

(No Model.)

3 Sheets—Sheet 1.

B. L. STOWE.
COMPOUND FABRIC FOR HOSE, &c.

No. 427,929.

Patented May 13, 1890.

Fig. 1.

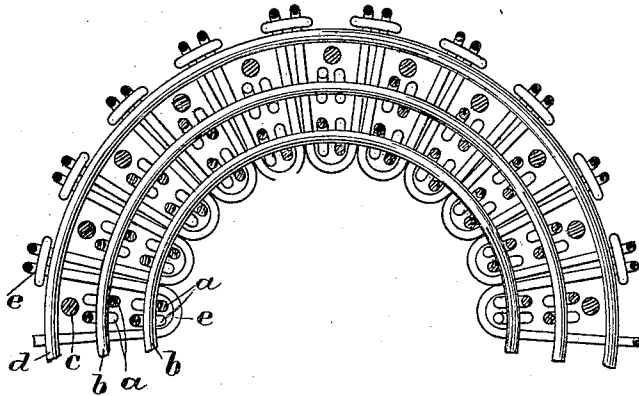


Fig. 2.

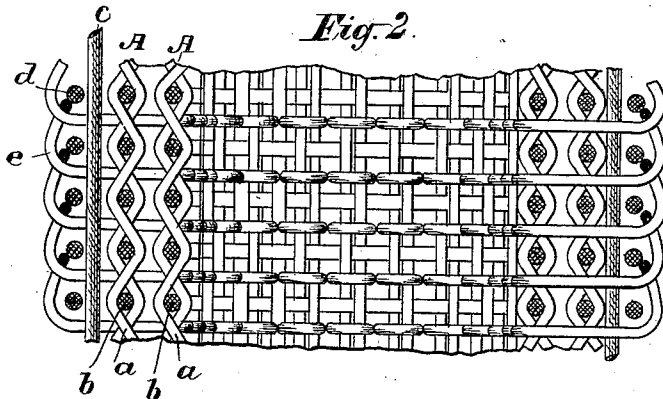
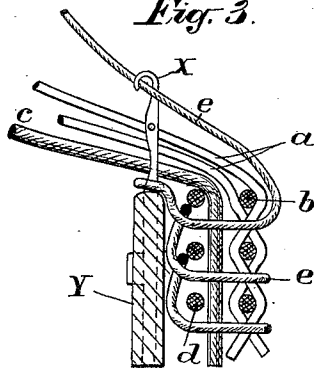


Fig. 3.



Witnesses:
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Frederick A. Stowe

Inventor
Benjamin L. Stowe
Manufactured by Stowe

(No Model.)

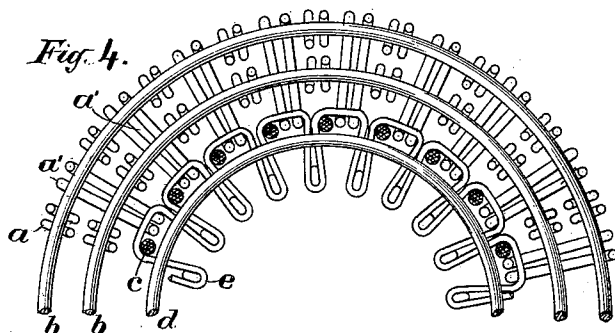
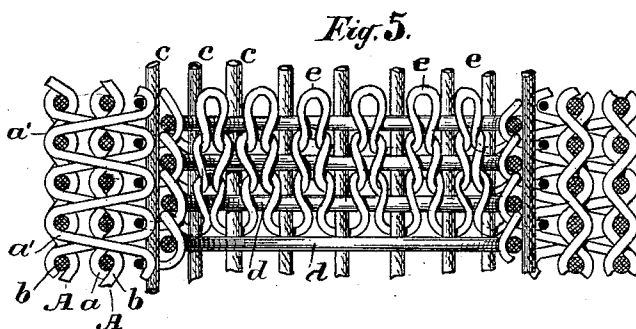
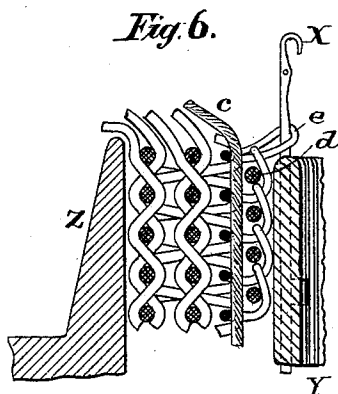
3 Sheets—Sheet 2.

