R. ROWLEY & J. J. COOMBER.

TIRE SHOE.

APPLICATION FILED MAR. 25, 1910.

991,894.

Patented May 9, 1911

Fig. 1

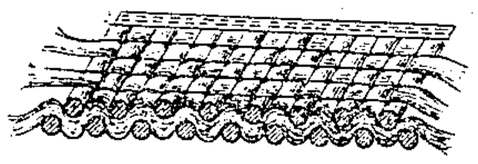


Fig. 2

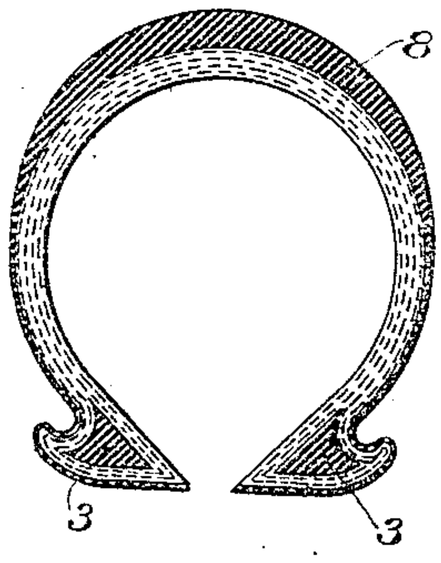
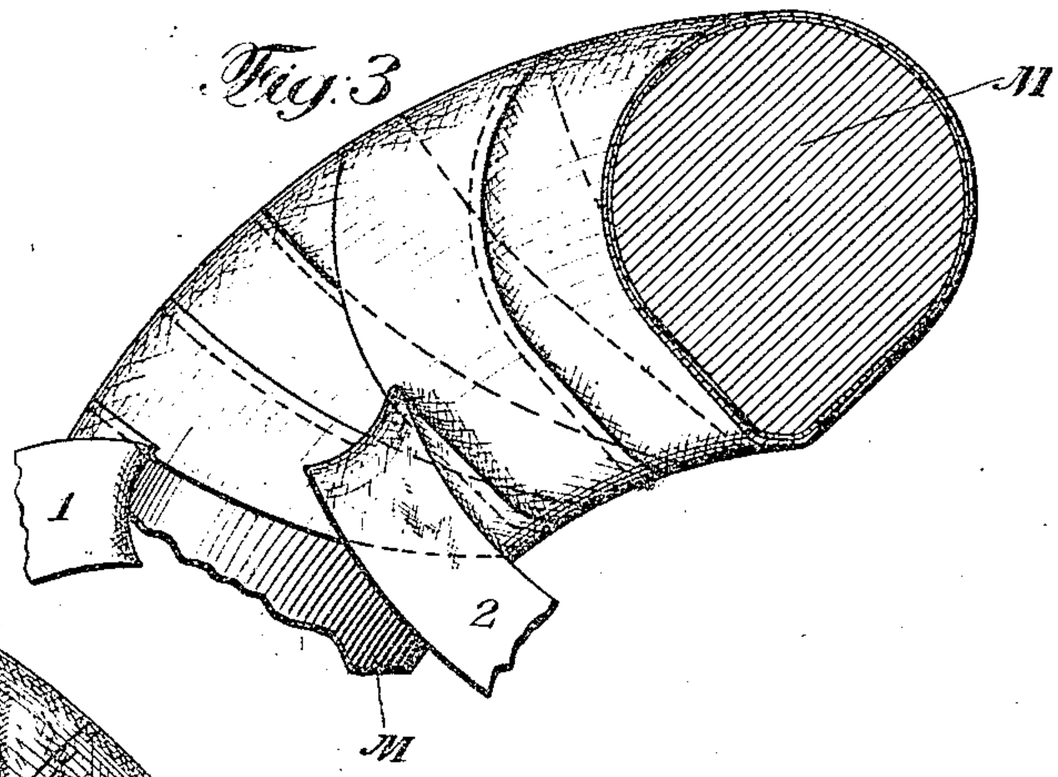


