

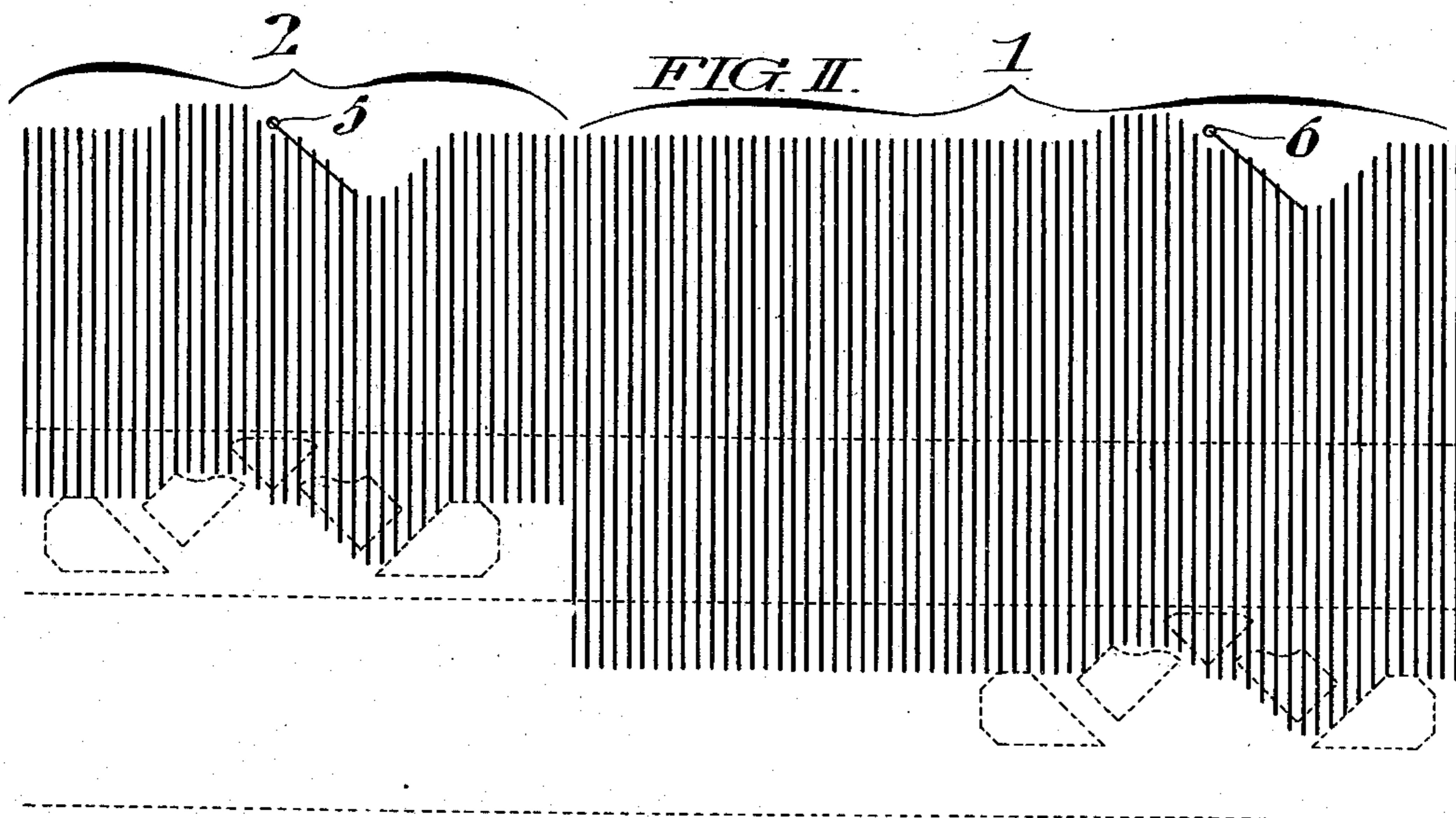
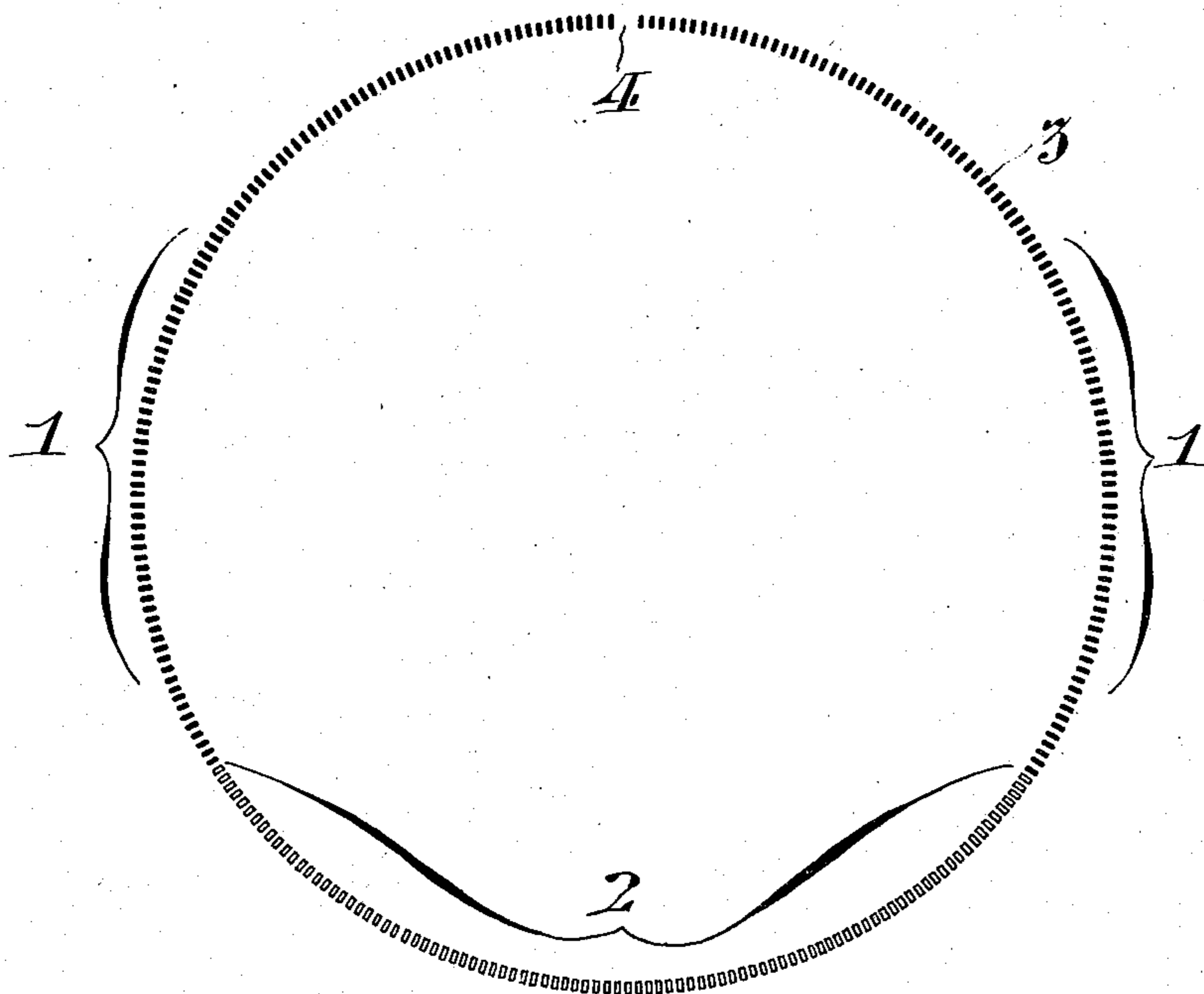
A. GEE.  
MANUFACTURE OF FASHIONED HOSIERY,  
APPLICATION FILED NOV. 18, 1907:

