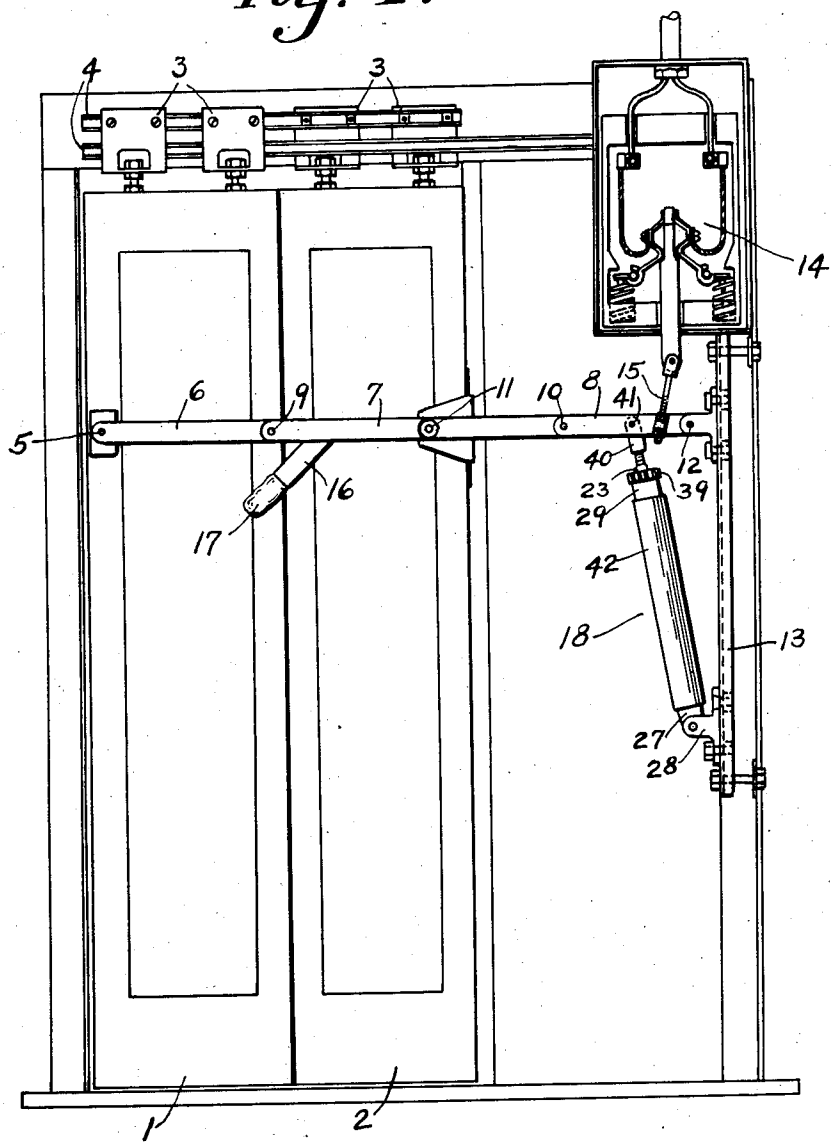
July 17, 1934. C. E. HAMMELL 1,966,445

ELEVATOR DOOR CONTROL MECHANISM

Filed July 30, 1931 4 Sheets-Sheet 1

Fig. 1.



