

March 31, 1925.

1,531,548

W. H. ENGLISH.

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 1

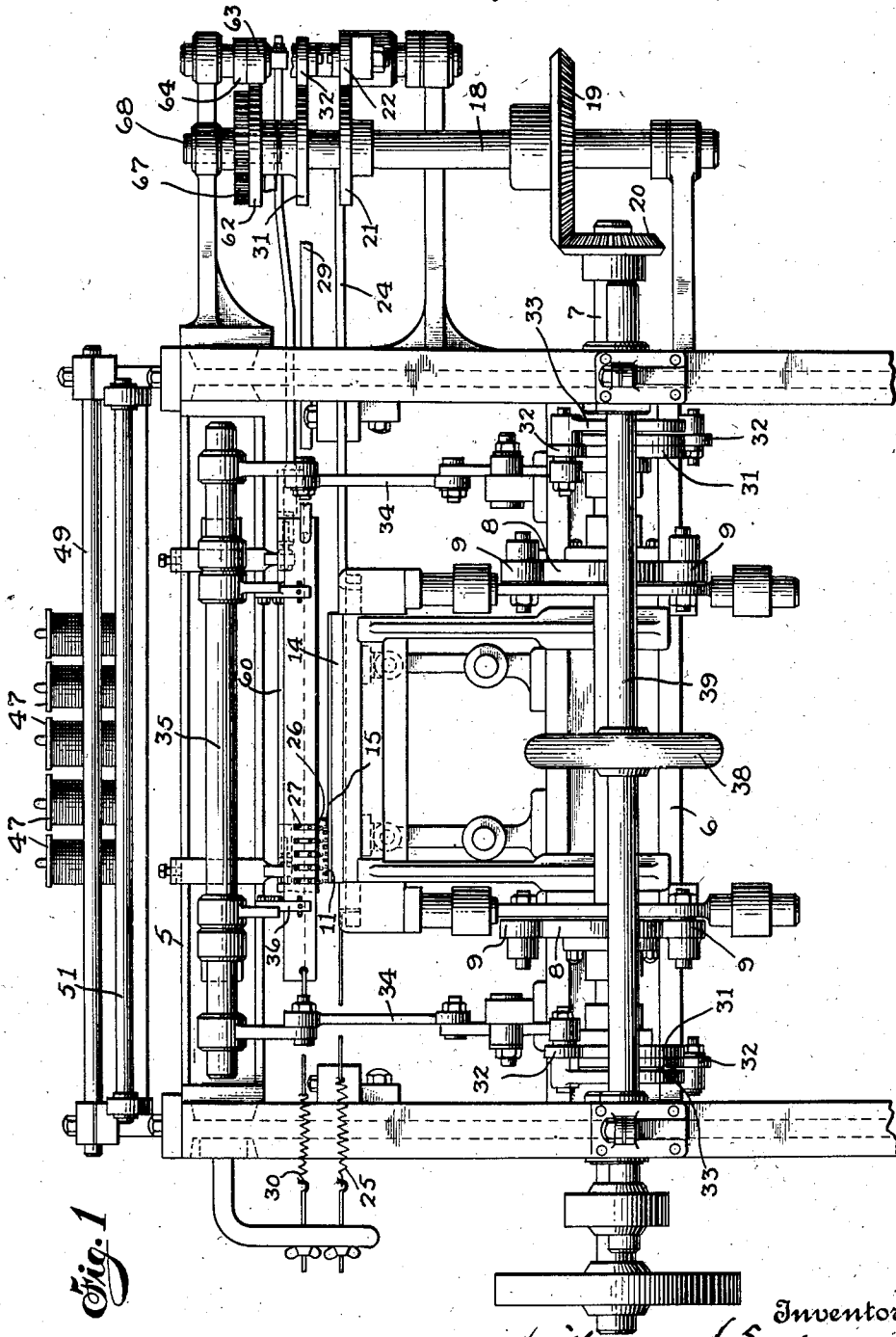


Fig. 1

Inventor  
*William H. English*  
By *H. Attorney*  
*Henry August*

March 31, 1925.

