W. J. KEENE.

DOOR CLOSER.

APPLICATION FILED FEB. 15, 1915.

1,243,947.

Patented Oct. 23, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

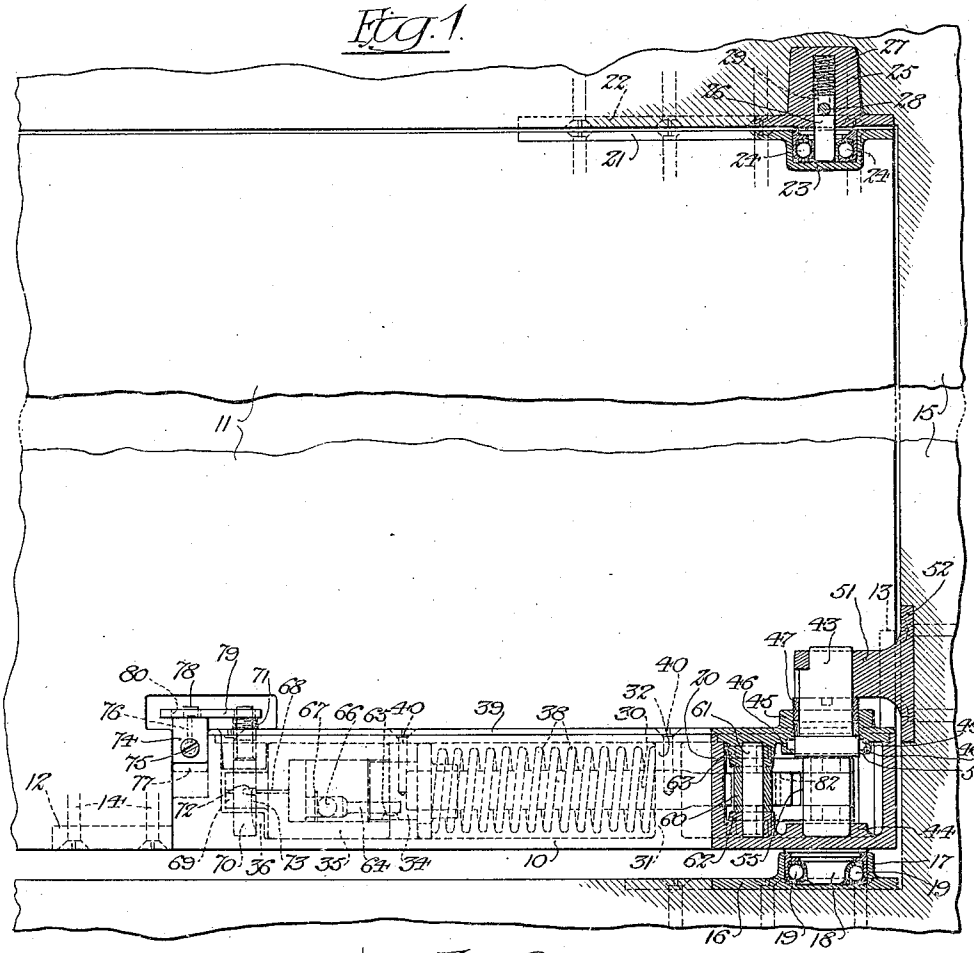


Fig. 2.

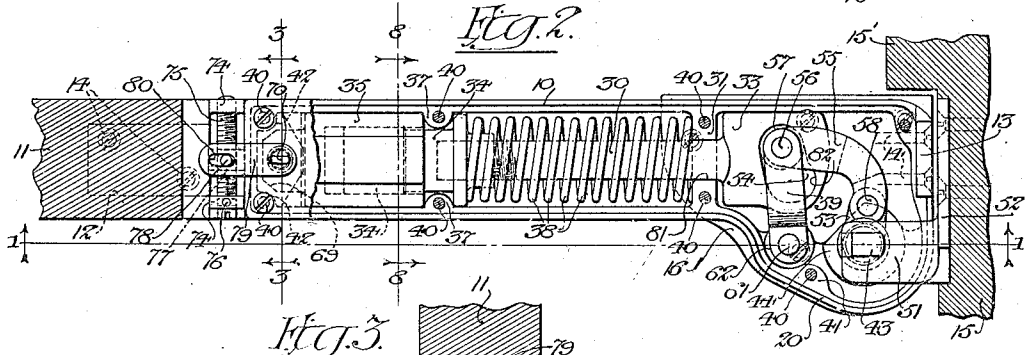
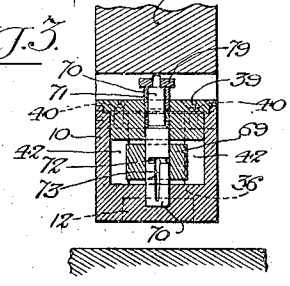


Fig. 3.



