(Specimens.)

2 Sheets—Sheet 1.

L. E. SALISBURY.

KNIT FABRIC.

No. 385,481. Patented July 3, 1888.

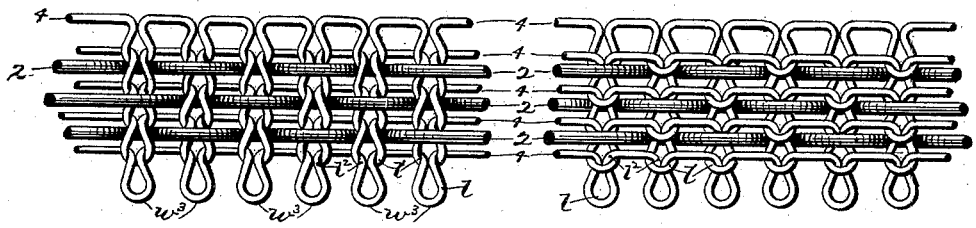

FIG. 1.

FIG. 2.

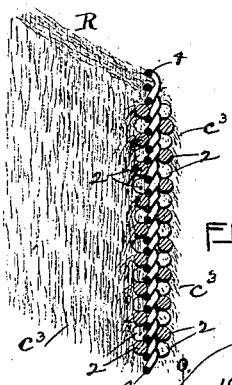

FIG. 4.

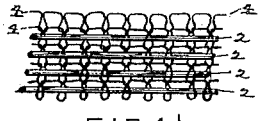

FIG. 4½.

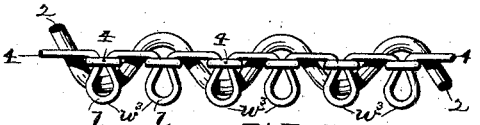

FIG. 3.

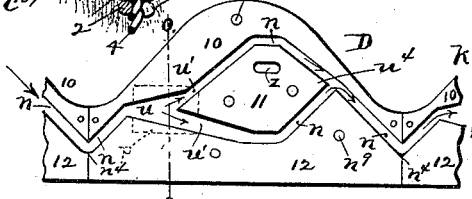

FIG. 9.

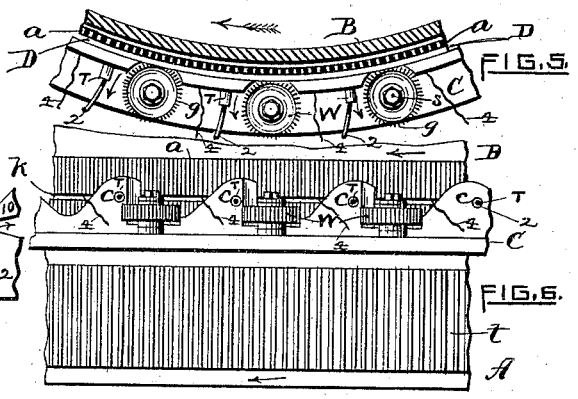

FIG. 5.

FIG. 6.

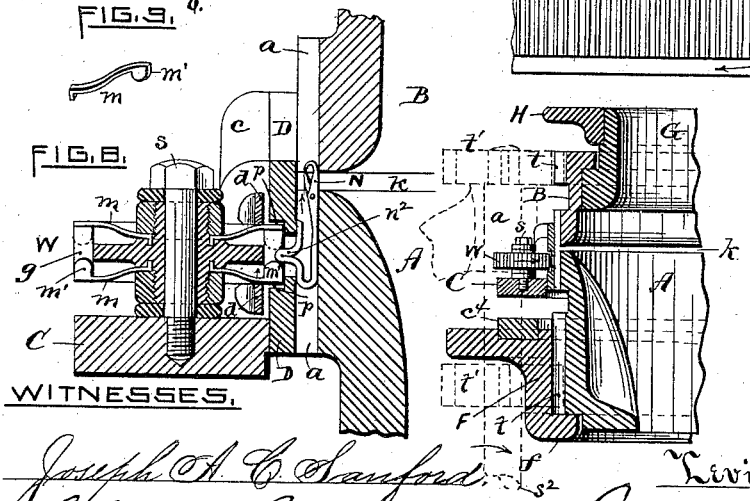

FIG. 8.

FIG. 7.

WITNESSES,

Joseph A. C. Sanford.

Charles Hasungan

INVENTOR,

Levi E. Salisbury.

by Remington & Hutchison

Attys.

(Specimens.)

