Feb. 4, 1941. W. WENNMANN 2,230,661

DOOR CLOSING DEVICE

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Fig. 1.

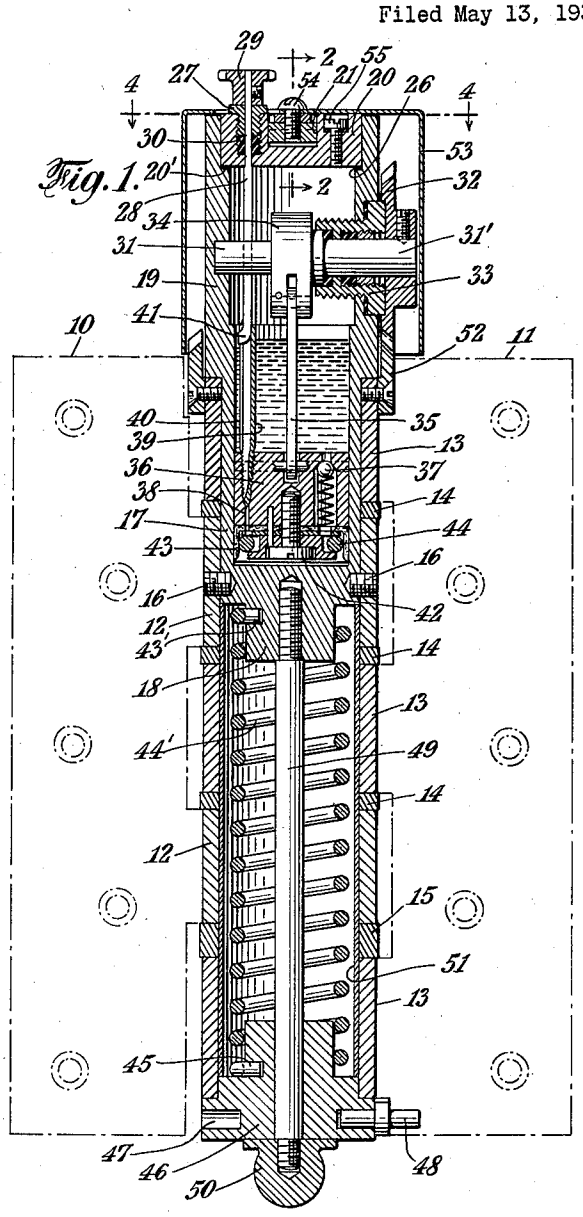


Fig. 3.

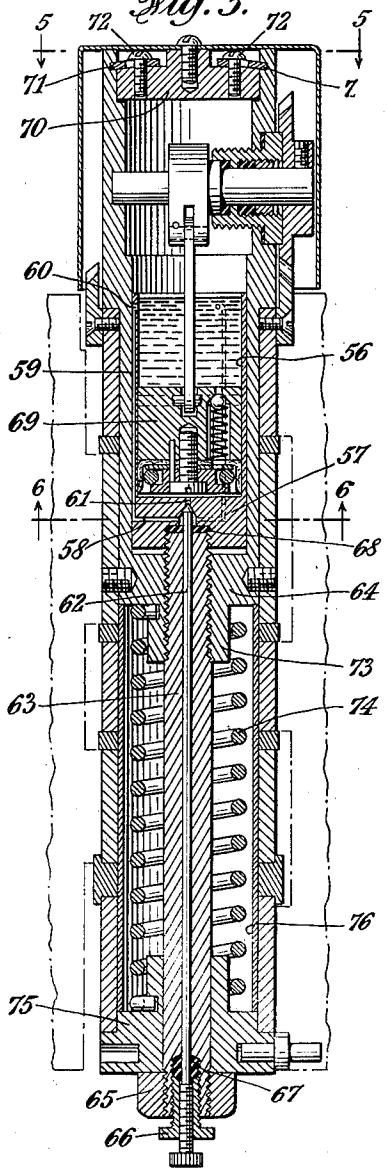
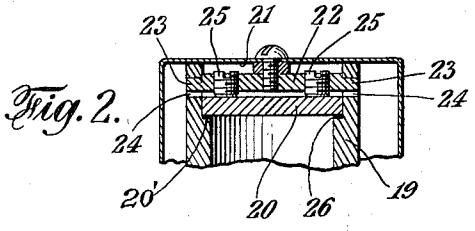


Fig. 2.



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Fig. 4.

