

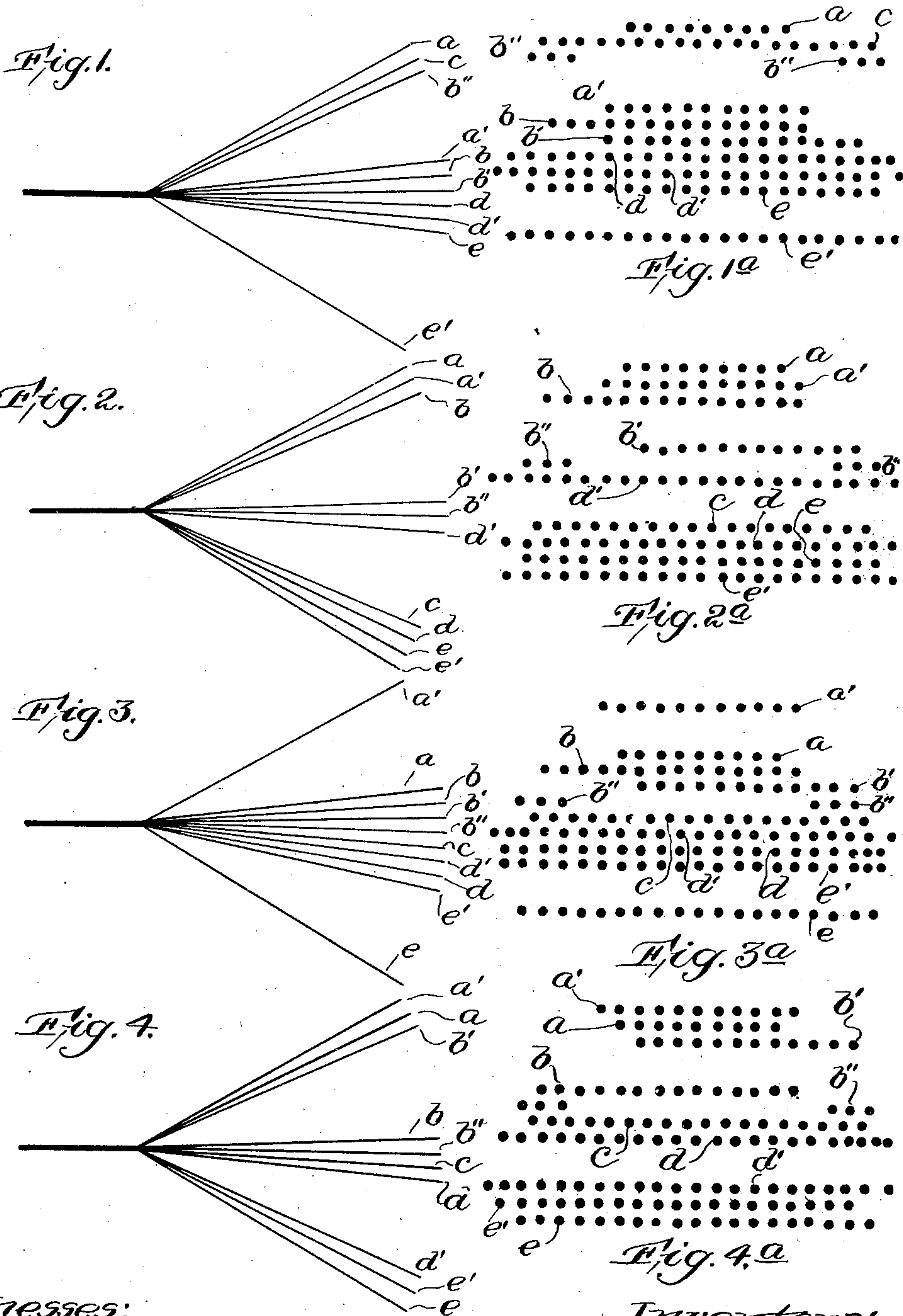
W. BECK & J. F. PRESTON.

WOVEN TUBULAR FABRIC.

(Application filed Jan. 6, 1900. Renewed Jan. 22, 1902.)

