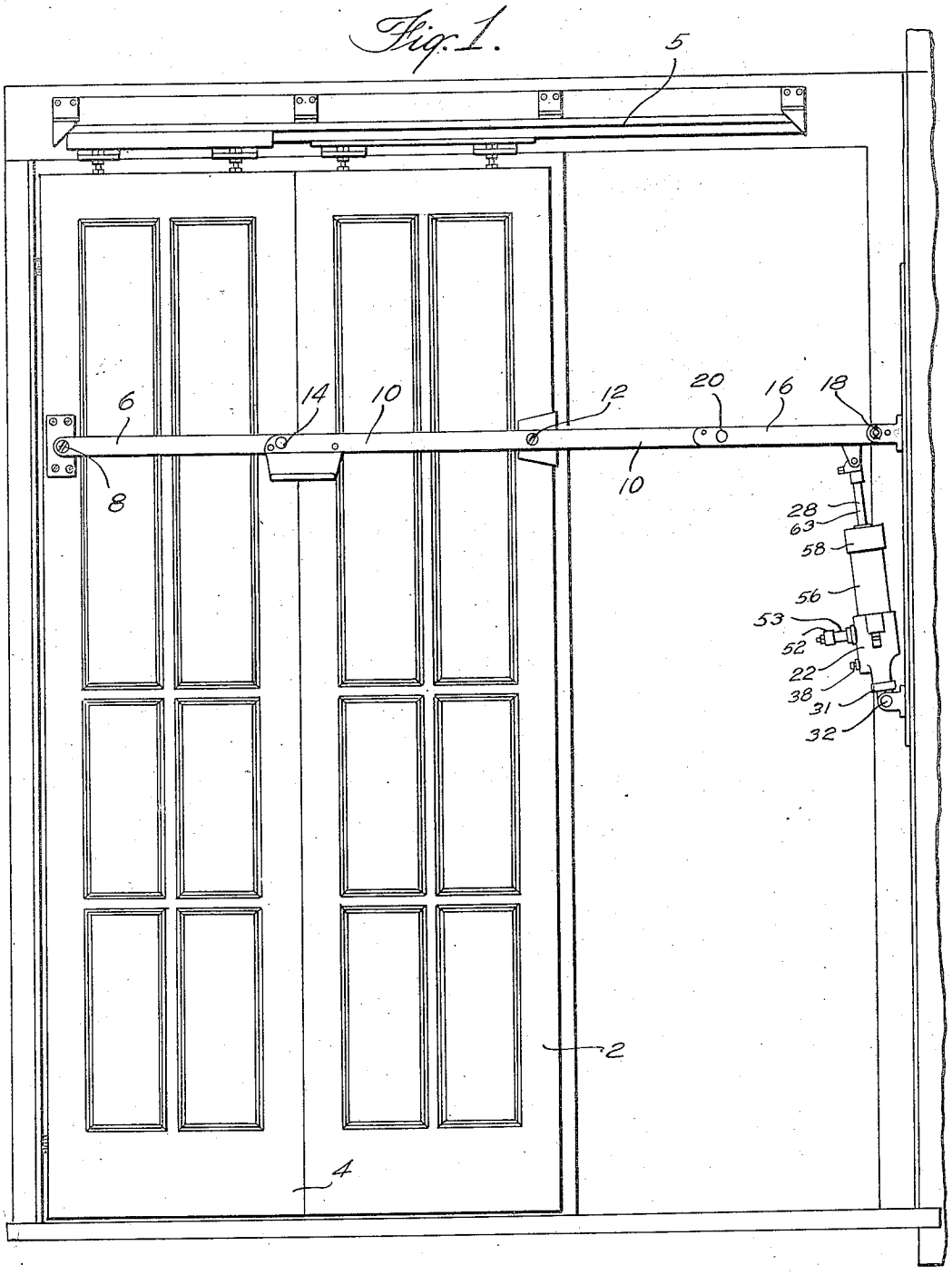
Aug. 10, 1926. 1,595,171

H. W. SHONNARD

DOOR CLOSING AND CHECKING MECHANISM

Filed Oct. 11, 1924 3 Sheets-Sheet 1

Fig. 1.



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DOOR CLOSING AND CHECKING MECHANISM

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Fig. 2.

