

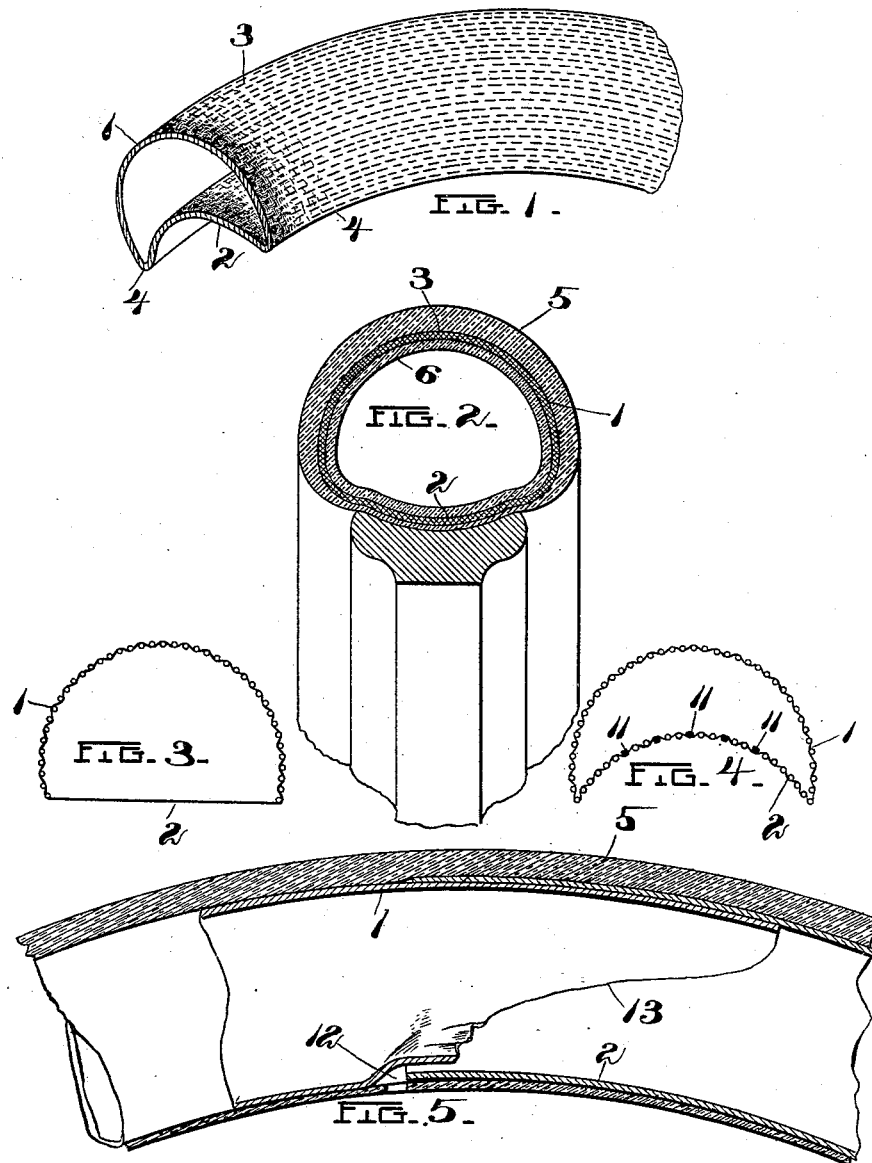
(No Model.)

2 Sheets—Sheet 1.

G. C. MOORE.
PNEUMATIC TIRE.

No. 523,365.

Patented July 24, 1894.



Witnesses.
Arthur J. Randall
Harry M. Kaye

Inventor.
George C. Moore
by *Macedon Balvers & Randall*
his Attorneys.