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3 SHEETS—SHEET 2.

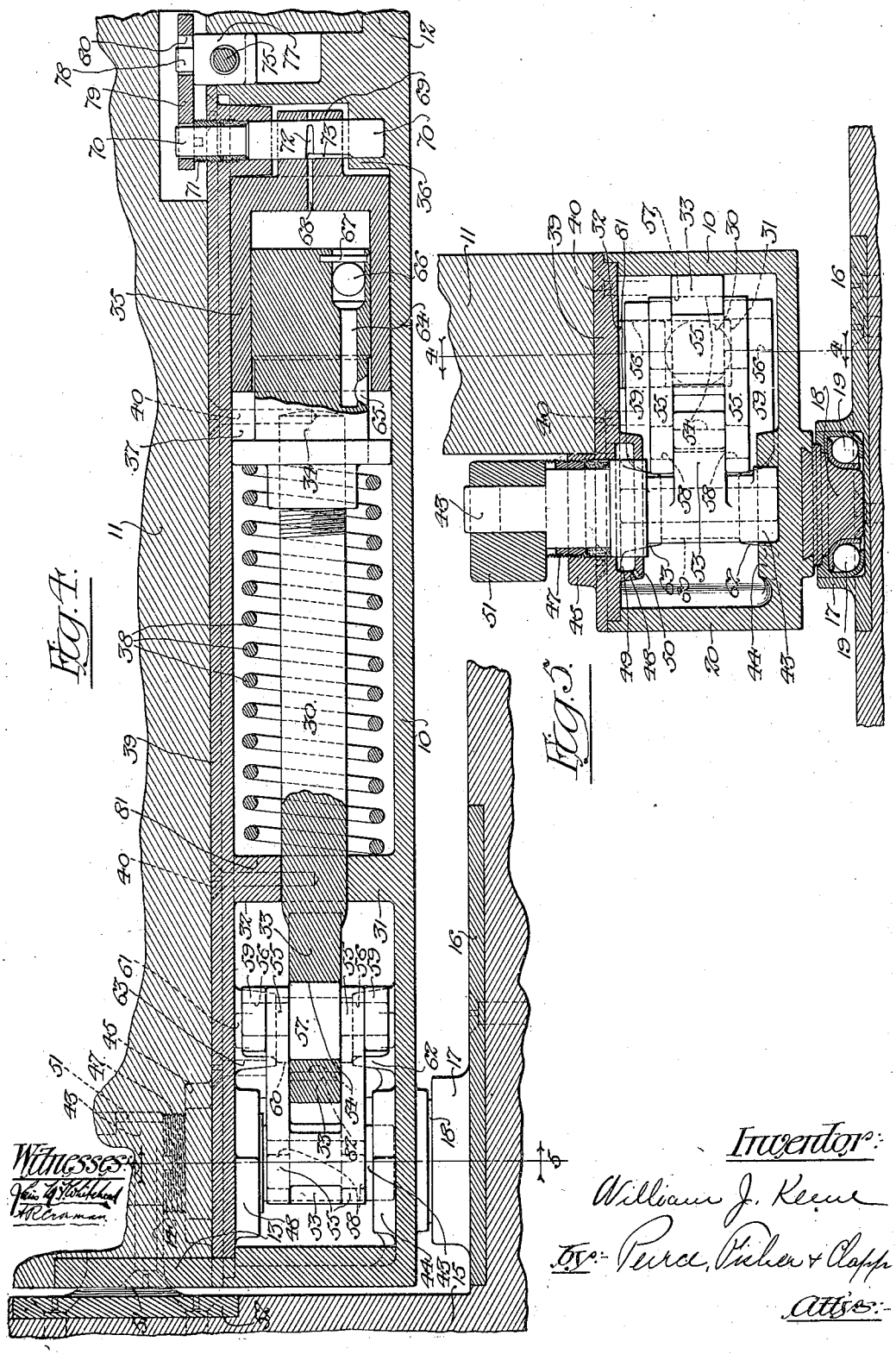


FIG. 1.

