

June 7, 1927.

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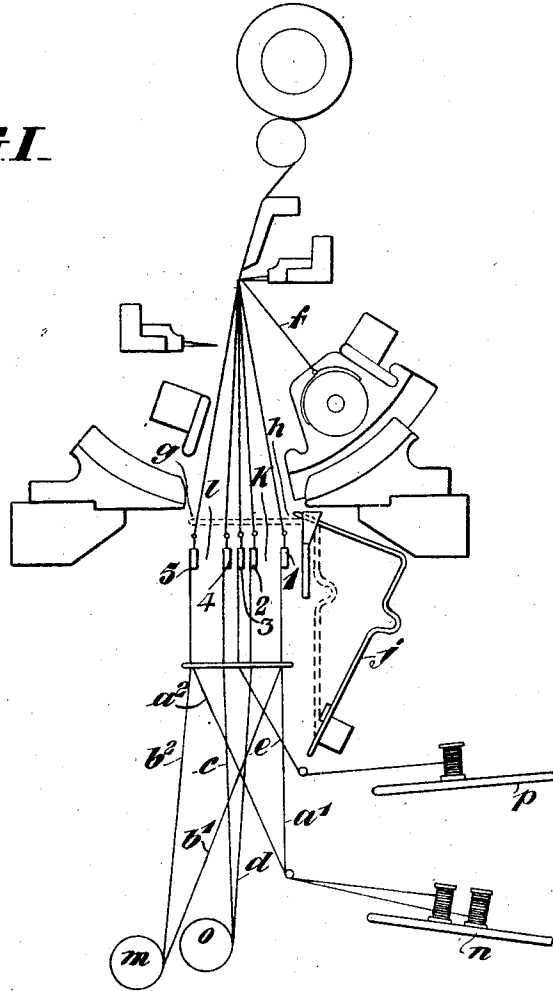
1,631,886

LACE FABRIC AND METHOD OF PRODUCING SAME

Filed May 15, 1926

4 Sheets-Sheet 1

FIG. 1.



