goods, becomes a full spiral; hence the name.

The herring-bone, shown at *d* in Fig. 2, is the same, except that after running the spiral or diagonal as far as desired the loops are then transferred in the opposite direction, and the knitting continued so as to knit the rib in that direction only as far as desired, by transferring in that direction only. The diamond, or any other style capable of being made by mere transferring, or, indeed, any style of which the machine is capable, may be intervened, if desired, between the herring-bones. This herring-bone piece leaves the edge of the strip pointed or scalloped, and, by uniting the corresponding points of two such strips, each, say, of different color, a beautiful tidy is made, having spacious diamond openings between them, inclosed by the two joined strips. The points I unite together by hand or by a third uniting-thread; but the complete knitted strip is connected to the other strip while under the process of being knitted by simply taking the loop at each point of the completed piece and hooking it at the proper time onto the needle, which is to form the loop at the next point of the other strip being made. The ends of the tips of each strip are narrowed or widened in the usual manner by simply throwing out of action or calling into action such needles (more or less, at each end of the series being used) as may be desired.

To make a circular tidy or mat, proceed as follows: A series of herring-bone strips are united together in concentric circles around a central piece. Each outer strip (being of larger circle than its next inner one) has more stitches in each row of its herring-bone—that is, say two stitches in the first strip, three stitches in the second strip, four in the next larger, and five in the next larger, and so on—the tips of each being united to the tip of the other, as named in the flat tidy. The central piece may all be made in the same manner—that is, the whole tidy made of a series of concentric circles—or the center may be made of other material or fabric and the united concentric knitted rings fastened thereto. The ends of all the strips are united by hand after they come from the machine and after their tips have been joined. The joining of the tips of itself brings the union strip to a circular form, so that their ends are about in position to be joined. The made strip (as in the other case) is united to the strip being made. The number of courses in each larger circle or strip should be greater (say, one or two more) than the next inner one. To make three courses or ridges of regular stitches would require five rows of stitches in the strip. To commence at the center of the mat a short strip is used, and all its inner tips drawn together by hand by a yarn. It is better that such center part or strip have but few, say, two courses; or the inner points may be first stretched or pulled

out to be more salient, and then united by a connecting-yarn to make a good center for a mat entirely knitted from center to circumference.

The pine-apple stitch, shown in Fig. 2 at *e*, is made as follows: Commence as before, *i. e.*, by placing every other (not every) stitch previously regularly made on its next needle, all in the same direction, (either to the right or left, at option.) Next knit across and form the row of loops on every other needle—(*i. e.*, on those thus left empty,) and by the same process forming stitches on the intervening needles—viz., those which already had loops. Next remove to every alternate one of the needles having a stitch thereon the loops from the needles on both sides of it. This would leave the needles four and six without any loop, while the other alternate stitch-holding needles would have two loops transferred to them. This process, without change, and in the same direction of transferring, may be continued; but sometimes I reverse the process by commencing to put the first loop to the right, if before the first were put to the left, and vice versa. The number of times or courses of knitting without reversing may be regulated as taste may dictate. In this pine-apple stitch (so called only when reversed, and because of its leaving a portion of its pattern somewhat of pine-apple shape) the right side is the inner side.

The honey-comb stitch, shown in Fig. 2 at *f*, is very like the zigzag in appearance. The stitch is the same as the pine-apple, except that the change or transfer of loops from two needles to the one between them occurs at every course or reversal of the movement of the machine. In moving or reversing in one direction, I commence the transfers to the right, and in moving in the other direction I commence to transfer to the left.

There is the same difference between the honey-comb and the pine-apple as there is between the zigzag and the herring-bone.

The fabrics shown at *b*, *d*, and *f* are illustrated so as to show also their opposite surfaces or sides.

I claim—

1. The described method of making fancy stitches and fabrics on reversible rotary knitting-machines, the same consisting in employing any desired number of needles, and in transferring the loops from and to the needles in the manner set forth, and without removing the needles during the operation.

2. I also claim the fabrics herein described, made by transferring the loops from and to the needles, in the manner set forth.

3. I also claim the described circular mat, made and joined together, as shown, on a rotary reversible knitting-machine.

4. I also claim the described method of fabricating the circular mat or similar article.

Witnesses: DANA BICKFORD.

WILLIAM FITCH,
JARVIS MOULDEN.