No. 792,555. PATENTED JUNE 13, 1905.

P. W. PRATT.

ELASTIC TREAD.

APPLICATION FILED FEB. 27, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

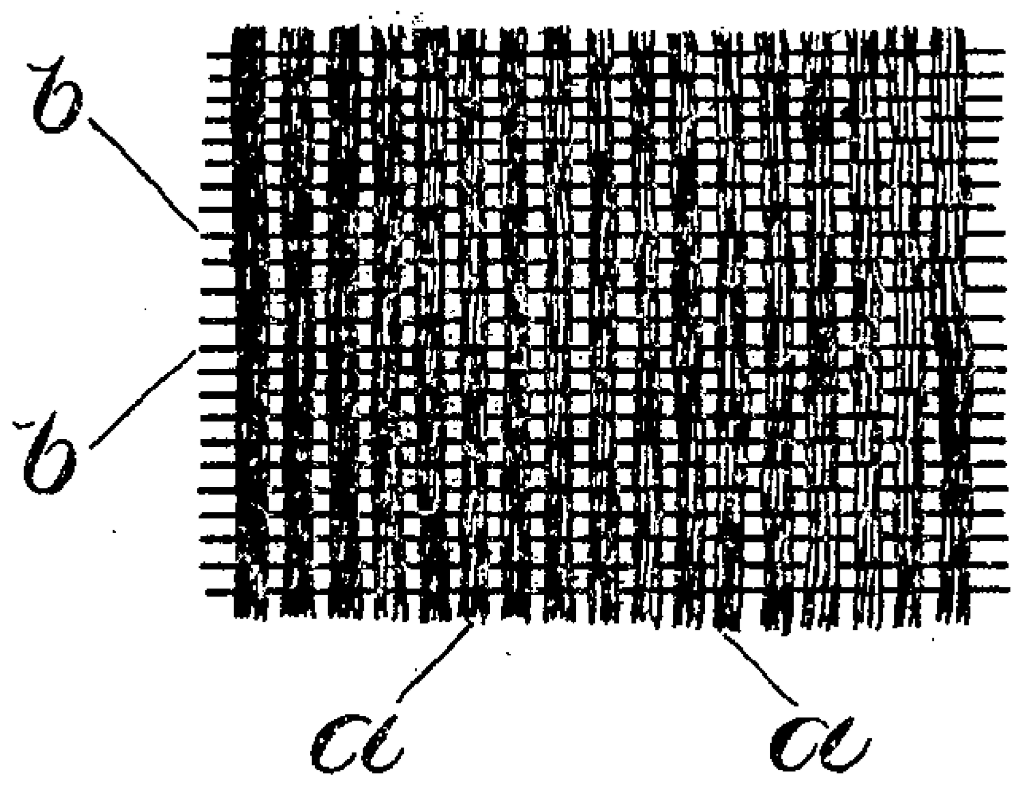


Fig. 2.

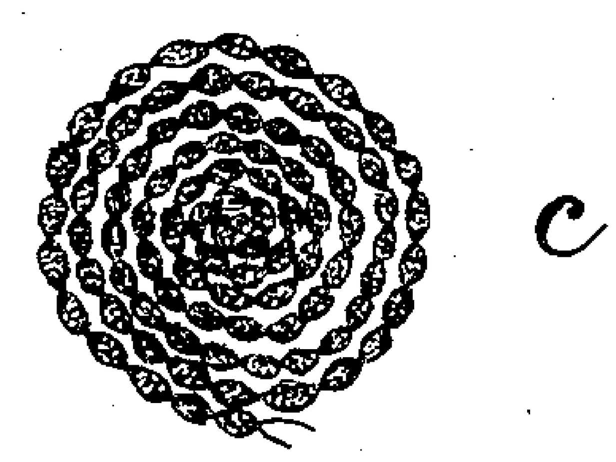


Fig. 3.

