

No. 698,499.

Patented Apr. 29, 1902.

E. A. HIRNER.

MANUFACTURE OF FIGURED KNIT FABRICS.

(Application filed Mar. 28, 1901.)

(No Model.)

3 Sheets—Sheet 1.

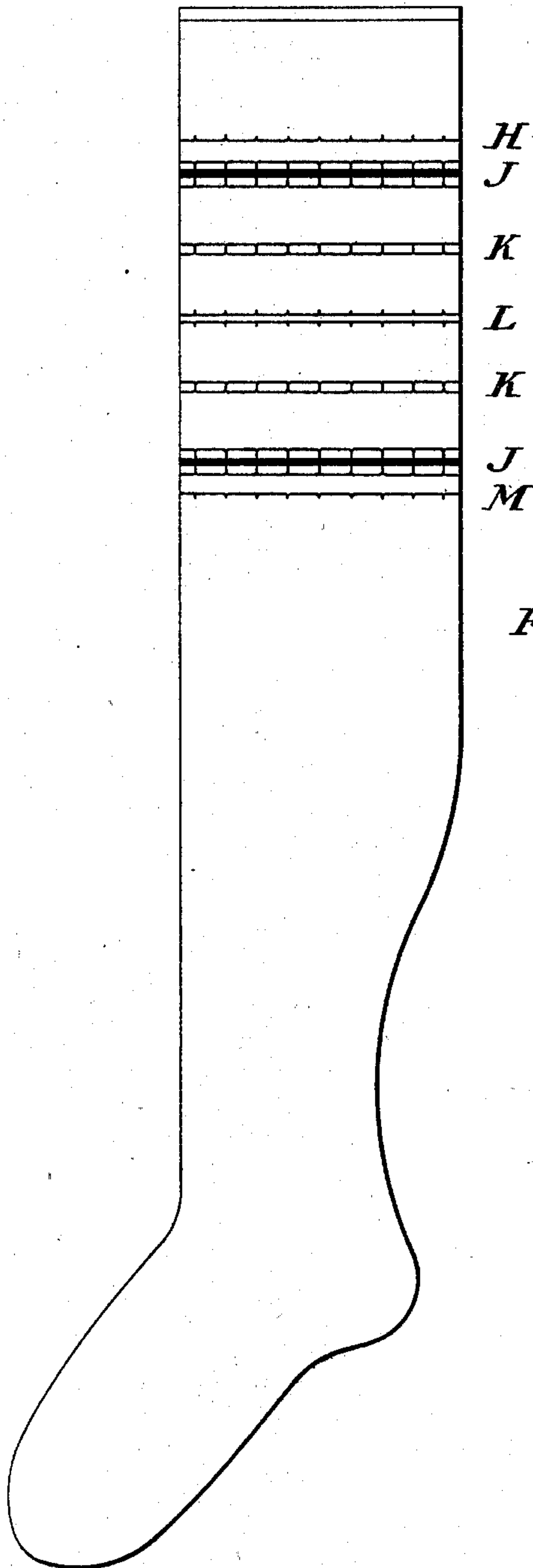


FIG. 1.