1,531,548

W. H. ENGLISH

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 2

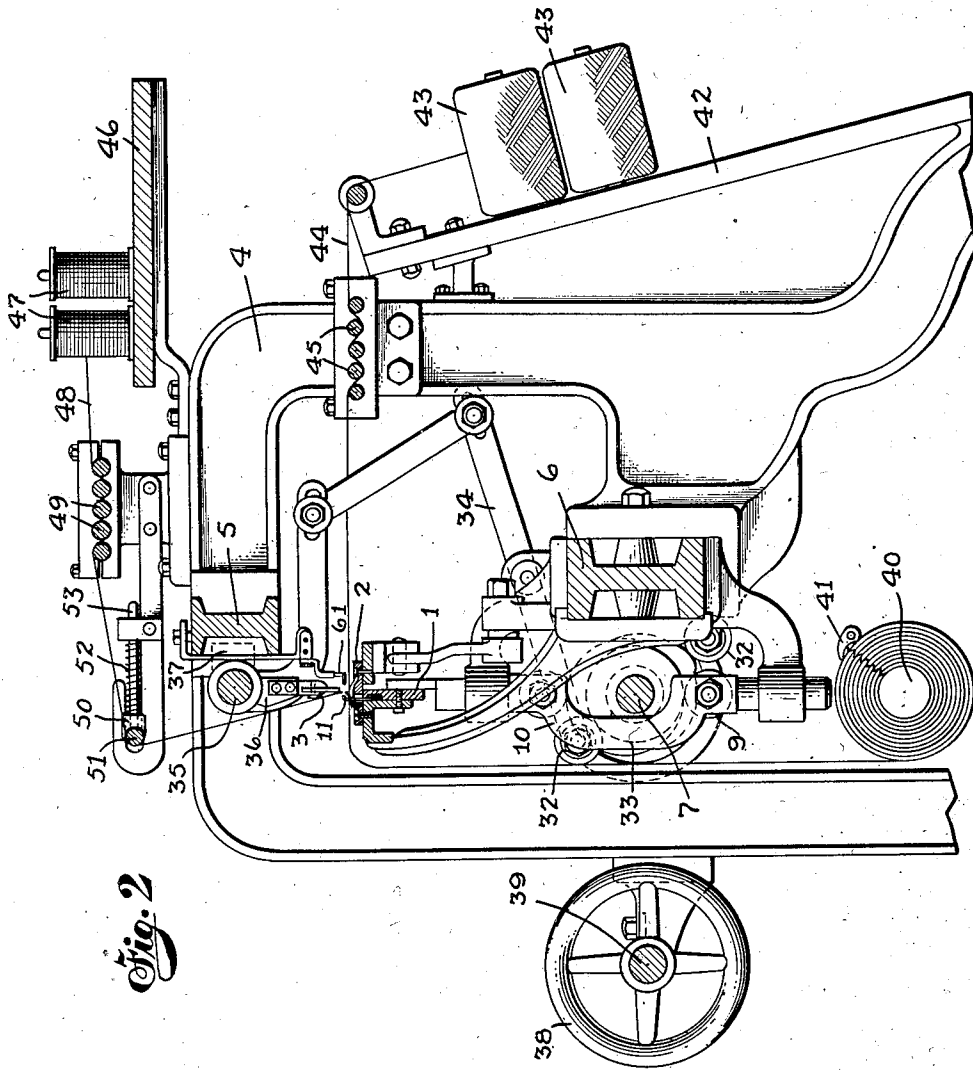


Fig. 2

William H. English Inventor  
By an Attorney  
Henry A. G. G. G.

March 31, 1925.

