

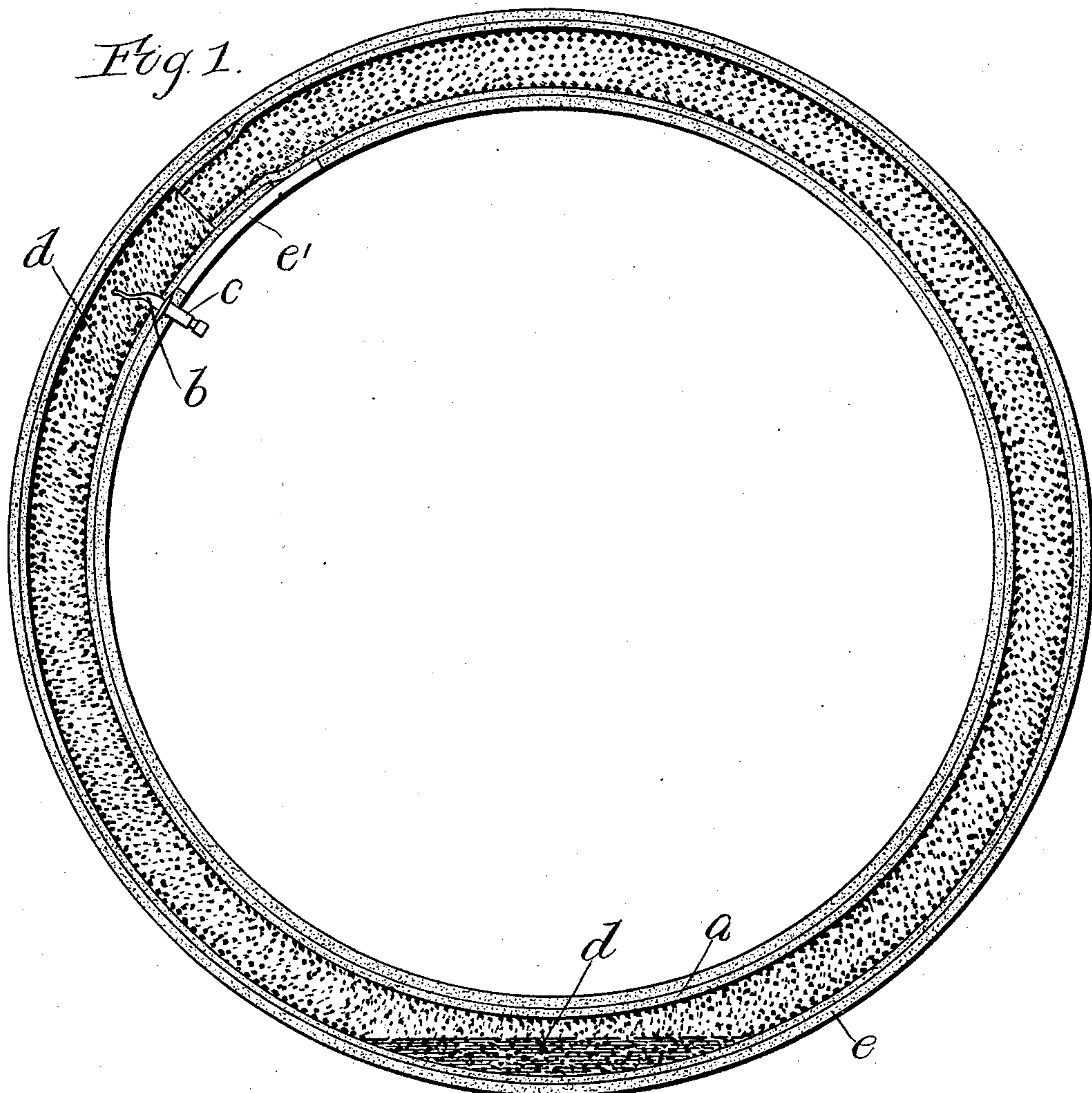
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