M. P. HAYWARD.

PNEUMATIC BUFFER FOR SELF PROPELLED VEHICLES.

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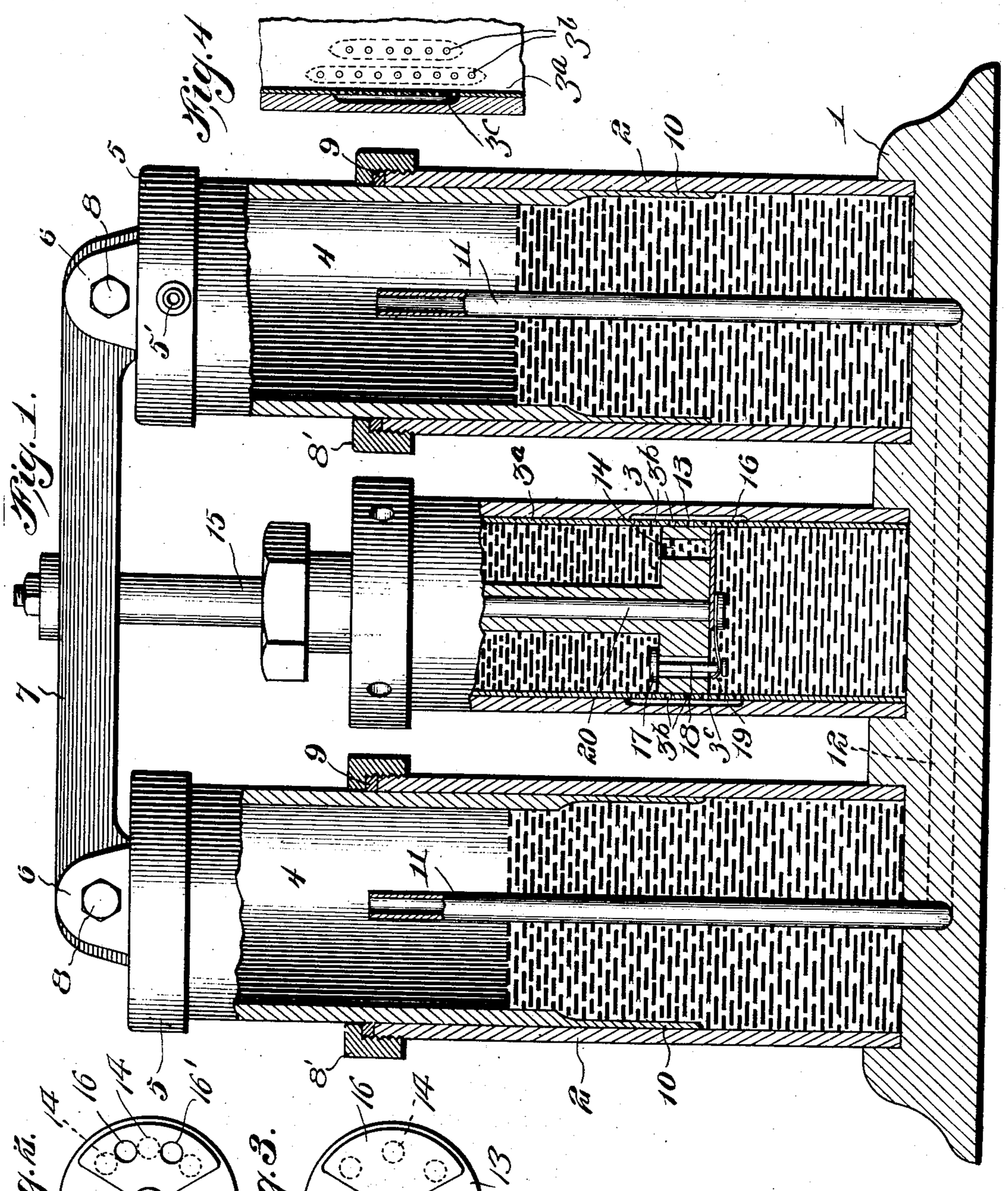

Witnesses

Louis R. Heinrichs

6. Bradway.

Inventor

Melville P. Hayward

By Victor J. Evans

Attorney

UNITED STATES PATENT OFFICE.