2 Sheets—Sheet 2.

L. E. SALISBURY.

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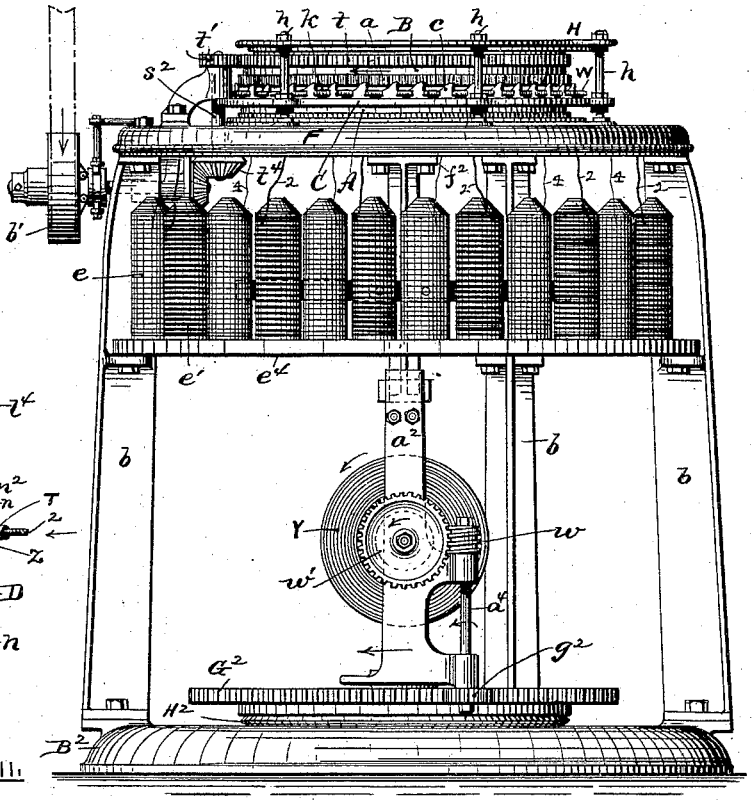
FIG. 13.



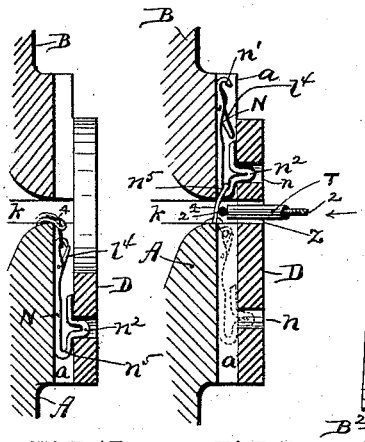


FIG. 12.

FIG. 11.

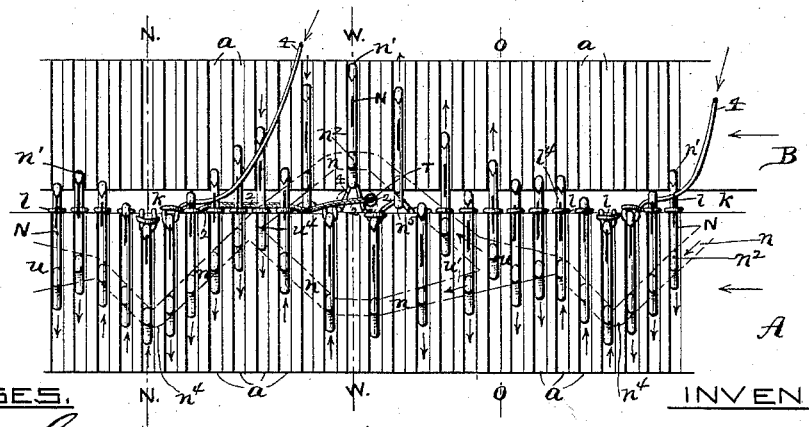


FIG. 10.

WITNESSES.

Charles Hannigan.

Joseph A. C. Sanford.

INVENTOR

Levi E. Salisbury.

by Remington & Hentrow

Attys.

UNITED STATES PATENT OFFICE.

LEVI E. SALISBURY, OF PROVIDENCE, RHODE ISLAND.

KNIT FABRIC.

SPECIFICATION forming part of Letters Patent No. 385,481, dated July 3, 1888.

Application filed December 14, 1886. Renewed December 7, 1887. Serial No. 257,214. (Specimens.)