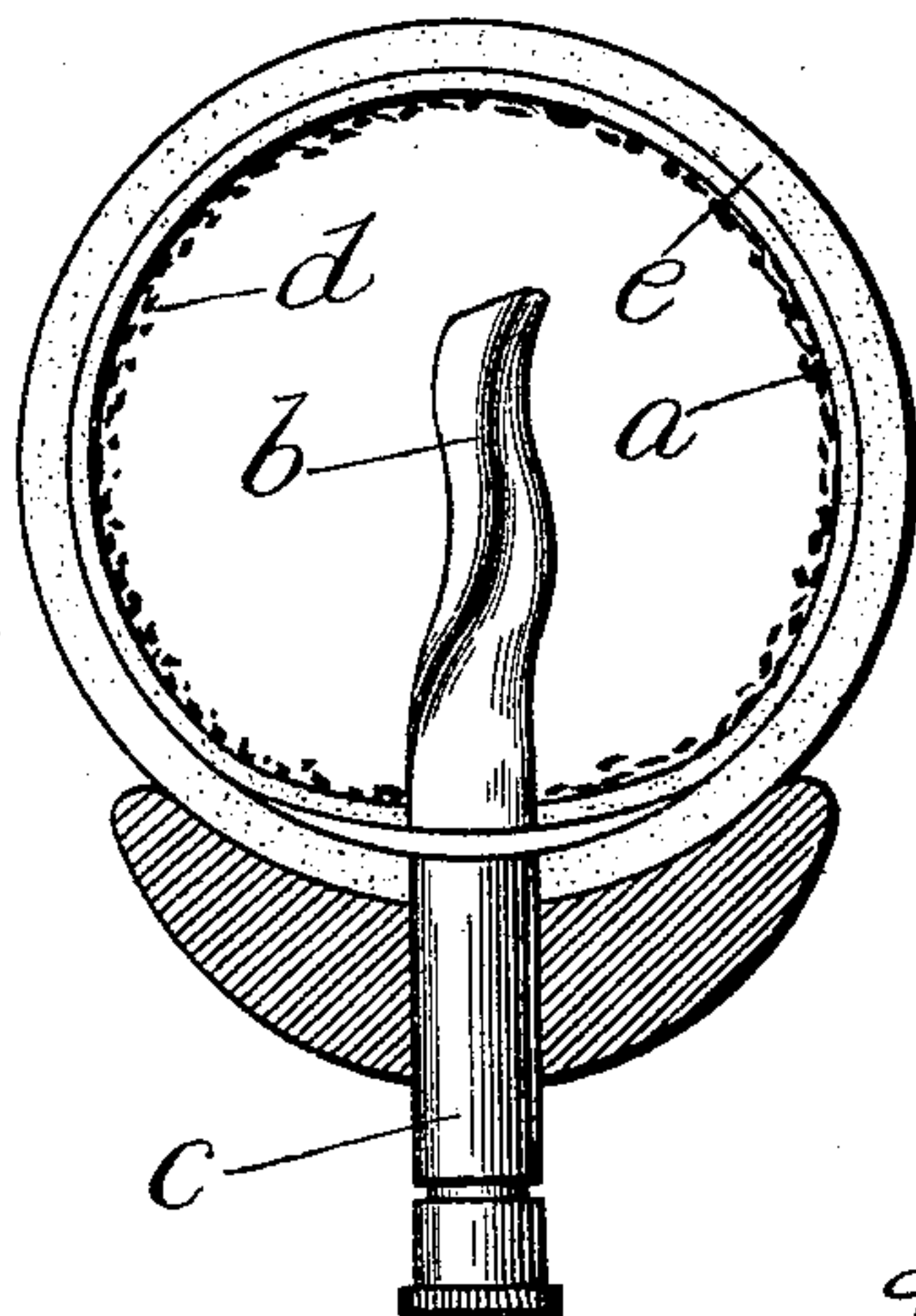
A. H. CROCKFORD.  
PNEUMATIC TIRE.

