R. W. SCOTT.

HOSIERY.

APPLICATION FILED JULY 16, 1908.

1,114,538.

Patented Oct. 20, 1914

4 SHEETS—SHEET 1.

Fig. 1

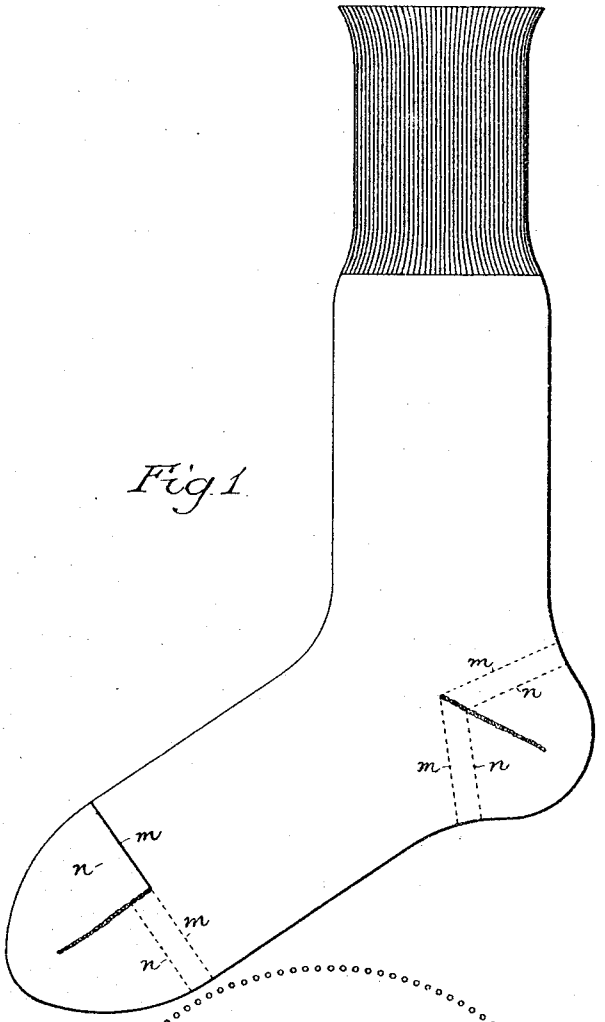
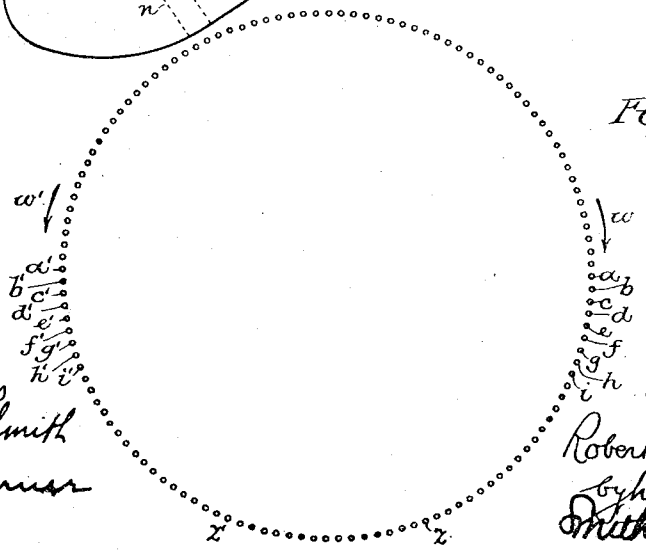


Fig. 2



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4 SHEETS—SHEET 2.