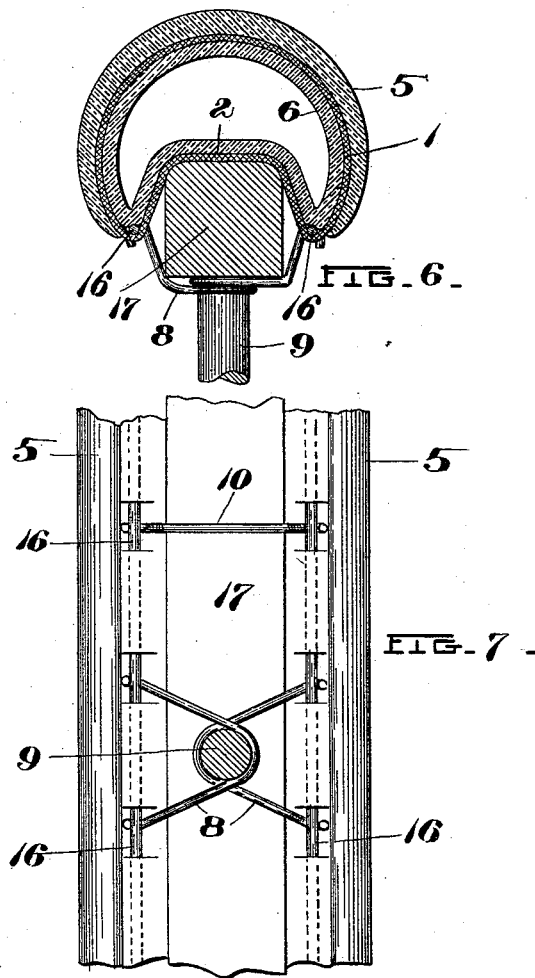
(No Model.)

2 Sheets—Sheet 2.

G. C. MOORE.
PNEUMATIC TIRE.

No. 523,365.

Patented July 24, 1894.



Witnesses.
Arthur F. Randall.
Harry M. Keys.

Inventor.
George C. Moore
by Mackay Balver & Randall
his Attorneys

UNITED STATES PATENT OFFICE.

GEORGE C. MOORE, OF EASTHAMPTON, MASSACHUSETTS.

PNEUMATIC TIRE.

SPECIFICATION forming part of Letters Patent No. 523,365, dated July 24, 1894.

Application filed April 12, 1894. Serial No. 507,220. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. MOORE, a citizen of the United States, residing at Easthampton, in the county of Hampshire and State of Massachusetts, have invented certain new and useful Improvements in Pneumatic Tires, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to pneumatic tires such as are employed on the wheels of bicycles, and other light vehicles, and it consists in certain improvements which first will be explained with reference to the accompanying drawings, after which the characteristic features thereof will be particularly pointed out and distinctly defined in the claims at the close of this specification.

In the drawings, Figure 1 is a view in perspective of the improved lining or foundation fabric which is described hereinafter. Fig. 2 is a sectional view illustrating such fabric embodied in a shoe or cover, the latter being combined with a wheel-rim and an air-tube. Figs. 3 and 4 are views in cross section showing modifications in the fabric. Fig. 5 is a sectional view illustrating the manner of joining the ends of the lining fabric to make an endless ring of the same. Figs. 6 and 7 are views in cross section and elevation illustrating certain features of my invention.

The first feature of my present invention is the lining or foundation fabric which I have produced for use in the shoes or covers of pneumatic tires. The said fabric is shown separately in Fig. 1 of the drawings. The distinguishing characteristics of the said fabric are the facts that it is composed of two unequal longitudinal segments 1 and 2, of which the large segment 1 constitutes substantially the major portion of the lining or foundation, such segment having its greatest length at its midwidth 3, while its marginal portions 4, 4 at both sides of the portion 3 of greatest length are of the least, that is to say, are of the minimum length in the fabric, the said marginal portions 4, 4, constituting oppositely located portions of least fixed length for the tubular fabric, and the small segment 2 connecting the said margins and completing the tubular formation. The varied lengths

of the different portions of the large segment are shown clearly in Fig. 1.

