Dec. 22, 1931. C. I. JOHNSEN 1,837,716

DOORCHECK

Filed June 5, 1928 5 Sheets-Sheet 1

Fig. 1.

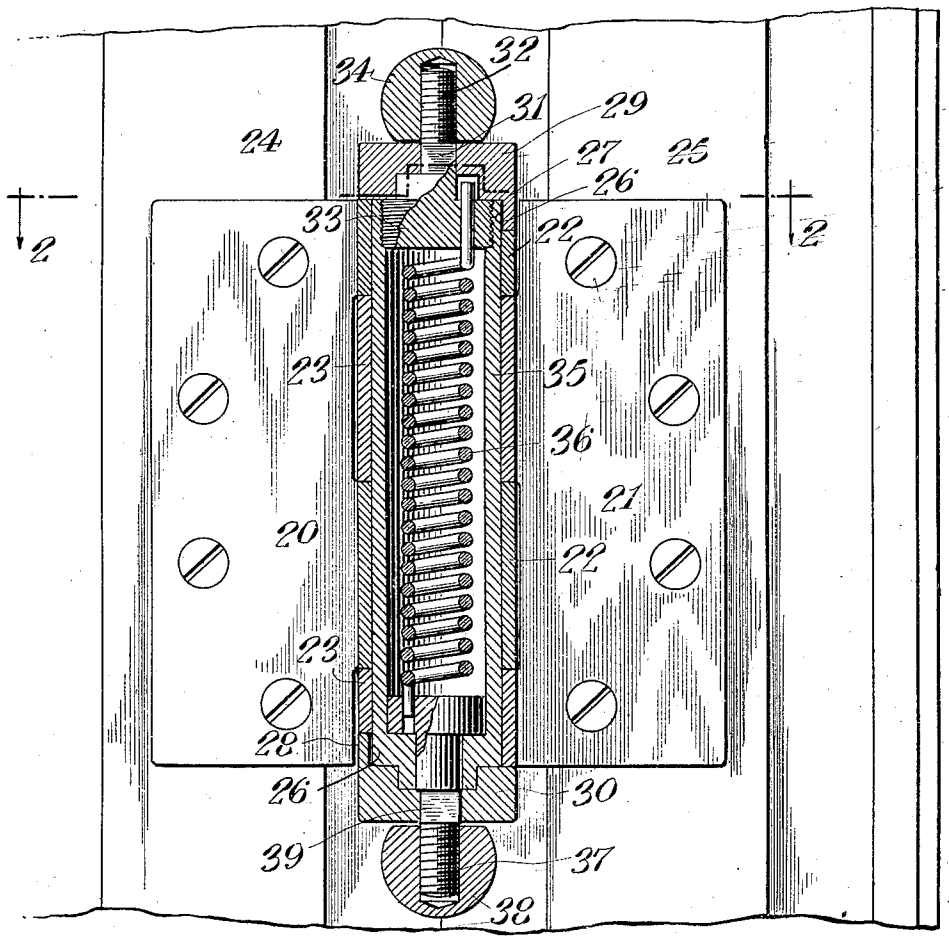
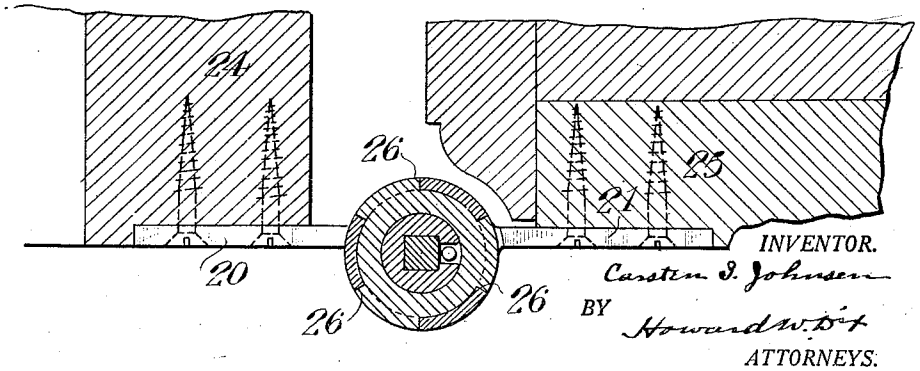


Fig. 2.