Fig. 3



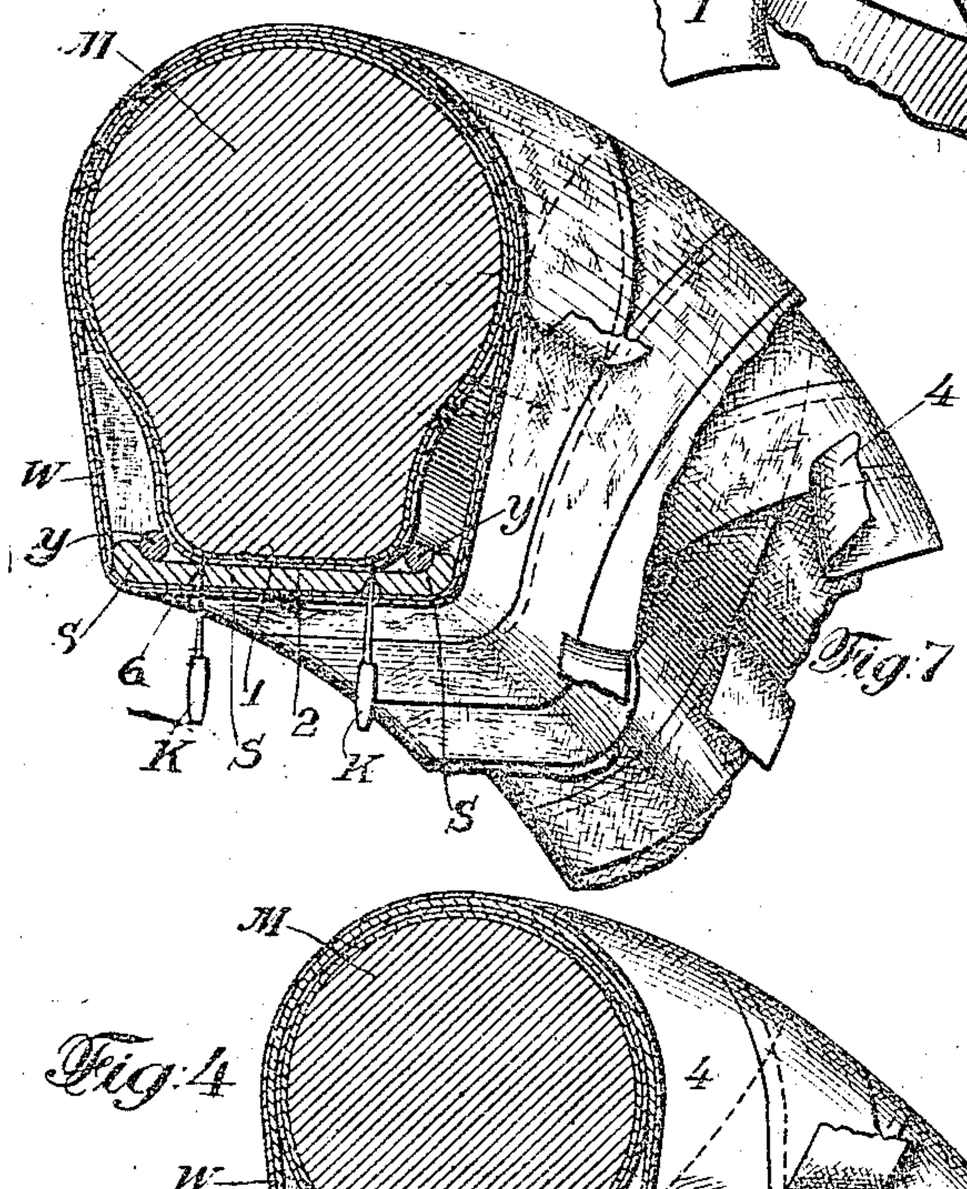


Fig. 7

Fig. 5

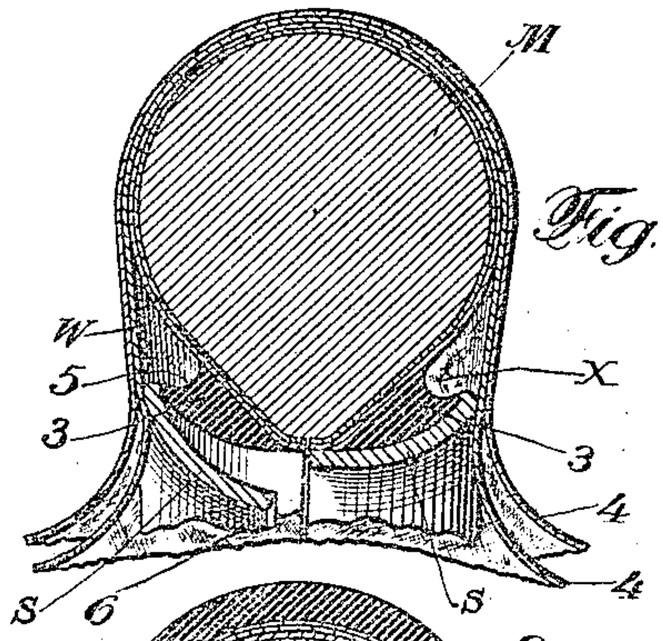