(No Model.)

2 Sheets—Sheet 1.



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No. 697,391.

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2 Sheets—Sheet 2.

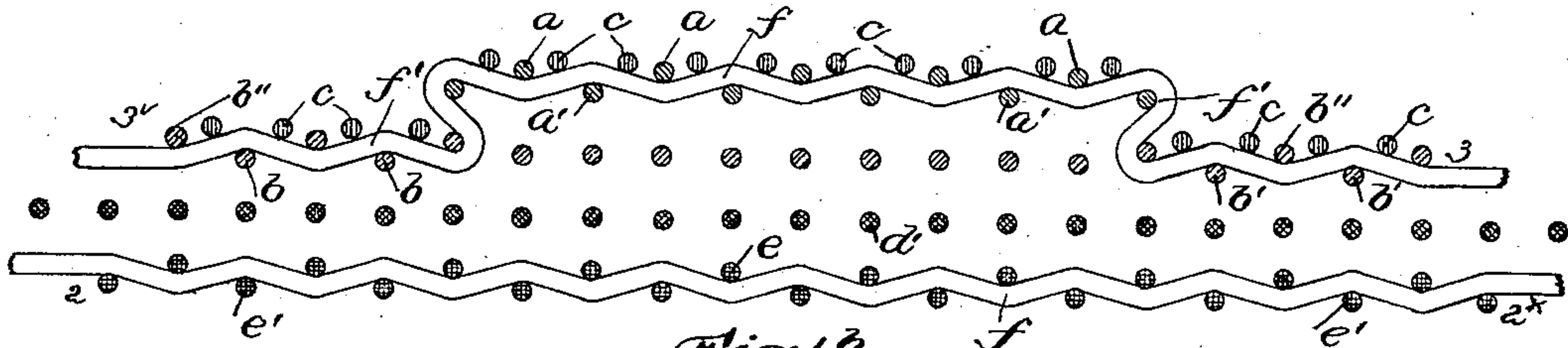


Fig. 1b

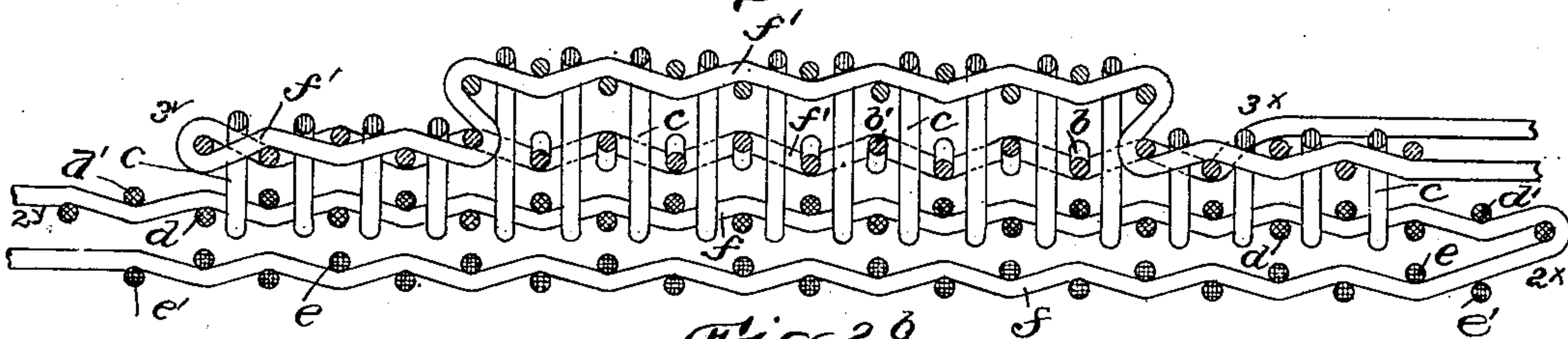


Fig. 2b

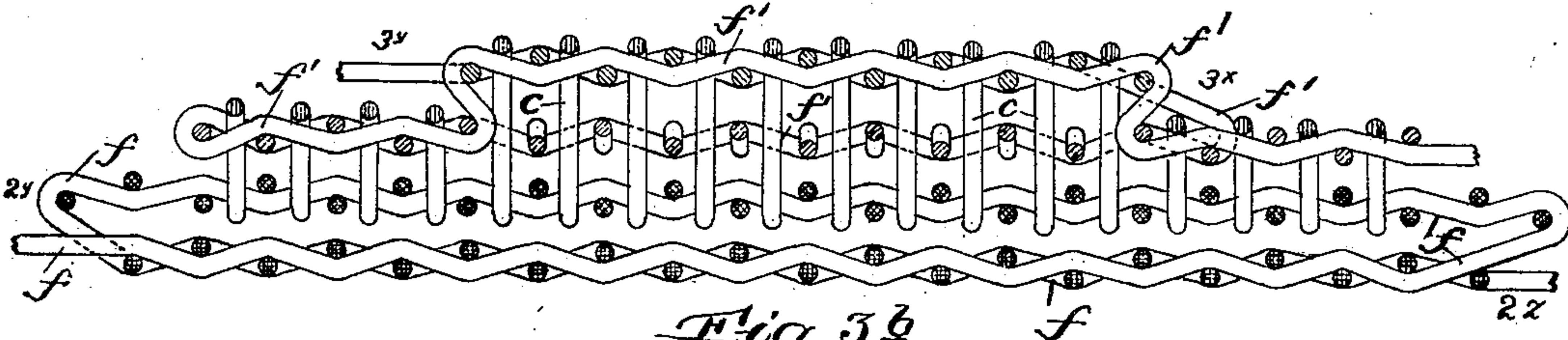


Fig. 3b

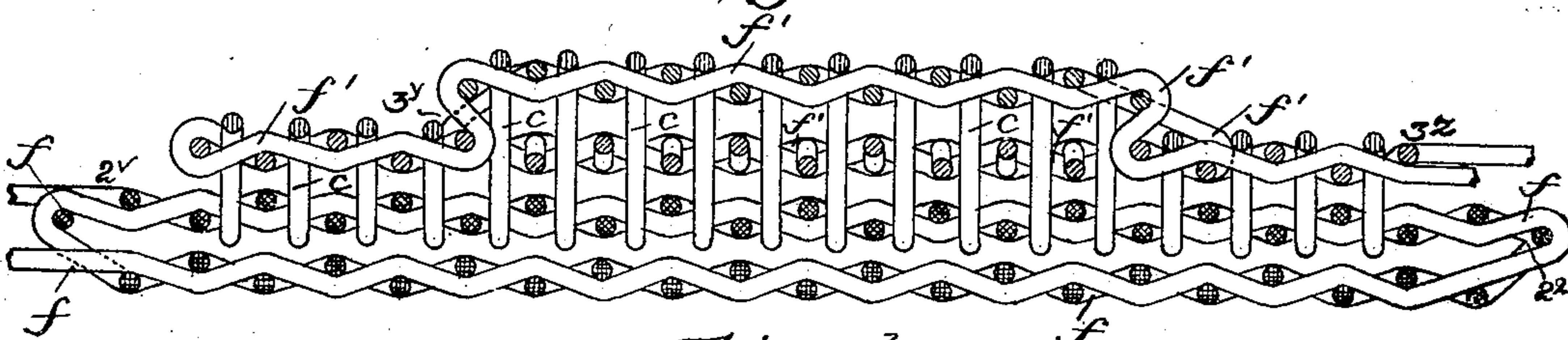


Fig. 4b

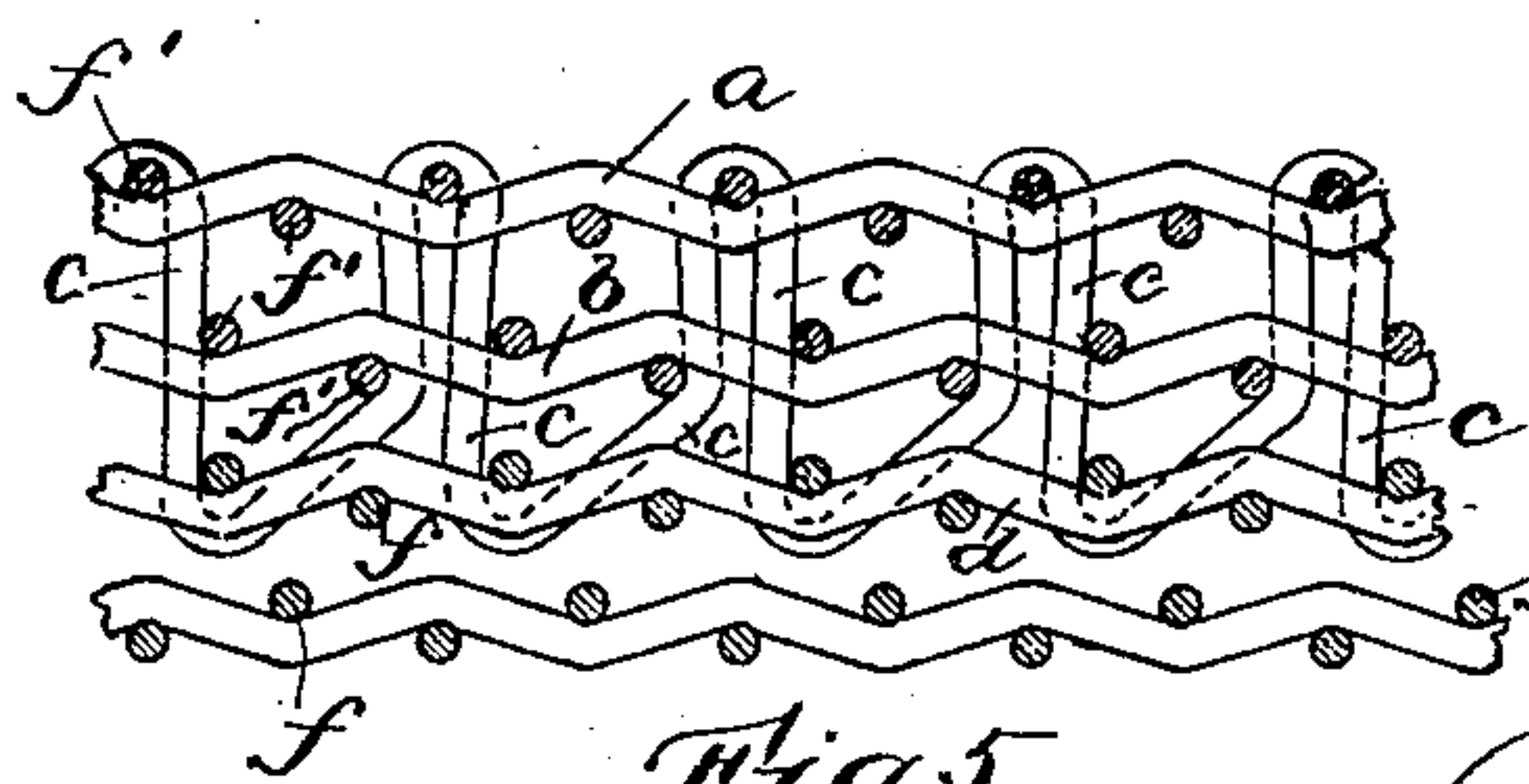


Fig. 5

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UNITED STATES PATENT OFFICE.

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WOVEN TUBULAR FABRIC.

SPECIFICATION forming part of Letters Patent No. 697,391, dated April 8, 1902.

Application filed January 6, 1900. Renewed January 22, 1902. Serial No. 90,846. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM BECK, of Lawrence, in the county of Essex, and JAMES F. PRESTON, of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Woven Tubular Reinforced Fabrics for Vehicle-Tires, of which the following is a specification.

10 The present invention relates to tubular reinforced fabric for incorporation in vehicle-tires; and the object is to produce a component structure wherein the tread portion of the tube proper has a plurality of superposed
15 plies overlying it and united to it and also to each other, while at the same time uniformity of weave along each side of the tread is maintained.

