

March 28, 1944.

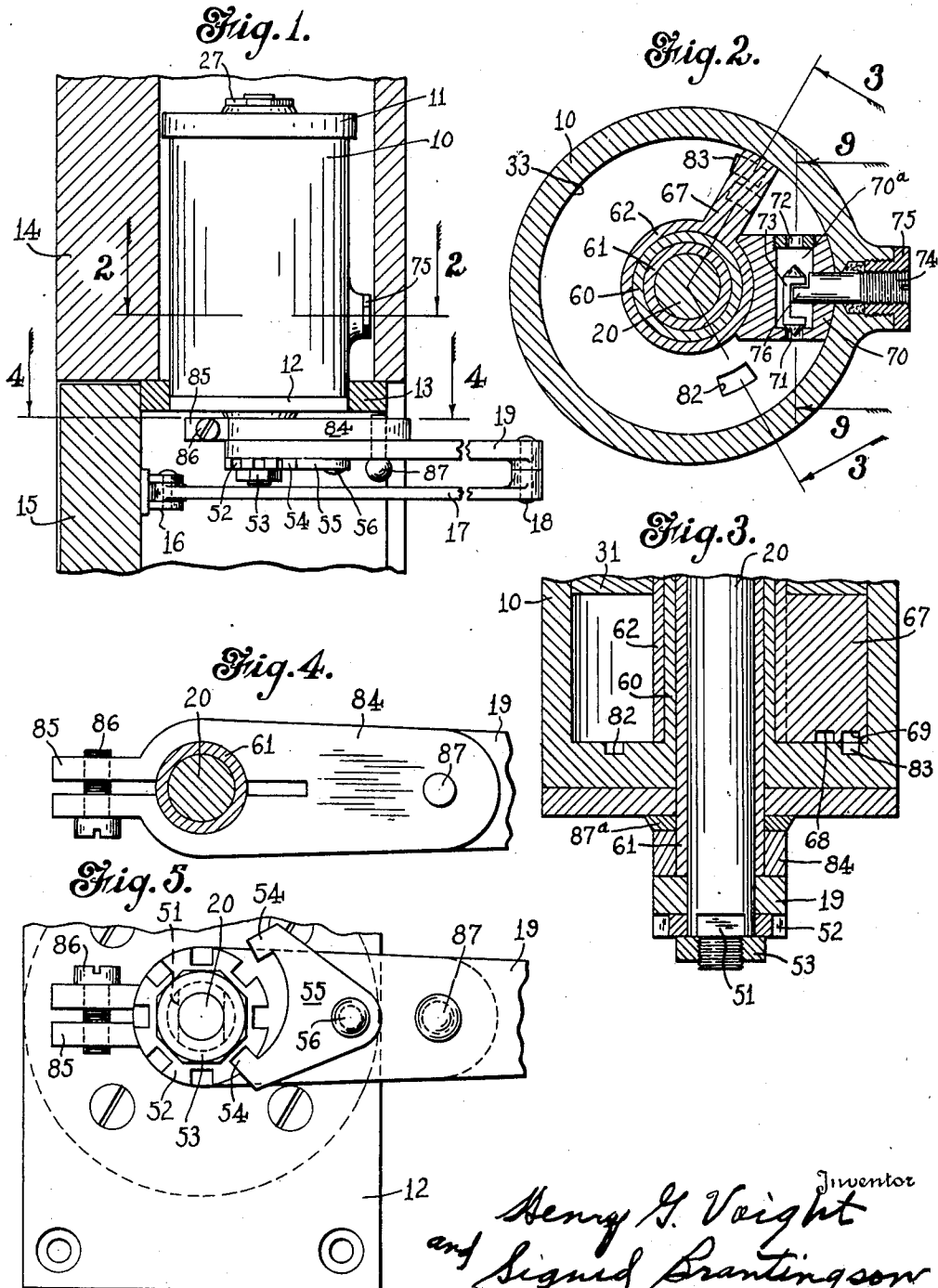
H. G. VOIGHT ET AL

2,345,368

DOOR CLOSER

Filed Nov. 16, 1942

2 Sheets-Sheet 1



Inventor
Henry G. Voight
and *Sigurd Brantingson*
334
Rockwell - Southworth
Attorneys

