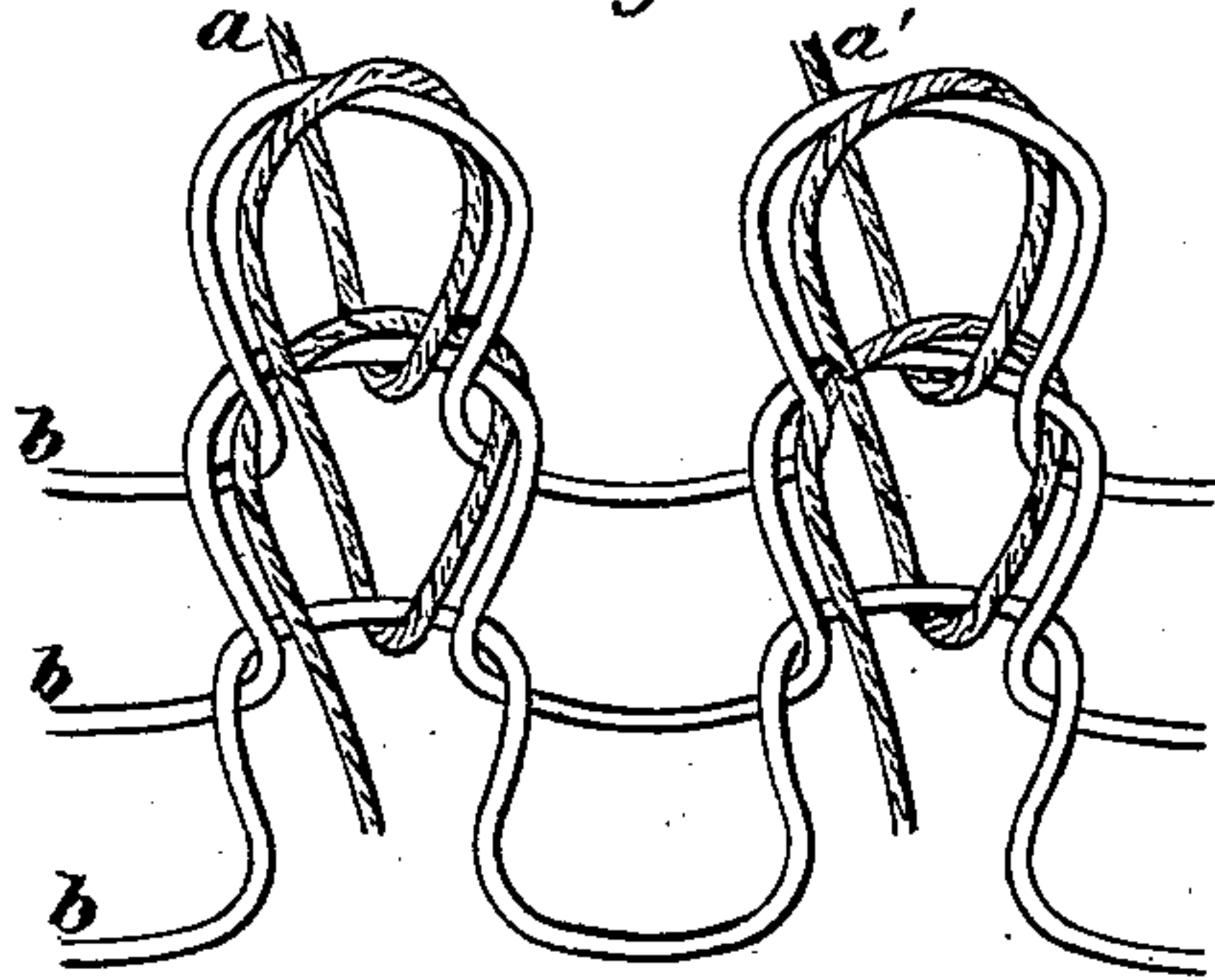


R. F. M. CHASE.  
