No. 868,822. PATENTED OCT. 22, 1907.

H. SWINGLEHURST.

KNITTED FABRIC AND MODE OF MAKING SAME.

APPLICATION FILED SEPT. 11, 1905.

6 SHEETS—SHEET 1.

Fig. 1.

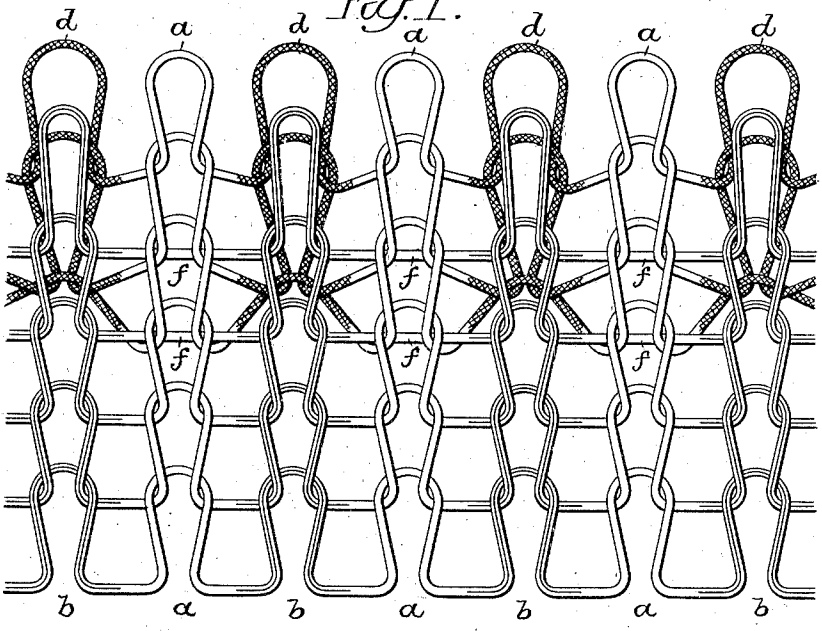


Fig. 3.

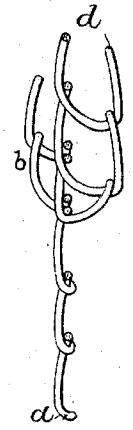


Fig. 2.

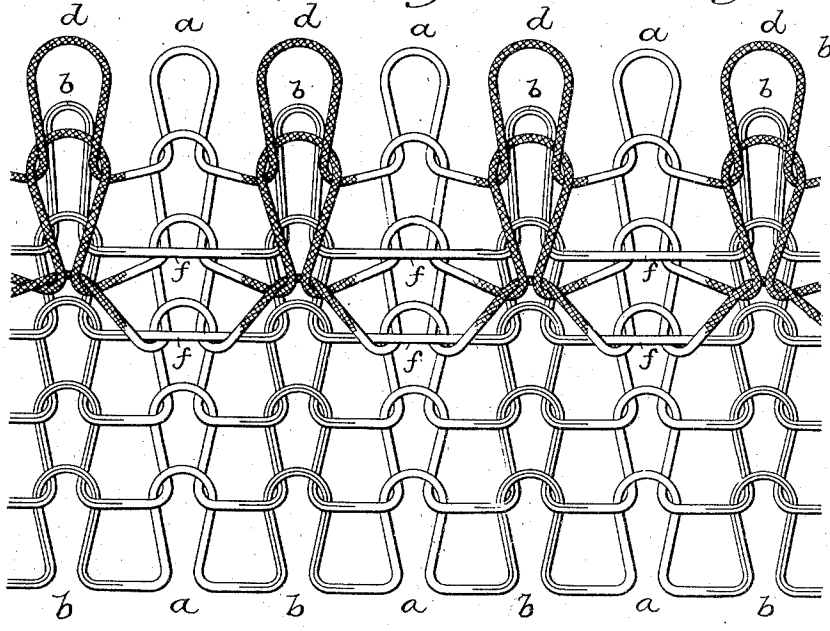
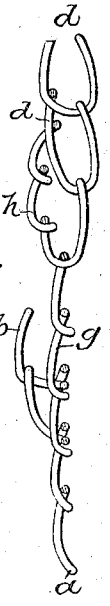


Fig. 4.



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Augustus B. Coppes

Inventor:
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6 SHEETS—SHEET 2.

Fig. 5.