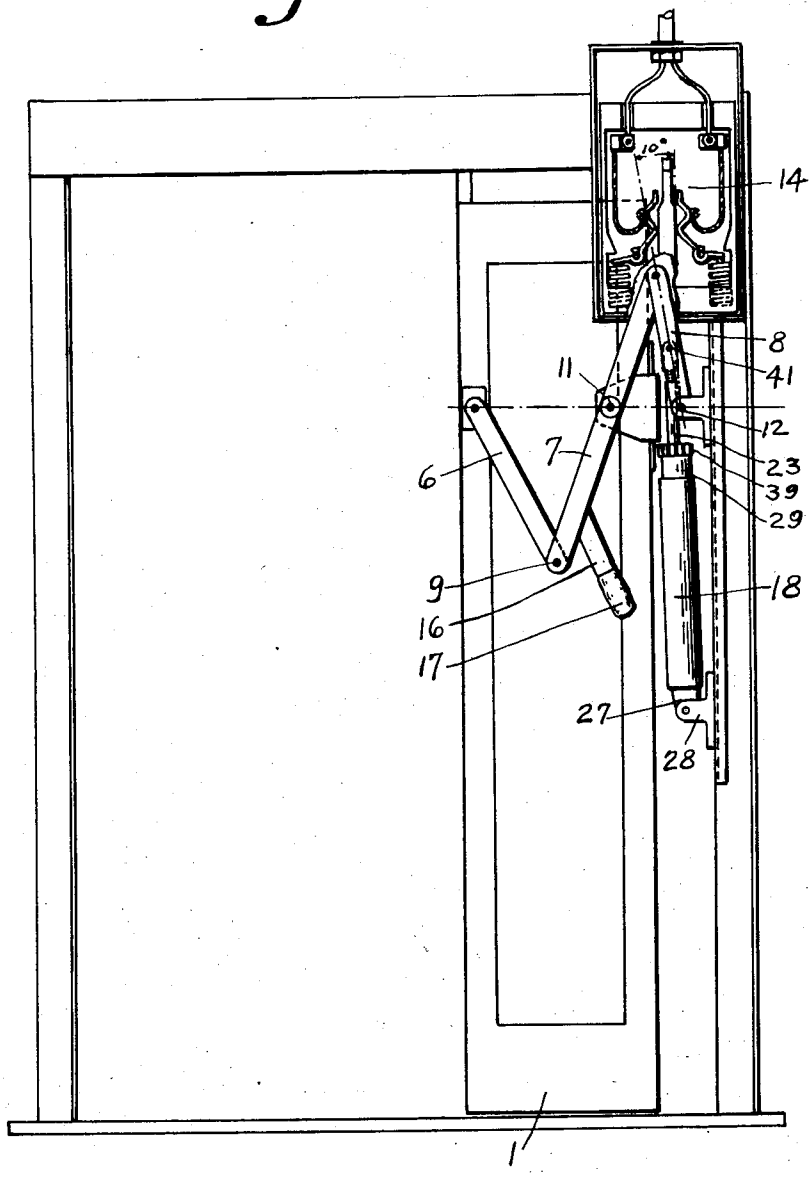
INVENTOR.
CHARLES E. HAMMELL
BY Ernest L. Gale.
ATTORNEY

July 17, 1934. C. E. HAMMELL 1,966,445

ELEVATOR DOOR CONTROL MECHANISM

Filed July 30, 1931 4 Sheets-Sheet 2

Fig. 2.



INVENTOR.
CHARLES E. HAMMELL
BY Ernest L. Gale.
ATTORNEY

July 17, 1934. C. E. HAMMELL 1,966,445

ELEVATOR DOOR CONTROL MECHANISM

Filed July 30, 1931 4 Sheets-Sheet 3

Fig. 3.