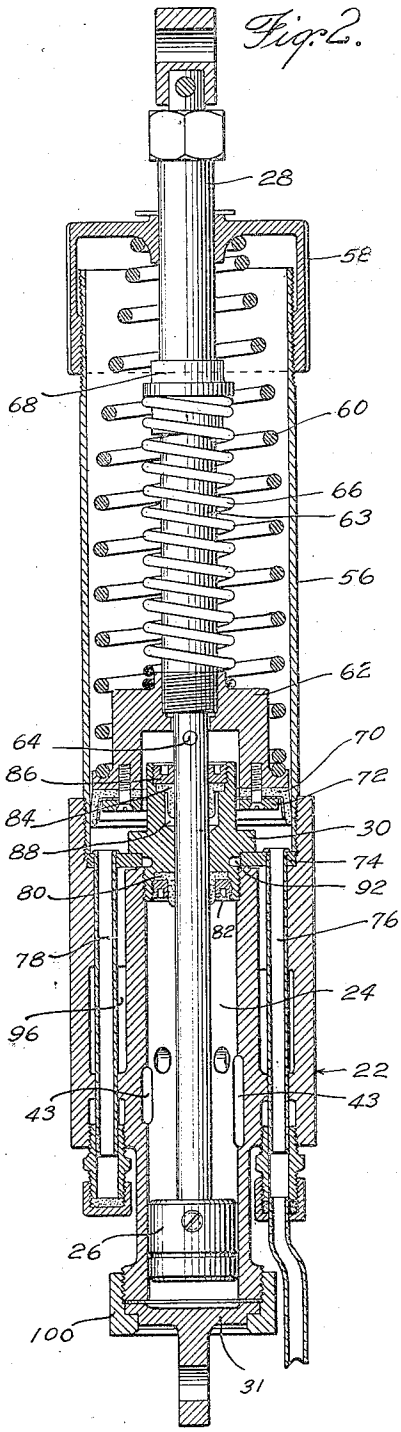
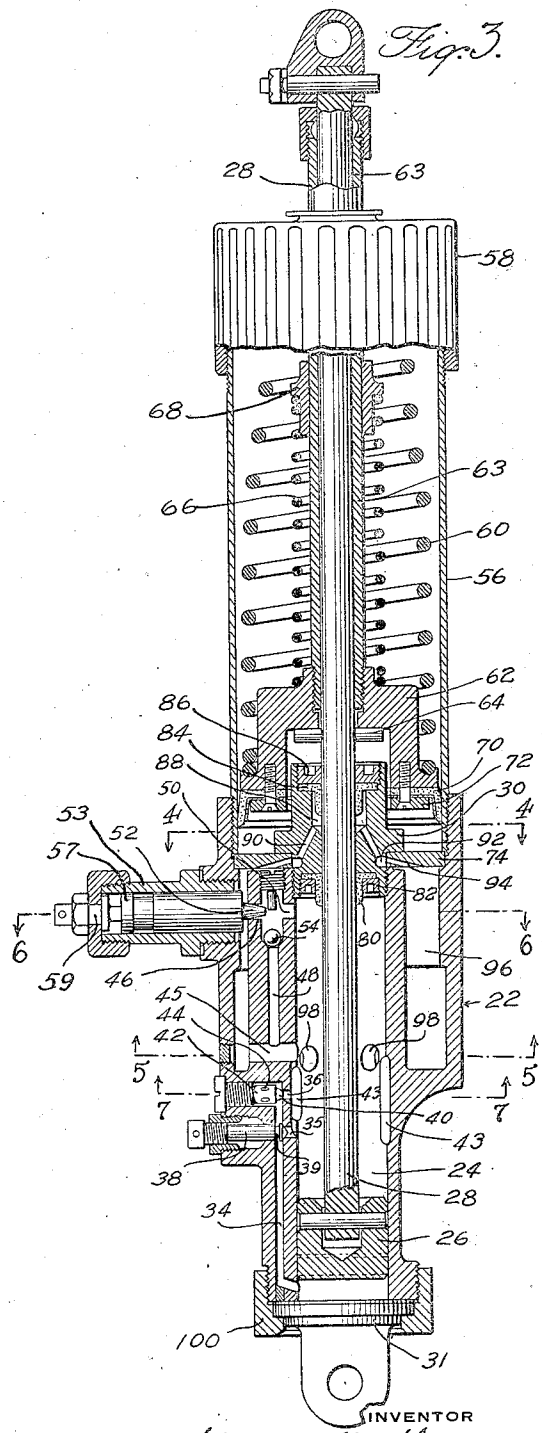


Fig. 3.



