

# KNITTING:—PROCESSES AND MACHINERY.

## A Novel Way of Changing the Texture in Rib-Knitted Fabrics.

THE OBJECT is to produce a seamless, tubular, machine-knit ribbed fabric comprising two webs, one having wales in excess of those in the other, some of the wales of each face extending throughout both webs, and other wales of either face having stitches drawn only through wales of the other face where the change of web is effected.

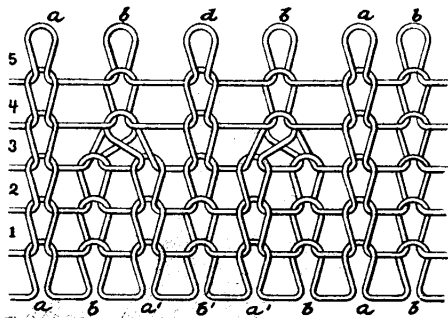


Fig. 1

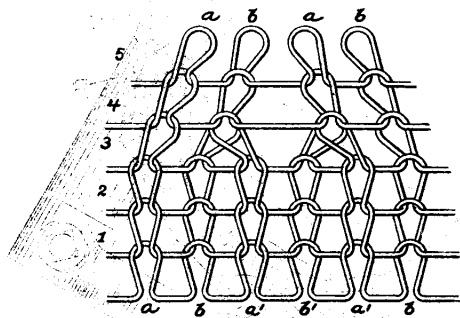


Fig. 2

For example, the fabric may be a tube having in one portion 160 or 180 wales and in the other portion only 120 wales, or again the fabric may have in the portion containing the greater number of wales a two-and-one rib or a two-and-two rib, and in the portion having the lesser number of wales a one-and-one rib.

Change in the character of the web is effected by manipulation of the needles of the machine and without stopping said machine or requiring the intervention of an attendant, the new process, the invention of Messrs. Scott and Williams, being therefore well adapted for use in the manufacture of hosiery fabrics upon automatic knitting machinery.

ILLUSTRATIONS.—Fig. 1 represents (enlarged) a fabric in which the change is from a web having the greater number of wales to a web having less wales. Fig. 2 is a similar view illustrating a web in which the disparity between the number of wales in the two webs is still greater. Fig. 3 is a view illustrating a fabric in which the web having the greater number of wales is a two-and-one rib, and the web having the lesser number of wales is a one-and-one rib. Fig. 4 is a view representing a fabric in which the web having the greater number of wales is a two-

and-two rib and that having the lesser number of wales is a one-and-one rib. Figs. 5 and 6 represent webs in which the change is effect from web having the lesser number of wales to web having the greater number of wales. Figs. 7 and 8 are sectional views illustrating sufficient portions of a knitting machine to show the method of transfer when a stitch is changed from a dial needle to a cylinder needle, and Figs. 9 and 10 are similar views, illustrating the method of transferring from a cylinder needle to a dial needle.

A DESCRIPTION OF THE NEW FABRICS.—In Fig. 1 *a* represents plain stitch wales or those formed upon the cylinder needles of the machine, and *b* represents rib stitch wales or those formed upon the dial needles of the machine, the web in courses 1 and 2 representing a one-and-one rib having a certain number of wales, say 160, in a tube of given diameter, and the web in courses 4 and 5 representing a one-and-one rib having a lesser number of wales, say 120, the change being effected by interknitting in course 3, stitches of certain plain stitch wales *a'* with adjoining rib wales *b*, and in course 2 by transforming the rib wale *b'* into a plain stitch wale *d*.

The fabric has what is termed a thirty-three-and-one-third ( $33\frac{1}{3}$ ) per cent. doubling, that is to say, the web having the greater number of wales has thirty-three-and-one-third ( $33\frac{1}{3}$ ) per cent. more wales than the web having the lesser number of wales.