No. 587,075.

Patented July 27, 1897.



*Fig. 3.*



Witnesses  
A. F. Durand.  
A. Miller Belfield

Inventor:  
Alfred H. Crockford  
by Chas. F. Page, Atty.

(No Model.)

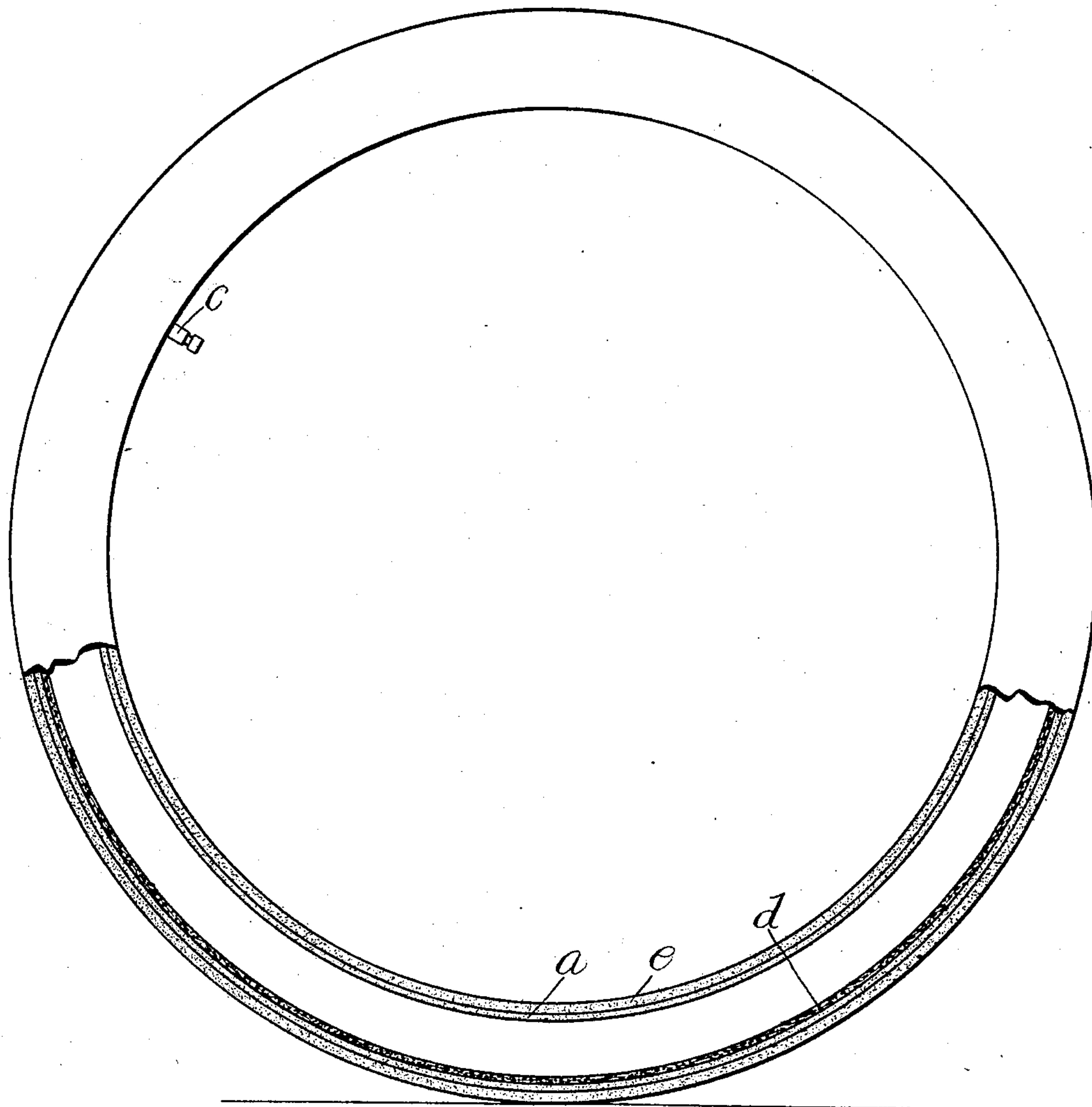
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*Fig. 2.*



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# UNITED STATES PATENT OFFICE.

ALFRED H. CROCKFORD, OF DARTFORD, ENGLAND.

## PNEUMATIC TIRE.

SPECIFICATION forming part of Letters Patent No. 587,075, dated July 27, 1897.

Application filed March 13, 1896. Serial No. 583,271. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED HENRY CROCKFORD, engineer, a citizen of the United States of America, residing at Dartford, England, have invented certain new and useful Improvements in Pneumatic Tires, of which the following is a specification.

My invention relates to pneumatic tires of the kind or class known as "self-healing" tires for the wheels of bicycles, tricycles and other vehicles; and its chief object is to insure more effectually than heretofore the fluid-tightness of the inner or air tubes of such tires.

In the accompanying drawings, Figure 1 is a central longitudinal vertical section of my improved tire. Fig. 2 is a side elevation of the same, partly in vertical section, showing the conditions existing while in motion. Fig. 3 is a vertical section through a portion of the air-tube at the valve.

Attempts have heretofore been made to attain the desired end by introducing materials of certain kinds into pneumatic tires with the object of sealing any punctures that may be made therein, but so far as I am aware no material has yet been proposed which will satisfactorily accomplish the desired result.

My invention consists in the combination, with the air-chamber of a pneumatic tire, of a suitable quantity of bran mixed with water or other suitable liquid in or about in the proportions hereinafter specified.

I have discovered that bran, when mixed with water or other suitable liquid, is well adapted for the purpose of my invention, as it is light, will not dissolve in the water, and contains a proportion of gluten or adhesive matter, which causes the pieces to adhere to some extent to each other and to the interior surface of the air-tube without preventing their being carried around with the water. Moreover, while the wheel is in motion the water serves to moisten the bran and thus improve its action in closing the pores or punctures and also to carry or sweep the bran around the interior of the said tube and insure the efficient distribution thereof, under the action of the centrifugal force, over the inner surface of the tread portion of the said tube. I sometimes mix a small quantity of

size or similar glutinous substance with the water which I force into the said tube.

I find it advantageous to introduce into the air-tube about one-half pint to one pint of bran, and a sufficient quantity of water or other suitable liquid should be forced into the same to prevent the accumulation of the bran at any one part of the tube. I find that with the quantity of bran above stated about half a pint of water is enough for the purpose.

