(No Model.)

L. S. LA SERVE.

FABRIC AND METHOD OF MAKING THE SAME.

No. 303,168. Patented Aug. 5, 1884.

Fig. 1.

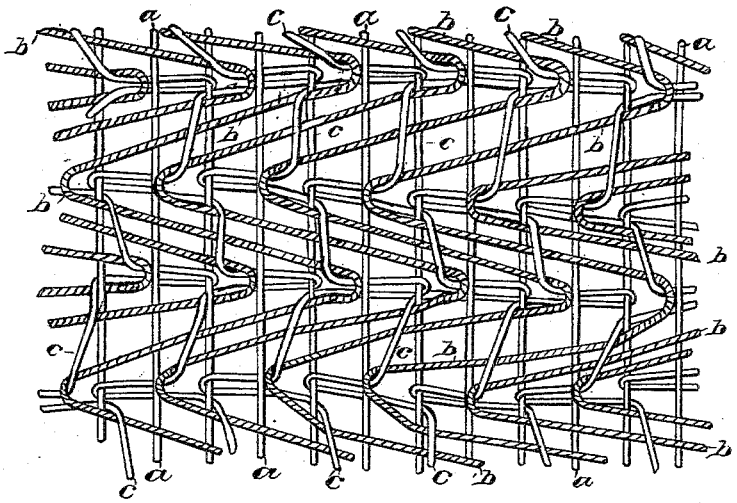


Fig. 2.

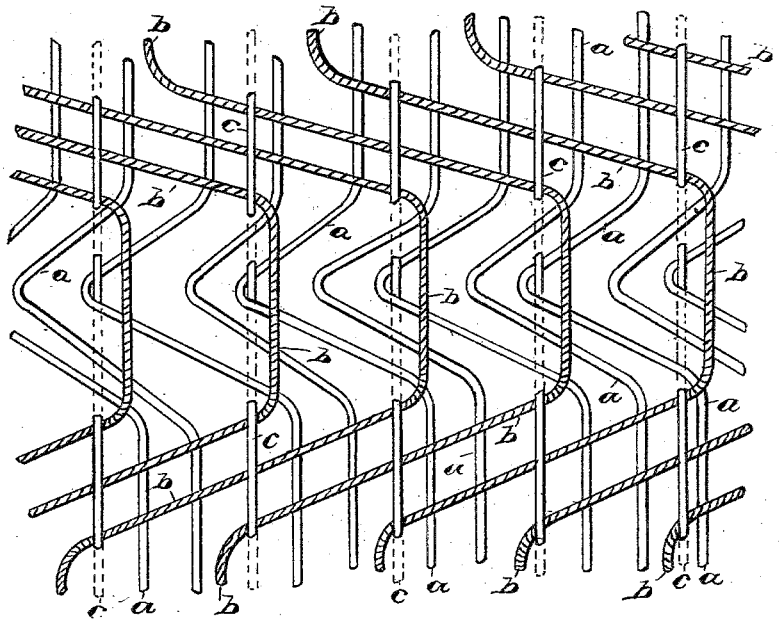
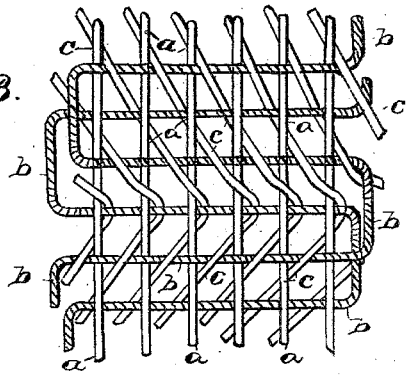


Fig. 3.



Witnesses
Wm. J. Dannel
C. J. Hedrick

Inventor
Léon Sival la Serve
by A. Pollok
his attorney.

UNITED STATES PATENT OFFICE.

LÈON SIVAL LA SERVE, OF NEUILLY, DEPARTMENT OF THE SEINE, FRANCE.

FABRIC AND METHOD OF MAKING THE SAME.

SPECIFICATION forming part of Letters Patent No. 303,168, dated August 5, 1884.

Application filed December 7, 1880. (No model.) Patented in France July 3, 1880, No. 137,602; in England July 12, 1880, No. 2,876; in Belgium July 28, 1880, No. 52,141; in Germany October 13, 1880, No. 17,436, and in Austria-Hungary March 21, 1881, No. 31/429 and No. XV/402.

To all whom it may concern:

Be it known that I, LÈON SIVAL LA SERVE, of Neuilly, Department of the Seine, Republic of France, have invented certain new and useful Improvements in Fabrics and Method of Making the Same, of which improvements the following specification is a full description.

This invention relates, more particularly, to the manufacture upon bobbinet or lace machines of fabrics having a close ground; and it consists in a new method of working and interlacing the threads, and in the new fabrics thus produced.

