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PATENTED JUNE 14, 1904.

W. R. SMITH.

TEXTILE FABRIC FOR BELTING AND METHOD OF MAKING SAME.

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NO MODEL.

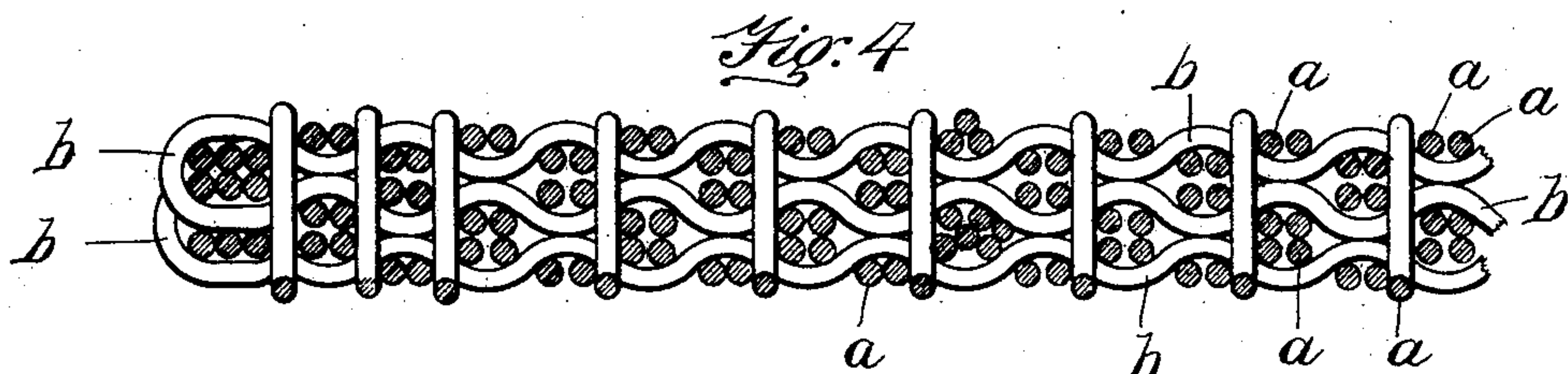
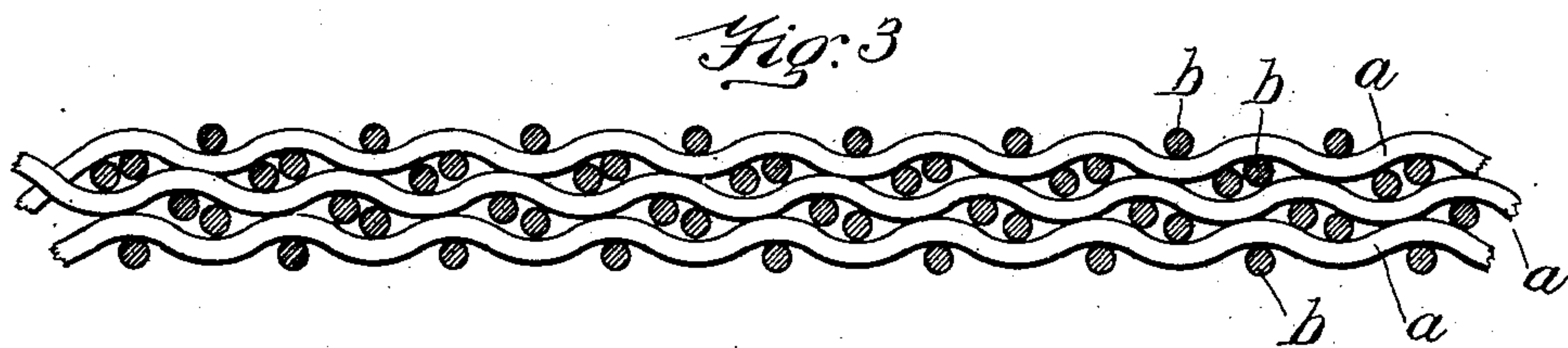
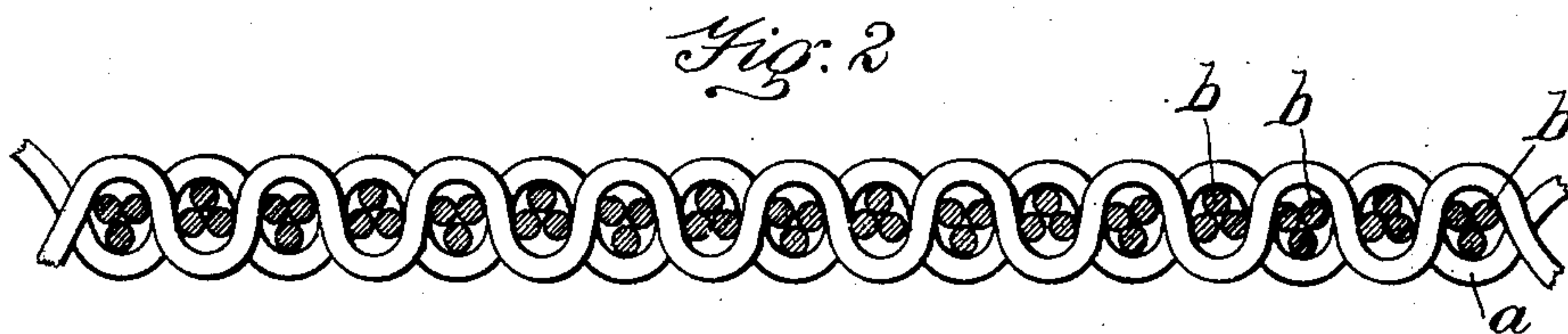
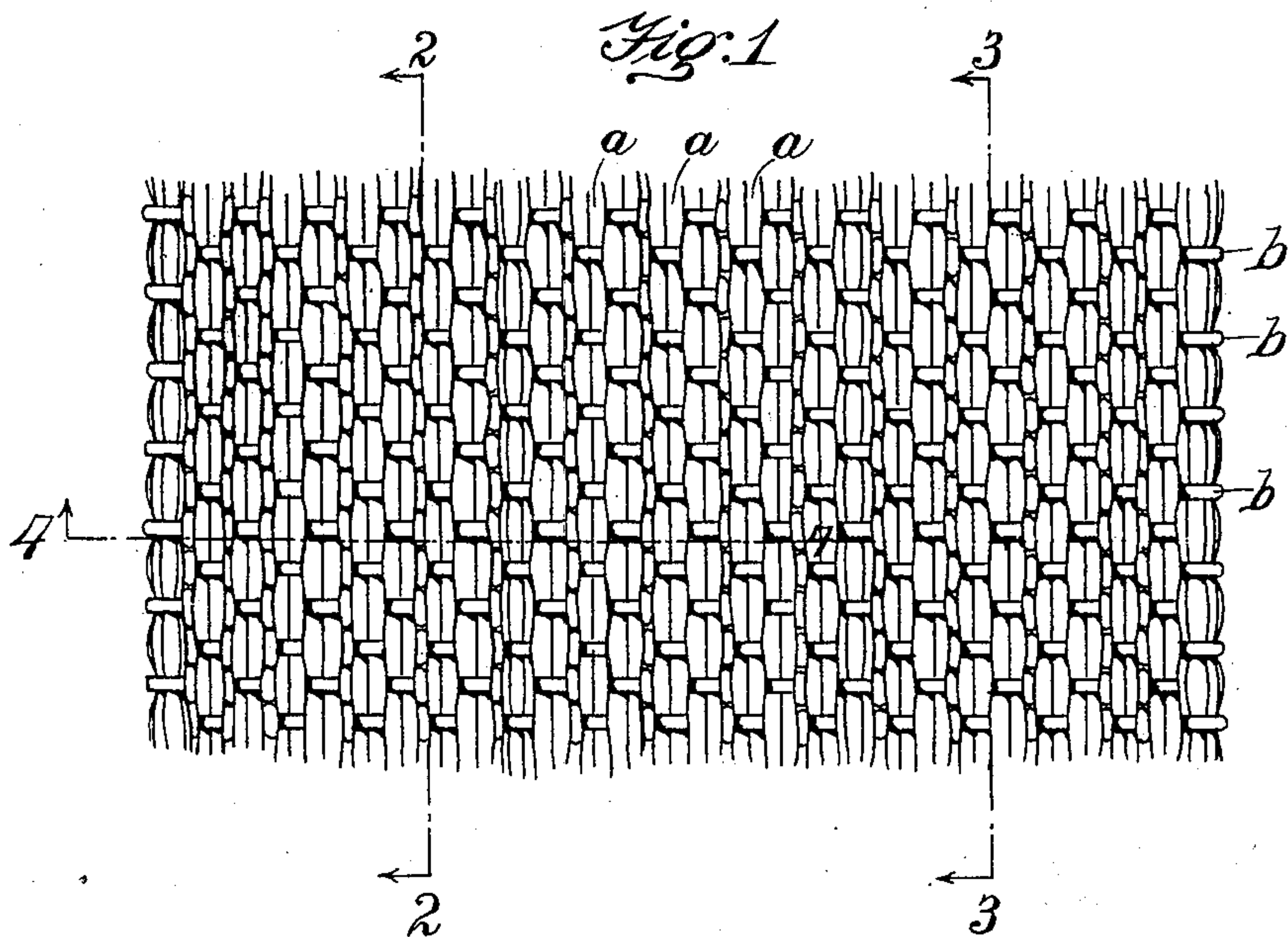