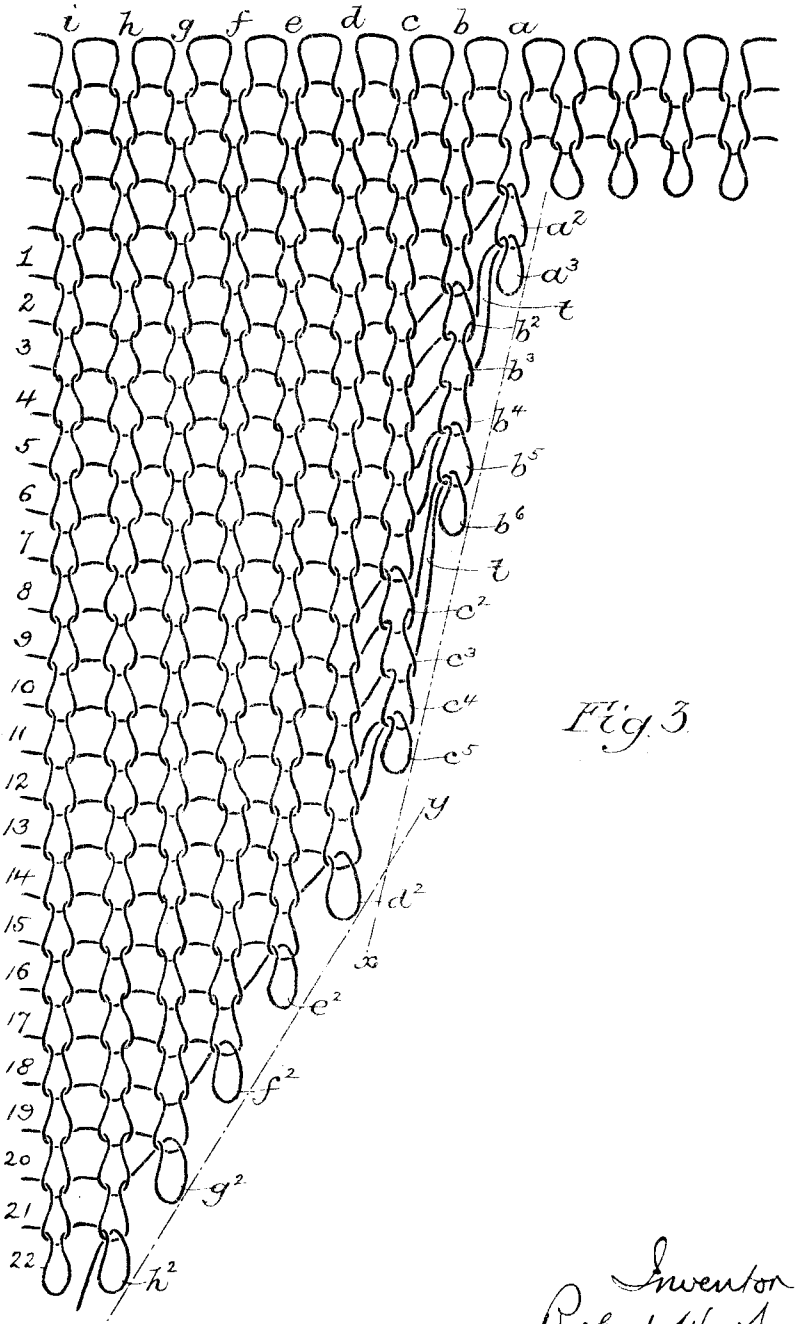


Fig 3

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4 SHEETS—SHEET 3.

