W. N. AMORY.

SHOCK ABSORBER FOR VEHICLES.

APPLICATION FILED MAY 9, 1918.

1,334,428. Patented Mar. 23, 1920.

4 SHEETS—SHEET 1.

Fig. 1.

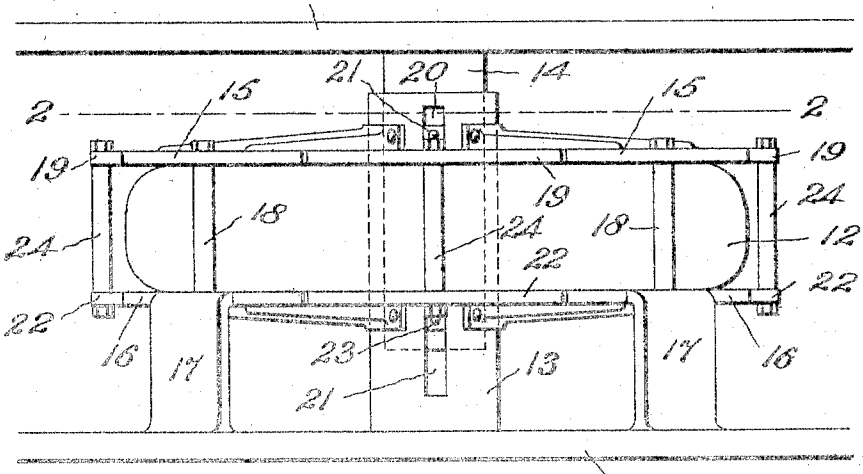
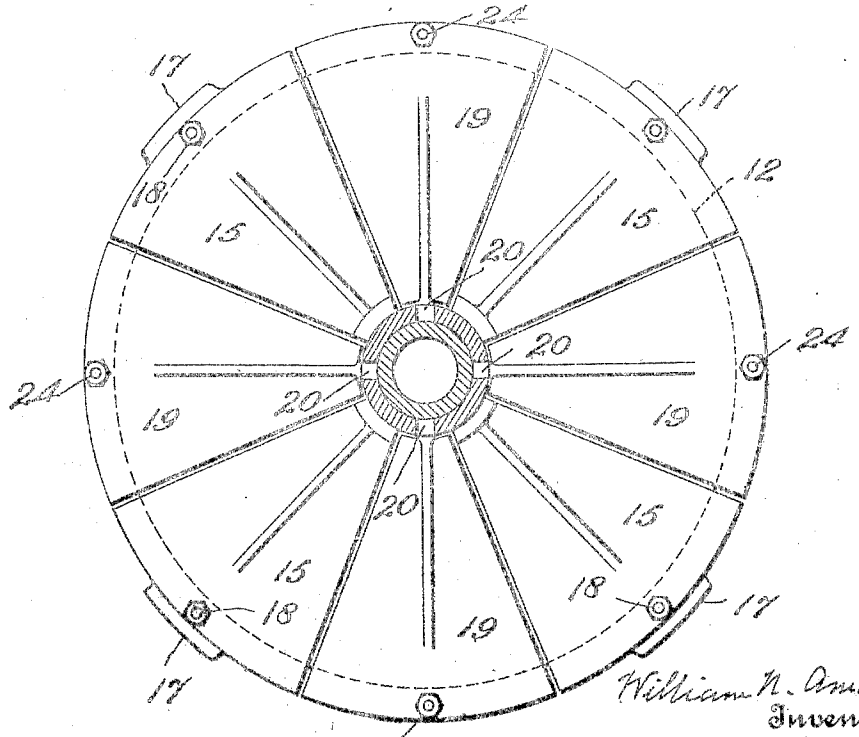


Fig. 2.



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4 SHEETS—SHEET 2.

Fig. 3.