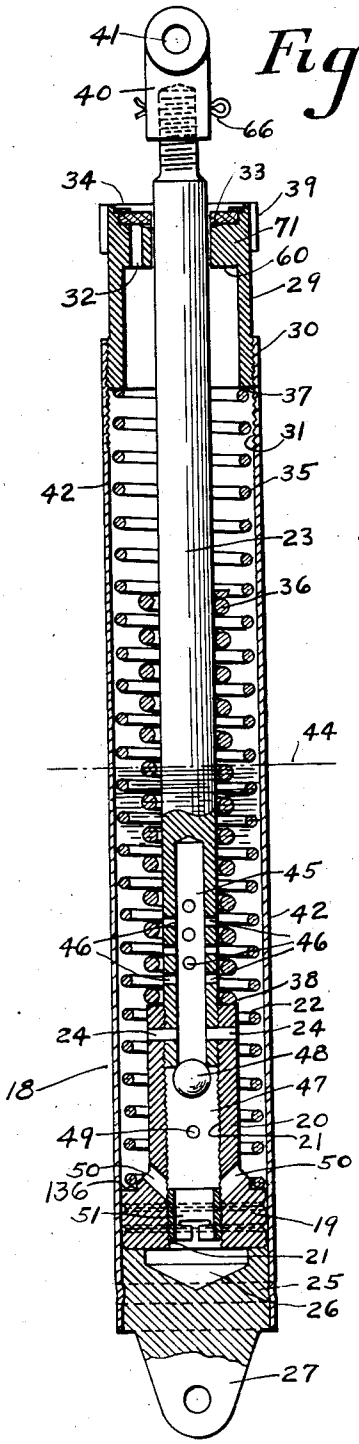


Fig 4

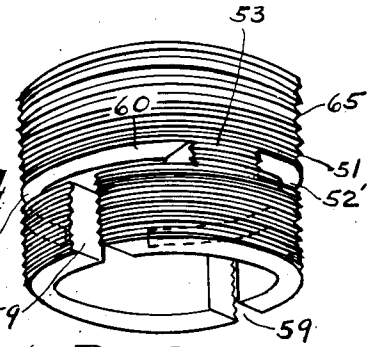
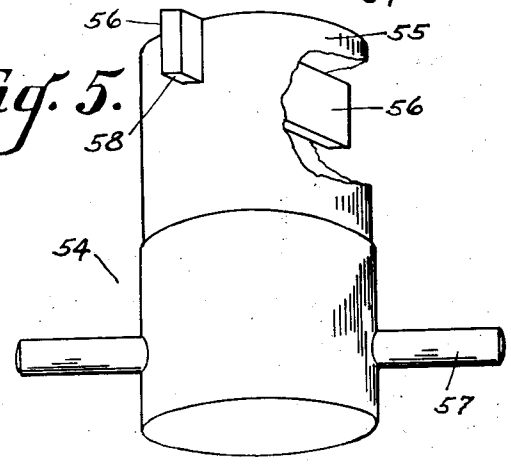


Fig. 5.



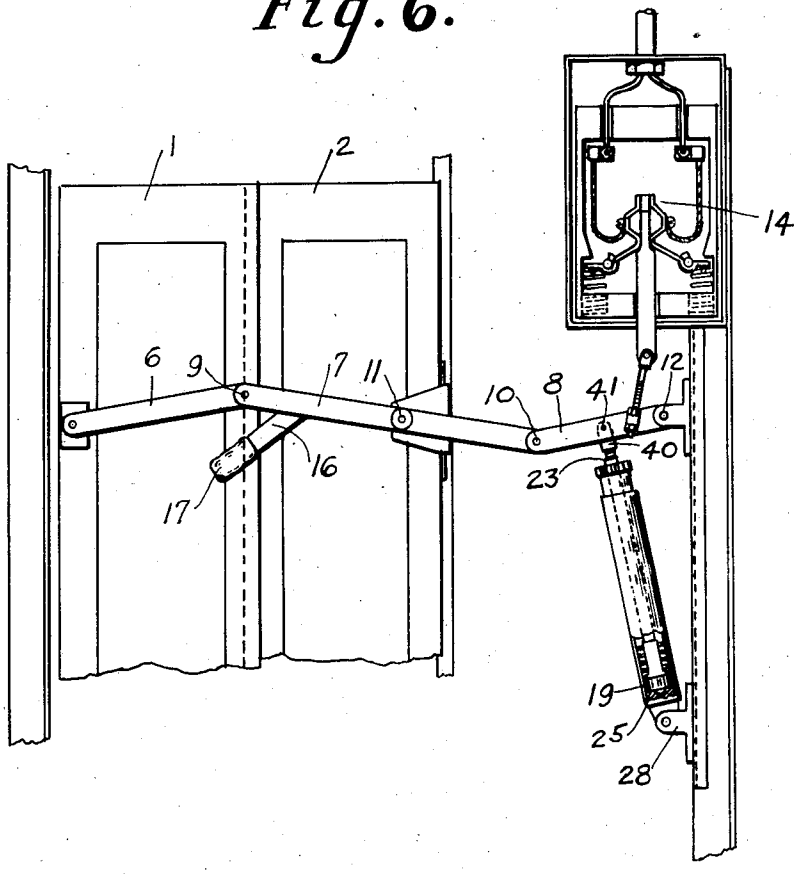
INVENTOR.
CHARLES E. HAMMELL
BY Ernest L. Hale.
ATTORNEY

July 17, 1934. C. E. HAMMELL 1,966,445

ELEVATOR DOOR CONTROL MECHANISM

Filed July 30, 1931 4 Sheets-Sheet 4

Fig. 6.



INVENTOR.
CHARLES E. HAMMELL
BY Ernest L. Gale.
ATTORNEY

Patented July 17, 1934

1,966,445

UNITED STATES PATENT OFFICE

1,966,445

ELEVATOR DOOR CONTROL MECHANISM

Charles E. Hammell, Red Bank, N. J., assignor, by mesne assignments, to The Gurney Elevator Co., Honesdale, Pa., a corporation of Pennsylvania

Application July 30, 1931, Serial No. 554,064

9 Claims. (Cl. 16—52)

My invention relates to door closers and particularly to closers such as are used in the elevator art for hoistway doors and car doors or gates.