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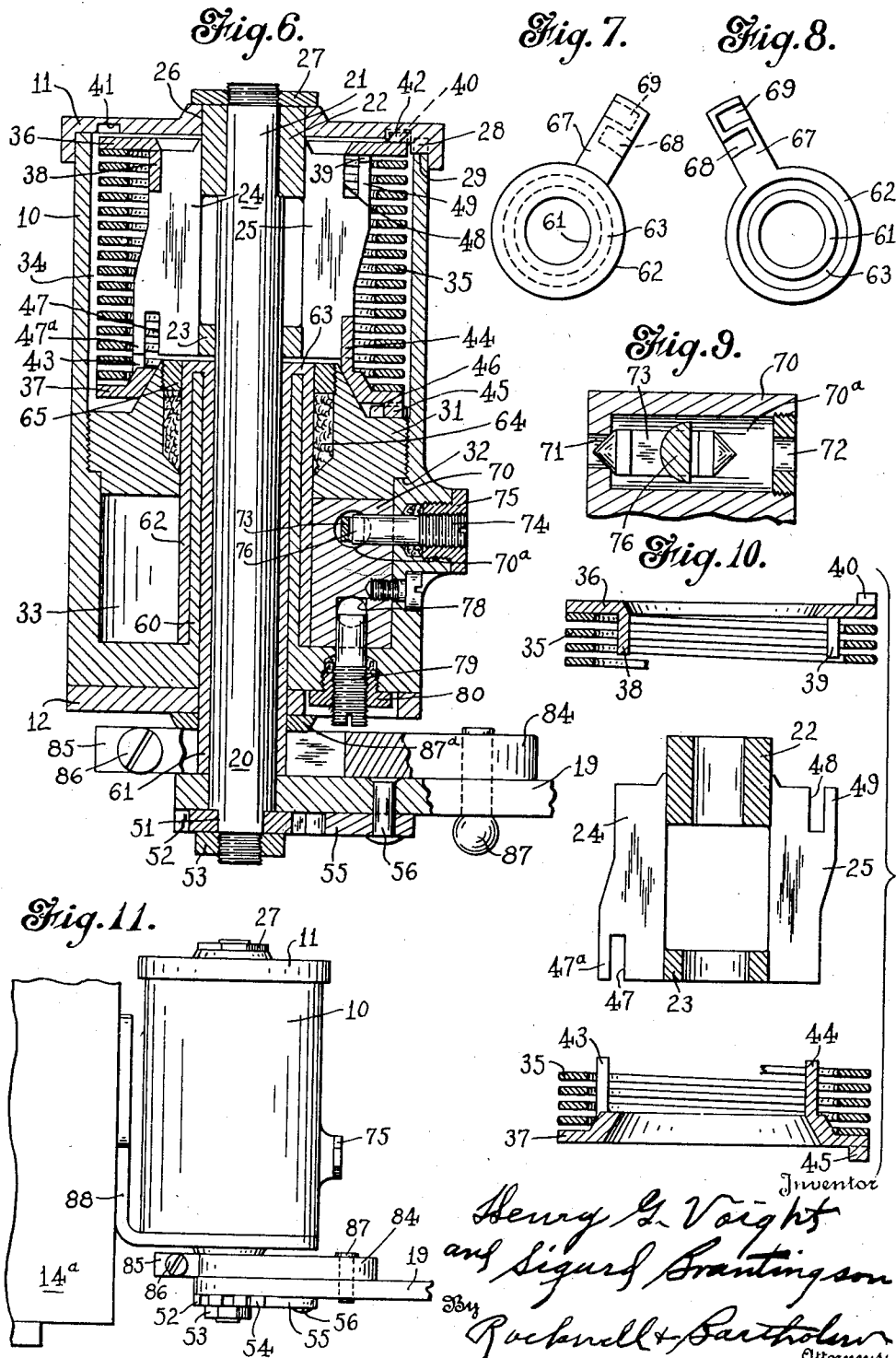
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DOOR CLOSER

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Henry G. Voight
and Sigurd Brantingson
Rockwell & Bartholomew
Attorneys

UNITED STATES PATENT OFFICE

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DOOR CLOSER

Henry G. Voight and Sigurd Brantingson,
Hamden, Conn., assignors to Sargent & Com-
pany, New Haven, Conn., a corporation of Con-
necticut

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13 Claims. (Cl. 16—58)

This invention relates to a door closer, and more particularly to a device designed to be secured to a door and door jamb, and adapted to effect a controlled closing movement of the door, that is to say, the device acts as a combined door closer and check, in that, while it serves to positively close the door, the closing movement is so checked or controlled that the door will be gradually closed and will not slam.