Fig. 5

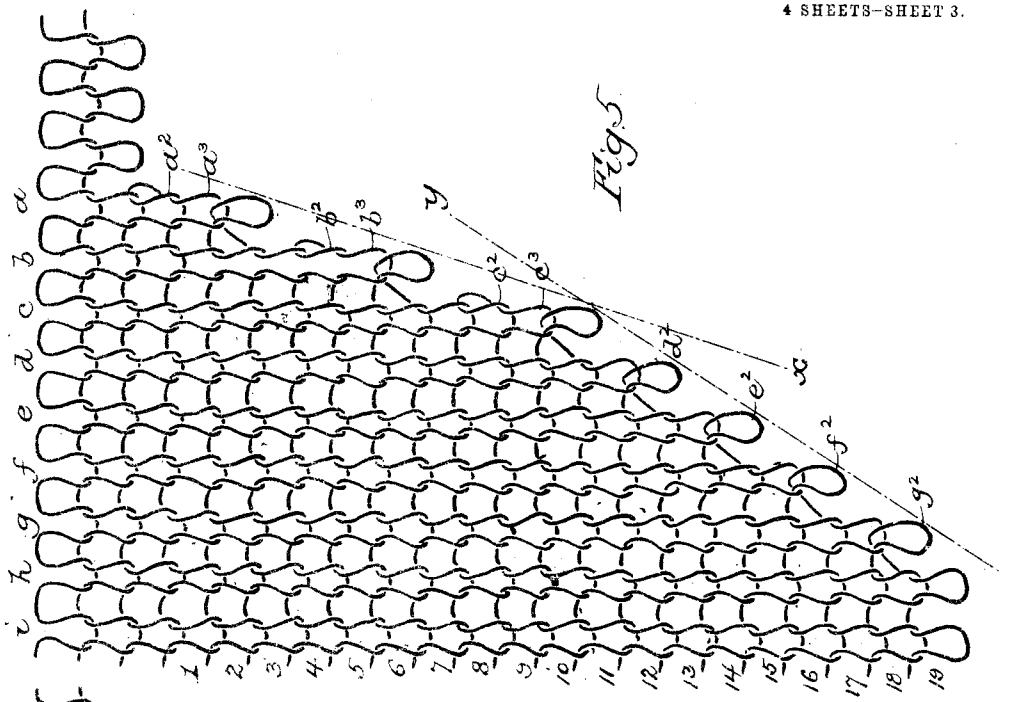
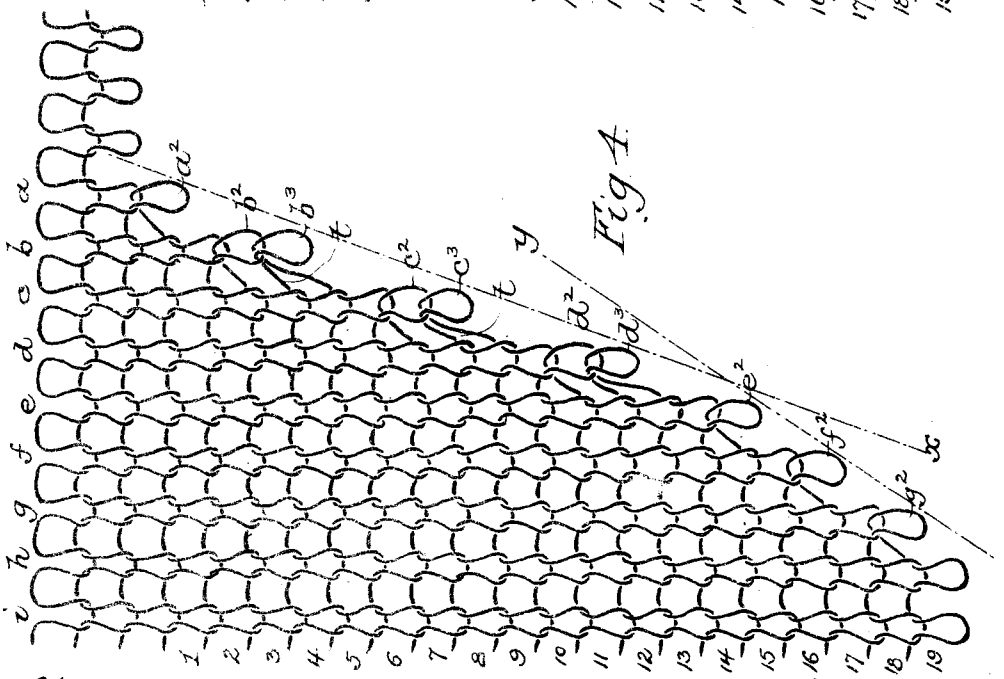


