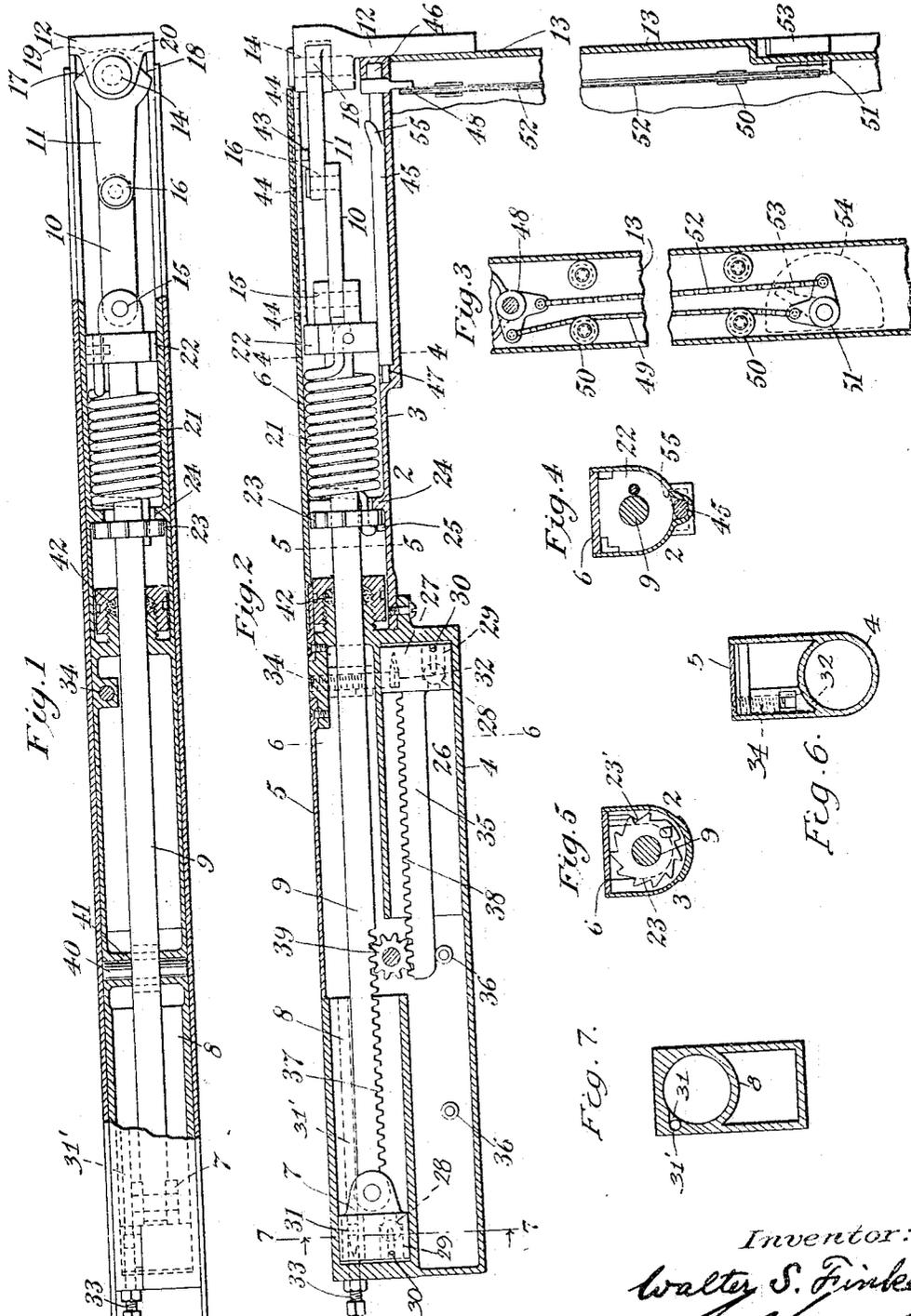


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 DOOR CHECK AND CLOSER.
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1,121,084.



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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER S. FINKEN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Door Checks and Closers, of which the following is a specification.

This invention relates to improvements in door-checks and closers, and the main object of the invention is to provide a device of this kind which will cooperate properly with the door to be checked and yet will be substantially wholly concealed within the door itself, and will not present the unsightly appearance of door-checks as ordinarily used.

