F. PHILLIPS.

DASH POT.

APPLICATION FILED SEPT. 24, 1906.

929,008.

Patented July 27, 1909.

FIG. 1.

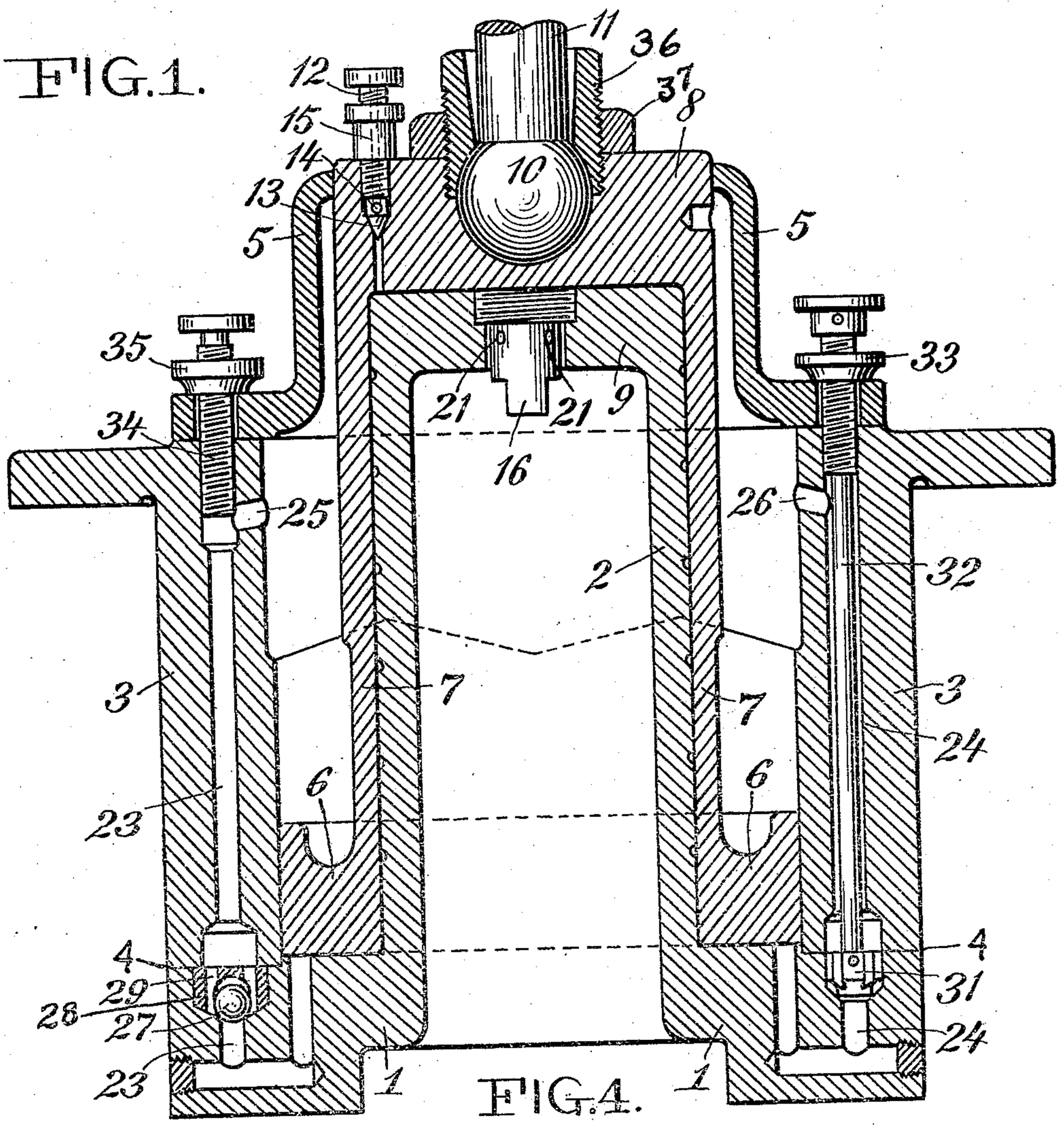


FIG. 4.

FIG. 2.