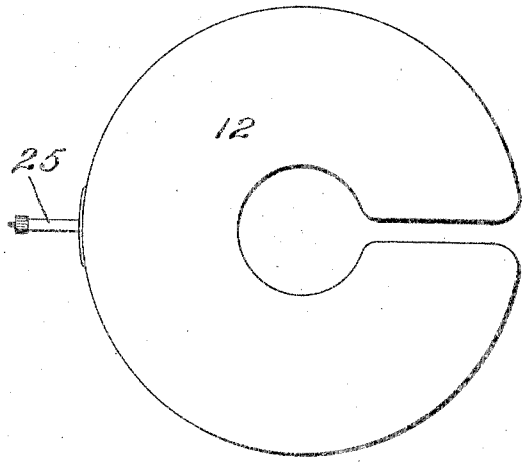


Fig. 4.

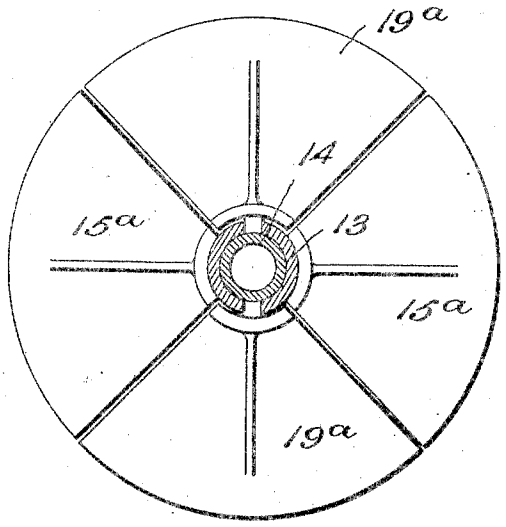
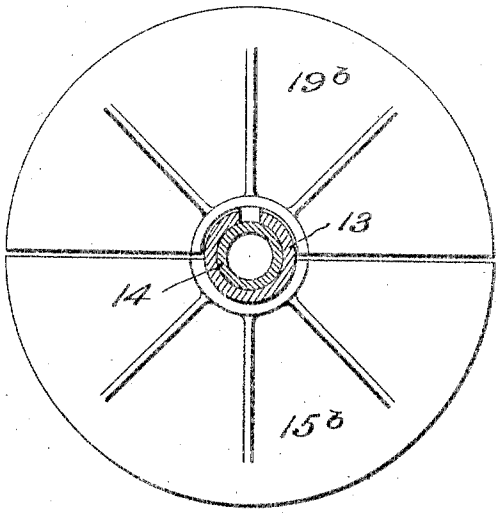


Fig. 5.



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4 SHEETS—SHEET 3.