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4 Sheets-Sheet 2

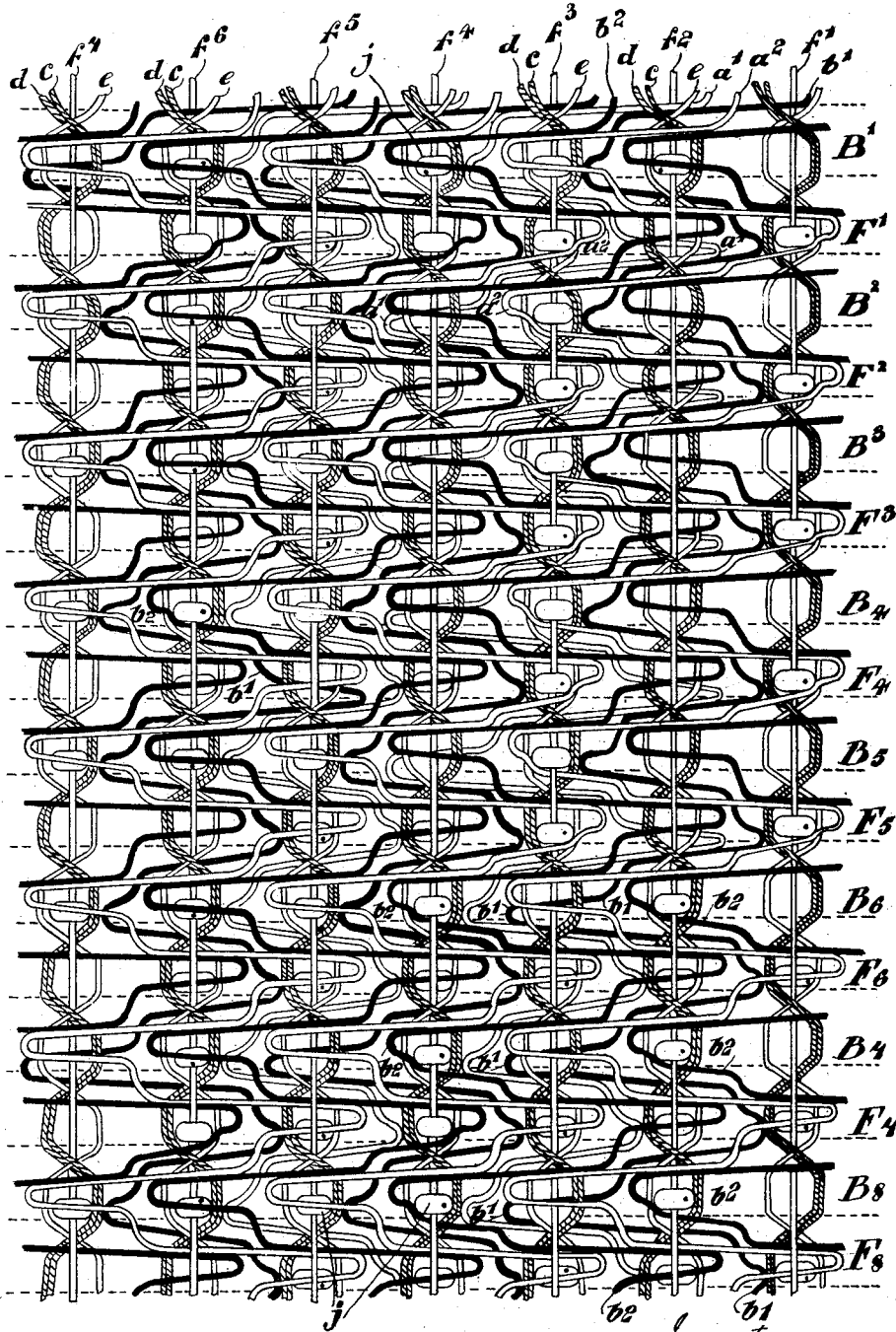


FIG 11

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LACE FABRIC AND METHOD OF PRODUCING SAME