1,531,548

W. H. ENGLISH

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 3

Fig. 3

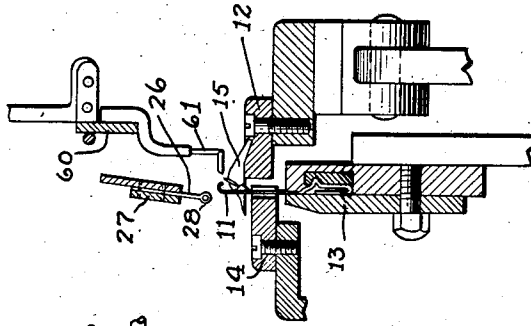


Fig. 4

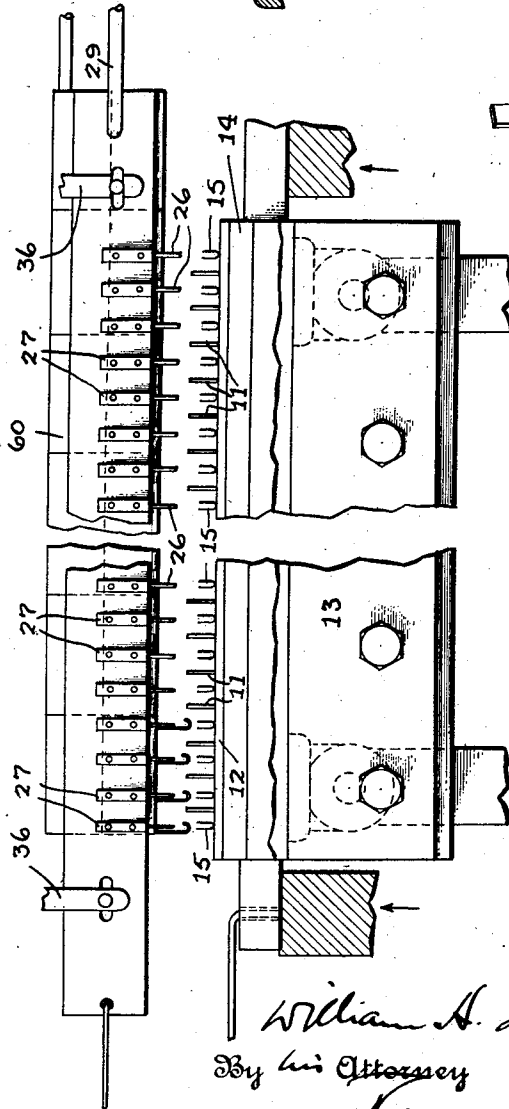


Fig. 6

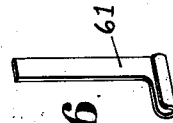
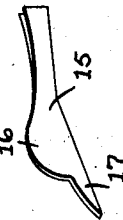


Fig. 5



Inventor  
William H. English  
By his Attorney  
Kemp & Ryan

March 31, 1925.