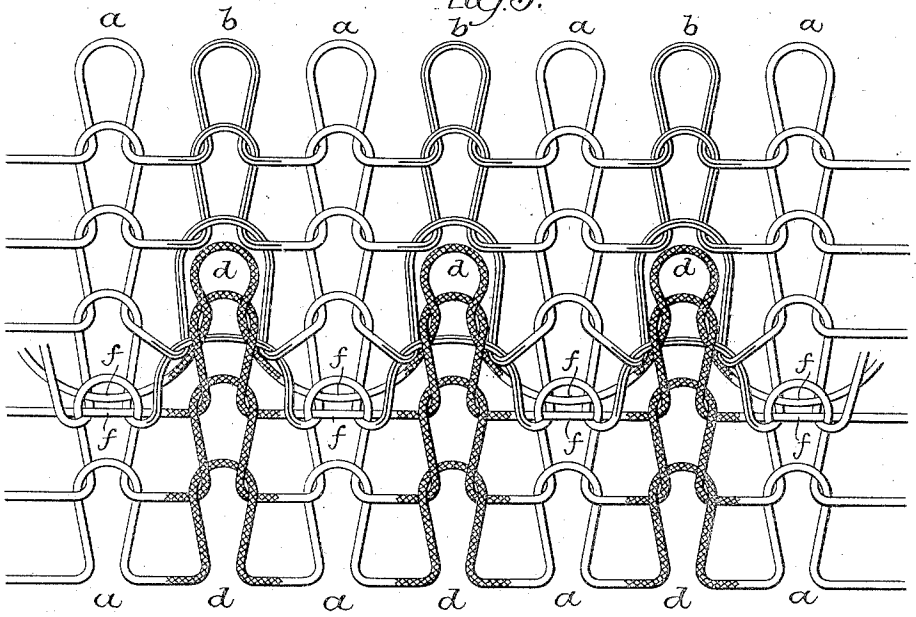
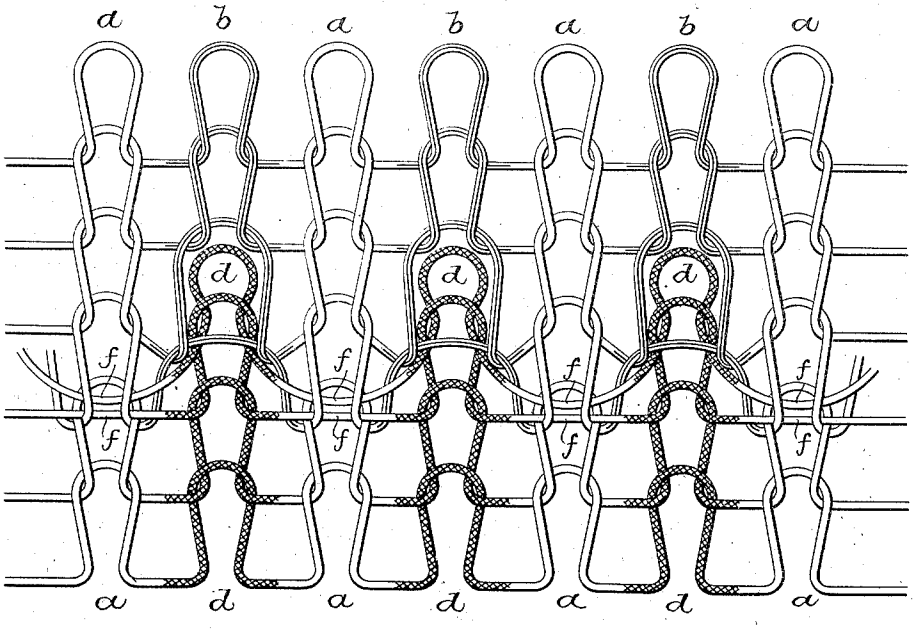