A divisional application has been filed April 21, 1934, Serial No. 721,750 covering the subject matter divided out of this application.

Closers of the above noted character are provided with fluid cushioning or checking means to cause the rapidly closing door or gate to be stopped without impact or slamming and the cushioning means is arranged to be regulated by a device such as for example a needle valve.

It is now common practice to construct and arrange such regulating device for adjustment from outside the cushioning unit but such arrangement, as found from experience, is objectionable because it invites tampering.

Hence one of the features of the present invention is to provide a closer constructed and arranged with the regulating means for the cushioning means concealed wholly within the closer casing so as to be inaccessible by any means whatsoever from without, which arrangement, in order to effect regulation, necessitates partial disassemblement of the closer and tampering is thus greatly minimized.

Another feature of the invention is to provide a regulating means of novel construction and arrangement which assures permanency of adjustment.

A further object of the invention is to provide a combined closer and cushioning mechanism of novel construction and arrangement to cause a relatively quick start of the door from full open position followed by rapid acceleration to about three-quarter closed position, the arrangement being such that for such relatively long door movement there is a relatively short and consequent slow movement of the piston in the fluid with consequent slight cushioning effect resulting therefrom, and during the remainder or relatively short door movement to fully closed position there is a relatively long and consequent fast piston movement with consequent increased cushioning effect which effectually prevents impact and slamming.

Other features will be obvious from the following description and appended claims.

Referring now to the drawings, Fig. 1 is a general elevation illustrating the closer as applied to a two speed sliding hoistway door, together with a switch having an interlocking function, operatively associated therewith; Fig. 2 illustrates the position of parts with the door in open position; Fig. 3 illustrates a sectional elevation of the closer; Fig. 4 illustrates a somewhat enlarged view of the regulating valve; Fig. 5 illustrates an instrumentality used to adjust said valve; Fig. 6 illustrates the relative position of certain parts due to adjustment.

The present door closer is applicable for use with either a single speed or two speed hoistway door. The two speed door mechanism illustrated herein comprises the two door sections 1 and 2, supported in a well known manner for sliding movement, by suitable hangers 3 mounted upon suitable tracks 4.

Any of the well known arrangements of levers may be used as the actuating mechanism for the doors and the present type is shown merely as an example. The actuating mechanism herein illustrated consists of levers 6, 7 and 8 the lever 6 being pivotally connected at 5 to the door section 1, the intermediate lever 7 being pivotally supported at 11 by the door section 2, and the lever 8 being pivotally supported at 12 by a bracket secured to a fixed supporting member 13 which in turn is secured to a studding or wall of the elevator hoistway.

In accordance with now common practice a switch mechanism 14 is operatively connected to the lever 8 so that actuation thereof to open and close an electrical interlock car control circuit (not shown) is dependent on movement of the hoistway door. A rod 15 permits adjustment to cause the switch to be open-circuited before the lever system is actuated sufficiently to unlock the door-sections and to be close-circuited only after the lever system assumes position to lock the door-sections in closed position.

The switch mechanism per se forms the subject matter of another patent by applicant Number 1,866,563, dated July 12, 1932.

A depending lever 16 attached to the lever 7 and having a suitable hand grip 17 permits manual operation of the door to open position against the action of the spring actuated closer mechanism designated 18 as a whole.

The closer, cushioning mechanism and regulating mechanism comprise a piston 19 disposed within a cylinder 42, and having a cylindrical shank 20 with interior screw threads 21 engaged by screw threads 22 at the lower end of a rod 23. Oppositely disposed pins 24 engage the shank and the piston rod to prevent their rotation relatively to each other.

The rod 23 is adjustably connected by a socket 40 threaded to the upper end of the rod directly to the actuating lever 8 by a pivotal connection

41. It will be particularly noted at this point, that the point of pivotal connection between the rod and lever is concentric with the pivotal support 12 for the lever 8, and is not eccentric thereto as in common practice and furthermore this difference coupled with that of providing a relatively long range piston movement as by locating said pivotal connection 41 a suitable distance from the pivotal point for the lever 8, results when the doors are moving to closed position, in a piston movement which produces a very desirable and novel cushioning action which will be referred to more specifically hereinafter, and which is not obtainable in similar devices now commonly used wherein the point of pivotal connection between the lever and the rod is eccentric with the pivotal support of said lever, and wherein there is only a relatively short range piston movement.