The door closer herein shown is of the same general type as that disclosed in the application of Henry G. Voight, Serial No. 461,423, filed October 9, 1942, as it is so constructed that it may be employed either in a concealed position within the door casing or frame, or it may be employed in an exposed position wherein the casing of the device is mounted exteriorly of the frame. The structure of the present device, however, differs in certain respects from the one shown in the prior application referred to, and particularly in the fact that it is so constructed that the operation of the device may be reversed for mounting upon either right- or left-hand doors by a simple manipulation which may be performed without removing any of the parts from the casing.

In most door closers of prior construction it has been necessary to gain access to the casing itself, and particularly to the spring which urges the door to closed position, so that the spring may be reversed in order that it be wound up by a movement of the main shaft of the closer in the opposite direction. As will be pointed out hereinafter, in the present device it is not necessary to remove the spring from the casing when making such changes as are necessary to adapt the device from a door of one hand to a door of the other hand.

One object of the present invention is to provide a door closer of simple and compact construction, such that it may be mounted either interiorly or exteriorly of the door frame.

A still further object of the invention is to provide a door closer of the class described such that the operation of the device may be reversed for application to a right- or left-hand door without having to disassemble any of the parts of the device.

A further object of the invention is the provision of a reversing valve structure of novel form for a door closer.

A still further object of the invention is to provide a door closer having a spring to urge the door to closing position, and a rotatable

piston to resist or control the movement imparted to the door by the spring, wherein the spring and piston will be connected to separate operating shafts so that the relative position of these shafts may be changed without it being necessary to remove any of the parts from the casing.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is an elevational view of a door closer mounted in concealed position above the lintel of the door, portions of the door and door frame being shown in section;

Fig. 2 is a horizontal sectional view on line 2—2 of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 4 is a sectional view on line 4—4 of Fig. 1;

Fig. 5 is a fragmentary bottom view of the door closer showing the adjusting nut for the spring;

Fig. 6 is a longitudinal sectional view of the device;

Fig. 7 is a top plan view of one of the operating shafts and the wing piston thereon;

Fig. 8 is a bottom view of the part shown in Fig. 7;

Fig. 9 is a sectional view on line 9—9 of Fig. 2;

Fig. 10 is an exploded view of the spring actuator; and

Fig. 11 is a view similar to Fig. 1 but showing the closer mounted exteriorly of the door frame.

To illustrate a preferred embodiment of our invention we have shown a door closer comprising a casing 10 provided with a cover 11 and a mounting plate 12 which is adapted to be secured by screws or the like to the lintel 13 of a door frame 14, the door being shown at 15. To the door is pivoted at 16 one end of an arm 17, the other end of which is pivotally connected at 18 to one end of a second arm 19, the other end of which snugly but rotatively embraces the main shaft 20 of the door closer, as shown more particularly in Fig. 6.

The shaft 20 extends upwardly through the casing and is provided with a non-circular end portion 21 upon which is mounted a sleeve 22 of the spring actuator. This spring actuator not only comprises the sleeve 22, but a second sleeve 23 spaced from the first, and opposed wing members 24 and 25. It will be understood that the opening in the sleeve 22 is of non-circular shape to conform to the shape of the upper end 21 of

the shaft 20, so that the actuator will turn with the shaft.

The sleeve 22 extends into an opening 26 in the cap 11, so that the sleeve will act as the upper bearing member for the shaft 20, and a nut 27 is threaded upon the projecting end of the shaft above the cap 11, which nut serves to hold the cap in place at the upper end of the casing. In order to prevent rotation of the cap with respect to the casing, the former is provided with a lug 28 which rests in a recess 29 in the upper edge of the casing wall.

The casing is divided into two parts by a circular plate 31, which may be threadedly secured in place, resting against an annular shoulder 32 formed on the casing wall. This plate divides the interior of the cylinder into a lower portion 33, which functions as a liquid reservoir, and an upper portion 34, which contains the closing spring 35. This spring, as shown particularly in Fig. 6, extends between upper and lower rings 36 and 37 to which its ends are secured, whereby when either one of these rings is rotated and the other held against rotation the spring will be wound.

