

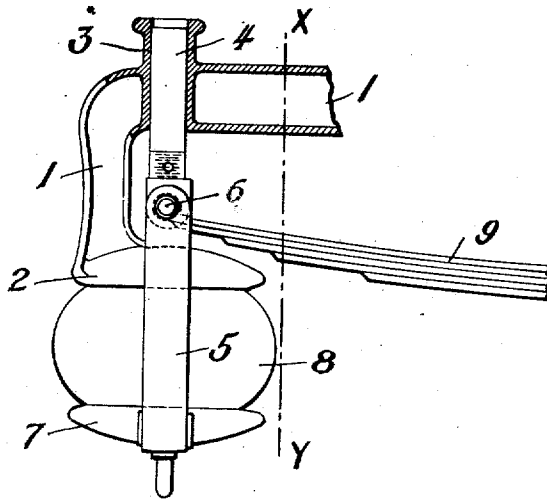
L. HARRIS.
 SPRING SUSPENSION FOR ROAD VEHICLES.
 APPLICATION FILED JUNE 17, 1911.

1,021,251.

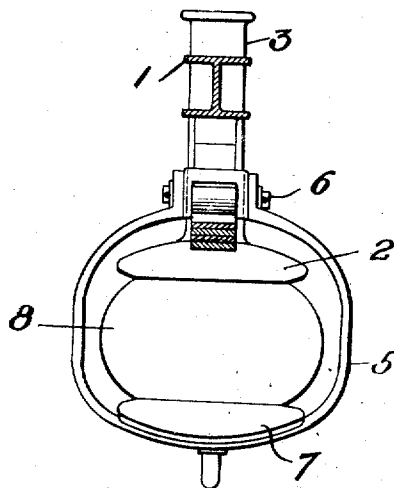
Patented Mar. 26, 1912.

3 SHEETS—SHEET 1.

— *FIG. 1.* —



— *FIG. 2* —



Witnesses.

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C. Walker

Inventor:

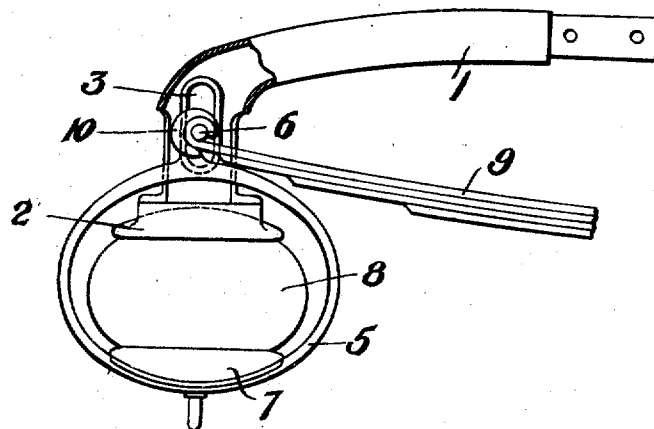
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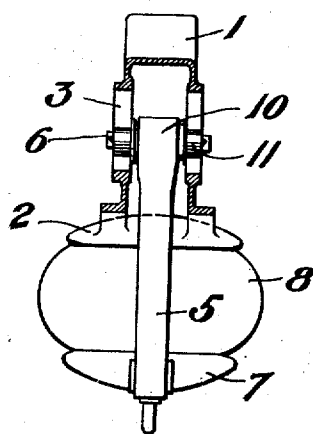
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 3 SHEETS—SHEET 2.

— Fig. 3. —



— Fig. 4. —



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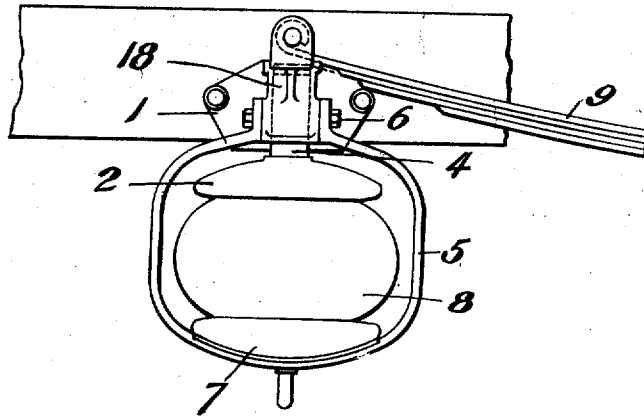
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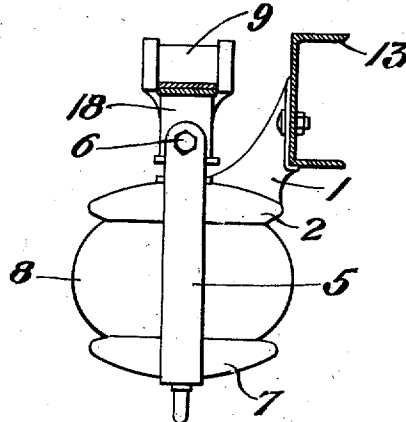
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3 SHEETS—SHEET 3.