Fig. 2 shows a fabric in which a fifty per cent. doubling has been effected; *a* and *b* in this case rep-

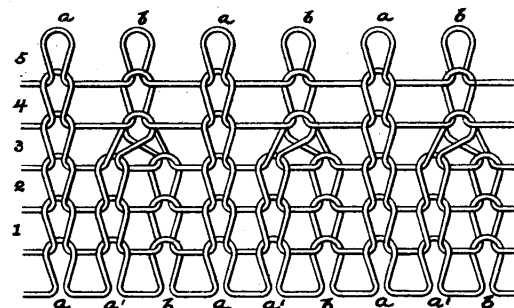


Fig. 3

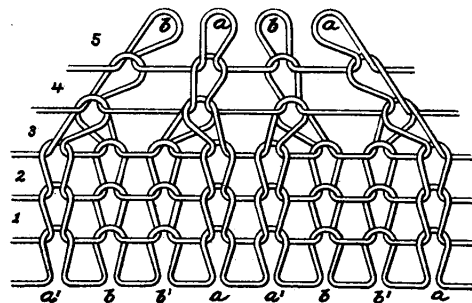


Fig. 4

representing respectively plain wales and rib wales which continue as such throughout the fabric, *a'* representing a plain wale which is interknitted with an adjoining rib wale at course 3 and *b'* representing a

rib wale which is interknitted with the adjoining plain wale also at course 3.

Fabric sketch Fig. 3 illustrates a structure which has in courses 1 and 2 a web consisting of a two-and-

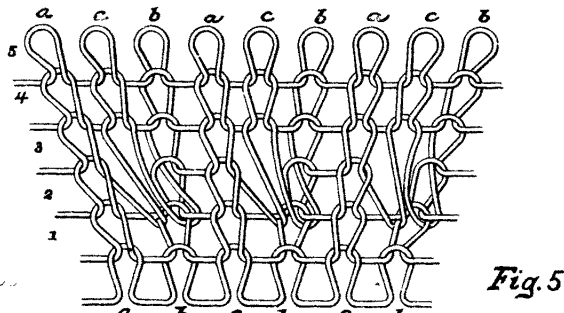


Fig. 5

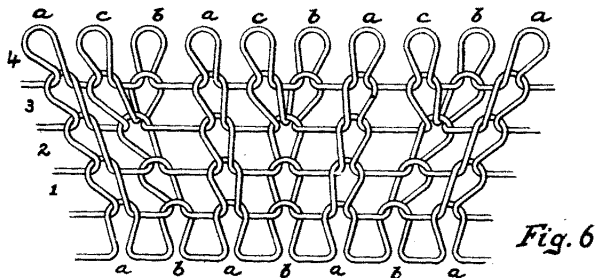


Fig. 6

one rib, that is to say, one having pairs of plain wales alternating with single rib wales, while the web shown in courses 4 and 5 is a one-and-one rib; change being effected in course 3 by transferring stitches of plain wales *a'* to adjoining rib wales *b*.

Fabric sketch Fig. 4 shows a structure in which there is a two-and-two rib in one portion and a one-and-one rib in the other portion, courses 1 and 2 showing the two-and-two rib, courses 4 and 5 showing the one-and-one rib, and course 3 representing the change course, the change in this case being effected by interknitting stitches of plain wales *a'* with adjoining rib wales *b*, and stitches of rib wales *b'* with adjoining plain wales *a*.

In the fabrics thus far described, the change is effected from a web having the greater number of wales to a web having the lesser number of wales. A reverse operation is shown in connection with diagrams Figs. 5 and 6, and of which fabric sketch Fig. 5 shows a structure in which a one-and-one rib web is changed to a two-and-one-rib web, *a* representing the continuous plain wales and *b* the continuous rib wales, while *c* represent plain wales which in course 3 are introduced between the adjoining plain and rib wales, the first stitches of each of said introduced plain wales engaging with a stitch in course 1 of the adjoining rib wale.

Fabric sketch Fig. 6 illustrates a structure in which the first stitch of each plain wale introduced in course 3 is caused to engage with a stitch in course 2 of the adjoining rib wale, this effect being produced by causing the cylinder needle to engage with the stitch on the dial needle instead of with a precedently formed stitch.