To all whom it may concern:

Be it known that I, LEVI E. SALISBURY, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Knit Fabrics; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to certain novel improvements in the manufacture of plush or carded face knitted goods; and it consists, essentially, of a knitted fabric having filling or plush threads, each passing around the front and back, alternately, of wales formed by base-threads of a similar or of different material, or, in other words, a fabric in which the plush-threads show the same on each side thereof, and at the same time nearly or quite conceal the said base-threads.

The object of my present invention is to produce a knitted fabric in which, as before stated, both its surfaces are plush-faced. The uses to which a knitted fabric thus improved may be put are numerous. I would mention particularly, however, that, after being suitably "fulled" and carded, said fabric has the appearance of a carded woven blanket. A "felt" surface is produced on each side thereof by subjecting the fabric after carding to a suitable shearing or cutting machine. By means of thus producing a knit blanket or fabric having both surfaces alike, the cost of manufacturing is greatly reduced as compared with analogous goods woven on a loom, as common.

In the accompanying two sheets of drawings illustrating my improved knitted fabric I have also represented a knitting-machine adapted to produce the said fabric.

In this connection I would state that the machine just referred to, and in its entirety, forms the subject of a separate application for Letters Patent filed by me in the United States Patent Office February 26, 1887, Serial No. 228,923.

Figures 1 and 2 herewith represent enlarged views of the front and back surfaces of the fabric, respectively. The several base-threads, as well as the "filling" or plush threads, are shown very loosely knitted, for the purpose of readily tracing out the individual threads composing the fabric. Fig. 3 is a top view of the same. Fig. 4 is a perspective view, also enlarged, of a portion of said fabric closely knitted, and having the plush-threads carded to produce a blanket surface on both sides thereof. Fig. 4½ is a reduced view showing a different arrangement of the filling-threads. The following figures represent partial views of a machine adapted to produce the fabric illustrated: Fig. 5 is a horizontal sectional view taken through a portion of the upper needle-cylinder and showing the needle-shifting wheels. Fig. 6 is a partial side view of the same and the lower needle-cylinder. Fig. 7 is a vertical sectional view taken through the said cylinders, &c. Fig. 8 is an enlarged vertical sectional view of one of the needle-shifting wheels and adjacent parts as in use. Fig. 9 is a detached view of one section of the cam-plate. Fig. 10, Sheet 2, is an enlarged front view of a portion of the upper and lower needle-carrying cylinders, the relative position thereto of one section of cam-grooves being indicated by broken lines. Said figure also shows a base or knitting thread and the manner of introducing the plushing-thread. Fig. 11 is a transverse sectional view taken on line W W of Fig. 10. Fig. 12 is a similar view taken on line N N of Fig. 10; and Fig. 13 is a side elevation, reduced, of the complete machine adapted to produce my improved knitted fabric.

The immediately-following description refers more particularly to mechanism adapted to produce the improved knitted fabric hereinafter claimed.

The principal novel features in the said machine are the employment of two independently-mounted needle-carrying cylinders traveling in unison, combined with a stationary ring having a series of peculiar-shaped cams secured thereto, and a series of wheels loosely mounted on said ring working into and operated by the needles, whereby the latter are deflected or shunted into suitable grooves formed in the cams, for the purpose of working the

filling-thread alternately to the front and rear of the wales, thereby producing a plush surface on each side of the fabric.

F, again referring to the drawings, designates (see Figs. 7 and 13) a section of the stationary bed or frame adapted to carry a "shipper-ring," e^4, as common.

A indicates the lower cylinder, having the outer surface of its upper portion grooved at *a* to receive each a needle, N. (See Fig. 8.) The lower portion of said cylinder is provided with gear-teeth *t*, and resting upon the inwardly-projecting inner flange, *f*, of said bed F. B indicates the upper needle-carrying cylinder. The latter is of the same diameter and has the same number of grooves *a* as the lower cylinder, A. The grooves of the upper cylinder are in the lower portion thereof, while gear-teeth *t* are formed in the upper portion.

G H, Fig. 7, indicate stationary rings, on which the upper needle-cylinder is mounted to revolve. The cylinders are separated about one-eighth of an inch at *k*, with the grooves *a* of the two cylinders being directly in line. A vertically-mounted revolving shaft, s^2, having equal-size pinions t' t' secured thereto, (see dotted lines,) serves to revolve the needle-carrying cylinders in unison. (See also Fig. 13.)

