

L. R. GRUSS.
 FLUID PRESSURE CUSHIONING AND WEIGHING MECHANISM.
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Patented June 8, 1915.

Fig. 1.

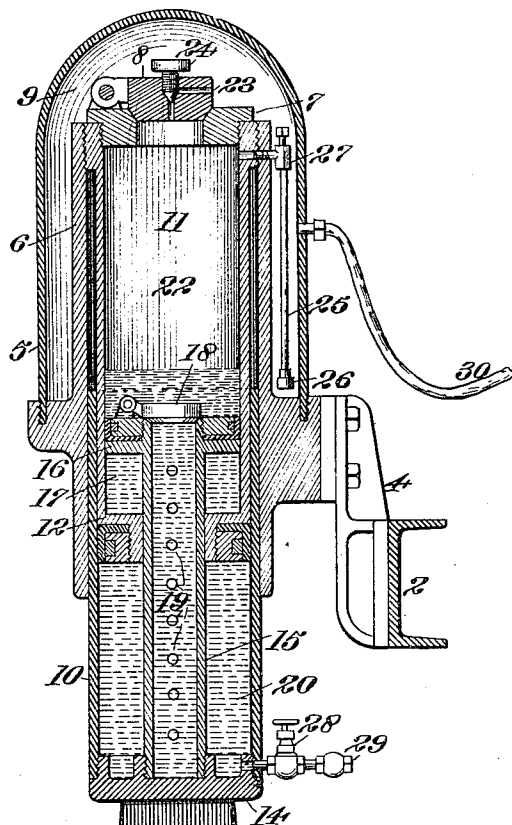
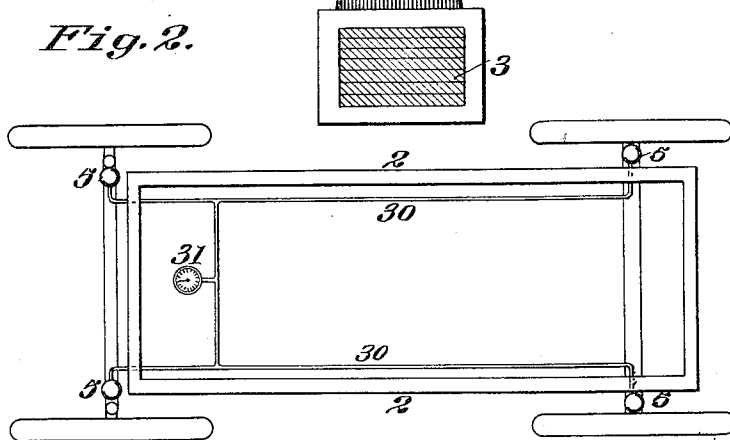


Fig. 2.



WITNESSES:

Charles Pokles
F. E. Maynard.

INVENTOR

Lucien R. Gruss.

BY *E. H. Strong.*

ATTORNEY

UNITED STATES PATENT OFFICE.

LUCIEN R. GRUSS, OF SAN FRANCISCO, CALIFORNIA.

FLUID-PRESSURE CUSHIONING AND WEIGHING MECHANISM.

1,142,162.

Specification of Letters Patent.

Patented June 8, 1915.

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To all whom it may concern:

Be it known that I, LUCIEN R. GRUSS, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Fluid-Pressure Cushioning and Weighing Mechanism, of which the following is a specification.

This invention relates to cushioning and weighing mechanism and pertains particularly to a shock absorbing means for cushioning vehicles or other bodies and for indicating load variations.

It is an object of my invention to provide a fluid cushion so designed and proportioned that the requisite resiliency for both shock and recoil of the supported structure is obtained.

It is an important object of the invention to provide a hydro-pneumatic cushion in which the liquid coacting with the air affords an efficient, durable and reliable shock absorber in which, during operation, a resistance to recoil is effected; and to provide a device which is so designed that the parts are few and simple and act as suction means for self-charging of air and restoring of oil, after displacement; the vacuum inducing the replacement when the displacement member recedes at recoil.

The invention includes telescopic headed cylinders with fixed pistons, said cylinders being attachable to respective contiguous parts of such structures, as vehicles, to be yieldably and resiliently related; and it also consists of the parts and the combination and construction of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical central section of the device as applied to a part of the running gear and vehicle body. Fig. 2 is a plan, diagrammatic view of a vehicle with the cushion-actuated, weight-indicating device. 2 shows a part of the frame of a vehicle body and 3 indicates the springs or other part of the running gear. Suitably attached to the body 2 is a casting 4 having an exterior shell 5 encompassing a cylinder 6, having one end integral with casting 4 and closed at the top by a cap 7, upon which is mounted a check valve 8. The valve 8 opens

upwardly for egress of air to the annular chamber 9, between the shell 5 and the cylinder 6 and has a fluid port 23, as later described.

The cylinder 6 is bored for the sliding telescoping fit of a cylinder 10, closed at its lower end and supported upon the part 3 so that upon relative movement of the parts 2—3 the tube slides in the cylinder 6.

Attached to the head 7 is an inner barrel 11 spaced from and concentric with cylinder 6, between which barrel 11 and cylinder 6 the cylinder 10 operates. Barrel 11 has at its lower end an inwardly turned packed flange 12 through which a hollow piston rod 15 reciprocates. Rod 15 is attached to the head 14 of cylinder 10; the head 14 with cylinder 10 being attached to and movable with the springs 3. The piston rod 15 carries at or adjacent to its upper end a loose fitting packed piston 16, which works in the fixed inner barrel 11, which latter with cylinder 6 is carried by the vehicle body 2.