FIG. 3.

Witnesses:

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3 SHEETS—SHEET 3.

Fig. 6.

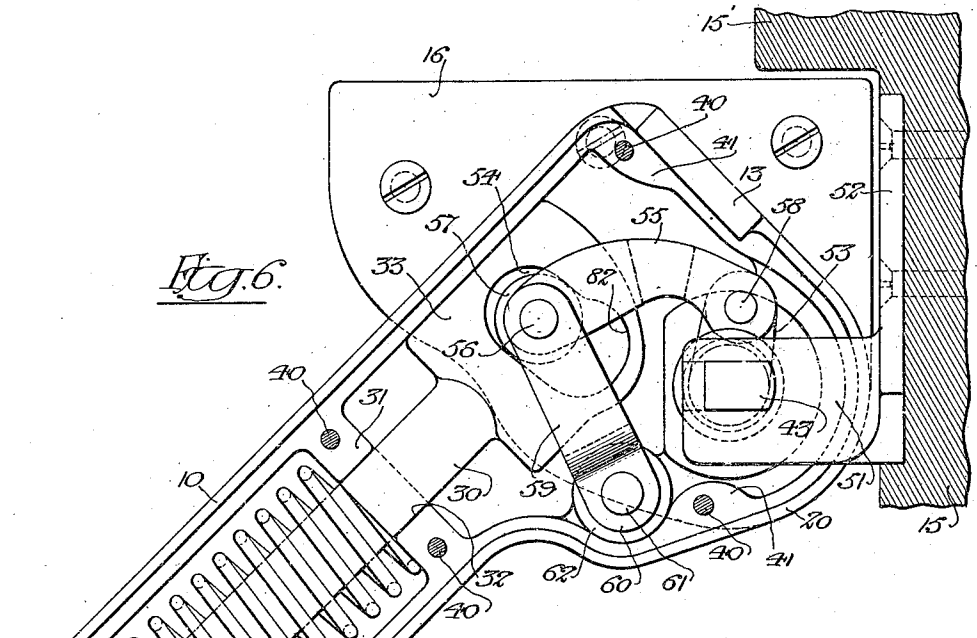


Fig. 7.

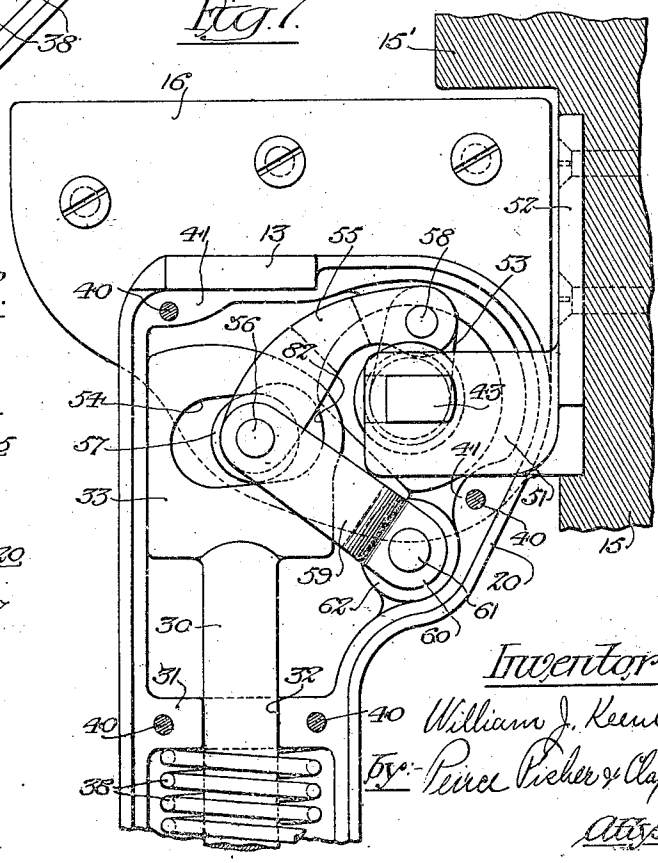
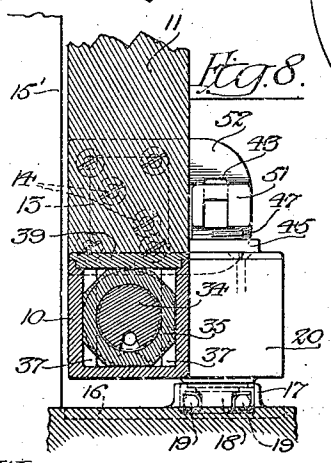