B. L. STOWE.

COMPOUND FABRIC FOR HOSE, &c.

No. 427,929.

Patented May 13, 1890.



Witnesses:

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Fredrick A. Stowe

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Marshall Bailey
attorney

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Fig. 7.

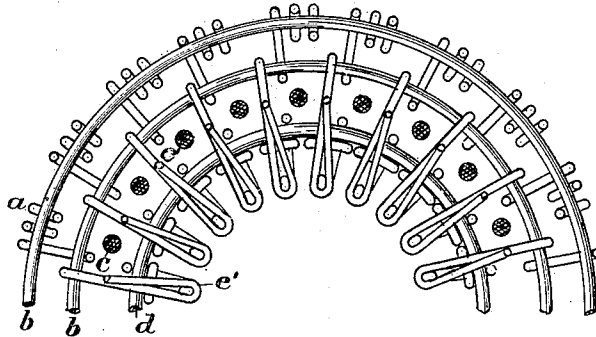


Fig. 8.

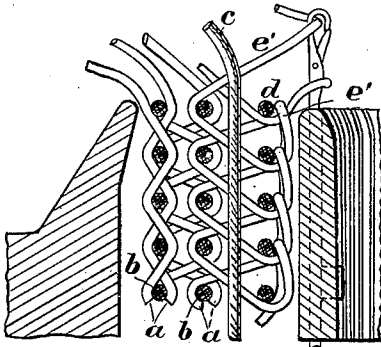
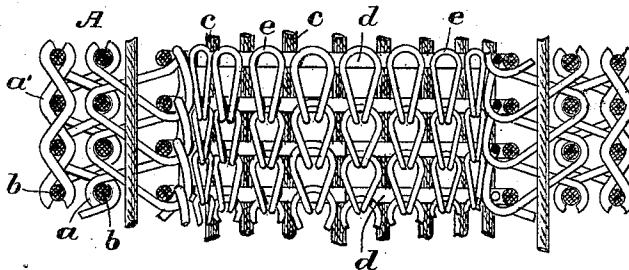


Fig. 9.



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UNITED STATES PATENT OFFICE.

BENJAMIN L. STOWE, OF BROOKLYN, ASSIGNOR OF THREE-FOURTHS TO
J. VAN D. REED, OF NEW YORK, N. Y.

COMPOUND FABRIC FOR HOSE, &c.

SPECIFICATION forming part of Letters Patent No. 427,929, dated May 13, 1890.

Application filed October 9, 1886. Serial No. 215,762. (No specimens.)

To all whom it may concern:

Be it known that I, BENJAMIN L. STOWE, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Compound Fabrics for Hose, &c., of which the following is a specification.

The fabric in which my invention is comprised is a fabric woven for a portion or portions of its thickness and knitted for the other portion or portions of its thickness. I am aware that what may be termed a "compound fabric" has before been proposed, consisting of a layer of woven fabric and a layer of knitted fabric, the two layers being cemented together. My fabric differs essentially from any such fabric as that just referred to in that under my improvement the knitted portion is integral with the woven portions, the fabric being a solid one, in which the knitted portion is embraced and, as it were, incorporated with the woven portion, so that the two are united by the intertwining or interlacing of the strands themselves. In this way I am enabled to combine in one homogeneous fabric those advantages which are possessed by both woven and knitted fabrics—as, for example, a tubular homogeneous fabric having a woven exterior and an interior knitted or provided with looped stitches will possess all the inherent strength of woven hose and at the same time will have the excellent interior surface which the looped stitches of a knitted fabric afford for the secure application of a rubber lining, and so in a flat homogeneous fabric for machine-belted the woven portion will afford the strength, while the knitted portion furnishes a frictional face which no woven fabric possesses.