Fig. 4

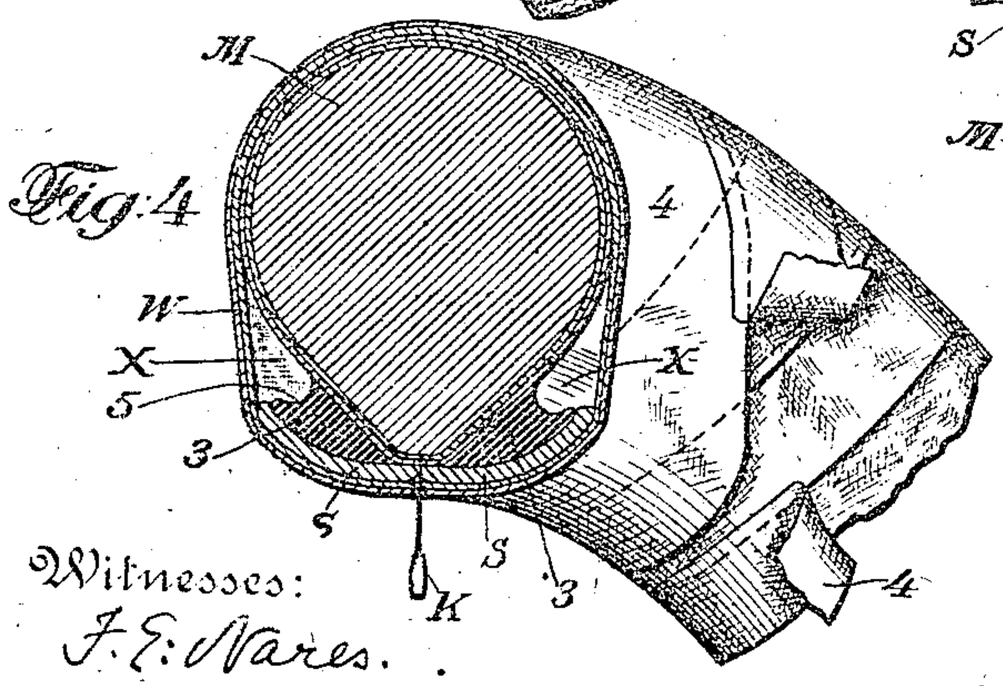
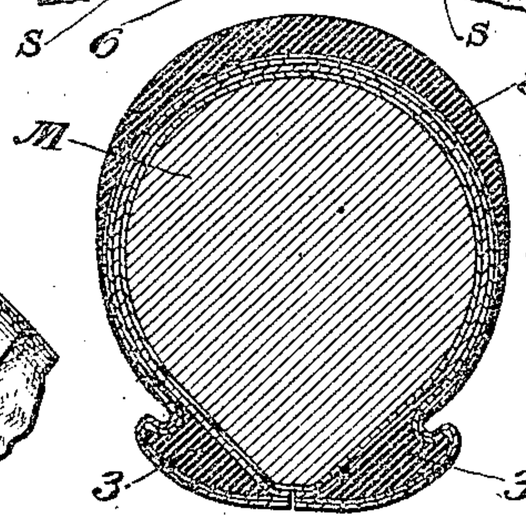