The upper plate 36, as shown in Fig. 10, is provided with depending lugs 38 and 39, the latter being at a greater radial distance from the center of the shaft 20 than the former, and it is also provided with an upstanding lug 40 designed to rotate in a recess 41 formed in the lower face of the cap 11. A stop 42 in this recess contacts the lug 40 and holds the plate 36 against rotation in one direction. Likewise the lower ring 37 is provided with upwardly projecting lugs 43 and 44, the former of which is more distant from the axis of the shaft 20, and is also provided with a downwardly projecting lug 45 designed to bear against a lug 46 on the plate 31 which serves to hold this ring against rotation in one direction.

It will be noted that the wing 24 on the spring actuator is somewhat wider at its lower end, and is provided at this end with a recess 47 through its lower face forming a finger 47^a, while the wing 25 is provided with a similar recess 48 and finger 49 at its upper end, and is of less width at its lower end.

With this construction it will be seen that if the shaft 20 be turned in a counterclockwise direction looking down upon the view of Fig. 10, the finger 49 will contact the lug 39 and rotate the ring 36, and thus wind the spring, inasmuch as the lower ring 37 will be held against rotation by the lug 46, and the finger 47^a will be turned in a direction away from the lug 43. When the wings 24 and 25 reach a position 180° from that shown in Fig. 6, it will be seen that the finger 47^a will clear the lug 44, in that the latter will pass through the recess 47, thus permitting a substantially complete rotation of the shaft 20. If this shaft is turned in the opposite direction, the spring will be wound from the bottom by means of the ring 37, while the ring 36 will be held against rotation.

The shaft 20 is provided with a non-circular portion 51 upon which is mounted a notched adjusting member 52 held in place by the nut 53 threaded on the end of the shaft. Cooperating with the notches in this nut are talons 54 formed at the ends of a double-armed pawl member 55 pivoted at 56 on the arm 19. This pawl and notched adjusting member serve to connect the arm 19 with the shaft 20, so that rotation of this arm serves to rotate the shaft. At the same time the tension of the spring may be adjusted by

moving the double-arm pawl 55 to a neutral position wherein neither of the talons 54 are engaged in the notches of the member 53, at which time this member and the shaft 20 may be rotated to give the spring any desired tension. Also when it is desired to change the closer from a door of one hand to a door of the other hand, it will be understood that the pawl 55 will be swung so that the corresponding talon will be engaged in a notch of the member 52.

As shown in Fig. 6, the casing is provided with a sleeve-like bearing member or core 60 extending upwardly from its lower end and surrounding the opening through which the shaft 20 extends. Also surrounding the shaft 20 is a double tubular shaft 61, one portion of which is disposed between the bearing member 60 and the shaft 20 and projects from the lower portion of the casing and another portion 62 of which projects downwardly upon the outside of the bearing member 60, the two portions of this shaft being connected together at their upper ends by the web 63. It will, of course, be understood that the portions 61 and 62 of the shaft, and web 63, may, and usually will be, integrally formed. To prevent the leakage of oil or other liquid from the reservoir 33, suitable packing 64 may be placed about the shaft 62 in a packing chamber in the plate 31, and held in place by the gland nut 65.

Upon the lower end of the sleeve-like portion 62 of the second shaft is secured or formed integrally therewith the wing piston 67 having in its lower face recesses 68 and 69. This piston operates in the chamber 33 and is adapted to cooperate with an abutment 70 having a passage 70^a therethrough, which passage communicates with the chamber through ports 71 and 72 adapted to be controlled by a valve 73, the position of this valve being in turn controlled by a screw 74 threaded into the gland nut 75 positioned in a wall of the casing, which screw has an eccentric end 76 designed to limit the movement of the valve 73 in one direction or the other, depending upon the position of the screw. As shown in Fig. 2, the valve 73 may close the port 71, but will be prevented from closing the port 72. If the screw 74 is turned through an angle of 180°, the opening 71 will be open at all times, but the valve may be moved to close the opening 72, the position of the valve being determined, of course, by the direction of the flow of liquid through the passage 70^a.

The abutment 70 is also provided with another through passage 78 the effective area of which is controlled by an adjusting screw 79 threadedly mounted in a gland nut 80 and projecting from the lower end of the casing through the mounting plate 12 so as to be accessible for adjustment by a screw driver or other suitable tool. It will be apparent, therefore, that liquid in the reservoir 33 may pass from one side to the other of the abutment freely at all times through the opening 78 as restricted by the screw 79, and may also pass through the abutment in one direction through the passage 70^a, as determined by the position of the valve 73 under control of the screw 74. In the lower portion of the casing are provided recesses or wells 82 and 83, shown more particularly in Figs. 2 and 3, which cooperate with the recesses 68 and 69, respectively, to permit flow of the liquid beneath the piston 67 when the piston reaches a point near the end of its travel to permit a quick and sharp closing of the door adjacent the end of the closing movement. It will be understood, of course, that one

set of recesses operates when the device is used with a door of one hand, and the other set when the device is used with a door of the other hand.