In carrying the invention into effect, I make use of a checking device within the door and embodying an element relatively movable in the door, usually crosswise thereof, the preferred construction being one in which a piston is movable in a cooperating fixture, such as a cylinder, and is combined with a liquid reservoir in such a manner as to form a liquid-check. In addition to these devices, and in connection therewith, there will ordinarily be employed a strong spring for returning the door to its normal position, the tension of which spring may be regulated by means also located within the door. A further regulation of the action of the door-check is obtained by providing a passage connecting the cylinder and the liquid reservoir for communication, and by employing in connection with such passage means for varying the area thereof to regulate the speed of flow of the fluid checking medium through it. The preferred construction is one in which two reciprocating pistons and cylinders, disposed oppositely to each other, are so combined that both of the pistons may be operated through a single set of connections to a proper point in the door-frame, in a manner which will be hereinafter more fully described.

Other features of the invention relate to means for stopping the door in any desired angular open position, for securing the door in such position, and to various other features which will be hereinafter more fully described and claimed, and which are illustrated in the accompanying drawings, in which,

Figure 1 is a plan, with parts broken away, of the upper edge of a door, etc., illustrating a door-check embodying my present invention; Fig. 2 is a sectional side elevation of the same; Fig. 3 is a detail illustrating in edge elevation a device for controlling the securing of the door in the desired angular open position, and will be hereinafter more fully described; Fig. 4 is a detail illustrating in vertical section and elevation the principal element for securing the door in the desired angular open position, the section being taken in line 4-4, Fig. 2, and Fig. 5 is a detail illustrating in a similar manner in vertical section and elevation, a ratchet-wheel for tensioning the spring of the checking device, the section being taken in line 5-5, Fig. 2; and Fig. 6 is a transverse section taken on line 6-6 of Fig. 2, the piston being omitted for the sake of clearness; and Fig. 7 is a transverse section taken on line 7-7 of Fig. 2, the piston structure being omitted.

Similar characters designate like parts in all the figures of the drawings.

As before stated, the principal feature of my invention is a concealed or invisible door-check located substantially wholly within a door, in order not to disfigure the appearance of the same, and yet so constructed as to constitute an efficient means for checking the closing movement of a door. Ordinarily my improved door-check will be applied to a door near the upper edge thereof, the construction illustrated being one in which substantially all of the principal elements of the door-check are contained within a casing located at the upper edge of, and intended to be inclosed by the door, whether said door is of wood or metal. In the construction illustrated, a casing suitable for the reception of the various working parts is shown, and it extends substantially from edge to edge of the door transversely thereof. This casing is designated generally by 2. As illustrated, it embodies two main parts, one of which constitutes in this construction a closed liquid chamber or liquid reservoir for containing a suitable liquid, such as oil, while the other is a casing for receiving the connections to the door-frame and certain other parts which will be hereinafter described. The casing for these connections is indicated at 3, and the liquid reservoir is shown at

4. Said reservoir is preferably closed by a suitable tight cover 5, for preventing escape of the contained liquid, and the casing 3 is also shown as closed by a cover 6.

5 The principal element of the door-checking device is one that has a relative movement within the door, preferably transversely thereof, this element usually being a reciprocating piston mounted to work in a suitable cylinder. Here a piston suitable for the purpose is indicated at 7, and a suitable cylinder at 8. This cylinder, as shown, is substantially closed at its outer end and is open at its inner end where it communicates freely with the interior of the liquid reservoir 4. The piston 7 is intended to travel back and forth in the cylinder 8 and is suitably connected to a proper piston-rod, such as 9, which in turn will have connections with a proper fixed point in the door-frame, for the purpose of obtaining the necessary to and fro movement of the piston and the piston-rod. These connections may be any suitable for the purpose, but are illustrated herein as a pair of connected links, such as 10 and 11, the former of which is pivoted directly to the free end of the piston-rod 9, while the latter is pivoted at its inner end to the other end of the link 10 and at its outer end to a suitable fixed point in the door-frame, which point in this case is located in an element, 12, coacting with the inner edge 13 of the door and adapted to be rigidly attached to the door-frame.

35 The fixed pivot of the link or rocker 11 is indicated at 14 and the pivot points of connection of the link 10 to the piston-rod and the link 11 are designated by 15 and 16 respectively. It will be noticed that the link or rock-arm 11 has two angular faces disposed substantially at an angle of ninety degrees to each other and designated by 17 and 18 respectively, for limiting the swinging movement of the arm 11 in one or the other direction as the case may be. These stop-faces on the part 11 cooperate respectively with fixed angular stop-faces, 19 and 20, on the element 12 of the door-frame, and the extent of movement of the part 11 in either direction is of course determined by the corresponding stop-face 19 or 20.