Fig. 5

c

d

Witnesses:

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UNITED STATES PATENT OFFICE.

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TEXTILE FABRIC FOR BELTING AND METHOD OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 762,357, dated June 14, 1904.

Application filed June 29, 1903, Serial No. 163,512. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM R. SMITH, of Buffalo, in the county of Erie and State of New York, have invented certain new and useful
5 Improvements in Textile Fabrics for Belting and Methods of Making the Same, of which the following is a specification.

This invention relates to multiple-ply woven fabrics the threads of which are of textile
10 material, such as cotton, and particularly to fabrics of this character made in elongated strips of suitable dimensions for machine-belting.

The invention has for its object, first, to
15 provide a fabric of this character which shall be inextensible longitudinally or in the direction of length of the warp-threads and free from liability to be affected by atmospheric conditions, so that the fabric when embodied
20 in a machine-belt will not stretch under the ordinary conditions of service to which it is exposed.

The invention also has for its object to enable the threads of a multiple-ply woven fabric to be permeated or saturated with an adhesive composition applied in a fluid or semi-fluid condition, to the end, first, that the individual fibers of each thread may be caused to cohere, and thus produce an increased degree
30 of tensile strength similar to that imparted to the well-known thread termed a "waxed end" by application of wax thereto, and, secondly, that the surface of a belt composed of threads thus treated may possess to a sufficient degree
35 the quality of adhering to the peripheries of the wheels or pulleys over which it passes, this quality being unaffected by the wearing away of the surface of the fibers of the threads because of the saturation of the threads with
40 the adhesive composition.

The chief object of my invention is to enable the threads of a multiple-ply woven fabric to be permeated or saturated with a fluid or semifluid composition containing rubber,
45 the composition being of such character that it can be cured or vulcanized within the threads by heating, thus producing a belt of

great durability and well adapted to take a sufficient frictional hold on pulleys.

Prior to my invention, so far as I am aware, 50 a multiple-ply woven fabric of textile material has never had its threads uniformly saturated with an adhesive composition applied in a fluid or semifluid condition. So far as I am aware it has been heretofore considered 55 impossible to force a fluid or semifluid adhesive composition, and particularly one containing rubber or its equivalent, into the threads of a multiple-ply woven fabric, owing to the fact that the warp and weft threads of 60 a multiple-ply fabric are so closely interwoven that it has been impossible by any methods heretofore known to force a composition of the character stated into the warp and weft threads in such manner as to permeate the same. I 65 have discovered that by heating a fabric of this character, and thus thoroughly expelling all moisture therefrom and putting its fibers in a receptive condition, and by stretching the fabric lengthwise or in the direction of its 70 warp-threads while it is heated the physical conditions of the fabric are so changed that an adhesive composition in a fluid or semifluid condition can be readily forced while in a heated condition into the pores between the 75 threads of the fabric and into the minute crevices between the fibers of the threads while the fabric is in stretched condition, heat and pressure being employed conjointly to force the said composition into the fabric. 80 I have also found that a fabric thus treated possesses certain new characteristics particularly adapting it for machine-belting, said characteristics being entire freedom from liability to shrink, resistance to the varying 85 conditions of the atmosphere as to moisture, and adaptability to cling or take an effective frictional hold upon the periphery of a pulley, this adaptability being unaffected by the wearing away of the surface fibers of the 90 fabric.