I prefer to produce the foundation fabric by weaving and in the shape of a seamless tube, with the two segments 1 and 2 integrally united to each other along their margins. Also, I prefer to vary the lengths of the successive portions of the large segment 1 progressively from the portion which is at midwidth thereof at 3, Fig. 1, to the marginal portions 4, 4, of the said large segment 1. When the said fabric is produced by weaving, this progressive variation in the lengths of the said successive portions is secured by conducting the weaving in a manner to give the greatest length of warp threads to the middle portion of the large segment 1, and to give proportionately decreased lengths of warp threads to the successive portions of the width of the said segment, on both sides of the said middle portion in proceeding from the latter toward the margins 4, 4. Giving the successive portions in the width of the large segment the said progressive variation in their length has the advantage that it causes the said segment to have a regular continuous curve in the direction of the fabric, so that it conforms naturally to the circle of the tire in which the fabric is embodied, the said large segment being located in the projecting or tread portion of the shoe or cover; also, in consequence of the curvature, all the portions of the width of such segment are under absolutely equal strain when a tire-cover or shoe containing the said fabric is inflated and subjected to practical use. However, in some embodiments of my invention, the variation in length need not be gradual and progressive as above. The small segment 2 may have all the warp threads which are embodied in the same of uniform length. I prefer, however, for reasons which presently will be made to appear, to weave this segment so as that the different portions in the width thereof shall vary in length, the middle portions of the said small segment being the longest and the portions at each side of such middle portion being the shortest, the lengths of such side portions decreasing gradually and proportionately to the margins of the said small segment, where they unite with the margins of

the large segment 1, as shown in Fig. 1. However, the variation need not in all embodiments of my invention be gradual and progressive.

At 5, Fig. 2 is shown the body of elastic material constituting the exterior of the shoe or cover, and at 6 the air-tube. As stated above, the large segment 1 is located in the outer or projecting portion of the cover or shoe, and constitutes the major portion of the lining or foundation fabric. The small segment 2 is located in the portion of the shoe or cover which lies against the rim of the wheel to which the tire is applied.

The shoe or cover embodying my invention as shown in Fig. 2, it containing a lining or foundation fabric such as that which has been described herein, when applied and used in the manner illustrated in the said Fig. 2, has several advantages over the forms of shoes or covers heretofore proposed and used.

I have ascertained through practical tests that when a detachable shoe or cover of U-shape in cross-section like the detachable shoes or covers now in common use is applied to the rim of a wheel and inflated, the tendency to lateral expansion and to spreading apart of the sides is so great as in some instances to split the grooved wooden rims which recently have come into use in the manufacture of the wheels of bicycles. My improved shoe or cover, it containing my improved lining or foundation fabric, is free from this objection, inasmuch as the small segment connecting the inner margins of the large segment limits the lateral expansion of the tire, and hence protects against the splitting of the rim. Further than this, the more completely my shoe or cover is inflated the firmer is the grip or hold which its inner perimeter exerts against the outer surface or periphery of the rim of the wheel to which it is applied. This results from the fact that the inner portions or margins of the large segment of the lining or foundation fabric, they lying opposite to each other in the shoe or cover and adjacent to the inner perimeter of the latter, constitute oppositely located lines or portions of the least or minimum length in the fabric, and between such lines or portions exists a portion of suitable width, constituted by the small segment 2, which is protected by the said lines or portions from excessive longitudinal or circumferential strain.

When the shoe or cover is inflated, the longitudinal or circumferential strain in the lining or foundation fabric is borne altogether or chiefly by the portions thereof which are comprised in the large segment, which portions stretch more or less under such strain. The marginal portions 4, 4, of the said large segment being of the least fixed length in the fabric, they relieve the small segment 2 of a considerable portion of the longitudinal or circumferential strain incident to the inflation. Consequently, when the large segment increases in diameter and circumference un-

der inflation, the small segment remains without material departure from its original dimensions, and although the large segment has become enlarged by the inflation, in a manner which would render the shoe or cover loose upon the rim of a wheel if proper compensation were not made the compensation is secured through leaving the small segment of substantially its original dimensions. Thus, while the large segment increases in diameter and circumference and expands outwardly, the small segment remains comparatively free from excessive tension, and free from material extension, and is free to expand inwardly upon the rim of the wheel, binding against the same with a pressure which is in proportion to the degree of inflation.