924,605.

Patented June 8, 1909.

2 SHEETS—SHEET 1.

FIG. I



WITNESSES:

John C. Bergner.  
Wm. J. Spier.

INVENTOR:

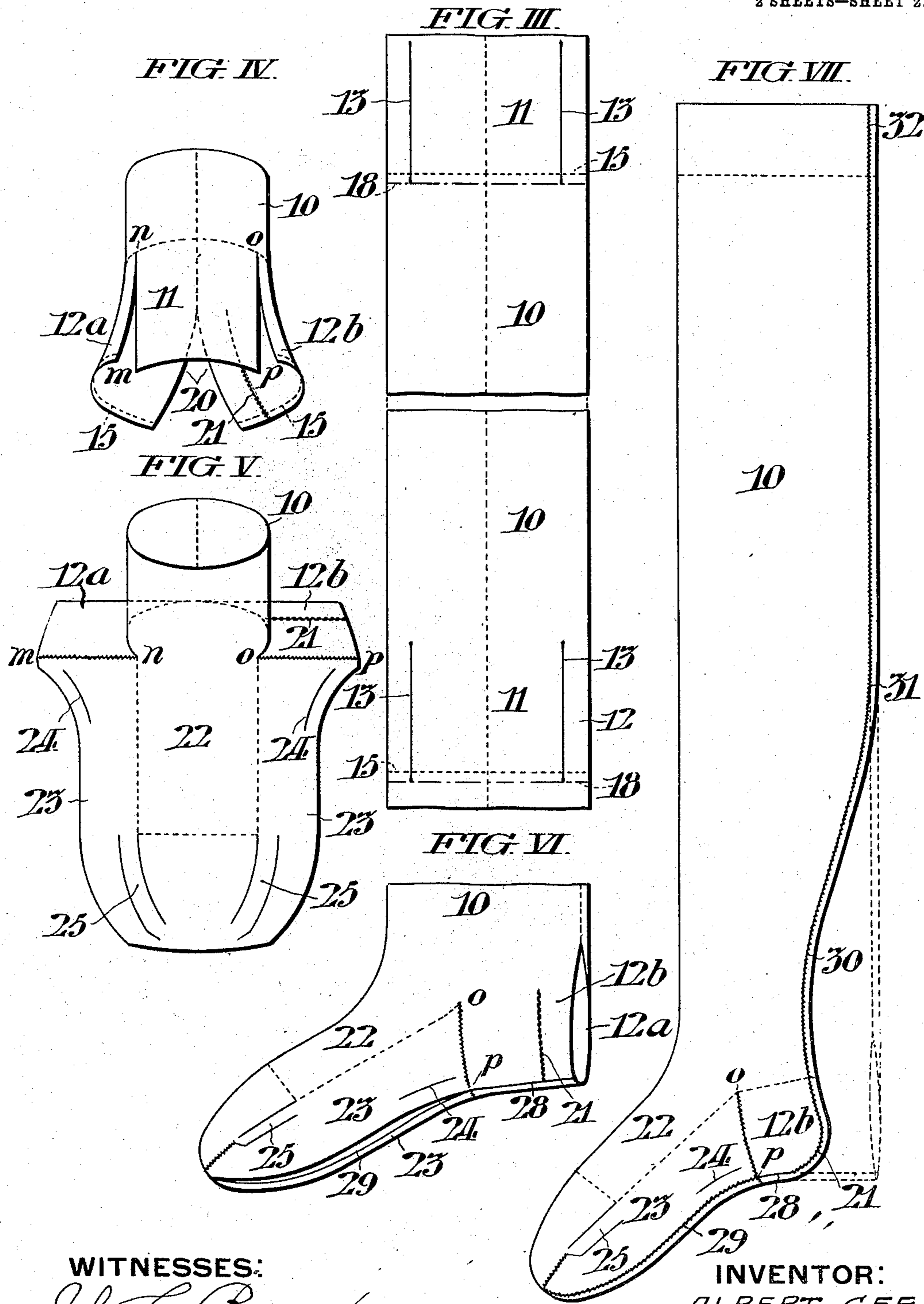
ALBERT GEE,  
by his Attorneys  
Meley & Paul

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INVENTOR:

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# UNITED STATES PATENT OFFICE.

ALBERT GEE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO THOMAS E. BROWN, OF WYNCOTE, PENNSYLVANIA.

## MANUFACTURE OF FASHIONED HOSIERY.

No. 924,605.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed November 18, 1907. Serial No. 402,592.

*To all whom it may concern:*

Be it known that I, ALBERT GEE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Fashioned Hosiery, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to a process of making fashioned hosiery by which I am enabled to produce the product with a minimum expenditure of time and labor.