MELVILLE P. HAYWARD, OF QUINCY, MASSACHUSETTS.

PNEUMATIC BUFFER FOR SELF-PROPELLED VEHICLES.

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To all whom it may concern:

Be it known that I, MELVILLE P. HAYWARD, a citizen of the United States, residing at Quincy, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Pneumatic Buffers for Self-Propelled Vehicles, of which the following is a specification.

This invention relates to shock absorbers or buffing devices intended for use in connection with self-propelled vehicles so as to permit easy running and movement of the vehicle body and prevent the transmission of shocks from the running gears thereto.

The invention has for one of its objects to improve and simplify the construction and operation of devices of this character so as to be comparatively easy and inexpensive to manufacture and keep in repair, thoroughly reliable and efficient in use, and of substantial and durable design.

A further object of the invention is the provision of a plurality of hollow piston-containing cylinders in which are confined bodies of elastic and hydraulic media that coöperate to absorb the shocks exerted on the device, means being employed for equalizing the air or elastic medium in the chambers.

A further object is the provision of a pneumatic buffer comprising a plurality of air-containing cylinders in which are arranged pistons of special form, and an additional cylinder in which is a hydraulic medium through which a piston churns back and forth under movement of the body of the vehicle to which the buffer is applied.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawing, which illustrates one of the embodiments of the invention, Figure 1 is a central vertical section of the device partly in elevation. Figs. 2 and 3 are bottom plan views of modified forms of piston for the middle cylinder. Fig. 4 is a detail sectional view of a modified form of main cylinder.

Referring to the drawing, 1 designates a suitable base-plate on which are fixed spaced upright main cylinders 2 and a central or intermediate secondary cylinder 3. In each of the main cylinders 2 is a hollow piston 4 closed at its upper end by a cup 5 provided with apertured lugs 6, and secured to the lugs of the pistons is a cross-head or bar 7 hingedly connected at its ends to the pistons by the bolts 8. By this means a limited unequal movement of the pistons is permitted. On the upper ends of the cylinders are glands or packing nuts 8′ that hold under compression suitable packing rings 9 resting on the upper ends of the cylinders, thus preventing leakage of liquid from the latter. To further assist in preventing leakage, the lower ends of the pistons are each interiorly reduced to provide a relatively thin and yieldable annulus 10 which is forced outwardly radially into intimate contact with the internal wall of the cylinder by the pressure of the liquid so that the greater the pressure in the cylinders, the tighter will the thin portions 10 of the pistons engage the cylinders. Arranged in each cylinder is an upright pipe 11 open at its upper end, and the lower ends of the pipes are connected by a passage 12 in the base plate so as to constitute an equalizing means for permitting the pressure in one cylinder to be the same as that in the other, thus insuring the uniform vertical movement of the pistons.

In each of the cylinders 2 is a body of oil or other suitable liquid that is somewhat below the upper end of the pipes 11 for the purpose of affording a large air space to give the pneumatic cushioning effect. The air pressure is established in the cylinders by means of an air pump that is adapted to be connected with a valve 5′ on one of the cylinder caps 5, the valve being of that type commonly employed in pneumatic tires.

In the secondary cylinder 3 is a piston 13 having a plurality of vertically extending ports 14 through which the oil or other hydraulic medium filling the cylinder 3 can pass back and forth to opposite sides of the piston, as the latter reciprocates. The piston is provided with a rod 15 that is bolted to the cross-head 7 so that all of the pistons will move simultaneously. The middle cylinder and piston constitute a resistance device for preventing sudden and excessive movement of the movable elements 4 and in order to permit the parts to move up and down quite freely within certain limits above and below the central position, the cylinder 3 is provided with vertically extending channels 3′ in its internal wall that are of different lengths so as to permit fluid to readily

pass the piston 13 during the first part of its movement in either direction and gradually resist the by-passing of the liquid as the piston moves farther and farther from the central position. In other words, the central piston and cylinder produces a gradually increasing resistance against the movement of the elements 4 of the main cylinders. The channels 3′ may be cast or otherwise formed in the cylinder and the latter bored so that the piston will make a good fit therein. If desired, the cylinder does not require to be bored but may be fitted with a lining 3^a, as shown in Fig. 4, which is provided with apertures 3^b communicating with the channels 3^c of the cylinder.