Fig. 4



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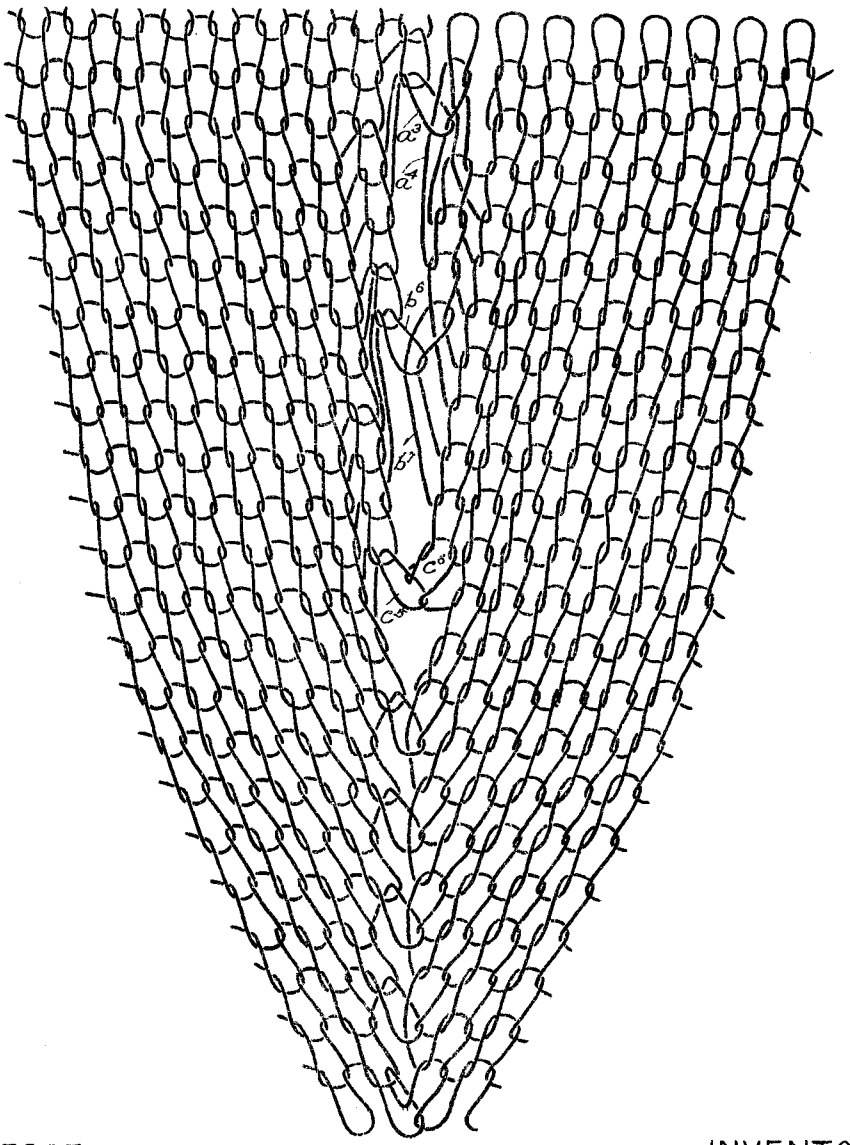
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4 SHEETS—SHEET 4.

Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

ROBERT W. SCOTT, OF LEEDS POINT, NEW JERSEY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO SCOTT & WILLIAMS, INCORPORATED, OF CAMDEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

HOSIERY.

1,114,538. Specification of Letters Patent. Patented Oct. 20, 1914.

Application filed July 16, 1908. Serial No. 443,905.

To all whom it may concern:

Be it known that I, ROBERT W. SCOTT, a citizen of the United States, residing in Leeds Point, Atlantic county, New Jersey, have invented certain Improvements in Hoisery, of which the following is a specification.

My invention relates to that class of hoisery having what are termed "seamless" heels and toes, the object of my invention being to produce a heel of this character having any desired depth, or a toe of any desired length. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a view of a sock having a heel and toe made in accordance with my invention; Fig. 2 is a diagrammatic representation of the needles of a circular knitting machine intended to aid in an understanding of the process whereby the heel portion of the stocking is knitted in accordance with my invention, Figs. 3, 4 and 5 are enlarged views of some of the stitches forming part of the "narrowed" web of the heel or toe and illustrating various embodiments of my invention, and Fig. 6 is a view similar to Fig. 3 but illustrating the suture between the narrowed and widened portions of the web.

In the usual process of making stockings with seamless heels, the tubular leg portion of the stocking is produced by round-and-round knitting upon all of the needles of the machine until the instep portion of the stocking is reached, whereupon a certain number of the needles, usually one-half of the same, are put out of action but permitted to retain their stitches. These needles, corresponding to the instep portion of the stocking and conveniently termed "instep needles", may be represented by those around the upper half of the circle of needles shown in Fig. 2. To-and-fro knitting is then carried on upon the remaining half of the needles, and, before each reciprocation, a needle first at one end of the fashioning set and then at the opposite end of the same is put out of action but permitted to retain its stitch, this operation being continued until the desired narrowing of the web has been effected, say until the needles from a to z and from a^1 to z^1 have been put out of action.