In connection with the devices just described, a suitable actuator will be employed for positively moving the door toward its closed position after it has been opened. For this purpose I prefer to make use of a suitable strong spring properly combined with the other elements just described. In the construction illustrated a strong coiled spring is shown at 21 for this purpose, one end of said spring being secured to a head or collar, 22, that is fast on and moves with the piston-rod 9, and the other end of which is suitably secured to a fixed part of the

door. Here this other end of the spring is shown as secured to a ratchet-wheel, 23, through which the piston-rod 9 is free to slide, said ratchet-wheel being held against movement with the piston-rod by a fixed stop or partition, in the form of a U-shaped rib 24, in the casing 3 and by a stop, 25, at the opposite side of said ratchet wheel and being held peripherally by a pawl 23'. This pawl 23' fits into the teeth of the ratchet wheel 23, in such a manner as to jam itself between the ratchet wheel and the inner wall of the casing and prevent the spring 21 from turning after it has been twisted. If it is desired to put more tension on the spring after the door check is in position on the door, the cover 6 is removed and a suitable tool used as a lever to turn the ratchet. The ratchet-wheel may be turned between its stops to vary the tension of the spring 21, and when properly adjusted may be held in place by a suitable pawl, such as that shown at 23'. It will be obvious from this description of the piston, the piston-rod, the spring, and the operating connections to the fixed element 12 of the door-frame, that when the door is opened and the connections 10, 11, etc., move to the right and partially withdraw from the door, the spring 21 will be under tension, and when so tensioned will be in a condition for returning said parts, including the piston-rod 9 and the piston 7, to their normal positions after the door has been opened to the desired extent and then released. This relative movement of the connections with respect to the door is permitted because of the manner in which the connecting means described is joined to the fixed element or door-frame. The point of connection with the door-frame is at one side of and at a considerable distance from the usual pivot of the door hinge (not shown) and when the door swings about its pivot in said hinge a gap of considerable length will be opened up between the edge of the door and the door-frame in the plane in which they are in juxtaposition when the door is closed. This movement of the door in opening is sufficient to give the necessary movement, through the connections 11, 10 and 9, to the piston 7, and the angularity of the door movement is not only taken care of, by providing vertical pivots at 15 and 16, but serves as a means for increasing the movement of the piston, owing to the fact that the link 10 turns about the pivot 16 relatively to the part 11 when the door movement is continued after the striking of the stop face 17 or 18 against the corresponding stop face 19 or 20.

In the construction illustrated I have shown two pistons and cylinders disposed oppositely to each other. This second cylinder and piston are indicated at 26 and 27 respectively. The cylinder 26 is substan-

tially similar in construction to the cylinder 8, and each piston contains a ball valve 28, controlling a longitudinal passageway, 29, in the piston, the movement of the ball lengthwise of the piston being limited by the stop wall at the end of the bore 29 in one direction, and by a pin, 30, in the opposite direction. This ball valve of course serves in one position to prevent the efflux of the liquid from the cylinder 26, when the piston is moving inward, and permits the flow of the liquid through the piston into the closed end of the cylinder when the piston is traveling outward. In connection with each of these liquid checking devices I prefer to employ suitable means for regulating the resistance opposed to the movement of the piston, particularly when the door is closing. Each cylinder, as before stated, is intended to be in connection with the main reservoir and there is shown at the closed end of each cylinder a passage communicating with the main portion of the reservoir. These passages are indicated respectively at 31 and 32. Each is preferably a relatively long passage extending lengthwise of the cylinder and at the far end thereof reduced in area, it being shown as tapering to a point at its far end. This provides for increasing the resistance opposed to the closing of the door during the last part of the closing movement of the door. In addition the normal area of each opening is preferably regulable in a suitable manner, as, for example, by adjusting screws, 33 and 34, the latter of which, it will be noticed, is practically concealed in the bore in which it is adjusted. By means of these adjusting screws any desired regulation of the checking action within proper limits may be obtained. The passage 31 communicates with the main reservoir by means of a longitudinal passage 31' formed in the solid corner portion of the casting, as shown in Fig. 7. This passage discharges at the end of cylinder 8 into the reservoir, as best shown in Fig. 2.