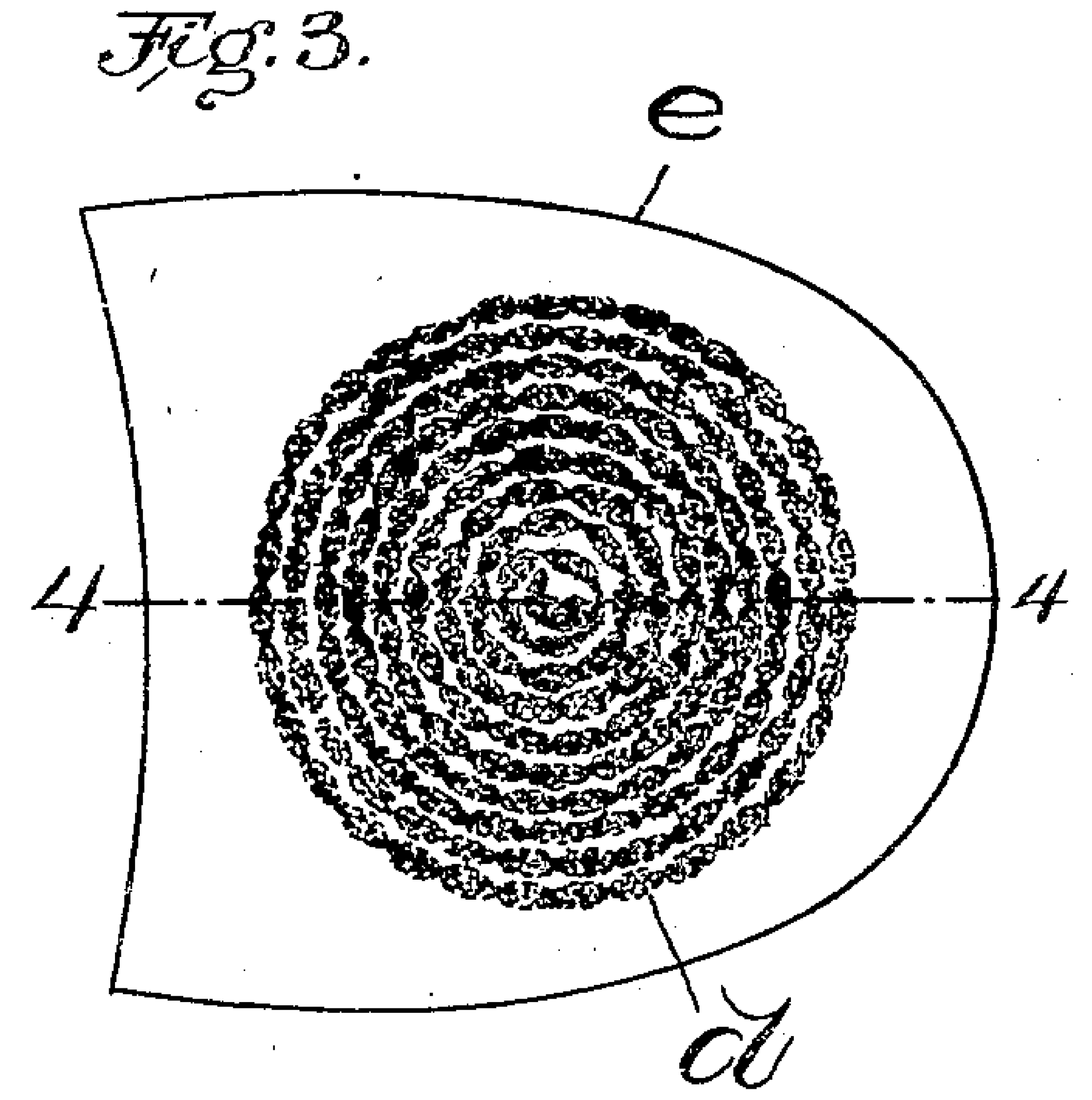


Fig. 4.

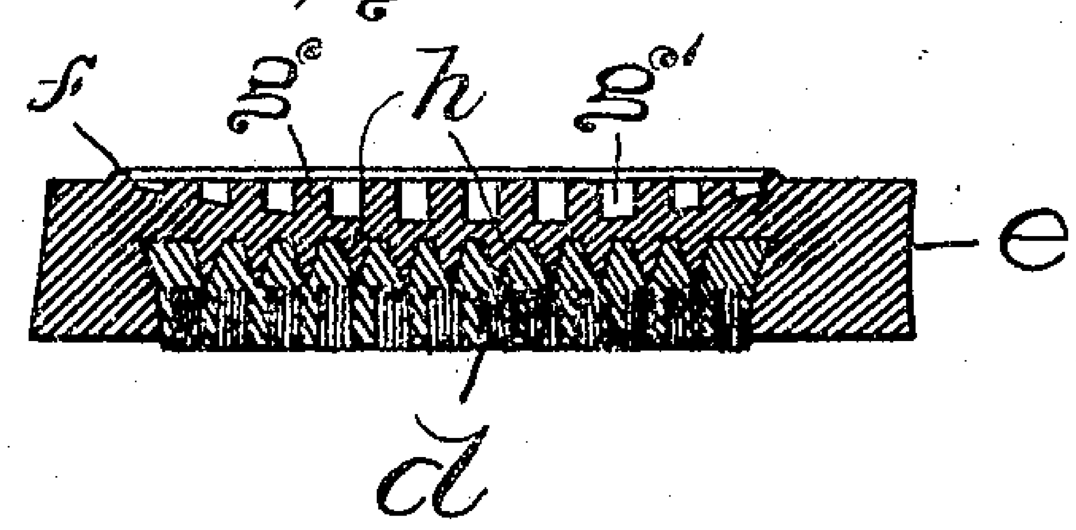


Fig. 5.

