No. 875,351.

PATENTED DEC. 31, 1907.

I. W. HODGSON.

RESILIENT TIRE.

APPLICATION FILED FEB. 25, 1907.

2 SHEETS—SHEET 1.

Fig. 1

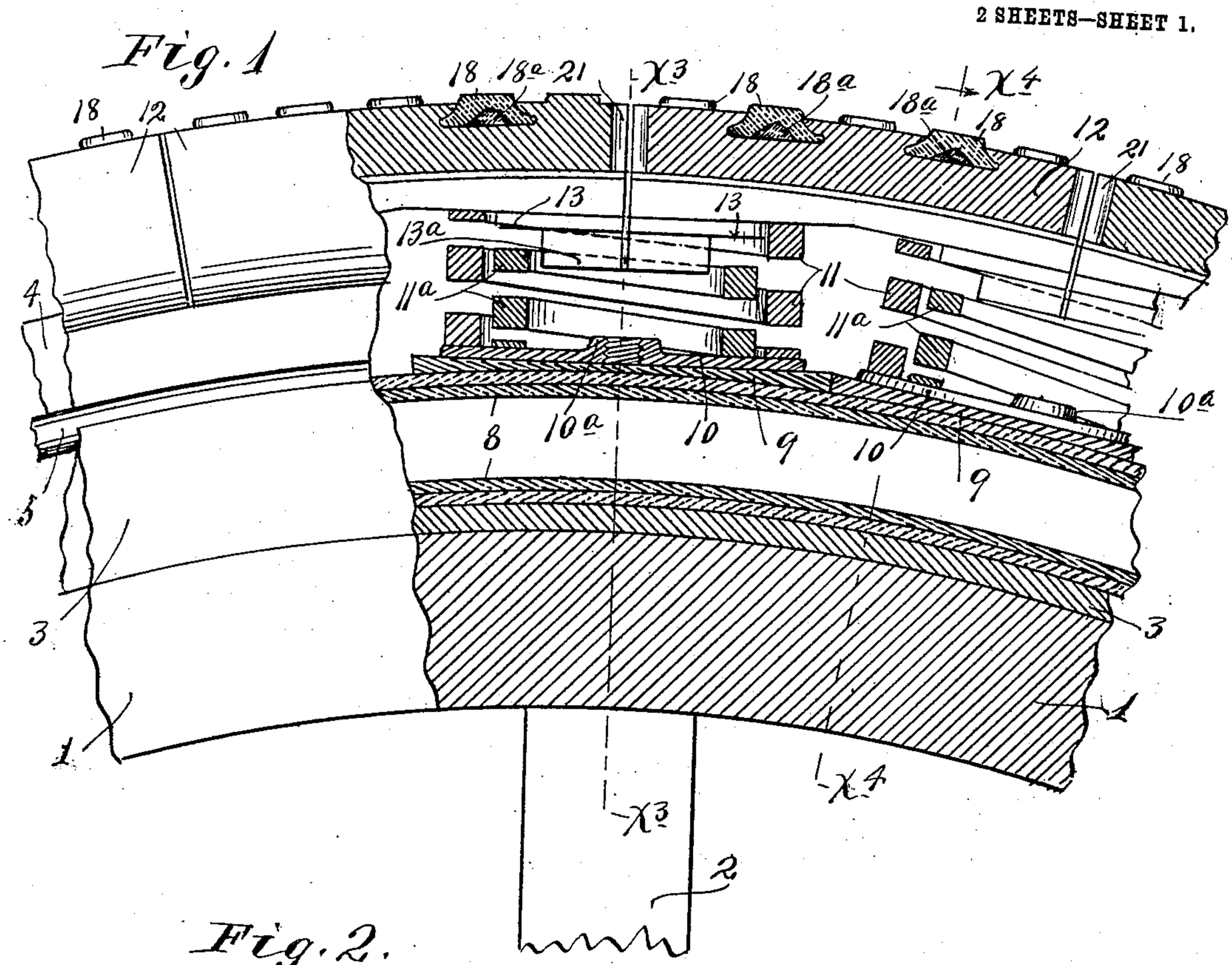
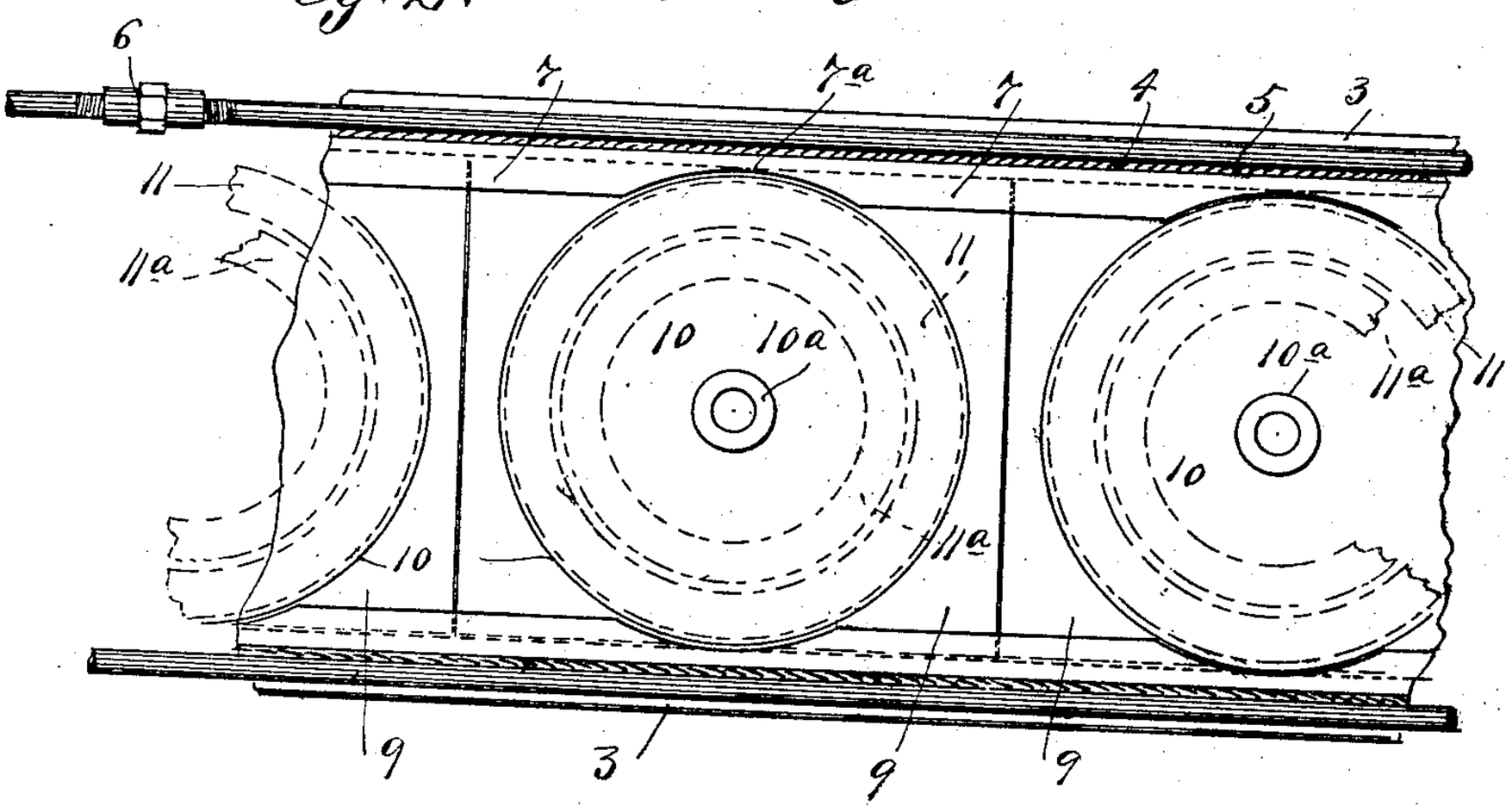


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 5.

