

Aug. 8, 1933.

F. C. GARRISON

1,921,314

DOOR CLOSER AND CHECK

Filed Dec. 24, 1931

4 Sheets-Sheet 1

Fig. 1.

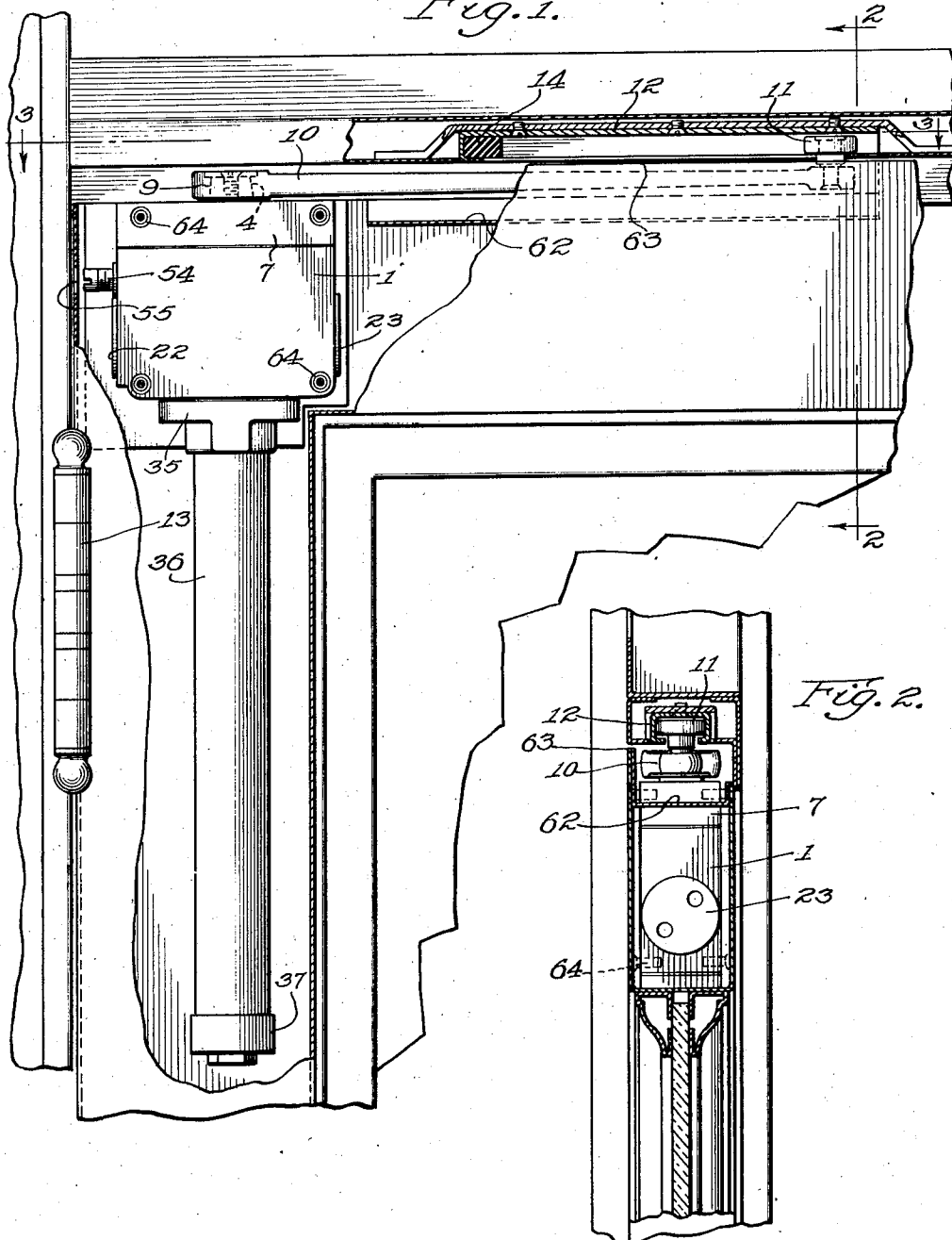


Fig. 2.