Fig. 8.



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DOOR-CLOSER.

1,243,947. Specification of Letters Patent. Patented Oct. 23, 1917.

Application filed February 15, 1915. Serial No. 8,362.

To all whom it may concern:

Be it known that I, WILLIAM J. KEENE, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Door-Closers, of which the following is a full, clear, and exact description.

The invention relates to door closers and more particularly to checking spring hinges, and seeks to provide an improved construction embodying a casing for containing the checking liquid and which is adapted to be mounted upon the door and preferably upon the lower, rabbeted corner of the door. The invention also seeks to provide an improved door closer or spring hinge which will serve to properly hold the door in closed position and in which a slight initial opening of the door will place the spring under sufficient tension to return the door to closed position. The invention also seeks to provide a checking spring hinge of improved construction.

The invention consists in the features of improvement hereinafter set forth, illustrated in the preferred form in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in elevation of a door with the improved closer applied thereto, parts of the latter being shown in vertical section on line 1—1 of Fig. 2. Fig. 2 is a plan view of the door closer with the cover plate broken away. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a longitudinal section on line 4—4 of Fig. 5 of the improved door closer on an enlarged scale. Fig. 5 is a cross section on the line 5—5 of Fig. 4. Figs. 6 and 7 are partial plan views of the closer with the cover plate removed and the parts shown in different positions. Fig. 8 is a cross section on the line 8—8 of Fig. 2.

The main hinge member 10 is preferably in the form of a narrow, horizontally elongated casing having imperforate side and bottom walls so that it can contain a suitable checking liquid. The casing is preferably formed of cast iron, and, in accordance with one of the objects of the invention, is adapted to be secured within the rabbeted lower corner of a door 11. For this purpose, the main body of the horizontal elongated casing is substantially the same or slightly greater in width than the door for which it is designed. The casing is provided with means whereby it may be secured to the door, and, for this purpose, has a horizontally projecting arm or lug 12 at its outer end, and a vertically projecting arm or lug 13 at its inner end. These arms or lugs are adapted to be arranged within suitable seats formed therefor in the horizontal and upright edges of the door and fastening screws 14 extending through the lugs to secure the hinge member in position.

The hinge member or casing 10 has a pintle-and-socket connection with a companion hinge member that is adapted to be secured to the door frame 15. In the preferred form shown, the companion hinge member comprises a floor plate 16 which is adapted to be secured in place upon the threshhold or horizontal portion of the door frame. This floor plate is provided with a boss 17 having a socket therein for receiving a hinge pintle or stud 18 which is fixed to the bottom wall of the casing 10 adjacent its inner end. Preferably, the pintle is formed of steel and is securely fixed within a seat formed in the bottom wall of the casing. Preferably, also, a suitable ball bearing 19 is interposed between the parts of this hinge-bearing which sustains the weight of the door.

Certain features of the present invention are particularly applicable to spring hinges of the single-acting type, and the hinge pintle or stud 18 is preferably located upon the outer side of the door so that the latter will swing away from the inwardly projecting portion or jamb 15′ of the door frame. For this purpose, the pivoted end of the hinge member or casing 10 is provided with a portion 20 which projects outwardly beyond the main body of the casing and beyond the face of the door, and the hinge pintle or stud 18 is located on this outwardly projecting portion. A companion hinge for the upper end of the door comprises plates 21 and 22, which are adapted

to be secured respectively to the upper edge of the door and the upper horizontal portion of the door frame. These plates are provided with outwardly projecting parts, one of which has a socketed portion 23 containing a ball bearing 24, and the other of which is provided with a socketed portion 25 within which a pintle 26 is mounted. The pintle 26 projects within the ball bearing 24 in the socket 23 and is preferably held in position by a spring 27. By means of a stud 28 on the pintle, which projects outwardly through a slot 29, the pintle may be disengaged from the socketed member 23 and the door removed from position.

