A. BURGESS.

TWIST LACE FABRIC.

APPLICATION FILED AUG. 1, 1911.

1,053,478.

Patented Feb. 18, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

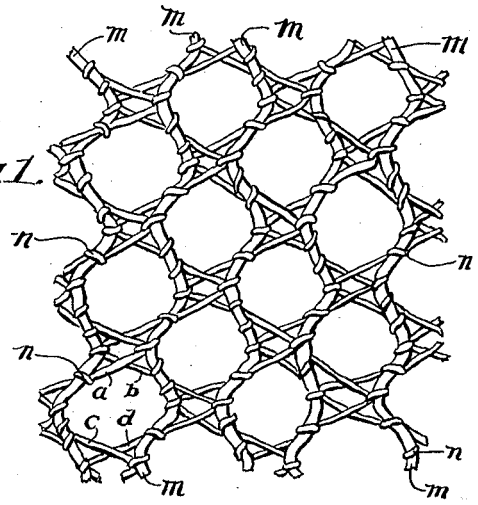
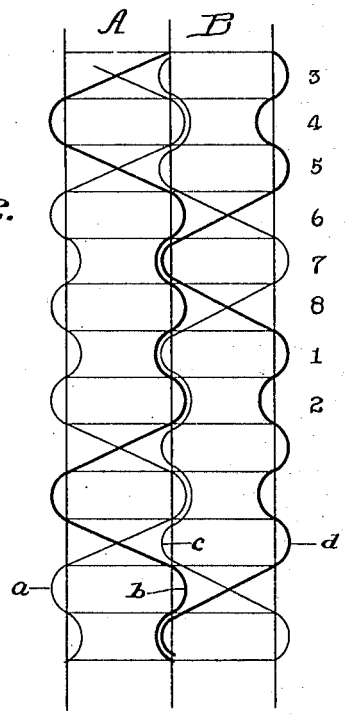


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

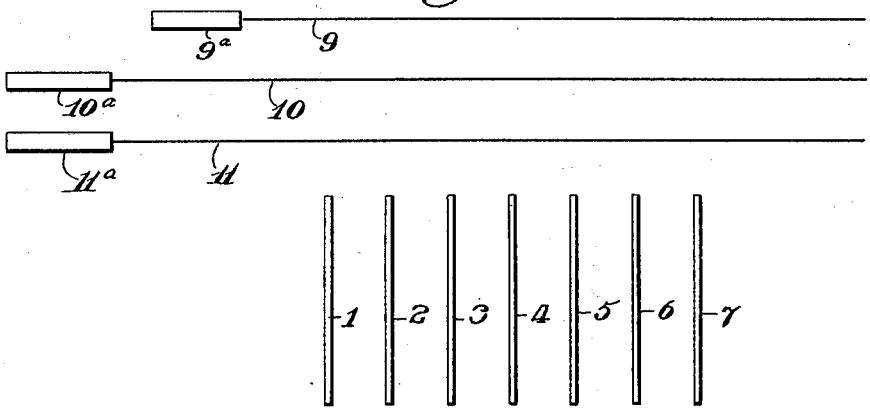


Fig. 4.

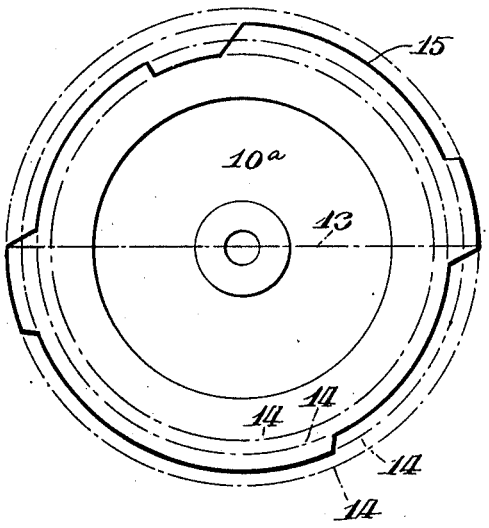
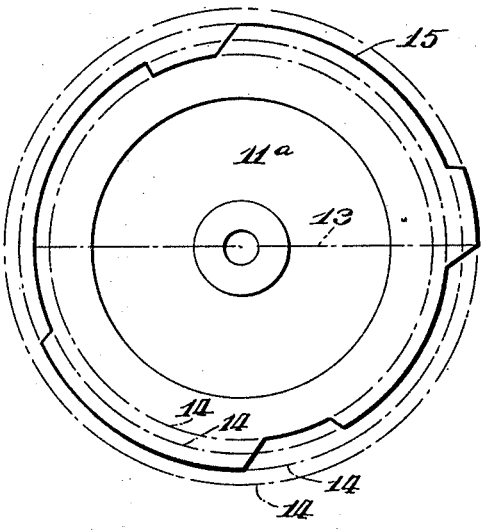