In bobbinet-machines there are, as is well known, threads which are delivered from one or more beams, and threads which are delivered each from an independent bobbin. The former, for convenience, will be called "beam-threads," the latter "bobbin-threads."

Heretofore the beam-threads have ordinarily been stretched, (after the manner of warps in ordinary looms,) and the bobbin-threads have been wrapped around and stretched between said beam-threads, (being thus somewhat anologous to the weft in ordinary looms.) The result is the production of open-work or lace fabrics.

The article, "Bobbinet Machinery," in Appleton's Dictionary of Machines, Mechanics, Engine Work, and Engineering, published by D. Appleton & Co., New York, 1866, describes a bobbinet-machine operating in this the ordinary way.

In the present invention the beam-threads are divided into two parts or sets, which are wound upon separate beams. One part or set is stretched to form warp-threads, as heretofore. The other set is laid across them side by side, and are pressed together so as to form a close filling or weft, while the bobbin-threads are passed around both sets of beam-threads to bind them together into the fabric. The motions to be given to the guide-bars and bobbins of the lace-machine in the formation of the fabric will be hereinafter explained.

In the accompanying drawings, which form a part of this specification, Figures 1 and 3 are diagrams showing the interlacings of the threads in fabrics made in accordance with the invention. Fig. 2 is a diagram showing the movements of the beam-threads and bobbin-threads in the formation of the fabric represented in diagram in Fig. 1, upon a Leaver's or Lever's machine having the comb-bars stationary.

In all the figures, *a b* are beam-threads, *a* being the warp and *b* the weft, and *c* are bobbin-threads. In the finished fabrics the warp-threads *a* constitute a sort of grating, across which the weft-threads *b* are laid, and to which they are bound by the bobbin-threads *c*. In Fig. 1 the weft and warp are both single, and the fabric is two-ply, the weft *b* constituting the face, the warp *a* the back. In Fig. 3 there are two layers of weft *b*, one on each side of the warp *a*, and the fabric is therefore three-ply. Obviously, the double weft, instead of being on opposite sides of the warp, could be on the same side; or the weft might be included between two layers of warp. Obviously, also, the fabric may be made of as many plies as desired by increasing the layers of warp or weft, or both.

In the drawings the weft-threads are shown as separated instead of being pressed together, as they actually are in the finished fabric. This is done in order that the relative positions and interlacings of the threads may be seen. The bobbin-threads *c* overlie the beam-threads, and in order to bind the weft to the warp are passed through the warp and weft back and forth at suitable intervals, so that they are sometimes at the face and sometimes at the back of the fabric. Thus in Fig. 1 the bobbin-threads *c*, in certain parts of their courses, lie in front of the weft-threads *b*, and appear on the face of the fabric. For the rest of their courses they lie behind the warp, or they lie in front of the warp and behind the weft, and are concealed from the face by the warp and weft, or the weft alone. In Fig. 3 the bobbin-threads appear alternately on the face and back. In either case, they, (the bobbin-threads,) by appearing on the face of the fabric, make the design or pattern, and since their position and the number of weft-threads to be crossed by them at each appearing are entirely within the control of the operator, the design or pattern may be varied at will.

Where there are two or more layers of weft,

it is not necessary in order to make a fabric with close ground that the threads of both should lie close together. On the contrary, those of one or more outside layers may be so worked as to leave open spaces through which the under layer is visible, and thus to constitute embroidery; or an under layer may be so worked as to produce raised patterns in the superposed layer by leaving between the threads of the under layer spaces or depressions, into which the threads of the superposed layers are drawn. The same weft-threads may be worked sometimes as embroidery, and again as filling-threads, by so working them as to leave open spaces between them for a suitable distance, and then making them lie close together. After making a certain length of close fabrics the threads may be interlaced to produce open or lace fabric by working the machine in the ordinary way, and thus close and open work may be combined in the same fabric.

In Fig. 1 the bobbin-threads do not on the face side cross the warp, but after crossing the weft return between the same pair of warps between which they were passed to the front. They thus draw the weft slightly into the space between the warps, and the result is the production of a smoother and more supple fabric than would be obtained by having the bobbins cross both weft and warp on the face as well as on the back. In Fig. 3 the bobbin-threads at some places cross both warp and weft on each side of the fabric, and at others cross the weft only. In making these and similar fabrics on a Leaver's or Lever's machine, the bobbins are not shifted across the warps; but the latter are, like the weft, shifted in front of the bobbins, which are passed from front to back, or from back to front, as the case may be, between the proper warps. The warps, being afterward straightened, draw the bobbin-threads wrapped around them to the right or left. The working will be understood from Fig. 2, which is typical, and illustrates the working to produce the fabric shown in Fig. 1. The beam-threads *a b* are shifted by guide-bars, which are reciprocated, right and left, by suitable mechanism, operated by jacquards, or by cams and like devices when the pattern is simple and regular, as shown.

The construction and disposition of the guide-bars, being well known, need not be described. They may be such as described in the article on bobbinet machinery, before referred to.

