(No Model.)

J. D. CITÉ.

DASH POT.

No. 393,690. Patented Nov. 27, 1888.

Fig. 2.

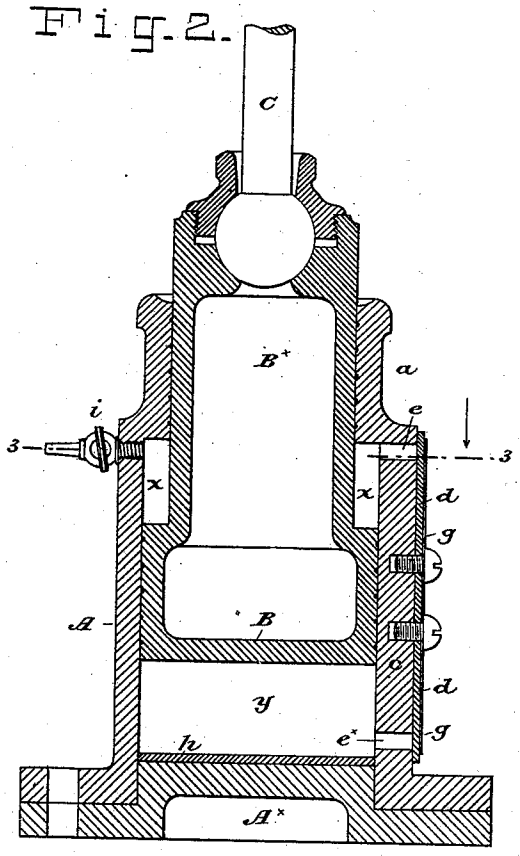


Fig. 1.

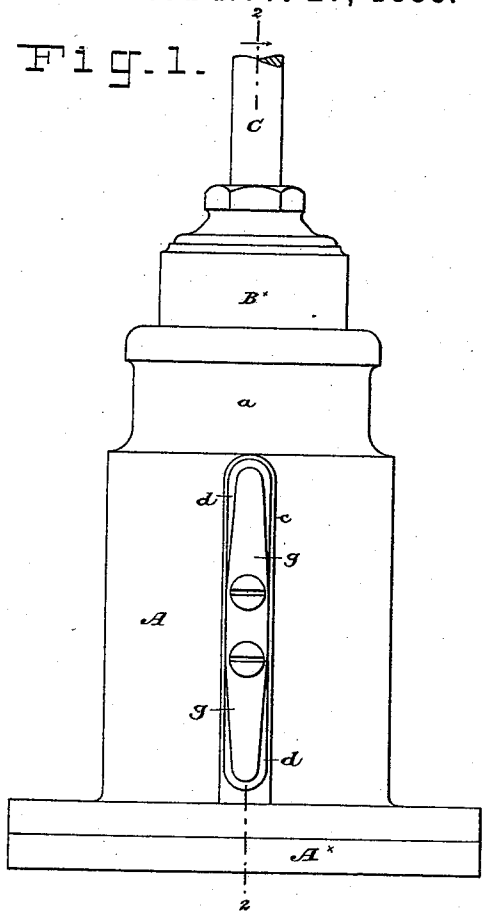


Fig. 4.

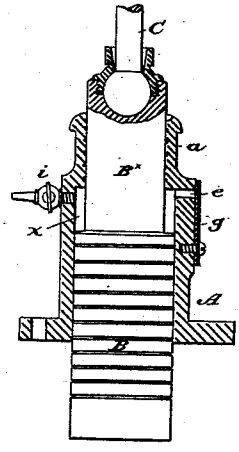
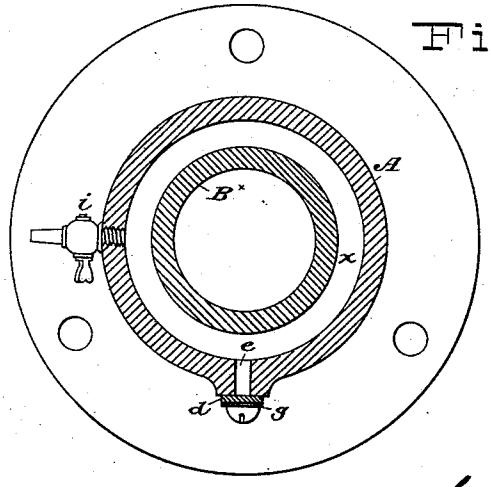


Fig. 3.



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UNITED STATES PATENT OFFICE.

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DASH-POT.

SPECIFICATION forming part of Letters Patent No. 393,690, dated November 27, 1888.