The lower projecting end of the sleeve shaft 61 has clamped thereon a short arm 84 which is provided with a split end, as shown at 85, the two parts of which are connected by the clamping screw 86 so that this arm may be clamped rigidly to the sleeve. This arm is secured to the arm 19 by means of a removable pin 87, so that the arms 84 and 19 will move together during the normal operation of the device, thus effecting simultaneous rotation of the shafts 20 and 61. It will be noted that, as the shaft 20 is connected with the spring actuator, and the shaft 61 carries the piston 67, removal of the pin 87 will permit the shaft 61 to be turned independently of the shaft 20, and that the wing piston may, therefore, be moved in the casing to another position without effecting movement of the shaft 20, and without having any effect upon the condition of the spring. Thus, when it is desired to change the device from a door of one hand to a door of the other, the pin 87 is removed, and the arm 84 is swung about with respect to the arm 19, thus swinging the piston 67 from the position shown in Fig. 2 to a position adjacent the other side of the abutment 70. The opening in the arm 84 is again aligned with the opening in the arm 19, and the two arms are again connected by the pin 87. The screw 74 is then turned through an angle of 180°, and this is all the adjustment which is necessary to adapt the device to a door of the other hand, with the exception, of course, of the swinging of the pawl 55 to engage the other talon 54 with the adjusting member 52.

Thus by securing the piston 67 to one shaft, and securing the spring actuator to another shaft, which shafts are normally secured together for simultaneous rotation, but which may be disconnected for relative rotation and for adjustment, the change-over of the device may be effected without having to obtain access to the interior of the casing.

A spacing washer 87^a may be placed between the plate 12 and the arm 84, as shown more particularly in Fig. 6. In Fig. 11 of the drawings the device is shown mounted exteriorly of the door casing. The only change necessary in such event is the removal of the plate 12 and the substitution therefor of the L-shaped bracket 88, which has a vertical arm which may be secured against the door casing 14^a.

The operation of the device may be briefly described as follows: As shown, for example, in Fig. 2 of the drawings, the parts are in the position occupied when the door has been closed. If the door is opened the piston 67 will be moved in a counterclockwise direction. The movement of the piston forces the liquid in the liquid chamber 33 through the opening 78, and also through the passage 70^a, as the pressure of the liquid will force the valve away from the port 71, but it will be prevented from closing the port 72 by the eccentric end 76 of the screw 74. Thus the liquid may move with freedom from one side of the abutment to the other, permitting easy opening of the door. At the same time the spring will be wound. If, after the door is opened, it is permitted to be closed by the spring, the piston 67 will move in a clockwise direction. The liquid in the reservoir 33 will now be moved in the opposite direction and will tend to be propelled through the port 72. This will cause the valve 73 to drop to the position shown in Fig. 2 and

close the opening 71, thus closing the passage 70^a, so that the passage of the liquid from one side of the abutment 70 to the other must take place entirely through the restricted passage 78, thus cushioning or controlling the movement of the door.

When the door reaches a point adjacent the end of its closing movement, the recess 69 will register with the recess 83, and thus permit passage of the oil beneath the piston 67, so that the door will close with a sharp final movement. If the device is to be used upon a door of the other hand, the wing piston 67 will be moved as described, after withdrawing the pin 87, to a position adjacent the other side of the abutment 70, which is approximately a position over the recess 82, as shown in Fig. 2. The screw 74 will be rotated through an angle of 180°, and the action will be the same as just described except that the piston will, of course, be moved in the opposite direction.

It will be seen that, as the sleeve 60 surrounds the opening in the bottom of the casing through which the shafts 61 and 20 extend, there will be no danger of any leakage about these shafts. At the same time the outer sleeve portion 62 of the outer shaft extends downwardly into the reservoir 33 so that it may carry the piston 67, and thus the spring actuator and piston are carried by separate shafts, so that, when these shafts are disconnected as by removal of the pin 87, adjustment of either the spring or piston may be obtained independently of the other part. It will, therefore, be obvious that we have provided a device in which the operating shaft projects through the lower end of the casing, and at the same time have insured against leakage of liquid or oil about this shaft. At the same time adjustment of the device may be effected without obtaining access to the casing itself or disassembling any of the parts.