— *FIG. 5.* —



— *FIG. 6.* —



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UNITED STATES PATENT OFFICE.

LEONARD HARRIS, OF LONDON, ENGLAND.

SPRING SUSPENSION FOR ROAD-VEHICLES.

1,021,251.

Specification of Letters Patent.

Patented Mar. 26, 1912.

Application filed June 17, 1911. Serial No. 634,182.

To all whom it may concern

Be it known that I, LEONARD HARRIS, a subject of the King of Great Britain, residing in London, England, have invented certain new and useful Improvements in Spring Suspension for Road-Vehicles, and of which the following is a specification.

This invention relates to improvements in that known type of elastic suspension for road vehicles in which a resilient buffer or cushion is interposed between an upper abutment carried by the chassis frame of the vehicle and a lower abutment to which the spring of the vehicle is connected. In such forms of elastic suspension devices it has been common to mount the lower abutment upon a member or members rigidly guided in a vertical direction upon the structure of the upper abutment, so that the lower abutment (which might be of cup-shaped form) was only permitted motion in a vertical line coaxial with the upper abutment (which might have an inverted cup-shaped form), and then the vehicle spring has been pivotally connected to the guide member or members proceeding from the lower abutment; and in fact throughout various known constructions of such devices, some portion of the lower abutment has always been in direct metallic contact in its sliding motions with the upper abutment.

The present invention consists in an improved construction of such elastic suspension devices of the type stated and as hereinafter described and claimed, in which two cup-like members (hereinafter termed cups) holding between them a pneumatic buffer or cushion, are not in immediate and direct metallic connection, the construction being such that the lower cup has a certain freedom of motion, or, in other words, swings freely to a sufficient extent for self-adjustment about a pivotal axis at the upper extremity of its supporting member (hereinafter termed a stirrup) which axis is at some distance from the lower cup, while the pivot itself may be directly connected to the spring of the vehicle, and is confined to vertical movements.

It is very necessary that the point of connection of the vehicle spring with the cushioning device, should be limited to a vertical motion and not permitted any deviation therefrom, but while providing that the said pivotal connection shall only have such

vertical motion, I arrange that the lower cup shall not be in direct metallic connection with the upper cup and also that the said lower cup shall have some amount of self-adjustment as regards its position relatively to the upper cup; and I have found that such an arrangement lessens the communication of vibrations between the upper and lower cups, and that such slight freedom of movement between the two cups increases the life of the outer casing of the pneumatic buffer located between them, which latter may conveniently be constructed in accordance with my United States Patent No. 783,833 dated February 28, 1905. According therefore to the present invention a member extends from the frame of the vehicle, and carries rigidly attached thereto or formed therewith an inverted cup; beneath and at a distance from said inverted cup is an opposed cup, an air-inflated buffer being interposed between the two cups; and the lower cup is fixed within the loop of a stirrup, the upward arms of which extend around and above the upper cup, but are not in contact therewith at any time. At the upper part of the stirrup, a horizontal pivot is guided vertically by the member extending from the frame of the vehicle which carries the upper cup, and one end of the vehicle spring is pivotally connected to said pivot, or to a part movable therewith. Thus while the pivotal connection of the vehicle spring with the elastic suspension is limited to a vertical motion and not permitted any deviation therefrom, yet the lower cup forming the base of the pneumatic suspension is not in direct metallic contact with, nor is it guided directly upon the upper cup, and thereby the transmission of vibrations from the lower to the upper cup is lessened, and the life of the outer casing of the pneumatic buffer has been found to be increased.

The invention will be more fully described with reference to the examples of construction shown in the accompanying drawings, whereon—

Figure 1 shows in sectional side elevation one form of construction, Fig. 2 being a sectional end view taken on the line X Y Fig. 1. Figs. 3 and 4 illustrate another form of construction, Fig. 3 being a sectional elevation, and Fig. 4 a sectional end view of the parts shown in Fig. 3. Fig. 5 is a side

elevation and Fig. 6 a sectional end elevation of a further modification of construction.

In the construction shown in Figs. 1 and 2, a bracket arm or frame member 1, which may form part of the chassis of the vehicle, is provided, one end of which bracket extends downward and at its lower end is provided with or supports a cup-like member 2, the concavity of which is inverted. Beyond this, the bracket arm 1 near the point where it bends downward is formed with a bearing 3 for a plunger 4, the axis of which is substantially perpendicular to the horizontal plane of the chassis, the plunger 4 being free to have motion in the said bearing 3, and means may be provided for lubricating the bearing of the plunger 4. To the lower end of the plunger 4 the upper ends of a pendant stirrup 5 are connected by a pivot bolt or the like 6 forming a horizontal pivotal axis, and conveniently transverse with reference to the adjoining vehicle spring 9, the lower portion of the stirrup 5 carrying the lower cup-like structure 7, the concavity of which faces the concavity of the relatively stationary cup 2 before described. Between these two cups I locate the resilient body 8 which is a pneumatic cushion of approximately spherical form, and preferably consists of a casing of flexible and inextensive material such as rubber and fabric fitted with a non-return valve (not shown) by which such casing can be inflated, as more fully set forth in said Patent No. 783,833. One end of the vehicle spring, an ordinary plate spring for instance, is connected to the pivot bolt such as 6 of the upper end of the pendant stirrup, so that shocks transmitted by the spring 9 to the stirrup 5 will produce a compression of the resilient body 8, with a corresponding upward movement of the stirrup 5 and plunger 4, and thereby insulate the body of the vehicle from vibrations which are not absorbed by the ordinary plate springs.