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

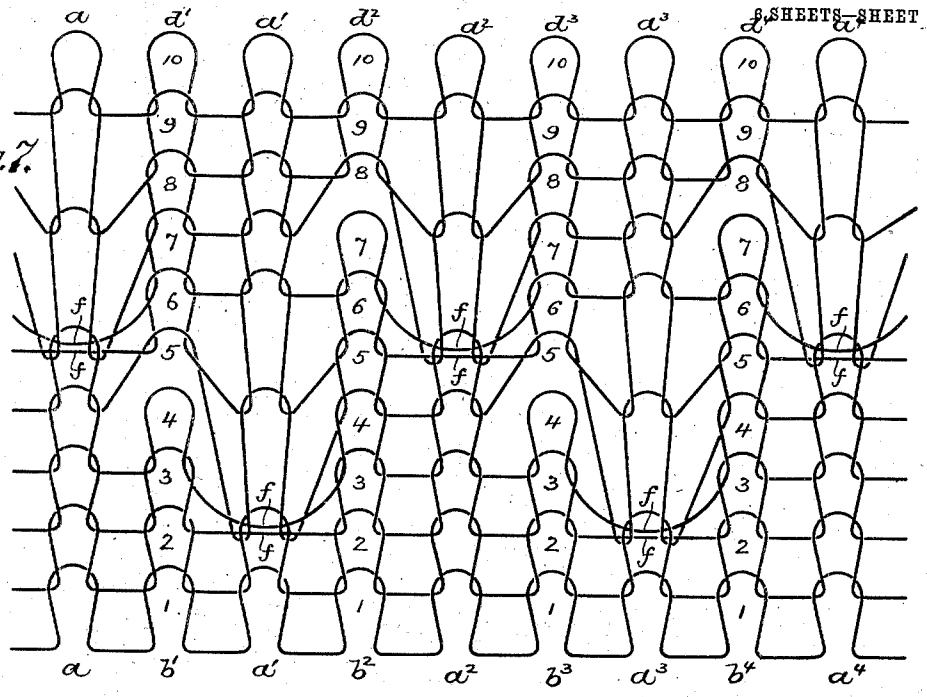
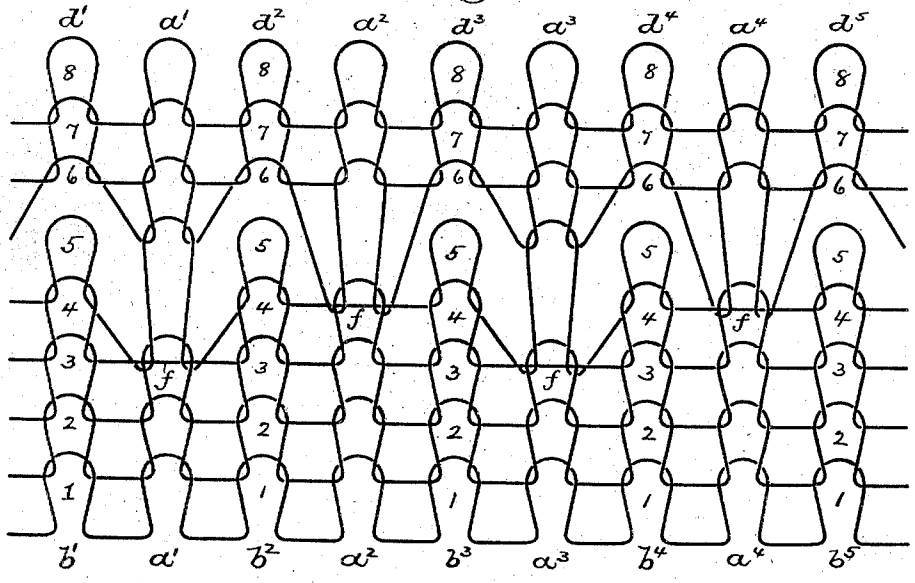


Fig. 8.



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6 SHEETS—SHEET 4.

Fig. 9.

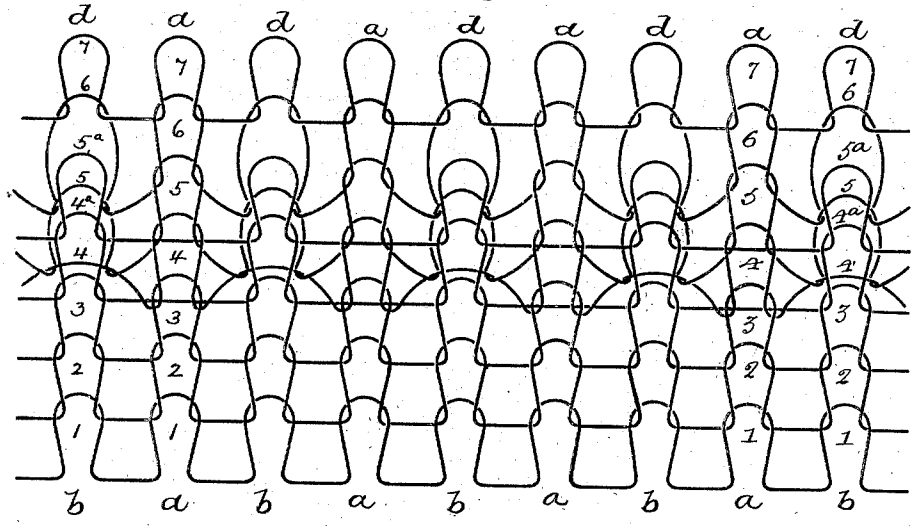
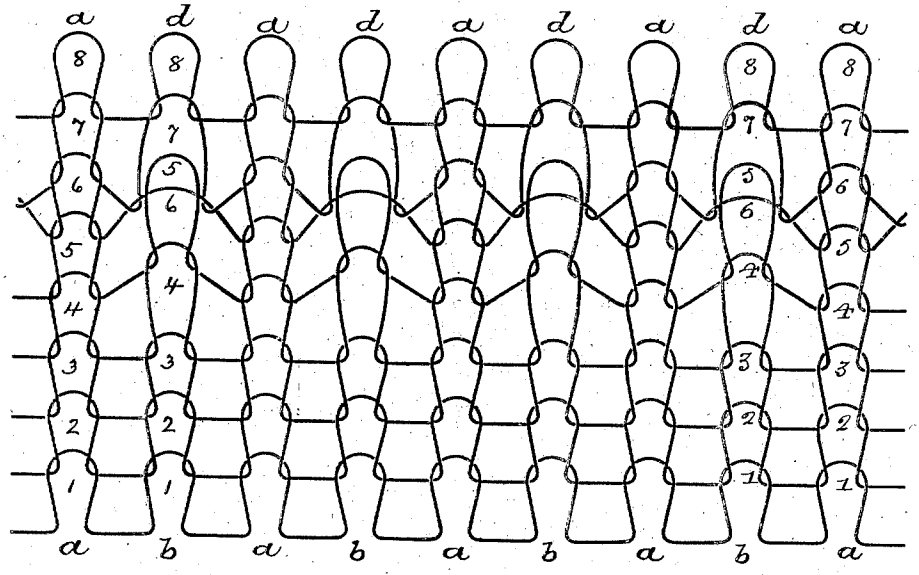