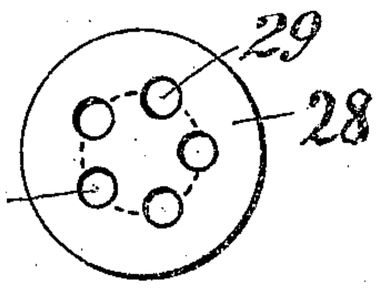
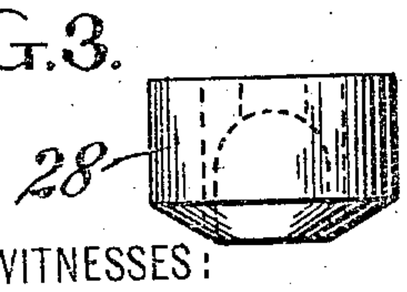


FIG. 3.



WITNESSES:

Oliver Williams

Orville D. Easton

FIG. 5.

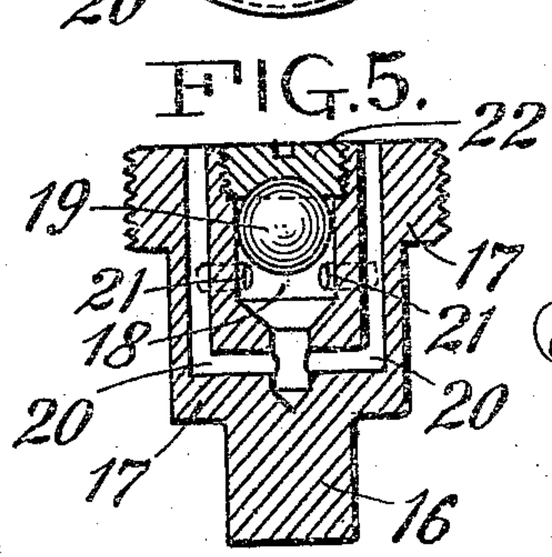


FIG. 6.

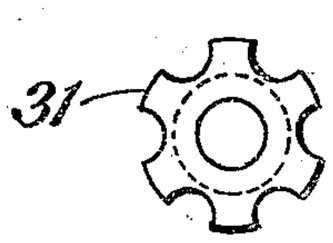
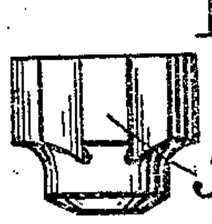


FIG. 7.



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UNITED STATES PATENT OFFICE.

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DASH-POT.

No. 929,003. Specification of Letters Patent. Patented July 27, 1909.

Application filed September 24, 1906. Serial No. 336,002.

To all whom it may concern:

Be it known that I, FRANKLIN PHILLIPS, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Dash-Pots, of which the following is a specification, reference being had to the accompanying drawings, which form a part thereof.

My invention relates generally to dash-pots such as are used with various mechanical movements, and more particularly to dash-pots adapted for use with the valve movements of steam engines of the type in which a vacuum is produced and the resulting excess of atmospheric pressure imparts a quick movement to the parts, while at the same time provision is made for the gradual arrest of the motion and the consequent elimination of shock.

This invention involves certain improvements upon a dash-pot previously invented by me and set forth in my prior patent No. 578,105. In the actual use of dash-pots constructed according to the specification of that patent, under certain conditions of operation and with engines of certain types, I find that the amount of "vacuum pull" is insufficient, and one of the objects of this invention is to increase the relative vacuum area and thus to promote the efficiency of the device. In addition, the improvements are designed to render the action of the dash-pot quieter, smoother, more uniform and more easily and more accurately regulable.

Referring to the drawings, Figure 1 is a sectional elevation of a dash-pot embodying my improvements. Fig. 2 is a plan view of the casing or cage for the ball check valve, and Fig. 3 is a side view of the same. Fig. 4 is a plan view and Fig. 5 a sectional elevation of the vacuum relief valve. Fig. 6 is a plan view and Fig. 7 a view in elevation of the regulator valve for the lower chamber.

The device comprises an annular cylinder arranged about a central hub and a bell-shaped piston. The cylinder consists of a base 1, the central hub 2 integral with said base and the cylindrical body 3. These parts may be cast in a single piece, but for convenience and economy of construction I prefer to build the cylinder of two pieces as shown, providing a ground joint at 4 and bolting the two parts together. The upper end of the cylinder is closed by a suitable cover 5 which is bored to receive the piston sleeve and to fit closely thereto though not necessarily to make an air-tight joint. The piston bell comprises the annular piston 6, the sleeve 7 and the closed head 8 which fits snugly to the head 9 of the hub. The piston head 8 is provided with suitable means for connecting it to the device, the movement of which is to be regulated, for example the ball joint 10 and the connecting rod 11.