My process may be practiced by the use of machinery known in the art, but the choice and method of operating said machinery and the sequence of the operations conducted thereupon are novel. The resulting hosiery is also different structurally from hitherto known hosiery, and hence novel.

According to my process I knit the leg of a stocking as a tubular web, upon a circular knitting machine, and also upon the same machine in integral prolongation of a limited portion of the tubular web, I knit a straight selvaged web to form the heel of the stocking, and then transfer the work to a flat machine and knit a foot portion, as for instance, a full fashioned French foot, in continuity with the heel selvages and the instep portion of the terminal course of the tubular web. The stocking thus knit is completed by looping and seaming operations as will be fully described.

In practicing my process, I employ two kinds of knitting machines, one circular and the other flat. For the circular machine I employ a type of machine which, in addition to producing a continuous tubular web by the spiral progression around the circle of needles of a single feed, is also capable of producing in integral prolongation of such tubular web, one or more (preferably two), flat webs with straight selvaged edges, by the independent reciprocatory manipulation of a limited continuous series of the needles, and the employment of a feed for each such series; as for example two feeds on opposite sides of the machine during its reciprocation, whereby two threads are simultaneously led back and forth, with the production of two ordinary selvaged webs. To accomplish this separate operation of a limited continuous series of needles which form part of a circle of needles, it is convenient to differentiate the series by employing needles having shanks of

differing lengths, whereby their butts lie in differing horizontal planes. A circular machine capable of thus simultaneously manipulating by reciprocating two differing continuous series of needles on opposite sides of the circle is shown and described in U. S. Letters Patent No. 784,882, dated March 14th, 1905, granted to Albert M. Pigeon. An earlier machine capable of the same operation was patented in Great Britain to W. H. Dorman, under date of February 15th, 1887, No. 2325, and other types of such machines are known in the art.

It will therefore not be necessary to describe the details of the circular machine employed by me for the manipulation of the needles in the particular method which I will explain, and I will illustrate and describe my process, so far as the mechanism for producing it is concerned, only to the extent of illustrating diagrammatically the arrangement of two complementary series of needles together forming a circle which it will be understood are capable of both continuous operation by rotation of the machine for the production of a tubular web, and also of simultaneous but discontinuous operation by reciprocation of the machine for the production of two flat webs in integral prolongation of said tubular web.

The flat machine for the production of the foot may be of any known type, depending upon the extent to which it is desired to carry the fashioning process. In the product which I have shown in the drawings and will describe the foot is what is known as full fashioned, (often called a "French" foot), having lines of fashioning under the instep and two fashioned gussets at the sides of the toe. Flat machines capable of doing this work automatically and known as Cotton machines have long been well known in the art, and need not be here described.

For the production of a stocking according to my process, I also employ looping and seaming machines, but these also are of well known types long used in the art, and need not be here particularly described, especially as their operations might be performed manually.

In the accompanying drawings,—Figure I, represents in diagrammatic plan view a circle of knitting needles organized for the practice of my process. Fig. II, shows in elevation the same circle of needles developed upon a plane.

Fig. III, represents diagrammatically string-work knit upon the needles arranged as in Fig. I, and employed in the practice of my process. Fig. IV, illustrates diagrammatically the cutting of this string-work. Fig. V, illustrates diagrammatically the method of attaching and constructing the foot portion. Fig. VI, shows the foot after the heel has been looped. Fig. VII, shows the completed stocking after the seaming operation.

I will describe the practice of my process for the production of long hose fashioned at the ankle and heel and provided with what is known as the "French" foot, but it will be understood that the same process may be employed in the manufacture of other sorts of hosiery where less fashioning is required and also that in the practice of my process other varieties of foot than the full fashioned French foot may be utilized.