Fig. 5.



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TWIST-LACE FABRIC.

1,053,478. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed August 1, 1911. Serial No. 641,722.

To all whom it may concern:

Be it known that I, ARTHUR BURGESS, a subject of the King of Great Britain, residing in the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Twist-Lace Fabrics, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to lace curtain fabrics, commonly known as Nottingham or twist lace, and has for its object the production of a new character of cross-net ground, adapted to be made upon the well known Nottingham lace curtain machine, with the changes therein hereinafter mentioned, and to be produced thereon, from continuous threads and in a continuous operation of the machine, in conjunction with the Swiss finings, open loops, and clothing, constituting the pattern, the cross-net ground surrounding the latter. Several varieties of ground netting have heretofore been made on such machines, one being the square mesh, now seldom made, and another the cable or combination or diamond-shaped mesh, the latter being that most commonly in use, and distinguished from the former chiefly in that the meshes in contiguous wales alternate in staggered relation. Such fabric is commonly made on a Nottingham lace machine employing but one warp-guide-bar, though it may be made upon two such bars if both are actuated by like cams and with same movements simultaneously. Such usual cable or combination net comprises a pillaring of straight spool-threads around which the carriage or bobbin threads are twisted, while the warp threads, under the action of the guide-bar in which they are threaded, and governed by thread-controlling jacks, are interlaced between each wale to form the meshes; but in such cable or combination netting there was but a single crossing of the warp threads for each mesh, which presents the appearance of a diamond-shaped square hole. My new fabric is similar thereto in structure save that there is a double-crossing of warp threads for each mesh, in other words a crossing at the top point of the diamond-shaped mesh; and another and like crossing at the bottom point of the diamond-shaped mesh; with the result that the constituent threads of the netting are not only more effectively tied in, imparting additional strength and indeed additional warp thread to the mesh, giving it a substantial and a silky appearance, but also changing the apparent shape of the mesh from a diamond-shaped square to substantially a round hole or mesh, especially when produced in a lace fabric as coarse as eight-point lace.

In the accompanying drawings illustrating the invention:—Figure 1 is a plan view of a section of the new double-cross netting, enlarged to show the constituent threads and the course thereof. Fig. 2 is a diagram of the course of the two pairs of warp threads carried by the pair of guide-bars threaded up therewith. Fig. 3 is a diagram of the spool bar and pair of warp bars, their cams, and the jacks; and Figs. 4 and 5 are like elevations of the two cams which impart the requisite gait movements to the pair of warp guide-bars.

Referring now to Fig. 1 of said drawings: The series of straight spool threads, delivered from the cam-actuated spool bar, and forming the pillaring threads, are indicated at *m*, and the bobbin threads twisted around the same are indicated at *n*, while *a* and *b* indicate one pair of warp threads delivered from one warp guide-bar, and *c* and *d* a pair of warp threads delivered from the other warp guide-bar. The pillaring of the spool and bobbin threads, is the same as before, the warp threads being interlaced therewith between each wale, as in combination or cable net, to form the alternating or staggered meshes, this being effected by the usual gait motions effected by that half of my new guide-bar cams which is shaped as before, and the then simultaneous control of the warps by the even-numbered jacks; but by reference to said Fig. 1, it will be seen that warps *a* and *b* cross at the top of the mesh, so to speak, and that warps *c* and *d* cross, in like manner, at the opposite side or bottom side of the mesh; the effect being to work in a little more warp than in cable net for a given area of the fabric, and to transform what would otherwise be a diamond-shaped mesh into substantially a round mesh opening.