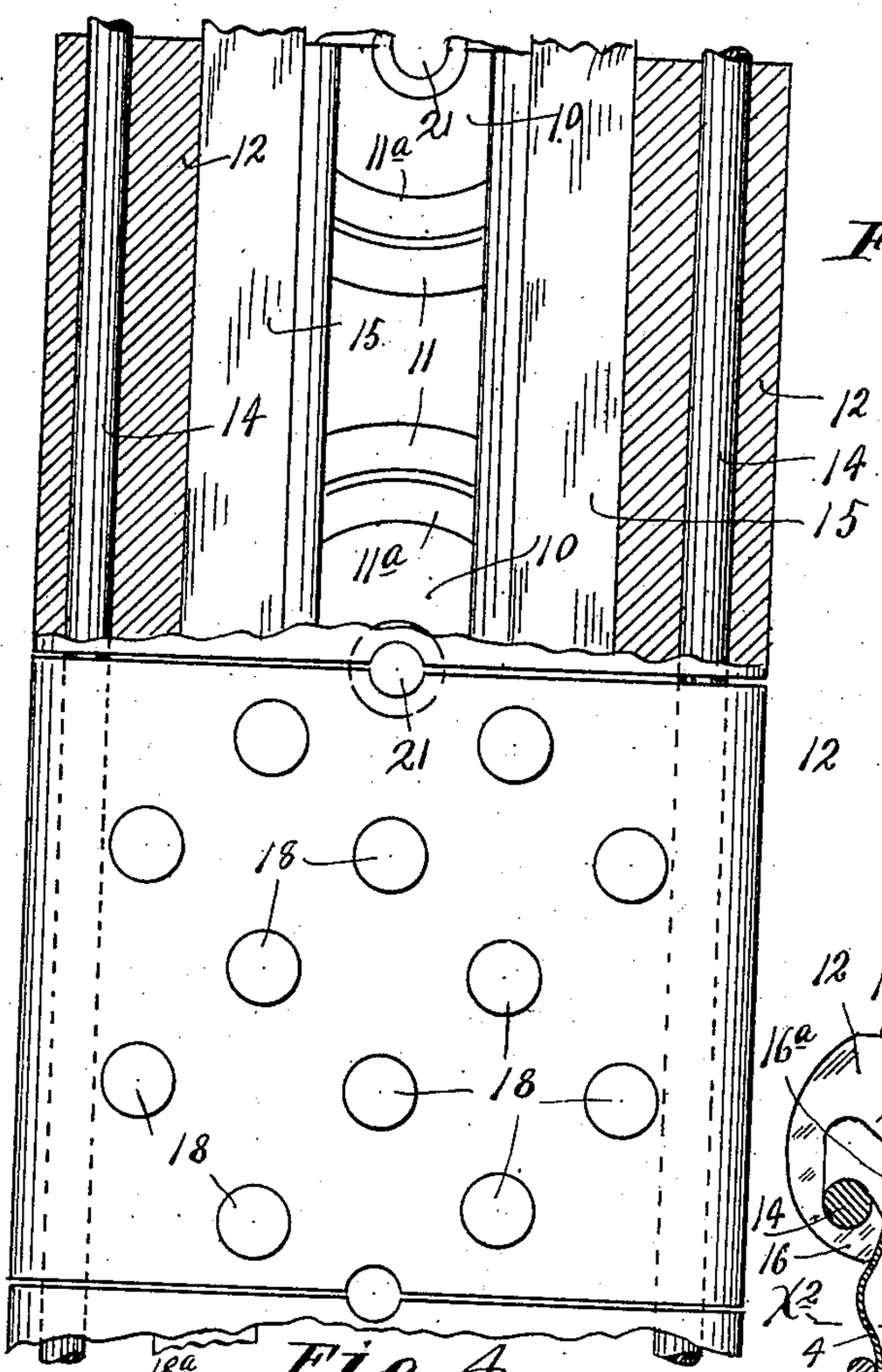


Fig. 3.