The bobbin-threads are carried back and forth between the beam-threads by shifting the bobbins from the front comb to the back comb, or vice versa. The portions of bobbin-threads represented in full lines indicate that the bobbins were on the front comb while the guide-bars carrying the beam-threads were shifted right or left, as indicated by the direction of said beam-threads, and the portions in dotted lines indicate that the bobbins were on the back comb during the shifting of the threads. Only two guide-bars are required to make the fabric as shown in Fig. 2—one for the warp and one for the weft.

Assuming only two guide-bars to be used, the weft-threads between the weft-beam and the work-beam pass through guides on one of the guide-bars, called, for convenience of reference, the "front guide-bar," the warp-threads between the warp-beam and the work-beam, through guides on the other guide-bar, called the "back guide-bar," for it lies behind the other. The motions are as follows: The bobbins, being on the back comb-bar, are passed between the beam-threads to the front comb-bar, as indicated by the change in bobbin-threads from dotted to full lines. The bobbins being now on the front comb-bar, the front guide-bar is shifted to the right, laying the weft-threads across the warp, (which remain straight up and down,) and also across the bobbin-threads, the latter being in front of the weft, (because the bobbins are on the front comb-bar,) while the warp is behind the weft. As shown, the bobbins are now shifted from the front to the back cross-bar between the beam-threads. Thus, the weft-threads behind the bobbin-threads will be held against the warp by the loops of bobbin-threads shown in full lines. The bobbins being now on the back comb-bar, and therefore behind both weft and warp, the back guide-bar is shifted to the left a sufficient distance to lay one warp across each bobbin-thread. The bobbins are then passed to the front comb-bar, leaving a loop of bobbin behind each alternate warp. The back guide-bar is now again shifted to the left, so as to lay another warp-thread across each bobbin-thread. Then the bobbins are passed to the back comb-bar, leaving a loop in front of the warp-threads last mentioned. The back guide-bar is now shifted to the right, so that three warp-threads lie across and in front of each bobbin-thread, and the bobbins are changed to the front comb-bar. The front guide-bar is then shifted to the left, laying the weft across the warp between it and the bobbin-threads, and the bobbins are passed again to the back comb-bar. The operations then proceed as before, except that the back guide-bar is shifted two small steps to the right and one long one to the left, instead of two short ones to the left and one long one to the right, as indicated above. Thus far the effect of stretching the warp has been disregarded. Assuming the threads to lie on as in Fig. 2, the straightening of the warp-threads will carry the bobbin-threads to the right, behind the weft, into the position shown at the top of Fig. 1. The interlacing being effected, as indicated, the threads are pressed together by the point-bars, which are placed above the guide-bars and just below the work-beam, and operate like the battens or lays of ordinary weaving-looms. The fabric is wound upon the work-beam as it is made. Either the warp or the weft may be carried by two or

more guide-bars. The division of the warp among several guide-bars is desirable when the warp-threads are very numerous, as it allows the use of bobbins thicker than the space between any two warps in the fabric. The warp-threads being divided among a number of guide-bars, there will be a less number of threads to each guide-bar, and the spaces between the threads guided by any one guide-bar will be correspondingly greater. Since the guide-bars can be shifted so as to bring the corresponding threads on the several bars one behind the other, comparatively large spaces will be left for the passage of the bobbins, although, in the finished fabric, since the whole of the warp-threads are brought together above the guide-bars, the space between them is very small.

As shown in Figs. 1 and 2, the warp-threads are twice as numerous as the weft-threads and bobbin-threads; but this proportion may be varied in either direction. In Fig. 3 the bobbin-threads equal the warps in number, while the weft-threads on either side of the warp are as one to six. It is evident that the invention admits of indefinite variation in its details. All kinds of fabric alike on both sides, or unlike, may be made under it—to wit, plain fabric, figured, chène, striped, tapestry, and others. The same beam-threads may be worked as warps in one part of the fabric and in another as wefts. To do this it is only necessary to stretch the beam-threads which have to be worked as weft-threads, so that they now become warp, and to relieve the tension on the former warp and to impart to the bars guiding the warp and weft, respectively, the movements before imparted to the other. Thus, in working as illustrated in Fig. 2, the threads *a* could be relieved of tension and the threads *b* subjected to it, and the front guide-bar be moved as the back guide-bar had been, and vice versa. The times for shifting the bobbins could also be changed. Each side of the fabric would then be for a certain distance the face, and then the back.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. The method of making fabrics upon bobbinet-machines by keeping one part of the beam-threads stretched as warps, and laying the other beam-threads as weft across the said warps and binding the whole together by the bobbin-threads, substantially as described.

2. The described fabrics, comprising straight warps with the weft-threads laid across the same on the face thereof, and bound thereto by the bobbin-threads, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LÈON SIVAL LA SERVE.

Witnesses:
THOMAS EAKIN,
CHARLES MARDELET.