The connecting means before described for joining the piston-rod 9 to the fixed part 12 of the door-frame is preferably common to both of the pistons. In this construction the piston 27 is illustrated as having a short piston-rod, 35, guided and supported on antifricition rolls, such as 36, and suitably connected to the other piston-rod 9. The connecting means employed may be any proper for the purpose. In the construction shown each piston-rod has a rack or rack teeth at one side thereof, these rods being indicated at 37 and 38. As shown, they are parallel, with the teeth facing toward each other, and are separated just sufficiently to enable the teeth of both racks to mesh with the teeth of a spur pinion, 39, mounted for rotation on a pin, 40, sup-

ported in a suitable transverse bearing, 41, in the casing 4. These racks and the pinion are so combined that when the piston-rod 9 is operated in one direction or the other, the spur-pinion 39 will be turned by the teeth of the rack 37 and will in turn impart reciprocating movement to the piston-rod 35. It will be noticed, however, that the piston-rods 9 and 35 and the pistons carried thereby are always moved in opposite directions. The parts are so combined that this will produce the proper checking action, each of the pistons being shown in the drawings as disposed in corresponding positions, that is, substantially at the inner ends of their respective cylinders, although they have been moved practically to the limit of their travel and in opposite directions to each other by the action of the gear teeth just described.

The casing 4 constituting the liquid reservoir, is closed at its outer end by the end of the casing as shown, but at the inner end where the piston-rod is movable back and forth through the inner end wall of said casing, it is necessary to provide a suitable packing, such as the stuffing box 42, for the purpose of preventing the oil or other liquid in the reservoir 4 from having free access to the chamber 3.

The devices previously described, to wit, the pistons and cylinders, the spring for returning them to their normal positions after the door has been opened, and the connections cooperating therewith and with the door-frame, constitute a sufficient means for closing the door and properly checking such closing movement. When, however, it is desired either to limit the extent of the opening movement of the door or to hold the door open after it has been opened, as will frequently be the case, some additional means must be provided for the purpose. In the construction illustrated I have shown a simple type of adjustable stop device for determining the extent of the angular opening movement of the door, and I have also illustrated means for preventing the closing of the door by the spring at certain times, and for holding the door when opened in any desired angular position. In the construction shown the plate 6 which covers the chamber or casing 3 has, in this instance, an adjustable stop or pin, 43, movable to any one of a plurality of positions for limiting the extent of the opening movement of the door. This pin is intended to come in contact with a projecting face of the connections to the piston and by stopping further movement of said connections to the right, as seen in Figs. 1 and 2, limit the extent of the angular opening movement of the door. This angle may be varied at will by varying the position of the stop 43, and in order to

permit said stop to be set in any one of a plurality of positions I have shown at 44 a series of perforations in the cover plate 6 into any one of which said stop pin may be inserted and secured in place.

When it is desired to secure the door in the open position to which it may have been swung, the connections may be held against relative movement crosswise of the door by a suitable device, such, for example, as the eccentric locking rod, 45, which is illustrated as journaled at its opposite ends, 46 and 47, in suitable bearings in the lower part of the casing 3. When in the position shown in Fig. 4, that is, with its flattened side up, the collar 22 of the connections to the piston may slide freely crosswise of the door, but when the eccentric is turned substantially through an angle of ninety degrees so that its largest diameter is vertical, the collar 22 will be securely wedged in place and movement of it crosswise of the door will be prevented. Under such conditions of course swinging movement of the door about the door-hinges will also be prevented. The length of the locking eccentric rod 45 should be sufficient to permit it to wedge said collar against movement whatever may be the angular position of the open door, and hence whatever may be the position of the collar crosswise of the door. Suitable means may be employed for turning the locking rod 45. In the construction illustrated said rod has at its right-hand end a bell-crank lever, 48, to one arm of which is connected the upper end of an operating element, such as a chain or cord, 49, preferably passing over rollers, 50, and connected at its lower end to one arm of another bell-crank lever, 51, the other arm of which is connected as by a chain, 52, to the lower arm of the bell-crank lever 48. In fixed relation with the bell-crank 51 is a short operating lever, 53, adapted to work in a suitable opening, 54, in the inner edge of the door. When the handle or lever 53 is turned properly the locking rod 45 may be shifted by the connections just described into or out of locking position as desired. All of these connections are also substantially concealed, and the operating member or handle 53 is within easy reach so that the operation of the locking rod, which is located at the upper edge of the door, may be readily and conveniently controlled.