Fig. 6



Witnesses:

F. E. Nares.

F. Blake

Inventors

Robert Rowley

John J. Coomber

By their Attorney

Edward L. Beach

UNITED STATES PATENT OFFICE.

ROBERT ROWLEY, OF NEW YORK, N. Y., AND JAMES J. COOMBER, OF JERSEY CITY, NEW JERSEY.

TIRE-SHOE.

991,894. Specification of Letters Patent. Patented May 9, 1911.

Application filed March 25, 1910. Serial No. 551,440.

To all whom it may concern:

Be it known that we, ROBERT ROWLEY, a citizen of the United States, residing at New York city, in the county of New York and State of New York, and JAMES J. COOMBER, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Tire-Shoes, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a tire-shoe carcass and also to a completed tire-shoe, either of the clencher-edged or mechanically fastened type.

The objects of the invention are to increase the strength and density of the carcass, which comprises superimposed layers of duck or the like and vulcanizable rubber, being conveniently made of so-called "friction fabric"; that is, suitable cloth surfaced with vulcanizable rubber. These carcasses when finished are usually assembled with annular treads of rubber, and are then subjected to operations attending vulcanization.

As is well known, tire-shoe carcasses are now built up on annular mandrels of various diameters and cross-sectional area, and of somewhat varying but generally more or less round or oval cross-sections; the superimposed friction strips being cut on the bias and drawn circumferentially around the mandrel and one over another, and "stitched" down against the sides and toward the inner periphery of the mandrel. By "stitching" in this connection is meant a rubbing, and not a sewing, operation. The bias cut, while greatly reducing the normal strength of the fabric, is essential in this old mode of construction in order to make the side and marginal portions of the strips smooth-fitting and without wrinkles whereby air-spaces would be formed and effect points of structural weakness in the completed shoe. By our invention, the friction fabric need not be cut on a bias, but may be cut straight along, not across, the threads into strips of suitable width, which will vary somewhat according to the cross-sectional area and diameter of the mandrel. We say that bias-cut strips need not be used; but within the broadest scope of our invention they may be used although with results inferior, as a general rule, to the results obtainable from use of the preferred and best form of our invention.

In the accompanying drawings, illustrating the principle of our invention and the best mode now known to us of applying that principle, and also one method of making our new tire-shoe carcass and tire-shoe, Figure 1 indicates a portion of a strip of duck cut along the warp and not on the bias, the rubber incorporated with it to form "friction" being omitted for greater clearness, and the threads being enlarged. Fig. 2 is a cross-section of a completed shoe. Fig. 3 is a perspective view of a portion of an annular mandrel tubularly wound, to show one process of making our invention, by reversed spiral strips, one over the other, to form a foundation for the clencher bead rings subsequently located on opposite sides of the foundation near the inner periphery of the mandrel. As shown, the foundation consists of two superimposed, reverse-spirally wound strips. Fig. 4 is a cross-sectional view of the mandrel and the foundation winding shown in Fig. 3, with the two clencher-bead rings in place and assembled with metallic bead-supporting rings at the inner periphery of the foundation and held in place by the outer, secondary reverse-spiral, tubular winding that completes the shoe-carcass forming material, excepting the usual rubber tread. This view also shows a cutter in position to sever the outer winding, to separate the bead-ring supports, and to sever the foundation around the inner periphery to form the shoe and for removal of the mandrel and the bead-ring supports. This view also shows the separation of the outer winding from the sides of the foundation in consequence of the lateral projection of the bead-ring supports. Fig. 5 is a cross-sectional view illustrating the parts in position for removal of the bead-ring supports, and rubbing, working or "stitching" into place of the free margins of the secondary or final winding while the carcass is still on the mandrel. Fig. 6 shows, in cross section, the shoe carcass on the mandrel after the free margins of the outer wrapping are positioned. Fig. 7 shows another form of our invention in process, and in which the clencher bead-rings and annular reinforcing wires are in place, and the tubular winding