Between the head 9 of the hub and the head 8 of the piston bell is the main vacuum chamber substantially as in the device of my earlier patent. The vacuum is controlled by a regulator screw 12. This consists of a tubular shaft terminating in a conical tip 13 and having a milled head for convenience of adjustment. A passage way is drilled through the head of the piston bell, the lower portion thereof being of small diameter, while the upper portion is enlarged to receive the regulator screw. It is tapped for a suitable distance to correspond with the thread cut upon the regulator screw, while the lower end of the enlarged portion is shaped to correspond accurately with the conical tip. The portion of the regulator screw between the conical tip and the threaded portion has a diameter slightly less than the diameter of the passage-way at that point and the bore of the tubular screw communicates with one or more orifices 14 in this portion. Thus when the regulator screw is turned down to its lower limit the conical tip seats against the corresponding portion of the passage way and prevents the passage of air in either direction. When, however, the screw is loosened, air can pass through the orifices into the bore of the screw, and thus to the atmosphere. To permit this regulator screw to be securely set at any desired point without danger from the jar, I provide a check-nut 15.

To permit the escape of any residual air which might impair the vacuum, I provide a suitable relief valve 16. It may be any suitable form of check-valve which will permit air to escape from the vacuum chamber, but will not permit it to enter. The operation of this valve is of considerable importance in the proper operation of the dash-pot, as a whole, and I have shown in the drawings, particularly in Figs. 4 and 5, the form of valve which I have successfully used in practice. It consists of a valve

box 17 the upper portion of which is threaded to be screwed into an opening in the head of the hub. Within this box is a chamber 18, which contains a steel ball 19, the chamber having a horizontal diameter equal to that of the ball and a vertical diameter somewhat greater. The bottom of this chamber has beveled edges to form a seat for the ball. Into the bottom of this chamber below the valve seat lead a plurality of passage-ways 20, which communicate with the vacuum chamber through the top of the valve box and at suitable points in the upper portion of the inner chamber are outlet ports 21 communicating with the outside of the box. This portion of the box is of less diameter than the opening in the hub, so that the air can freely escape. To permit the ball to be inserted or removed, I provide the top of the valve box with a threaded plug 22. Thus, when the piston rises the valve closes by the action of gravity, the ball dropping to its seat. When the piston falls the pressure of the air beneath the ball lifts it and the air can escape through the outlet ports to the outer air.

In the dash-pots heretofore used the annular portion of the piston and the lower portion of the cylinder, form a cushion chamber so that a fluid cushion is formed as the piston descends and the movement is thus arrested with little or no shock. I have found, however, that in certain contingencies the "vacuum pull" is not sufficient to seat the valve as completely and as quickly as the satisfactory operation of the apparatus requires. To remedy this defect I have devised means for producing an auxiliary vacuum within the part which is ordinarily known as the cushion or compression chamber, without sacrificing a sufficient amount of compression to properly cushion the device, and the means which I employ enable me to regulate to a nicety both the vacuum and the compression.

I provide two by-passes 23 and 24 extending from the bottom of the cylinder downwardly, outwardly and upwardly through the cylinder walls and into the cylinder again through ports 25 and 26 near the top. At a suitable point in the by-pass 23 I place a check-valve which will permit fluid to pass from the bottom of the cylinder to the top, but not in a reverse direction and at a suitable point in the by-pass 24 I provide a simple valve by which the passage of fluid may be shut off entirely or regulated to any desired amount. The form of these valves may of course, be varied greatly, but I have shown in the drawings structures which I have used with great success. The check-valve consists of a steel ball 27 accurately fitted to a seat formed in the by-pass and adapted to be seated thereon by the force of gravity. When no auxiliary means were provided, I found that this ball had a tendency to roll about for a short time before it seated, and as the operation of the check-valve must be prompt, I devised the cage 28 shown in Figs. 1, 2 and 3. This consists of a cylindrical box having a chamber within, which has a horizontal diameter equal to the diameter of the ball, and a vertical diameter slightly greater. About this inner chamber are a plurality of passage-ways 29 leading to the top of the box. These passage-ways are so arranged that when the ball is seated the passage of fluid is prevented, and when the pressure is applied from beneath the ball is lifted and the fluid can escape through the valve to the by-pass above and thence to the cylinder.

The regulator valve 31 in the by-pass 24 shown in Figs. 1, 6 and 7 has a solid cylindrical lower portion 31 having its lower edges beveled to correspond with similarly beveled edges of a valve seat formed within the by-pass. The by-pass is enlarged at this point and the upper portion of the valve is enlarged to correspond. Its sides, however, are channeled to permit the free passage of fluid. To provide means for operating this valve from the exterior, I attach to it a rod 32 which extends upwardly through the by-pass and through the cover. This rod is of less diameter than the by-pass so that the free passage of fluid along the by-pass is not interfered with. The upper end of the rod is threaded to correspond with a similarly threaded passage-way so that the rotation of the rod will open or close the valve as the case may be. To permit this valve to be set accurately, and to eliminate the effects of jar, I have provided a lock-nut 33 which seats against the cover 5.