A machine-belt made of multiple-ply woven fabric treated in accordance with my invention has all the desirable qualities of the or-

dinary so-called "rubber" belting composed of alternate layers of textile fabric and rubber without possessing the chief disadvantage of ordinary rubber belting—viz., the liability of the layers of the belting to separate—this liability, as is well known, often causing the disintegration and materially impairing the durability of an ordinary laminated cloth-and-rubber belt. A multiple-ply woven-fabric belt is not laminated, but is practically homogenous in its structure, so that when treated in accordance with my invention with an adhesive composition which permeates its pores and saturates its threads a belting fabric is produced which is practically waterproof and adapted to take an effective frictional hold on a pulley and is at the same time free from liability to separate into thin strips or shreds, its wear being due only to the gradual removal of the surface fibers. This removal, being gradual, has no effect analogous to that of the splitting away or removal of a surface layer in a combined cloth-and-rubber belt.

My invention may therefore be said to consist in a multiple-ply woven textile fabric characterized by the fact that it is first stretched and then has its threads uniformly permeated or saturated by an adhesive waterproof composition which causes the fibers of the threads to cohere and prevents shrinkage of the fabric, the said composition being of any suitable nature, preferably a solution of rubber.

The invention may also be said to consist in a multiple-ply woven textile fabric preliminarily stretched longitudinally and provided with a filling composition which prevents the later contraction of the fabric.

The invention also consists in certain improvements in the art of making non-shrinkable fabric, substantially as hereinafter described and claimed.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side view of a piece of multiple-ply woven textile fabric. Fig. 2 represents an enlarged longitudinal section on line 2 2 of Fig. 1. Fig. 3 represents an enlarged longitudinal section on line 3 3 of Fig. 1. Fig. 4 represents a section on line 4 4 of Fig. 1. Fig. 5 represents a transverse section on a smaller scale.

The same reference characters indicate the same parts in all the figures.

In the drawings, *a a* represent the warp-threads, and *b b* the weft or filling threads, of a multiple-ply woven textile fabric, the said threads being preferably of cotton, although they may be of any other suitable fibrous material. The threads may be interwoven to form a multiple-ply fabric in any suitable manner and by means well known to those skilled in the art. In carrying out my invention I take a web of the said fabric, the said web being usually relatively narrow and of

indeterminate length when intended for use as machine-belting. The web is thoroughly heated to expel all moisture from it, and while in a heated condition it is stretched longitudinally to render the warp-threads practically inextensible under the strains incidental to the use of the completed belt. The force employed in stretching the fabric is preferably such as to increase its length about five per cent., this increase in length being accompanied by a corresponding increase in the width of the crevices between the weft or filling threads. Practically speaking, the stretching operation creates crevices or spaces between the weft-threads, because in the fabric as it leaves the loom the weft-threads are in close contact with each other. In fact, all the threads are so closely related that when the fabric is in its natural condition such crevices or spaces as exist are not sufficient to render the fabric receptive to any fluid or semifluid composition of a relatively viscous and sticky nature. The heating and stretching of the fabric, however, so changes its character and forms sufficiently-enlarged crevices or spaces that a fluid or semifluid composition, which may be a solution of rubber or rubber dissolved in any suitable solvent, poured upon the heated and stretched fabric and pressed into the same will find its way readily into the enlarged crevices between the threads and into the bodies of the threads. The composition may be forced into the fabric by any suitable means, such as by heated pressure-rolls, between which the fabric, with the composition applied to it, is passed, the heated rolls forcing the composition into the pores and crevices of the fabric. If desired, the fabric may be additionally treated by rubbing its surfaces with heated reciprocating irons or polished-metal bodies. I have found that by maintaining the fabric in a stretched and heated condition while the composition, also in a heated condition, is being applied and forced into the pores of the fabric I am enabled to secure the uniform and thorough permeation of all parts of the fabric by the composition and that the fabric after the described treatment is free from all liability to contract, is unchanged by wear as to its structure and its capability of holding or adhering to a pulley, and is practically inextensible under any reasonable or ordinary strain such as a machine-belt is liable to be subjected to. The improved fabric is therefore distinguished from multiple-ply woven fabric in its original condition or as it leaves the loom by the features above enumerated. The fabric is further characterized by the fact that its tensile strength is increased from three to five times. The fabric when treated with a solution of unvulcanized rubber or its equivalent may be subjected to heat in a vulcanizing-press to vulcanize the rubber. Owing to the fact that a large part of the rubber is