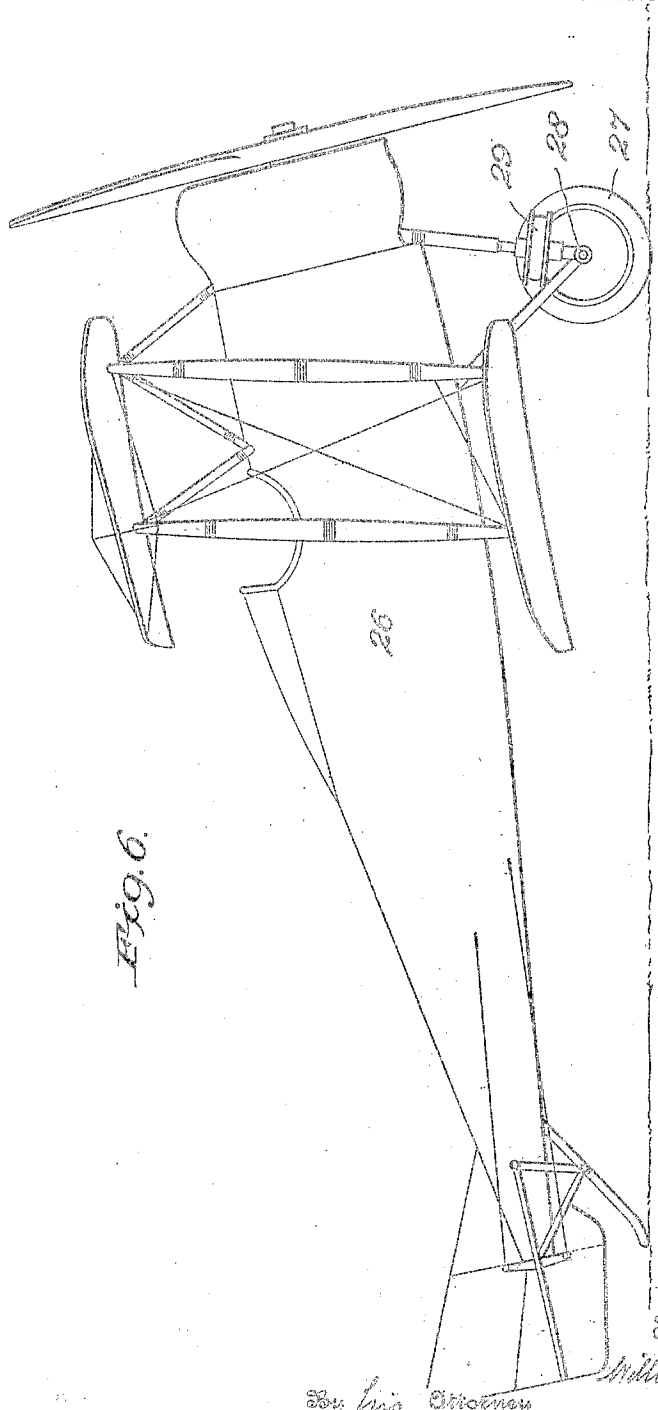


Fig. 6.

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4 SHEETS—SHEET 4.