While my invention is directed and adapted to the production of a partly-knitted and partly-woven fabric, whether flat or tubular, and whatever may be the nature or texture of the woven portion, it has nevertheless been designed more particularly with reference to combining in one multiple-woven fabrics, such as described, for instance, in Reissue Letters Patent No. 7,442, granted to J. Van D. Reed December 19, 1876, and knitted fabrics

provided with longitudinal strands and a weft in addition to the knitted warps, both of which kinds of fabrics have before been used in tubular form for fire-hose, and it is in this connection that I shall now proceed to describe my invention by reference to the accompanying drawings, in which—

Figure 1 is a cross-section of a portion of a hose having a woven interior and a knitted exterior. Fig. 2 is a longitudinal central section of the same. Fig. 3 is a view illustrating diagrammatically the manner of making the fabric. The woven portion of the fabric in Figs. 1 and 2 is two-ply, while in Fig. 3 it is only one-ply. Figs. 4 and 5 are respectively a cross-section and a longitudinal central section of a hose having a woven exterior and a knitted interior. Fig. 6 illustrates diagrammatically one way of forming such a fabric. Figs. 7 and 8 are respectively a cross-section and a longitudinal central section of a hose in which the woven and knitted portions have the same relation to each other as in Figs. 4 and 5, but in which the knitted warps or looped stitches are formed from a portion of the strands used in weaving the woven portion. Fig. 9 illustrates diagrammatically one way in which the fabric last referred to can be made.

Similar letters of reference indicate like parts in all the figures.

In the actual fabric the strands are of course packed or crowded into close contact with one another; but in all the figures of the drawings I have represented them on a much enlarged scale and separated widely from one another, in order that their relative position and direction can be clearly seen.

In Figs. 1 and 2 the woven portion of the fabric is two-ply and the two plies are shown at A A, *a* being the warp and *b* the weft. The external knitted portion consists of the longitudinal strands *c*, the weft *d*, and the knitting-warp *e*. The loops of knitting-warp extend from the interior to the exterior of the hose, the looped stitches being upon the exterior and binding the weft or filling *d* and the longitudinal strand *e* upon the woven portion. A flat knitted fabric of this general character is illustrated in my Letters Patent

No. 321,153, of June 30, 1885. This part-woven and part-knitted fabric can be made in various ways—as, for instance, it can be made upon a loom of the kind shown and described in Reissued Letters Patent No. 7,412, above referred to, with such obvious modifications of the loom as will suggest themselves to those skilled in the arts of weaving and knitting, the principal modifications being the substitution of a knitting-ring for the plain weaving-ring shown in said Letters Patent and such alterations of the harness as may be necessary to operate the various warp-strands at the proper time. For example, in making on the loom the fabric shown in Fig. 3 the mode of procedure would be in a general way as follows: All of the warp-strands *a* are depressed, and from the first shuttle-arm which passes over them a knitting-thread *e* is supplied to the needles, one of which is represented at X, (the knitting-ring being indicated at Y,) the needles at this time being in elevated position. The needles are then drawn down and the looped stitches are formed. The needles remain depressed, one-half of the warps pertaining to the woven ply are raised, and with a second shuttle-arm the weft *b* is deposited in the shed thus formed. Next the remaining warp-strands *a* are raised, together with all the longitudinal strands *c*, and with a third shuttle is deposited the weft *b* pertaining to the knitted fabric. The needles are then again elevated and the operations above described are repeated, of course with such manipulation of the weaving-warps *a* through their harness as necessary to form the sheds requisite in weaving.

The manner in which a number of shuttles such as hereinbefore indicated can be conjointly used is shown and described in my application bearing Serial No. 256,559, filed November 30, 1887, and various mechanisms known to those skilled in the art to which my invention pertains can be employed to operate the needles on the inner ring. For example, one such mechanism for operating needles on a ring inside of a knitted tube is illustrated in Letters Patent to J. Chantrell, No. 27,430, of March 13, 1860.