A slot and pin connection 66 with the slot through the top of the rod 23 for engagement by the pin, prevents unintended rotation of the piston rod 23.

The cylinder 42 is sealed at the bottom by a plug 25 having a counter-sunk space 26 and a lug 27 at which point the cylinder is pivotally supported by a bracket 28 secured to the supporting plate 13.

A hollow cylindrical cap 29 has at its lower end a screw threaded portion 30 to engage an interior screw threaded portion 31 at the top of the cylinder. The rod 23 is guided by the cap at the upper end 71. A vent 32 in the cap covered by a felt gasket 33 held in place by a metallic ring 34 seated in the annular face of the cap, permits the escape of air from within the cylinder and the felt gasket prevents possible loss of liquid from within the cylinder.

According to the present invention I propose to employ as a means to close the door or doors, through the intermediary of the actuating mechanism heretofore described, two helical compression springs designated 35 and 36. The spring 35 is a relatively long spring of larger diameter but of a smaller gauge than the shorter spring 36 and the latter is of the larger gauge and smaller diameter than the spring 35. The longer spring 35 is interposed between the top ledge 136 on the piston and the bottom face 37 of the cap 29 it being normally under compression with the piston seated against the plug 25. The shorter spring is normally inert as when the piston is seated against the plug and is seated on the top face 38 of the shank 20. Both springs embrace the piston rod with the smaller gauge spring telescoping the larger gauge spring. The pressure of the spring 35 may be adjusted by rotation of the cap 29 and to facilitate this operation the cap at its upper end may have a serrated surface 39.

The cylinder 42 is adapted to be approximately half filled with liquid such as oil, to a level which is indicated by a dot and dash line 44.

The lower end of the rod 23 is provided with a fluid chamber 45, the wall of which is provided with a series of ports such as 46. The chamber 45 communicates with a fluid chamber 47 in the shank portion, by way of a ball check valve 48 which opens downwardly and closes upwardly and a pin 49 is provided for supporting the ball when the piston is traveling upwardly. However when the piston moves downwardly the check valve will close so that the fluid cannot pass through the chamber 45 and ports 46 but it can, however, pass through by-pass ports 50 in the shank portion of the piston 19. The circulation of fluid through the ports 50 is restricted by an adjustable valve designated as a whole 51 which regulates the size of the openings and in this way the cushioning action is regulated. The valve together with a necessary tool to adjust same are shown in perspective and somewhat enlarged in Figs. 4 and 5 respectively. The adjustable valve is in the form of a hollow cylindrical member having threads 65 to engage with the interior threads 21 of the piston. The body of the valve member may be cut away as indicated at 52, 52', thus forming upper and lower portions connected by the webs 53. This construction permits the two lower sections to be formed with a slight outward flare which by its spring action maintains the valve as a whole in adjusted position.

A specially constructed hand tool, designated 54, see Fig. 5, is provided to properly adjust the valve 51 within the piston to regulate the size of the port openings 50. This tool consists of a cylindrical member 55 carrying at one end thereof a cross-bar 56. The other end of the member 55 is provided with a finger bar 57.

To make the adjustment, the cylindrical portion 55 is inserted through the bottom of the piston and into the interior of the valve with the over-hanging portions 58 of the cross-bar engaging oppositely disposed slots 59 in the wall of the valve and with the tool fully inserted the top ledge of the cross-bar 56 is seated against the ledge 60 of the valve. The valve having threaded engagement with the piston will, by rotation of the tool, be raised or lowered with respect to the ports 50 thus giving any desired degree of opening for the passage of oil from beneath the piston to the cylinder chamber above the piston.

The doors are opened in the usual manner through the intermediary of the actuating mechanism by manual operation of the lever 16. With the doors in full open position the parts assume a position as indicated in Fig. 2.

The initial opening movement of the door compresses the longer spring 35 and subsequent movement thereof compresses the shorter spring 36 because of it being seated against the face 60 of the cap 29. With the doors in full open position there is then available the combined stored-up energy of the two springs to give the doors a quick start to closed position when the handle is released. For this opening movement of the doors upward movement of the piston is unimpeded since the oil above same has free circulation from the cylinder chamber above the piston, through ports 46 in the rod to the interior chamber 45 in the rod, to the chamber 47 by way of the ball-valve 48, then through the hollow valve 51 to the space in the cylinder below the piston.