THE PROCESS FOR PRODUCING THE CHANGE ON THE MACHINE is shown in connection with diagrams 7 to

10, of which Figs. 7 and 8 show sufficient of the elements of a knitting machine to impart a proper understanding of the manner of manipulating the needles to effect the transfer of stitches from one to another. In these views *a* represents part of a needle cylinder, *b* part of the dial, as located on the inside of the cylinder. Dial needles *c* are carried by the lower ends of jacks *d*, as pivotally mounted upon a fixed ring *e*, and having their upper ends acted upon by cams *f* upon a cam plate *g*. This plate has two sets of cams, one for acting upon the jacks *d*, so as to cause operation of the dial needles *c* for ordinary knitting, and another set for causing an abnormal projection of said dial needles *c*, so as to carry them outwardly beyond the cylinder needles *h*, as shown in diagram Fig. 7. This has the effect of drawing or stretching the webs so as to dispose the stitches of the same over the needle cylinder *a*, as shown in Fig. 7; hence cylinder needles may be projected and caused to enter said stitches, as also shown in said Fig. 7, the dial needles *c* from which stitches are to be transferred directly to the naked cylinder needles

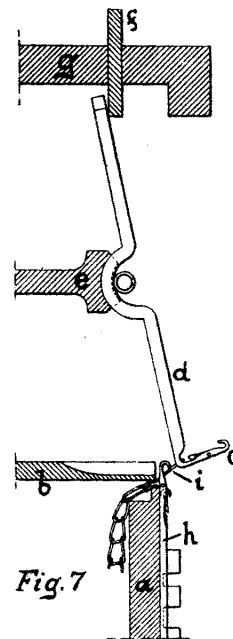


Fig. 7

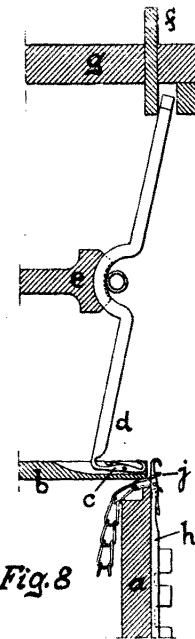


Fig. 8

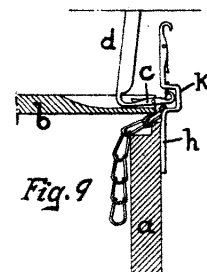


Fig. 9

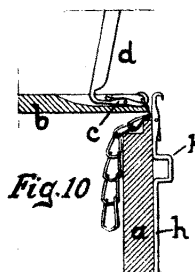


Fig. 10

*h*, preserving their normal position above said needles, while being thus projected. The dial needles, which have to double their stitches with those of the cylinder needles, are moved laterally into line with the cylinder needles which are to receive such stitches, the projection of the dial needles being such as either to

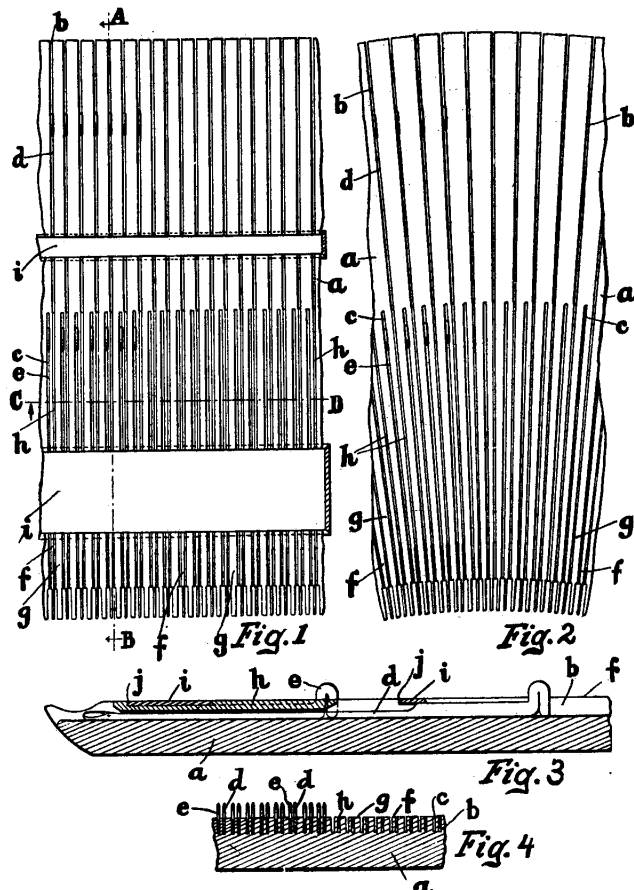
bring the stitches upon them, or precedently formed stitches, above the cylinder needles which are to engage the same.