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Fig. 4.

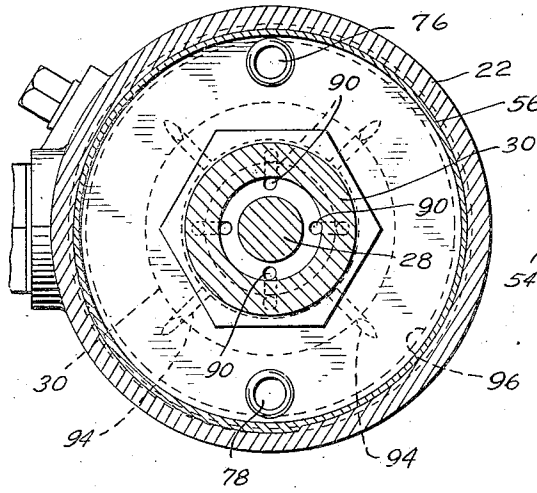


Fig. 5.

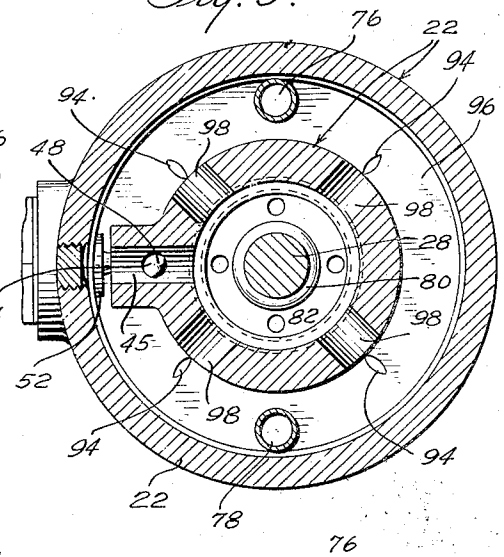


Fig. 6.

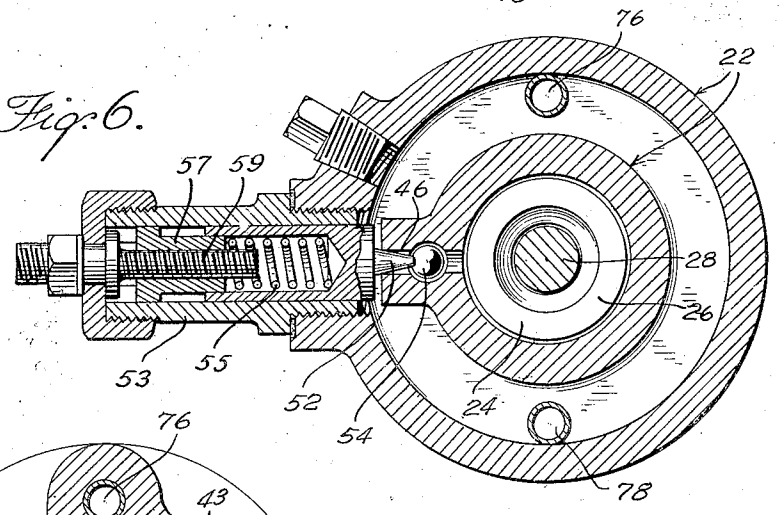
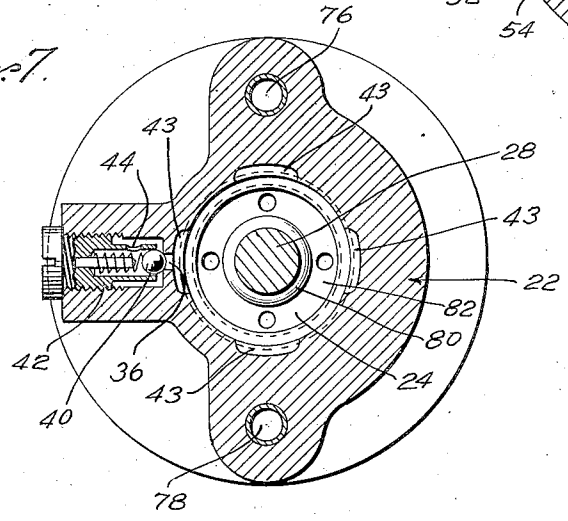


Fig. 7.



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Patented Aug. 10, 1926. 1,595,171

UNITED STATES PATENT OFFICE.