Knit-Fabric.

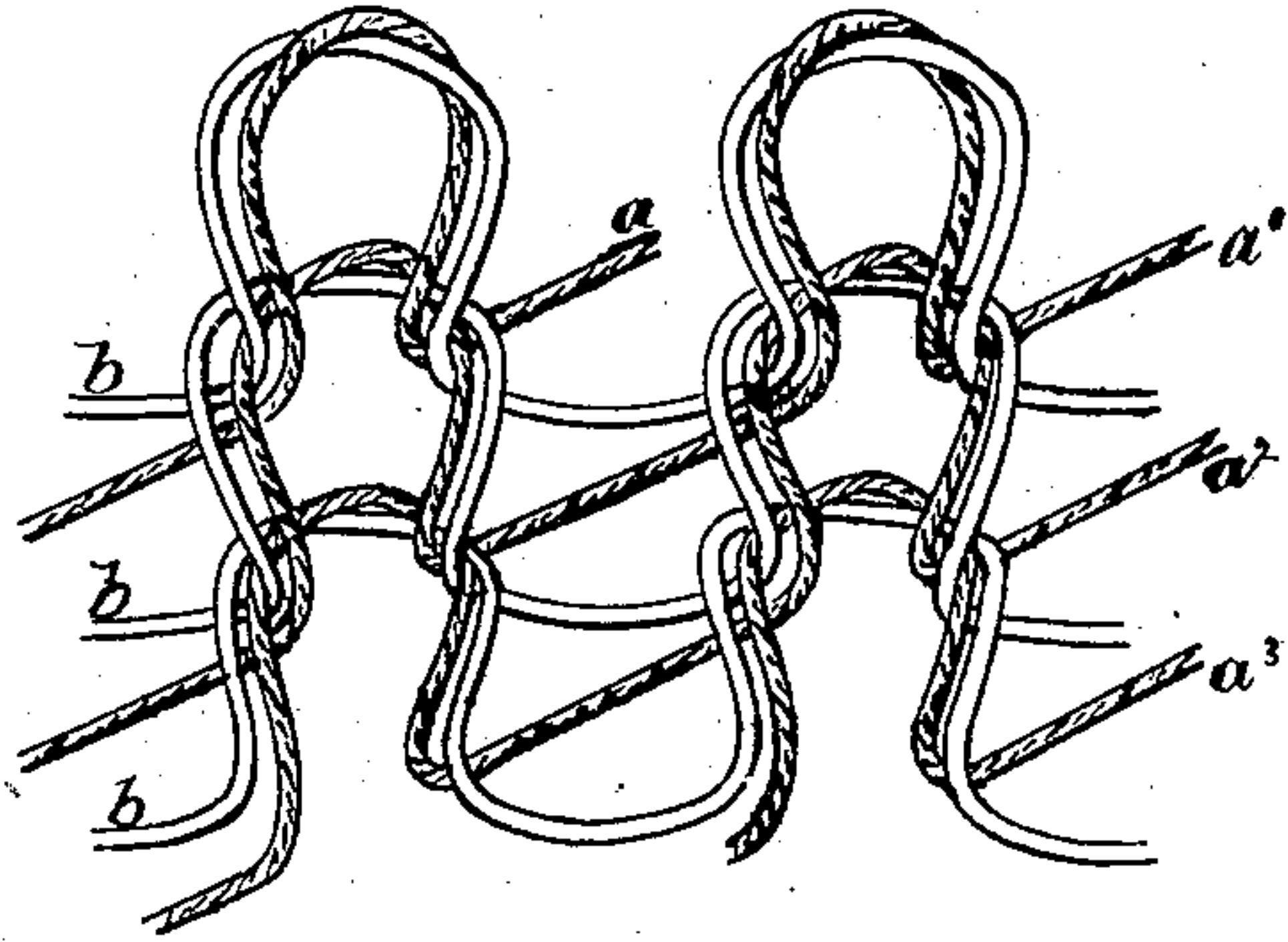
No. 226,595.