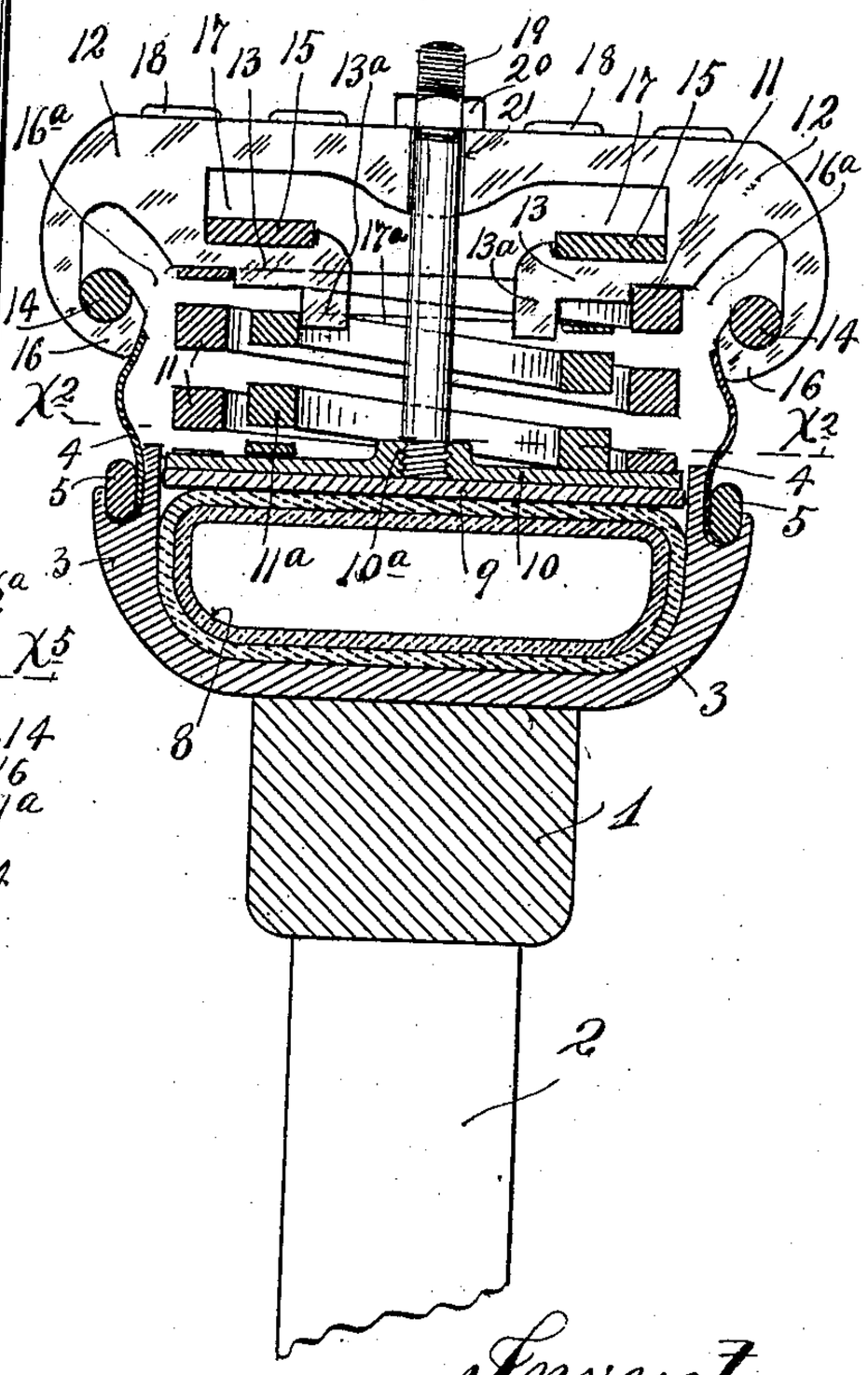