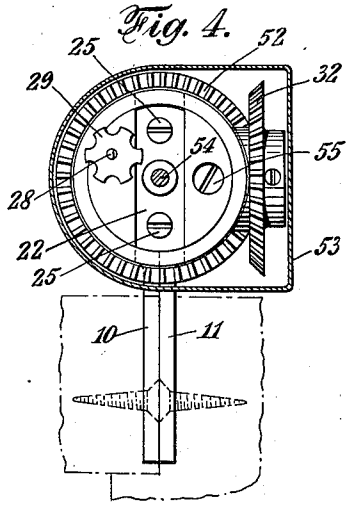


Fig. 5.

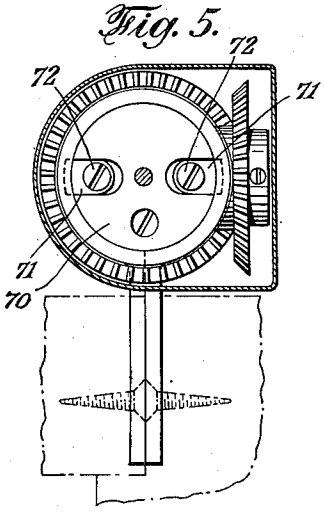


Fig. 6.

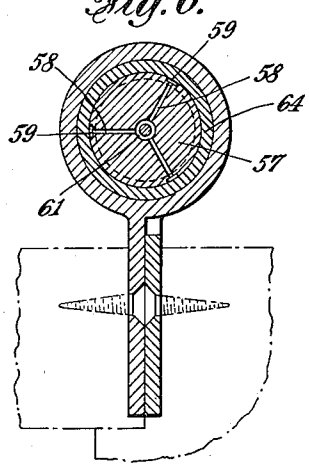


Fig. 7.

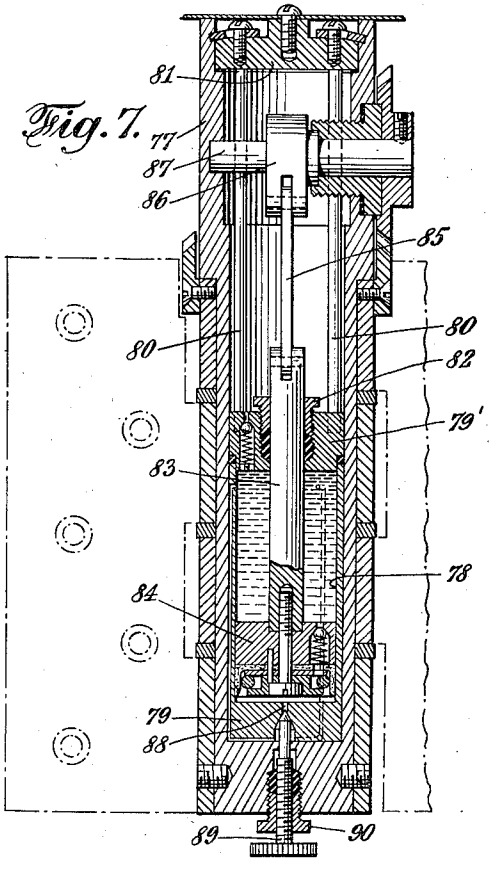
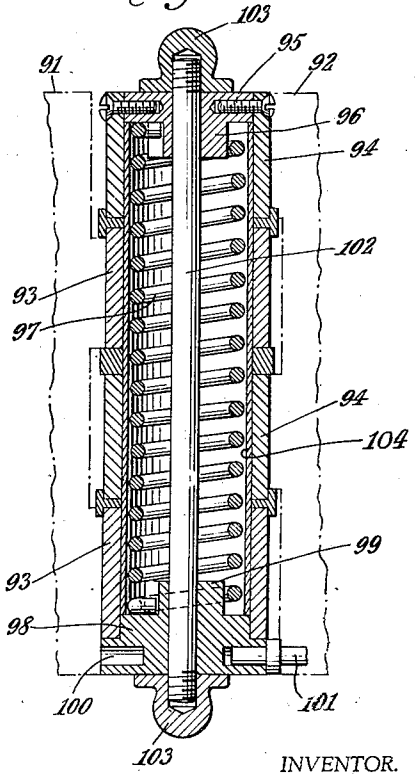


Fig. 8.