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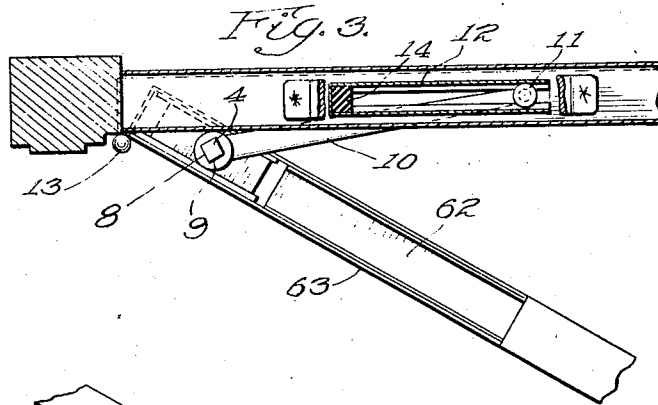
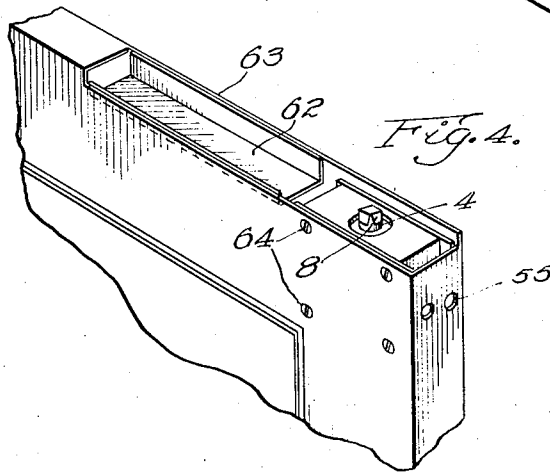
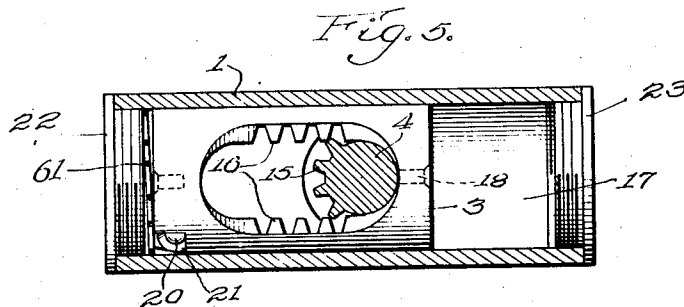
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