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4 Sheets-Sheet 3

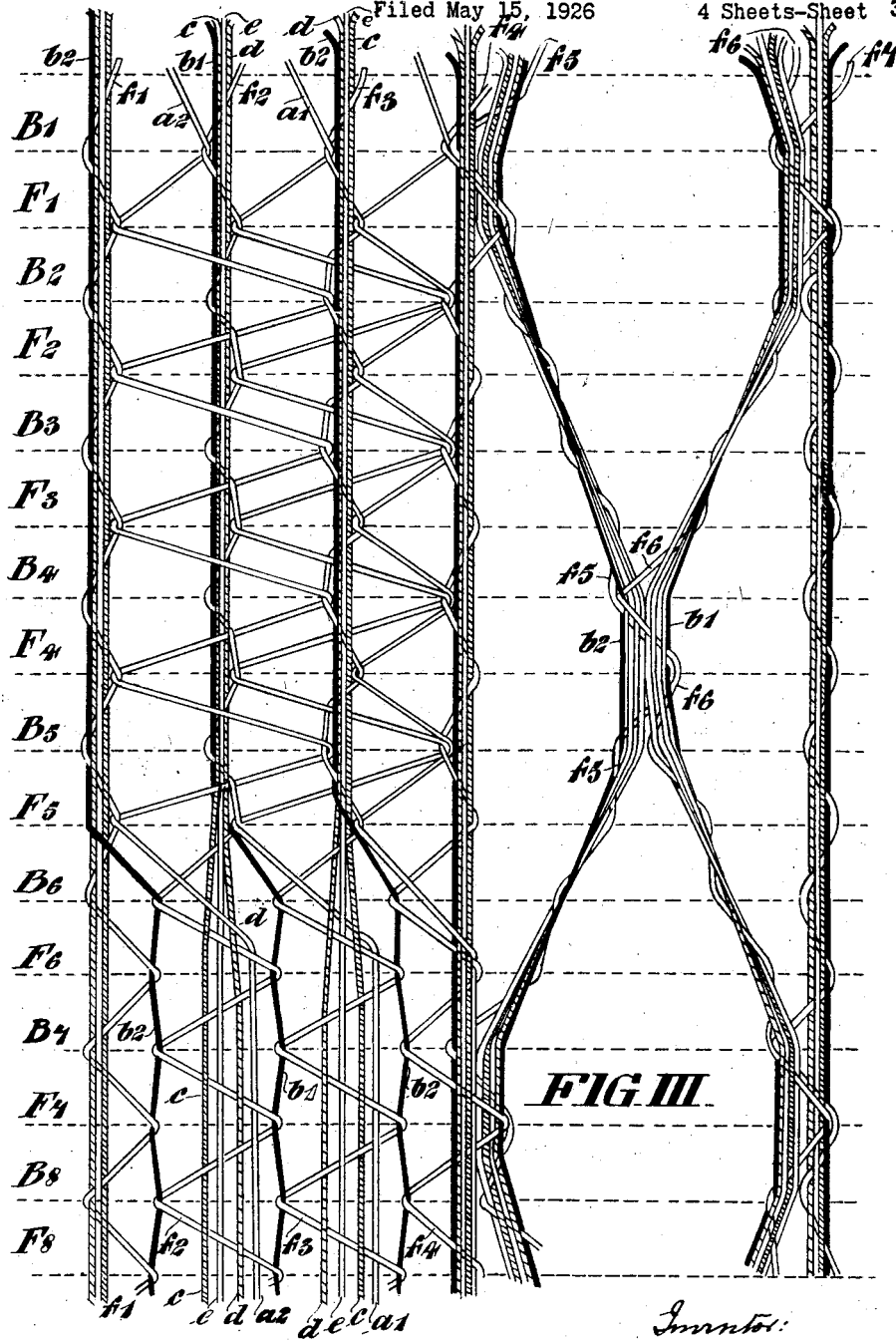


FIG III

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LACE FABRIC AND METHOD OF PRODUCING SAME

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4 Sheets-Sheet 4

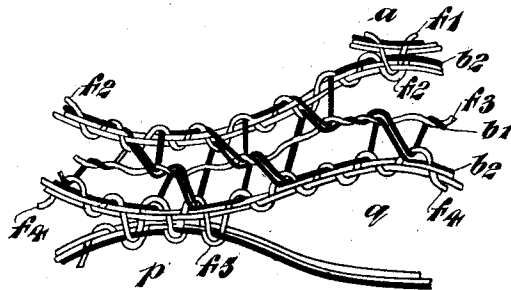


FIG. IV

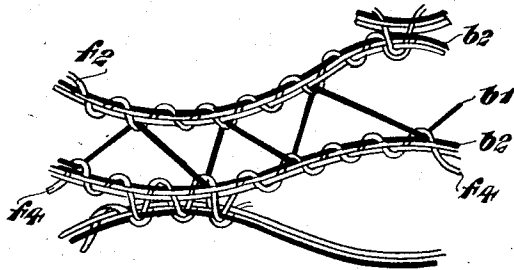


FIG. V

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LACE FABRIC AND METHOD OF PRODUCING SAME.

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This invention relates to improvements in fabrics adapted for production on twist-lace machines and in the method of producing such fabrics and has reference to the production of fabrics on twist lace machines utilizing guide bars and pickers or jacks in the manner customary to twist lace machines of the curtain type.

The invention is concerned primarily with the production of double fronted fabrics on twist lace machines of the said type. Normally fabrics produced on machines of this type have what is termed a right and a wrong side the right side being the relief-carrying face or side. It is of course to be understood that there may be no relief, this depending entirely on the nature of the pattern produced but providing there is relief then in fabrics as usually produced on curtain lace machines the relief will be on the right side.

By the expression double fronted fabrics is to be understood fabrics in which both sides are right sides. That is to say both sides present relief carrying faces. As intimated there may be no relief on either face depending on the pattern produced or alternatively there may be relief on only one face but both faces are capable of carrying relief.

For further elucidation it may be said that in ordinary lace curtain work the bobbin threads twist round all the patterning threads and tie them on to warp threads which latter threads are necessarily tight in order to hold the fabric. The warp and bobbin threads at the back or foundation of the twists show plainly as ribs on the fabric and these ribs characterize what is known as the wrong side of the fabric. This characteristic is not present in double fronted fabrics produced in accordance with this invention as will be apparent from the detailed description appended hereto.

The principal object of the present invention is the provision of an improved method for producing double-fronted fabrics, whereby a greater variety of effects in such fabrics can be produced than has hitherto been possible and whereby fabrics of this type can be produced of better quality and pattern and/or more cheaply.

The principal feature of this invention consists in the production of double faced fabrics on twist lace machines by the em-

ployment of two guide bars in combination with jacks or pickers but without the use of additional elements for mechanically acting upon the spool or warp threads to move such threads transversely of the machine.