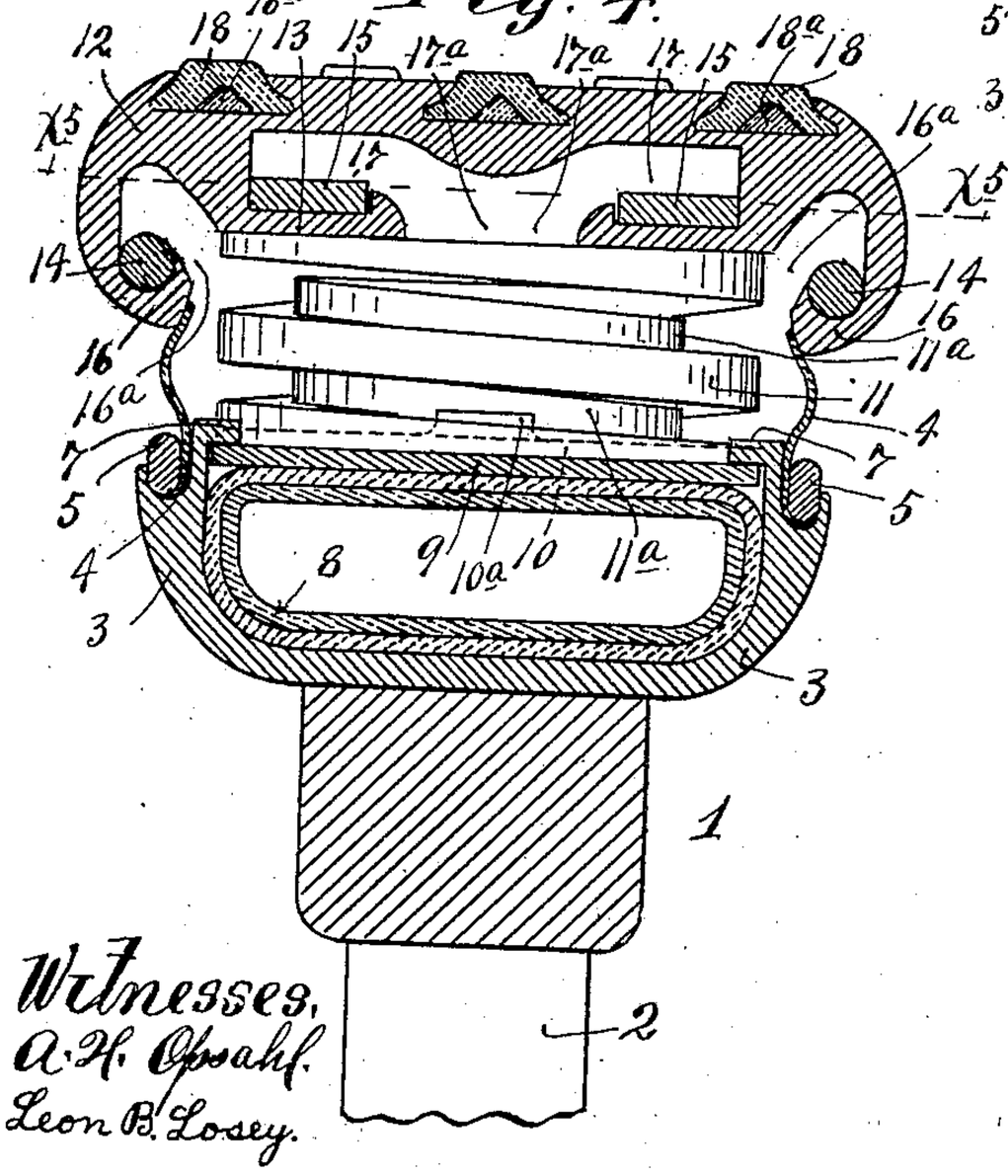