The fabric shown in Figs. 4 to 6, like that in Figs. 1 and 2, has a two-ply woven portion; but, unlike the latter, the knitted portion is upon the interior and not upon the exterior of the hose. In making this fabric upon a loom of the character hereinbefore referred to the weaving-ring is retained and the needle-ring (with accompanying knitting mechanism) is placed within the weaving-ring, as illustrated in Fig. 6, where Z indicates the external weaving-ring, the knitting mechanism being supported and operated from above in any convenient way.

In operation the needles are first elevated, and with the first shuttle-arm the weft *d* pertaining to the knitted fabric is deposited around against the outside of the needles. Then all of the longitudinal strands *c* are

raised, and with a second shuttle-arm the knitting warp or thread *e* is deposited beneath them, (that is to say, so that the longitudinal strands shall be between the knitting-warp and the needles). Then, with a horizontal hook or needle from which the latch has been removed, I reach out between each two of the longitudinal strands and draw in a loop of the knitting-warp and deposit it upon a knitting-needle X, and so, successively, with each knitting-needle. The horizontal hooks or needles just referred to are what I term “feeding-hooks,” which, together with the various ways in which they may be used, are fully described and illustrated in my Letters Patent Nos. 393,184, 393,186, and 393,189, of November 20, 1888. The needles are then depressed and the looped stitches formed. The warp-strands and woof-threads are then operated in the manner indicated to produce hose in the reissued Letters Patent referred to. In this arrangement the knitting-warp is represented as being inlaced or interlooped with those warp-strands of the woven fabric described in said reissued Letters Patent, there designated as tying threads or strands, and which I here distinguish by the reference-letters *a'*.

The fabric in Figs. 7 to 9, inclusive, is similar in a general way to that shown in Figs. 4 to 6, the main difference being that in the former the looped stitches of the knitted portion of the fabric are formed from a portion of the strands used in weaving one of the woven plies. The strands selected for this purpose are distinguished by the reference-letters *e'*. In making such a fabric I first elevate the knitting-needles and deposit the weft pertaining to the knitted ply. I then raise the longitudinal strands and one-half of the weaving-warps. I then reach between each two longitudinal strands *c*, and with a hook seize a weaving-warp strand that at the previous revolution of the loom pertained to the lower warp-shed of the innermost woven ply, and drawing in a loop of it deposit it over a knitting-needle, and so on successively for each knitting-needle. The needles are then lowered to form the looped stitches, the weaving operation then proceeds, and so on.

I can, if desired, provide each face of the fabric with a knitted ply instead of forming said ply upon one face only.

Having described my invention and the manner in which the same is or may be carried into effect, I desire to be understood that the particular arrangement and disposition of the strands of the compound fabric shown in the drawings can be widely varied by those skilled in the art without departure from my invention, the main characteristic of which is the union in one solid homogeneous fabric of woven and knitted fabrics or plies.

I do not here claim, broadly, a combined fabric fire-hose having a knitted interior in which are incorporated a filling or weft and straight longitudinal strands, a woven jacket

or exterior, and a rubber lining for the knitted interior, the same being the subject of my application for Letters Patent filed April 2, 1890, bearing Serial No. 346,305.

5 What I claim, and desire to secure by Letters Patent, is—

1. A compound woven and knitted fabric composed of woven and knitted plies interlooped or interlaced to form a solid homogeneous fabric, substantially as and for the purposes hereinbefore set forth.

2. A compound woven and knitted tubular

fabric composed of woven and knitted plies interlooped or interlaced to form a solid homogeneous fabric tube with a knitted interior, substantially as and for the purposes hereinbefore set forth. 15

In testimony whereof I have hereunto set my hand this 28th day of September, 1886.

BENJAMIN L. STOWE.

Witnesses:

FREDERICK A. STOWE,

NATHAN STOWE.