W. LAPWORTH.

Elastic Fabric for Suspenders, &c.

No. 196,980. Patented Nov. 13, 1877.

Fig. 1.

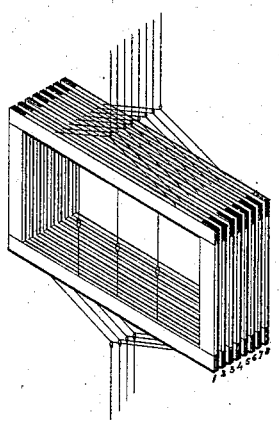


Fig. 3.

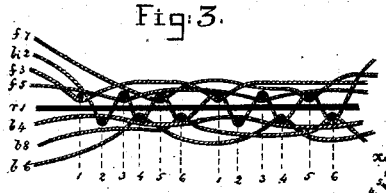


Fig. 2.

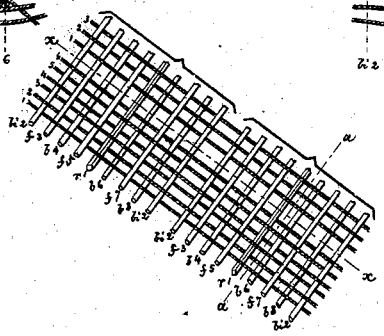
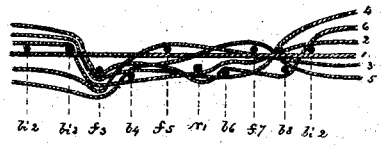


Fig. 4.



Witnesses.

H. J. Pratt.

E. C. Perkins.

Inventor.

William Lapworth

by Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

WILLIAM LAPWORTH, OF CHELSEA, MASSACHUSETTS.

IMPROVEMENT IN ELASTIC FABRICS FOR SUSPENDERS, &c.

Specification forming part of Letters Patent No. **196,980**, dated November 13, 1877; application filed January 31, 1877.

To all whom it may concern:

Be it known that I, WILLIAM LAPWORTH, of Chelsea, in the county of Suffolk and State of Massachusetts, have invented Improvements in Elastic Fabrics, of which the following is a specification:

This invention relates to improvements in narrow and other fabrics having elastic or cord warps at intervals, and used chiefly for suspender and boot webbing, garters, &c.

Suspender and garter and boot webbing, as now commonly made, is of two classes—first, web-twilled on its right and plain-woven on its wrong side, and, second, plain-woven on both sides. Webs of the first class are used in the manufacture of all first-quality suspender, boot, and garter webs, the twill enabling the fabric to be woven thicker and stronger than if woven plain. The longer the twill the fewer the ties on the rubber warp, and the shorter the twill the wider the fabric, the same number and size of warps being employed.

In weaving ordinary suspender-web of the first class eight harness-frames are employed—four for the front of the fabric, two for the back, (the two back frames each carrying two threads in each heddle-eye, to balance the face,) one for the india-rubber warps, and one for the binder-warps—and eight crossings of the shuttle, in eight different sheds, are required to tie the rubber warps, or, in other words, the rubber warps are completely bound only at every eighth pick, that number of picks being necessary to form the twill and complete the pattern.

In a web of this class, twilled face and plain back, one and three-eighths inch in width, two hundred and fifty-seven warp-threads are required—viz., for the face and edge, one hundred and one threads; for the back, seventy-six; for the binders, forty; rubber threads, twenty-one; and body-threads, nineteen in number, the latter extending through all the heddle-eyes in which the rubber warps are carried, except the two outside eyes. These body-threads are, in the weaving, bound against the rubber warps by the weft-threads, and, by their friction against the rubber warps, act greatly to prevent the rubber from shirring the fabric when released from the tension to which it is subjected when being woven. Were it not for these body-threads lying parallel and in contact with the rubber warps, the latter could not be held with sufficient firmness in this class of fabric, wherein the rubber warps are bound only at each eighth pick.

In my invention I produce a fabric twilled on both its front and back, thereby making a fabric both sides of which, like threads being employed, will present a like appearance.

In my improved fabric the rubber warps are bound at every sixth pick, and being bound more frequently, I am enabled to dispense with the body-threads commonly used in the heddle-eyes with the rubber warps, and also to produce a wider fabric with a less number of warp-threads than though the twill were longer.

To make a web one and three-eighths inch in width by my method, and with threads of corresponding size, as above described, and in the same reed, I employ but eight harness-frames—three for the face, three for the back, one for the binders, and one for the rubber threads—and I open and close the shed, complete the pattern of the twill, and completely bind or tie the rubber warps at every sixth crossing of the weft-thread. By binding the warps oftener I am enabled, as before stated, to dispense with the nineteen body-threads, and I also dispense with one set of face and back threads, for, as the twill is shorter, and the warp is bound more frequently, the number of warp-threads may be lessened without decreasing the width of the completed fabric.