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DOOR CLOSING AND CHECKING MECHANISM.

Application filed October 11, 1924. Serial No. 743,051.

This invention relates to door closing and check mechanisms and more particularly to mechanisms of this class, especially adapted for use upon the doors of elevator hatchways. Certain mechanisms of this character at present in common commercial use embody a dash pot comprising a cylinder and a piston mounted on a piston rod and operating in the cylinder and operating connections between an elevator door and one of said parts. The movement of the piston through the cylinder is controlled by oil or other suitable fluid with which the cylinder is filled, the movement of the piston being checked by the oil as the piston approaches an end of the cylinder to check the movement of the door. In one form of door operating and controlling mechanism embodying this form of check mechanism, a second cylinder is connected with the dash pot cylinder and a second piston is mounted on the piston rod and is arranged to be operated by air or other fluid under pressure to produce movements of the door. Certain features of the present invention relate to means for preventing in a door operating and controlling mechanism of the latter type, the leakage of oil from the dash pot cylinder between the head of the dash pot cylinder and the piston rod into the second cylinder. In their broader aspects these features are not limited to a door operating and controlling mechanism having a dash pot cylinder and a door operating cylinder but may be embodied in a simple dash pot mechanism.

Certain features of the invention relate to improvements in the mechanism for controlling the flow of oil or other fluid from one side of the piston to the other in a door controlling dash pot mechanism.

In door operating and controlling mechanisms of this class the dash pot cylinder is often provided with devices mounted on one side of the cylinder to regulate the action of the dash pot mechanism and it is therefore desirable to be able to locate the dash pot cylinder in an angular position about its axis to render these devices always readily accessible. Certain features of the invention relate to devices for supporting the dash pot cylinder to secure this latter result.

The features of the invention will be readily understood from the accompanying drawings illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawings—

Figure 1 is a view in front elevation illustrating a door operating and controlling mechanism embodying the invention applied to the sliding doors of an elevator hatchway;

Figure 2 is a sectional view taken in a plane containing the axis of the dash pot and door operating cylinders;

Figure 3 is a view similar to Figure 2 taken in a plane at right angles to the plane of the latter figure;

Figure 4 is a sectional view taken substantially on the line 4—4 of Figure 3;

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 3;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 3; and

Figure 7 is a sectional view taken substantially on the line 7—7 of Figure 3.

In the form of the invention illustrated in the drawings the invention is embodied in mechanism for operating and controlling two horizontally sliding doors 2 and 4 for an elevator hatchway which are hung upon rollers engaging an overhead track 5. The doors are arranged to be operated by toggle levers comprising a lever 6 pivoted at 8 to the door 4, a lever 10 pivoted at 12 to the door 2, and pivotally connected at 14 with the lever 6, and a third lever 16 pivoted at 18 to a fixed bracket secured to the door frame and pivotally connected at 20 with the lever 10. Thus the doors may be opened by swinging the lever 16 upwardly from the position shown in Figure 1, and the doors may be closed by swinging the lever back to the position shown in this figure.

The mechanism for operating and controlling the movements of the doors is preferably connected with the lever 16. This mechanism embodies a dash pot for checking the movement of the doors comprising a cylinder 22 having a cylindrical chamber 24 in which slides a piston 26 attached to one end of a piston rod 28, the other end of

which is pivotally connected with a lug on the lever 16. The chamber in the cylinder is closed at one end by a head 30 preferably threaded into the cylinder and having an opening through which the piston rod moves. The other end of the cylinder is closed by a cap 31 having a lug by which the cylinder is pivotally supported at 32 upon a bracket attached to the door frame.

The cylinder 22 is filled with a fluid preferably oil, which controls the movement of the piston through the cylinder. In the present embodiment of the invention the dash pot mechanism is arranged to check both the final opening and the final closing movements of the door and to allow a comparatively free movement of the doors in either direction until they approach open or closed positions. The cylinder 22 is provided with a by-pass 34 through which the oil may flow in either direction during the movement of the piston in the outer or lower end of the cylinder. Two openings 35 and 36 are provided leading from the by-pass into the central chamber in the cylinder and the flow of oil through the opening 34 is controlled by an adjustable check valve 38. This check valve is cut away at 39 back of its head to allow the free flow of oil through the portion of the by-pass across which the valve extends. During the downward movement of the piston in the lower end of the chamber 24 the opening 36 is closed by a spring-pressed ball valve 40. This valve is mounted in a tubular holder 42 having openings 44 to permit the oil to flow into the same and through its pressure on the ball assist in holding the ball in closed position during this part of the movement of the piston.