The spring actuated checking mechanism is arranged within the hinge casing 10 and comprises a spring-actuated member connected at its outer end to a suitable checking piston and cylinder, and connected at its inner end to an actuating spindle which is arranged in axial alinement with the hinged pintle or stud 18. The spring-actuated member is preferably in the form of a plunger 30, which is guided to shift longitudinally in the main portion of the casing 10. An abutment 31 formed upon the bottom and side walls of the casing is provided with a guide slot 32 for the inner end of the plunger 30. This slot is preferably open at its upper end so that the plunger can be readily removed from the casing for repairs and the like. The extreme inner end of the plunger is provided with an enlarged head 33 having a flat inner face which is in guiding engagement with the inner wall of the casing 10. The plunger is connected at its outer end to the movable member of a checking device that comprises relatively movable piston and cylinder members. In the preferred form shown, the piston 34 is the movable member of the checking device and it is connected to the end of the plunger 30. Preferably, as shown, the piston is adjustably threaded upon the plunger. The cooperating cylinder 35 is removably disposed between a lug 36, formed upon the lower outer end portion of the casing, and two inwardly projecting lugs or ribs 37, formed upon the side walls of the casing. A spring 38 coiled about the plunger extends between the piston 34 and the guiding abutment 31 and holds the parts in normal position with the door closed.

The casing 10 is filled with oil or other suitable checking liquid and its open upper portion is normally closed by a cover plate 39 which overlaps the upper edge of the side walls of the casing. The cover plate is held securely in position by screws 40 extending therethrough and into the lugs formed upon the walls of the casing. As shown, these screws extend into the lugs 31 and 37 of the casing and into lugs 41 and 42 formed at the opposite ends thereof. Preferably, as shown, the abutting edges of the casing and cover plate are rabbeted so that a tight-joint can be formed between them.

An actuating spindle 43 is journaled in the projecting portion 20 of the casing 10 and is in axial alinement with the hinge stud 18. The lower end of the spindle is removably journaled in a socket 44 formed upon the bottom wall of the casing and the spindle projects upwardly through a stuffing box 45 formed in the cover plate 39. The stuffing box is provided with packing 46 held in place by a gland 47 to prevent leaking of oil around the spindle. Preferably also the cover plate is provided with a depending portion 48 having an internal annular groove 49. Oil working up on the spindle collects in the groove 49 and passes back into the interior of the casing through a port or passage 50. The upper projecting end of the spindle 43 is provided with a square portion which engages a correspondingly shaped opening in a projecting bracket 51. The latter is formed upon a plate 52 which is adapted to be secured in place upon the upright portion of the door frame 15. In the preferred form shown, the upwardly projecting portion of the spindle 43 and the bracket 51 are outside the outer face of the door.

Within the casing, the actuating spindle 43 is provided with a crank arm 53 which projects inwardly and is preferably inclined slightly toward the upright portion of the door frame. A connecting link 55 is interposed between the arm 53 and the inner end of the plunger 30 and has a pin-and-slot connection with the plunger. Preferably, as shown, the headed outer end 33 of the plunger is provided with a transverse slot 54 and the end of the connected link 55 is provided with a pin 56 having a roller 57 thereon which is arranged within the slot. The link 55 is preferably provided with a forked end, the members of which extend above and below the plunger head 33 and engage the opposite ends of the pin 56. The opposite end of the link is also preferably forked and its members extend above and below the end of the crank 53 and are connected thereto by a pivot pin 58. Preferably, as shown, the transverse slot 54 is inclined inwardly to a slight extent toward the actuating spindle 43.

A guide link for the connecting link 55 is pivoted within the casing at a point adjacent and in substantially longitudinal alinement with the spindle 43. This guide link 59 is preferably U-shaped in form and is provided with upper and lower members which engage the ends of the connecting pin 56. The outer contracted end portion 60 of the guide link is connected

by a vertical pivot pin 61 to recessed lugs 62 and 63 formed respectively on the bottom wall of the casing and the cover plate 39. The pin 61 and spindle 43 are removably mounted in the bearings therefor formed in the casing and in the cover plate, so that these parts and the links 55 and 59 can be readily removed with the plunger 30 for repairs and the like, when the cover plate is taken off.