In the manufacture of a one and three-eighths inch web, I employ only one hundred and ninety-one threads—viz., face and edge, seventy-nine; back, fifty-four; binders, thirty-eight; and rubber, twenty. Of these binder-threads two are employed with each rubber warp in the body of the fabric; but with the rubber warps at the edge I need employ but one binder, because of the passage of the weft-thread about the edges. Of the seventy-nine face and edge threads, as above stated, fifty-four are used in connection with the eighteen rubber warps forming the body of the fabric—three for each; and twenty-five threads are used for the edges of the fabric—twelve for one edge, and thirteen for the other. This extra thread at one edge is commonly employed in webbing at that edge from which the shuttle is thrown with most force. The one

and three-eighths inch fabric, twilled alike on both sides, and made according to my plan, from threads like in size and kind, but less in number by sixty-six than used in the old fabric woven with eight harnesses, is as firm and durable and more salable than the old fabric, and is, it will be readily seen, much cheaper.

Figure 1 represents the harness-frames used to weave my improved fabric, and Fig. 2 a detail of the fabric; Fig. 3, a longitudinal section of the fabric on line *a a*, Fig. 2; and Fig. 4, a cross-section on the line *x x*. In Figs. 2, 3, and 4 the numerals next the letters of reference indicate the number of the harness-frame through which the thread indicated by the letter passes.

In my new fabric the face and back warps are each led into the heddle-eyes of their own three harness-frames, as practiced in weaving three-leaf twill. The rubber *r* and binder-warps *b i* are mounted in their own harness-frames. The face-warps *f* are mounted in frames Nos. 3, 5, 7, (counting the frame nearest the lay as No. 1,) the back warps *b* in frames Nos. 4, 6, 8, and the rubber in No. 1, and the binder in No. 2.

To complete the pattern, the following harness-frames are lifted to form sheds, viz:

First pick: the binders *b i* in the second frame, and face-threads *f* in the fifth and seventh frames.

Second pick: the rubber *r* in frame 1, face-threads *f* in frames 3, 5, and 7, and back threads *b* in frame 4.

Third pick: the binders *b i* in frame 2, face-threads *f* in frames 3 and 7.

Fourth pick: the rubber *r* in frame 1, face-threads *f* in frames 3, 5, and 7, and back threads *b* in frame 6.

Fifth pick: the binders *b i* in frame 2, face-threads *f* in frames 3 and 5.

Sixth pick: the rubber *r* in frame 1, face-threads *f* in frames 3, 5, and 7, and the back threads *b* in frame 8.

The seventh pick is a repetition of the first pick, and so on.

In weaving a piece of webbing one and two-thirds inch in width according to my plan, the pattern being completed at each sixth, rather than at each eighth pick, the fabric is made more solid, and consequently it moves back more rapidly under the blows of the reed, thereby enabling the production in each reed-space of a greater length of fabric in a given time than if eight picks were required for the pattern. This difference enables the saving of a very considerable amount on the cost of weaving each yard of my improved fabric, having both sides alike, over the usual fabric having only one perfect face.

If a fabric twilled back and front alike should be woven in the old way, ten harness-frames would be required—four for face, four for back, and one each for binders and rubber. This would necessitate the employment of two extra harness-frames and their operative mechanism, the rubber warp would be bound only at each eighth pick, would be held less firmly than in my fabric, the body-threads would be required, and the fabric would be softer than with the old style of plain back with the same number of harnesses.

This plan of weaving rubber fabric with two twilled faces by means of three harness-frames each, for face and back, may be practiced with great benefit in weaving wider fabrics for boot-webbing or Congress-gaiters, and the fabric may have its face and back of same or different materials.

The better class of Congress web is usually made with a silk or wool face and a cotton back, four harness-frames being used for face, and the rubber being bound at each eighth pick only.

By my system it can be woven firmer than by the eight "time-motion," and one harness-frame for face, and its threads and one set of back threads can be saved, thus making a saving of two threads for as many rubber threads as are used in the web, and I also save the body-threads.

In the drawings, Fig. 2, I have shown threads in number equal to the number of threads employed in my improved fabric in two dents of the reed, such threads being spread out to show how the weft-thread passes between for the six picks constituting the pattern. The weft-threads, when beat up by the reed, will come closely together. The number of dents employed will depend upon the width of the fabric. Each dent, excepting those working the edges or selvages of the fabric, holds nine threads—viz., three face, three back, two binders, and a rubber warp—making for the body-dents one hundred and sixty-two threads, while in the edge-dents there are the twenty-five edge-threads, as before mentioned, and two rubber warps, and two binders, making in all one hundred and ninety-one threads.

Were it not for the binding-threads, the face-warps and back-warps, with the weft, would form a tubular fabric from selvage to selvage. By introducing the binders the face and back are united at intervals, leaving small tubes or pockets for the rubber warp. This, however, is not, broadly, claimed.

I claim—

The improved elastic fabric herein described, composed of an india-rubber warp and binders, and three face and three back threads for each rubber warp, constituting the body of the fabric, the face and back threads forming a three-leaf twill on the face and back of the fabric, covering the india-rubber warp, the latter being bound at each sixth pick, all as and for the purpose set forth.

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

WILLIAM LAPWORTH.

Witnesses:
G. W. GREGORY,
W. J. PRATT.