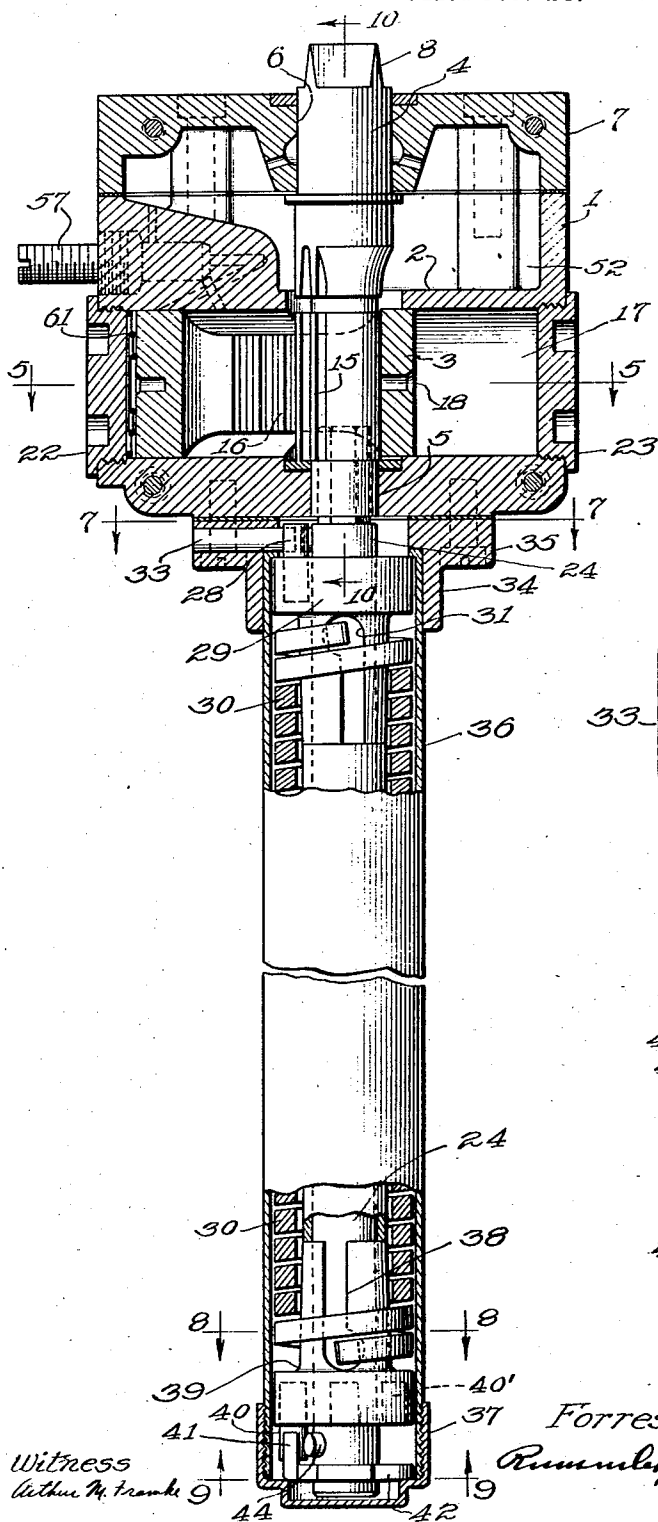
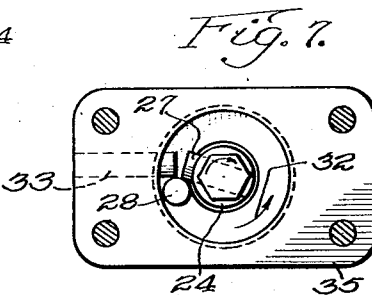
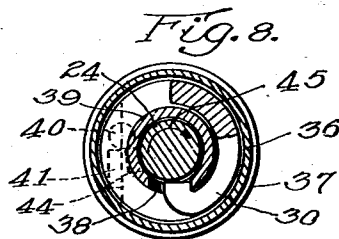
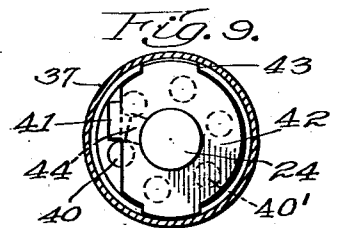
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DOOR CLOSER AND CHECK