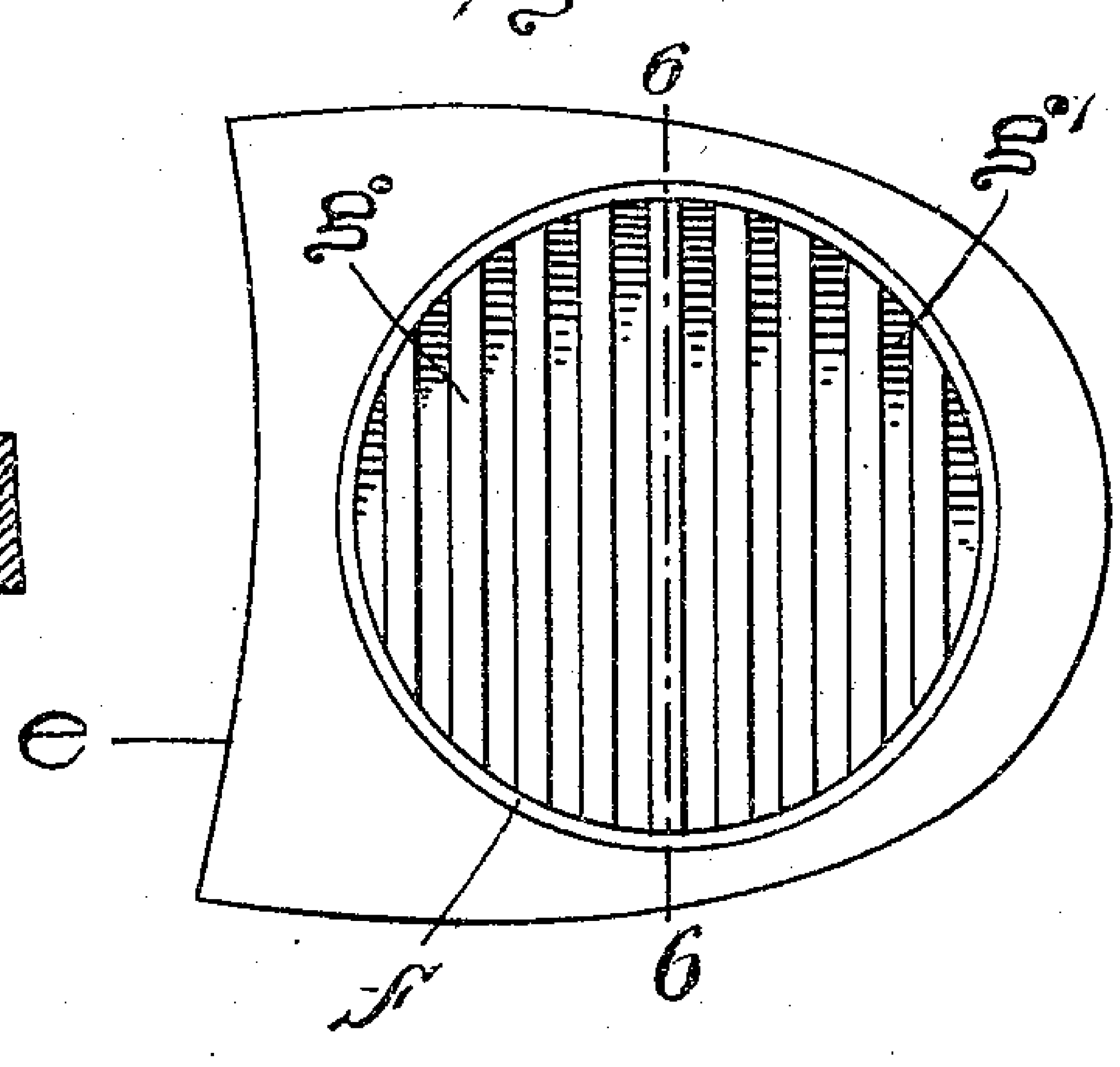
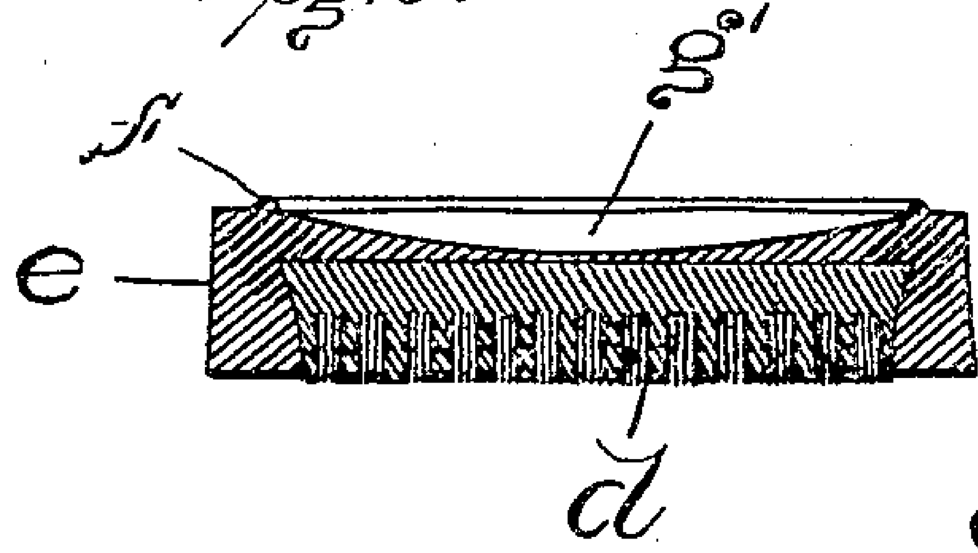


Fig. 6.