The best results are secured when the small segment is longer in the portion at midwidth thereof than it is in the marginal portions thereof. In this case, no matter how much the marginal portions 4, 4, of the large segment may be stretched by the inflation, the middle portion of the small segment will remain comparatively lax or full and free to be pressed radially inward toward the rim of the wheel.

In accordance with one modification in the manner of embodying my invention in practical form, the warp-threads may be omitted from the small segment 2, as in Fig. 3. Or I may incorporate into the small segment 2 warp-threads consisting of strands or threads of india rubber (caoutchouc) as in Fig. 4 at 11.

My lining or foundation fabric is self-shaped: that is, as produced and in its normal condition and before being combined in a shoe or cover, it has naturally the shape and characteristic features which are referred to herein and in the claims at the close hereof.

In making a shoe or cover, a suitable length of the tubular lining or foundation fabric is taken and one end thereof is cut away in a slanting direction as indicated in Fig. 5 at 13. This end of the tubular fabric is then inserted a short distance into the other end as in the said figure to form a lap joint extending entirely around the shoe or cover, and is secured therein, as by cement, save at the inner side of the shoe or cover, where the ends are left disconnected as at 12. When the elastic covering or surfacing is applied to the lining, this portion is left disconnected in order to provide for the passage of the air-tube used in the pneumatic tire, the latter being in the form of a straight tube which is introduced or withdrawn endwise through the passage-way thus produced. The ends of the tubular lining or foundation overlap at the said passage-way as shown, and after the air-tube is in place the inflation thereof will cause the overlapping ends to be compressed tightly together between the air-tube and the surface of the rim of the wheel.

When the small segment 2 of the tubular lining is made longer in the portion at midwidth thereof than it is at the opposite mar-

gins thereof, the tubular fabric tends naturally to assume a shape which in cross section is essentially like a crescent, as shown clearly in Fig. 1. This facilitates the production of a detachable pneumatic tire which is fitted especially for application to the rims or fellys of ordinary carriage wheels, in the manner shown in Fig. 6. For example, a shoe or cover containing such a lining or foundation fabric may be applied to the rim or felly of an ordinary carriage, with the small segment 2 resting against the periphery thereof, and with the marginal line or lines on which the segments 1 and 2 are united, located at the opposite sides of the rim or felly, and lying on opposite sides of the rim or felly 17. To the said marginal lines I apply wires or cords or the equivalent thereof. These may be combined and connected with the shoe or cover in a variety of ways.

I have shown in Fig. 6 wires 16 which are threaded in and out through slits or openings formed in the shoe or cover. These wires, cords, or the like, serve as a means of connection for detachable securing devices which are employed for the more reliable holding of the tire in place. Thus I have shown wire fastenings each of which may be either U-shaped, as shown at 8, to pass around the spokes 9 of the wheel and arranged to have its free ends hooked or bent around one of the wires or cords aforesaid, or they may be like that which is shown at 10, it extending transversely across the inner face of the rim or felly, and having its opposite ends bent or hooked around the opposite wires or cords as shown. A wide range of variety is possible in the form and arrangements of the devices for engaging with the sides of the shoe or cover. These devices hold the said sides drawn inwardly along the opposite sides of the rim or felly of the wheel. The essential characteristic of this portion of my invention consists in providing a detachable pneumatic tire for use on carriages and similar vehicles, fitted to be readily and securely applied to a wheel which is or may be of the usual character throughout and such that in case of a puncture or other accident to the tire the carriage still may be used without waiting for repairs, and either with or without the removal of the damaged tire having been effected.

Sofar as I am at present aware, when pneumatic tires have been used on the wheels of vehicles heretofore, the construction of the rims or fellys of the wheels has been modified or altered in such manner as to render it undesirable to use the vehicle in the event of injury to the tire until after the tire shall have been mended or replaced.