Fig. 4.



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UNITED STATES PATENT OFFICE.

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RESILIENT TIRE.

No. 875,351. Specification of Letters Patent. Patented Dec. 31, 1907.

Application filed February 25, 1907. Serial No. 359,047.

To all whom it may concern:

Be it known that I, ISAAC WALTER HODGSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Resilient Tires; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to resilient tires, such as required for use in automobile wheels, and has for its object to improve the same in point of efficiency, durability and cost of maintenance.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view partly in side elevation and partly in vertical section, showing a portion of a wheel rim and a portion of my improved tire. Fig. 2 is a detail in section taken approximately on the line x^2 x^2 of Fig. 3, some parts being broken away and some parts being indicated by dotted lines only. Fig. 3 is a transverse vertical section taken on the line x^3 x^3 of Fig. 1. Fig. 4 is a transverse vertical section taken approximately on the line x^4 x^4 of Fig. 1; and Fig. 5 is a fragmentary view, partly in plan and partly in horizontal section on the line x^5 x^5 of Fig. 4.

Of the parts of the wheel shown, the numeral 1 indicates the felly, the numeral 2 the spokes. To the outer portion of the felly 1 is rigidly secured an annular metallic rim 3, which is channel-shaped in cross section and is formed in the outer edges of its flanges with annular seats adapted to receive the inner edges of thin metal guard plates 4 of annular form, and also receive plate clamping hoops or annular rods 5. The hoops 5 are sectioned and at their ends are threaded and adjustably connected by a sleeve-like turn buckle 6 which adapt them to be tightly drawn into the grooves of the rim 3, to thereby firmly secure the spring metal guard plates 4 in working positions. The out-turned flanges of the rim 3, at their outer edges, are provided with inwardly extended stop ribs 7 that are formed at suitable intervals with segmental notches 7^a, the purpose of which will presently appear.

The tire herein illustrated is especially designed to meet the requirements of very heavy service, and in this preferred form it comprises a multiplicity of yieldingly connected tread sections, a pneumatic tube seated in the wheel rim, and a multiplicity of coiled springs interposed between the tread sections and the said pneumatic tube. For lighter service and, in fact, what may be designated as the average service, the pneumatic tube may be dispensed with and the springs made to react directly or through rigid parts against the wheel rim.

Describing the construction as illustrated, the numeral 8 indicates the pneumatic tube which is placed within the channel shaped rim 3. This tire is confined within the said rim by a multiplicity of so-called cage plates 9, the outward movements of which are limited by the in-turned stop ribs 7 of the rim 3. These cage plates 9 extend completely around the rim and completely cage the tire within the rim. When the tire is deflated, these plates 9 may be easliy placed in working position or removed. When the tire is inflated, it is tightly pressed against the rim 3 and against the cage plates 9, and its expanding movement is limited, so that the force of the air in the tire is resisted by the rim 3 and plates 9, thereby very greatly relieving the pneumatic tube from tensile strain.

Seated on each cage plate 9 is a spring base plate 10 that fits loosely within the alined notches 7^a of the stop rib 7. Seated on each spring base 10 is a multi-coil spring made up of a main section 11 and supplemental section 11^a. The main spring 11 is longer than the supplemental spring 11^a.

The yieldingly connected tread sections 12 are in number equal to the number of multi-coil springs and, hence, also equal in number to the number of base plates 10, but they are set to lap joints with the said base plates 10, and so that the joints between the said sections are located in axial alinement with the respective springs. These tread sections 12 are, of course, of metal, and they may be made either of cast steel, malleable iron, or of drop forged steel or iron. The main springs 11 are normally compressed between the respective base plates 10 and the abut-

ting ends of two tread sections 12, and at their abutting ends the said tread sections are formed with segmental bosses 13, that telescope into the outer ends of the alined main springs 11, and they are also preferably formed with concentrically located smaller segmental bosses 13ª that telescope into the outer ends of the supplemental springs 11ª. These bosses 13 and 13ª hold the springs 11 and 11ª in proper concentric positions, and as each spring embraces the segmental bosses of two adjacent tread sections, the said springs are caused to assist in locking the tread sections together against endwise separation, and the said bosses, as is evident, keep the outer ends of the springs properly spaced apart.