Fig. 10.



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APPLICATION FILED SEPT. 11, 1905.

6 SHEETS—SHEET 5.

Fig. 11.

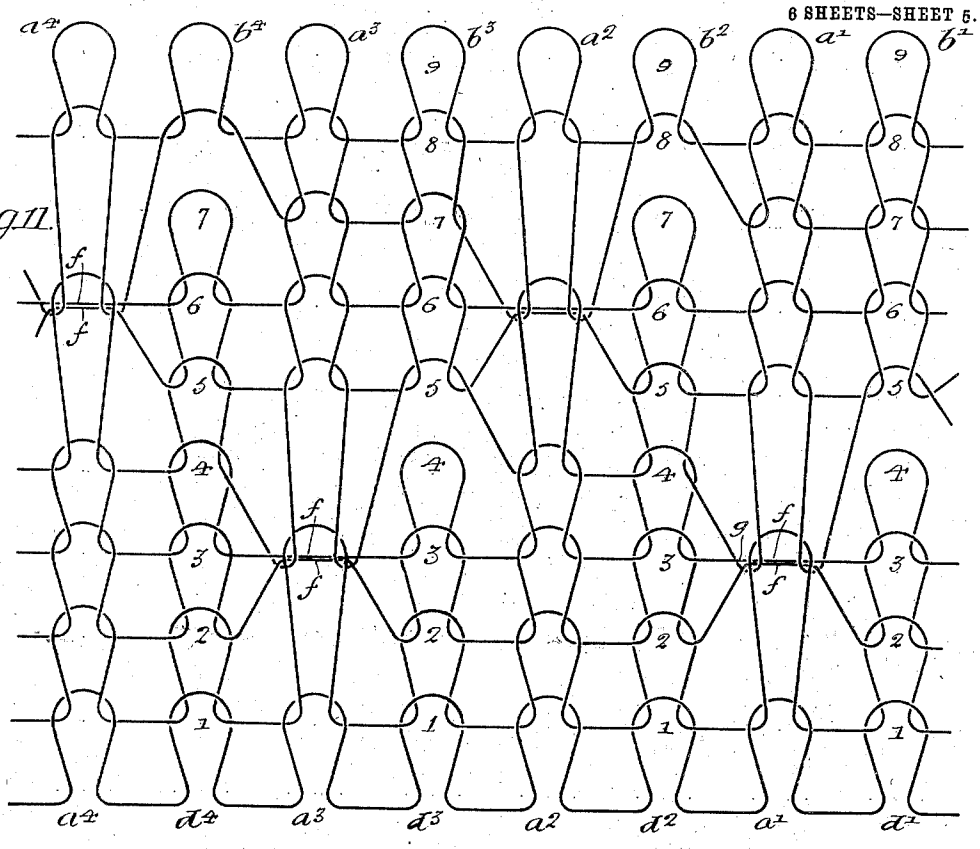
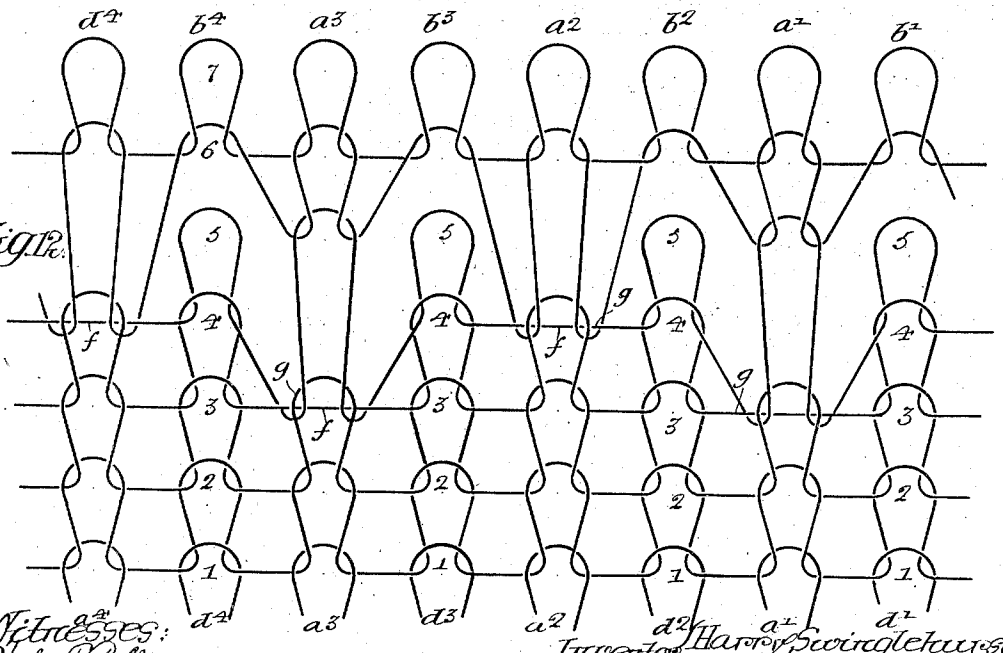