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2 SHEETS—SHEET 2.

Fig. 7.

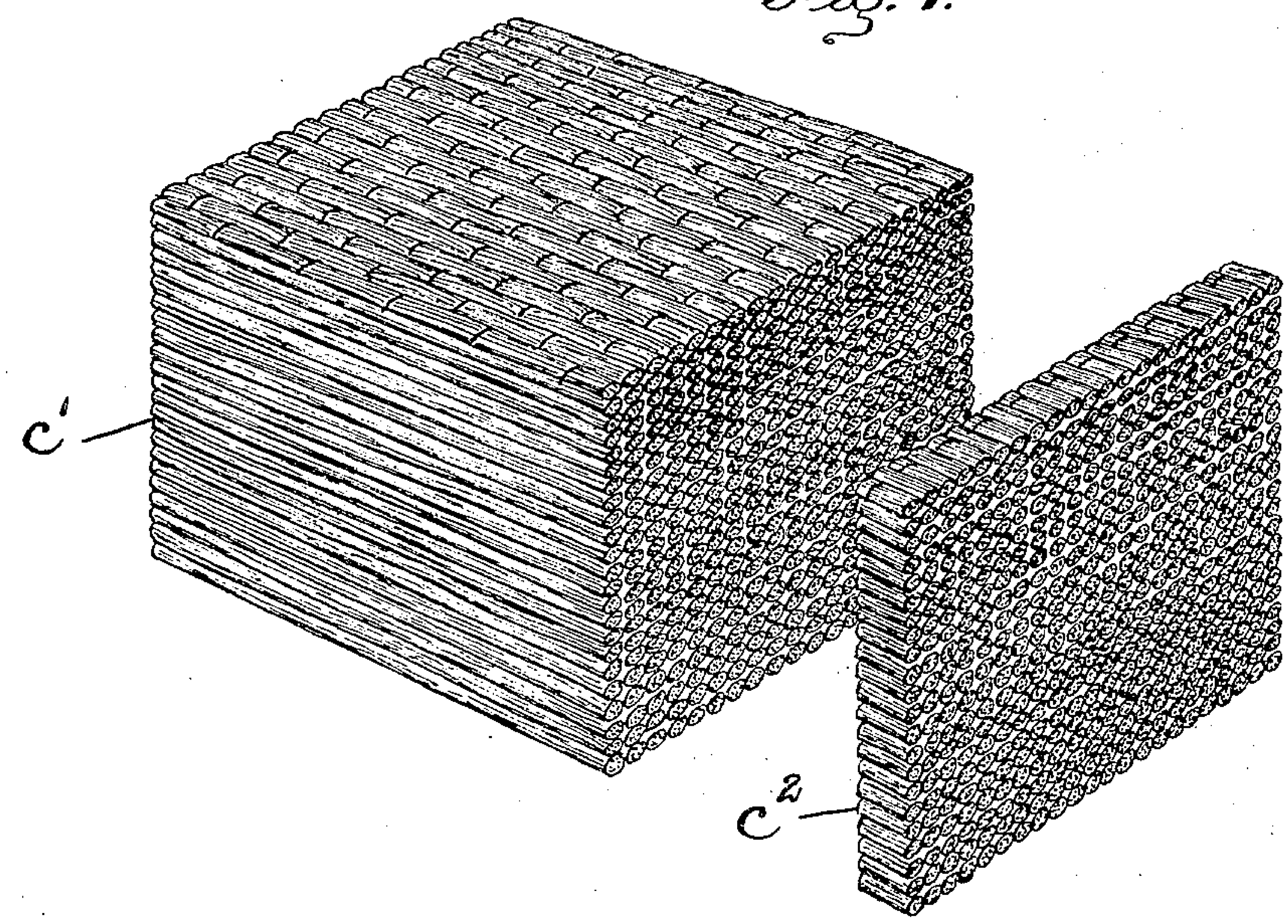


Fig. 8.