A further feature of this invention consists in the production on twist lace machines of double fronted fabrics with relief carrying faces on both sides in which the space occupied by relief work in the front is occupied by corresponding relief work in the back.

In the present specification the terms "a full warp" and "a full set of spools" and like expressions are to be interpreted as meaning the warp or spool threads necessary to furnish one thread to every carriage i. e. the same number of warp or spool threads as there are bobbin threads.

Another feature of the present invention consists in the production of double fronted fabrics on twist lace machines of the type set forth by the employment of a full warp and a full set of spools (hereinafter referred to as the basic threads) one half of the warps and spools of the basic threads functioning as front threads and the remaining half as back threads, the warps in each half alternating with the spools of the same half and each warp/spool of one half being opposed to a spool/warp of the other half if threads additional to the basic threads are utilized there being no threads to the front of any of the front threads and no threads to the back of any of the back threads.

It will of course be appreciated that any convenient number of threads additional to the basic threads may be utilized depending upon the nature of the fabric or pattern to be produced; and yet another feature of the invention may be said to reside in this; that none of the threads additional to the basic threads lie outside (i. e. to the front or back) of said basic threads.

It is to be understood that the expressions "front basic threads" and "back basic threads" and similar expressions are utilized merely to differentiate the basic threads so that the relative dispositions of such threads may be more readily understood and more easily defined and further that half of the front and half the back basic threads may be disposed in one and the same bar.

Another feature of this invention consists

in the production of double-faced fabrics embodying cross-net effects wherein one of the threads forming each cross is of right twist and the other thread of such cross is of reverse twist.

It is well understood that lace machines of the type to which my invention belongs are adapted to produce lace fabrics having different characteristics, which are to the trade and those acquainted with machine-made lace designated by different names, such as single-tie, combination, madras, cross-net, double-tie, double-action, fillet, etc. The character of any such machine-made lace is determined by the pattern mechanism that is employed, and which governs the operations of the lace-making machine itself, and also by the manner of threading the guide bars of the machine.

My invention, when incorporated into a lace machine, as will be hereinafter described, is adapted, by the use of proper controlling or pattern mechanisms such as are now well known in the art, to produce lace fabrics of different kinds such as above enumerated, in each and all of which may be embodied the features of novelty herein to be described.

In order that the nature of the invention may be more readily understood reference will now be made to the accompanying drawings wherein:—

Fig. 1 is a part sectional view of a lace machine set up in accordance with one method of carrying out this invention.

Fig. 2 is adapted to illustrate the movements of the threads through the guide bars and the interceptions by the pickers for the production in accordance with this invention of double fronted fabrics embodying relief clothing, wickerwork, fining and the back and front combination nip.

Fig. 3 shows the pattern, or the result of the combined movements of threads and pickers as shown in Fig. 2 after the pickers have released the threads.

Figs. 4 and 5 illustrate a method of producing a fast edged scallop with plaited pillars in accordance with this invention.

In Fig. 1 the machine is shown with five guide-bars one, designated 1, at the back between the lines h and k guiding the basic thread a' b' and another in the front between the lines g and l and designated 5 guiding the basic thread a^2 b^2 . In the example three intermediate bars are shown in the middle between the lines k and l , but the number of such middle, or intermediate bars may vary in accordance with the character of the intermediate or secondary effects incorporated with the invention.

The basic threads are passed through the bars in the manner that a spool thread a' running from a spool board n is threaded through the back bar 1 and a warp thread

b^2 running from a full warp beam m is threaded directly opposite to it in the front bar 5, the next guide in the back bar is threaded with a warp thread b' and the opposite guide in the front bar with a spool thread a^2 and so on, threads b^2 a^2 being opposed to threads a' b' throughout the length of the machine.

The threads a' b' tie, that is pass under and over the bobbin threads, through the action of the back guide-bar unless pickers j are inserted to prevent the tie. Thus the pickers may be said to influence the threads in the back bar negatively. The threads a^2 b^2 in the front guide-bar do not tie unless pickers are inserted to hold them until the bobbin thread has changed from back to front, or vice versa. The pickers therefore influence the threads in the front bar positively.