20 In producing the fabric a main or foundation tube is woven as a continuous structure, and simultaneously therewith reinforcing-plies are woven over what is to be the tread portion of such main tube, one of such plies, together with the middle portion of that be-
25 neath it, forming a tubular structure, but these plies being stitched or tied together and to the main tube throughout their width. Lateral extensions of the inner ply run beyond the tubular reinforcing structure over the
30 main tube and are likewise tied or stitched thereto.

The accompanying drawings illustrate a way of producing the fabric and show the characteristics of the same, which are pointed
35 out in the appended claims.

40 Of said drawings, Figures 1 to 4 are diagrammatic representations of the several sets of warps, showing how the sheds are made for different picks. Figs. 1^a to 4^a are corresponding cross-sectional illustrations. Figs. 1^b to 4^b are cross-sectional views illustrating the fabric at different stages of construction, showing the course of the filling or weft threads in different picks. Fig. 5 is a fragmentary longitudinal sectional illustration of the fabric.

45 In making the fabric shown in the drawings we employ ten sets of warp-threads, of

which *a* and *a'* designate two sets of warps for the outermost reinforcing layer or ply; *b* and *b'*, two sets of warps for the wider reinforcing-ply, which comes next to the main tube; *b''*, an extra set of warps for the portions of said wider reinforcing-ply which extend beyond the outer ply, this extra set comprising two small groups at opposite sides, as shown in Figs. 1^a to 4^a; *c*, a set of stitching-warps or tie-threads, which unite the two reinforcing-plies together and to the main tube; *d* and *d'*, two sets of warps for the upper side of the main tube, and *e* and *e'* two sets of warps for the lower side of the main tube. Two wefts or filling-threads *f* and *f'* are used, one for the main tube and the other for the reinforcing-plies, this other being common to both plies and extending continuously through them in the manner presently to appear.

Figs. 1 and 1^a show the relative positions of the sets of warps when the sheds have been made for picks of the shuttles during which one lays the filling-thread *f* in the lower side of the main tube, (from 2 to 2^x, Fig. 1^b), while the other lays the filling-thread *f'* in the outer reinforcing-ply and in both portions of the inner reinforcing-ply which extend beyond the same, as clearly shown in Fig. 1^b from 3 to 3^v. The upper side of the top shed comprises one set *a* of the outer-ply warps, the set of stitching-warps *c*, and the extra set of inner-ply warps *b''*. The lower side of this shed and upper side of the lower shed comprise the other set of outer-ply warps *a'*, the two sets of inner-ply warps *b* and *b'*, the two sets of warps *d* and *d'* of the upper side of the main tube, and one set of warps *e* of the lower side of said tube. The under side of the lower shed comprises the warps *e* of the other set belonging to the lower side of the main tube. It will be seen that the filling-thread *f'* is laid under the set of stitching-warps. For the next pick the sheds are made up as follows, (see Figs. 2 and 2^a;) The upper side of the upper shed comprises both sets of warps *a* and *a'* belonging to the outer