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UNITED STATES PATENT OFFICE

2,230,661

DOOR CLOSING DEVICE

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Application May 13, 1939, Serial No. 273,377

7 Claims. (Cl. 16—54)

This invention relates to devices for closing and for checking the closing movement of doors, windows, or the like, and wherein such devices are in the form and take the place of hinges.

The present disclosure is an improvement upon my co-pending application, Serial #204,788, filed April 28, 1938, which has become Patent No. 2,166,651, July 18, 1939, for Door closer, and its prime object is to provide a hinge-like closing and checking instrumentality of a more compact and simplified form, and which has the advantages of being less costly in its manufacture and which may be assembled and adjusted more readily than the device covered by the above mentioned application.

Another important object of the present invention is to provide a simplified cover arrangement which may be readily inserted or removed, and which will positively seal the piston chamber of the device.

Still another object of this invention is to provide means for controlling the piston movement, and which means may be adjusted from either the top or bottom of the device, and wherein such top adjusting means are in cooperative position with, and are disposed in the piston of the device.

The foregoing objects and other important advantages of this invention will become more fully apparent from the following description of the accompanying drawings, which latter are intended to serve more or less for explanatory purposes only, and are not to be construed to restrict me to the actual constructions illustrated.

In the drawings,

Fig. 1 is a vertical cross sectional view through one of the presently preferred forms of my invention.

Fig. 2 is a fragmental cross sectional view through the cover arrangement of my device, taken on lines 2—2 of Fig. 1.

Fig. 3 is a modified form of my device shown in vertical cross section.

Fig. 4 is a top view, partially in cross section, of my device, as seen along lines 4—4 of Fig. 1.

Fig. 5 is a similar top view, partially in cross section of Fig. 3, taken on lines 5—5 of that figure.

Fig. 6 is a transverse cross sectional view taken on lines 6—6 of Fig. 3.

Fig. 7 is a vertical cross sectional view through another modified form of my device, and

Fig. 8 is a similar cross sectional view through the cooperating part of the device shown in Fig. 7.

Referring now more specifically to Figs. 1, 2 and 4, numerals 10 and 11 denote hinge leaves adapted to be attached to doors, windows or the like. These leaves are shown in broken lines in Fig. 1, and in full lines in Fig. 4, and are provided with a set of cooperating ears 12 and 13, respectively, and are spaced by bearing rings 14 and 15.

Immovably secured to the uppermost ear 12 by means of set screws 16 or their equivalent, is a hollow casing, forming a piston chamber 17, provided with a reduced solid lower extension 18 and a thickened, broadened, hollow upper portion 19, which latter is normally closed by a cylindrical cover 20, seated within an annular recess 20'. This cover is of a disk-like formation with a diagonal recess 21, in which latter is placed a clamping bar 22. This bar possesses reduced ends 23, projecting into diametrically opposite openings 24, provided in upper casing portion 19. In bar 22 there are lodged two set screws 25, which may be tightened down against cover 20, whereby the latter is forced against a gasket 26, provided in the annular recess 20'.

Within cover 20 there is operatively mounted in a bushing 27 an adjusting element 28, the upper end of which is provided with an operating knob 29. A suitable packing 30, compressed by bushing 27, seals element 28 in respect to cover 20.

Below cover 20 there is operatively lodged a crank shaft 31, one end 31' of which extends to without the casing. A bevel gear 32 is mounted upon the shaft extension. The opening and the bearing for the crank shaft are sealed by suitable means 33. Since cover 20, adjusting element 28 and crank shaft extension 31' are all sealed, the entire upper casing portion, and therefore the entire casing is made leak-proof.

Secured to crank 34 of crank shaft 31 is a connecting link 35, which engages a piston 36. This piston is provided with a one-way check valve 37, and a bleeder or by-pass port or passage 38, in which latter is operatively mounted a hollow gaging tube 39, which is slit longitudinally at 40. In the thus formed slot operates the flattened end 41 of adjusting element 28. By turning knob 29 of the latter, gaging tube 39 is also turned. The end of this tube is threaded and engages a corresponding thread provided in the piston. By adjusting tube 39 the passage of a liquid medium through the piston is controlled. At the bottom of the piston there is secured at 42 a piston gasket 43 which is spread against the

interior wall of casing portion 17 by an expansion ring 44.