Where a thread a' is required to tie, a picker is drawn back to the line h , an odd-numbered picker if the carriages are at the back, an even-numbered picker if the carriages are in front. Where a thread b' is required to tie, an even-numbered picker is drawn back to h if the carriages are at the back, an odd-numbered picker if the carriages are in front. Where a thread a^2 is required to tie, an even-numbered picker is inserted to the line g if the carriages are at the back, while an odd-numbered picker is inserted to the line g if the carriages are in front. Where a thread b^2 is required to tie, an odd-numbered picker is inserted to the line g if the carriages are at the back, an even-numbered picker to the line g if the carriages are in front. Where neither back nor front threads are required to tie, but a hole is desired in the fabric, pickers are inserted to the line h . This principle of manipulating the pickers obtains in every case where the basic threads are alternatively disposed, half in the extreme back and half in the extreme front bar, and regardless of what the number of intermediate bars in the middle between these back and front bars may be.

As odd-numbered pickers the first picker in the machine, the third, fifth and so on, are understood, as even numbered the second, fourth, and so on.

The foregoing directions are given under the assumption that a thread a' is in the first guide of the back bar; if the first guide in the machine is started with a warp thread b' the directions regarding odd and even pickers would have to be transposed.

In the example given in Fig. 1 with three middle, or intermediate bars, the middle bar of all is full-threaded with right twisted spool threads e running from a spool board p and the two remaining intermediate bars are each full-threaded with reverse twisted threads c d running from a double warp

beam *o* (that is to say, a warp beam with two threads to every carriage in the machine).

It will be understood, as has already been suggested, that a curtain lace machine to which my invention is applied may be threaded differently from what is illustrated in Fig. 1, accordingly as one or another effect in the lace being made is desired. For instance one or more intermediate bars—that is the thread bars between those designated 1 and 5—may remain unthreaded and the proper shogging and pattern mechanism employed in order to produce the particular form of lace fabric desired. It is deemed unnecessary to herein describe all the arrangements of threading the bars and all of the movements which may be given to them to secure the desired effects in lace production. I shall therefore only set forth the movements required in producing a fabric such as illustrated in Figs. 2 and 3, it being understood that the machine is threaded as indicated in Fig. 1.

In order to produce multiple wickering in combination with plaited pillars in which four threads wicker in every wale (i. e. the distance between adjacent pillars) five fully threaded bars are employed of which bars Nos. 1, 3 and 5 carry right yarns and bars 2 and 4 carry reverse twisted yarns. In this case the basic threads will be located in the two bars 1 and 5. One double lift jacquard in double action or two single lift jacquards in double action is/are employed in the determined sequence as follows:

Quarter motions.	Trick bar.	Intermediate bars.					Pickers.
		1	2	3	4	5	
		Back.	Re-verse.	Right.	Re-verse.	Front.	
1	Rise 1.	Rise 2.	Fall 1.	Rise 1.	Fall 1.	Rise 2.	Enter.
2	Rest..	Rise 1.	Rest..	Rest..	Rest..	Fall 1.	Withdraw.
3	Fall 1.	Fall 2.	Rise 1.	Fall 1.	Rise 1.	Fall 2.	Enter.
4	Rest..	Fall 1.	Rest..	Rest..	Rest..	Rise 1.	Withdraw.

By the above method torchons, scollops and other hand-made lace effects are enabled to be produced by virtue of the multiple wickering in combination with the plaited pillars and firm nip whilst additionally all the effects enumerated with reference to the above described arrangements can also be obtained.

For the purpose of heightening the relief work and distinctiveness of each face in fabrics produced according to the last mentioned method the intermediate bars 2, 3 and 4 or certain of these bars are caused to fall an additional gait so that clothing is made behind the spool weaving in the front and in front of the spool weaving at

the back. By this means an approximation to an independent fabric between two faces is obtained. According to the thickness of the intermediate clothing desired one, two, or all of the bars may be employed and where any bar is not required to make clothing between the relief surfaces a stop screw may be provided for preventing such bar from falling the additional gait.

Referring now to the drawings which as stated illustrate only one embodiment of the invention it will be seen from Figure 1 that the bars are threaded as described with reference to the table hereinbefore appearing. The movements of the bars are as given in this table and the following description particularly with reference to Figures 2 and 3 will render clear the manner in which double fronted fabrics with various effects are produced in accordance with this invention.