Fig. 12.



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No. 868,822. PATENTED OCT. 22, 1907.

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KNITTED FABRIC AND MODE OF MAKING SAME.

APPLICATION FILED SEPT. 11, 1905.

6 SHEETS—SHEET 6.

Fig. 13.

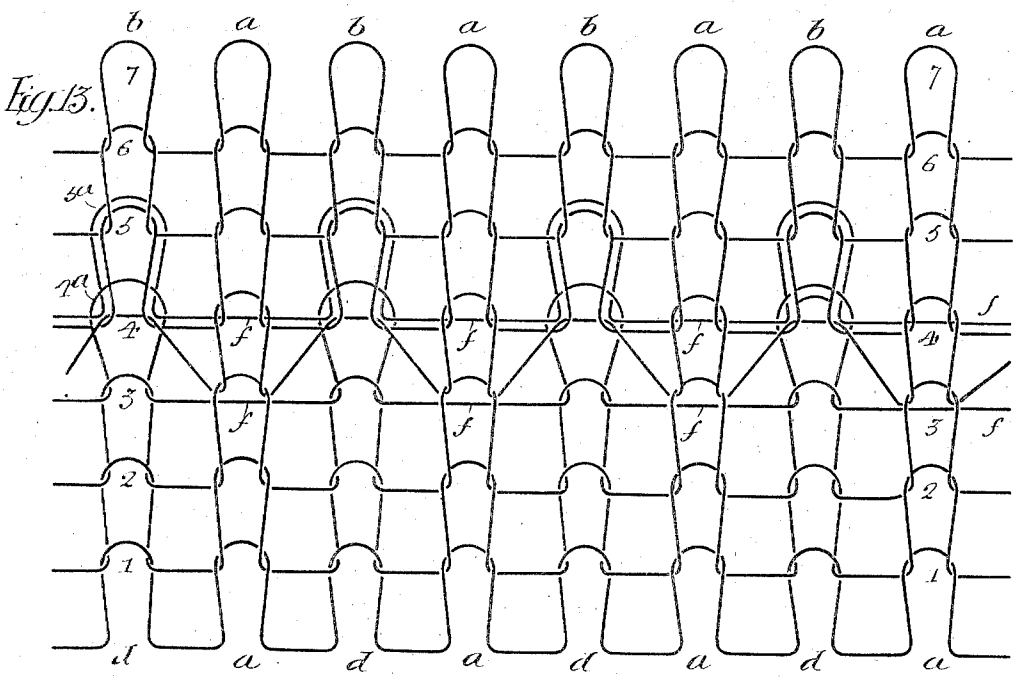
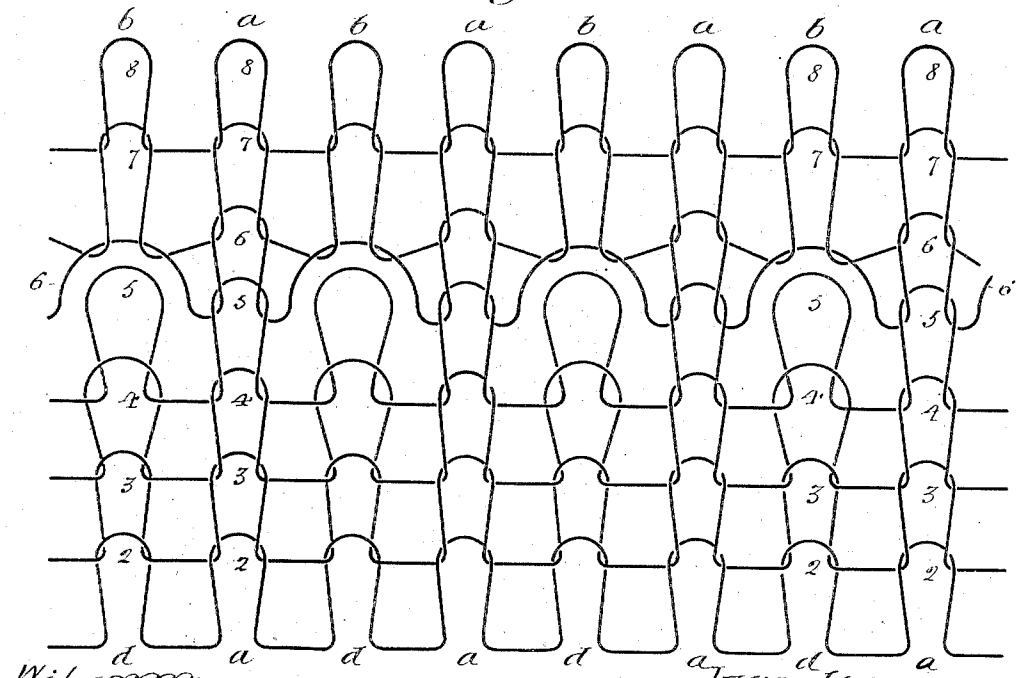