has two parallel cuts spaced apart around its inner periphery for removal of an interiorly peripheral, annular section of the foundation and final winding, and for removal of a three-part tire-supporting ring and the mandrel.

Referring to the drawings, M is an annular mandrel and 1 a strip of friction fabric cut along the warp x; that is, transversely of the weft threads y, and parallel to the warp threads, leaving the latter uncut at their longer opposite edges. This fabric is closely woven duck, suitably impregnated or coated with rubber, and known as friction fabric. Such a non-bias cut strip is wound spirally and drawn tightly around the mandrel to inclose it tubularly. 2 is another strip of similarly cut friction fabric, wound reverse-spirally over the winding 1. All the windings lap marginally as indicated, and all are drawn as tightly as feasible in place. As the friction fabric is normally adhesive, the superimposed strips of both the primary or initial and of the secondary or final windings form a unitary mass when they are in contact.

As we are now describing the use of our invention in the production of clencher tire-shoes, we note that the primary, initial or foundation winding, shown made up of two reverse-spiral windings, 1 and 2, may consist of a single spiral winding or of more than two reverse-spiral windings, as preferred.

When the spirally-wound foundation of desired thickness has been formed tubularly around the mandrel, for clencher shoes, annular, metallic-clencher bead-ring supports S, of a diameter to fit within the interior periphery of the foundation tube, are put in place either before or after the clencher bead rings 3 (which are made of strips of suitable cross-sectional contour,) are applied to the sides of the tubular foundation, adjacent to its inner periphery. As these bead rings are of unvulcanized rubber, and as the outer surface of the friction foundation is adhesive, the clencher beads may be pressed home, and will then stick in place. Consequently it is of no moment in which order the bead rings and bead-ring supports are assembled with the foundation. The bead-ring supports are shown as a pair of annular rings of equal width, and each formed, at its outer edge, with an outwardly extending flange adapted to sustain the lower outward side of a bead ring and also the secondary tubular winding W, which is composed of as many reverse-spirally wound, straight-cut strips 4 as may be needed to bring the carcass to the desired thickness. The inner edges of the supports S contact midway between the sides of the shoe, and their flanged, outward sides project laterally beyond the mandrel.

When the component strips or the secondary winding are drawn in place, the laterally projecting side flanges of the supporting ring S prevent contact of the innermost strip 4 with the foundation winding, from the flanges to points on the sides of the foundation, thus forming annular chambers x on each side of the foundation and extending above the usual concavity 5 of the bead rings. The inner peripheral corners of the members of the bead-support are chamfered at 6 to facilitate the insertion between them of a knife or cutter K thrust through the secondary winding and thence between the supports S, S, and then through the foundation winding to slit the complete tubular winding around its inner periphery for removal of the supports S, S and mandrel M, and for the conversion of the tube into shoe-form. A shoe carcass thus produced may be made very compact, according to the tension applied to the strips when they are spirally wound in place; and as the strips are straight cut (according to the preferred feature of our invention,) and not cut on the bias, great tension may be applied to them without stretching them out of normal shape.

