No. 837,086. PATENTED NOV. 27, 1906.

A. M. LOCKETT.

PNEUMATIC CUSHION FOR VEHICLES.

APPLICATION FILED APR. 28, 1906.

2 SHEETS—SHEET 1.

Fig. 2.

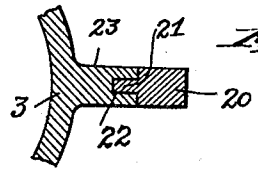
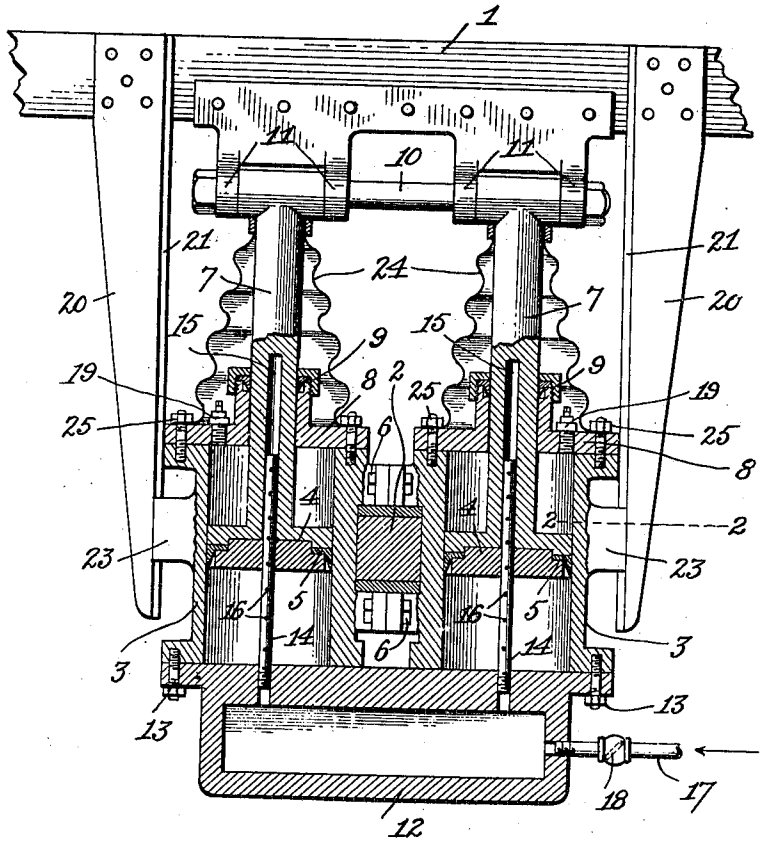


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 4.