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DOOR CLOSER AND CHECK

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Fig. 10.

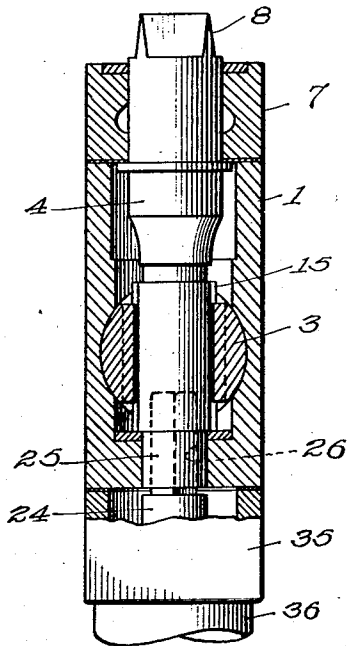


Fig. 11.

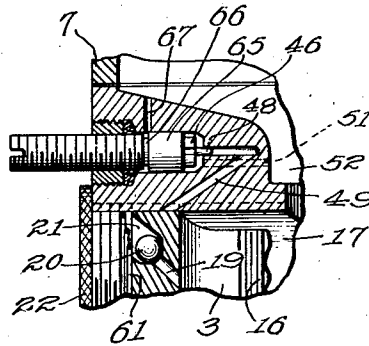


Fig. 12.

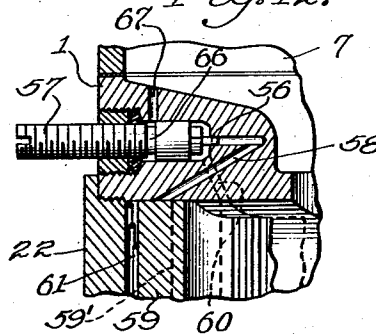


Fig. 13.

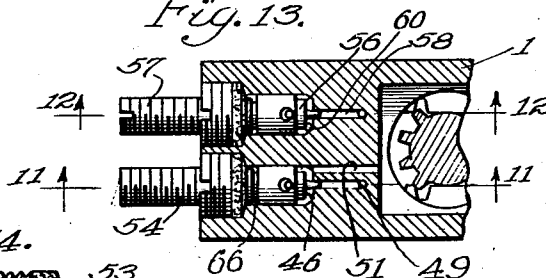
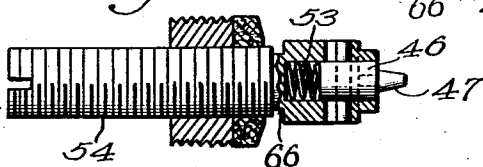


Fig. 14.



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UNITED STATES PATENT OFFICE

1,921,314

DOOR CLOSER AND CHECK

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Application December 24, 1931. Serial No. 583,025

2 Claims. (Cl. 16—49)

This invention relates to door closing and checking mechanisms of the class which are manufactured as combined units for installation within the frame structure of a door, so as not to be visible and to be suitable for standard door constructions and the casings within which the doors are mounted.

The objects of the invention are to provide a compact unitary structure of this nature which may be readily installed within door frames, particularly the customary designs of metal frames; to provide a new, general arrangement of such door closers and checks permitting the use of a durable and compact mechanism easily assembled, having a separable or detachable spring barrel depending from the body portion of the check, and to provide various refinements in the mechanism, and an improved arrangement for rendering invisible the arm connecting the door check with a door casing when the door is in closed position; to provide an improved arrangement of the controlling valves for the fluid acted upon by the checking piston for making a check immediately effective in all positions of a door; and to provide improved means for taking up any possible backlash or play in the mechanism.

The objects of the invention are accomplished by means of the construction as illustrated in which:—

Figure 1 shows an exterior elevational view of the door closer and check in connection with a door and its casing partly broken away and in section.

Fig. 2 is a sectional detail taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan section taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary perspective view showing the corner of the door within which the closer and check are mounted.

Fig. 5 is a horizontal section through the piston portion of the check, as indicated by the line 5—5 of Fig. 6.

Fig. 6 is a sectional view taken longitudinally through the door closer and check.

Fig. 7 is a plan view of the door closing spring portion of the device, as indicated by the line 7—7 of Fig. 6.

Fig. 8 is a sectional view of the spring and its housing as indicated by the line 8—8 of Fig. 6.

Fig. 9 is another sectional view as indicated by the line 9—9 of Fig. 6.

Fig. 10 is a detail view showing the operating

spindle of the check and the door check casing as indicated by the line 10—10 of Fig. 6.