During the downward movement of the piston in the chamber 24 which occurs during the closing movement of the door, the movement of the piston is comparatively free until the piston reaches the opening 35. As the piston continues its downward movement the opening 36 is closed by the ball valve 40 and the oil is forced to flow from the by-pass 34 between the head or check valve 38 and the wall of the opening 35 into the chamber 24, thereby checking the oil flow and causing a slow and gradual movment of the piston. During the upward movement of the piston in the cylinder which occurs during the opening movement of the door, the movement of the piston is comparatively free until the piston approaches the upper end of the cylinder when the flow of the oil in the cylinder is checked in substantially the same manner as during the movement of the piston in the lower portion of the cylinder thereby checking the last part of the upward movement of the piston. During the first part of the upward movement of the piston in the cylinder the valve 40 is opened by the pressure of the oil within the chamber 24 and the oil can then flow freely through the by-pass 34, allowing a comparatively free movement of the piston. The cylinder 22 is formed along the central portion of the chamber 24 with a series of grooves 43 so that the movement of the piston through the central part of the cylinder is substantially unretarded.

The upper portion of the cylinder is provided with a by-pass 45 connected by an opening 46 with a by-pass 48. The by-pass 48 is connected with the chamber 24 by an opening 50 and said by-pass opens at its lower end into the by-pass 45. The flow of oil through the opening 46 is controlled by a spring pressed check valve 52. During the upward movement of the piston in the chamber 24 the by-pass 48 is closed by a ball valve 54.

During the upward movement of the piston in the cylinder the movement of the piston is comparatively free until the piston passes the lower end of the by-pass 45. As the piston continues its upward movement the by-pass 48 is closed by the ball valve 54 and the oil from the chamber 24 is caused to flow through the opening 50, across the upper end of the latter by-pass between the check valve 52 and the wall of the opening 46, and then downwardly through the by-pass 45 into the chamber 24 on the other side of the piston. Thus the last part of the upward movement of the piston is checked to check the final closing movement of the doors. As the piston moves downward from the upper part of the cylinder, the ball valve 54 is lifted by the pressure of the oil beneath the same, allowing the oil to flow freely from the chamber 24 through the lower end of the by-pass 45 and through by-pass 48 and opening 50 back into the chamber on the other side of the piston. Thus the movement of the piston at this time is comparatively free.

The check valve 52 is slidably mounted in a barrel 53 and is acted upon by a coiled spring 55 interposed between the valve and a block 57 also slidably mounted in the barrel. The block 57 is adjusted to adjust the tension of the spring by means of an adjusting screw 59.

To the upper part of the cylinder 22 is connected a second cylinder 56 preferably threaded into the cylinder 22 and having a cap 58 forming a head for the same, through which the piston rod 28 passes. Mounted within the cylinder 56 is a door closing spring 60 engaging the cap 58 at its upper end and seated at its lower end on a marginal flange on a thimble 62 mounted on the piston rod 28. The thimble 62 is secured to the lower end of a sleeve 63 mounted on the piston rod and the movement of the thimble under the action of the door closing

spring is limited by a pin 64 passing through the piston rod. The door closing spring 60 is compressed upon opening the doors and will actuate the piston rod to close the doors upon their release.

To increase the force tending to close the doors at the beginning of their closing movement, the present mechanism comprises a coiled spring 66 seated at its lower end on the thimble 62 and secured at its upper end to a collar 68 mounted to slide longitudinally on the sleeve 63. Figures 2 and 3 illustrate the position occupied by the collar 68 when the doors are closed, the collar then being located at some distance from the cap on the cylinder 56. As the doors are opened the collar 68 engages the cap 58 during the latter part of the opening movement of the doors, thereby compressing the coiled spring 66. When the doors are released the force of the coiled spring 66 is added to that of the spring 60 during the first part of the closing movement of the doors. The continued movement of the piston rod in the closing movement of the doors, however, at a certain point, disengages the collar 68 from the cap 58 with the result that the final closing movement of the doors is produced by the action of the spring 60 alone.