ply and one set of warps *b* of the inner ply. The lower side of the upper shed and upper side of the lower shed comprise the other set of warps *b'* of the inner ply, the extra warps *b''*, and one set of warps *d'* of the upper side of the main tube. The lower side of the lower shed comprises the tie-threads or stitching-warps *c*, the other set of warps *d* of the upper side of the main tube, and the two sets of warps *e* and *e'* belonging to the lower side of the main tube. The filling-thread *f* will then be laid in the upper side of the main tube above the tie-threads or stitching-warps *c* (from 2^x to 2^y in Fig. 2^b) while the filling-thread *f'* is being laid in the inner reinforcing-ply from one edge of the same beyond the corresponding edge of the outer ply as far as the other edge of the latter, but not to the corresponding edge of the inner ply, (from 3^y to 3^x , Fig. 2^b.) It will be noted in this connection that the two sets of warps *b* and *b'*, while of the same width, are offset from each other laterally, so that they overlap only throughout the width of the outer ply, and the warps lying beyond work in conjunction with the two groups of extra warps *b''*, respectively. (See Figs. 1^a to 4^a.) For the next pick the upper side of the upper shed comprises only the set of warps *a'* of the outer ply, and the lower side of the lower shed comprises only the warps *e* of the lower side of the main tube, so that all the other warps are between the two sheds. Hence the filling-thread *f* is laid in the lower side of the main tube (from 2^y to 2^z , Fig. 3^b) and the filling-thread *f'* is laid simply in the outer reinforcing-ply, (from 3^x to 3^y , Fig. 3^b.) It will be noted that the tie-threads have moved up into the top of the lower shed, and it may be added that they remain in this intermediate position during the next pick also. For this next pick the top side of the upper shed comprises both sets of warps *a* and *a'* of the outer ply and the set of warps *b'* of the inner reinforcing-ply. The intermediate warps comprise the other set *b* belonging to the said inner ply, the extra warps *b''*, the stitching-warps *c*, and the set of warps *d* of the upper side of the main tube. The lower side of the lower shed comprises the other set of warps *d'* belonging to said upper side of the main tube and the two sets of warps of the lower side of the latter. It follows that the filling-thread *f* will be laid in the upper side of the main tube (from 2^z to 2^x , Fig. 4^b) while the filling-thread *f'* is being laid in the inner reinforcing-ply from one edge of the outer ply to the far edge of the inner ply, (3^y to 3^z , Fig. 4^b.) For the next pick the sheds are formed as first described, the stitching-warps and the extra warps *b''* being carried into the upper side of the upper shed. This, it will be seen, occurs at every fourth pick, the said extra warps remaining in the lower side of the top shed and upper side of the bottom

shed during the three intervening picks, whereas the stitching-warps go down into the lower side of the bottom shed for the first succeeding pick and then remain in the upper side of said shed during the other two picks of the three referred to as intervening.

It will be seen that by pursuing the method above described a continuously-woven main tube will be produced by the filling-thread *f* and the warps *d d'* and *e e'*, and simultaneously two reinforcing-plies, tubularly continuous and comprising the warps *a* and *a'*, those of the warps *b* and *b'* which are superposed, and the filling-thread *f'*. At the same time extensions of the inner ply are woven composed of the rest of the warps *b b'* and the extra warps *b''* and the filling-thread *f'*. Furthermore, both reinforcing-plies are tied together throughout the width of the outer ply by the stitching-warps, which also unite the plies to the upper side of the main tube, including the lateral extensions of the inner ply.

It will be seen that the object primarily stated is thoroughly accomplished by the construction of fabric herein specifically described. However, it is to be understood that this construction is susceptible of modifications within the scope of the invention.

The method herein described is claimed in a separate application, Serial No. 555, filed by us January 6, 1900.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, it is declared that what is claimed is—

1. Fabric hose for tires, the same comprising a continuously-woven tube, and a plurality of tubularly continuous reinforcing-plies overlying the tread portion of said tube and stitched together and to the tube.

2. Fabric hose for tires, the same comprising a continuously-woven tube, and a plurality of tubularly continuous reinforcing-plies overlying the tread portion of said tube, and single-ply lateral extensions from the junctions of said reinforcing-plies, the latter being stitched together and to the main tube together with the lateral extensions.

3. Fabric hose for tires, the same comprising a continuously-woven tube, and a plurality of tubularly continuous reinforcing-plies overlying the tread portion of said tube, together with stitching-warps or tie-threads uniting the reinforcing-plies together and to the tube.

4. Fabric hose for tires, the same comprising a continuously-woven foundation-tube, a tread-reinforce double-ply at the middle and single ply at the sides, each ply having its own warps but the filling thread or weft of the entire reinforce being common to all the plies and extending as follows: from one edge of the single-ply portion of the reinforce

to the double-ply portion and then through
the outer ply of the latter and on through the
single-ply portion to the opposite edge from
that first mentioned, thence back through
5 this portion of the single ply and on through
the inner ply of the double-ply portion of the
reinforce and back through the outer ply
thereof and thence returning through the in-

ner ply and the single-ply part of the rein-
force to the first-mentioned edge thereof.

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