Fig. 11 is a fragmentary sectional detail to illustrate a valve for controlling the closing action of a door. This section is taken on the line 11—11 of Fig. 13.

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 13 to illustrate a valve which controls the final or latching motion of a door.

Fig. 13 is a fragmentary view in horizontal section of the check casing and shows both valves.

Fig. 14 is an enlarged sectional view of one of the valves.

The construction illustrated provides a compact unit suitable without change for doors which swing either to the right or to the left and is of such dimensions as to be received by the hollow frame portions of a door of standard thickness.

The principal elements of the construction are a casing formed to provide a cylinder for a fluid-cushioned piston which is actuated by a spindle geared thereto and may be turned by an arm connecting the upper end of the spindle with a rail on the door casing. The lower end of the spindle is connected with a spring shaft around which is a coiled spring having connection with the shaft at its opposite ends whereby it may be tensioned upon a partial rotation of the shaft either to the right or to the left.

Referring to the drawings, the casing portion 1 of the door closer and check is a casting formed to provide a cylinder 2 for a checking piston 3. The checking piston may be reciprocated within the cylinder 2 by means of a spindle 4 which has teeth 15 for engaging rack teeth 16 formed on piston 3. The spindle is rotatably supported in a bearing 5 formed at the bottom of casing 1 and a bearing 6 in a cover 7 for casing 1. The upper end 8 of the spindle is squared and tapered to fit a similarly formed aperture 9 in an actuating arm 10. A roller 11 is carried at the outer end of arm 10 and fits a rail or channel bar 12, fixed in the lintel portion of the door casing. When the door is swung open around its hinges 13, Fig. 1, the spindle 4 is necessarily turned on its axis as the roller 11 holds the outer end of arm 10 within the channel bar 12. The roller travels along the channel bar toward a rubber stop 14 at the end of the channel bar.

The turning of spindle 4 causes its teeth 15 to engage rack teeth 16 on piston 3. The piston is thereby shifted along the cylinder 2. The

casing 1 is nearly filled with an oil and thus the cylinder 2 is filled with this oil and the oil must travel between opposite ends of the cylinder whenever the piston is moved. In the door-opening motion of the piston, that is toward the right in Fig. 6, the oil flows from end 17 of the cylinder through aperture 18 at the end of the piston. From the middle hollow portion of the piston, the oil may pass to the opposite end of the cylinder through an inclined port 19, Fig. 11, which is controlled by a ball check 20. This ball is seated in a continuation 21 of the port 19 but which is of larger diameter than the ball 20, while the port 19 is of smaller diameter. The port 19 is below the axial center of passageway 21, to insure complete closure of the port, due to the weight of the ball alone, except when the ball is lifted by the pressure of the fluid in back of it.

Due to this arrangement, when the fluid is flowing in the opposite direction, there is no chance for any of it to escape around the ball. The cylinder ends are closed by the caps 22 and 23 which have threaded engagement with the walls of the cylinder.

The spring shaft 24 is hexagonally formed at its upper end 25 to fit within a correspondingly formed socket 26 in the lower end of spindle 4. Thus the spring shaft turns with the spindle. The spring shaft carries a pin 27 extending radially therefrom in position to engage a pin 28 extending upwardly from a collar 29 which is loose on the upper end of the spring shaft and to which the upper end of a spring 30 is hooked in a groove 31 formed in a reduced portion of the collar.

Thus, if the lower end of the spring is held against rotation, the spring is wound upon the turning of the spring shaft in the direction indicated by an arrow 32, Fig. 7, by pin 27 engaging pin 28 and rotating collar 29.

The opposite unwinding motion of the spring is limited by a fixed stop pin 33, in position to be engaged by pin 28. The pin 33 projects from a flanged member 34 which is secured by screws 35 to casing 2, and carries rigidly a spring casing or barrel 36. The lower end of spring casing 36 is closed by cap 37.