In Fig. 2 the sections B', B², B³, etc., show the movements of the threads and the insertions of pickers on back motions, that is to say, when the carriages with the bobbin threads *f* are at the back; the sections F', F², F³, etc., show the movements of the threads and the insertions of pickers on front motions, that is to say, when the carriages with the bobbin threads *f* are in front. The discs *j* represent the pickers; odd-numbered pickers are characterized by a dot, even-numbered pickers are shown blank. A full disc denotes that the picker has advanced to the line *g* and influences a thread *a*², or *b*² positively; where a picker has advanced to the line *K* and intercepts a thread *a'*, or *b'*, only, the threads *a*² or *b*² show in front of the disc. At those places in the sections where no picker is shown, this has been withdrawn to the line *h*.

In the section F' an odd-numbered picker inserted to *g* by the bobbin thread *f'* causes a thread *a*² to tie with this bobbin thread, in B² an even-numbered picker inserted to *g* causes the same thread *a*² to tie with the bobbin thread *f*³. This thread *a*² floats in front of all the other threads and, in natural size, covers them, thereby giving a relief effect to the work seen from the front. In section F' by the bobbin thread *f*² a picker is drawn back to *h* so that a thread *a'* ties with the bobbin thread *f*², in section B² a picker is drawn back to *h* by, or at, the bobbin thread *f*⁴ so that the same thread *a'* ties with the bobbin thread *f*⁴. This thread *a'* floats behind all the other threads, which, in natural size, gives a relief effect to the work seen from the back.

In B³, B⁴, B⁵ by *f*² and *f*⁴ odd-numbered pickers advanced to *g* cause threads *b*² to tie with the bobbin threads *f*² and *f*⁴; by *f*³ the picker is withdrawn to *h* and a thread *b'* ties with the bobbin thread *f*³. The threads *b*² form loops which catch the bobbin threads in front of the middle threads *c*, *e*, *d* and

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when the pickers release the threads these loops, in straightening themselves on account of tension, draw the bobbin threads over the thread *c* in the manner described and illustrated in British Patent 155,925; the middle threads *e* which form secondary loops and catch the bobbin threads in front of *d*, on straightening themselves on account of tension, draw the bobbin threads over *d* in like manner. The point where the bobbin threads are thus drawn over the reverse threads *c* and *d* is where the back motion commenced, that is to say, at that point where these reverse threads (together with all the other threads) had been moved or laid over the bobbin threads. The thread *b'* forms loops which catch the bobbin thread behind the threads *d*, *e*, *c* and draw the bobbin thread under *d*, while the thread *e* draws it under *c*, at the point where the front motion commenced, that is to say, the point where the threads had been laid under the bobbin. Thus bobbin threads and reverse threads have hereby changed positions; where the right twisted threads remain over the bobbin thread this is drawn over the reverse threads, where the right twisted threads remain under the bobbin thread, this is drawn over the reverse threads, where the right twisted threads remain under the bobbin thread, this is drawn under the reverse threads. The consequence of this is that the bobbin threads wicker or plait alternately under and over the different warp and spool threads as shown in Fig. 3 in the sections B⁶ to F⁸ between the bobbin threads *f'* and *f''*.

Referring again to Fig. 2 in B⁴ by *f'* an odd-numbered picker intervenes to tie a thread *b''* to this bobbin thread, while by *f''* and *f'''* pickers are inserted to K in order to leave a hole on each side of the accomplished tie. In F⁴ by *f''* an odd-numbered picker is drawn back to *h* and a thread *b'* ties with the bobbin thread *f''*, while by *f'''* and *f''''* pickers are inserted to K in order to leave a hole on both sides of the accomplished tie. When the pickers are withdrawn in these sections the thread *b''* pulls the bobbin threads *f''* and *f'''* together from the front, while the thread *b'* pulls them together from the back. In this way a firm combination nip is formed as shown in the corresponding sections in Fig. 3.

If the threads *d*, *e* were taken away, the middle bars guiding them either left empty, or removed from the machine, so that only the reverse thread *c* remained as middle thread and the same pickers inserted as in Fig. 2 the result would be the same, minus of course the two missing middle threads *d*, *e*, that is to say, two threads would wicker in each wale (the distance from the one warp thread to the next) instead of four as shown in the example.

If, with the insertions of pickers as in Fig. 2, five middle, or intermediate bars were used and threaded alternately with reverse and right twist, the result would be the same as above, with the exception that 6 threads would wicker in a wale.