The tread sections are yieldingly connected and the outward thrust of the springs is resisted preferably by two pairs of endless thrust hoops or metal bands 14 and 15. The thrust hoops 14 are seated in in-turned hook-like side portions 16 of the tread plates 12, and are adapted to be placed in working position and removed by lateral movements through openings 16ª formed between the ends of the hooks 16 and the bodies of the said tread sections. The thrust hoops 15 are shown as flat in cross section and they are placed within seats 17 formed within the tread sections 12, just above their segmental bosses 13. These hoops are adapted to be removed and placed in working position through central passages 17ª formed between the segmental bosses 13 of the said tread plates. If desired, the hoops 14—15 may be provided with means for adjustment, such, for instance, as the turn buckles 6, shown as applied to the clamping rods or hoops 5. Preferably, each tread section 12 is provided with a multiplicity of rubber calks 18 set into, but projecting from, seats formed in the outer faces thereof, as best shown in Fig. 4.

The outer edges of the guard plates 4 bear frictionally against the inner surfaces of the hook-like side portion 16 of the tread sections, and thus inclose the springs and protect the same from dirt and dust without, however, in any way interfering with the yielding movements of the tread sections.

I also provide simple and efficient means which makes it possible to easily and quickly assemble the springs and tread sections and other parts of the resilient tire. This means comprises a multiplicity of short rods or bolts 19 that are threaded at both ends and provided at one end each with a nut 20. The threaded inner ends of these bolts are adapted to be screwed into threaded hubs 10ª of the spring bases 10, and the outer ends of said bolts are adapted to be passed through holes 21 formed in part in the abutting ends of each of two tread sections. When the bolts are thus applied and the nuts 20 are tightened, the springs may be compressed to any desired extent, so that the thrust hoops 14 and 15 may then be evenly applied in working position or removed therefrom.

When the parts are assembled and the wheel ready for use, the main springs 11 are always under initial compression, but the supplemental springs 11ª are brought into action and compressed only when the cooperating main springs 11 have been compressed far enough to cause the segmental bosses 13 of the tread sections to engage the outer ends of said supplemental springs.

The pneumatic tube when used should be charged with air under such high compression that it will act substantially as a solid base of resistance until the springs have been compressed solid. Otherwise stated, the said pneumatic tube or air cushion is intended to afford a reserved resilience which will be brought into action under extreme pressure and thereby not only prevent breaking of the springs, but give an increased resilience to the tire.

With the arrangement of springs and connections above described, irrespective of the pneumatic cushion, very great resilience is afforded, and the arrangement is such that no one spring can be compressed without compressing to a greater or less extent, a number of springs in both directions from the spring which is subject to the greatest compression. This feature is, of course, of great importance in the practical operation of the tire.

By reference to Figs. 1 and 4 it will be seen that the so-called calks 18 flare or are expanded inward toward their bases, and are formed with internal cavities that are adapted to receive bodies of soft rubber 18ª. In placing these calks in working position within the undercut seats in the metallic tread sections 12, their rims are puckered together and forced into said seats and onto the body of crude or soft rubber 18ª, which latter must, of course, be placed in the pockets in advance of the calks. After they are thus applied, the calks and the rubber filling blocks 18ª are preferably vulcanized to a moderate degree of hardness, so that they will be firmly held in working position.

The so-called thrust hoops, while preferably in the form of spring rods, may, nevertheless, take many different forms, and might be in the form of a wire cable or link chain. Their primary function is to resist the outward pressure of the springs and to yieldingly connect the tread sections.

What I claim is:

1. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of yieldingly connected tread sections, and springs interposed between said rim and tread sections arranged to overlap the joints

between the tread sections, and having interlocking engagement at their outer ends with the adjacent ends of said tread sections, substantially as described.