Fig. 14.



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UNITED STATES PATENT OFFICE.

HARRY SWINGLEHURST, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ROBERT W. SCOTT, OF LEEDS POINT, NEW JERSEY, AND LOUIS N. D. WILLIAMS, OF OGONTZ, PENNSYLVANIA.

KNITTED FABRIC AND MODE OF MAKING SAME.

No. 868,822. Specification of Letters Patent. Patented Oct. 22, 1907.

Application filed September 11, 1905. Serial No. 277,897.

To all whom it may concern:

Be it known that I, HARRY SWINGLEHURST, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Knitted Fabrics and in the Mode of Making Same, of which the following is a specification.

The object of my invention is to prevent the "running back" of stitches cast from the needles of a knitting machine in changing the character of the knitting, for instance in changing from plain web to ribbed web, by casting the stitches from certain cylinder needles, retiring the same and introducing dial needles in their stead, or in changing from ribbed web to plain web by casting stitches from the dial needles, retiring the same and introducing cylinder needles in their stead.

The change from ribbed web to plain web may be effected at the junction of the top and leg, or at the junction of the leg and foot of a stocking, and the change from plain web to ribbed web may be effected after the completion of a toe pocket upon a stocking tube, in which case the casting off of the stitches from certain cylinder needles may be followed immediately by the introduction of corresponding ribbing needles for the formation of a setting-up course for the next section of ribbed web, or for the formation of the welt thereon, or any desired number of courses of plain web may be formed upon the remaining active cylinder needles before beginning said setting-up course. In either case a transfer operation is avoided and the production of the sock or stocking is therefore simplified and cheapened.

In the accompanying drawings Figure 1, shows an exaggerated view of a piece of knitted web embodying my invention, when the change in the character of the knitting is from plain web to ribbed web; Fig. 2, is a similar view taken from the opposite side of the web; Fig. 3, is a sectional view of said web on a reduced scale, the section being taken through a standing wale; Fig. 4, is a similar view showing a web formed with a welt at the beginning of the ribbed section of the fabric; Figs. 5 and 6, are views similar to Figs. 1 and 2, respectively, but illustrating a fabric in which the change in the character of the knitting is from ribbed web to plain web; Figs. 7, 8, 9 and 10, are views similar to Fig. 1, but illustrating other ways of effecting the object of my invention, when the change in the character of the knitting is from plain web to ribbed web; and Figs. 11, 12, 13 and 14, are views, similar to Figs. 7, 8, 9 and 10, respectively, but showing a change from ribbed to plain web.

Supposing that the knitting machine upon which a composite ribbed and plain web is being produced is one having cylinder needles and dial needles, and that the plain web is being produced upon the cylinder needles, the stitches cannot simply be cast from alternate cylinder needles prior to the introduction of the dial needles in their stead, nor can the stitches simply be cast from the dial needles prior to the introduction of the cylinder needles in their stead, because the stitches thus cast off have nothing to retain them and will "run back" under the strain to which the fabric is subjected in the knitting operation, or in subsequent use, if such use is attempted. By "running back" is meant the pulling out of the cast off stitches and the transformation of the same into elongated sinker wales intervening between the standing wales, so that there will be, at the point of junction between the plain and ribbed webs, a plain fabric of very open mesh, and of indefinite extent. Such a method of changing from plain web to ribbed web or from ribbed web to plain web is therefore, commercially impracticable, and in order to overcome the objection noted, I, in accordance with one method of carrying out my invention, discontinue the formation of stitches on the standing wale needles, while continuing such formation on the needles which are to be retired, this operation continuing for one or more courses, and preferably for a plurality of courses, before casting the stitches from and retiring said needles, the result being that the standing wales take the strain exerted upon the fabric, the discontinued wales being relieved from such strain and the running back of the stitches of such discontinued wales being thereby prevented.