While still continuing the to-and-fro knitting the needles formerly put out of action are brought into action again, one at a time, in reverse order from that in which they were put out of action until all of the needles from z to a and from z^1 to a^1 have been again restored, whereupon the instep needles are also returned to action and round-and-round knitting is resumed for the production of tubular web for the foot of the stocking. The heel pocket produced in this way, however, does not possess sufficient amplitude, the number of courses of stitches in the heel being confined to the number of needles in the fashioning set upon which the narrowing and widening operations are performed, thus if there are fifty-six of such needles at each end of the fashioning set, there will be only one-hundred and twelve courses of stitches in the heel. This objection has been overcome by knitting to-and-fro upon all of the needles from a to a^1 for a number of courses before beginning the narrowing operation and after completing the widening operation, the effect of this method of knitting being to produce at the top and front of the shaped heel, selvage-edged gussets of the full half diameter of the knitted tube and of any desired width, but the objection to this method of operation is that the adjoining edges of these gussets must, after the removal of the stocking from the knitting machine, be united by sewing or looping, thus producing a seam at each side of the stocking, which is objectionable not only because of its presence but also because of the added cost of production for which it is responsible. Attempts have also been made to enlarge the heel by introducing supplemental courses of stitches between successive narrowing and widening operations, each of such introduced courses being of lesser extent than the courses preceding and following it, but this method of manufacture does not arrest the regular narrowing or widening of the tapered heel webs, nor does it lessen the angle of taper or increase the depth of the heel at the center, whereas this is one of the main objects to be attained.

The object of my invention has been to

avoid the seams and the added cost of production arising from the formation and subsequent uniting of the selvaged gussets at the top and front of the heel, and to produce a seamless fashioned heel of any desired depth by the operation of the knitting machine alone. This object I attain by arresting or reversing the narrowing and widening operations between successive narrowings and widenings to introduce extra courses of stitches, equalling or exceeding in length those which precede and follow them, these operations being repeated as many times as may be necessary to produce a heel of the desired depth. Various methods of accomplishing this result may be adopted in accordance with my invention and in Figs. 3, 4 and 5 of the drawing I have illustrated, in connection with the narrowing operation, three different embodiments of my invention, which are sufficient to indicate the principles on which such invention is founded, and to suggest to those skilled in the art other methods within the scope of the invention, whereby the desired result may be obtained.

I will, in the first place, describe, in connection with diagram Fig. 2, the manipulation of the needles adopted in effecting the method of narrowing shown in Fig. 3, it being understood that the needles are put out of action at the beginning of a course and before the yarn guide reaches the same, in knitting said course, and into action at the end of a course and before the yarn guide reaches the same, in knitting said course.

The yarn guide travels in the direction of the arrow w in knitting the odd numbered courses and in the direction of the arrow w^1 in knitting the even numbered courses, the manipulation of the needles being as follows: First course needle a out; second course needle a^1 out; third course needle b out; fourth course needle a out and needles b and a in; fifth course needle a out and needles b^1 and a^1 in; sixth course needle c out; seventh course needle b out; eighth course needle b^1 out; ninth course needle c out; tenth course needle c^1 out and needles c and b in; eleventh course needle b out and needles c^1 and b^1 in; twelfth course needle b^1 out; thirteenth course needle c out; fourteenth course needle c^1 out; fifteenth course needle d out; sixteenth course needle d^1 out; seventeenth course needle c out; eighteenth course needle c^1 out; and so on until the narrowing has been completed.

In Fig. 3, a^2 represents the stitch hanging on needle a when the latter is put out at the beginning of the first course; b^2 the stitch on needle b when the latter is put out at the beginning of the third course; b^3 and a^3 stitches formed on needles b and a respectively at the completion of the fourth course, stitch a^3 remaining on needle a when the latter is put out at the beginning of the fifth course; b^4 the stitch formed on needle b at the beginning of the fifth course; b^5 the stitch formed on needle b at the end of the sixth course and remaining on the needle when the latter is put out at the beginning of the seventh course; c^2 the stitch remaining on the needle c at the beginning of the ninth course; c^3 and b^6 the stitches formed on needles c and b respectively at the completion of the tenth course, the stitch b^6 remaining on the needle b when the latter is put out of action at the beginning of the eleventh course; c^4 the stitch formed on needle c^2 at the beginning of said eleventh course; c^5 the stitch formed on the needle c at the completion of the twelfth course, and remaining on said needle when the latter is put out of action at the beginning of the thirteenth course; d^2 the stitch formed on needle d at the completion of the fourteenth course, and remaining thereon when the needle is put out of action at the beginning of the fifteenth course; c^6 the stitch formed on the needle c at the completion of the sixteenth course, and remaining thereon when said needle is put out of action at the beginning of the seventeenth course, and so on.