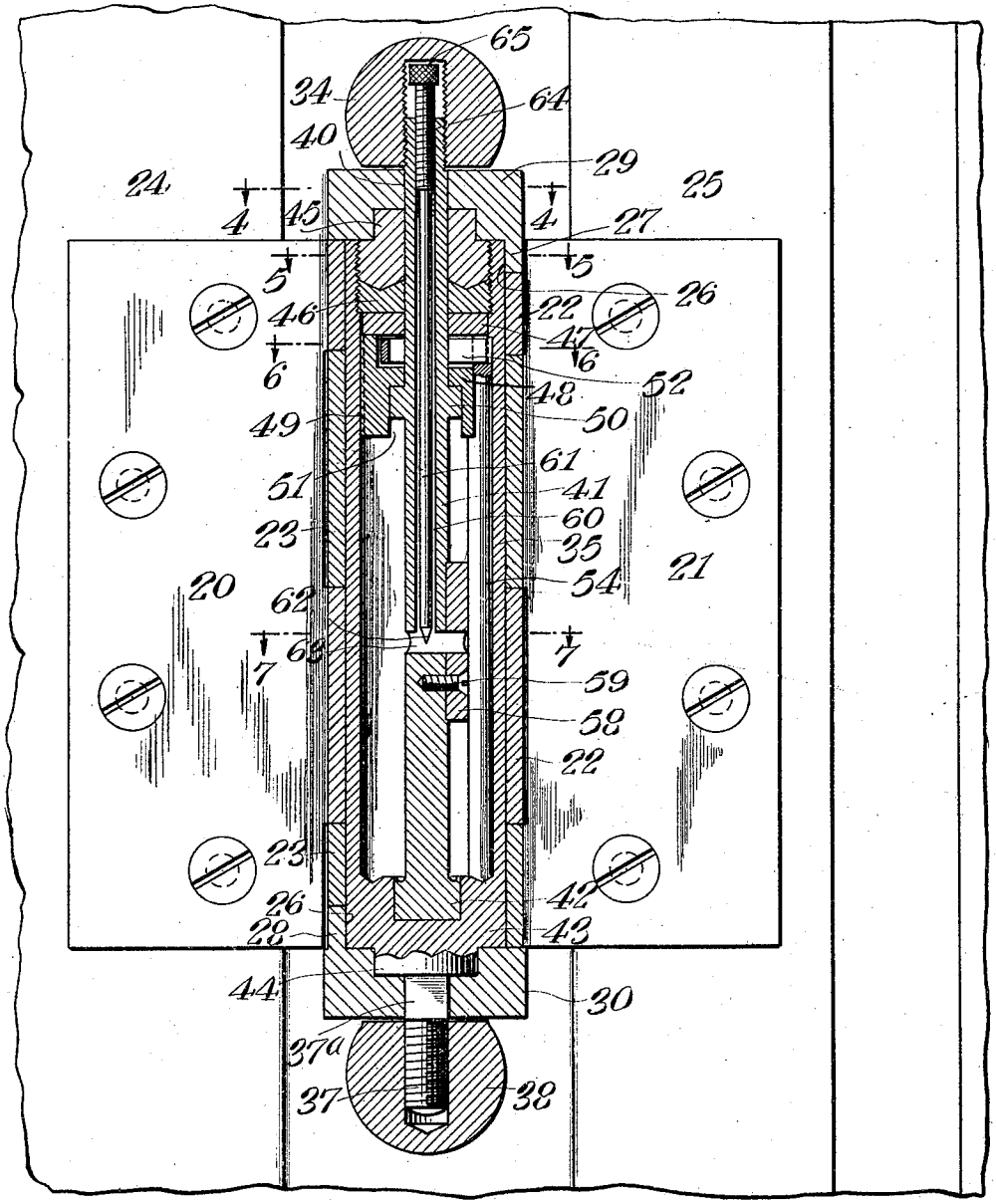
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Dec. 22, 1931. C. I. JOHNSEN 1,837,716

DOORCHECK

Filed June 5, 1928 5 Sheets-Sheet 2

Fig. 3.



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Dec. 22, 1931. C. I. JOHNSEN 1,837,716

DOORCHECK

Filed June 5, 1928 5 Sheets-Sheet 3

Fig. 4.

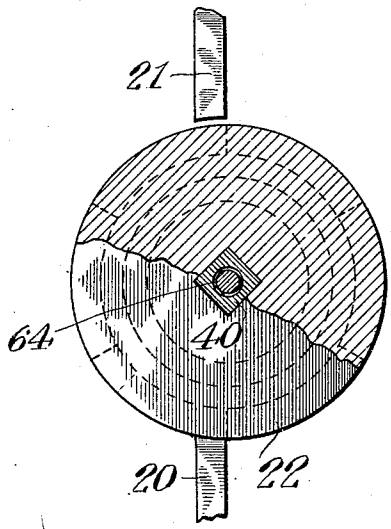


Fig. 5.