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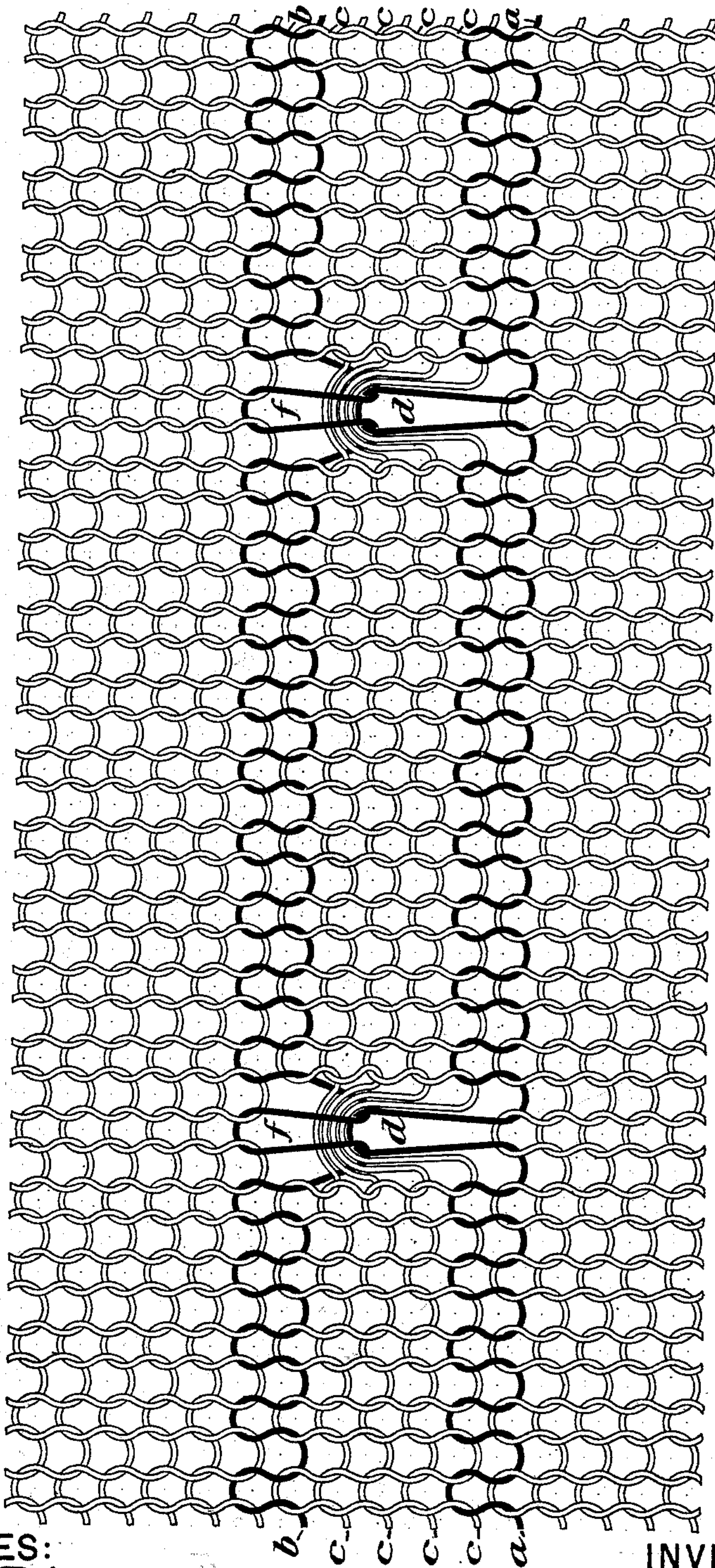
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FIG. 2.