When the cylinder needles *h* are projected so as to enter the stitches upon the dial needles *c*, either of said needles may be moved laterally to the extent necessary to cause engagement of the cylinder needles with the dial stitches (see *i* in Fig. 7) and the dial needles can then be withdrawn so as to cast their stitches onto the cylinder needles, as shown at *j* in Fig. 8, but when the cylinder needles engage stitches other than those upon the dial needles, the lateral movement referred to is not necessary.

When a transfer is to be effected from a cylinder needle *h* to a dial needle *c*, said cylinder needles are in like manner abnormally projected, so that their lugs *h* may stretch the cylinder stitches of the web, so as to draw them, or precedently formed cylinder stitches, into line with the dial needles, the latter being, if necessary, moved laterally into line with the cylinder needles from which the transfer is to be effected. This operation of transferring from a cylinder needle to a dial needle is represented in Figs. 9 and 10.

### Improvements in Needle-Beds for Straight-Frame and Circular-Knitting Machines.

THE OBJECT is to provide a needle-bed for independently reciprocating needles—either spring or



latch—in which a higher gauge than heretofore can be used. Until now the gauge, *i. e.*, the number of needle grooves in a given space has been limited by the thickness of walls required to resist lateral strains imposed by the operating cams upon the butt ends of the needles. The inventor of the new needle-bed, Mr. H. A. Klemm of New York, uses long and short grooves, to receive long and short needles, the same being arranged alternately, wall strengthening filling pieces being inserted over the needles in the front parts of the long grooves opposite those parts of the short grooves traversed by the butts of the short needles.

ILLUSTRATIONS. Fig. 1 represents a plan view of a portion of a needle-bed with some of the needles therein, adapted for use in connection with the straight-frame knitting machine and adapted for the production of so-called Swiss-rib underwear. Fig. 2 is a view similar to Fig. 1, showing a dial needle-bed adapted for use in connection with a circular knitting machine. Figs. 3 and 4 are sectional views taken respectively on the lines *A, B* and *C, D*, of Fig. 1.

DESCRIPTION OF THE CONSTRUCTION OF THE NEW NEEDLE-BED. With reference to illustrations, *a* designates a needle-bed of a shape as the particular case may require, *i. e.*, either cylindrical, straight or circular dial in form. *b* and *c* show grooves therein, provided for the purpose of receiving or holding needles *d* and *f*. Examining our illustrations, it will be readily noticed, that the needle grooves *b* and *c* are arranged in pairs, each comprising a short groove *c* and a long groove *b*. *f* shows us the division wall between each pair of grooves *b* and *c*, said walls being thin or narrow, while the walls *g* as located between the pairs of grooves are relatively thick or wide.

To strengthen the thin dividing walls *f*, in order to resist the lateral strains imposed by the operating cams upon the butt-end portions of the short needles, filling pieces *h* are fitted between the walls of the grooves *c* over the front portions of the long needles. These filling pieces *h* are approximately the length of the short grooves, as shown in Fig. 3, but however that may be, they must be opposite those parts of the short grooves traversed by the butts of the short needles.

The filling pieces *h* are so fitted as to provide a space between them and the lower surface of the needle grooves *c*, to admit of the free and ready insertion or withdrawal of the long needles from the rear, and in order that both the long and short needles shall be securely held against displacement, during the operation of knitting, keepers *i*, in the form of bars (adapted to rest over and upon the needle shanks) are provided. These keepers *i* fit in guides *j*, formed at intervals across the upper face of the needle-bed.