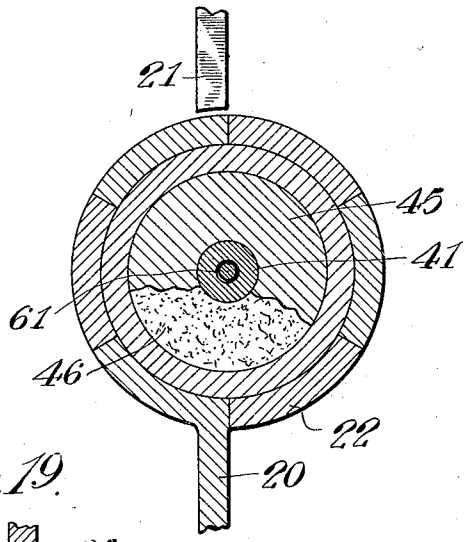


Fig. 19.

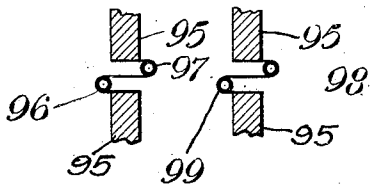


Fig. 6.

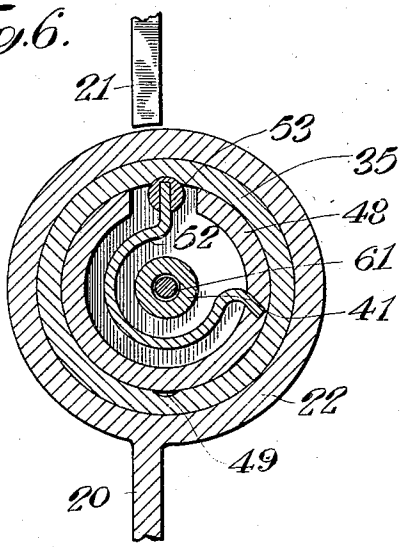
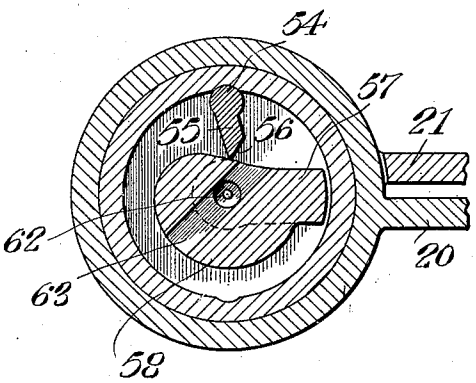


Fig. 7.



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Dec. 22, 1931. C. I. JOHNSEN 1,837,716

DOORCHECK

Filed June 5, 1928 5 Sheets-Sheet 4

Fig. 8.

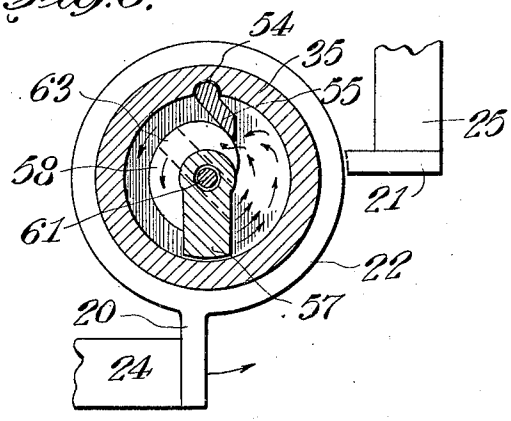


Fig. 9.

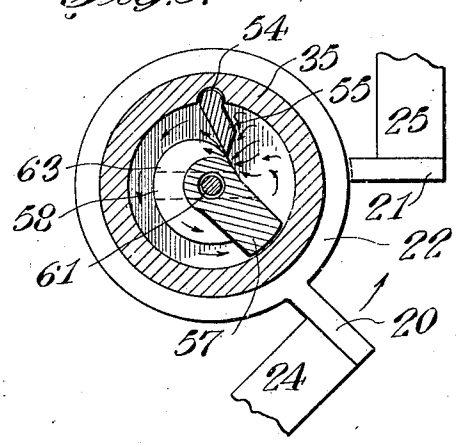


Fig. 10.

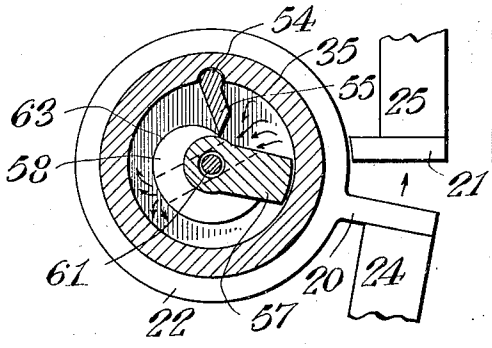


Fig. 13.