The first step in my process involves the production, preferably as string-work, of a tubular web prolonged integrally upon one side as a selvaged web. This might be produced upon any ordinary circular knitting machine, as it is possible on such a machine after continuously rotating it, for the production of a tubular web, to put a part of the needles out of action (as for instance, by throwing them to the idle level), and then by knitting with a reciprocatory motion upon the remaining active continuous series, to produce a selvaged web corresponding in width to the active series. If, during such a process of knitting, the loops remain upon the idle needles, and if the selvaged web is much prolonged, there is a puckering of the work near the corners of the selvaged web, which renders the process of knitting difficult. In order to avoid this it is preferable not to maintain an idle series of needles during the knitting of the selvaged web, but instead to knit simultaneously two selvaged webs complementary to each other, one upon one series, and the other upon the other complementary series of the needles, by the reciprocation of the machine. Such a method of knitting may be conveniently practiced upon the machine of the Pigeon patent No. 784,882, to which I have referred, as well as upon other varieties of knitting machines and as I have illustrated the arrangement of the needles of Figs. I, and II, it is such as might be employed in the Pigeon machine for the practice of my process.

Referring to Fig. I, it will be seen that as an example a circular series of two hundred and ninety needles is shown. Of these, one variety 1, 1, are one hundred and ninety-eight in number, (two having been omitted), and occupy that part of the circle which is concerned in knitting the heels, and I will therefore refer to them as the heel needles. It is convenient in the center of this series

to omit one or two needles as at 4, for the production of an open-work stitch down the middle of the back of the tube, for the purpose of assisting in the cutting and seaming of the stocking, as will hereafter be described. It is also convenient to insert at the proper place, as at 3, a tucking needle which during the reciprocation of the machine will produce a tuck stitch. This also is for marking purposes as will hereafter be explained. The complementary series of needles 2, may be ninety in number, and are those which during the reciprocation of the machine knit a false instep, to be subsequently cut or raveled away, and they will therefore be called the instep needles. In order that these two series of needles may be simultaneously but separately operated during the reciprocation of the machine, it is convenient to provide the two series with shanks of differing lengths whereby the butts of the two series of needles occupy differing horizontal planes. As shown in Fig. II, the heel needles 1, are longer than the instep needles 2. In this way by the employment of two sets of reciprocatory knitting cams occupying different horizontal planes it is possible by reciprocating the cam cylinder of the knitting machine to knit separate selvaged webs simultaneously upon each series of needles, and it is also possible by throwing both sets of cams in vertical line and rotating the machine, to operate the entire circle of needles as one series for the production of continuous tubular knitting. During the reciprocatory process two feeds 5, and 6, are employed to feed yarn to the needles, one to each series, while during rotary knitting only one of these feeds is operated. This method of operation is fully described in the Pigeon patent to which I have referred, the arrangement of the needles only differing in that according to my process all of the heel needles form a continuous series, and all of the instep needles form another continuous series, so that when the machine is reciprocated there can be no interknitting or formation of sutures between the two webs as in the Pigeon patent, where one of the short needles is interspersed in the field of the long needles for the production of an interknit suture.

Upon such a machine organized as I have explained, I produce an indeterminate length of knitting, often denominated "string-work". The structure of this string-work is indicated in Fig. III, it being understood that the repetition of the parts there shown is continued in indefinite succession. It comprises plain tubular portions 10 (broken in the drawing to economize space), to be used for the production of the leg of the stocking. These are knit by the continuous rotary action of the entire series of needles as described. After a proper length of such

tubular web has been knit it is succeeded by the production integrally therewith, by reciprocation of the machine as described, of two complementary selvaged webs of which the narrower one 11, is the instep web, and the wider one 12, is the heel web. Each of these webs is edged by a plain straight selvage indicated by the lines 13, 13; so that the string-work has the appearance of a long knit tube with paired lengthwise selvaged slots, at intervals along its length. It will be noted that with the needles arranged as has been previously described, this heel web is considerably wider than ultimately required for the formation of the heel. This is in order to allow the central portion of it at the back of the heel to be subsequently cut away as part of a fashioning operation which also involves the ankle portion of the leg tube.