What I claim is—

1. A lining fabric consisting of a self-shaped tube composed of two unequal longitudinal segments, the large segment having its greatest length at midwidth thereof and its minimum length in its marginal portions at both

sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the small segment connecting the said margins, substantially as described.

2. A lining fabric consisting of a self-shaped tube composed of two unequal longitudinal segments, the large segment having its greatest length at midwidth thereof and its minimum length in its marginal portions at both sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the small segment connecting the said margins, it containing a greater length or fullness at midwidth than adjacent to the said margins, substantially as described.

3. A lining fabric consisting of a self-shaped tube composed of two unequal longitudinal segments, the large segment having its greatest length at midwidth thereof and its minimum length in its marginal portions at both sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the small segment connecting the said margins, it having its greatest length at midwidth thereof, and being progressively shorter in the successive portions intermediate such length and the said margins, substantially as described.

4. A shoe or cover for pneumatic tires having a fabric foundation or lining consisting of a self-shaped tube composed of two unequal longitudinal segments, the large segment being located in the outer or tread portion of the shoe or cover and the small segment in the inner portion of the shoe or cover which contacts with a wheel-rim or felly, the said large segment having its greatest length at midwidth thereof, and being progressively shorter in the portions at both sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the said small segment connecting the said margins, substantially as described.

5. A shoe or cover for pneumatic tires having a fabric foundation or lining consisting of a self-shaped tube composed of two unequal longitudinal segments, the large segment being located in the outer or tread portion of the shoe or cover and the small segment in the inner portion of the shoe or cover which contacts with a wheel rim or felly, the said large segment having its greatest length at midwidth thereof and being progressively shorter in the portions at both sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the said small segment connecting the said margins, it containing a greater length or fullness at midwidth than adjacent to the said margins, substantially as described.

6. A shoe or cover for pneumatic tires having a fabric foundation or lining consisting

of a self-shaped tube composed of two unequal longitudinal segments, the large segment being located in the outer or tread portion of the shoe or cover, and the small segment in the inner portion of the shoe or cover which contacts with a wheel-rim or felly, the said large segment having its greatest length at midwidth thereof, and being progressively shorter in the portions at both sides of such length, the margins of such segment constituting oppositely located portions of least fixed length for the tubular fabric, and the said small segment connecting the said margins, it having its greatest length at midwidth thereof and being progressively shorter in the portions at both sides of such length intermediate such length and the said margins, substantially as described.

7. The combination with the rim or felly of a wheel, of a pneumatic tire, having a shoe or cover which is crescent-shaped in cross section and composed of two unequal segments joined at their margins, of which the large segment constitutes the face or tread portion of the shoe or cover and the small segment lies against the surface of the rim or felly with the sides of the shoe or cover extending inwardly by the sides of the rim or felly, and detachable securing devices engaging with the said sides of the shoe or cover and holding it removably in place on the rim or felly, substantially as described.

8. The combination with the rim or felly of

a wheel, of a pneumatic tire having a shoe or cover which is crescent-shaped in cross section and composed of two unequal segments joined at their margins, of which the large segment constitutes the face or tread-portion of the shoe or cover and the small segment lies against the surface of the rim or felly with the sides of the shoe or cover extending inwardly by the sides of the rim or felly, wires at opposite sides of the rim of the wheel in engagement with the said sides of the shoe or cover, and detachable securing devices engaging with the said wires and the wheel and removably holding the shoe or cover in place on the rim or felly, substantially as described.

9. The shoe or cover for pneumatic tires consisting of a tubular lining or foundation fabric and an elastic covering or surfacing, the said lining having one end thereof inserted into the other to form a lap-joint extending entirely around the shoe or cover and secured therein except at the inner side, where such ends, in addition to being overlapped, are left disconnected from each other to permit of the insertion of the air-tube, substantially as described.

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

GEO. C. MOORE.

Witnesses:

E. L. MESSERSCHMIDT,

F. W. MESSERSCHMIDT.