In connection with the means for holding the door open I may provide for automatically actuating the same. Here the locking rod or rock-shaft 45 has a cam, 55, projecting into the path of the collar 22, and the parts are so combined that when said collar reaches the cam 55 it will turn said cam and with it the rock-shaft 45. Here the movement is in a direction for

releasing said rock-shaft from locking engagement with the collar. It will be understood that even when locked open the door may be swung by hand, though not freely.

What I claim is:

1. In a door-check, the combination with a door and a door-frame, of a locking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame, and means carried by and located within the door and operative with said connecting means for stopping the door in a predetermined angular position, said means including a pair of cooperative stops one of which is movable in unison with said movable element of the checking device.
2. In a door-check, the combination with a door and a door-frame, of a checking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame, and means carried by and located within the door and cooperative with said connecting means for stopping the door in any one of a plurality of angular positions, said means including a pair of cooperative stops one of which is movable in unison with said movable element of the checking device.
3. In a door-check, the combination with a door and a door-frame, of a cylinder within the door, a piston mounted to work in said cylinder, connecting means between said piston and the door-frame, a stop within the door and cooperative with said connecting means for stopping the door in a predetermined angular position, and a stop cooperative with and movable in the path of said first stop and movable in unison with said piston.
4. In a door-check, the combination with a door and a door-frame, of a cylinder within the door, a piston mounted to work in said cylinder, connecting means between said piston and the door-frame, a stop adjustable to any one of a plurality of positions within the door and cooperative with said connecting means for stopping the door in any one of a plurality of angular positions corresponding to the position of said stop, and a stop cooperative with and movable in the path of said first stop and movable in unison with said piston.
5. In a door-check, the combination with a door and a door-frame, of a pair of oppositely facing cylinders within the door, pistons mounted to work in said cylinders, piston-rods connected respectively to said pistons, means for simultaneously moving said piston-rods in opposite directions, and connecting means embodying two members pivoted together and one of which is pivoted

to one of said pistons and the other of which is pivoted to the door-frame and has a limited angular movement.

6. In a door-check, the combination with a door and a door-frame, of a pair of oppositely facing cylinders within the door, pistons mounted to work in said cylinders, piston-rods connected respectively to said pistons, connecting means between said pistons for simultaneously moving them in opposite directions, and connecting means embodying two members pivoted together and one of which is pivoted to one of said pistons and the other of which is pivoted to the door-frame and has a limited angular movement.

7. In a door-check, the combination with a door and a door-frame, of a liquid reservoir within the door and extending transversely thereof, a pair of oppositely facing cylinders within said liquid reservoir, pistons mounted to work in said cylinders, piston-rods connected respectively to said pistons, connecting means between said piston-rods for simultaneously moving them in opposite directions, and connecting means embodying two members pivoted together and one of which is pivoted to one of said pistons and the other of which is pivoted to the door-frame and has a limited angular movement.

8. In a door-check, the combination with a door and a door-frame, of a liquid reservoir within the door and extending transversely thereof, a pair of oppositely facing cylinders within said liquid reservoir, pistons mounted to work in said cylinders, piston-rods connected respectively to said pistons and having racks, a pinion disposed between and in constant mesh with the teeth of said racks, and connecting means between one of said piston-rods and the door-frame.

9. In a door check, the combination with a door and a door-frame, of a cylinder within the casing of the door, a piston mounted to work in said cylinder, a spring connected with said piston and also located within the casing of the door, means within said casing for regulating the tension of said spring, and connecting means between said piston and the door-frame.

10. In a door-check, the combination with

a door and a door-frame, of a checking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame and embodying a slidable collar, and means for engaging said collar and holding it against sliding movement.

11. In a door-check, the combination with a door and a door-frame, of a checking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame and embodying a slidable collar, and means for holding said collar against sliding movement said means embodying an eccentric for engaging said collar.

12. In a door-check, the combination with a door and a door-frame, of a checking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame and embodying a slidable collar, and means for holding said collar against sliding movement said means embodying a rock-shaft having a long eccentric surface and adapted to engage and lock said collar in various longitudinal positions of the latter.

13. In a door-check, the combination with a door and a door-frame, of a checking device within the door and embodying an element relatively movable in said door, connecting means between said relatively movable element and the door-frame, a device shiftable between two positions in one of which it holds said relatively movable element against relative movement in said door and in the other of which it permits relative movement of said element, and means controlled by the movement of the door to a predetermined position for shifting said device from one of its positions to the other.

Signed at New York in the county of New York and State of New York this 1st day of March, A. D. 1913.

WALTER S. FINKEN.

Witnesses:

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