Reduced extension 18 of the piston chamber serves at 43' as anchorage for the upper end of torsion spring 44', the lower end of which is anchored at 45 to an adjustable body 46. The latter is provided with a plurality of sockets 47 for the reception of a suitable tool by means of which body 46 may be turned, and which sockets also serve for accommodating stop pin 48. Body 46 is secured in place by threaded pin 49 and nut 50 engaging its lower threaded end.

Enclosing torsion spring 44', and serving as a guide for the two sets of ears 12 and 13, is a tubular element 51, which is held in place between the piston chamber and body 46.

Fixedly secured to the uppermost ear 13 is a bevel gear 52, which engages gear 32. These two gears cooperate in that one gear may roll upon the other gear, depending upon which one of the hinge leaves 10 and 11 is to be operated and which one of them is to remain stationary. The gears are preferably housed in a casing 53, which latter is preferably secured to bar 22 of the cover arrangement, by means of a screw or similar device indicated at 54.

The operation of the device depends upon the movement of one leaf relative to the other leaf. When one of the leaves moves in one direction, this motion will cause the turning of gear 32 in one direction, thereby causing crank shaft 31 to, for instance, elevate the piston. Inasmuch as valve 37 is a one-way valve, the liquid above the piston will readily pass to below the piston. When the leaves operate in opposite direction, the turning motion of crank shaft 31 is reversed, and the piston is caused to descend.

During the downward motion, valve 37 closes and will not permit any liquid to pass by. However, bleeder port 38 will permit the escape of the liquid from below the piston to above the piston, provided gaging tube 39 will permit such escape, that is, if it is slightly unscrewed by way of adjusting rod 28. In the event the bleeder port passage is completely closed, there will be no transfer of the liquid medium from below to above the piston, and the movement will stop.

Torsion spring 44' has the function of bringing the two leaves back to their normal or originally intended position, at which position a door for example is closed. Such position is indicated in Fig. 4. The action of the spring will cause the downward movement of the piston. Depending upon the adjustment of member 39 in respect to bleeder passage 38, the closing will be slow or rapid. As the piston nears its lowermost position, the pressure exerted by it against the liquid will gradually diminish, thereby allowing an increase in the action of spring 44', which will eventually bring the device back to the original position at which the door is completely closed.

It will be noted that parts of the adjusting elements controlling the bleeder passage or by-pass 38 are designed in this embodiment to move with the piston. It will be also observed that the piston chamber is made of one piece, therefore precluding any possibility of leakage. The liquid medium within the chamber is completely sealed from the top and in the vicinity of the crank shaft bearing, and therefore will require only infrequent replacement. However, if such replacement should be required, there is provided in cover 20 an opening which is normally closed by means of a screw 55.

A modified form of my device is illustrated in Fig. 3. This modification is very similar to the device shown in Fig. 1, with the exception that the piston chamber is provided with a lining 56, which terminates at the bottom in a cylindrical enlargement 57, which virtually forms the bottom of the piston chamber. This enlargement is provided with radial passages 58, which latter extend into wall passages 59, provided at the exterior surface of lining 56, and which wall passages terminate in openings 60 near the top of the lining. Radial passages 58 converge towards a center point, at which is provided a bleeder or by-pass passage 61, controlled from below by an adjustable rod 62. This rod is lodged in a stout tubular member 63, which is threaded at both ends, the upper end engaging enlargement 57, as well as the lower end of casing 64, in which lining 56 is mounted. The lower end of tubular member 63 is engaged by a nut 65. Adjusting rod 62 is threaded at its lower end and operates in a bushing 66. A suitable packing 67 at the lower end of tubular member 63, and a gasket 68 at its upper end prevent any leakage of a fluid along rod 62.

Piston 69 is constructed very similarly to piston 36 of Fig. 1, with the exception that the bleeder passage in that piston is omitted. The upper portion of this device corresponds substantially to the upper portion of the device described in Fig. 1, with the exception that the cover 70 and its locking arrangement is made somewhat different. This locking arrangement consists of two slidable detents 71, which are arranged opposite to one another and which are held in connection with the cover by means of screws 72. These detents are provided with slots and are movable in radial direction. Their outer ends are adapted to engage suitable recesses or an annular undercut provided in the upper portion of casing 64.

The reduced lower end 73 of the casing again provides anchorage for a torsion spring 74, the lower end of which is secured in adjustable end body 75, corresponding to end body 46 of Fig. 1. There is also provided in this modification a guide sleeve 76, which not only houses the spring, but also serves as alining means for the lower portions of the hinged ears. All the operations of this device are very similar to those of the previously described embodiment, with the exception that the control of the liquid passing from below to above the piston, during the latter's downward movement, is located at the bottom end of the device.