In Fig. 2 column A indicates the first wale and column B the second wale, the numerals 3, 4, 5, 6, 7, 8, 1 and 2, representing the eight full motions of the pair of warp guide bars

effected by the complete rotation of the cams. In said figure the illustration begins with the third motion as that represents the first movement of the guide-bar, through the first quarter section of the cam, which causes the first crossing of a pair of the warp threads. This will be clear to a person skilled in the art of making Nottingham lace fabrics, especially as the illustration shows only the new crossing of the warps the remaining interlacing of the warps with the pillared spool threads, to form what would otherwise be cable or combination net, not being shown in this Fig. 2.

In order to better enable those skilled in the art of making twist-lace fabrics to produce my improved net, I will describe the changes I have made in the well-known lace curtain machines for that purpose, and to the particular method of operating the same; but I have not claimed the same in this patent application.

Referring to Fig. 3 of the drawings, I have illustrated diagrammatically three guide-bars indicated at 9, 10 and 11, the shorter and first in order of which, indicated at 9, carries the spool or pillar-forming threads; the other two bars marked 10 and 11 are threaded up with fine warp threads. The transverse lines 1, 2, 3, 4, 5, 6, and 7 indicate a series of thread-controlling jacks, governing the warp threads, and controlled by a jacquard mechanism. The guide-bars 9, 10 and 11 are operatively moved by cams, indicated at 9^a, 10^a and 11^a. All of these elements, in the same relation, though not having the same gait movements, for the purpose of producing the usual diamond-shaped mesh commonly called cable net, are very well known, and remain as heretofore in my machine except in two particulars, namely, I supply a new form of cam 10^a operating warp guide-bar 10, and another new form of cam 11^a operating warp-guide-bar 11. It should be noted however that the ordinary cable net can be and usually is made with a single warp guide-bar, though there is no objection, for certain purposes, of duplicating them, as stated, both being governed by a like shaped cam. In making my fabric two warp bars are necessary, each governed by its own specific cam. It is the new gait movements imparted to these two warp bars by these two new cams, in connection with certain movements or non-movements, as the case may be, of certain of the thread-controlling jacks, timed to co-act therewith, whereby I am enabled to produce, on this machine so modified, my new fabric described.

The two new warp-bar cams 10^a and 11^a are shown in side elevation in Figs. 4 and 5; the former showing the cam 10^a which actuates warp-bar 10 and the latter showing the cam 11^a which actuates warp-bar 11; this order of the warp-bars and their said cams, relatively to the spool bar 9 and its cam, which latter are the same as heretofore, is essential in the following method of operating them, now to be described. Each of said warp bars is threaded up as usual across the machine, with the requisite number of threads to the inch, depending upon whether 6-point lace, or any finer or closer mesh netting is to be made, and the new cams cause the bars to rise or fall by one, two or three gaits, as the case may be, on each of the four half motions backward and forward. To accomplish the object sought, the jacks must be caused to suitably coact with such gait movements of the two warp-bars, the odd numbered jacks being so operated by the jacquard cards stamped to cause the warps to cross each other, on each wale in alternating relation, and forming what is in effect a double cross for each mesh. For example, the cards governing the 1st and 5th jacks are stamped to produce the warp crossing on the 1st wale, while the cards governing the 3rd and 7th jacks are stamped to produce such cross on the 2nd wale, and this order with a card similar to that governing No. 1 jack is repeated in the 3rd wale, and so on. This control however governs only on each opposite backward or forward motion of the two warp-bars, to form the double cross effect. On the remaining motions of the bars, produced by other parts of the cam-face, both bars moving in the same direction, the even-numbered cards say 2, 4 and 6 are cut to so govern the jacks, as usual, to form the remaining portion of the ground-net, *i. e.*, to interlace the warp threads with each other and with the pillaring spool threads to form what would otherwise be the usual combination or cable netting. It will be observed that in both warp-bar-actuating cams 10^a and 11^a, all that half above the dotted diametric line 13 on each cam (Figs. 4 and 5) operates the bars to produce the usual interlacing of the threads for usual cable net, while the lower half of the cams, below such diametric line, actuates the bars to produce the additional crossing to form the new net, the warps being controlled by appropriate jacks for each purpose, as before stated. In other words, the odd-numbered jacks are caused to coact with the movement of the warp-bars under the action of the lower half of each cam, to make the double crossing for each wale, while the even-numbered jacks coact with the movements of the warp-bars, under the action of the upper half of each cam, as shown in said Figs. 4 and 5 to do the interlacing; the bobbin threads being inserted as usual and governed by the usual movements of the carriages.