In the present embodiment of the invention mechanism is provided for actuating the piston rod 28 to produce a closing movement of the doors. This mechanism comprises a piston operating in the cylinder 56 and arranged to be actuated by air or other fluid under pressure introduced into said cylinder. As shown in the drawing this piston comprises the thimble 62 upon which is mounted a flexible packing 70, held in place on the thimble by a ring 72. The lower end of the cylinder 56 is closed by the cylinder head 30 and by a ring-shaped plate 74 surrounding the head 30, as clearly shown in Figures 2 and 3. Air under pressure is introduced into the cylinder 56 by means of a pipe 76, the upper end of which is inserted in an opening in the plate 74, and the lower end of which is connected with the pipes of the air supply mechanism. Figure 2 of the drawing shows a second pipe 78 for introducing air into the chamber which may or may not be used as desired.

In order to prevent oil from being forced from the dash pot cylinder between the piston rod and the cylinder head 30, the cylinder head is provided with spaced stuffing boxes separated by a catch chamber. The lower stuffing box comprises a packing 80 surrounding the piston rod and a packing holding and compressing ring 82 threaded into the cylinder head. The upper stuffing box comprises a packing 84 surrounding the piston rod and a packing holding and compressing ring 86 threaded into the cylinder head. Between the two stuffing boxes the cylinder head is formed with a chamber 88 for catching the oil forced through the lower stuffing box by the pressure of the oil in the upper part of the chamber 24. The oil forced into the chamber 88 is drained off through ducts 90 leading to an annular groove 92, both formed in the cylinder head 30. From the groove 92 the oil is discharged through ducts 94 in the plate 74 into an annular chamber 96 in the cylinder 22, the lower end of which chamber is connected with the central chamber 24 by a series of openings 98. It will be noted from an inspection of Figure 3, that the left-hand groove 43 is connected with the by-pass 45 and also with the opening 35 by suitable passageways. It will also be noted that the grooves 43 are constructed and arranged so that when the upper part of the piston in its upward stroke reaches a point just above the lower part of the by-pass 45 at which point an increase in pressure above the piston begins, the lower ends of the grooves are exposed below the piston. There is, therefore, never any pressure in the chamber 88 which would tend to force the oil through the upper stuffing box into the cylinder 56.

It will be noted that the check valves 38 and 52 are both mounted on one side of the dash pot cylinder. If the cap 31 is threaded on the end of the dash pot cylinder the angular position of the cylinder about its axis with relation to the cap when the cap is screwed tight may be such that these valves will be difficult of access. To enable these valves to be rendered readily accessible at all times it is desirable that the dash pot cylinder should be able to be located in an unvarying position with relation to the cap when the cap is tight and that the position of the cylinder with relation to the cap should be able to be varied for different installations. To secure these results the cap 31 is attached to the lower end of the dash pot cylinder by means of a collar 100 threaded upon the cylinder and having a flange arranged to overhang the cap, as clearly shown in Figures 2 and 3, a gasket preferably being inserted between the cap and the end of the cylinder. This enables the cylinder to be located in an unvarying angular position with relation to the cap or to be adjusted angularly in different positions.

It is to be understood that the invention is not limited to the particular construction and arrangement of parts of the illustrated embodiment of the invention but that the invention may be embodied in other forms within the scope of the claims.

Having explained the nature and object of the invention and having specifically de-

scribed a mechanism embodying the invention in its preferred form, what is claimed is—

1. A door closing and check mechanism having in combination a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a piston rod, a quantity of fluid in said cylinder for controlling the movement of the piston, a closure for the cylinder having spaced inner and outer openings through which the piston rod moves and arranged to fit closely to the piston rod at said openings, a catch chamber between said openings to receive the fluid forced between the closure and the wall of the inner opening, and constantly open ducts leading from said openings to a space in the cylinder in which only low pressure occurs.

2. A door closing and check mechanism having in combination, a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a piston rod, a quantity of fluid in said cylinder for controlling the movement of the piston, a closure for an end portion of the cylinder in which relatively high pressure occurs having an opening through which the rod extends and arranged to fit closely to the rod, and means for catching the fluid forced between the closure and the rod and constantly open ducts for returning the same to the cylinder at a place where only low pressure occurs.

3. A door closing and check mechanism having in combination a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a piston rod, a quantity of fluid in said cylinder for controlling the movement of the piston, a closure for an end portion of the cylinder in which relatively high pressure occurs, having spaced inner and outer openings through which the piston rod moves and arranged to fit closely to the piston rod at said openings, a catch chamber between said openings to receive the fluid forced between the closure and the wall of the inner opening, and constantly open ducts leading from said openings to a space in the cylinder in which only low pressure occurs.