It is convenient to knit the instep web 11, of a very light cheap yarn, as it is to be entirely raveled or cut away; while it is best to knit the heel web 12, of heavy or reinforced yarn. At the proper point in the knitting of this heel web a loose course 15, may be knit as a line for the subsequent looping operation, which is to complete the bottom of the heel. Or, if a splicing thread is employed in reinforcing the heel, the intermission of the splicing thread for one course, will conveniently produce the same result. The string-work will further preferably have a line or mark in the form of an open stripe extending continuously down that portion of the tube which is to form the backs of stockings by reason of the omission of a needle or needles in the center of the heel series as heretofore explained. The string-work thus produced is severed by cutting along the lines 18, 18, thus dividing it into lengths, each suitable for the production of one stocking, and each comprising a tubular portion and two complementary selvaged webs in prolongation thereof. At this stage of the process a vertical cut 20, may be made by the shears along the open-work line at the back, to about the depth of the selvaged edges. Accordingly the lower end of the fabric will then have the appearance indicated in Fig. IV, where 11, is the false instep, and 12<sup>a</sup>, and 12<sup>b</sup>, the two heel cheeks produced by dividing the heel portion by the cut 20. On one of these heel cheeks 12<sup>b</sup>, there is preferably a line of tuck stitches 21, produced by the tucking needle 3, convenient for the purpose hereinafter explained.

The second stage of the process is now reached which consists in transferring to a straight or flat series of needles, the selvage loops of the heel web and also the loops of that portion of the terminal course of the leg tube which is complementary to the portion of that course from which the heel web

originates. This transfer line is indicated in both Figs. IV, and V, by the letters *m*, *n*, *o*, *p*. This is accomplished by distending the two heel cheeks until their selvages are in line and placing these selvaged loops, and also the course of ordinary knitting loops which is at the base of the false instep, upon a line of transfer points often called a transfer rod, and then transferring these loops to a straight series of needles upon a flat knitting machine known as a "footer". Upon this footer the foot is knit as a flat fashioned web. If it is desired to produce a full fashioned French foot, the work will then have the appearance indicated in Fig. V, where 10, is the lower end of the tubular portion, 12<sup>a</sup>, and 12<sup>b</sup>, the two heel cheeks, 22 the instep, and 23, 23, the two sole flaps with lines of fashioning 24, 24, at the instep and toe gussets 25, 25, for the fashioning at the sides of the toe pocket.

When the transfer operation is made the entire false instep 11, is cut or raveled away back to the line of loops *n*, *o*, at its base upon which the transfer operation takes place, and from which the true instep 22, knit on the footer springs.

The final step of the process consists in completing the sole of the foot by uniting the opposed lower edges of the heel cheeks and sole flaps along the middle of the sole. In the formation of the French foot the edges of the heel cheeks 12<sup>a</sup>, and 12<sup>b</sup>, are united by a looping operation along the line 28, in Fig. VI, while the edges of the sole flaps are united by a seaming operation along the line 29. This completes the foot but leaves the tubular leg portion without any fashioning at the ankle and the heel open at the back as seen in Fig. VI. The stocking is therefore completed by a further seaming operation. This begins near a point near the back of the heel conveniently indicated by the line of tuck stitches 21, and continues along the line 30, as indicated in Fig. VII, until the point 31, is reached where it is desired that the leg shall have the full diameter of the tube as originally knit. The seaming might stop here, but, as it is unsightly to thus end the seam it is best to prolong it along the line 31, 32, to the top of the stocking. This seaming operation results in cutting away that portion of the knit fabric which is illustrated in dotted lines in Fig. VII, and leaves the completed stocking having the desired configuration as there shown.

Such a stocking as thus produced by my process is as completely fashioned as one wholly knit upon a flat machine as the process is commonly practiced in Germany, and with its edges united by the seam running from toe to top at the back of the stocking; but my process has the advantage that much the greater part of the fabric comprising all

of the leg and the heel is produced by the rapid operation of a circular knitting machine, where very little labor is required, and where the work may be produced in continuous succession as string-work, which results in much economy, both of labor and time, and therefore much cheapens the cost of the stocking.