In our new tire-shoe, the sides of the shoe, where shoes are most apt to burst in use, are made much stronger than by the present process, which involves the circumferential stretching of strips one upon another around the mandrel, and the rubbing-down of the opposite sides of the strips upon the mandrel sides, these prior strips being cut on the bias, and each consisting, in part, of two or more pieces cemented endwise together. Tire shoes heretofore built up on annular, rotary mandrels, usually involve a variety of successive manual operations, the operator turning the mandrel from vertical into one horizontal position and then turning the mandrel over into horizontal position to bring the theretofore lower side of the shoe uppermost, and using a variety of hand tools to rub down the layers and different parts thereof one upon another. The so-called stitching operation is done by a plain-edged, chisel-like tool, and hand-wheels comprising thin disks and cylindrical rollers of various contours are successively used for consolidation of the constituent plies and rubbing out of wrinkles and air chambers. From three to four shoes, according to size, constitutes a normal day's work for one man by the old hand process. Our preferred winding operation eliminates many of these hand operations, quickens production, and produces a substantially better carcass, each ply in the spiral-winding operation being drawn tight and smooth either upon the mandrel or an underlying ply. As the plies are first wound spirally and tightly one upon another, they are

drawn into tight, adhesive relations, for all the plies are impregnated and coated with vulcanizable rubber, so that they are adhesively united during their superimposition. This is very important for the elimination of spaces containing air; for in the subsequent vulcanizing operations, if there are any air-filled spaces in the carcass, the air becomes heated and expands, producing blisters, which result in an inferior product known as a "second;" or else the carcass has to be disintegrated and built up anew, in whole or in part, as the case may be, at very considerable expense.

Our new carcasses and tires may be made either by hand or by a suitable mechanical apparatus.

In Fig. 7 we show another form of procedure. Herein, the shoe is of the well-known Hartford-Dunlop style, without clencher edges and clencher rings, the edges being reinforced by wires *y;* and in this case two peripheral cuts are made, as indicated by two knives K, for withdrawal of the mandrel. As shown, the rings S are present for convenience in locating the annular reinforcements *y*.

Various other forms of shoes may be made in accordance with our invention, which is mainly characterized by the break-joint arrangement of superimposed strata of carcass-forming strips whereby tightness and strength are secured, and also by the fact that the carcass-forming strips have their opposite ends at or near the opposite edges of the open-bellied carcass or shoe. We have referred to the carcass-forming strips as being of "friction" fabric, and by this we mean any suitable fabric treated in any suitable manner with any suitable rubber preparation or rubber-like compound.

After the carcass has been built up, a vulcanizable rubber tread 8 is stretched in place around the outer periphery and sides of the carcass; and then, according to our preferred mode of treatment, the carcass and assembled tread will be wound in accordance with the method and apparatus set forth in our allowed applications Serial No. 511,188 and Serial No. 511,189, preparatory to the vulcanizing operation, after which the assembled tread, carcass and mandrel are to be removed from the heaters used in the vulcanization; the mandrel being afterward removed from within the carcass, whereupon it will have the form shown in Fig. 2.

Another advantage of our product lies in the fact that the carcass is so thoroughly consolidated or compacted by the tensioning of the reverse-spiral windings that, in the subsequent pre-vulcanizing operations of wrapping with a strip or strips of wet cloth and tensioning the wrapping under great pressure, usually applied by hydraulic presses, to force the wrapping-compression rings inwardly toward the opposite marginal parts of the shoes when on the mandrel, less strain is required on the wrapping, which therefore lasts longer than at present; and this is a matter of considerable economic importance in the manufacture of tire-shoes by the open cure vulcanizing process, for at present the wrapping strips are speedily worn out and have to be renewed at material expense.

Of course, our new carcasses may be vulcanized while inclosed in metal molds, if that method of curing is preferred to the open cure process. Both methods of curing are well known.

