F. M. RENNIE.

SHOCK ABSORBER.

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1,037,052. Patented Aug. 27, 1912.

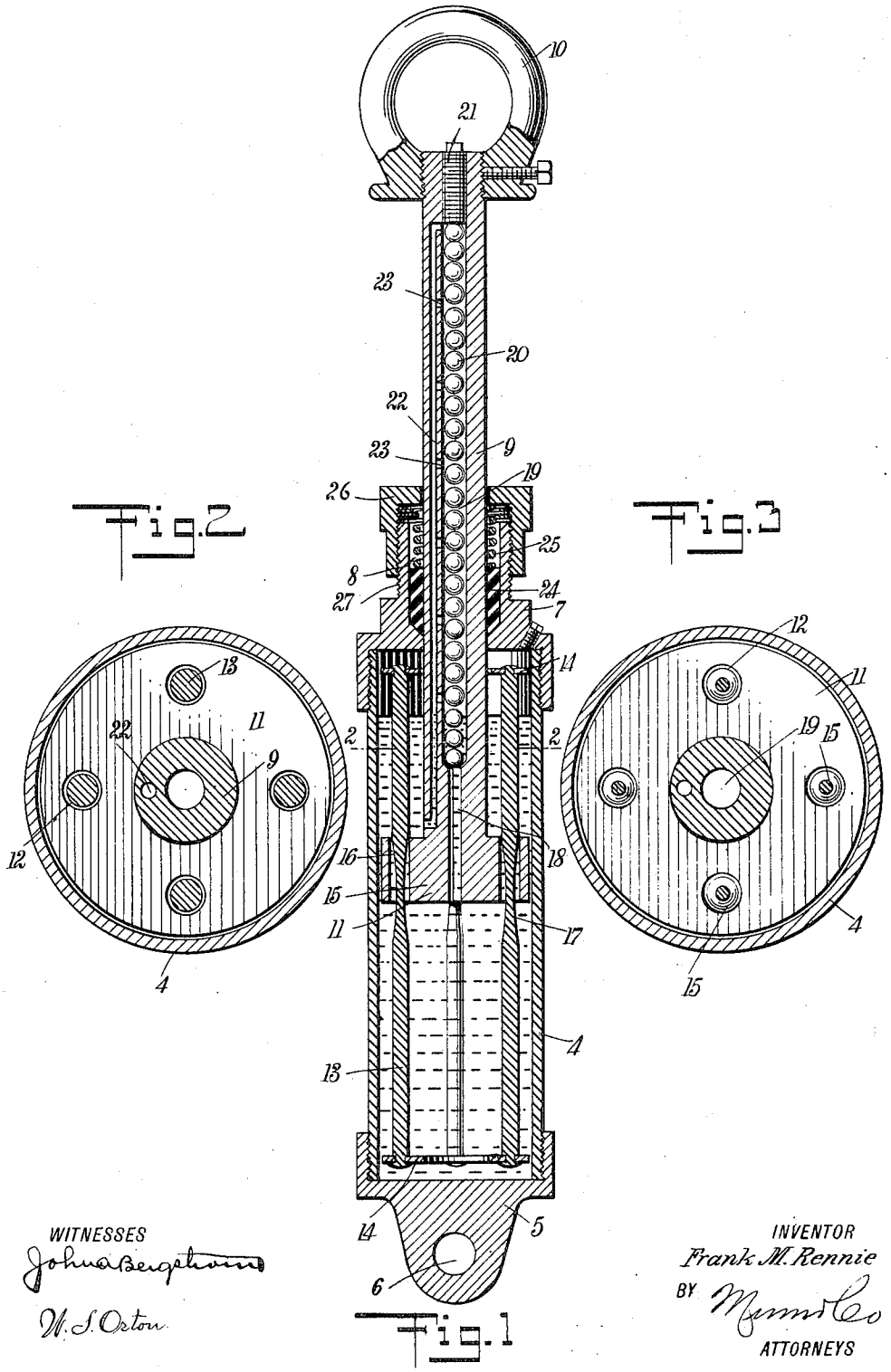

Fig. 2

Fig. 3

Fig. 1

WITNESSES

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SHOCK-ABSORBER.

1,037,052. Specification of Letters Patent. Patented Aug. 27, 1912.