2. In a resilient tire, the combination with a rim, a tread made up of a multiplicity of metallic tread sections, a thrust hoop yieldingly connecting the said tread sections, and coiled springs interposed between said rim and tread, the outer ends of which springs overlap joints between the tread sections, and which tread sections are provided at their abutting ends with supplemental bosses that telescope into the said springs, substantially as described.

3. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of yieldingly connected metallic sections, and multi-coil springs interposed between said rim and the tread sections, the main coils of which springs are under initial compression, and the supplemental coils of which are arranged to be compressed only after said tread sections have been given forced inward movement, substantially as described.

4. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of yieldingly connected metallic tread sections having projecting supplemental bosses at their abutting ends, and multi-coil springs interposed between said rim and the said tread sections, and into the outer ends of the coils of which the supplemental bosses of said tread sections are telescoped, substantially as described.

5. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of metallic tread sections, laterally spaced thrust hoops engaging laterally open seats in the sides of the said tread sections, springs interposed between said rim and the tread sections, and holding said thrust hoops interlocked with the open seats of said tread sections, and annular guard plates locked to the side flanges of said rim and frictionally engaging the seat forming side portions of said tread sections, substantially as described.

6. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of yieldingly connected metallic sections, springs interposed between said rim and tread sections, annular guard plates seated in the grooves in the side flanges of said rim, and frictionally engaging the side portions of said tread sections, and endwise adjustable annular clamping rods or bands also seated in the grooves of said rim and holding the said guard plates interlocked therewith, substantially as described.

7. In a resilient tire, the combination with a rim, of a tread made up of a multiplicity of yieldingly connected tread sections, spring base plates seated in said rim, coiled springs interposed between said base plates and tread sections, and means for drawing the said base plates outward or toward said tread sections, and against the tension of the said springs, for the purpose of applying and removal of the tread and springs to and from said rim, substantially as described.

8. In a resilient tire, the combination with a channel-shaped rim, of a tread made up of a multiplicity of metal sections, means detachably interlocked with said tread sections and yieldingly connecting the same, base plates seated in said rim, coiled springs interposed between said base plates and tread sections, and draw bolts detachably securable to said base plates at their inner ends and provided with nuts at their outer ends arranged to react against said tread sections, to thereby draw the said base plates outward and compress the springs, for the purpose of applying and removal of the tread and springs to and from said rim, substantially as described.

9. In a resilient tire, the combination with a channel-shaped rim, of a pneumatic tube seated in the channel of said rim, spring base plates also seated in the channel of said rim and engaging the outer portion of said pneumatic tube, a tread made up of a multiplicity of yieldingly connected metallic sections, and coiled springs interposed between said base plates and tread sections, substantially as described.

10. In a resilient tire, the combination with a channel-shaped rim having lock ribs extended inwardly from its flanges, of a tread made up of a multiplicity of yieldingly connected metallic sections, a pneumatic tube seated in the channel of said rim, cage plates engaging the said pneumatic tubes and held in the channel of said rim by the inturned lock ribs thereof, spring bases loosely seated on said cage plates, and coiled springs interposed between said spring bases and the said tread sections, substantially as described.

11. In a resilient tire, the combination with a tread made up of a multiplicity of yieldingly connected tread sections, radially disposed coiled springs overlapping the joints between the tread sections and having interlocking engagement therewith at their outer ends, and means operative on the inner ends of said springs and on said tread sections, for compressing said springs, whereby when the said springs are compressed the tire may be applied to a wheel or removed therefrom, and the said tread sections will be held coupled together, substantially as described.

12. In a resilient tire, the combination with a tread made up of a multiplicity of yieldingly connected tread sections, radially disposed coiled springs overlapping the joints between said tread sections and having interlocking engagement therewith at their outer ends, base plates applied to the inner ends of said springs, and draw bolts detachably applicable to said base plates and tread sec-

tions, for drawing said base plates toward said tread sections and thereby compressing said springs, so that the tire may be applied to or removed from a wheel and the said tread sections will be held coupled together when the said tire is removed, substantially as described.

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

ISAAC WALTER HODGSON.

Witnesses:
MALIE HOEL,
F. D. MERCHANT.