As the door is opened, the hinge member swings upon the axis of the hinge pintle or stud 18, but the pin 56 and roller 57 thereon must swing about the axis of the eccentric crank pin 58, the latter being held stationary by the engagement of the bracket 51 with the spindle 53. This relative movement of the roller shifts the plunger 30 longitudinally of the hinge member and places the spring 38 under tension. When the door is released the tension of the spring 38 will restore it to closed position. It should be noted that the arrangement of the parts is such that the extent of movement of the plunger 30 effected by shifting the door from closed position to a partially open position, as shown in Fig. 6, is greater than that effected by opening the door from the partially open to the fully open position shown in Fig. 7. That is to say, the extent of movement of the plunger is greatest at the beginning of the opening movement of the door, and gradually diminishes as the door approaches its fully open position. This effect is due to the relative arrangement of the different centers about which the parts swing, and is also aided by the inclination of the transverse slot 54. By reason of this arrangement, the spring will be sufficiently compressed to close the door, even when the latter is opened to a slight extent, and it will not be excessively compressed when the door is fully opened.

As the door is opened, and the plunger 30 is shifted, the piston 34 is withdrawn from the cylinder 35. Oil then passes into the cylinder through a passage 64 extending longitudinally through the piston adjacent its periphery. This passage is in communication with the interior of the casing through a port 65 in the side wall of the piston. The inner, enlarged end of the passage is provided with a check-valve in the form of a ball 66 held in place by a pin 67. The ball check-valve permits the free entrance of the oil into the cylinder 35 as the door is opened, but when the door closes, the check-valve is seated and the oil in the cylinder is forced out through a contracted passage 68 extending through the rear end of the cylinder. This port is preferably controlled by an adjusting valve so that the checking effect can be varied as desired. For this purpose, the cylinder is provided with a rearwardly projecting lug 69 having an opening extending therethrough for a valve plug 70 and the latter extends down into and is rotatably seated at its lower end in an opening formed in the lug 36. The upper end of the valve is journaled in an opening in the cover plate which is provided with a stuffing box 71. The face of the valve is provided with a segmental groove 72 in line with the port 68, and with a vertical groove 73 depending therefrom. The segmental groove 72 tapers toward one end so that by rotating the valve the escape of the checking liquid from the cylinder can be throttled to a greater or less extent. The outer portion of the adjacent end of the casing is provided with a pair of lugs 74 within which is rotatably mounted a transverse horizontal screw 75. This screw is held against longitudinal movement by a pin 76 extending through one of the lugs and engaging an annular groove formed in the screw. A nut 77 mounted on the screw engages a flat facing on the casing and is therefore held against rotary movement. This nut is provided with a pin 78 extending upwardly therethrough and a link 79 connects this pin to the upper projecting end of the valve 70. As shown, one end of the link is provided with a rectangular opening which fits over the correspondingly shaped end of the valve and its opposite end is provided with a slot 80 with which the pin 78 engages. The parts are so located that the screw may be readily adjusted without removing the hinge from the door, and thereby vary the checking action of the hinge. As above noted, the greater part of the movement of the plunger takes place during the initial portion of the opening movement of the door so that the checking device will act properly to prevent slamming of the door even when it is slightly opened.

It should be noted that the bottom wall, and preferably also the side walls of the inclosing casing are imperforate to prevent leaking of the checking fluid. The actuating spindle 43 is necessarily arranged in alinement with the hinge pintle 18, but an imperforate portion of the bottom wall extends between the adjacent ends of the actuating spindle and hinge pintle, and these parts, in the preferred construction shown, are separate and distinct from each other. To permit the free discharge of oil from the rear end of the cylinder 35, the latter is preferably hexagonal in outline, as shown. The various parts are securely held in place within the casing by a cover plate which is provided with a lug 81 that extends within the slot 32 and engages the plunger rod 30, but when the latter is taken off, the parts can readily be removed from the casing for repairs or the like. If desired, the slot 54 may be provided with a recess 82 which will

receive the roller 57 when the door is fully open. The door will then remain open until a slight push is given to it to thereby disengage the roller from the recess.