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To all whom it may concern:

Be it known that I, FRANK M. RENNIE, a citizen of the United States, and a resident of New Rochelle, in the county of Westchester and State of New York, have invented a new and Improved Shock-Absorber, of which the following is a full, clear, and exact description.

My invention relates in general to a shock absorber for taking up shocks between two relatively movable members and is intended more particularly as an improvement in pneumatic shock absorbers for automobiles or other vehicles, whereby the device is adapted to cushion sudden relative movements between the traction wheels and the body of the vehicle.

My invention has for an object, to provide means whereby the movement between the relatively movable parts is restrained during the last part of each of the long strokes yet is substantially unrestrained during the first part of said strokes as well as during the shorter strokes.

A further object of my invention is to provide means for taking up the heavy jars independently of the means absorbing the relatively slight pulsations.

I attain the above outlined objects by positioning a piston within a cylinder partially filled with oil or other liquid, and extending through apertures in the head of said piston, a cage formed of a series of spindles, each of the spindles having a reduced waist which will regulate the flow of the oil through the passageways in the head, to cushion the movement of the piston relative to the cylinder. Further, I provide within a pocket in the stem of the piston, a series of steel balls, which balls either form a tortuous passage for the movement of the oil, or by removing one or more of these balls, they will act as a dampening means to the oil forced into the pocket by the collapsing movement of the piston within the cylinder.

With the above and other objects in view, as will more fully hereinafter appear, the present invention consists in certain novel details of construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a vertical transverse sectional view showing a preferred embodiment of my invention; Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1, and Fig. 3 is a view similar to Fig. 2 when the piston has moved to a position opening communication through its ports.

Described more in detail, I have shown a cylinder 4 having a closure 5 extending through which closure is an aperture 6, by means of which the device may be attached to one of the movable parts of the vehicle. The opposite end of the cylinder is similarly closed by a cap 7 having a pocket 8 therein, extending through which cap and pocket is a hollow piston rod 9 movably attached to the upper end of which is a ring 10, by means of which the device is attached to the other of the relatively movable parts. The inner end of the piston rod 9 within the cylinder is enlarged to form a head 11, the diameter of which is slightly less than the internal diameter of the cylinder 4. Equally spaced about the head 11 and extending therethrough parallel with the axis of the cylinder, are a series, in this case shown to be four in number, of cylindrical passageways 12. Extending through each of said passageways and of a length slightly less than the length of the cylinder, is a spindle 13, the several spindles being fastened together by a spacing plate 14 at the upper and lower ends, to form a cage structure within which moves the piston rod 11 and the lower portion of the rod 9. Each of said spindles, intermediate its length, is reduced to form a waist 15, said waist being formed by two cones with an apex common to both, the upper cone being materially shorter than the lower cone 17. Each spindle 13, above the cone 16, is of slightly greater diameter than the diameter of the passageway 12, so that the cage rests open and is supported by the head 11. The lower portion of the spindle 13 below the cone 17, is of the same or slightly less diameter than the diameter of the passageway 12.

The cylinder 4 is partially filled with oil or other liquid to a level some material distance above the normal highest point of movement of the head 14 and below the upper spacing plate 14, as more particularly shown in the drawings. The rod 9

has extending therethrough a bore 18, in order to form an auxiliary means for taking up light shocks, said bore being enlarged a short distance above the top of the head 11 to form an elongated pocket 19, in which pocket is disposed a series of spheres 20, preferably steel balls, the upper end of which pocket is closed by any suitable means, as, for instance, a threaded cap 21 extending parallel with the bore 18 and from a point adjacent the uppermost ball 20, and communicating with the fluid within the cylinder is an escape channel 22 connected with the pocket 19 by a series of spaced apart ports 23.

Any suitable form of packing 24 may be inserted within the cap surrounding the reciprocating rod 9, and, as shown, the packing is forced into position by a spring 25 bearing upon the top of the packing and forced into position by a cap 26 in screw-threaded engagement with a nipple 27 extending from the cap 7 and concentrically disposed about the rod 9.