At this point it will be particularly noted, that since the pivotal connection 41 between the lever 8 and the rod 23 is concentric with the pivotal support 12 for said lever, said pivotal point will be carried to substantially the highest point of the arc followed by connection with the lever and with the doors fully open the point 41 does not quite reach what may be termed a dead center or locking position but is approximately and not more than 10 degress off the vertical center-line of the pivotal support 12 for the lever 8 and this is an important feature. When the lever 16 is released, both springs 35 and 36 act together to give the door a relatively quick start or kickoff action and a rapidly accelerated closing movement and subsequently, that is when the door is about three-quarters closed, the spring

36 becomes inert and the spring 35 acts by itself to complete the closure of the door.

The piston throughout the entire door opening movement does not have a range of movement which carries it above the oil level.

It will be noted here that for movement of the doors from full open position, the pivotal point 41 of the rod starts its cycle of movement from approximately the highest point of an imaginary arc so that even though movement of the doors from full open position to approximately three-quarters closed position, is relatively long and rapid, the piston movement at the same time is short and consequently at a slow rate so that there is practically no impedance to the door movement at this time. However during the remaining and relatively short range movement of the doors to fully closed position the piston has at the same time a relatively longer range and faster rate of movement than at first and this results in a substantially increased cushioning action which effectually prevents impact and slamming.

During this closing movement of the door in which case the piston is moved downwardly in the cylinder, the oil passes from the cylinder chamber below the piston, through the hollow valve to chamber 47, thence through the restricted ports 50 to the cylinder chamber above the piston. The oil at this time cannot pass from below the piston to the cylinder chamber above the piston by way of the chambers 47 and 45 and ports 46 because the ball valve 48 becomes seated thereby to cut off communication between the chambers 47 and 45 and in which case the only path for the circulation of oil is by way of the restricted ports 50.

From the description already given it will be seen that I have provided a regulating means for the cushioning means which is concealed wholly within the cylinder casing so as to be inaccessible by any tool or other instrumentality whatsoever from without and in order to regulate the valve the parts must be disassembled and the piston, together with the rod 23 and springs, withdrawn from the cylinder and in such way the valve is made accessible for adjustment by the specially made hand tool. Such construction and arrangement minimizes very greatly the possibility of tampering.

It will be observed in connection with the construction of the cushioning or checking means, that the passages for the oil when flowing in both checking and non-checking directions are formed wholly by the reciprocating elements consisting of the piston and rod 23 connecting with the door actuating mechanism and this construction permits the use of the plain shell-like cylinder instead of those now commonly used which are provided with complicated and costly constructions to provide a throttled by-pass for the passage of fluid around the piston.

The door actuating mechanism of the type herein shown and commonly used for two speed doors as well as the type used for single speed doors is provided with what is called a rule-joint to prevent sagging of the toggle-levers.

According to the present invention the use of the rule-joint is eliminated due to the fact that adjustment is made by the socket 40 so that with the doors in closed position in which case the levers 6, 7 and 8 are in parallelism, the piston 19 is bottomed against the plug 25 and in this manner sagging is effectually prevented.

By adjustment of the socket 40, the lever system with the doors closed may be broken or out of parallelism in a reverse direction to that in which they are normally actuated to open the doors (see Fig. 6) for which position thereof the piston is bottomed against plug 25 so that in effect a locked condition exists so that the doors cannot be opened from the landing side. This arrangement is advantageous since it permits a movement of the levers from the hoistway side, from the broken position as shown to a position which brings them in parallelism as in Fig. 1 and for which position thereof they still hold the doors locked. Hence by such movement of the levers and without unlocking the doors, the inter-lock switch mechanism is open-circuited before the doors are unlocked.

Conversely as the doors are closed, the lever mechanism assumes a position to lock the doors and a further movement thereof to locking position closes the inter-lock switch mechanism. This arrangement allows a relatively wide range of movement to actuate the inter-lock switch before the levers assume an unlocking position and which is not obtainable in similar devices wherein the levers remain in parallelism with the door closed and the initial movement thereof to open-circuit the inter-lock switch throws them slightly out of parallelism.

What I claim is:—

1. In a door check, a cylinder, a reciprocal piston in said cylinder and means for connecting the same to a door, said piston having ports permitting of the flow of cushioning liquid in the cylinder from one side of the piston to the other, and a single means adjustably connected with the piston and coacting with each of a plurality of said ports to correspondingly regulate the flow of the liquid therethrough while maintaining a free flow of fluid around said last mentioned means from other of said ports in one direction of movement of the piston.