It will be noted that instead of discontinuing the formation of wale a at the beginning of course 1, of wale b at the beginning of course 3, of wale c at the beginning of course 5, and so on, as in the ordinary method of procedure, wale a is discontinued at the beginning of course 5, and wale b at the beginning of course 11, showing a gain of eight courses, which can be increased indefinitely by postponing correspondingly the beginning of the regular narrowing operation which in the web shown in Fig. 3 begins at course 15.

When the web has been narrowed to the desired extent it is again widened, extra courses being introduced during the widening operation whose selvage stitches c^6, b^7 and a^4 are interlocked respectively with the selvage stitches c^5, b^4 and a^3 introduced during the narrowing operation, as shown in Fig. 6, introduced during the narrowing operation. The presence of these extra courses between the successive narrowings and widenings of the web reduces the angle of such narrowing or widening as compared with that portion of the web in which the regular method of narrowing and widening is adopted, as indicated by the dotted lines x and y in Fig. 3.

In Fig. 1 of the drawing the zone between the dotted lines w and x at the top and front of the heel represents that portion of said heel knitted in accordance with my invention, and in that portion of the heel the angle of reduction is as represented by the dotted line x in Fig. 3, and is less than in

the portions below and in the rear of the dotted line *n*, which is as represented by the dotted line *y* in Fig. 3.

The presence of the extra courses results in the deepening of the heel to the extent of the number of such extra courses produced therein and I can, therefore, by repeated manipulations of the needles in the manner described, produce a heel having any desired depth.

In Fig. 3 I have shown but one edge of the narrowed web but it will be understood that the opposite edge of the web will present the same appearance as that which is shown, except that where in Fig. 3 certain effects are shown as produced at the ends of odd numbered courses, said effects will, at the opposite edge of the narrowed web, be produced at the ends of the even numbered courses, and vice-versa.

The plan described of widening between successive narrowings by bringing into action two needles and then immediately putting one of them out of action again, is adopted because this method is best adapted for use in a common type of seamless hosiery machine having what is known as a "two-and-one" pick, and intended to avoid selvaging on the end needle, and provide a sinker wale on each side of the same for the action of the web holder but this method of operation is not essential to the attainment of this result, and in Fig. 4 I have shown a portion of the narrowed web in which another method of knitting has been adopted, the manipulation of the needles being as follows:—First course needle *a* out; second course needle a^1 out; third course needle *b* out; fourth course needle b^1 out and needle *b* in; fifth course needle *b* out and needle b^1 in; sixth course needle b^1 out; seventh course needle *c* out; eighth course needle c^1 out and needle *c* in; ninth course needle *c* out and needle c^1 in; tenth course needle c^1 out; eleventh course needle *d* out; twelfth course needle d^1 out and needle *d* in; thirteenth course needle *d* out and needle d^1 in; fourteenth course needle d^1 out; fifteenth course needle *e* out; sixteenth course needle e^1 out; seventeenth course needle *f* out; eighteenth course needle f^1 out, and so on. In this web a^2 represents the stitch remaining on the needle *a* when it was put out of action at the beginning of the first course: b^2 the stitch on the needle *b* when it was put out of action at the beginning of the third course; b^3 the stitch formed on the needle *b* when it was put into action at the end of the fourth course, this stitch being retained when the needle was put out of action at the beginning of the fifth course; c^2 the stitch on the needle *c* when it was put out of action at the beginning of the seventh course; c^3 the stitch formed on said needle when it was restored again at the end of the eighth course, this stitch being retained by the needle when the latter was put out of action at the beginning of the ninth course; d^2 the stitch on the needle *d* when it was put out of action at the beginning of the eleventh course; d^3 the stitch formed on the needle *d* when it was restored at the end of the twelfth course, this stitch being retained by the needle when the latter was put out of action at the beginning of the thirteenth course, regular narrowing being then resorted to. In this web, the wales *a*, *b*, *c* and *d* instead of being discontinued as usual at the beginning of courses 1, 3, 5 and 7, respectively, are discontinued respectively at the beginning of courses 1, 5, 9 and 13, showing a gain of six courses, which can be increased as desired by postponing the beginning of the regular narrowing operation.