A third modified form of my invention is shown in Figs. 7 and 8, wherein my device consists of two separate cooperating portions. The arrangement shown in Fig. 7 differs from the previously described embodiments in that casing 77 is longer and is divided into two compartments, of which the lower is a piston chamber provided with a lining 78, which extends from the bottom member 79. The upper end of the lining is sealed by means of a cylindrical dividing member 79', which is held in place by a plurality of stays or rods 80. The upper ends of these rods are forced downwards by cover member 81 of a construction similar to that described in connection with Figs. 3 and 5.

In cylindrical member 79' there is provided a bushing 82, in which operates a piston rod 83, to the bottom end of which is connected piston 84, while its upper end is engaged by connecting link 85, which is secured to crank 86 of crank shaft 87.

The arrangement of lining wall 78 and cylin-

drical end member 79' is constructed in a manner similar to that described in connection with Fig. 3. Also the adjustment of bleeder passage 88 in the cylindrical member 79' is effected from the bottom by means of adjusting pin 89, lodged within bushing 90, secured in the lower end of casing 77.

The device shown in Fig. 7 would be incomplete as to its function without a torsion spring, which latter is intended to bring piston 84 to its lowermost position after it has been elevated by the movement of the usual gears operating shaft 87. I therefore employ, in connection with another hinge of the door to which my device is attached, a hinge-like spring housing shown in Fig. 8, wherein leaves 91 and 92 are provided, respectively, with ears 93 and 94. Fixedly connected to the uppermost ear 94 is a cover member 95 which has a downward extension 96, accommodating the upper end of torsion spring 97. In the lowermost ear 93 is lodged a bottom member 98, which is provided with an interior extension 99, forming the anchorage for the lower end of spring 97. This bottom member 98 is adjustable and is provided with radial recesses 100 for accommodating an adjusting tool and stop pin 101. A connecting bolt 102, provided with suitable end nuts 103, passes through cover and bottom members 95 and 98, which are spaced from one another by a tubular inlay 104, serving as hinge pin for the ears.

Résumé

The aforedescribed figures deal in principle with the same invention, that is of a closing and checking device for doors, windows, or the like, wherein is employed at least one pair of hinge leaves with cooperating hinge ears, and wherein a casing with a piston chamber is fixedly held in respect with one set of ears, and from which casing extends a crank shaft upon which is mounted one operating gear, which latter is in mesh with another gear, fixedly held in respect to the other set of ears, and whereby one gear is caused to roll upon the other gear, depending upon which of the leaves is being operated. These features are identical in every one of the embodiments illustrated.

A further identical arrangement for all modifications consists of the crank shaft mounted in the upper end of the casing for operating the piston, reciprocatingly mounted in the piston chamber, and the extension of the crank shaft to without the casing, for accommodating the gear.

The main differences between the modification shown in Fig. 1 and that shown in Figs. 3 and 7 are those concerning the location and the operation of the bleeder or by-pass ports. In Fig. 1 the bleeder passage is provided in the piston and the instrumentality for adjusting this passage is also partly located in the piston, and moves with the piston. The adjustment is effected from the top of the device.

In Figs. 3 and 7 on the other hand the bleeder port adjustments and the bleeder ports are located below the piston, and within the bottom enlargements of the chamber linings inserted in the outer casing. The device in Fig. 7 is provided with a chamber dividing member 79', which has bushing 82 for the reception of the piston rod 83. This arrangement is very similar to the construction of my previously mentioned co-pending application, in that above member 79' there is provided an additional space for the reception of reserve liquid which may be passed downwards by depressing a suitable check valve which remains normally closed. The modification shown in Fig. 7 requires the employment of separate spring housing, as indicated in Fig. 8, for complementing the device seen in Fig. 7.

All of the devices employ torsion springs, which are either directly joined with the casing or which are mounted separately, but all of which springs are intended to bring the different parts of all of the devices to their normal position, after they have been forcibly operated to assume another position; in other words, the springs serve to bring the pistons of the devices to their bottom position.

While my devices are primarily intended for the use with doors, windows, or the like, they may be applied to any other use, wherein a rapid movement in one direction and a controlled movement in opposite direction are desired. The constructions illustrated are intended more or less for explanatory reasons, and therefore are not intended to restrict me to any of the specific embodiments disclosed. By the same token, it is quite obvious that my device may require changes and improvements for its adoption to different application, and I, therefore, reserve for myself the right to make such changes and improvements, all within the broad scope of the annexed claims.