The lower end of the spring 30 is hooked into a groove 38 in a collar 39 loosely fitted over the spring shaft 24. To prevent the collar from rotating when the spring is wound in the direction indicated by arrow 32, a pin 40 projects downwardly therefrom and it may be fitted within any one of the apertures 40' at the lower end of collar 39. The pin 40 engages a stop lug 41 on a washer-shaped element 42 fitted within notches 43 in the lower end of spring barrel 36. When the spring shaft is rotated in the opposite direction, indicated by arrow 32, as would be the case when the door opens in the opposite direction, the spring is not wound from the upper end but is wound from the lower end. In this direction of movement, pin 27 engages stop pin 28, and a radially extending pin 44 on the lower end of the spring shaft engages pin 40 on the spring anchor collar 39 and rotates this collar in the direction indicated by arrow 45, Fig. 8.

The spring is, therefore, tensioned regardless of the direction of rotation of the spindle 4 and the spring shaft coupled therewith. Also, piston 3 is reciprocated in a like manner, regardless of the direction of rotation of the spindle 4 since this spindle is provided with a set

of teeth 15 for engaging either one of the opposed racks 16 on the piston.

When the door is released, the unwinding of spring 30 reverses the action of all moving parts of the mechanism and draws the door to its closed position. The action of the spring is prolonged sufficiently to effect an easy closing of the door by controlling the rate at which the fluid returns from the left side of piston 3, Fig. 6, to the right thereof. This is accomplished by means of a valve 46, Fig. 11, constructed as indicated by the enlarged view of Fig. 14.

This valve has a conical end 47 for controlling a port 48 communicating by means of a passageway 49 in the cylinder wall with the left end portion of a cylinder chamber 50. The port 48 also communicates by means of a passageway 51 with a space 52 in casing 1 and from there the checking fluid may flow into the hollow portion of the piston downwardly through the opening in the piston between racks 16 and from thence through the passageway 18 in the piston to the opposite end of the cylinder. The valve construction is disclosed in the patent to Garrison, No. 1,773,988, dated August 26, 1930. The valve 46 is slidably fitted within the valve body by a slot and pin connection and is pressed outwardly by a spring 53. By adjusting the valve body 54, the point of the valve is withdrawn slightly from the seat so that normally the fluid may slowly pass by the valve. The valve is lifted further from its seat when excessive closing pressure is exerted against the door. The valve body may be adjusted as desired through the aperture 55, Fig. 1, in the door. As the door moves toward its closed position, the piston 3 covers the inlet of passageway 49 and the final latching motion of the door is regulated by valve 56, similar to valve 46, but generally adjusted to permit a freer flow of the fluid so that the spring 30 may more easily overcome the resistance of the door latch.

The adjustment of valve 56 is effected by means of a screw 57 also accessible from the rear edge of the door. Both valves are shifted further away from their seats by the pressure of the fluid.

Valve 56 controls a port in a passageway 58 leading to the left end of the cylinder chamber. This port remains uncovered by the piston 3 throughout the stroke of the piston. When the door is closed the piston comes to rest in the position indicated by the broken lines 59', Fig. 12. The detailed sectional views of the drawings, such as Figs. 5, 6, 11 and 12, illustrate the piston in the extreme end position in the cylinder as forced by spring 30, Fig. 6, before the device is installed in the door and the lever 10, Fig. 3, applied thereto with its roller within the guide or rail 12. When lever 10 is applied to spindle 4, the spindle is turned manually about 45 degrees in order to tension spring 30 and keep it tensioned when the roller 11 on the arm is in the guide rail 12 and the door is in its closed position. When the piston moves far enough to the left, Fig. 12, to uncover port 60, the latch valve 56 becomes effective to by-pass fluid around the piston head 59 according to the pressure of the fluid. The fluid flowing outwardly through passageway 58 past the valve is returned to the piston chamber to the right of piston head 59 through the passageway 60.