C indicates a stationary "cam-ring," so called, having the series of steel cams D secured to its inner face. The cams are turned or bored out, so as to allow the grooved portions of the needle-cylinders to freely revolve therein. A side view of one of the cams D is shown detached in Fig. 9. Said cam in reality consists of three pieces, 10 11 12. The same are cut and separated so as to form the cam-shaped grooves *n*, in which the shanks n^2, formed on the outer face of the needles N, are adapted to travel. (See Figs. 8 to 12.) Opposite the line *o o* (see Figs. 9 and 10) of each cam D is loosely mounted upon a stationary stud, *s*, tapped into the cam-ring C, a needle-shunting wheel, W, having a series of grooves, *g*, formed in its rim, each of said grooves having a light spring-arm, *m*, working therein by means of its engagement with a suitably-mounted stationary cam, *d*, Fig. 8. The outer end of each spring-arm has a lug, *m'*, formed thereon, adapted to engage with the shank n^2 of the needles, for the purpose of moving the latter in an endwise direction.

In plushing the two sides of the fabric, as represented in the first four figures of the drawings, the arms *m* are alternately arranged in the wheel W—that is to say, assuming there are twenty-four grooves *g* formed in the rim, an arm *m* is fitted into a groove on top, the next groove at the bottom being reversely fitted with an arm, and so on around the wheel. There are then twelve arms on top, alternating with twelve reversely-placed arms at the bottom. The cams D are partly cut through at *p*, adjacent to said wheels, (see Figs. 8 and 9,) thereby permitting the outer ends of the spring-arms and the rim portion of the wheel to revolve therein. It is obvious, now, that as the needle-carrying cylinders revolve, the shanks n^2 of the needles, by reason of their engagement with the cam-grooves *n*, cause all the needles to move up and down in the grooves *a* of the cylinders. At the point *o o*, however, Figs. 9 and 10, of each cam D the cam-groove separates, (see $u\,u'\,u'$, arrow direction,) so that as the said shanks n^2 successively engage the teeth or webs of metal separating the grooves *g* and revolve the wheel W the lugs *m'* of the spring-arm *m* engage the said shanks n^2 at the enlargement *u* of the cam-opening and alternately shunt the needles up and down the cam-grooves u' u'. By means of this arrangement every other needle is guided up over the opening *z*, through which the plush-thread enters, and the other needles pass under said opening. The deflection of the arms *m* producing this result is effected by the upper and lower stationary cams, *d d*.

Shortly after passing the opening *z* the two columns of needles unite again in the common cam-groove *n* and successively move up and down therein until the next corresponding point in the cam is reached, when the separation of the column of needles is repeated, as just described, and so on consecutively around the machine.

Each cam-section constitutes a "feeder" for the threads forming the fabric.

I will now more specifically point out the manner of producing my improved knitted fabric upon the machine just described.

A foundation or base thread, 4, is first introduced from a bobbin, *e*, into each cam-section D at the point indicated, which thread is then caught up by the latch-needles N and looped in the lower revolving cylinder, A, by means of the action of the cam-groove and the successive passage of the needles, as usual in making knitted fabrics. (See right-hand portion of Fig. 10.) The continuous rotation of the machine thus threaded would, in fact, produce a web of ordinary plain-knitted fabric, the upper needle-cylinder, B, the shunting-wheels W, and upper cam-grooves, u' u', of the cams D thus far not having been called into play. To plush both sides of a fabric having a plain-knitted base, I next introduce the filling or plushing threads 2 from a creel or bobbin, e', into each cam-section D through a tube, T, inserted through the opening *z*, Figs. 9, 10, and 11. Said tube extends nearly or quite to the rear of the needles and into the space *k* between the two needle-cylinders A B, as shown in Fig. 11.

Having first assumed the machine to be constructed and arranged as hereinbefore described, and shown in Fig. 13, and having a loop *l* upon each needle, as in ordinary knitting, I would particularly refer to Fig. 10 of the drawings as representing one cam-section wherein such a loop is shown on each needle, and trace out the action of the needles.

It will be noticed that the base-thread 4 is fed to the needles and the knitted loops made in the lower revolving cylinder as common, as