It is obvious that numerous changes may be made in the details set forth without departure from the essentials of the invention as defined in the claims, and that parts may be taken without the adoption of the improved hinge as a whole.

I claim as my invention:

1. In a checking hinge, the combination with a hinge-member adapted to be secured to the door frame, of a liquid-containing casing adapted to be secured to the door, a hinge stud interposed between said casing and said hinge-member, a spindle journaled in said casing in axial alinement with said hinge stud, said casing having an imperforate portion interposed between the adjacent ends of said stud and said spindle, means adapted to be secured to the door frame and engaging said spindle to hold the same against movement, and a checking device in said casing operatively connected to said spindle.

2. In a checking spring hinge, the combination with a floor plate, of a liquid-containing casing having imperforate bottom and side walls adapted to be secured in the lower rabbeted corner of a door, a pivot-stud-and-socket connection between said floor plate and the bottom wall of said casing, a spindle journaled in said casing in axial alinement with said pivot-stud, a part adapted to be secured to the door frame and engaging said spindle to hold the same against movement, a spring-actuated checking device in said casing, and operating connections between said checking device and said spindle.

3. In a checking spring hinge, the combination with a socketed floor plate, of a liquid-containing casing adapted to be secured to the rabbeted lower corner of the door and having a hinge-stud fixed to the bottom wall and swiveled in the socket of said floor plate, a spindle journaled in said casing in axial alinement with said stud and having a projecting upper end, a bracket adapted to be secured to the door jamb and engaging the upper projecting end of said spindle to hold the same against movement, and checking cylinder and piston members in said casing, one of said members being spring-actuated and operatively connected to said spindle.

4. In a checking spring hinge, the combination with a door and door frame, of an elongated, liquid-containing casing having imperforate side and bottom walls secured within a rabbeted portion of the door, a vertical spindle journaled in said casing at one end thereof and having a projecting upper end, checking cylinder and piston members in the opposite end of said casing, one of said members being spring actuated and operatively connected to said spindle, a bracket secured to the side of the door frame and having an outwardly projecting portion engaging the upper projecting end of said spindle to hold the same against movement, and a hinge connection between the door and door frame having a pivot in axial alinement with said spindle.

5. In a checking spring hinge, the combination of a horizontally elongated, liquid-containing casing having imperforate bottom and side walls and horizontal and vertical projecting arms at the ends whereby it may be secured to the lower rabbeted corner of a door, a vertical spindle journaled within said casing at its inner end, checking piston and cylinder members within the outer end of said casing, one of said members being spring actuated and operatively connected to said spindle, and a bracket adapted to be secured to the side of the door frame and having an outwardly projecting portion engaging the upper end of said spindle to hold the same against movement.

6. In a checking spring hinge, the combination of an elongated, liquid-containing casing adapted to be secured in a rabbet in the hinged edge of the door and having a laterally offset portion at its inner end, a vertical spindle journaled in the offset portion of said casing, checking cylinder and piston members in the opposite end of said casing, one of said members being relatively movable and spring-actuated, a crank arm on said spindle, links connecting said crank arm and said movable checking member, and a bracket adapted to be secured to the door jamb and projected outwardly on one side of the door and engaging the upper end of said spindle to thereby hold the same against movement.

7. In a checking hinge, the combination of a hinge member, a reciprocating checking member movably mounted thereon, a spindle provided with a crank-arm journaled on said hinge member on one side of the line of movement of said checking member, a link connecting said crank arm to said checking member and a swinging guide link for said connecting link.

8. In a spring hinge, the combination of a reciprocating, spring actuated plunger, an actuating spindle having a crank arm, a connecting link having a pin-and-slot connection with said plunger, and a swinging guide link for said connecting link.

9. In a spring hinge, the combination with a hinge member, of a spring-actuated plunger guided on said hinge member to reciprocate longitudinally, an actuating spindle

journaled on said hinge member on one side of the line of movement of said plunger, an inwardly projecting crank arm on said spindle, and a link connected to said crank arm and having a transverse slot-and-pin connection with said plunger.