I claim:

1. In a door closing and door movement checking device adapted to take the place of hinges, the combination with cooperating hinge leaves having hinge ears, of a torsion spring actuated instrumentality, the latter comprising a casing adapted to contain liquid, said casing being immovably secured to the ears of one of the hinge leaves and rotatably mounted in respect to the ears of the other hinge leaf, an exterior gear immovably associated with the ear of the other hinge leaf, a crank shaft rotatably mounted in the casing, a gear secured to the outer end of the shaft and in engagement with said exterior gear, said shaft being adapted to be rotated through the cooperation of the two gears when either one of the hinge leaves is moved in respect to the other leaf, a piston reciprocatingly mounted in said casing and operatively connected with said crank shaft, a one-way valve in said piston for facilitating the passage of liquid from above to below the piston, and exteriorly adjustable means for governing the passage of liquid from below to above the piston.

2. In a closing and checking device adapted to replace hinges for doors or the like, the combination with the equivalent of at least two cooperating hinge leaves, of a torsion spring actuated instrumentality, the latter comprising a casing for the reception of liquid, said casing being immovably associated with one of the leaves and movable relative to the other leaf, a gear fixedly secured to said other leaf and exteriorly to the casing, a crank shaft operatively lodged in the casing and extending therefrom, another gear secured to the extending shaft portion and engaging the first gear, a piston reciprocatingly operable within the casing and actuated by said crank shaft, a one-way valve in said piston for facilitating the passage of liquid from above to below the piston, and means adjustable from without the casing for controlling or stopping the passage of liquid from below to above the piston.

3. In a closing and checking device adapted to replace hinges of doors or the like, the combination with two cooperating hinge leaves, of an adjustable torsion spring, a casing for the reception of liquid fixedly secured to one of the leaves and movable relative to the other leaf, said torsion spring being adapted to normally urge the casing leaves toward one another, a gear immovably associated with said other leaf and exteriorly to said casing, a crank shaft lodged in said casing and having one of its ends extending outwards, another gear mounted upon the outward end of the shaft and being in operative engagement with the first gear, a piston reciprocatingly operative within the casing and being actuated by said crank shaft, an automatic one-way valve in said piston, and manually controllable, exteriorly adjustable means, provided in said piston, for governing the passage of liquid from below to above the piston, said means being so constructed and arranged as to facilitate its adjustment at any position of the piston.

4. In a closing and checking device, as set forth in claim 3, said governing means comprising a hollow member adjustably lodged in a through passage of the piston, said hollow member being adapted to move with the piston, and a stationary adjusting member extending to the exterior of the casing and operatively engaging said hollow member.

5. In a closing and checking device for doors or the like, a pair of cooperating hinge leaves, a chamber fixedly united with one leaf and movable relative to the other leaf, a crank shaft at one end of the chamber, one end of the shaft projecting beyond the chamber, a gear fixedly secured to the projecting shaft end, a gear secured to said other leaf and meshing with said shaft gear, a piston in said chamber and operatively connected with said shaft, liquid in said chamber, a one-way valve in said piston, a regulable control port provided in the piston, a threaded hollow member cooperating with said port and movable with said piston, stationary means, operable from without the chamber, and in operative engagement with said hollow member, for adjusting the latter in respect to said control port, thereby regulating or stopping the flow of liquid from below to above the piston, and an adjustable torsion spring for urging the leaves normally towards one another.

6. In a closing and checking device, as set forth in claim 5, said leaves being provided with spaced ears, spacer ring between the ears, said torsion spring engaging said chamber with one of its ends, the other spring end being adjustable and engaging said other leaf, and a guide sleeve passing through the ears in which the spring is mounted.

7. In a device for the purpose indicated, the combination with two superimposed, cooperating instrumentalities, the longitudinal center axes of which are substantially aligned, such as hinges, of a casing fixedly associated with one of the instrumentalities, operating means fixedly united with the other instrumentality, a reciprocating piston in said casing, exterior piston operating means in engagement with the fixed operating means, a liquid control passage in said piston, passage regulating means operative in and movable with the piston, exteriorly actuable adjusting means for said regulating means extending into said casing and fixedly lodged in respect to the latter, and a torsion spring for normally urging said instrumentalities to an inoperative position relative to one another.

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