In Figs. 1 and 2, of the drawing, *a* represent standing wales of plain fabric which are continued up into the ribbed fabric and correspondingly lettered therein, *b* representing discontinued wales of plain fabric, *d* rib wales which take the place of the latter, and *f* sinker wales passing from one discontinued wale *b* to another, the term "sinker wale" in this connection meaning the yarn between the needle wales.

In Figs. 1, 2 and 3, of the drawing, I have shown my invention as applied to a web in which the change is made directly from continuous plain web to ribbed web, and in Fig. 4, I have shown an instance in which, after casting off the stitches of the discontinued wales *b*, a number of courses of plain web *g* are first knitted upon the remaining cylinder needles, and a welt *h* is then formed in the usual way, before beginning the production of ribbed web *d*.

Figs. 5 and 6, show a fabric in which the change has been effected from ribbed web to plain web, *a* representing standing wales contained in both webs, *d* discontinued rib wales, *b* plain wales which take the place of said discontinued rib wales and *f* sinker wales connecting the latter.

In the fabric shown in Figs. 1, 2, 5 and 6, the knit-

ting operation is arrested simultaneously upon all of the standing wale needles of the cylinder and the terminal stitches of all of the discontinued wales are in the same course, but this is not a necessary feature of my invention, for instance in the fabric shown in Fig. 7, knitting is temporarily discontinued after the formation of course 2 upon the needles which produce standing wales a' and a^3, and, after the formation of course 5 on the needles which produce standing wales a, a^2 and a^4, the terminal stitches of the discontinued wales b' and b^3 being in course 4, and the terminal stitches of discontinued wales b^2 and b^4 being in course 7.

In the fabric shown in Fig. 8, knitting is discontinued upon the standing wale needles after the production of course 3 in wales a' and a^3, and after the production of course 4 in wales a^2 and a^4, but is discontinued for but one course on each needle, the yarn which forms the stitches in course 4 in discontinued wales b' and b^3 failing to form stitches in the standing wales a' and a^3, the yarn which forms the terminal stitches in course 5 in the said wales b' and b^3 also forming stitches in the standing wales a' and a^3, and the yarn which forms the terminal stitches in course 5 in the discontinued wales b^2 and b^4 failing to form stitches in the standing wales a^2 and a^4.

In all of the fabrics thus far illustrated there are a plurality of yarns in some of the courses of the standing wales corresponding to courses in the terminal portions of the discontinued wales, because of the arrest of the knitting operation for one or more courses upon the standing wale needles while the knitting yarn is still being fed thereto as well as to the alternating active needles, but the object of my invention may be attained without recourse to this method of knitting or to the production of a fabric of this character. In Fig. 9, for instance, I have shown a fabric in the production of which all of the standing wale needles have been temporarily put out of action but permitted to retain their stitches, while two courses of stitches 4^a and 5^a have been knitted upon the retirable cylinder needles, without feeding the knitting yarn to the standing wale needles, the stitches being then cast from the retirable needles, the latter retired, and the previously inactive dial needles brought into action, together with the temporarily retired standing wale needles for the production of ribbed web. In this fabric, as in all of the preceding fabrics, the number of courses of stitches in the terminal portions of the discontinued wales and in the initial portions of the rib wales which supplant the same, together exceed the number of courses of stitches in the corresponding portions of the standing wales.

In the production of the fabric shown in Fig. 10, knitting is not discontinued at any time upon the standing wale needles but long or slack stitches are drawn upon the retirable cylinder needles in the terminal courses of the wales b formed thereon, and in the courses preceding said terminal courses, as indicated at 4 and 5, or such longer stitches may be drawn in more than one of such preceding courses, the effect of the operation being to prevent the tendency to "run back" in the discontinued wales, by providing the stitches in the terminal portions of said wales with an excess of yarn to compensate for the strain upon them.

It will be evident that any of the modifications shown in Figs. 7 to 10, is applicable as well to a fabric in which change is effected from ribbed web to plain web, and in which the discontinued wales are, therefore, rib wales instead of plain web wales. (See Figs. 11 to 14.)

My invention is applicable to ribbed fabric having but a limited number of wales of plain web side by side; for instance, it is applicable in changing from a web knitted in three-and-one rib, or a web knitted in five-and-one rib to a web knitted in one-and-one rib, as will be readily understood.

While my improved fabric can, and in most cases will, be knitted with a single continuous yarn, I have, in Figs. 1, 2, 5 and 6 of the drawing, shaded this yarn so as to indicate more clearly the three different wales, the unshaded stitches showing the standing wales, the lined stitches showing the alternating wales of the plain web, and the cross-hatched stitches showing the rib wales.