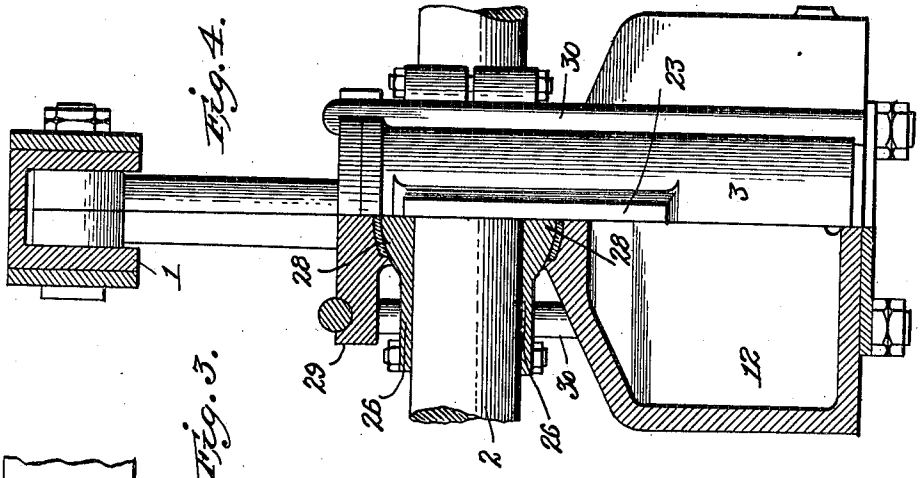
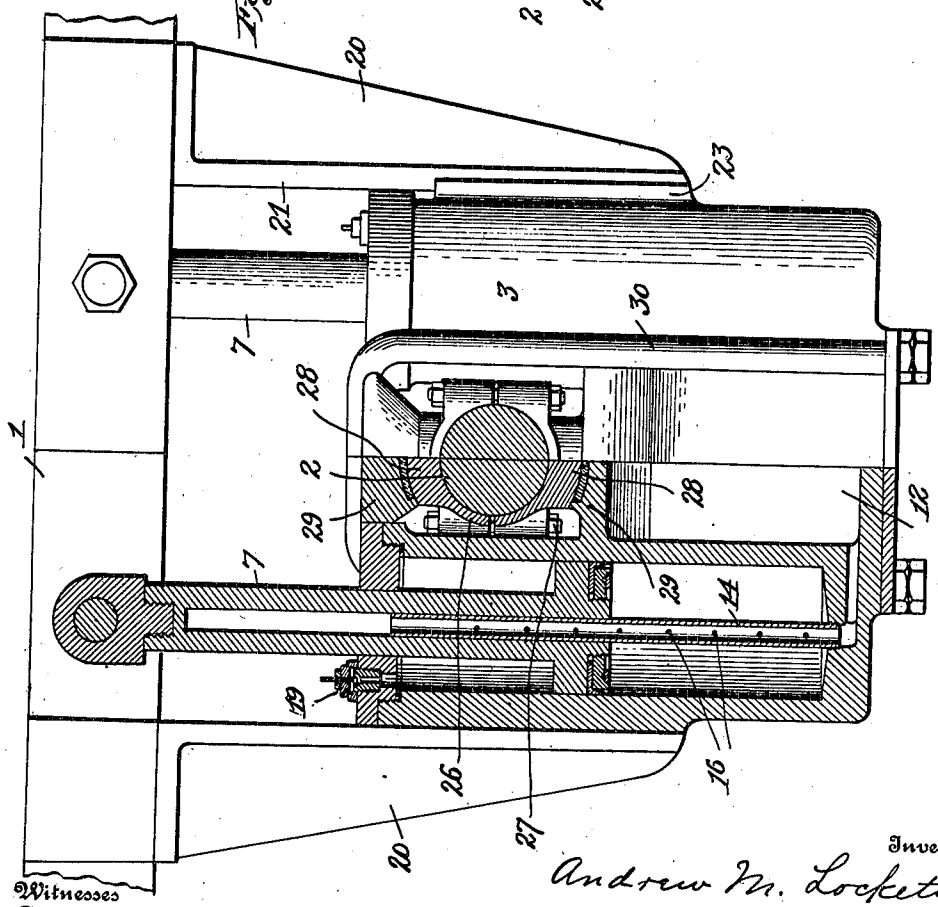


Fig. 3.



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ANDREW M. LOCKETT, OF NEW ORLEANS, LOUISIANA.

PNEUMATIC CUSHION FOR VEHICLES.

No. 837,086. Specification of Letters Patent. Patented Nov. 27, 1906.

Application filed April 28, 1906. Serial No. 314,162.

To all whom it may concern:

Be it known that I, ANDREW M. LOCKETT, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Pneumatic Cushions for Vehicles, of which the following is a specification.

My invention has reference to improvements in pneumatic cushions for vehicles, and more especially to such springs for carriages, cars, automobiles, or the like.

The objects of my invention are to provide means whereby a spring is produced which recovers gradually and does not rebound or have other injurious action common in the pneumatic and ordinary steel springs now in use; furthermore, to provide means whereby the action of the springs is quickly regulable and in accordance with the load to be carried, and the various kinds of vibrations usually accompanying the use of ordinary springs is entirely eliminated, other evident objects of construction and relation of parts comprising the invention, which will be more clearly understood from the detailed description.

The invention consists of structural features and relative arrangements of the elements comprising the invention, which will be hereinafter more particularly described, and pointed out in the appended claims.