Application filed February 14, 1888. Serial No. 264,028. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH D. CITÉ, who have declared my intention to become a citizen of the United States, and am a resident of Fishkill-on-the-Hudson, Dutchess county, New York, have invented certain new and useful Improvements in Dash-Pots, of which the following is a specification.

My invention relates to devices for automatically closing the inlet-ports of steam-engines provided with cut-off-valve gear. These devices are commonly called "dash-pots." In engines of the class to which my invention will be applied the lever of the steam-inlet valve is liberated automatically by a movement of the parts under the control of the governor, and the valve is then instantly returned and the port closed by the dash-pot. The sole purpose of the dash-pot is to quickly close the steam-inlet when the valve is released at the proper point in the stroke; and to be effective it is desirable that it shall do its work quickly and without jar and noise. The ordinary vacuum dash-pot comprises a cup-like cylinder or pot and a piston playing therein which is connected to the valve-arm. The extent of lift of the piston in the pot varies directly with the cut-off. Another form is the weight dash-pot, wherein the valve is closed by the descent of a heavy weight, the movement of which varies also directly with the cut-off. The work to be performed by the dash-pot will vary with the pressure of steam in the generator and with the cut-off. This work is due to the friction of the valve on its seat, and will be proportionate to the travel of the valve. The force required to close the valve must then act through a distance proportionate to the travel of the valve. This force is applied to the valve through the medium of connecting parts, which by their movement acquire a momentum which must be counterbalanced by an exterior force, and as the momentum increases with an increase in the travel of the valve operated the counterbalancing force should be automatically proportioned to the variable travel of the valve.

In both forms of the ordinary dash-pot the momentum acquired by the parts in motion will bring down the weight or piston forcibly and produce a disagreeable hammering and pounding, which must be obviated by an air-cushion; but the forcible escape of this air, necessary to allow the piston or weight to reach the end of its stroke, produces a whistling noise, which is also disagreeable. In neither of these forms of dash-pot is the cushion made to vary automatically with the lift, and if set for a certain lift it must be varied when the point of cut-off is altered.

The object of my invention is to produce a dash-pot which will neither pound nor produce a whistling noise, and one which will adapt itself automatically to all conditions or degrees of cut-off to a sufficient extent.

My invention will be fully described hereinafter, and its novel features carefully defined in the claims.

In the drawings which serve to illustrate my invention, Figure 1 is a side elevation of a vacuum dash-pot embodying my invention. Fig. 2 is an axial section of the same in the plane indicated by line 2 2 in Fig. 1, and Fig. 3 is a horizontal section in the plane indicated by line 3 3 in Fig. 2. Fig. 4 is a sectional view similar to Fig. 2, but on a smaller scale, illustrating the application of my invention to a weight dash-pot.

A represents a cylinder closed at the bottom by a base or head, $A^{\times}$. This cylinder is bored out to receive a close-fitting piston, B. This piston has a stem, $B^{\times}$, of comparatively large diameter, which fits and plays in a bore formed in the reduced neck or upper part, *a*, of the cylinder.

C is the connecting-rod which couples the piston to the arm of the valve. This rod is or may be connected to the piston-stem by a ball-and-socket joint in a well-known way. The construction described provides a close chamber, *x*, of annular form, behind the piston, which I will call, for convenience, the "upper vacuum-chamber," and a close chamber, *y*, in front of the piston, which I will call the "lower vacuum-chamber."

On the side of cylinder A is formed a suitable valve-seat, *c*, on which rests a valve, *d*, of leather or other like yielding material, which closes two ports, *e* $e^{\times}$, the former opening into the upper vacuum-chamber, *x*, at its top, and

the other opening into the lower vacuum-chamber, *y*, near its bottom. The leather valve *d* is held firmly up to its seat by a double leaf-spring, *g*, secured to the cylinder at its middle by screws or the like and its free ends resting on the valve over the ports *e* $e^{\times}$, as shown. In the bottom of chamber *y* is placed a cushion, *h*, of rubber, leather, or the like; but this I do not consider absolutely essential to the proper working of my invention.

The valves controlling ports *e* $e^{\times}$ are check-valves and do not allow any air to enter the vacuum-chambers from without. As the port $e^{\times}$ enters chamber *y* a little way above the bottom of said chamber, it necessarily follows that when piston B shall have descended far enough to mask this port the air remaining below will serve as a cushion to assist in counterbalancing the inertia of the descending parts.

It will be seen that the displacement in chamber *y* when the piston B descends will be equal to the displacement of its stem $B^{\times}$ plus the displacement in chamber *x* when said piston rises.