For the purpose of making filet in conjunction with the above effects the middle bar of all with the spool threads *e* is used.

Where filet net is desired in the fabric the pickers change from the line *k* to the line *l* in the sequence

1st back motion pickers to <i>k</i>	
1st front motion pickers to <i>l</i>	
2nd back motion pickers to <i>k</i>	80
2nd front motion pickers to <i>l</i>	
3rd back motion pickers to <i>k</i>	
3rd front motion pickers to <i>l</i>	
4th back motion pickers to <i>l</i>	
4th front motion pickers to <i>k</i>	85
5th back motion pickers to <i>l</i>	
5th front motion pickers to <i>k</i>	

The above is the formula for 5 motion filet net; for 3 motion filet net the formula, beginning with the back motion, would be *k l k l k*; for 7 motion filet net, beginning with a back motion, *k l k l k l k l k l k l k l k*. In conjunction with filet net the basic threads work as before described, namely, pickers withdrawn to *h* to tie *a' b'* threads, advanced to *g* to tie threads *a'' b''*, the only difference being that in this case wherever holes are required in the fabric pickers must advance to *l*.

In the production of plaited pillars in accordance with this invention a fast edged scollop may readily be obtained in the manner illustrated in Figures 4 and 5. Figure 4 shows the production of fabric with the full complement of bobbins, *f'*, *f''* . . . etc. represent the bobbin threads and *b'*, *b''* . . . etc. represent the warp threads in both figures. At *p* firm combination nips draw the work together; at *q* a large hole is made in the fabric so that the scollop (of which the plaited pillar with the bobbin threads *f''* represents the edge) can recede into its concave part.

Now the fabric is produced without the bobbin *f''*. That is to say the carriage with this bobbin thread is removed from the machine where the division is required. At the division the fabric is then produced as shown in Figure 5 and it will be seen that thread *b'* can be readily withdrawn leaving the pillar of *f''* as a fast edge, that is, an edge that requires no cutting.

Claims:

1. Double fronted fabrics produced on twist lace machines in which there are relief carrying faces on both sides of the fabric and in which the space occupied by relief work in the front is occupied by corresponding relief work in the back.

2. The method of producing double front-

ed fabrics on twist lace machines, which consists in dividing the basic threads employed into a front group and a back group, through which the bobbin threads are carried and with which they twist, and shifting the spool threads of one group of basic threads to cause relief to be produced on one face of the fabric, and shifting the spool threads of the other group of basic threads to produce a design on the other face of the fabric.

3. The method of producing double fronted fabrics on twist lace machines, which consists in dividing the basic threads, composed of warp threads and spool threads, into two groups, a front group and a back group, through which the bobbin threads are carried and with which they twist, and shifting the spool threads of both said groups to produce identical designs on correspondingly opposite faces of the fabric, the design on one face being formed by the spool threads of one group and the design on the other face by the spool threads of the other group.

4. The method of producing double fronted fabrics on twist lace machines, which consists in providing a full warp and a full set of spool threads, these being arranged into two groups, one half the warp and spool threads to function as front threads and the remaining half to function as back threads, and arranging the same so that the warp threads in each group alternate with the spool threads in the same group, and each warp thread of one group is opposed to a spool thread of the other group, shifting the spool threads of each group to produce

a design on one face only of the fabric, and tying the warp and spool threads by means of bobbin threads which are passed back and forth through the two groups of warp and spool threads.

5. The method described in the last preceding claim, including as an additional step the introduction of additional threads, which tie with the bobbin threads, intermediate the aforesaid front and back threads.

6. The method of producing double fronted fabrics on twist lace machines which consists in dividing the basic threads employed into a front group and a back group through which the bobbin threads are moved and with which they twist, and arranging intermediate warp and spool threads between the said groups of basic threads, certain of said intermediate threads being reversely twisted and others right twisted, said reverse twisted and right twisted threads being positioned intermediate each other in the direction in which the bobbin threads are moved, and arranged whereby an intermediate right twisted thread operates to draw a bobbin thread over the reverse twisted thread that is opposite thereto on those motions where the reverse twisted threads are laid with the bobbin threads thereunder, and wherein a right twisted thread behind a reverse twisted thread draws the bobbin thread under the reverse twisted thread opposite thereto on those motions where the reverse twisted thread is laid with the bobbin thread thereover.

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