It is to be understood that the several parts are normally in the position shown in Fig. 1, with the cage resting on the head 11. Should a shock cause the relatively movable members to approach each other, the piston 9 will tend to sink in the oil or other fluid, approaching the position shown in section in Fig. 3. This will permit the oil in effect, to rush through the passageways 12, and due to the narrow waisted construction of the shank at 15, relatively little resistance will be offered to the passage of the oil, and the initial relatively rapid movement will be practically uninterrupted, but as the head 11 sinks lower, the extent of the opening through which passageway 12 becomes gradually more and more restricted due to the closing effect of the lower cone 17 until the passageway 12 is entirely closed by the lower portion of the spindle 14, closing the entrance. At the same time, the oil or other liquid will be forced up through the bore 18 and the channel 22, and due to the tortuous passage formed by these superimposed balls 20, a resistance is offered to the passage of the oil, which will counteract to further cushion the shock between the two movable members. If desired, one or more of these balls 20 may be removed and the oil flowing through the bore 18 into the pocket 19 will tend to lift the balls 20. The ports 23 afford means by which the oil may flow from the pocket 20 into the channel 22, and thereby flow back into the cylinder 4.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. A shock absorber, comprising a cylinder partially filled with fluid, a piston rod movable in said cylinder, a head carried by said piston rod, said head having passageways extending therethrough on opposite sides of said rod, and a floating cage comprising a series of solid spindles, one spindle passing through each of said passageways, each of said spindles having means for choking the passage of fluid through said passageways when said head is forced through the liquid.

2. A shock absorber, comprising a cylinder partially filled with a fluid, a piston rod extending into said cylinder, a head within said cylinder rigidly mounted on said rod, said head having a passageway extending therethrough, and a floating spindle extending through said passageway, said spindle intermediate its length reduced to form a waist, the upper portion of the waist being relatively shorter than the lower portion and adapted to gradually close said passageway, to regulate the flow of fluid therethrough.

3. A shock absorber, comprising a cylinder partially filled with a fluid, a piston rod movable within said cylinder, said piston rod having a bore extending therethrough, and weighted spheres within said bore retarding the admission of said fluid to said bore.

4. A shock absorber, comprising a cylinder partially filled with a fluid, a piston rod extending within one end of said cylinder, said rod having a head within said cylinder and passageways extending through the same, and a cage carried by said head, said cage comprising a plurality of spindles, one spindle extending through each of said passageways, said cage being free to move within said cylinder, each of said spindles normally closing one of said passageways, each of said spindles being reduced in diameter intermediate its length and materially below the point where said spindle closes said passageway, said spindle below said reduced portion being of a diameter less than the diameter of the passageway, to permit the head to move to the bottom of the cage.

5. A shock absorber, comprising a cylinder, a piston rod reciprocating through one end of said cylinder, the end of the rod within the cylinder terminating in an enlarged head, a bore extending within said rod from said head, said bore being enlarged to form a pocket, and a series of balls within said pocket, whereby the movement of the head through said cylinder will force the liquid in the cylinder into said pocket, to raise the balls.

6. A shock absorber, comprising a cylinder, a piston rod reciprocating through one end of said cylinder, the end of the rod within the cylinder terminating in an enlarged head, a bore extending within said rod from said head, said bore being enlarged to form a pocket, a series of balls within

said pocket, whereby the movement of the head through said cylinder will force the liquid in the cylinder into said pocket, to raise the balls, and a channel within said rod and parallel with said pocket, said channel having an outlet into said cylinder, whereby the fluid within said pocket may escape into said cylinder.

7. A shock absorber, comprising a cylinder, a hollow rod reciprocating in said cylinder, a head within said cylinder carried by said rod, means carried by said head regulating the passage of a fluid through said head to take up shocks of one character, and steel balls disposed in said rod regulating the admission of the fluid to said rod, thereby forming an auxiliary shock absorber to take up shocks of a different character.

8. A shock absorber, comprising a cylinder, a piston head movable in said cylinder, said head having passageways extending therethrough, and a floating cage having members positioned in said passageways and adapted to gradually close the same.

9. A shock absorber, comprising a cylinder, a piston rod reciprocating through one end of said cylinder, the end of the rod within the cylinder terminating in an enlarged head, a bore extending within said rod from said head, said bore being enlarged to form a pocket, a series of balls within said pocket, whereby the movement of the head through said cylinder will force the liquid in the cylinder into said pocket to raise the balls, and an escape channel placing said pocket in fluid connection with said cylinder.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK MAXWELL RENNIE.

Witnesses:
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K. CHISHOLM, Jr.