2. In a door check, a cylinder, a reciprocal piston in said cylinder and means for connecting the same to a door, said piston having an axial passage and ports communicating therewith permitting of the flow of cushioning liquid from one side of the piston to the other, and a valve member common to a plurality of said ports adjustably mounted in said axial passage for regulating the flow of the liquid through said ports while maintaining a free flow of fluid around said valve from other posts in one direction of movement of the piston.

3. In a door check, a cylinder, a piston in said cylinder and means for connecting the same to a door, said piston having an axial passage therethrough, valve means within said passage operating to close the passage in the movement of said piston in one direction, said piston being in spaced relation to said valve means and having ports permitting of the flow of cushioning liquid through said passage from one side of the piston to another, and additional valve means adjustably mounted in said passage and cooperating with said ports to regulate the flow of the liquid therethrough independently of said first named valve means.

4. In a door check, a cylinder, a piston in said cylinder and means for connecting the same to a door, said piston having an axial passage therethrough, valve means within said passage operating to close the passage in the movement of said piston in one direction, said piston being in spaced relation to said valve means and having ports permitting of the flow of cushioning liquid

through said passage from one side of the piston to another, a tubular valve member open at its opposite ends to permit free flow of the liquid through said passage, and means for adjusting said valve member within said passage to position one of its ends in cooperative relation with said ports for regulating the flow of the liquid therethrough.

5. In a door check, a cylinder, a piston in said cylinder and means for connecting the same to a door, said piston having an axial passage therethrough, valve means within said passage operating to close the passage in the movement of said piston in one direction, said piston being in spaced relation to said valve means having ports permitting of the flow of cushioning liquid through said passage from one side of the piston to another, the wall of said passage being threaded, and a tubular valve member open at its opposite ends adjustably engaged with said threads, whereby one end of said valve member may be positioned relative to said ports to regulate the flow of liquid therethrough while permitting of the free flow of liquid in each direction through said passage.

6. In a door check, a cylinder, means permanently sealing said cylinder at one of its ends, a reciprocal piston in said cylinder and means for connecting the same to a door, said piston having an axial passage therethrough provided with a threaded wall and opening upon one end of the piston in opposed relation to the sealed end of the cylinder, said piston having ports therein permitting of the flow of cushioning liquid in the cylinder through said passage from one side of the piston to the other, a tubular valve member open at its opposite ends adjustably engaged with the threaded wall of said passage, and having means to be engaged by a tool insertable into said open ends of the passage and into engagement with said valve member to adjust the same for regulating the flow of liquid through said ports only when said piston is disassembled from the cylinder.

7. In a door check, a cylinder, a reciprocal piston in said cylinder and means for connecting the same to a door, said piston having a longitudinal passage and plural groups of ports communicating therewith and permitting the flow of cushioning liquid from one side of the piston to the other, a valve member in the passage controlling the flow of fluid through one group of valves and operating to close the flow of liquid through said ports when the piston moves in one direction, and a second valve controlling the ports of another group, said second mentioned valve operating to constrict the flow of fluid through ports with which it is associated while maintaining free flow of fluid through said passage.

8. In a door check, a cylinder, a piston in said cylinder and means for connecting the same to a door, said piston having a longitudinal passage therethrough provided with ports in one end thereof, valve means within the passage operating to close the passage to the flow of fluid through said ports in one direction of movement of the piston, said piston having ports communicating with the passage below said valve means and permitting flow of cushioning liquid through said passage from one side of the piston to another, and additional valve means mounted in said passage and cooperating with the ports in the piston to regulate the flow of fluid therethrough independently of said first mentioned valve means.

9. In a door check, a cylinder, a piston in said cylinder and means for connecting the same to a door, said piston having a longitudinal passage therethrough provided with a port, valve means within said passage operating to close the passage to the flow of liquid through said port at the movement of said piston in one direction, said piston having ports communicating with said passage below said valve and permitting flow of cushioning liquid through the passage from one side of the piston to another, a tubular valve positioned in the passage in spaced relation to the first mentioned valve and permitting free flow of liquid through the passage, and means for adjusting said last mentioned valve within the passage to control the flow of fluid through the ports of the piston while maintaining free flow through the passage.

CHARLES E. HAMMELL.