In order to prevent a positive check or shock by the piston 13 moving past the longest channel 3′ under extreme shocks or blows sustained by the vehicle, the piston 13 has a plurality of ports 14 through which the liquid can pass from one side of the piston to the other. These ports are controlled by a flap valve 16 for retarding the passage of the liquid upwardly and puppet valves 17 for resisting the downward movement of liquid. The valves 17 are provided with stems 18 that are engaged by springs 19 that tend to hold the valves seated. The springs 19 and flap valve 16 are secured to a stem 20 extending through the piston rod 15. The flap valve 16 springs away from the ports when the pressure of the liquid on the upper side of the piston reaches a certain point, as do also the valves 17 when the pressure on the under side becomes great enough. The valve 16, as shown in Fig. 2, may be provided with ports 16′ which can be brought into complete or partial register with the ports 14, thereby controlling the freedom with which the liquid can pass to the bottom side of the piston.

In practice, the buffers are attached to a vehicle in such a manner that the pistons will move up and down to follow the relative movement between the wheels and body of the vehicle. The compressed air in the upper ends of the cylinders 2 will be compressed upon the downward movement of the head 7 and thus cushion the shocks that would be transmitted to the vehicle body and the expansion of the air assists to return the parts in normal position. Any excessive and violent movement of the vehicle body is retarded or checked by the cylinder and piston 3, this checking occurring, however, more or less gradually, so as to eliminate the transmission of shocks to the vehicle body.

From the foregoing description, taken in connection with the accompanying drawing, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired, as are within the scope of the claims.

Having thus described the invention, what I claim is:—

1. In a device of the class described, the combination of a plurality of main piston cylinders, the cylinders each containing a body of liquid and compressible fluid, equalizing means between the cylinders, means for connecting the pistons, and a hydraulic check device connected with the said means.

2. In a device of the class described, the combination of a plurality of cylinders adapted to contain a body of liquid and a compressible fluid, pressure equalizing means between the portions of the cylinders containing the compressible fluid, a hollow piston in each cylinder provided with thin walls that yieldingly engage the internal surfaces of the cylinders under the pressure of the liquid therein, and packings on the cylinders and disposed around the pistons.

3. In a device of the class described, the combination of a plurality of cylinders adapted each to contain a body of liquid and a compressible fluid, a common base plate having a passage, and open-ended tube connected with the passage and extending into the air space of the cylinders, pistons in the cylinders, means for connecting the pistons to act in unison, and a hydraulic check device for retarding the movement of the pistons.

4. In a device of the class described, the combination of a plurality of parallel cylinders each adapted to hold a body of liquid and elastic fluid, hollow pistons in the cylinders, caps for the outer ends of the pistons, a cross head hingedly connected with the caps, a secondary cylinder adapted to be filled with a liquid, a piston movable back and forth therein and provided with ports, valves controlling the ports, and a connection between the cross head and the piston in the secondary cylinder.

5. In an apparatus of the class described, the combination of a plurality of parallel cylinders, relatively movable elements therein, there being a body of liquid and compressible fluid in each cylinder, a device for connecting the elements to move in unison, means for connecting the fluid spaces of the cylinders permanently together, a hydraulic checking device associated with the cylinders and including a movable element, and means for positively connecting the movable element with the device.

6. In an apparatus of the class described, the combination of a base plate, a pair of parallel cylinders secured to the base plate

and containing a body of liquid and of compressible fluid, chambered pistons movable in the cylinders, upright tubes mounted on the base plate and extending upwardly through the cylinder and into the chambers of the pistons, a conduit connecting the ends of the tubes together, a cross member hingedly connected with the pistons, a hydraulic motion checking device supported on the base plate and disposed between the cylinders, said device having a movable element, and means for connecting the element with the said member.

7. In an apparatus of the class described, the combination with cushioning means, of a retarding device associated therewith, said device comprising a cylinder having longitudinal channels in its internal wall, a lining for the cylinder having apertures communicating with the channels, a piston movable in the cylinder, ports in the piston, and valves controlling the ports.

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

MELVILLE P. HAYWARD.

Witnesses:

CLIFFORD B. DANIELS,

BERTHA R. DANIELS.