located within the pores of the fabric the vulcanization does not require to be carried to such a state of hardness as would be required if the rubber were disposed in layers upon the surfaces and between the cloth layers of an ordinary cloth-and-rubber belt. The rubber may therefore be left in a relatively soft and adhesive condition, thus improving the frictional hold of the belt upon the pulleys. A suitable apparatus for performing the operations above described, which convert a multiple-ply woven fabric into an inextensible non-shrinkable waterproof fabric characterized as hereinbefore described, is shown in another application for Letters Patent of the United States, Serial No. 163,511, filed by me concurrently herewith.

Figs. 1, 2, 3, and 4 are intended to show the general relative arrangement of the warp and weft threads of an ordinary multiple-ply fabric. The said figures do not, however, represent the close relation of the threads to each other which occurs in the actual fabric.

Fig. 5 is intended to represent conventionally the appearance of a cut end of the fabric when the filling composition is applied to the threads of the outer or surface portions of the fabric, the fabric being cut crosswise. The more deeply-shaded parts *c* in this figure represent the parts filled or permeated by the filling composition. The lighter central part *d* represents the internal portion of the fabric which has not been permeated by the composition. I find it desirable in some cases to force the composition partly but not entirely through the thickness of the fabric. In other words, I prefer for some purposes to leave the central part *d* unfilled. While the filling increases the tensile strength of the threads, as already stated, it decreases their flexibility. When a particularly flexible fabric is desired which is capable of being bent freely either lengthwise or crosswise, the treatment illustrated in Fig. 5 is desirable. I desire it understood, therefore, that I do not limit myself to a fabric in which all the threads are permeated or saturated with a filling composition. It is essential that all the surface threads be thus permeated; but I regard a fabric having its surface threads permeated or filled and its internal threads left in their original condition as an embodiment of my invention and as within the scope of the following claims.

I claim—

1. A multiple-ply woven textile fabric stretched longitudinally and provided with a filling composition while the fabric is stretched, whereby the contraction of the fabric is prevented.

2. A multiple-ply woven textile fabric stretched longitudinally and provided with a filling composition while the fabric is stretched, whereby said composition permeates the threads of the fabric or parts thereof

and fills the crevices formed or enlarged between the weft-threads by the stretching operation.

3. A multiple-ply woven textile fabric stretched longitudinally and provided with a filling composition which permeates the threads of the fabric or parts thereof, said composition being adhesive and applied while the fabric is stretched.

4. A multiple-ply woven textile fabric stretched longitudinally and provided with a filling composition containing rubber, said composition being applied in a fluid or semifluid condition while the fabric is stretched.

5. A multiple-ply woven textile fabric preliminarily stretched longitudinally and then provided with a filling composition containing rubber, said composition being applied in a fluid or semifluid condition, and vulcanized.

6. A multiple-ply woven textile fabric characterized by the fact that its threads are preliminarily stretched and then permeated or saturated by an adhesive waterproof composition which causes the fibers of the threads to cohere and prevents shrinkage of the fabric.

7. A multiple-ply woven textile fabric characterized by the fact that its threads are preliminarily stretched and then permeated, or saturated with a waterproof adhesive composition or filling containing rubber.

8. A multiple-ply woven textile fabric characterized by the fact that its threads are preliminarily stretched and then permeated, or saturated with a waterproof adhesive composition or filling containing rubber, the said filling being vulcanized.

9. A multiple-ply woven textile fabric characterized by the fact that its surface threads are permeated or saturated by an adhesive waterproof composition, while its inner threads are free from said composition, the composition being applied while the fabric is in a preliminarily-stretched condition.

10. The improvement in the art of making non-shrinkable belting, &c., which consists in longitudinally stretching and heating a piece of multiple-ply woven textile fabric, and while the piece is so stretched and heated, forcing into its threads and crevices by means of heat and pressure, a heated filling composition.

11. That improvement in the art of making non-shrinkable belting, &c., which consists in heating and longitudinally stretching a piece of multiple-ply woven textile fabric, and while the piece is so stretched and heated, forcing into its threads and crevices by means of heat and pressure, a heated filling composition containing rubber, and subsequently heating the whole to vulcanize the filling.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM R. SMITH.

Witnesses:

J. E. VOORHIS,
MILLARD F. BOWEN.