W. H. ENGLISH

1,531,548

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 4

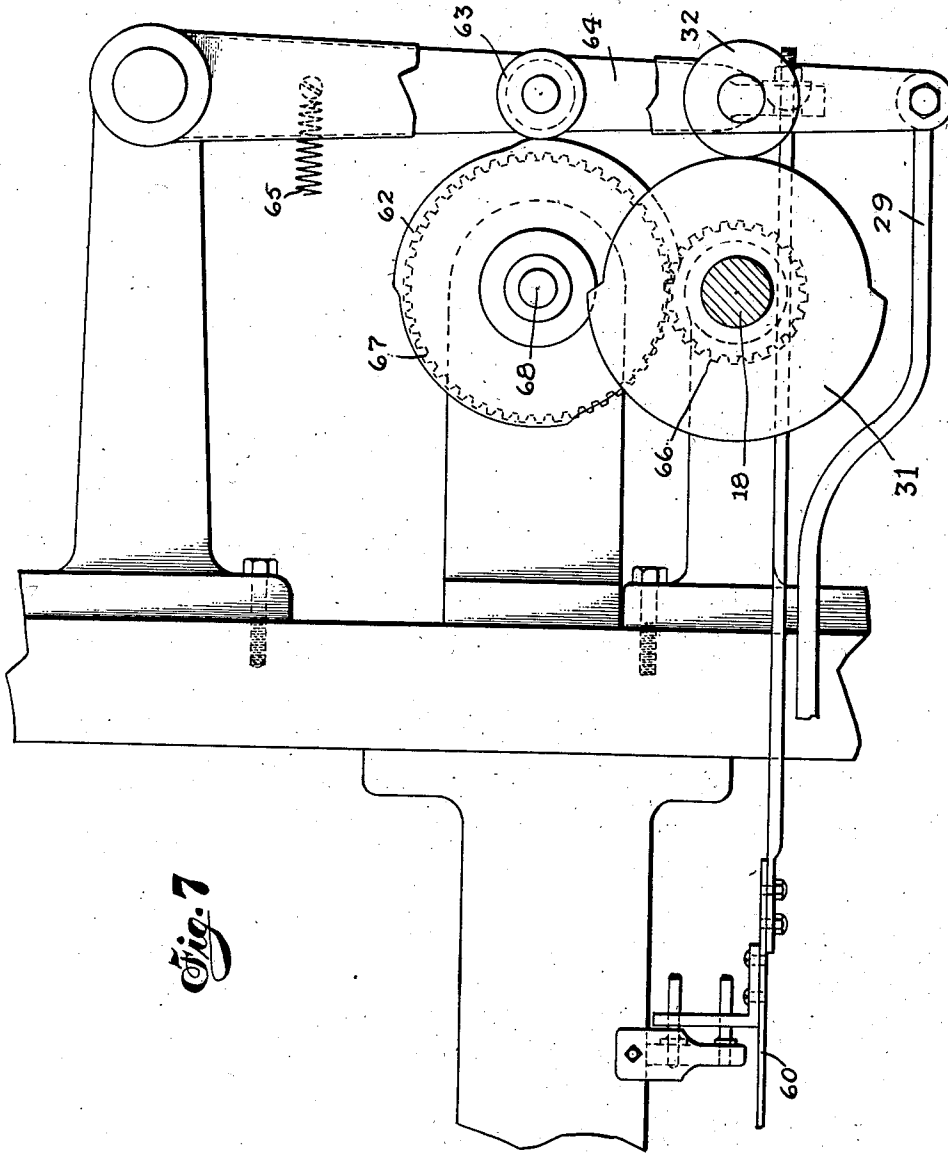


Fig. 7

William H. English Inventor  
By his Attorney  
Rams & Argall

March 31, 1925.

1,531,548

W. H. ENGLISH

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 5

Fig. 9

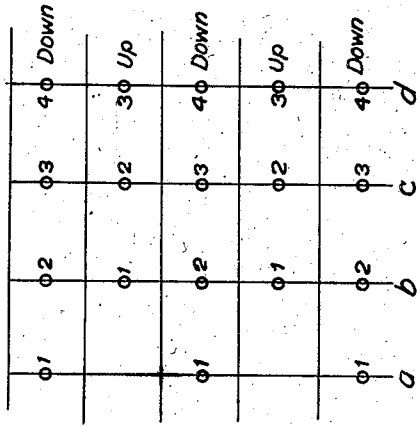
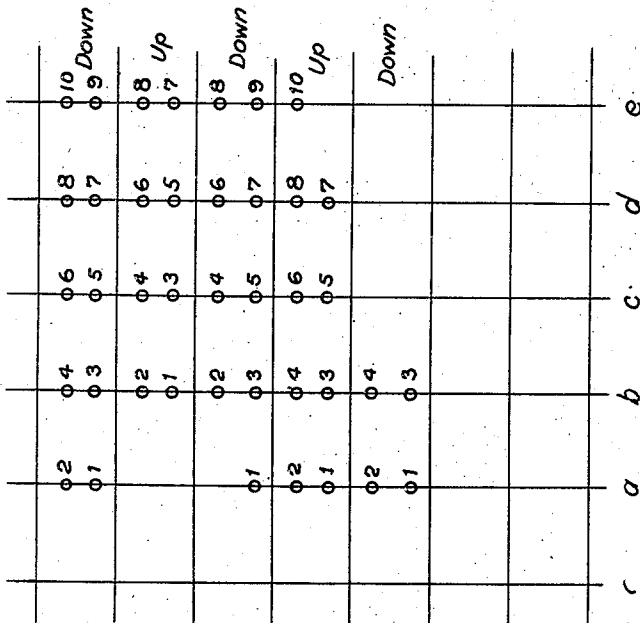


Fig. 8



Inventor  
*William H. English*  
 By *Attorney*  
*Samuel H. Ryan*

March 31, 1925.