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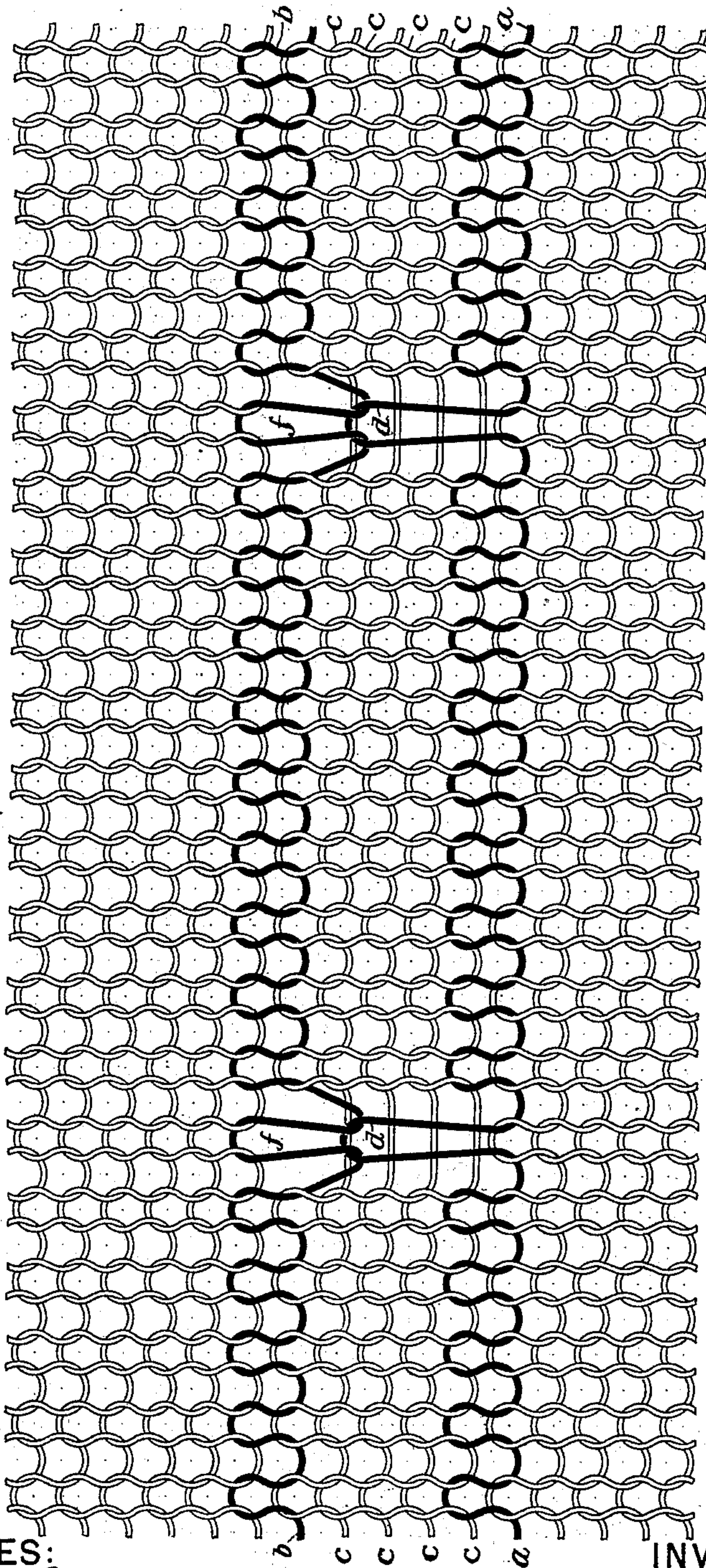
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FIG. 3.



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MANUFACTURE OF FIGURED KNIT FABRICS.

SPECIFICATION forming part of Letters Patent No. 698,499, dated April 29, 1902.

Application filed March 28, 1901. Serial No. 53,168. (No specimens.)

To all whom it may concern:

Be it known that I, EMIL A. HIRNER, a citizen of the United States, residing at Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Figured Knit Fabrics, of which the following is a specification, reference being had to the accompanying drawings.

10 My invention relates to the art of figured knitting, and has for its object to obtain a figured effect by employing courses knit with different kinds of threads, producing horizontal stripes combined with the production of
15 a longitudinal projection of certain of the stripes at predetermined points. By the various combinations which are possible in the employment of horizontal stripes provided with these longitudinal projections an almost
20 infinite number of pleasing and novel effects may be produced.

My invention applies generally to knit fabrics of any sort and to figured effects produced by the use of threads differing in material,
25 quality, thickness, or color; but for the purposes of description it will be convenient to specifically explain its application to the manufacture of hosiery knit from threads of different colors.

30 In the accompanying drawings, Figure 1 illustrates a stocking the leg portion of which has been knit according to my invention, so as to embody a number of different designs which may be produced by my invention; but
35 it will be understood that, as has been stated, the variety of design which can be produced is almost infinite and that what I have shown in the drawings is merely to be taken as illustrative of a few particular applications. Fig.
40 2 is a diagrammatic view of a piece of fabric knit from threads of two colors, enlarged sufficiently to show the arrangement of the knit loops by which the figured effect is produced; and Fig. 3 is a similar view showing a different
45 arrangement of the threads of the intermediate courses.