In the accompanying sheet of drawings, in which similar reference characters indicate the same parts in the different views, Figure 1 shows a sectional view, partly in elevation, of the improved cushion as applied to the body of the vehicle. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is an end view, showing one half in section and the other half in elevation, of a modified form of the invention. Fig. 4 is a side view of Fig. 3, showing one half in section and the other half in elevation.

Referring to Fig. 1 of the drawings, 1 represents a portion of the vehicle body or frame directly over the ends of an axle 2. 3 3 are separated and independent vertical cylinders each of which is provided with a piston 4, having any suitable packing 5 to make them air-tight with the inclosing cylinder. 6 6 are bolts or other means for firmly securing the cylinders to the axle. 7 7 are piston-rods connected to the pistons 4 4 of the cylinders and which pass upwardly and through suitable stuffing-boxes 9 9 in the heads 8 8. The upper ends of the piston-rods may be rigidly but are preferably pivotally connected or hinged to the vehicle-body 1 by means of a rod or large bolt 10, which passes through holes formed in the upper ends of the piston-rods 7 7 and depending lugs 11 11, which are attached by any means, such as indicated, to the vehicle-body 1 directly over the axles. 12 is an auxiliary air cylinder or chamber attached by bolts 13 13 and made to close the lower ends of the cylinders 3 3. 14 is a vertical tube in each of the cylinders 3, communicating with the auxiliary air-chamber 12, and extends centrally and nearly the entire length of the cylinder 3 and into a close-fitting hole 15 in the axis of the piston-rod 7. 16 16 are suitably-spaced holes in the tube 14, whereby communication is established with the auxiliary air-chamber 12 and the interior of the cylinder 3 below the piston 4. 17 is a pipe connecting the auxiliary cylinder 12 with any suitable tank or source of air-pressure and is provided with a check-valve 18, which permits the air to pass into the cylinder 12, but not outwardly. 19 19 are any one of the many forms of adjustable valves for regulating the size of the opening communicating with the chamber in the cylinder 3 above the piston 4, whereby the outlet of the air can be regulated when the piston 4 is moving upwardly. 20 20 are any form of suitable guides attached to and depending from the vehicle-body and are provided on their sides toward the cylinders 3 3 with a tongue 21, (see Fig. 2,) which slides in a groove 22 in a lug 23, attached to the outer sides of each of the cylinders 3 3. This construction and arrangement enable the said cylinders 3 3 to move up and down on the guides 20 in taking up the shocks against the axles through the wheels while the vehicle is running. 24 is a folded or corrugated sheet of flexible material—such as canvas, leather, or rubber—formed in the shape of a frustum of a cone and having its smaller end connected with the upper or pivoted end of the piston-rod 7, while the larger or lower end is preferably inserted under the nuts 25 of the bolts, which secure the upper heads 8 8 of the cylinders 3 3, whereby is formed a dust-proof covering for the piston-rod 7, and also prevents any dust, grit, or sand from passing into the cylinder through stuffing-boxes 9 or valves 19.

The tank from which the auxiliary cylin-

der or receiver 12 receives the compressed air may be provided with a pressure-gage in order that one may readily see that the required pressure has been established or preserved in the tank in order to support the pistons 4 against the load.

Referring to Figs. 3 and 4, it will be seen that the general arrangement of the cylinders 3, pistons 4, vertical tubes 14, and guideways 20 is the same as that shown in Fig. 1, except that the auxiliary cylinder 12 is placed just below the axle 2 and between the two cylinders 3 in order to reduce the depth of the pneumatic cushion and at the same time enable the device to be made compact in form and in one casting, as indicated. A most important feature of construction, however, is to permit the wheels to assume different angular relations with respect to the axis of the shaft, and thereby enable any one wheel to rise independently of the others should it strike a high obstruction, and thereby maintain the body of the vehicle or car on an even keel. In order to effect such an operation, I may provide any suitable form of ball-bearing between the axle and the adjacent section of the casting between the two cylinders 3 3. This ball-bearing connection is preferably constructed by having two bearing-sections 26 26, which are clamped by means of bolts 27 27 to the axle 2. Said bearing-sections are provided with the rounded or segment-of-a-sphere extensions 28 28, which are engaged by corresponding bearing surfaces or depressions 29 29. 30 represents U-shaped rods which form a yoke and are so constructed and arranged as to enable them to securely hold the ball-bearing sections together and at the same time support the cylinders 3 3 and body of the vehicle on the axle, as shown.