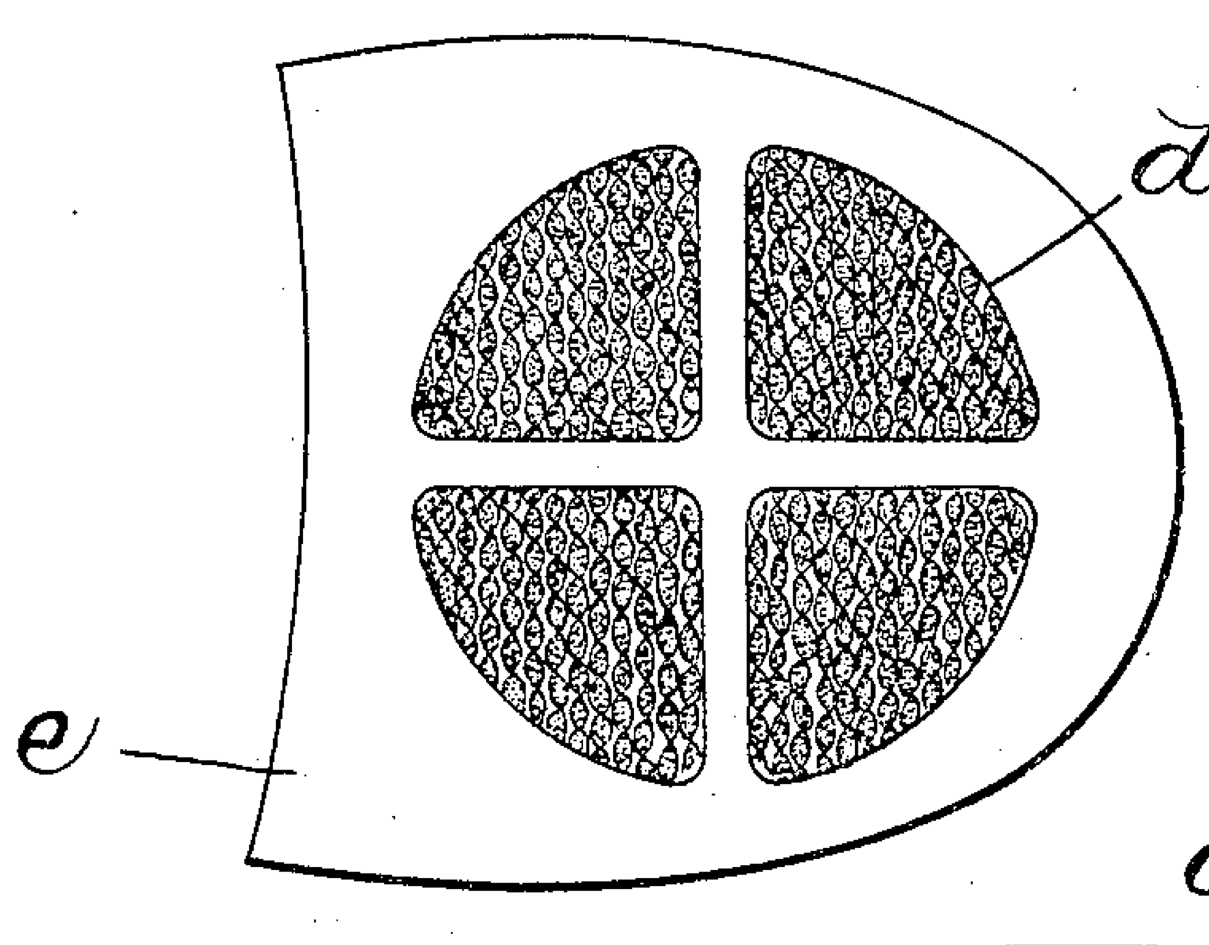


Fig. 9.