10. In a spring hinge, the combination with a hinge member, of a spring-actuated plunger guided on said hinge member to reciprocate longitudinally, an actuating spindle journaled on said hinge member on one side of the line of movement of said plunger, an inwardly projecting crank arm on said spindle, a link connected to said crank arm and having a transverse slot-and-pin connection with said plunger, and a swinging guide link for said connecting link pivotally mounted on said hinge member.

11. In a spring hinge, the combination of a hinge member, a spring-actuated plunger guided to reciprocate longitudinally on said hinge member, an actuating spindle journaled on said hinge member adjacent the inner end of said plunger and on one side of the line of movement thereof, an inwardly projecting crank arm on said spindle, a transverse slot in the adjacent end of said plunger, a pin in said slot, a connecting link between said pin and said crank arm, and a swinging guide link pivoted on said hinge member adjacent said spindle and engaging said pin.

12. In a checking spring hinge, the combination with a casing having an offset portion at its inner end, of a spring-actuated checking plunger guided to reciprocate longitudinally in said casing, an actuating spindle jouraled in the offset portion of said casing adjacent the inner end of said plunger and on the one side of its line of movement, an inwardly projecting crank arm on said spindle, a link connected to said crank arm and having a transverse slot-and-pin connection with the outer end of said plunger, and a swinging guide link for said connecting link pivoted in said casing.

13. In a checking spring hinge, the combination with a casing having an offset portion at its inner end, of a spring-actuated checking plunger guided to reciprocate longitudinally in said casing, an actuating spindle journaled in the offset portion of said casing adjacent the inner end of said plunger and on the one side of its line of movement, an inwardly projecting crank arm on said spindle, said plunger having a transverse slot in its outer end inclined toward said spindle, a roller in said slot, a link connecting said crank arm and said roller, and a guide link pivoted in said casing adjacent said spindle and engaging said roller.

14. In a checking hinge, the combination of a liquid-containing casing adapted to be secured in a rabbet of the door, checking cylinder and piston members and an actuating spindle therefor, mounted in said casing, one of said checking members being fixed in position in said casing and having a contracted outlet, a rotatable valve for adjusting said outlet having a vertically disposed stem, a horizontally disposed adjusting device and a connecting member between said adjusting device and said stem for rotating said valve.

15. In a checking spring hinge, the combination of a casing having a cover plate, a cylinder removably mounted in one end of said casing, the latter having lugs on its side walls adjacent the end of said cylinder, a piston in said cylinder, a plunger rod connected to said piston, said casing having a slotted guide for the inner end of said plunger, a spring coiled about said rod and interposed between said guide and said piston, an actuating spindle removably journaled in the inner end of said casing, and operating connections between said spindle and said plunger and removable therewith from said casing, said cover plate having portions for holding said removable parts in position.

16. In a checking spring hinge, the combination of a horizontal elongated liquid-containing casing adapted to be secured in a rabbet of the door, checking cylinder and piston members and an actuating spindle therefor mounted in said casing, one of said checking members being fixed in position and having a contracted outlet, a vertically disposed valve plug for adjusting said outlet, a horizontal screw journaled on said casing and held against longitudinal movement and a nut on said screw held against rotary movement and connected to said vertically disposed valve plug.

17. In a checking spring hinge, the combination with a door and door frame, and a liquid-containing casing secured within a rabbet at the hinged edge of the door, a vertical spindle journaled in the casing and having a projecting upper end, checking cylinder and piston members mounted in said casing, one of said members being spring actuated and operatively connected to said spindle, a bracket secured to the door frame and having a part arranged to engage the upper projecting end of said spindle to hold the same against movement, and a hinge connection between the door and door frame having a pivot in axial alinement with said spindle.

18. In a checking hinge, the combination with a door and door frame, of a liquid-containing casing secured in a rabbet in the hinged edge of the door and having a laterally offset portion projecting outwardly on one side of the door, a vertical spindle journaled in said offset portion and having

a projecting upper end, checking cylinder and piston members arranged in said casing, one of said members being operatively connected to said spindle, a bracket secured to the door frame and projecting outwardly on one side of the door and engaging the upper projecting end of the spindle to thereby hold the same against movement, and a hinge connection between the door and door frame having a pivot in axial alinement with said spindle, substantially as described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."