In both of the cases described the web is first narrowed by dropping a needle out, and then after the formation of two or more courses, is widened by bringing said needle in again, but my invention can also be embodied in webs in which the narrowing operation is simply arrested for one or more courses between successive narrowings and the widening operation is likewise arrested for one or more courses between successive widenings, Fig. 5 representing the narrowed portion of a web of this type. In knitting such web the needles are manipulated as follows: First course all of the needles in; second course all of the needles in; third course needle *a* out; fourth course needle a^1 out; fifth course all of the needles in except needles *a* and a^1; sixth course all of the needles in except needles *a* and a^1; seventh course needle *b* out; eighth course needle b^1 out; ninth course all of the needles in except needles *a*, a^1, and *b* b^1; tenth course same needles in; eleventh course needle *c* out; twelfth course needle c^1 out; thirteenth course needle *d* out; fourteenth course needle d^1 out; fifteenth course needle *e* out; sixteenth course needle e^1 out, and so on. This operation results in the formation of successive courses having selvages at their ends, as represented at a^2a^3, b^2b^3, c^2c^3, these selvaged portions being introduced between the successive narrowing courses and between successive widening courses.

The methods of operation described in connection with Figs. 3 and 4 are, however, preferred for the reason that they provide sinker wales, such as shown, for instance, at *t* in Figs. 3 and 4, to cross and partially close the eyelet holes which would be produced in a web having selvaged courses between successive narrowings or widenings.

The courses a^2a^3, b^2b^3, c^2c^3, in Fig. 5 I term "arresting" courses, since their formation simply delays the dropping of a needle out of action, and in widening will delay the bringing of a needle into action, while the

introduced courses in the webs shown in Figs. 3 and 4 I term "arresting and reversing" courses, since they not only arrest the regular narrowing of the web, but in narrowing involve the bringing into action of needles already put out of action, and, in widening, involve the putting out of action of needles already brought into action.

It will, of course, be understood that while it is preferable, it is not necessary to confine my improved method of knitting to a zone at the top and front of the heel, as arresting courses or arresting and reversing courses can be introduced between narrowing and widening courses throughout the full extent of the fashioned portions of the heel if desired, nor is my invention confined to the production of the heel, as it can be used in the formation of the toe as well, if desired, in order to lengthen the same, and in Fig. 1, I have shown a sock provided with both heel and toe made in accordance with my invention.

I claim:—

1. An article of hosiery having a seamless heel or toe composed of narrowed and widened webs interknitted at their ends, the webs in the body of the heel or toe being uniformly and progressively narrowed and widened wale after wale, but said body of the heel being preceded and followed by webs in whose courses the successive narrowings and widenings are interrupted.

2. An article of hosiery having a seamless heel or toe composed of narrowed and widened webs united at their ends, the narrowed web having at intervals at the selvage a widening course between narrowing courses, and the widened web having at intervals at the selvage a narrowing course between widening courses.

3. An article of hosiery having a seamless heel or toe composed of narrowed and widened webs united at their ends and provided at the top and front with a tapering zone in which the narrowing web has, at intervals at the selvage, a widening course between the narrowing courses and the widened web has, at intervals at the selvage, a narrowing course between widening courses.

4. An article of hosiery having a seamless heel or toe composed of tapered and united knitted webs, and provided at the top and front with a tapering zone in which the line of union between the webs is at a lesser angle than in the remaining portion.

5. An article of hosiery having a seamless heel or toe composed of tapered and united knitted webs and presenting, between successive united courses of said webs, eyelet holes crossed by sinker wales.

6. An article of hosiery having a seamless heel or toe composed of tapered and united knitted webs, and provided at the top and front with a tapered zone in which successive united courses of the webs are separated by eyelet holes crossed by sinker wales.

7. The mode herein described of fashioning the heel or toe web of a stocking, said mode consisting in knitting a plurality of courses extending to the selvage in the same wales between successive retirements of needles, first at one end and then at the other end of the web, then retiring a needle in each successive course first at one end and then at the opposite end of the web, then reintroducing an end needle in each course first at one end and then at the other end of the web, and then knitting a plurality of courses extending to the selvage between successive reintroductions of needles.

8. The mode herein described of fashioning the heel or toe web of a stocking, said mode consisting in knitting a plurality of courses extending to the selvage in the same wales between successive retirements of wales at an end of the narrowing web and between successive reintroductions of wales at an end of the widening web, again bringing in a retired wale before finally retiring it in narrowing, and again dropping out reintroduced wale before finally restoring it in widening.

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

ROBERT W. SCOTT.

Witnesses:
HAMILTON D. TURNER,
KATE A. BRADLE.