The by-pass 23 is continued upwardly beyond the port 25, through the cylindrical wall and through the cover. The portion above the by-pass is tapped to correspond with a threaded regulator screw 34. This screw is sufficiently long to extend by, and to close the port 25, although in the ordinary operation of the machine the port is left wholly or partially open according to the position of this screw. This is also provided with a lock-nut 35.

The check-valve thus operates as a relief valve precisely as the valve 16 operates for the upper vacuum chamber. The valve 31 operates to increase or diminish the amount of vacuum as desired; when the valve is closed there is almost a complete vacuum, as any residuum of fluid which may be left when the piston rises will be expelled through the check valve when the piston falls; but when the piston rises again no fluid can return through the check-valve. As the valve 31 is opened the amount of vacuum is diminished until it is almost entirely destroyed. The amount of compres-

sion or air cushion is regulated in part by the screw 34 and in part by the valve 31, and it will be found that this regulation can be made most accurate.

It is to be observed that the vacuum chambers both act upon the piston in its upward motion only, or that the restraining influences of said chambers is on the under side of the said piston. It is also to be seen that the one chamber is cylindrical, while the other is annular and of an area more or less than the other.

By the use of the above described construction, wherein each of the chambers acts during a portion of the piston stroke as a vacuum chamber, I have been able to use my dash-pot successfully under extreme conditions where dash-pots having but a single vacuum chamber have failed. For instance, where a dash-pot has to be used to operate the valves of an engine subject to great and sudden variations of load, it is apparent that it must operate positively and quickly, sometimes through a long stroke, when there must be enough air in the cushion chamber to prevent pounding; and at another time, quickly following the former condition, with a very short stroke, when with a vacuum in but one chamber and much air in the other chamber, the desired result would be impossible. With the construction which I have set forth, however, when the stroke of the dash-pot becomes short, the excess of air in the cushion chamber will be immediately driven out, and the combined effect of the vacuum in the two chambers will insure positive action and instantaneous cut-off. It will be seen that these results flow from the use of more than one vacuum chamber.

For the purpose of holding the ball 10 on the piston-rod 11 in its seat in the piston head, and to provide means for taking up wear I use the adjustable threaded collar 36, fitted to the tapped orifice about the ball 10, the inner surface of the collar being shaped to form the upper half of the socket. The upper end of the collar is provided with flattened sides to permit the application of a wrench. To securely hold the collar after the proper adjustment has been attained I employ the lock-nut 37 tapped to correspond with the threads upon the collar. Thus as the bearing surfaces become worn it is a very simple matter to loosen the lock-nut, screw down the collar until the required adjustment is secured, and then tighten the lock-nut once more. I do not claim this construction in this application.

I have shown and described a form of device embodying my improvements, but it will be obvious that the said improvements can be applied to devices varying greatly in matters of detail. I do not wish, therefore, to be understood as limiting myself to the precise form shown and described, but desire to cover the invention broadly, as pointed out in the following claims:

1. A dash-pot provided with separate vacuum chambers constructed to act in the same direction.

2. A dash pot provided with separate vacuum chambers constructed to act in the same direction, each of said vacuum chambers being provided with a relief valve.

3. A dash pot comprising a vessel and a piston working therein, the parts being formed to provide a vacuum chamber and a second chamber arranged on the same side of the piston, and means associated with the second chamber permitting egress of fluid from said second chamber on one stroke of the piston more rapidly than fluid may enter said second chamber on the other stroke thereof.

4. A dash-pot provided with separate vacuum chambers constructed to act in the same direction and means for admitting fluid to one chamber to form a cushion.

5. A dash-pot comprising a vessel and a piston working therein, the parts being formed to provide separate vacuum chambers arranged on the same side of the piston.

6. A dash-pot comprising a vessel and a piston working therein, the parts being formed to provide separate vacuum chambers arranged on the same side of the piston, and means for admitting fluid to one chamber to form a cushion.

7. A dash-pot comprising a vessel and a piston working therein, the parts being formed to provide separate vacuum chambers arranged on the same side of the piston, each of said vacuum chambers being provided with a regulating valve and relief valve.