1,531,548

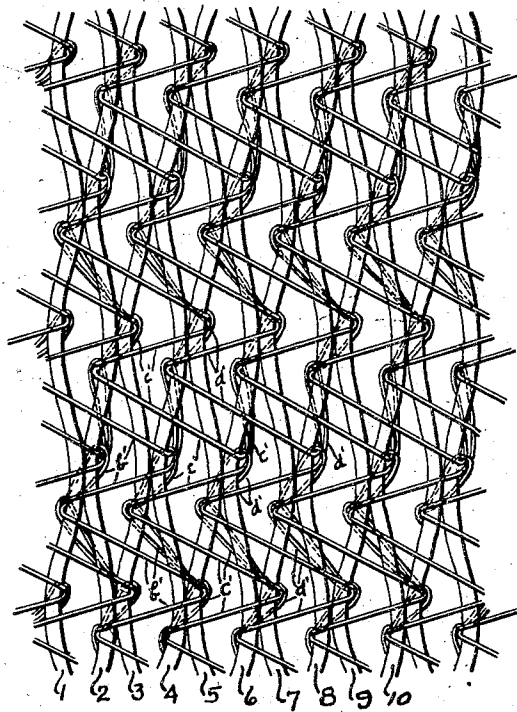
W. H. ENGLISH

KNITTED FABRIC AND METHOD OF MAKING THE SAME

Filed July 27, 1922

6 Sheets-Sheet 6

FIG. 10



INVENTOR  
*William H. English*

BY  
*Ramsay Hoqueh*  
ATTORNEY

Patented Mar. 31, 1925.

1,531,548

# UNITED STATES PATENT OFFICE.

WILLIAM H. ENGLISH, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR TO EARLE L. MILLER, OF PAWTUCKET, RHODE ISLAND.

## KNITTED FABRIC AND METHOD OF MAKING THE SAME.

Application filed July 27, 1922. Serial No. 577,866.

*To all whom it may concern:*

Be it known that I, WILLIAM H. ENGLISH, a citizen of the United States, and a resident of Pawtucket, in the county of Providence and State of Rhode Island, have invented an Improvement in Knitted Fabrics and Methods of Making the Same, of which the following is a specification.

My invention relates to knitted fabrics of the general character described in my pending application for United States Letters Patent Serial No. 490,260 filed August 6, 1921, and relates more particularly to an improved method of manufacture and improved fabric of the character described, by which important advantages are obtained. In the practical use of my improved fabric in connection with the manufacture of cord automobile tires, it has been found desirable in some cases to use fewer cords per unit width of the fabric thereby introducing a greater proportion of voids which are filled with rubber during the calendering process, thereby producing a more thoroughly impregnated fabric, and decreasing the amount of fabric required without substantially reducing the strength of the finished product.

My improved fabric retains all of the advantages of the specific fabric illustrated in my said copending application, since the cords lie flat during the calendering process and in the building up of the tire carcass, since the cords are longitudinally displaceable with respect to one another in the same manner, and since the connecting threads run in the general direction of the cords instead of across them as in a woven cord fabric.

In general my improved fabric differs from that of my said copending application in that instead of loops being lapped about adjacent single cords alternately, a series of three cords are operated upon, the loops being lapped about two cords of the series in one stitch and about two other cords of the same series in the next succeeding stitch, the middle cord of the series being thus alternately combined with the adjacent cords on each side of it.

In the drawings I have shown:

In Figure 1: a front elevation of my improved machine;

In Figure 2: a vertical cross-section thereof;

In Figures 3 and 4, detail view showing

the arrangements of the needles and their cooperating parts;

In Figure 5: a view on an enlarged scale of the sinker;

In Figure 6: a view on an enlarged scale of the quill;

In Figure 7: a detail view of the cam mechanism operating the quills;

In Figures 8 and 9, diagrams explaining the operation of my machine; and

In Figure 10, an enlarged view of my improved fabric.