Patented April 20, 1880.

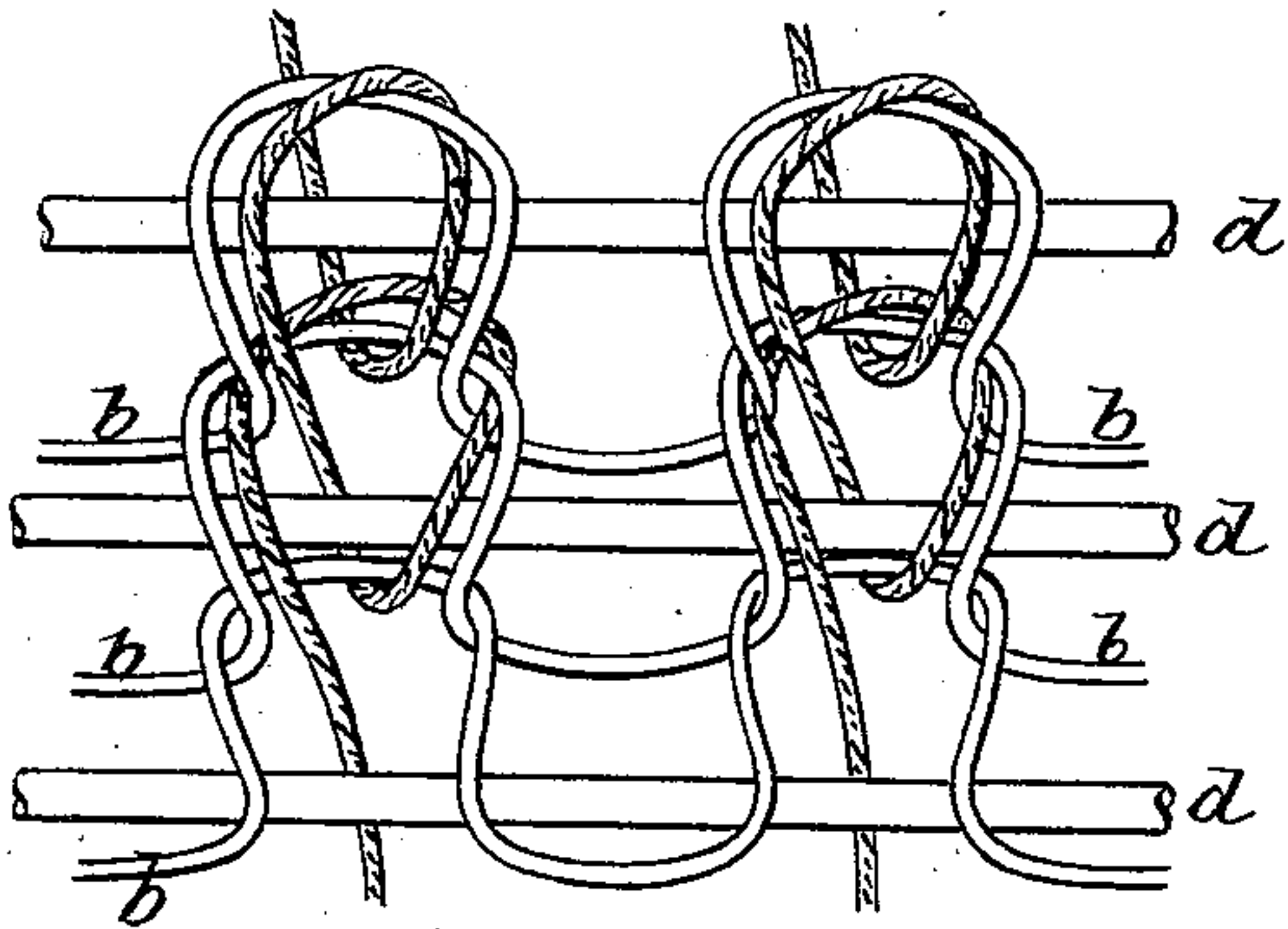
*Fig. 1.*