It is well known that when ordinary pneumatic tires are inflated the internal air-pressure diminishes in a longer or shorter space of time, either by reason of the porosity of the rubber of which the tube is made and the consequent gradual escape of the air through the same, or by reason of the slow leakage of the air through small or fine punctures therein the existence and location of which it is not easy to ascertain or determine, or by reason of slow leakage at or around the valve. Moreover, when the tire is in use it is liable to be punctured by contact with sharp objects on the road in such a manner that it will collapse and must be repaired before it can be again inflated. By my invention I overcome these difficulties and provide a pneumatic tire which when once inflated will not lose its internal pressure unless the valve is opened for the purpose of deflating it or a puncture or cut of unusually large dimensions is made in the tire, the pores of the rubber being completely closed in my tire by the moistened bran, which also serves to automatically close punctures which would render any ordinary tire useless until repaired and effects this result so rapidly and effectively as not to permit the accidental deflation of the tire.

In making a tire according to my said invention I find it advantageous to fit a piece of flexible rubber tubing on a projecting piece or nozzle formed on the inner end of the pipe forming the body of the air-inlet valve, which piece of tubing is of such length as to extend to about the center of the air-space of the inner or air tube of the tire. This piece of tubing being flexible will not be liable to injure the air-tube should the latter be pressed down upon the end of it. Into the inner or air tube so constructed I introduce a suitable quantity of the bran, preferably before joining the ends



of the said tube to form the endless tube. I then, either before or after the outer cover or sheath has been applied, force in through the valve, by means of a pump or inflator, a  
5 suitable quantity of water or suitable liquid to mix with and moisten the bran and insure the distribution thereof through the said tube while the wheel is rotating.

Any suitable sheath or cover can be used  
10 with the inner tube thus made.

When I make my tire with an endless tubular sheath or cover, as above described, I thread the inner tube through the slit thereof, then introduce the bran and unite the ends of  
15 the tube to form an endless tube, and then close the slit in the sheath or cover and force in the water or other liquid.

In the accompanying drawings, *a* is the air-tube.

20 *b* is the flexible rubber tube fitted upon the valve-tube *c*.

*d* indicates the bran and water, which while the wheel is in motion are thrown outward by centrifugal force, as shown in Fig. 2.

25 *e* is the endless tubular cover or sheath, which is made with a slit *e'* to permit the insertion of the inner tube *a* and the joining of the ends thereof.

My improved air-tube can be used with  
30 any suitable form of outer cover or sheath, or my improvements can be applied to a one-tube or "hose-pipe" tire.

Although I prefer that the air-tube should be endless, my improvements are also appli-  
35 cable to tires in which the inflatable tube is closed at both ends.

Since my improved air-tube is much less liable than those hitherto made to be punctured in such a manner as to require removal  
40 or withdrawal for repairs, I can, if desired, in cases where an endless tubular sheath is employed, join the two ends of the air-tube, after it has been drawn into said sheath, through the slit therein, so as to form an end-  
45 less air-tube in said endless tubular sheath.

I am aware that it has been heretofore proposed to insert in the air-chamber of a tire small pieces of oiled silk, rubber-coated fabric, sheet india-rubber, and like materials,

but such materials differ very greatly in 50 character from bran and will not fulfil the same functions as the bran. It has also been proposed to introduce into the tire with the said small pieces of oiled silk or like materials some lubricating substance—such, for 55 instance, as glycerin and water—but such lubricating substance was used only to coat the interior surface of the air-chamber and not, as the water is used in my improved tire, to moisten the inclosed material and 60 sweep it around the air-chamber, so as to properly distribute it throughout the interior thereof. I am also aware that it has been heretofore proposed to stuff a tire with bran to deaden the noise arising from a special 65 construction of rim or felly; but I am not aware that it has ever been proposed prior to the date of my invention to introduce into the air-chamber of the tire bran mixed with a liquid, such as water, in such quantities or 70 proportions that when the wheel is rotated the bran will be carried around and distributed by the water, so that a puncture occurring at any point in the circumference of the tire will be closed by the bran. Moreover, 75 bran has certain inherent qualities or properties which peculiarly adapt it, when properly moistened with water, for the purpose of stopping or closing punctures in pneumatic tires. 80

What I claim is—

The combination, with the air-tube of a pneumatic tire of a mixture of bran with a liquid such as water contained in the said air-tube, the bran and liquid being mixed in 85 the proper proportions to sufficiently moisten the bran and to sweep the same around and distribute it throughout said tube while the wheel is in motion, substantially as heretofore described. 90

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

A. H. CROCKFORD.

Witnesses:

JOHN T. KNOWLES,  
HENRY W. LYNDEN.