indicated at the right of said figure. Now the needles, or rather the shanks n^2 thereof, successively rise from the lowest point, n^4, of the cam-groove n into the enlargement u thereof. The head of the needles then engages the upper cylinder. During said upward movement of the needles through the new loops the latter throw all the latches l^4 down. The loops, however, do not slide entirely therefrom, but rest against them. The weight of the web of fabric Y, &c., produces considerable tension upon each loop resting on the top edge of the lower cylinder, A. As the needle-shanks enter the said enlargement u they engage the rim of the shunting-wheel, W, Fig. 8, thereby revolving the wheel. The latter, in connection with the stationary upper and lower cams, d, and the alternately-mounted spring-arms m, separate and guide the needles alternately into the lower and upper cam-grooves, u'. Then, as the needles rise in the upper grooves to the top thereof, the new loops thereon slide from the latches down into the lower bend, n^5, of the needles. Each needle in passing the highest point in the cam is wholly retained in the upper cylinder, B, its lower bend being just flush with the lower edge of the cylinder, as shown at line W W and also in Fig. 11, the loop at the same time being drawn up from the edge of the lower cylinder, and also being considerably elongated thereby. While every other needle is rising in the upper cam-groove the alternate needles are shunted into the lower groove until the hooks are flush with the upper edge of the lower cylinder. Now, as the upper and lower columns of needles pass the line of the highest portion of the upper cam, they unite at the intersection u^4 of the two grooves $n\,n$, and all are then guided downwardly. The needles, however, in the lower groove previously rise sufficiently to slip the loops from the latches. It will be seen that as the needles descend from the point u^4 another base-thread, 4, is fed in, (practically the beginning of the next cam-section,) which in turn is caught up by the hooks n' and shut in by the latches. The closing thereof is effected by the first or prior set of loops, which latter finally are "shed" over the ends of the needles, thereby forming the newer loops as the needles successively pass the lowest portion, n^4, of the cam-grooves. The operation is continuously repeated round the machine.

The manner of introducing and interlocking the filling or plush thread 2 between the several courses and over the wales w^3, Fig. 1, is as follows, first stating that the end of a suitably-mounted stationary tube, T, is inserted through a hole formed in the cam-ring, thence through the enlarged opening z of the cam D, and to or nearly to the back of the needles, (see Fig. 11:) The outlet of the tube is just back—*i. e.*, in the line of rotation—of the elongated loop retained in the lower bend of the highest needle. Now the said thread 2 passes from a bobbin, e', through and to the rear end of the tube T. The thread is laid across and in front of the elongated loop and to the rear of the adjacent loop or wale, then front of the next loop, and so on alternately. The forward end is locked into the fabric at about the line N N. The filling-thread always passes to the rear of all the needles. It will be readily seen now that the needles in the upper cylinder in descending will pass over the filling-thread, while those in the lower cylinder will rise up over or in front of it, by which arrangement the said thread shows in front of the wales formed by the upper shunted needles and appears in the rear of the wale produced by the lower shunted needles.

The diagonal or "staggered" effect of the filling-thread is produced by setting the alternate cam-wheels W so as to cause the needles to travel in a reverse order—that is to say, the needles which were first wholly deflected into the upper cylinder are next guided into the lower cam-groove, and the (former) lower needles at the same time are guided into the upper cam-groove. By means of this arrangement I produce the fabric represented in Fig. 1, wherein the same plush-thread 2 appears alternately in the front and rear of the wales w^3. The wales and filling-threads are interknitted in each horizontal course. The corresponding back surface of the fabric is shown in Fig. 2.

I contemplate the knitting of fabrics having figured surfaces on each side, the same to be produced as hereinbefore described, except that I change the arrangement of the spring-arms m in the shunting-wheel W.

The producing capacity of the machine is directly increased by simply multiplying the feeders. A feeder comprises a base-thread and a filling-thread, with the necessary cams, &c., for deflecting and operating the needles.

I do not claim herewith the mechanism shown and described for producing my improved knitted fabric, as the same, as hereinbefore stated, forms the subject of another application for United States Letters Patent.

Having thus described my improved fabric and a method of making the same, what I claim, and desire to secure by Letters Patent, is—

1. The improved knitted fabric having filling or plush threads, each passing around the front and back, alternately, of wales formed by base-threads of a similar or of different material, and having the base-threads nearly or quite concealed on both sides of the fabric by the said filling-threads.

2. The improved knitted fabric hereinbefore described, consisting of wales formed by the base-threads 4 and the filling or plush threads 2, of similar or of different material, each passing around the front and back, alternately, of one or more of the said wales, and having the base-threads nearly or quite concealed on both sides by the filling-threads.

3. The improved knitted fabric R, herein-

before described, consisting of base-threads forming the plain portion, and having fulled and carded filling or plush threads of similar or of different material, each passing around the front and back, alternately, of wales formed by the said base threads and entirely concealing the latter on both sides of the fabric, substantially as shown and set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

LEVI E. SALISBURY.

Witnesses:
CHARLES HANNIGAN,
WM. R. DUTEMPLE.