It should be understood that in the various views of the drawing some of the stitches have, as compared with their relation in the actual fabric, been distorted or displaced for clearer illustration of the manner in which they are interknitted.

By the words "terminal portion" as applied herein to a discontinued wale I mean the actual terminal stitch and the stitch or stitches preceding the same in such wale, and thus distinguish from the terminal stitch alone.

I do not here claim a composite ribbed and plain fabric, in which the change from ribbed web to plain web has been effected by discontinuing rib wales and replacing them by wales of plain web, as this specific embodiment of my invention forms the subject of a separate application filed by me, of even date herewith, Serial No. 277,898 but

I claim as my present invention and desire to secure by Letters Patent:

1. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both webs, loose-ended and discontinued wales of one web replaced by wales of the other web, and means for preventing running back of the loose ends of the discontinued wales.

2. A machine knit fabric, partly ribbed and partly plain, having discontinued wales in one web, and standing wales contained in both the ribbed and plain webs, and having a plurality of yarns in a course corresponding to a course in terminal portions of the discontinued wales.

3. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of one web alternating with standing wales of said web and connected by sinker wales.

4. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of one web alternating with standing wales of said web and having in their terminal portions a plurality of courses of stitches connected by sinker wales.

5. A machine knit fabric partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, loose-ended and discontinued wales of one web replaced by wales of the other web, and means for preventing running back of the loose ends of said discontinued wales.

6. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of one web replaced by wales of the other web, the number of courses of stitches in the terminal portions of the discontinued wales

and in the initial portions of the wales which supplant the same being together in excess of the number of courses of stitches in the corresponding portions of the standing wales.

7. A machine knit fabric, partly ribbed and partly plain, having discontinued wales of one web replaced by wales of the other web and standing wales contained in both the ribbed and plain webs and having a plurality of yarns in a course corresponding to a course in terminal portions of the discontinued wales.

8. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of one web replaced by wales of the other web and connected by sinker wales.

9. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of one web replaced by wales of the other web, a plurality of courses of the terminal portions of the discontinued wales being connected by sinker wales.

10. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, discontinued wales of plain web replaced by wales of ribbed web, and means for preventing running-back of the discontinued wales of plain web.

11. A machine knit fabric partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs and discontinued wales of plain web replaced by wales of ribbed web, the number of courses of stitches in the terminal portions of the discontinued plain web wales and in the initial portions of the ribbed wales which supplant the same being, together, in excess of the number of courses of stitches in the corresponding portions of the standing wales.

12. A machine knit fabric, partly ribbed and partly plain, having discontinued wales of plain web replaced by wales of ribbed web, and standing wales contained in both the ribbed and plain webs, said standing wales having a plurality of yarns in a course corresponding to a course in terminal portions of the discontinued plain web wales.

13. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of plain web replaced by wales of ribbed web and connected by sinker wales.

14. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed and plain webs, and discontinued wales of plain web replaced by wales of ribbed web, a plurality of courses in the terminal portions of the discontinued wales being connected by sinker wales.

15. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed web and the plain web, discontinued wales of plain web replaced by rib wales, means for preventing running back of said discontinued wales of plain web, and a welt formed at the beginning of the ribbed web.

16. A machine knit fabric, partly ribbed and partly plain, having standing wales contained in both the ribbed web and the plain web, discontinued wales of plain web replaced by rib wales, means for preventing running back of said discontinued wales of plain web, a short section of plain web interposed between the two webs, and a welt formed at the beginning of the ribbed web.

17. The mode herein described of producing a knitted fabric, said mode consisting in first knitting upon one set of needles to produce a plain web, arresting for one or more courses the production of stitches upon certain of the needles of said set but permitting said needles to retain the stitches already upon them, continuing the formation of stitches upon the other needles of the said set, then casting the stitches from the latter needles and retiring them from action, then bringing into action needles which were before put out of action and also needles of another set alternating therewith, and drawing stitches in a different direction therefrom, and continuing the knitting with the inclusion of both sets of needles.

18. The mode herein described of producing a knitted fabric, said mode consisting in knitting upon one set of needles to produce a plain web, arresting for one or more courses the production of stitches upon certain of the needles of said set but permitting said needles to retain the stitches already upon them, continuing the formation of stitches upon the other needles of said set and feeding the fresh yarn also to the retired needles of the set, then casting the stitches from the needles which were not before retired and retiring them from action, then bringing into action the previously retired needles along with needles of another set alternating therewith, and drawing stitches in a different direction therefrom, and continuing the knitting with the inclusion of both sets of needles.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HARRY SWINGLEHURST.

Witnesses:
WM. E. SHUPE,
JOS. H. KLEIN.