While we have shown and described a preferred embodiment of our invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What we claim is:

1. A door closer comprising a casing, an arm rotatably connected to the casing and adapted to be connected to the door, a spring in the casing to urge said arm in a direction to close the door, a movable check member in a portion of the casing, releasable means connecting said member to said arm, whereby when said connection is released, said member may be moved independently of said arm, and means connecting the arm to either end of the spring whereby the latter may be wound by rotation of the arm in either direction.

2. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, said shafts both projecting from the lower end of the casing, and disconnectible means for connecting the projecting ends of the said shafts.

3. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mount-

ed in the casing, a piston in the fluid chamber connected to said second shaft, said shafts each having an end projecting below the casing, means to prevent fluid leakage about said shafts, and means on the projecting ends of the said shafts to connect them together.

4. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, said shafts each having an end projecting from the lower end of the casing, and disconnectible means located exteriorly of the casing for connecting said shafts for rotation together.

5. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, said shafts each having an end projecting from the lower end of the casing, an arm secured to the projecting end of one of said shafts and adapted for connection to the door, and means located exteriorly of the casing for connecting the other shaft to said arm.

6. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, one of said shafts being hollow and surrounding the other, the lower ends of both shafts projecting from the casing disconnectible means for connecting said shafts and means for preventing fluid leakage about said shafts.

7. A door closer comprising a casing having a fluid chamber in its lower portion, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, said shafts each having an end projecting from the lower end of the casing, means on the projecting ends of the said shafts to connect them together, and means to prevent fluid leakage between the casing and shafts.

8. A door closer comprising a casing constituting a fluid chamber, a shaft rotatably mounted in the casing, a spring operatively connected to the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, disconnectible means for connecting said shafts, said second shaft being hollow and surrounding the first shaft, and having a sleeve-like portion extending downwardly from its upper end for connection with the piston.

9. A door closer comprising a casing constituting a fluid chamber, a shaft rotatably mounted in the casing, a spring operatively connected to

the shaft and tending to effect rotation thereof, a second shaft rotatably mounted in the casing, a piston in the fluid chamber connected to said second shaft, disconnectible means for connecting said shafts, said second shaft being hollow and surrounding the first shaft and having a sleeve-like portion extending downwardly from its upper end for connection with the piston, said sleeve-like portion being spaced from the shaft body, and a core on the casing extending into said space to prevent leakage of fluid from the chamber.

10. A door closer comprising a casing constituting a fluid chamber, an abutment in said chamber having a passage therethrough, a rotatable piston in the chamber adapted to force fluid through said passage, a double-ended check valve movably mounted in said passage, each end of which is adapted to cooperate with an end of the passage to close the same, and means to restrain said valve from closing one end of said passage, said means comprising an abutment on the valve and a member mounted in the casing and having a lug engaging said abutment.

11. A door closer comprising a casing constituting a fluid chamber, an abutment in said chamber having a passage therethrough, a rotatable piston in the chamber adapted to force fluid through said passage, a double-ended check valve movably mounted in said passage, each end of which is adapted to cooperate with an end of the passage to close the same, and means to restrain said valve from closing one end of said passage, said means comprising a recess provided in said valve and a member rotatably mounted in the casing and having a lug eccentrically carried thereby to engage in said recess.

12. A door closer comprising a casing having a fluid chamber in its lower portion, a spring in the casing above said chamber, a shaft rotatably mounted in the casing and projecting from the lower end thereof, an arm non-rotatably carried by the shaft and designed to be connected to the door, said spring being operatively connected to the shaft to effect rotation of the latter, a movable check member in said chamber, means releasably connecting said member to said arm whereby when said connection is released said member may be moved independently of said shaft, and means for preventing fluid leakage about said shaft.

13. A door closer comprising a casing having a fluid chamber in its lower portion, a spring in the casing above said chamber, a shaft rotatably mounted in the casing and projecting from the lower end thereof, an arm non-rotatably carried by the shaft and designed to be connected to the door, said spring being operatively connected to the shaft to effect rotation of the latter, a movable check member in said chamber, means releasably connecting said member to said arm whereby when said connection is released said member may be moved independently of said shaft, and means for preventing fluid leakage about said shaft, said connection being releasable from without the casing.

HENRY G. VOIGHT.

SIGURD BRANTINGSON.