Referring to Fig. 2, it will be observed that it shows a piece of ordinary knitting, all except two of the horizontal courses of which are
50 knit with white threads. Two courses (lettered *a* and *b*) are knit with black thread. Between these two black courses are four white

courses *c c c c*. If the entire piece of fabric had been plain knitting, it would therefore exhibit nothing but two black horizontal stripes 55 on a white ground. Instead of this at two points loops *d d*, belonging to course *a*, have been drawn forward, so as to project longitudinally ahead of their fellow loops of the same course and into the territory of the succeeding 60 white courses *c c*. Furthermore, the interknit loops *f f* of the course *b*, by which this forward projection of the loops *d d* is effected, are themselves drawn back behind their fellow loops by the tension of the loops *d d*, so 65 that there is produced along the same longitudinal series of loops a forward projection of the black stripe *a* and a backward projection of the black stripe *b*, and by the meeting of these two projections the effect produced to 70 the eye is that of a longitudinal line or stripe joining the two horizontal stripes.

I will now describe the improvement in the art of knitting by which this fabric is produced. It may be made upon any ordinary 75 circular-knitting machine. In Fig. 2 the projected loops *d d* are ten stitches apart. To effect this, every tenth needle of the machine must be so operated that after receiving the loops of the black course *a* it shall be prevented from knitting during the knitting of 80 the four succeeding courses *c c c c*. This may be accomplished by preventing these needles during the knitting of these four courses from rising far enough to throw the loops of the 85 black course below their latches and returning them into line with the rest of the needles at a point either above or below the feeding-level. The fabric of Fig. 2 has been made by throwing them in at a point above 90 the feeding-level. Consequently the threads *c c c c* of the four succeeding courses have all been laid in the hooks of the inactive needles without being interknit with each other. When the work has progressed as far as the 95 course *b*, these needles are again thrown into ordinary action and having taken within their hooks the loops *f f* from thread *b* when drawn down by the knitting-cams shed simultaneously loops *d d* and the four unknit white 100 threads over their backs, thus interlooping all five threads with the loops *f f*. Thereafter these needles continue to knit, as do their fellows, and plain knitting is produced until

it is desired to again reproduce the pattern, when the operation repeats itself. If instead of throwing these needles in at a point above the feeding-level they had been thrown in at a point below the feeding-level, the action and resulting fabric would have been the same, except that threads *c c c c* would not have been taken within the hooks of these needles, and consequently instead of being interlooped with loops *f f* these four threads would pass across straight behind loops *f f* and *b b*. The resulting fabric is shown in Fig. 3.

It should be observed that Figs. 2 and 3 represent the fabric diagrammatically, and in order to make the stitches distinct to the eye the threads are made much too narrow in proportion to the size of the loops. In practice, with threads of normal thickness, no substantial aperture is visible in the middle of loops *d* and loops *f*, and, furthermore, in the fabric of Fig. 2 the top of loop *d*, which is taut, lies in front of the successive white threads and forms the face of the fabric, so that to the eye there is only visible a longitudinal black line or stripe connecting the two horizontal stripes.

It is impossible to enumerate all the variations to which this method of knitting lends itself. I may, however, mention some of them.

The number of courses *c c* which succeed course *a* before loop *d* is again knit in may vary according to the length of longitudinal projections desired. If threads *a* and *b* are fed to the machine under the same tension as the rest of the knitting, the extra tension thus thrown upon the loops *d* and *f* causes a slight pulling together of the horizontal black stripes at these points, producing what may be termed a "link" or "chain" effect, as shown at K, Fig. 1, where the particular effect produced by the threads of Fig. 2 is illustrated. If thread *b* instead of being a black thread is a white one, it ceases to form a stripe, although it nevertheless serves to project loops *d* of thread *a*. As a result this latter thread forms the stripe H of Fig. 1. If, on the other hand, the thread *a* is white and thread *b* black, there will be produced the effect shown at M, Fig. 1. By combining H and M back to back with a few courses of plain knitting between the effect shown at L, Fig. 1, is produced. The effect J is obtained by knitting two of the link or chain double stripes K K with a few courses of plain knitting of the color of the stripes in between. All of the effects thus described are produced on a machine which is adapted at proper intervals to withdraw every tenth needle from operation; but it is obvious that the intervals of the needles by which these longitudinal projections are formed may be varied at will. A number of such needles may be placed near together, succeeded by an interval in which no such needles are employed, thus producing a checkered or plaid pattern, and so on. It will be observed, however,