In Figs. 4 and 5 the four parallel circular dotted lines show the four possible gait movements of each warp-bar under the ac-

tion of its cam, while the heavy line 15 in each figure shows the shape of the cam and enables the reader to understand more readily the following description thereof, especially when read in connection with Fig. 2 in which the eight motions in the aggregate are shown beginning with the third motion, acting on two contiguous wales.

The gait movements, or rising and falling of the warp-bars, by means of their cams, and the operation of the carriages relatively to the front and back guide-combs, and of the jacks, governing the warps, are as follows:—The bar 10 is threaded up with the warps *a* and *c*, and the bar 11 with the warps *b* and *d* (see Fig. 2). On the first motion, both bars 10 and 11 move to the left or "rise" two gaits, the jacks being out, both bars then move to the right or "fall" one gait, and the carriages pass into the front combs. On the second motion both bars "fall" two gaits, the jacks being out, and the carriages return to their first position in the back guide combs. On the third motion, bar 10 rises two gaits, bar 11 not moving, the even-numbered jacks enter the threads on bar 10 which then falls one gait; bar 11 rises one gait to the left, and the carriages pass into the front combs. On the fourth motion, bar 11 falls two gaits, even-numbered jacks enter the threads, bar 10 falls one gait, and bar 11 rises one gait, the carriages then pass into the back combs. On the fifth motion, both bars rise two gaits, the jacks being out, both bars then fall one gait, and the carriages pass into the front combs. On the sixth motion, both bars fall two gaits, the jacks being out, both bars then rise one gait, and the carriages return into the back guide combs. On the seventh motion, bar 10 rises two gaits, bar 11 is not moved, and odd-numbered jacks now enter the threads; bar 10 then falls one gait, bar 11 rises one gait, and the carriages pass into the front combs. On the eighth motion, effected by the cams, bar 11 falls two gaits, while bar 10 is not moved, and odd-numbered jacks enter the threads; after which bar 10 falls one gait, bar 11 rises one gait, and the carriages pass into the back guide-combs.

As will be obvious to persons skilled in the art, the ordinary cable-net can also be made on this machine employing the new warp-bar cams, by merely reversing the action of the odd and even jacks, which will render the described gait movement inoperative to produce the double crossing of the warps, hence the machine may be used for both purposes in a single piece of fabric. My new double-cross-netting which results, is due to the double crossing of the warps on each wale, effected by the new warp-bar-cams which impart to the pair of warp-bars a new set of gait movements to the extent described, the jacks being appropriately selected and governed by the cards, as stated, has a mesh which is not diamond-shaped like cable net but substantially a round shape, imparting a decidedly novel appearance, is necessarily more substantial in texture, and has a fine "lacy" appearance, which the usual cable or combination net wholly lacks.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. As a new article of manufacture the herein described machine-made double-cross netting consisting of a twist-lace cross-net composed of pillared spool threads, bobbin threads twisted around each of the same, a series of warp threads between said pillared threads, forming open meshes in staggered relation, and a series of additional warp threads crossing each mesh of the netting alternately and in opposite directions.

2. A twist-lace cross-net composed of pillared spool threads, bobbin threads twisted around each of the same, a series of warp threads forming with each two pairs of pillared threads a series of open meshes in staggered relation, and an additional set of warp threads crossing and tying-in each mesh of the net.

In testimony whereof, I have hereunto affixed my signature this 15th day of July A. D. 1911.

ARTHUR BURGESS.

Witnesses:
A. M. BIDDLE,
R. A. DUNLAP.