It will be noted that my machine is similar and in general conformation to the machine illustrated in my said copending application, having the supporting frame 4 and needles 11 mounted upon the needle bar 13, and sinkers 15 mounted upon the sinker bar 12, and the guides 28 mounted upon the guide bar 27. These parts are suitably operated in timed relation to one another by means of the cams 21 and 31 operating the sinker and guide bars 24 and 29 respectively, and the cam 33 oscillating the needle bar vertically.

As shown in Figs. 2, 3 and 4 in the machine of my present invention, there is inserted the additional bar 60, carrying a plurality of quills 61, illustrated in detail in Fig. 6, through which an additional series of cords are adapted to be led in a manner similar to that in which the cords are led through the sinkers. In my improved machine there are thus two sets of cords being fed to the machine, one through the quills 61 and the other through the sinkers 15. The quills 61 are equal in number to the sinkers 15 and their movement is coordinated with the movement of the sinkers 15 in the manner which will be described hereafter.

The quill bar 60 is oscillated longitudinally of the machine by means of the cam 62 upon which roller 63 rides, which roller is mounted on pivotally mounted bar 64, one end of which is connected to the quill bar 60 as shown. A spring 65, or other suitable means, is used to return the bar and to hold the roller in contact with the cam. As will be seen from Fig. 1, the cams 21 and 31, which operate the sinker and guide bars respectively, are driven by means of shaft 18, so as to have a two to one relation of movement to the movement of the needle bar.

Mounted upon shaft 18 is the pinion 66 meshing with a driving gear 67, which rotates about the stud 68 and is fixedly connected to the cam 62. The relation of the movement of gear 67 to the movement of shaft 18, and consequently to the movement of the guide and sinker bars, is two to one; and the relation of the movement of the gear 67 to the movement of the needle bar is therefore four to one. It will be noted the configuration of the cam 62 is so chosen as to cause the movement of the quill bar at the same rate as the movement of the sinker bar, but that the quill bar moves alternately with the sinker bar and in the opposite direction.

The operation is such as to cause each thread to be lapped alternately about pairs of adjacent cords, the thread extending only for the purpose of retaining from one pair of cords to the adjacent pair and at each pair of cords to cause a thread to be lapped about the cords with an adjoining thread in such manner that there is formed a plurality of chains each chain being formed of adjacent threads with the cords lying in the wales. Referring to Figure 10, cords 1, 2, 3, 4, etc., it will be seen that thread *c'* first binds cords 4 and 5 forming there a chain loop with thread *b'*. This thread then extends over to cords 6 and 7, binds these two together with the loop *d'* and then extends to bind 5 and 6, binding them with a loop formed in conjunction with thread *c'*. In a similar manner, the thread *d'* alternately binds cords 6 and 7, and 7 and 8. It will thus be seen that the arrangement of threads and cords is such that the threads are looped about pairs of cords holding them in accurately spaced relation in a direction transverse to the cords, but the cords may be easily moved with respect to one another longitudinally or may if desired be withdrawn singly from the fabric without disrupting the fabric.

The difference between the operation of the machine of my pending application and that of my present application will be made clear from consideration of Figs. 8 and 9. These diagrams illustrate the positions of the cords during certain portions of the cycle of operations. Thus, if the vertical lines be considered to be the needle positions in the machine, and the distance between any two horizontal lines be considered to be the portion of the cycle occupied by a stroke of a needle in one direction, the positions indicated will be the positions occupied by the cords during that portion of the cycle. Thus, for instance, referring to Fig. 9, and assuming that the cords are numbered beginning from the left 1, 2, 3, etc., the position of the cords during the down stroke of the needles would be that shown between the first pair of horizontal lines opposite the po-

sition marked "down." After the formation of the loop, the sinker bars having been moved to the right, the cords would occupy the position shown between the second pair of horizontal lines, which position they would maintain during the upward movement of the needles as indicated by the word "up." During the next succeeding downward movement of the needle the sinkers and the cords would occupy their original positions as shown between the third pair of horizontal lines, and so on; it being evident that since the needle bar and the sinker bar bear a one to one relation, a movement of the sinker bar occurs for each needle stroke, and that the cords are alternately presented to adjoining needles.