17 is an annular chamber between the head 12 and piston 16. The piston rod 15 which is preferably tubular, is perforated at 19 along its length both above and below the head 12, and is provided with an upwardly opening valve 18 whereby free communication is established between the oil or other liquid chamber 20 in cylinder 10 and the chamber 22 in barrel 11, when the slidable parts telescopically contract, and at which time both valves 8 and 18 lift.

In practice, the chambers 20 and 17 are charged with a liquid as oil, which also stands normally in the chamber 22 at a suitable level, above which oil level the device becomes charged with air at desired pressure. Upon a downward movement of the barrel 11 and cylinder 6, such as occurs when the vehicle body is being loaded, or as when it jolts when traveling and encountering irregularities of roadway surface, the air in chamber 22 on being compressed above the inelastic oil will equalize the pressure on the two sides of head 7 by lifting valve 8 and escaping into the storage chamber 9. As the barrel descends into chamber 20 it will displace a corresponding quantity of oil which will pass valve 18 and be trapped thereby in chamber 22 above the piston 16. The upward movement of piston 16 at the same

time causes a lengthening and enlargement of the variable oil chamber 17 and a movement of oil from chamber 20 into chamber 17 through the holes 19 in piston 15. The amount of displacement of oil from chambers 20 into chamber 22 depends on the thickness of the walls of the barrel 11 and the length the latter is pushed down into cylinder 10.

On the reverse or return stroke the two valves 8—18 close, and as the upper members 5—6—11 recede from the piston 16, or conversely as piston 16 withdraws downward in barrel 11 a vacuum tends to be created above piston 16 in the chamber 22 and a slow return movement of the air takes place from chamber 9 back into chamber 22. Gradually an equalization of pressure takes place in chambers 9 and 22 through the small bleed port 23 in valve 8, controlled by the needle valve 24.

One important feature of this invention is the peculiar arrangement and construction of the parts by which I get an actual displacement of oil in one compartment on the movement in one direction of one of the moving parts, and on the reverse movement a tendency to create a vacuum in the compartment results. This is due to the difference in diameter of chambers 17 and 20. The oil displaced from cylinder 10 to the chamber 22 on the compression stroke cannot pass the piston 16 quickly enough to immediately fill the space vacated by the barrel 11, and there is therefore a vacuum created in chamber 20. This vacuum is destroyed by the gradual flow of oil past the piston 16 into the chamber 17 and from thence by means of the tube 15 and perforations 19, to the cylinder 10.

Should any oil collect in the bottom of chamber 9 it would be pumped back to the main charge in chamber 22 through a pipe or duct 25 by the air suction on recoil strokes. A foot valve 26 holds the oil drawn into the pipe to prevent it returning on the pressure stroke. The rate of flow of air or oil through the pipe 25 is controlled by a stop 27. The chambers can be automatically or otherwise charged with oil or with air and the desired cushioning effect obtained by a valve 28 at the bottom of the cylinder 10; a suitable check valve 29 being provided to prevent outflow of the fluids.

Preferably there is one of these hydro-pneumatic cushions at each corner of the vehicle so that by connecting all of the chambers 9 by a pipe system 30 as indicated in Fig. 2, and leading this pipe 30 to a gage 31 on the dash-board of the vehicle, a convenient and novel method of determining the load is furnished. This gage would indicate pounds pressure at all times either when the car was empty or loaded.

Having thus described my invention what I claim and desire to secure by Letters Patent is—

1. A fluid pressure device comprising in combination, a pair of telescoping cylinders, one of them carrying a piston dividing the space within the two cylinders into two chambers, one of said chambers having a greater diameter than the other, a valved piston carried by the other of the cylinders to divide the chamber of smaller diameter into two compartments, said valve forming a fluid connection between said compartments, and fluid connections between the individual chamber and the adjacent compartment.

2. A fluid pressure device comprising in combination a pair of upper and lower telescoping cylinders, a solid piston carried by the upper of said cylinders and dividing the space within the cylinders into two chambers of different diameters, a tube carried by the lower of said cylinders, a valved piston on said tube, said piston dividing one of said chambers into two compartments, a fluid connection between one of said compartments and the adjacent chamber, said connection comprising perforations in said tube, the construction and arrangement of the parts being such that the tube forms a guide for said solid piston.

3. A hydro-pneumatic cushion apparatus, comprising a tubular member containing liquid, a compression head having concentric inner and outer walls telescoping on the opposite sides of said tubular member, a valved piston carried by said tubular member and telescoping within the inner wall of said compression head, and a second piston carried by said inner wall and telescoping within the tubular member and dividing said member into two chambers, one of said chambers being greater in diameter than the other.

4. A hydro-pneumatic cushion apparatus, comprising a tubular member containing liquid, an air compression head having concentric inner and outer walls telescoping on the opposite sides of the tubular member, a valved piston carried by the tubular member and telescoping within the inner wall of the compression head whereby on a telescopic action of the parts compression of the air takes place in the compression head, and a second piston carried by the inner wall of the compression head and telescoping within the tubular member, the arrangement of parts being such that the telescopic action of the parts forces oil from the tubular member into the compression head to maintain an oil seal above said first mentioned piston for the compression head.

5. A fluid pressure device comprising in combination, a pair of telescoping cylinders,

5 one of said cylinders carrying a piston dividing the space within the two cylinders into two chambers, the chamber below said piston having a greater diameter than the chamber above said piston, a second piston carried by the other cylinder to divide the upper chamber into two compartments, a valve in said piston forming a fluid connection between said compartments, and fluid

connections between the lower chamber and 10 the adjacent compartment.

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

LUCIEN R. GRUSS.

Witnesses:

IRVINE SINNETT,
W. W. HEALEY.