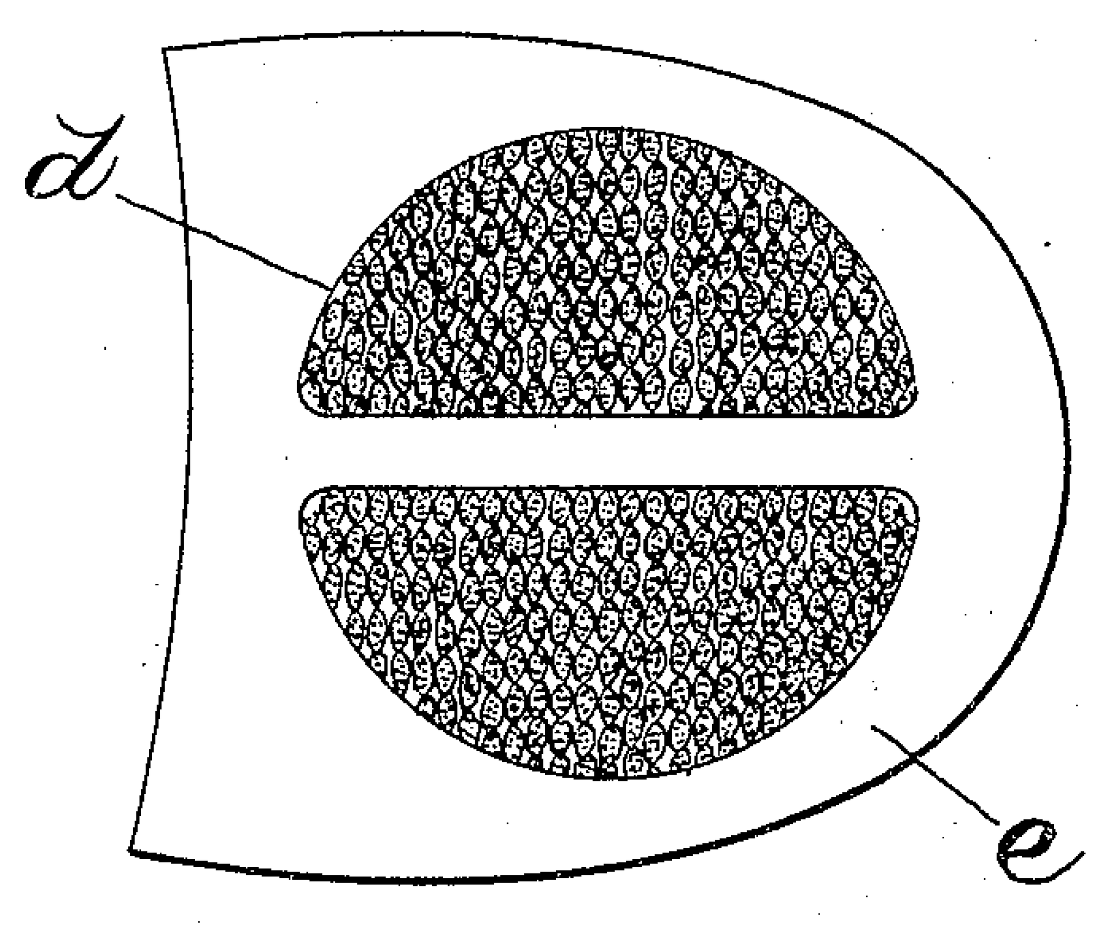
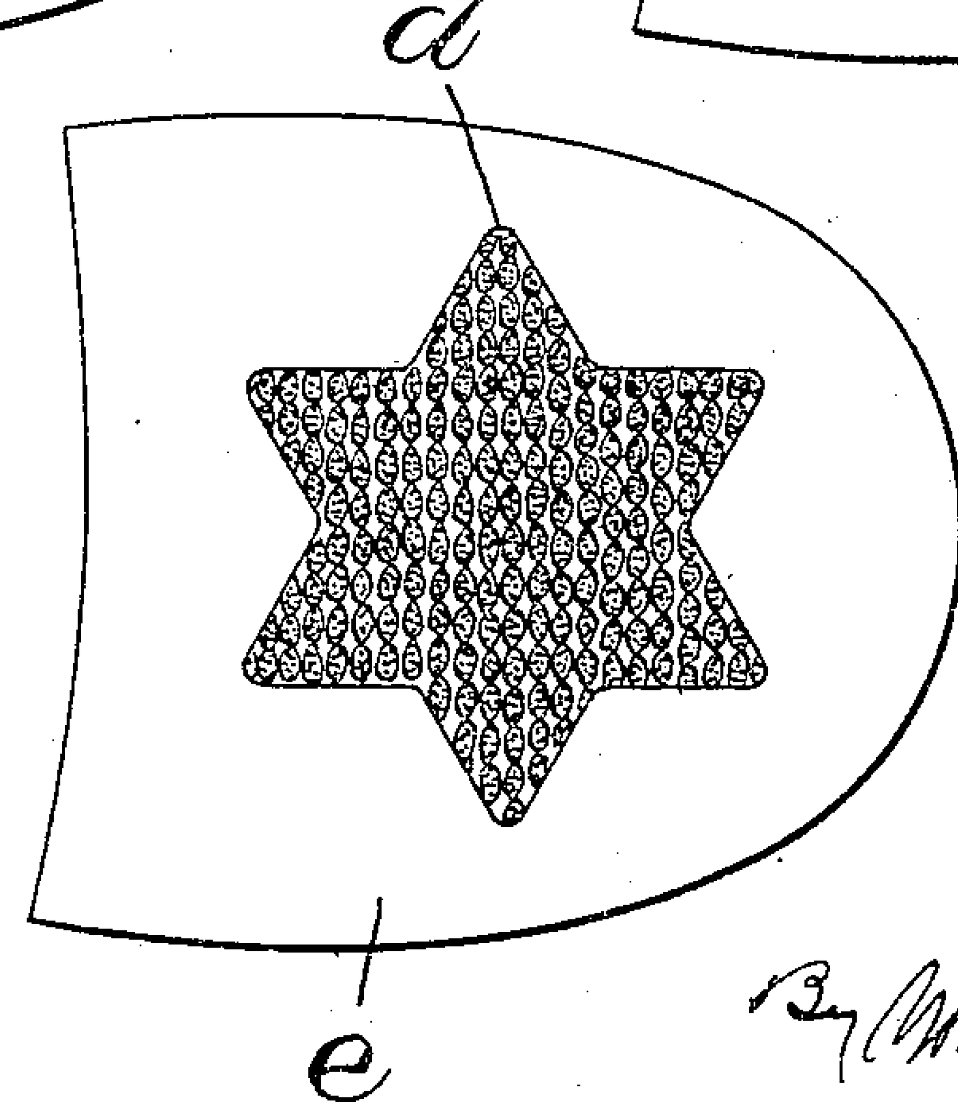


Fig. 10



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No. 792,555. Patented June 13, 1905.

UNITED STATES PATENT OFFICE.