The clencher-beads constitute annular reinforcements for the shoe margins, as do also the annular wires indicated in Fig. 7; and it will be observed that by our invention, these annular reinforcements are embedded and confined in the marginal portions of the shoe, between layers of superimposed short strips extending downwardly from margin to margin in diagonal relations to the circumference of the tread. Prior to the wrapping operation, if that is used; but, at any rate, prior to vulcanization, the free ends of these diagonally disposed strips that are formed by the interior peripheral cutting of the carcass while in its tubular stage, are adhesively united to inclose the annular reinforcements. The ends of these strips may be trimmed off as may be required in the production of shoes of different physical cross-sectional form, and thus the space between the free edges of the shoe may be varied.

In the completed shoe, the rectangular strips of which the stratum or strata of the foundation is composed are shorter than the strips of which the stratum or strata into which the secondary winding is converted by the cutting operation, in consequence of the secondary winding or windings encompassing the bead-rings and the bead-ring supports S. The strips into which the secondary windings are converted are long enough to be bent down (by "stitching", for example,) into the circumferential concavities 5 of the bead-rings, and thence over the thereto adjacent outer wall of each bead-ring, covering the two surfaces of the bead-rings that are exposed when the bead-rings are applied to the foundation. The free ends of the strips of the foundation and of the strips formed out of the secondary windings are united along the edges of the shoe, as is plainly shown in Figs. 2 and 6. We may here remark that an advantage of our shoes not heretofore referred to lies in the fact that in case of repairs the strips may be devulcanized and readily separated at the edges of the shoe, and while the shoe is in a devulcanized condition may be peeled off very readily to any desired extent.

We have above referred to the building-up of shoe carcasses by the old hand operation, on rotatable, annular mandrels; but we are aware of the Seiberling and Stevens Patent No. 762,561 of June 14, 1904, showing a machine for making these endless, open-bellied or open tire-shoes direct from sheeted fabric; and we are also aware of State's Patent No. 941,962 of November 30, 1909, showing a machine for the same purpose; but in the case of each machine, bias-cut goods are stretched circumferentially around the mandrel and worked down upon the sides thereof by mechanisms corresponding generally to the hand tools now commonly used in the hand process. While the State patent emphasizes his use of "alternating layers of crossed fabric" in the form of friction or skin-coated strips of canvas, duck or the like, cut on the bias, yet we do not understand that by "crossed fabric" is meant any diagonal placement of superimposed, reverse-spirally wound strips such as is due to our process, but merely that the bias-cut strips strained circumferentially around the mandrel are relatively arranged to cause the threads of one bias-cut strip to stand crosswise to the threads of another bias-cut strip.

It will be obvious that if our invention is embodied in the manufacture of shoe carcasses for "mechanically fastened tires", such as those shown in the Cole Patent No. 855,693 of June 4, 1907, the supports S need not be used.

We do not herein claim the method referred to, or any other method of making our new shoes, as a method of making them forms the subject-matter of our divisional application, Serial No. 582,637 filed September 19, 1910.

Having thus explained the principle of our invention, what we claim is:—

An open-bellied tire shoe comprising superimposed, circumferentially extending strata of rubber-treated, closely woven fabric having warp and woof threads, the respective strata breaking joint reverse-spiralwise one with another, and each stratum being composed of rectangular strips of said fabric that overlap one another at their opposite long edges and that are located with their warp threads extending transversely of the plane of the tire, at an acute angle thereto, and have their opposite ends transversely severed in the marginal portions of the shoe; clencher bead rings embedded in the marginal portions of the shoe between superimposed strata, the strips of inward strata extending past the inner edges of the bead rings and the strips of the outward strata being longer than the strips of the inward strata and forming a close covering for the grooves and outward walls of the bead rings, the margins of the inward and outward strips being united adjacent to but inwardly of the inner edges of the bead rings; and all the strips and the bead rings being vulcanized together in a unitary mass.

In testimony whereof we have hereunto affixed our respective signatures, in presence of two witnesses.

ROBERT ROWLEY.
JAMES J. COOMBER.

Witnesses:
E. S. Beach,
F. E. Nares.