In thus describing my process, I have made frequent reference to the knitting machines upon which it is practiced and to the method of operating these machines, because this is the most convenient way of clearly teaching one skilled in the art how to practice the process, but it must be understood that the process which I have invented is not necessarily dependent upon the particular mechanism employed in its practice, but consists essentially in a series of operations performed upon threads or yarns by which they are built up into the structure which we call a stocking. Essentially, therefore, my process consists in first knitting the leg as a continuous closed tubular web; then knitting in integral prolongation of a limited portion of this tubular web, a selvaged web of uniform width and of sufficient length to form the heel of the stocking; and then knitting the foot as a flat web, whose first course is drawn through the selvage loops of the heel web, and also through the terminal loops of that part of the leg tube which is not prolonged to form the heel web. This I believe to be novel, for although I am aware that it has hitherto been proposed in United States Letters Patent No. 185,561, to Moses Marshall, to knit a heel prolongation on one side of a knit tube and to employ the selvage loops of this prolongation in starting the foot, yet, such process, as well as the stocking thereby produced, differs essentially from mine, in that the foot is not knit as a flat web, nor does it employ as the foundation of the foot the terminal loops of that part of the leg tube not prolonged to form the heel web, but, on the contrary, Marshall prolongs the complementary portion of the leg tube, and incorporates this prolonged complementary web into the foot of his stocking, producing an essentially different article, and operating according to a different scheme of knitting from that involved in my process.

A further process which is involved in the invention, as I have described it, is found in the plan of knitting not only the selvaged heel web, but also a complementary selvaged web of equal length, which I have referred to as a false instep, in order that the entire tubular knitting may be performed on a single circular knitter, with indefinite reduplication as string-work; and then cutting away or sacrificing the false instep thus formed, in order that the foundation of the foot may be the continuous line of loops formed jointly by the heel selvages and the

course of knitting loops which lies between the origins of these heel selvages.

I further consider as novel, the process of forming the heel from the single selvaged web by cutting and seaming it at the back, whereby a considerable portion of the central part of the heel web is sacrificed in order that the formation of the back of the heel may coincide with that fashioning which takes place at the ankle portion of the tubular web.

It will be understood that when in the claims I speak of a "straight selvaged web" I mean a flat web of uniform width which is knit upon a continuous and constant series of needles by reciprocation of the thread back and forth with formation of straight selvaged edges.

Having thus described my invention, I claim:—

1. The improvement in the art of knitting fashioned hosiery, which consists in first knitting the leg as a continuous tubular web; then knitting simultaneously two straight but complementary selvaged webs as integral prolongations of the tubular web, one to form the heel and one as a false instep; then discarding the false instep and knitting the foot as a flat web, the first course of which is drawn through the selvage loops of the heel web, and also the loops of that portion of the terminal course of the leg tube from which the false instep originates; and completing the stocking by uniting the edges of the foot and heel portions.

2. The improvement in the art of knitting fashioned hosiery which consists in first knitting the leg as a continuous closed tubular web; then knitting as an integral prolongation of a limited portion of this tubular web a straight selvaged heel web, having a width in excess of that required to form a heel; then knitting the foot as a flat web, the first course of which is drawn through the selvage loops, of the heel web, and also the loops of that portion of the terminal course of the leg tube which is complementary to the portion of that course from which the heel web originates; and completing the stocking by uniting the edges of the foot and heel portion, and cutting away so much of the central part of the heel web and the ankle portion of the leg tube at the back as is required to fashion these parts, and uniting the cut edges together.

3. The improvement in the art of knitting fashioned hosiery which consists in knitting, as string-work, tubular webs for legs, alternating with sections comprising two complementary selvaged webs; severing the string-work below the selvaged webs which are to constitute the one the heel, and the other a false instep; removing the false instep from each leg tube; and knitting the foot as a flat fashioned web upon the foundation of the

line of loops formed by the selvage edge of the heel web and the terminal loops of the leg tube at the base of the removed instep.

4. The method of producing a fashioned  
5 stocking, which consists in knitting a continuous leg tube on a circular knitting machine; then knitting on the same machine two complementary selvaged webs one to form a heel and the other a false instep; transferring  
10 to a flat knitting machine of the Cotton type the line of loops formed by the selvages of the heel web and the loops of that portion of the

terminal course of the leg tube from which the false instep originates; discarding the false instep; knitting the foot upon this latter  
15 machine as a flat fashioned web; and completing the stocking by looping and seaming.

In testimony whereof, I have hereunto signed my name, at Philadelphia, Pennsylvania, this sixteenth day of November, 1907. 20

ALBERT GEE.

Witnesses:

JAMES H. BELL,  
E. L. FULLERTON.