PHILIP W. PRATT, OF BOSTON, MASSACHUSETTS.

ELASTIC TREAD.

SPECIFICATION forming part of Letters Patent No. 792,555, dated June 13, 1905.

Application filed February 27, 1904. Serial No. 195,629.

To all whom it may concern:

Be it known that I, PHILIP W. PRATT, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Elastic Treads, of which the following is a specification.

This invention relates to elastic treads for boot and shoe heels and soles, crutch-tips, and other purposes.

It relates particularly to treads of this character which are provided with wear-resisting and antislipping material which comprises threads or strands of textile material embedded in the rubber body of the tread, the ends of the strands being presented at the tread-surface. The threads or strands whose ends are presented at the tread-surface are united or connected to form a fabric by crossing threads which are interwoven with them, and the fabric is formed into a roll or plug after being frictioned on one or both sides—or, in other words, coated with a solution of unvulcanized rubber—the same causing the convolutions of the fabric to adhere together and uniting them permanently to each other and to the body of the rubber tread when the whole is subjected to the process of vulcanization. The threads which give the plug its chief utility are those extending substantially at right angles with the tread-surface, so that their ends only are presented at the tread-surface. These threads may be termed the "warp-threads." The connecting-threads, which may be termed the "weft-threads," serve to bind the warp-threads together and form a fabric adapted to be frictioned and converted into a plug, as above described. When the threads are so arranged in the plug that the weft-threads are substantially parallel with the tread-surface, these threads, considerable portions of which become detached simultaneously if made of the same size as the warp-threads, are a source of annoyance and trouble, because they hang loosely from the tread-surface, giving it a ragged appearance, and are liable to become saturated with mud.

My invention has for its object to obviate this difficulty; and it consists, primarily, in making the plug of a fabric in which the weft-threads are relatively slender or attenuated, so that when they become detached, as above described, at the tread-surface their presence will not be objectionable owing to their attenuation, which will cause them to be quickly detached or worn away from the tread-surface.

A further object of my invention is to provide an improved structure for insuring the retention of the parts of the tread in their proper relative positions.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side view of a piece of fabric used in producing my improved frictioned plug. Fig. 2 represents an enlarged transverse section showing the improved fabric rolled into a plug. Fig. 3 represents a bottom view of a rubber heel having my improved plug. Fig. 4 represents a section on line 4 4 of Fig. 3. Fig. 5 represents a top view of the rubber heel or tread, illustrating one form which may be given to the recessed portion of the body above the plug. Fig. 6 represents a section on line 6 6 of Fig. 5. Fig. 7 is a perspective view representing the fabric of which the plugs are made as formed in a rectangular block instead of a roll, said figure also representing a relatively thin section as having been cut from one end of the block. Figs. 8, 9, and 10 are views similar to Fig. 3, but illustrating various forms in which the plugs may be died out previous to being embedded in the rubber body of the heel.

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

In carrying out my invention I form a fabric comprising relatively coarse and heavy longitudinal threads or strands *a*, which I will term "warp-threads," and relatively slender or attenuated crossing-threads *b*, which I will term "weft-threads." These threads may be interwoven in any suitable or desired manner to form a fabric adapted to be frictioned or coated with a solution of unvulcanized rubber and rolled into the form in transverse section indicated in Fig. 2, thus forming a roll *c*. After the fabric has been frictioned and formed into a roll the roll may be cut up into a series of disks or sections, each constituting a plug *d*, which may be embedded in a rubber body e by molding the rubber of the body around the plug before any vulcanization is effected either in the plug or the body, the whole being then vulcanized, so that the threads are permanently united and the plug is permanently united with the body e. The warp-threads a extend substantially at right angles with the tread-surface of the body e, while the weft-threads b extend substantially parallel with said surface. The only function of the weft-threads is to hold the warp-threads together in such relation to each other that they can be conveniently frictioned and formed into a roll. The weft-threads are not relied upon to strengthen the plug nor to add to its wear-resisting properties. On the other hand, the weft-threads b are to be made as slender as they can be in order to hold the warp-threads together during the frictioning and subsequent operations above described. In practice the weft-threads may be made of very slender sewing-cotton, while the warp-threads may be composed of stout twine.

When the elastic tread is subjected to wear, the weft-threads b are exposed from time to time as the tread-surface wears away and become detached; but owing to their slender nature they are usually practically disintegrated at the time of their detachment, so that they do not constitute a source of objection, as would be the case if these threads were of the same size as the warp-threads.

The weft-threads b may be made of untwisted or very slack-twisted fibers or fibers compressed together into compact form by a rolling pressure. The threads thus formed will readily disintegrate when detached, the fibers of each thread separating from each other and disappearing. The warp-threads may also be made of untwisted or slack-twisted fibers or of fibers laid together in such manner that the rubber solution used for frictioning the fabric will permeate or saturate the threads more thoroughly than if the fibers were closely intertwisted. The fibers should be assembled under suitable pressure to cause them to cohere and form a strand of suitable tensile strength.