In the operation of my improved machine, however, the complete cycle of operations extends over four needle strokes instead of two as in the previous case, as will be seen by referring to Fig. 8 in which the conventions are the same as those of Fig. 9, except that additional cords passing through the quills have been added, these cords being numbered 2, 4, 6, 8; etc., those passing through the sinkers being numbered 1, 3, 5, 7, etc. It will be seen that during the first down-stroke of the needles the pair of cords 1 and 2 are presented to one needle, (say needle *a*); the pair 3 and 4 to the next, (say needle *b*); the pair 5 and 6 to the next, (say needle *c*); and so on. During the next succeeding upward movement of the needles, the cords 1 and 2, having been moved to the right, are presented to the next adjoining needle on the right (i. e. needle *b*), and all of the other pairs of cords are similarly moved. Upon the completion of this needle stroke the quill bar is operated to throw the number 1, 3, 5, 7, etc. cords back to their original positions, leaving the sinker cords 2, 4, 6, 8, etc. in the positions to which they had been previously moved. It will thus be apparent that cord 2 instead of being paired with cord 1, as during the previous needle stroke, is now paired with cord 3, cord 4 with cord 5, cord 6 with cord 7, etc. During the next succeeding movement (this being the fourth needle stroke of the cycle and an upward stroke of the needle) cords 2 and 3, having been together moved to the left by the operation of the quill and sinker bars, are together presented to the adjoining needle on the left (i. e. needle *a*). This completes the cycle of operations, the position of the cords during the next down-stroke of the needle being the same as the first position considered in connection with Fig. 8.

It will be evident that the cycle of operations, considering for the moment only cords 1, 2 and 3, consists in presenting cords 1 and 2 to needle *a*, then presenting this same pair of cords to needle *b*, then presenting cords 2 and 3 to needle *b*, and then



presenting cords 2 and 3 to needle *a*. In other words, cord 2 is alternately combined with cords 1 and 3, and the pairs thus formed are alternately presented to adjoining  
5 needles.

From the foregoing description it will be seen that the fabric produced by my improved machine is similar to that illustrated and described in my said copending application, but differs from it in that instead of single cords being contained within the loops of thread, pairs of cords are looped, and that each cord is alternately combined within a loop with the adjoining cords on  
15 either side of it.

What I claim is:

1. The method of making a fabric comprising a plurality of parallel cords and transverse threads which comprises alternately looping a thread about a cord and the adjacent cord thereto on one side thereof and the same cord and the adjacent cord thereto on the other side thereof.  
20

2. The method of making a fabric comprising a plurality of parallel cords and transverse threads which comprises alternately combining each cord with the adjoining cord on each side thereof within loops formed by said threads, each loop embracing two cords.  
25

3. The method of making a fabric comprising a plurality of parallel cords and transverse threads which comprises looping adjacent cords together to form pairs, each pair being within the same loop and successive pairs comprising different adjacent cords.  
30

4. The method of making a fabric com-

prising a plurality of parallel cords and transverse threads which comprises forming  
40 pairs of cords by looping the thread about adjacent cords in pairs, successive pairs of cords containing one cord only in common.

5. The method of making a fabric comprising a plurality of parallel cords and transverse threads which comprises lapping adjacent needles alternately to form a series of loops with the transverse threads and subsequent to the formation of said loops causing each loop to embrace a pair of  
45 parallel cords.

6. The method of making a fabric having a plurality of parallel cords and transverse threads which comprises successively presenting a pair of cords to adjacent  
55 needles and thereafter presenting the needles, in the alternate order, another pair of cords, one of the cords of said pair being one of the cords of the first pair.

7. A fabric comprising a plurality of parallel cords and transverse threads in which a transverse thread is alternately looped about a cord and a cord adjacent thereto on one side thereof, and the same  
60 cord and the cord adjacent thereto on the other side thereof.

8. A fabric comprising a plurality of cords and threads, a plurality of loops formed by the threads, each loop including a pair of cords and each cord being successively paired with its adjacent cord on  
65 each side.

In testimony whereof, I have signed my name to this application this 19 day of July, 1922.

WILLIAM H. ENGLISH.