From the foregoing description of the modified form of invention shown in Figs. 3 and 4 it will be seen that I have provided a kind of ball-bearing at the axle which permits the pneumatic cushion to remain in a vertical position, although the axle changes its position with respect to it. Another further advantage of this modified form is that it eliminates all joints where air leakage is likely to take place, and there are no joints below the air-piston, and therefore no place for leaks except from the piston itself.

The operation of the cushion is as follows: The air in the auxiliary cylinder 12 is brought to a given pressure, so that the pistons 4 will assume an intermediate position between the two heads of the cylinders when the load is placed in the vehicle. The combined area of the two pistons is such that with a moderate air-pressure one-fourth of the load is supported by them through the piston-rods connected with the vehicle-body. When the vehicle is passing over a road and the wheels thereon (not shown) strike an obstruction or unevenness in the road, the shock produced is transmitted to the axle 2 and forces the cylinders 3 3, together with the auxiliary cylinder 12 and the tube 14, in an upward direction toward the pistons 4 4. By this upward movement of the cylinders the space between the pistons and the lower heads or ends of the cylinders is gradually decreased, and the air confined therein is correspondingly compressed and forced into the auxiliary cylinder 12 through the openings 16 of the tube 14. The degree of compression of the air, which acts as a cushion, depends upon the size and number of the holes 16 16 of tubes 14, which communicate with the auxiliary cylinder 12, and it will be seen from my improved construction and mode of operation in having the tubes 14 pass up in the piston-rods 7 that the number of holes 16 16 for the air to pass through and into the auxiliary cylinders 12 are gradually reduced, and consequently the shock is correspondingly and easily absorbed without in any way being transferred to the vehicle-body or passengers in the car, and has an action or effect similar to that of a feather pillow rather than that of a steel spring. On the return of the cylinders or pistons to their normal position the operation is reversed and the pistons gradually and easily recover, but do not rebound, as in the springs usually employed for this purpose. This return action of the pistons 4 4 can be regulated, if so desired, by the adjustable valves 19 so as to control the rapidity with which the air can be pressed out in the chambers of the cylinders above the pistons. The other auxiliary features are readily understood and their operations and functions it is thought unnecessary to further describe in detail.

While I have shown and described two cylinders 3 3 and pistons 4 4, this number can be varied in many ways without departing from my invention, and, if so desired, only one cylinder and piston could be utilized if the area of the piston is such as to support a given load with the desired air-pressure in order to keep the piston and cylinder in their proper and operative relations, as indicated. I wish it also to be fully understood that instead of using the tube 14 with openings 16 16 any other expedient could be employed which would accomplish the same result of gradually decreasing the area of the outlet-passage for the confined air as the piston compresses the same or reduces the volume of the chamber which the air occupies in the lower part of the cylinder.

If so desired, the tubes 14 14 may be entirely omitted and the opening between the cylinders 3 3 and the auxiliary cylinder 12 made sufficiently small or restricted to cause an appreciable time to elapse before equilibrium is established between the cylinders 3 3 and the auxiliary cylinder.

It is not absolutely essential that the guides 20 20, adjustable valves 19, or the dust-shields 24 be employed in order to carry out the broad principles of my invention, and I have simply shown them in order to increase the life of the device and to illustrate the developed refinements of its application.

From the foregoing description of the structural features, relative arrangements, and operation, it will be readily seen I have devised a pneumatic cushion for vehicles in which all the parts are readily assembled or taken apart for the purpose of cleaning or making repairs.