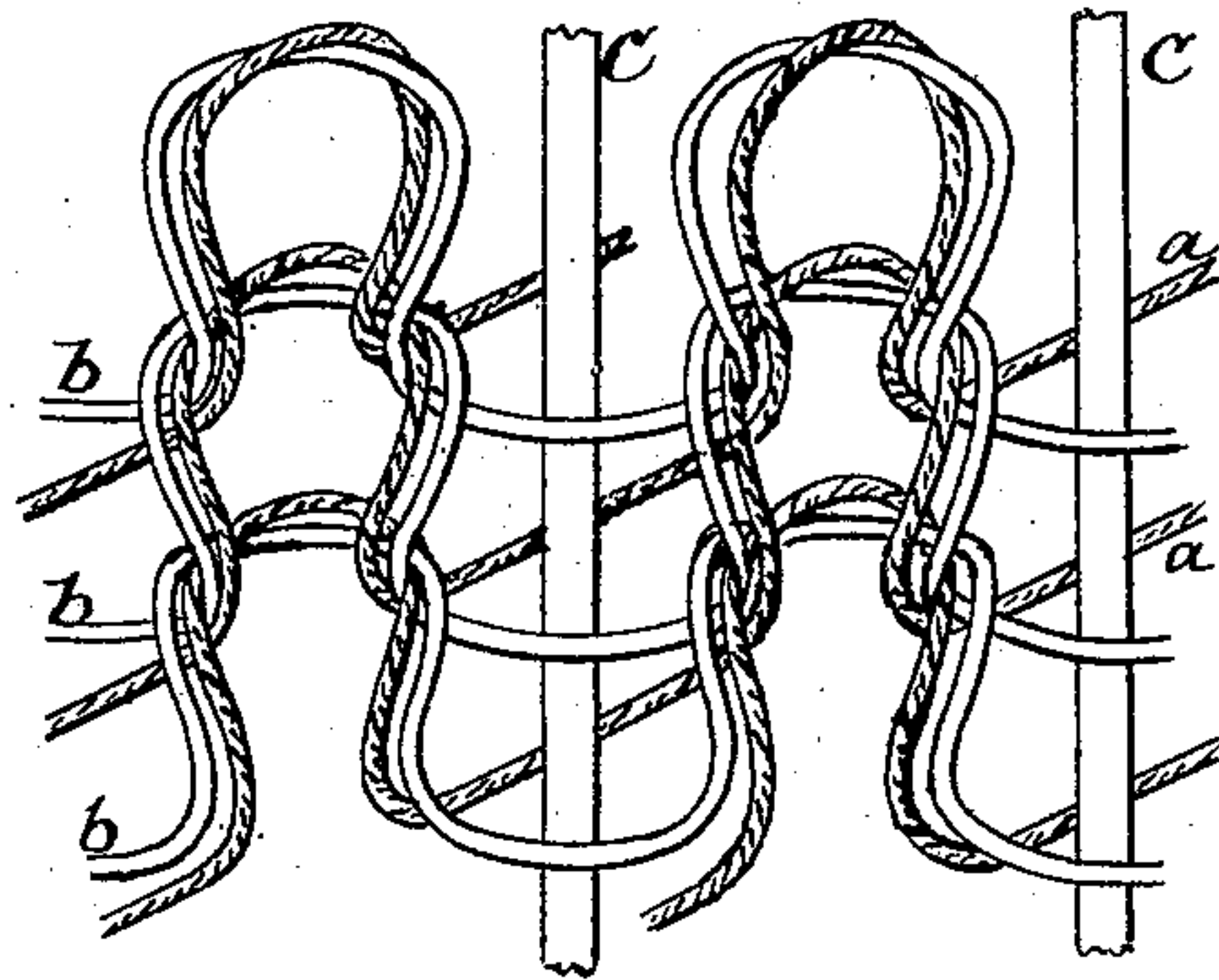
*Fig. 2.*



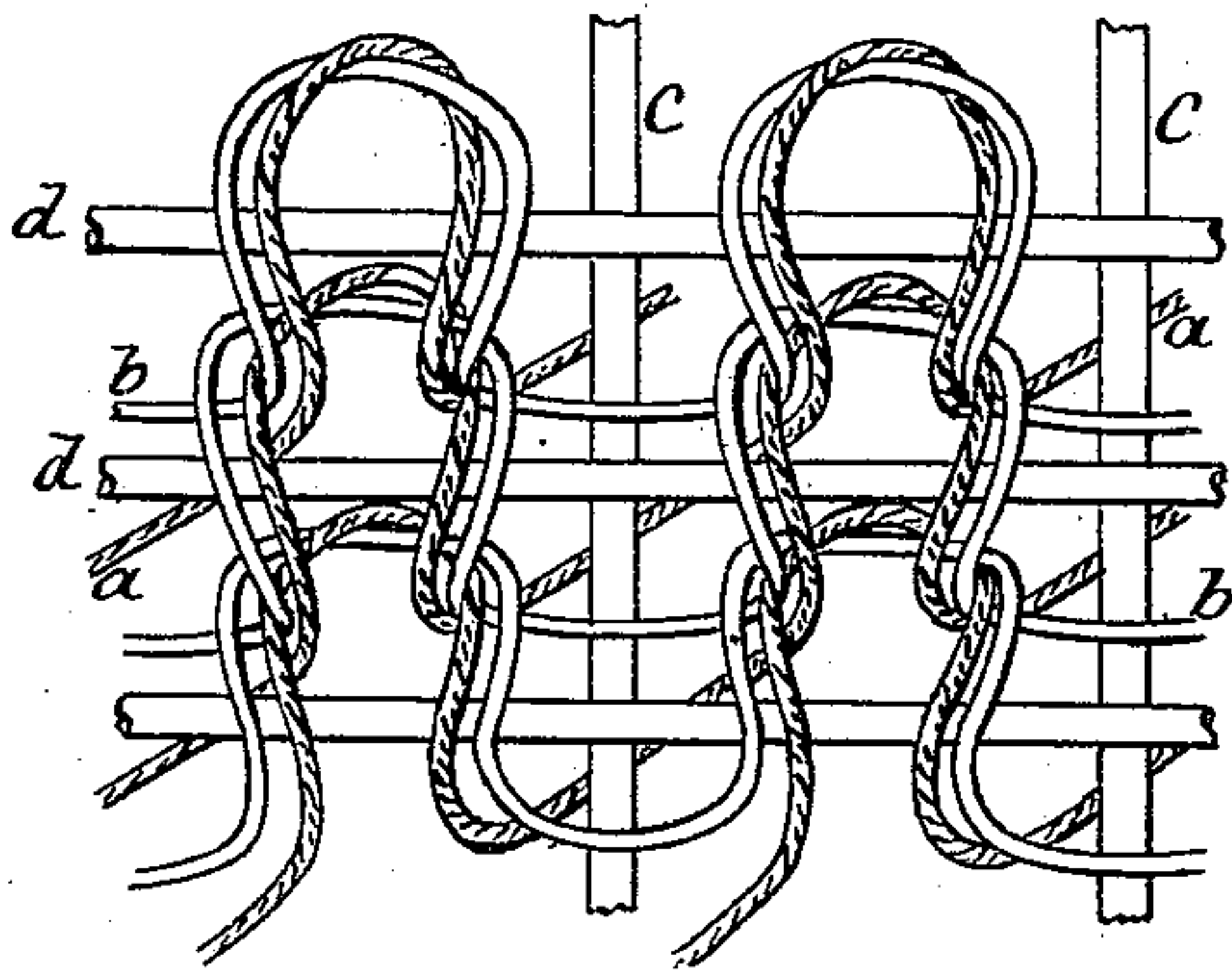
*Fig. 3.*