In order to enable plugs of various forms to be cut by suitable dies, so as to present configurations or shapes other than the circular form shown in Fig. 3, I may form the fabric in a rectangular bunch, the threads being frictioned or coated with a solution of unvulcanized rubber, and then cut said bunch into sections, as indicated in Fig. 7, in which c' represents the body or bunch of material so formed, and c^2 a section cut from said body. Then by means of suitable dies I may cut from a section c^2 plugs d of various shapes, such as segmental, as in Fig. 8, semicylindrical, as in Fig. 9, or star-shaped, as represented in Fig. 10. Plugs so formed will be embedded in the body of rubber, the same as a circular plug, as represented in Fig. 3.

I will now proceed to describe the method of embedding a plug d in the rubber body of the heel.

The completed plug d may be upset or enlarged at its inner end to give its periphery a tapering form, as shown in Fig. 4. This may be accomplished by pressure suitably applied before the parts are connected. The plug thus formed is firmly interlocked with the body portion e. The pressure which spreads the inner end of the plug may be effected by forming numerous tapering holes h in the plug, the material thus displaced causing the enlargement of the plug at one end. The holes h constitute mortises, which are filled by portions of the material of the body e, said portions constituting tenons which after vulcanization adhere firmly to the plug and greatly increase the strength of attachment of its central portion to the body e.

The manner in which I prefer to construct my improved tread or heel piece is to form the body e of a solid mass of rubber having an opening through it, which opening will be then partially filled by the plug, another portion above the plug being filled with a piece of rubber. Then when the parts are assembled and before vulcanization the portion of the body which has been filled in with a disk of rubber, as described, is subjected to the pressure of a suitable die, which will form recesses in the surface of the rubber. In my Patent No. 769,324, granted September 6, 1904, I have shown the rubber above the plug as formed with a single cavity or a plurality of concentric cavities alternating with rings or ridges, the air space or spaces affording sufficient elasticity at the center of the heel as a whole to compensate for the relative rigidity of the plug. In a heel or tread having a plug constructed according to the present invention the cavity or cavities above the plug may, if desired, be formed as shown in said other application. In Fig. 5 of my present illustration I show a form which may be preferred for many reasons. In said Fig. 5 it will be noticed that the upper surface of the rubber is formed with a circular ridge f, which I term a "dam." This ridge or dam f serves to prevent the access of water to the cavities when the tread-piece has been nailed or cemented or otherwise secured to the leather heel of a shoe. As indicated in Fig. 6, the ridges g, which alternate with the spaces or cavities g', extend across or beyond the outer diameter of the rubber that is directly above the plug. These ridges are formed when the tread-piece is completely assembled and molded, the rubber portion, which is above the plug, having the ends of the ridges g forced outward in the molding operation, so that said ends of the ridges serve to connect with the body of the tread-piece, and thereby strengthen the hold of the parts upon each other and prevent the plug from separating from the surrounding rubber. It will now be understood that when the members have been assembled and are molded under compression the outward or radial compression of the rubber portion containing the cavity or cavities causes a compacting of the rubber, thus preventing liability of the loosening or detachment of the rubber portion above the plug from the surrounding rubber portion.

I claim—

1. An elastic tread having relatively heavy wear-resisting threads or strands, and attenuated weft-threads, said threads forming a fabric which is united to the body of the tread, the heavier threads extending toward the tread-surface.

2. An elastic tread having relatively heavy wear-resisting threads or strands, and weft-threads varying in thickness relatively to said wear-resisting threads, said weft-threads being composed of fibers readily separable, said threads forming a fabric which is united to the body of the tread, the wear-resisting threads extending toward the tread-surface.

3. An elastic tread comprising an elastic body portion, and a wear-resisting plug having relatively heavy wear-resisting threads or strands, and attenuated weft-threads, said plug being embedded in said body portion with one end flush with the tread-surface of the body, the said plug being enlarged at its inner end to anchor its periphery in the body.

4. An elastic tread comprising an elastic body portion having tenons and a wear-resisting plug embedded therein with one end substantially flush with the tread-surface of the body portion, the inner surface of the plug being provided with recesses or mortises which receive the tenons on the body portion, said recesses extending partially through the plug, the tenons and recesses being solely above the wear-resisting portion of the plug.

5. A rubber tread comprising an elastic body, and a wear-resisting plug occupying a portion of the tread-surface of said body, the upper portion of the body being reduced above said plug to compensate for the relative hardness of the plug, the said portion of the body above the plug having its margin condensed and firmly united with the surrounding portion of the elastic body.

6. A rubber tread comprising an elastic body, and a wear-resisting plug occupying a portion of the tread-surface of said body, the upper portion of the body being reduced above said plug to compensate for the relative hardness of the plug, the said portion of the body above the plug having its margin condensed and firmly united with the surrounding portion of the elastic body, strengthening-ridges being formed to extend across the central portion above the plug to the surrounding portion of the elastic body.

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

PHILIP W. PRATT.

Witnesses:

A. W. HARRISON,

R. M. PIERSON.