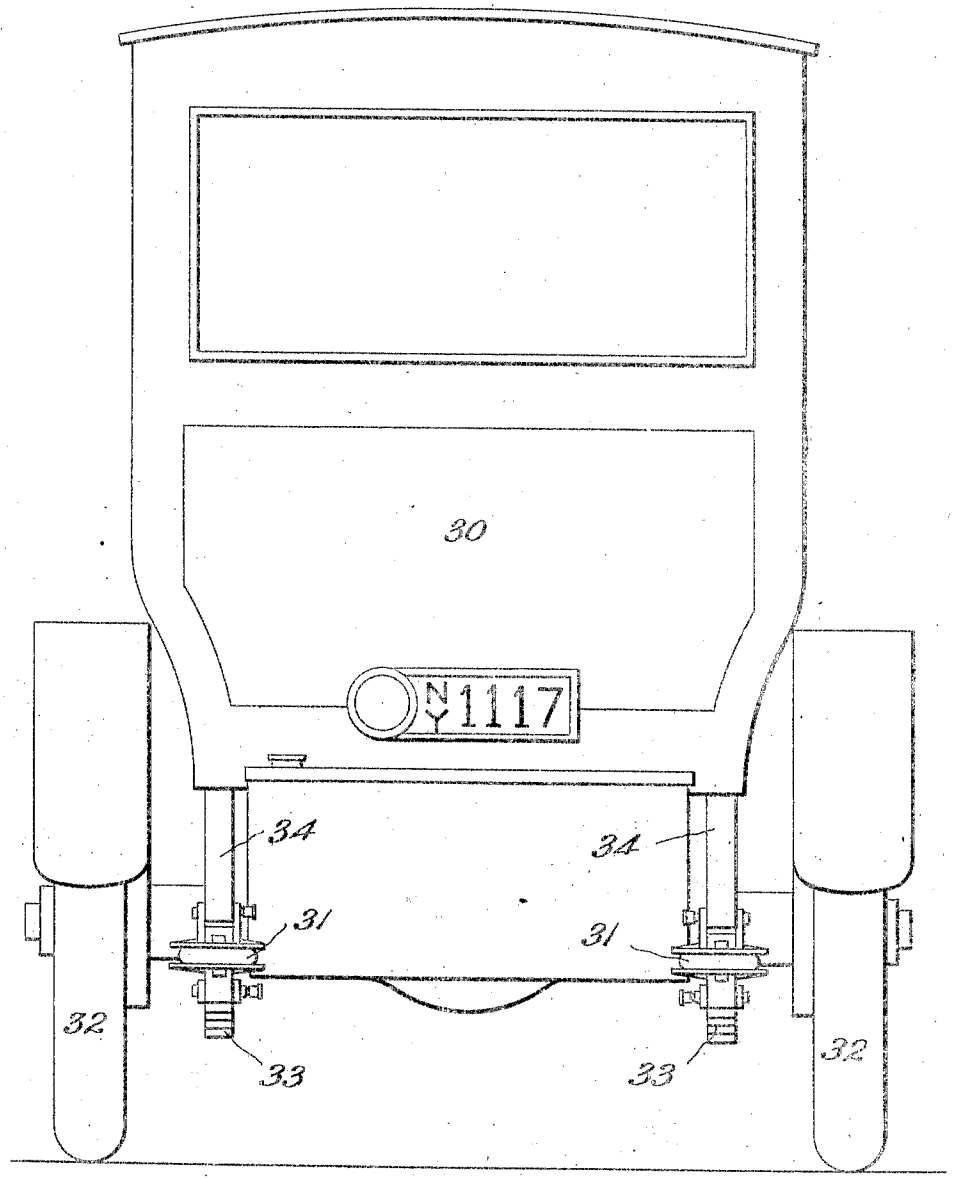


Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIAM N. AMORY, OF NEW YORK, N. Y.

SHOCK-ABSORBER FOR VEHICLES.

1,334,428. Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed May 9, 1918. Serial No. 233,420.

To all whom it may concern:

Be it known that I, WILLIAM N. AMORY, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Shock-Absorbers for Vehicles; 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 present invention relates to an improved and novel construction for use upon aeroplanes, automobiles and, indeed, vehicles of all kinds, whereby shocks and vibrations due to travel over rough surfaces are absorbed or dissipated. In its application to aeroplanes, my improvement successfully relieves the aviator from the shock incident to landing, or at least greatly lessens its effect.

It is a valuable characteristic of my present invention that it serves to resist both the primary upward blows or thrusts due to rough roads and the secondary shock due to rebound and exerted in the opposite direction. Furthermore, I accomplish this by the use of a single pneumatic cushion with resilient walls arranged to yield horizontally, or at right angles to the direction of impact.

My invention is illustrated in a preferred form in the accompanying drawings, wherein Figure 1 is an elevation of one shock-absorbing unit, Fig. 2 is a plan view partly in section on the line 2—2 of Fig. 1, Fig. 3 is a plan view of a preferred form of cushion, Figs. 4 and 5 are plan views of modified forms of shock-absorbing units, Fig. 6 is a side elevation of an aeroplane as equipped with my invention and Fig. 7 is a rear elevation of an automobile furnished with my shock absorbers.

My improvement comprises a single pneumatic cushion which is arranged to resist the pressure of two pairs of compression plates fixed respectively to the vehicle body on the one hand and to the truck, chassis, axle or other lower member on the other hand. These compression plates are alternately arranged and move past each other as the body of the vehicle swings up and down with relation to the lower or wheel carrying member. My improved shock-absorbing unit may be associated more or less directly with the usual supporting springs or with auxiliary movable parts already familiar in the art of vehicle construction, and I have therefore not limited myself in this regard to any particular location of my cushion, and shall describe and claim it in connection with a "body member" and a "lower member", broadly so described.

In Fig. 1 the "body member" is indicated at 10 and may be of any convenient construction, while any suitable "lower member" is indicated at 11. The shock-absorbing cushion 12 is brought into play between these members preferably by the following means.

Fixed to the lower member 11 is an upwardly extending tube 13 within which plays a sliding spindle 14, preferably also tubular, which is fixed to the body member 10. Four compression plates 15 are firmly fixed to the tube 13 near its upper end and are arranged to radiate symmetrically therefrom, while directly below these are four similar plates 16 (two of which appear in Fig. 1) which are fixed to the tube 13 nearer its lower end. The outer ends of the lower plates 16 are provided with legs 17 which unite them with the lower member and serve greatly to strengthen them. I prefer also to unite the upper plates 15 with the plates 16 at the outer ends of both by means of pins 18 for purposes of greater strength.

The spaces between the upper radiating plates 15 are occupied by four similar plates 19 which lie normally in the same plane with the plates 15. These plates are fixed to the inner spindle 14 by means of ribs 20 passing through four slots 21 in the tube 13.