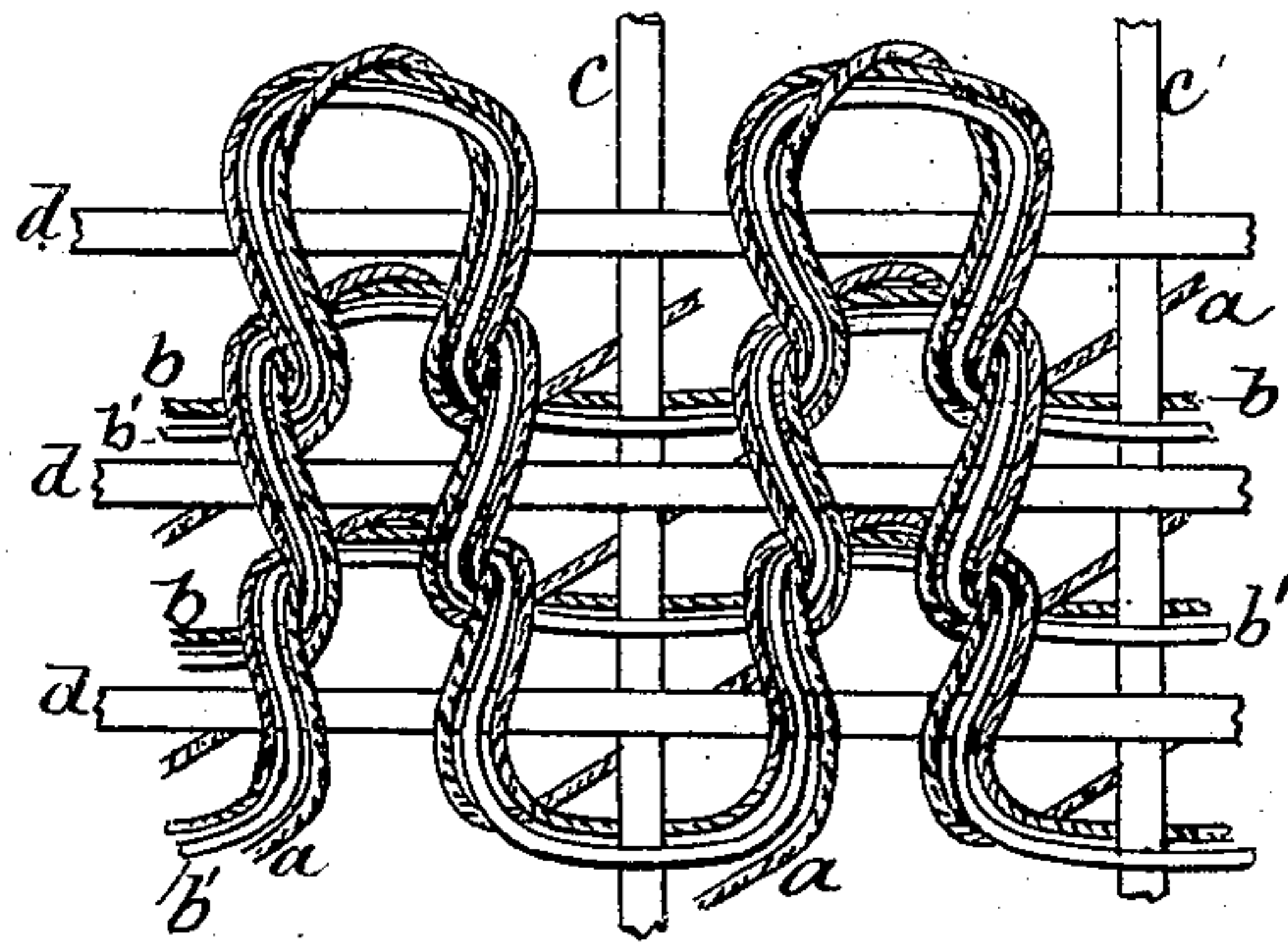
*Fig. 4.*



*Fig. 5.*



*Fig. 6.*



Witnesses

E. A. Dick  
D. P. Cowl

Inventor:

Richard F. M. Chase  
by A. Pollok  
his attorney.