4. A door closing and check mechanism having in combination a piston, a cylinder having relatively high pressure spaces at its opposite ends, and an intermediate space in which only low pressure occurs, operating connections between a door and one of said parts, a quantity of fluid in said cylinder for controlling the movement of the piston, a piston rod, a closure for one end of the cylinder having an opening through which the rod extends arranged to fit closely to the rod at said opening, means for retarding the movements of the fluid from said high pressure spaces during the movement of the piston from the central portion of the cylinder toward either end thereof, and means for catching fluid forced between the closure and the rod and returning the same to a low pressure space in the cylinder.

5. A door closing and check mechanism having in combination a piston, a cylinder having relatively high pressure spaces at its opposite ends, and an intermediate space in which only low pressure occurs, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movement of the piston, a piston rod, a closure for one end of the cylinder having an opening through which the rod extends arranged to fit closely to the rod at said opening, by-passes through which the fluid flows from the high pressure spaces into the intermediate low pressure space during the movements of the piston from the central portion of the cylinder toward either end thereof, means for catching the fluid forced between the closure and the rod and returning the same to a low pressure portion of the cylinder.

6. A door closing and check mechanism having in combination means for retarding movements of the door, comprising a cylinder, a piston, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movement of the piston, a piston rod, a closure for one end of the cylinder having an opening through which the piston rod extends and arranged to fit the rod closely at said opening, means for producing movements of the door comprising a second cylinder connected with the latter end of the first cylinder, a piston mounted on the rod and operating in the latter cylinder, means for introducing fluid under pressure into the latter cylinder to actuate the piston, and means for catching fluid which may be forced from the first cylinder between the closure and the piston rod and returning the same to the first cylinder.

7. A door closing and check mechanism having in combination, means for checking movements of the doors comprising a cylinder, a piston, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movements of the piston, a piston rod, a closure for one end of the cylinder having spaced openings, and arranged to fit closely to the rod as said openings, means for producing movements of the doors comprising a second cylinder connected with the latter end of the first cylinder, a piston mounted on the rod and operating in the latter cylinder, means for introducing fluid under pressure into the latter cylinder, an intermediate catch chamber in said closure be-

tween said openings for catching fluid forced from the first cylinder between the wall of the adjacent opening and the piston rod and ducts for conducting the oil from the chamber back to the first cylinder.

8. A door closing and check mechanism having in combination a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movement of the piston, a cap on one end of the cylinder, means for supporting the cylinder carried by the cap, and means for securing the cap to the cylinder with the cap and the cylinder in any desired relative angular position about the axis of the cylinder.

9. A door closing and check mechanism having in combination a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movement of the piston, a cap on one end of the cylinder, means for supporting the cylinder carried by the cap and means for securing the cap to the cylinder with the cap and cylinder in any desired relative angular position about the axis of the cylinder comprising a collar threaded on the end of the cylinder and having a flange overhanging the cap.

10. A door closing mechanism having in combination a piston, a cylinder in which the piston operates, operating connections between a door and one of said parts, means for strongly retarding the outward travel of the piston from the center toward either end of the cylinder at the end of the piston stroke while only weakly retarding the inward travel of the piston from either end of the cylinder, means for storing energy during the operation of the piston in one direction, said means being capable of actuating the piston on the return stroke and being characterized by the fact that a greater part of the energy is expended during the first portion of the return stroke of the piston, said proportion of energy being greater than that capable of being released by a single coiled spring.

11. A door closing mechanism having in combination a piston, a cylinder in which the piston operates, operating connections between a door and one of said parts, means for strongly retarding the outward travel of the piston from the center toward either end of the cylinder at the end of the piston stroke while only weakly retarding the inward travel of the piston from either end of the cylinder, means for storing energy during the operation of the piston in one direction, a plurality of coiled springs arranged to be progressively compressed by the movement of the piston in one direction, whereby the force exerted on the piston in the opposite direction shows a high maximum during the first portion of the return stroke.

12. A door closing and check mechanism having in combination a cylinder, a piston operating in the cylinder, operating connections between a door and one of said parts, a quantity of fluid in the cylinder for controlling the movement of the piston, a cap on one end of the cylinder, means for supporting the cylinder carried by the cap, and means for securing the cap to the cylinder with the cylinder in an unvarying angular position with relation to the cap.

Signed at Hoboken, New Jersey this 8th day of October 1924.

HAROLD W. SHONNARD.