Normally in the same plane with the lower plates 16 and occupying the spaces between them directly under the plates 19 are four radiating compression plates 22; and these are also united to the spindle 14 by ribs 23 passing through the slots 21. For purposes of increased strength I prefer to unite the upper plates 19 to the lower plates 22 by pins 24, as shown in Fig. 1.

Between the upper series of relatively movable plates 15, 19, and the lower series 16, 22, I insert a stout inflatable pneumatic cushion 12, preferably of the construction shown in Fig. 3, so made in order to permit its ready insertion between the plates when deflated. After such insertion it is inflated by means of the usual valved tube 25.

The operation of my improved device will now be quite clear. As the vehicle body

tends to sway up and down in response to the rapidly repeated shocks of travel, the pair of compression plates 19 and 22, which are fixed to the spindle 14 and through it to the vehicle body, act to squeeze the cushion 12, first against the lower plates 16, fixed to the tube 13, and the lower member 11; and then, on the rebound, to compress it against the upper plates 15, also fixed to the tube 13.

It will thus be seen that by my invention, a single cushion is made to take up, absorb or suppress vibratory shocks in both directions.

It is clear that the principle of my invention may be embodied in other and modified forms or constructions. For instance, instead of eight plate-sections in each plane I may use any convenient number. In Fig. 4 is shown a structure in which the outer tube 13 carries only two upper plates 15^a (corresponding, of course, to similar lower plates) and wherein the spindle 14 carries only two plates 19^a (with similar lower plates, not shown).

In Fig. 5 there is shown only one upper plate 15^b, fixed to the tube 13 and one upper plate 19^b, fixed to the spindle 14.

My shock absorbing unit may be applied to vehicles in a variety of ways, but I prefer to provide a separate unit in association with each wheel of the vehicle, as shown in Figs. 6 and 7.

In Fig. 6, the body of an aeroplane is shown at 26, and one of the two usual wheels is shown at 27. Here there is provided a separate unit of the character above described near each end of the axle 28, and I have indicated one of these units as a whole at 29.

In Fig. 7, the body of an automobile is shown generally at 30 and a separate shock-absorbing unit 31 is provided for each wheel 32 of the vehicle. In the modification shown in Fig. 7, the lower member is the spring 33 and the upper member is, in each case, a bar 34.

The advantage of supplying a separate shock-absorbing unit at or near each wheel is found in the fact that a perfect equalization of action is assured, and each wheel is free to respond to the particular inequalities which it meets, without respect to those affecting other wheels.

What I claim is:—

1. In combination with the body member and the lower member of a vehicle, a shock absorbing unit comprising a single pneumatic cushion with resilient walls free to expand in every horizontal direction, and means attached to said body member and lower member, respectively, adapted to exert pressure upon said cushion from above and below alternately.

2. Apparatus of the character set forth generally in claim 1 hereof, wherein the cushion is substantially of toric form, and is free to expand horizontally both within and without the toric circle.

3. Apparatus of the character set forth generally in claim 1 hereof, wherein the lower member carries a tubular element having a longitudinal slot while the body member carries a spindle playing in said tubular element, and wherein a pair of plates is fixed on said tubular member and a pair of plates is fastened to said spindle by means of ribs passing through said slot.

4. In apparatus of the general character set forth, a tube having radiating plates fixed thereon and provided with slots, a spindle playing in said tube, and radiating plates occupying the spaces between said first named plates and fixed to said spindle by means passing through said slots.

5. Apparatus of the character set forth in claim 3 hereof, wherein the cushion is in the form of an interrupted torus whereby the same may be easily introduced into place between the pressure plates while undistended.

6. In combination with the body member and the lower member of a vehicle, a shock absorbing unit comprising a single horizontally distendible pneumatic cushion, pressure plates on opposite sides of the cushion connected with the lower member, a second connected set of pressure plates on opposite sides of the cushion, and means for conveying the weight of the body member of the vehicle to the upper plates of said second set.

In testimony whereof I affix my signature.

W. N. AMORY.