# UNITED STATES PATENT OFFICE.

RICHARD F. M. CHASE, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF OF HIS RIGHT TO HENRY F. HERKNER, OF SAME PLACE.

## KNIT FABRIC.

SPECIFICATION forming part of Letters Patent No. 226,595, dated April 20, 1880.

Application filed March 25, 1879.

*To all whom it may concern:*

Be it known that I, RICHARD F. M. CHASE, of New York, in the county of New York and State of New York, have invented a new and useful Improvement in Knit Fabrics, which improvement is fully set forth in the following specification.

Heretofore in what are known as "knit fabrics" the knitting-threads ordinarily extend around and around or back and forth continuously. Into fabrics of this class straight warp and weft threads crossing each other at right angles have been introduced by means of suitable machines, such as that patented to George Merrill, No. 140,635, of July 8, 1873, and as set forth in an application made by me, and filed June 17, 1878. There is, however, another class of fabrics made by what are called "warp-machines," in which a separate knitting-thread is employed for each needle, which threads are called "warp-knitting threads," and are essentially different from what are called above "straight warps," as the latter are simply inclosed or held in place by the separate knitting-threads. The same needle does not always knit the same thread, as the knitting made by the several needles would then be unconnected; but the threads are shifted from one needle to another in a variety of ways, which need not be here more particularly set forth, as they are well known in the art.

In the fabrics which, together with the method of knitting them, constitute this invention, warp-knitting and continuous-knitting threads are interlaced and looped or knit together with or without the introduction of straight warps or wefts, or both, the warp-knitting threads being knit upon the same needles to form straight lines, or shifted to form a diagonal or any other desired pattern, and one or two continuous-knitting threads being used, which may be introduced at every feed or on alternate feeds, or as desired to make a particular figure or design. The loops of the warp-knitting threads pass through and are held by the loops of the continuous-knitting thread or threads, being both knit upon the same set of needles. Fabrics thus composed of warp-knitting and continuous-knitting

threads are stronger, more durable, and less easy to unravel than those heretofore made, and may be figured or ornamented in patterns which it would be impossible or very difficult otherwise to make.

When neither straight warp nor weft is used the fabric is elastic in every direction, like plain knitting. When a warp or weft singly is used it will be elastic in the direction at right angles thereto, and when both warp and weft are employed the fabric is substantially inelastic, like ordinary woolen cloth.

The drawings show the interlacing and looping and binding together of the threads, which, it will be evident in the fabric itself when drawn up close, do not all appear on either side of the fabric.

Figure 1 represents plain knitting with a single continuous thread, each warp-knitting thread being looped always upon the same needle; Fig. 2, the same with the warp-knitting threads looped at every feed upon the needle next to that upon which the last loop is formed; Fig. 3, the same as Fig. 1, with the addition at each feed of a weft; Fig. 4, the same as Fig. 2, with the addition of a warp between each needle; Fig. 5, the same as Fig. 2, with the addition of both warp and weft; Fig. 6, the same as Fig. 2, with two—an inner and an outer—continuous-knitting threads and both warp and weft.

In all the figures like parts are designated by the same letter.

$a$   $a'$   $a^2$  are the warp-knitting threads;  $b$   $b'$ , continuous-knitting threads;  $c$   $c'$ , the straight warps, and  $d$  the weft or filling thread.

It is evident that both straight and diagonal feeding of the warp-knitting threads may be used with warp and weft, either or both, and also that the interlacing of warp-knitting and continuous-knitting threads may be effected at alternate feeds, or the weft may be introduced only on alternate feeds.