At Figs. 3 and 4 another form of construction is illustrated, in which the bracket arm or member 1 is bifurcated at its downwardly extending end, and the walls of the bifurcations are formed with slots or guide-ways 3, while the lower end of the member 1 has rigidly fixed to it the inverted cup-like member 2, with which the upper portion of the resilient body 8 engages. The stirrup 5 carries the lower cup-like structure 7, with which the lower portion of the resilient body 8 engages, and the upper portion of the stirrup has a hook formation 10, through which passes the pivot pin or bolt 6, the projecting ends of which pin 6 are guided by passing through the slots 3 of the member 1; or as preferred, the pivot pin 6 is fitted with flanged rollers 11 (Fig. 4), which form an anti-friction bearing within

the slots 3 of the member 1. The end of the vehicle spring 9 also engages the pin 6 in any convenient manner; or in the construction illustrated, the pin 6 passes through the eye in the end of the spring, and the hook formation of the stirrup 5 passes on to the said eye of the spring, the construction of this device generally being clearly illustrated in the drawings at Figs. 3 and 4.

Referring to the construction shown at Figs. 5 and 6, the inverted cup-like member 2 is fixed to, or forms part of, a bracket 1 secured to the chassis or frame 13 of the vehicle, while the lower cup 7 is carried in the loop of the stirrup 5. The upper ends of the stirrup are connected by pivot-forming studs or trunnions 6 to a connection head 18, the axis in this case of the studs or trunnions 6 extending in a plane parallel with the length of the vehicle. The connection head 18 is formed with a fork at its upper end, between the arms of which the eye of the vehicle spring 9 passes, and a pin extends through the fork of the head 18 and through the eye of the said spring; this pin extending at right angles to the axis of the studs 6. The upper cup-like member 2 is formed in this case (see Fig. 5) with a vertical plunger 4 extending from its upper face, and passing into a socket formed in the connection head 18, whereby the latter head is guided in its vertical motions.

What I claim as my invention and desire to secure by patent is:—

1. In spring suspension for road vehicles; the combination of a frame member, an inverted cup rigidly connected therewith, a lower opposed cup, a pneumatic cushion of approximately spherical form located between said cups, a stirrup fixed to said lower cup and having upwardly extending arms passing around and above the upper cup but not in contact therewith, a vehicle spring, and means for connecting the end of said vehicle spring to said lower cup including a pivot at the upper extremity of said stirrup forming a horizontal axis about which said lower cup is free to swing independently of the motion of the upper cup and vehicle spring to render said lower cup self-adjusting, said frame member being provided with means for vertically guiding said pivot.

2. In spring suspension for road vehicles; the combination of a frame member, an inverted cup rigidly connected therewith, a lower opposed cup, a pneumatic cushion of approximately spherical form located between said cups, a stirrup fixed to said lower cup and having upwardly extending arms passing around and above the upper cup but not in contact therewith, a vehicle spring, and means for connecting the end of said vehicle spring to said lower cup including a pivot pin transverse with reference to said

vehicle spring at the upper extremity of said stirrup, forming a horizontal axis about which said lower cup is free to swing independently of the motion of the upper cup and vehicle spring to render said lower cup self-adjusting; said frame member being provided with means for guiding said pivot pin in a vertical direction, and said pivot pin extending through the upper ends of said stirrup and through the customary eye of said vehicle spring.

3. In spring suspension for road vehicles; the combination of a frame member, an inverted cup rigidly connected therewith, a lower opposed cup, a pneumatic cushion of approximately spherical form located between said cups, a stirrup fixed to said lower cup and having upwardly extending arms passing around and above the upper cup but not in contact therewith, a vertically mov-

able plunger, a pivot pin passing through the extremities of the upwardly extending arms of said stirrup and through the lower end of said plunger, said frame member having a vertical guideway for said plunger, and a vehicle spring having an eye at its end through which said pivot pin passes, whereby said pivot pin is restricted to vertical motions while said stirrup is free to swing about said pivot pin to accommodate itself to the pneumatic cushion, and the efficiency of the latter is more fully utilized.

The foregoing specification of my improvements in spring suspension for road vehicles signed by me this first day of June 1911.

LEONARD HARRIS.

Witnesses:

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R. THIRIOT.