The operation is as follows: When the piston B is first set in motion and rises, air is displaced in vacuum-chamber *x* and escapes at port *e*. The proportion of air displaced will depend on the lift of the piston. A partial vacuum is formed below the piston when it rises. When the valve is released, the piston descends rapidly under atmospheric pressure. In its descent a partial vacuum is formed in chamber *x*, due to the rarefaction of the air therein. This produces a retarding effect toward the end of the piston's descending stroke and overcomes the momentum of the piston, thus obviating the hammering or pounding of the piston commonly heard in these devices.

It will be seen that the work done by my dash-pot is directly proportional to the travel of the piston, and that the piston is arrested or held back by a force directly proportional to the extent of fall or downward movement of the piston, which renders its action automatic and adapts it to any degree of cut-off. The whistling noise is wholly obviated, as there is no expulsion of air on the sudden downstroke, and the upstroke is effected so slowly, comparatively, that the small quantity of air expelled in making that stroke will produce no noise. Thus my dash-pot operates without appreciable noise of any kind, the momentum of the parts being overcome by a vacuum, so to speak, instead of by an air-cushion. The small quantity of air incarcerated under the piston at the end of its downstroke serves as a sort of spring to neutralize the inertia of the parts and start the piston on its upstroke.

When my invention is applied to a vacuum dash-pot, I make the piston hollow, as shown, so as to reduce its weight as much as possible; but when it is applied to a weight dash-pot, as seen in Fig. 4, the piston or plunger will be given the necessary weight to perform its work properly.

The rationale of my dash-pot is this: When the valve is opened to its fullest extent, the piston will be raised to its highest point. This will displace nearly all the air in chamber *x*. When the valve is released, the piston will suddenly descend, and will acquire a maximum momentum, due to the excessive fall; but the vacuum produced behind it in chamber *x* will be the more nearly perfect for the same reason, and will be the more potent as a force to neutralize the momentum. Now suppose the valve only opens to a slight extent and the piston rises only a little; then, when the valve is released and the piston descends, the latter will have very little momentum, owing to the diminished fall. At the same time, owing to the slight displacement produced in chamber *x* by the diminished rise of the piston, the vacuum in said chamber produced by the piston's descent will be very imperfect and have little potency.

I have here treated vacuum as a positive force merely for convenience. If the vacuum in chamber *x* were perfect, then the atmospheric pressure tending to drive down the piston B would be measured by the area of its stem $B^{\times}$—the minimum. If the chamber *x* were fully open to the atmosphere, then the atmospheric pressure tending to drive down the piston B would be measured by its full area—the maximum.

The difference of area of the stem $B^{\times}$ and piston B may be fixed approximately to suit the conditions; but the potency of the vacuum in chamber *x* may be modified at will by providing said chamber with an air-cock, as *i*, or some similar device for admitting a small quantity of air thereto. This would be substantially equivalent to effecting a variable enlargement of the area of the stem $B^{\times}$ of the piston and a corresponding lessening of the annular chamber around it.

Of course any known form of check-valve might be employed to control the ports *e* $e^{\times}$. The construction herein shown is simple and efficient. I may say, also, that it is immaterial to the operation of my dash-pot which of the two elements of the same is the moving part, the cylinder or the piston.

Having thus described my invention, I claim—

1. A dash-pot containing a piston having differential areas, with a vacuum-chamber on the side of the piston of the lesser area, substantially as set forth.

2. A dash-pot comprising a cylinder with a main bore for the piston and a lesser bore for the piston-stem, a piston in said cylinder having a stem which fits said lesser bore, and a check-valve controlling a port in said cylinder behind said piston, substantially as set forth.

3. In a dash-pot, the combination of the cylinder, closed at the bottom and provided with two bores of different diameters, and with ports *e* $e^{\times}$ at its ends for the escape of air, of the piston, which fits the larger bore in said cylinder and has a stem which fits the lesser bore in same, and check-valves controlling the

ports in said cylinder, substantially as set forth.

4. In a dash-pot, the combination, with the cylinder A, having a neck, *a*, and ports *e* $e^{\times}$, of the piston B, having a stem, $B^{\times}$, the check-valves controlling the ports in the cylinder, and an air-cock in said cylinder behind said piston, as set forth.

5. In a dash-pot, the combination, with the cylinder A, having a valve-seat, *c*, and ports *e* $e^{\times}$, of the valve *d*, of soft material, extending over said ports, and the leaf-spring *g*, resting on said valve and secured at its middle to the cylinder, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEPH D. CITÉ.

Witnesses:
ROBERT S. HALPIN,
M. E. CURTISS.