8. A dash-pot comprising a vessel and a piston working therein, the parts being formed to provide separate chambers and means associated with the chambers whereby a vacuum will be formed in each chamber during the outstroke and maintained in each chamber during the first part of the instroke, and means for admitting fluid into one of the said chambers to form a cushion during the latter part of the instroke.

9. A dash-pot comprising a vessel and a piston therefor, the parts being formed to provide two separate vacuum chambers acting in the same direction, means for admitting fluid into one of the said chambers to form a cushion during the latter part of the instroke, and separate means to regulate the cushioning effect.

10. A dash-pot comprising a vessel and a piston therefor, the parts being formed to provide two separate chambers, means associated with one of said chambers whereby a vacuum will be formed therein and maintained substantially throughout both strokes, means for regulating the degree of

said vacuum, means associated with the second chamber whereby a vacuum will be formed therein during the outstroke and maintained during the first part of the instroke, means for admitting fluid to said second chamber to regulate the degree of said second vacuum and to form a cushion during the latter part of the instroke, and separate means to regulate the cushioning effect.

11. In a dash-pot the combination of a cylinder, a reëntrant hub concentrically surrounded thereby, and a piston comprising a head and sleeve, said sleeve adapted to work in the inter-space, the wall of said cylinder, said hub and the said piston sleeve forming an outer vacuum chamber therebetween, the crown of said hub, the head of said piston and the piston sleeve forming an inner vacuum chamber, and a relief valve and a regulating valve communicating with each of said respective chambers.

12. In a dash-pot the combination with a cylinder a hub located centrally within said cylinder and a piston provided with a sleeve terminating in a closed head adapted to fit over the said hub, of a regulating valve and a check valve communicating with the chamber formed between the head of the hub and the head of the sleeve, the cylinder being provided with two by-passes each leading from one end of the cylinder to the other, a regulator valve located in one of said by-passes and a check valve located in the other.

13. In a dash-pot the combination of a cylinder, a central hub, a piston provided with a sleeve having a closed head forming, with the central hub, a vacuum chamber, means for regulating the vacuum in said vacuum chamber, means for regulating the vacuum in the bottom of the cylinder, and means for regulating the fluid cushion in the bottom of the cylinder.

14. A dash-pot of the character described provided with two separate chambers, one a vacuum chamber, the other a cushion chamber, the cushion chamber being so constructed that a vacuum will be produced therein at intervals, the effect of said vacuum and of that in the vacuum chamber being cumulative.

15. In a dash-pot the combination of a cylinder, a piston therefor, said cylinder provided with two by-passes adapted to transfer fluid from one side of the piston to the other, a valve in one by-pass adapted to regulate the flow of fluid therethrough, a check valve in the second by-pass adapted to permit fluid to pass from the forward end of the cylinder to the rear end thereof but not in the reverse direction, and a means for regulating the flow of fluid from the second by-pass into the cylinder.

16. In a dash-pot the combination of a cylinder, a central hub therein, a piston having a sleeve provided with a closed head adapted to fit over said hub to form an upper vacuum chamber and a relief check valve connected to said chamber, the cylinder being provided with two by-passes each leading from one end of the cylinder to the other, a check valve in one of said by-passes adapted to permit the flow of fluid from the bottom of the cylinder to the top but to prevent its flow in the opposite direction, a regulator screw operable from the exterior and adapted to regulate the admission of fluid from the said by-pass into the said cylinder, and a regulator valve in the other by-pass operable from the exterior.

17. In combination in a dash-pot, a cylinder, a reëntrant concentric hub therein, a piston working in the space between the hub and the outer cylinder wall and forming in connection with the cylinder two vacuum chambers, one between the inner and outer walls of the cylinder below the annular part of the piston, and the other between the head of the cylinder hub and the central part of the piston, each of said chambers being provided with a check valve.

18. A dash-pot provided with a cylindrical and an annular vacuum chamber the vacua in both of said chambers acting on the under side of the piston of said dash-pot.

19. In combination, in a dash-pot, a cylinder, a hub in said cylinder concentric therewith, a piston having an annular sleeve working in the space between the cylinder and hub, an annular cover attached to said cylinder and surrounding the piston sleeve and forming a closed space above the part of the piston in the space between the cylinder and hub, a by-pass leading from the space under the piston to the space above the same, and a check valve in said by-pass permitting fluid to flow from beneath the piston upward, but not in the reverse direction.

FRANKLIN PHILLIPS.

Witnesses:
ARTHUR MUDD,
WILLIAM E. PHILLIPS.