In order to avoid any free uncushioned motion of the door, due to backlash between the teeth 15 and racks 16, a spiral cone-shaped

spring 61 is placed between the piston 3 and the cylinder head 22. This spring is made cone-shaped so that the convolutions thereof will interfit when the spring is compressed the maximum amount by the movement of the piston. The check valve 20 being located in an inclined passageway 21 is held against its seat by gravity and aids in eliminating backlash with or without pressure in the compression end of the cylinder. The checking action is immediately effective on release of the door. Both the spring and the gravity operated check are essential for correct operation of the door check.

The upper edge of the door, near the hinge end thereof, is provided with a pocket 62 for receiving arm 10, when the door is in its closed position, and a flange 63, at one side of the recess, conceals the arm 10 from the face side of the door.

The rail 12 is mounted within a recess provided therefor in the upper transverse element of the door casing. Thus the only part of the door closing and check mechanism which is visible is the arm 10 and that only when the door is in its open position. The door closing and checking device is supported in the door by screws 64, Fig. 1, which afford an easy means of attachment.

A forced closing of the door results in developing a high fluid pressure in back of the plunger. It is therefore necessary to have the parts of the construction strongly built and arranged to prevent leakage of oil through the casing, particularly at such points where the valves are carried thereby and which are adjustable from the outside of the casing to respond to various pressures.

The valve bodies 35, as shown in Fig. 11, are provided with an annular groove 66 which registers with a drain back aperture 67. Thus, if the pressure is high enough to force the oil along the exterior of the body of the valve, such oil may freely return through the drain back aperture 67.

The valve shown in Fig. 12 is subjected to the full pressure in the compression chamber when the door is closing from 90 degrees to 20 degrees, as both ends of the two passageways 58 and 60 are then opened to the compression chamber. This would cause the checking fluid to leak out through the valve packing if it were not for the groove 66 in drain 67.

In the operation of this door closing and check mechanism, when the door is swung outwardly on its hinges 13, the arm 10 turns the spindle 6, thus causing the piston 3 to move from its normal position, as shown by broken lines 59', Fig. 12, to the right end of the cylinder. The fluid in the cylinder to the right of

the piston escapes through the port 18 in the piston. When the door is released and permitted to swing to its shut position, a reverse rotation of spindle 6 returns the piston 3 to the position 59'.

On the opening movement of the door, the spring 30 is tensioned by one of the pins 27 or 40 engaging pins on one of the collars 29 or 39. When the door is released, the spring, through one of these collars and pins thereon, reversely rotates the spring shaft and spindle 4. The spindle, through its geared connection with the piston 3, restores the piston to the position indicated by 59', Fig. 12, and upon the restoring motion, the flow of the fluid from the left end of the cylinder back to the right end of the cylinder is controlled by the pressure operated valves 46 and 56 in succession; valve 46 controlling the return swing of the door to near its latching position when its supply passageway 49 is covered by the piston and the liquid is forced through the passageway 58 past the valve 56.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that certain details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A door closer and check comprising a casing formed to provide a cylinder the axis of which extends horizontally, a piston within said cylinder, said piston having a central longitudinally extending opening and rack teeth formed on one side of said opening, a spindle extending vertically through the opening in the piston and having pinion teeth for engaging the rack teeth, a spring barrel removably attached to the bottom of said casing, a coil spring within said spring barrel, and a shaft extending through said spring and connected therewith to wind the same, said shaft being co-extensive with said spindle and arranged to be coupled with the spindle upon attachment of the spring barrel to the casing.

2. The combination with a door casing of a door having a hinged connection with the casing, a door check concealed within the door and provided with an operating arm fitting a longitudinal recess in the upper edge of the door, said casing having a guideway in the lower surface of its lintel which is above the door when the door is in its closed position, a roller carried at the outer end of said operating arm and projecting upwardly into said guideway.

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