that in all of these variations the same characteristic method of knitting is employed—namely, the holding of a loop belonging to one course upon an inactive needle until one or more courses of thread of a different kind have passed by the needle, and then drawing forward this loop among the courses which succeed it by again throwing the needle into action after a predetermined period of inactivity.

Having thus described my invention, I claim—

1. The method of producing figured knitting, which consists in withholding from action certain predetermined needles, bearing loops of a thread of one kind, during the knitting of successive courses with thread of another kind, and upon the completion of a predetermined number of these courses, again throwing the inactive needles into operation, whereby the loops which they still carry from the first course are projected forward into the territory of the succeeding courses, substantially as described.

2. The method of producing figured knitting, which consists in withholding from action certain predetermined needles, bearing knitting-loops, during the knitting of a predetermined number of successive courses, and then knitting a course with a thread of a different kind during which the formerly inactive needles are again thrown into action, whereby the loops formed on these needles from the latter thread are drawn back into the territory of the preceding courses, substantially as described.

3. The method of producing figured knitting, which consists in withholding from action certain predetermined needles, bearing loops of thread of one kind, during the knitting of successive courses with thread of another kind, and upon the completion of a predetermined number of these courses, again throwing the inactive needles into operation, during the knitting of a succeeding course with the thread of the first kind, whereby the effect of a link or chain figure is produced, substantially as described.

4. The herein-described figured knit fabric, which contains courses of threads of different kinds, having certain of the loops of a course formed of one kind of thread drawn forward over one or more intervening courses of a different kind of thread, and knit into a subsequent course; substantially as described.

5. The herein-described figured knit fabric, which contains courses of threads of different kinds, having certain of the loops from a preceding course drawn forward over one or more intervening courses, and knit into a subsequent course formed of a thread of a different kind from the intervening course or courses; substantially as described.

6. The herein-described figured knit fabric, which contains courses of threads of different kinds, having certain of the loops of a course formed of one kind of thread drawn forward

over one or more intervening courses of a different kind of thread and knit into a subsequent course formed of the same kind of thread as the course from which the loops were
5 drawn forward; substantially as described.

7. The herein-described figured knit fabric, which contains courses of threads of different colors, having certain of the loops of a course
10 of a thread of one color drawn over the face of one or more intervening courses of threads of a different color, and knit into a subsequent course; substantially as described.

8. The hereinbefore-described knit fabric, which contains courses of threads of different
15 kinds, having certain of the loops of a course of one kind of thread drawn forward over one or more intervening courses of a different kind of thread, and knit into a subsequent course, of which the corresponding loops are drawn
20 backward over one or more of the intervening courses of a different kind of thread and into interlooping arrangement with the forwardly-projecting loops; substantially as described.

9. The herein-described figured knit fabric,
25 which contains courses of threads of different colors, having certain of the loops of a course formed of one colored thread drawn forward

over one or more intervening courses of a different-colored thread, and knit into a subsequent course, and also having certain loops
30 formed of one colored thread drawn backward over one or more intervening courses of a different-colored thread, and knit into a preceding course; substantially as described.

10. A continuously-knit tubular web, containing courses knit with threads of different
35 colors, and having certain of the loops formed of one color drawn forward over the face of intervening courses of a different color, and interlooped into a subsequent course; substantially as described.
40

11. A continuously-knit seamless stocking, the tubular portion of which contains courses knit with threads of different colors and having certain of the loops formed of one color
45 drawn forward over the face of intervening courses of a different color, and interlooped into a subsequent course; substantially as described.

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Witnesses:

D. H. KRATZ,
O. R. B. LEIDY.