Various changes may be made in the specific construction of the several parts of the cushion proper, its mode of attachment to the vehicle-body or guiding the same, and while I have shown my preferred form I do not care to limit myself to the specific arrangements, as they could be modified in many ways without departing from the spirit of my invention and accomplish the same results—as, for example, instead of having the cylinders attached to the axles, as shown, the pistons could be connected with the axles, while the cylinders could be attached to the vehicle-body without in any way changing the operation of the device or nature of the invention.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. A pneumatic cushion for vehicles comprising a cylinder fixed to a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a passage-way communicating with the interior of the cylinder, and means for gradually varying the size of the said passage-way leading from the cylinder to the auxiliary cylinder or pressure-chamber by the change of position or relative arrangement between the cylinder and piston.

2. A pneumatic cushion for vehicles comprising a cylinder fixed to a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a tube extending into and communicating with the interior of said cylinder by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinder and piston.

3. A pneumatic cushion for vehicles comprising a cylinder fixed to a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a passage communicating with the interior of the cylinder, means for gradually varying the size of the said passage-way leading from the cylinder to the auxiliary cylinder or pressure-chamber by the change of position or relative arrangement between the cylinder and piston, and means for guiding the movable axle.

4. A pneumatic cushion for vehicles comprising a cylinder fixed to a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a tube extending into and communicating with the interior of said cylinder by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinder and piston, and means for guiding the movable axle.

5. A pneumatic cushion for vehicles comprising a cylinder fixed to a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a tube extending into and communicating with the interior of said cylinder by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinder and piston, and an adjustable valve controlling a passage leading from the exterior to the space in the opposite end of the cylinder from that which communicates with the auxiliary cylinder or pressure-chamber.

6. A pneumatic cushion for vehicles comprising a plurality of cylinders fixed to a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder or pressure-chamber having a separate tube extending into each and communicating with the interiors of said cylinders by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinders and pistons.

7. A pneumatic cushion for vehicles comprising a plurality of cylinders fixed to a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder or pressure-chamber having a separate tube extending into each and communicating with the interior of said cylinders by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinders and pistons, and means for guiding the moving axle.

8. A pneumatic cushion for vehicles comprising a plurality of cylinders fixed to a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder or pressure-chamber having a separate tube extending into each and communicating with the interior of said cylinders by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinders and pistons, and an

adjustable valve for each of the cylinders controlling a passage leading from the exterior to the space in the opposite ends of each of the cylinders from that which communicates with the auxiliary cylinder or chamber.

9. A pneumatic cushion for vehicles comprising a cylinder having a ball-bearing connection with a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a passage-way communicating with the interior of the cylinder, and means for gradually varying the size of the said passage-way leading from the cylinder to the auxiliary cylinder or pressure-chamber by the change of position or relative arrangement between the cylinder and piston.

10. A pneumatic cushion for vehicles comprising a cylinder having a ball-bearing connection with a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a tube extending into and communicating with the interior of said cylinder by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinder and piston.

11. A pneumatic cushion for vehicles comprising a plurality of cylinders yieldingly connected to a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder or pressure-chamber interposed between the said cylinders and having a separate tube extending into each and communicating with the interiors of said cylinders by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinders and pistons.

12. A pneumatic cushion for vehicles comprising a plurality of cylinders having a ball-bearing connection with a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder or pressure-chamber interposed between the said cylinders, having a separate tube extending into each and communicating with the interior of said cylinders by a series of openings, said openings being opened or closed by the change of position or relative arrangement between the cylinders and pistons, and means for guiding the moving axle.

13. A pneumatic cushion for vehicles comprising a cylinder having a ball-bearing connection with a movable axle of the vehicle, a piston in said cylinder adapted to support the body of the vehicle, an auxiliary cylinder or pressure-chamber having a restricted passage or opening communicating with the interior of said cylinder.

14. A pneumatic cushion for vehicles comprising a plurality of cylinders having a ball-bearing connection with a movable axle of the vehicle, a movable piston in each of said cylinders, a rod connected with each of the pistons and the body of the vehicle, an auxiliary cylinder interposed between the said cylinders and having a restricted passage or opening communicating with the interior of said cylinders.

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

ANDREW M. LOCKETT.

Witnesses:
W. W. YOUNG,
C. C. LOCKETT, JR.