To illustrate the manner of making the fabric, I will refer to the machine described in Merrill's patent, referred to above. If the warp-threads therein represented by suitable mechanism be introduced under the hook of the corresponding needle at each reciprocation, the machine otherwise operating as set forth,



a fabric as represented in Fig. 3 will be produced.

In introducing the warp-threads under the hooks it is preferable to carry them behind and then around the needles. The mechanism employed may be varied and may be similar to that heretofore employed for the purpose in warp-machines. For example, cams might be used, or each warp-knitting thread may be delivered by a device similar to that by which the "inner weft-thread," as Merrill terms it, is delivered. Such a device may, of course, be much smaller and simpler, and should be secured to the ring or warp-frame in aforesaid patent, which may be made of smaller diameter, and by rotating these devices once or twice or more at each feed the knitting-warps could be looped under the needle-hooks as many times as might be desired.

By moving the warp-frame at each feed or delivery of the continuous-knitting thread the distance between the needles the fabric formed will have the warp-knitting in diagonal lines, it being understood that the straight warps in Merrill's case are looped on the needles, as above described, to form the warp-knitting threads—that is, it will be like Fig. 2 with the addition of a weft. If the weft (or, as Merrill calls it, the "outer weft,") be omitted, the fabric will be like Fig. 1 or Fig. 2, according as the warp-frame is stationary or moved forward at each end.

When it is desired to introduce straight warps into the fabric the warp-frame modified, as above described, to loop the warp-threads on the needles, could be used in addition to the warp-frame, as shown in the said patent.

It is to be noted that when it is desired to use straight warps without a weft and with one continuous-knitting thread, then the warp-knitting thread should be shifted so as to be looped by different needles, and the knitting-threads should be on opposite sides of the warps, as shown in Fig. 4.

If this additional modified warp-frame be used in connection with the machine set forth in my application filed June 17, 1878, the fabric may be made with a continuous-knitting thread on each side of the aforesaid straight warps, and with or without the weft or filling thread, the warp-knitting being either in straight or diagonal lines, as desired.

In Fig. 6 the fabric has both straight warp and weft and the warp-knitting is in diagonal lines. In Fig. 5 a similar fabric with a single continuous-knitting thread is shown.

It is obvious that many other mechanical means may be employed for effecting the aforesaid operations.

To loop the warp-knitting threads under the needle-hooks by means of cams, as indicated above, the threads should descend from

the warp-frame slanting to the right or to the left—that is to say, the hole through which each warp-knitting thread is delivered should not be in the same plane as the needle on which it is looped.

In making the fabric knitting-threads of various colors may be used, or each thread proper may consist of several strands of different colors; or, instead of a single carrier for the continuous-knitting thread, several operating simultaneously, as well understood in ordinary continuous knitting, may be used, and each may have a different color, or carriers, both outside and inside the knitting-warps, may be used, whether straight warps or wefts be or be not used.

I design also to use certain jacquard and other pattern appliances in the formation of my new fabrics. In fine, the methods heretofore known for varying warp-knit fabrics may be used in connection with this invention, and also the methods employed in knitting with continuous threads, and also various combinations of such methods.

Hose, Cardigan jackets, counterpanes, and various other knit and woven-knit goods may be made by this invention.

I do not confine myself to the particular mechanism employed, nor, although I have indicated such mechanism, do I herein make claim thereto; but I intend to make separate application for Letters Patent for a machine for knitting the herein-described fabrics in the manner set forth.

Having thus fully described my said invention and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is as follows:

1. A fabric in which warp-knitting and continuous-knitting threads are interlaced and looped together, the loops of the warp-knitting threads passing through and being held by the loops of the continuous-knitting thread or threads, substantially as described.

2. A fabric composed of warp-knitting threads and one or more continuous-knitting threads interlaced and looped together and combined with straight threads, substantially as described.

3. The method of making fabrics by interlacing and looping together upon the same needles one or more continuous-knitting threads and a series of warp-knitting threads, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

RICHARD F. M. CHASE.

Witnesses:

E. A. DICK,

C. J. HEDRICK.