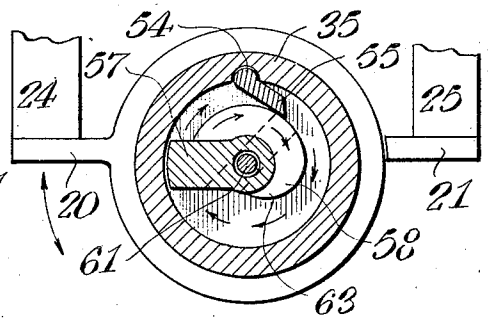


Fig. 12.

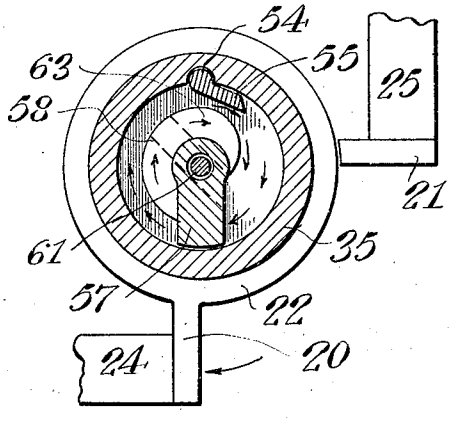
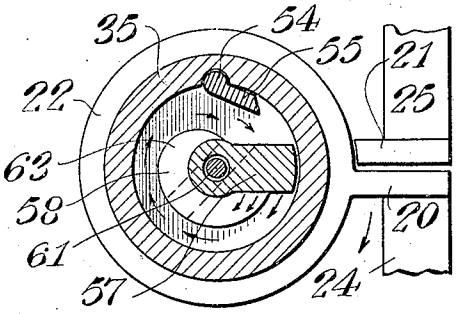


Fig. 11.



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Dec. 22, 1931. C. I. JOHNSEN 1,837,716

DOORCHECK

Filed June 5, 1928 5 Sheets-Sheet 5

Fig. 14.

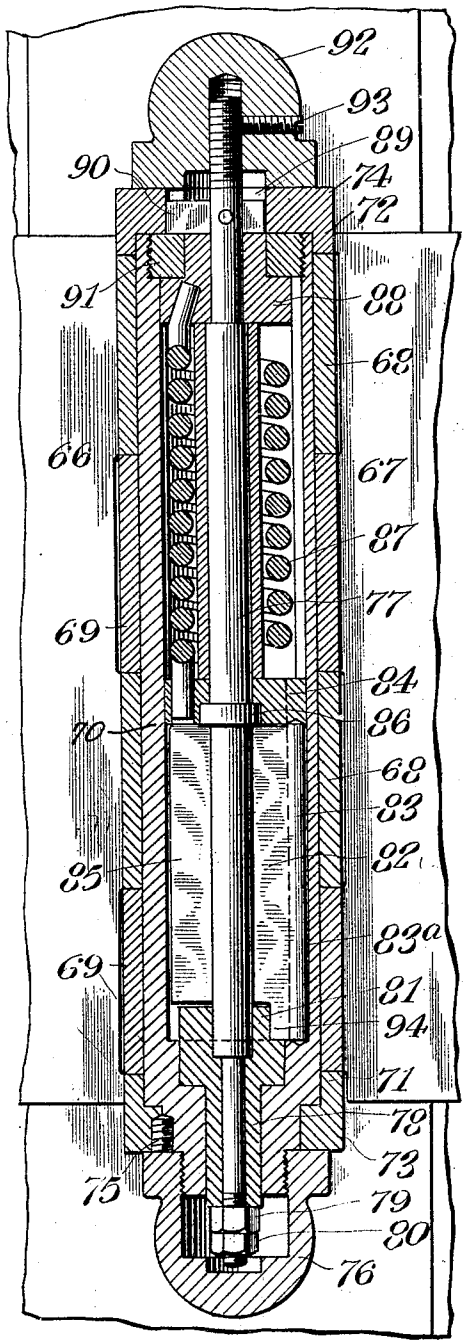


Fig. 15.

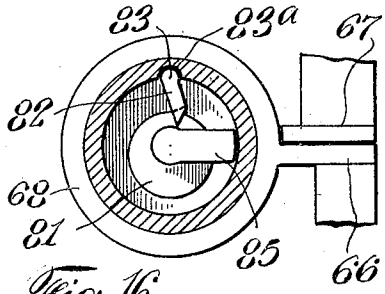


Fig. 16.

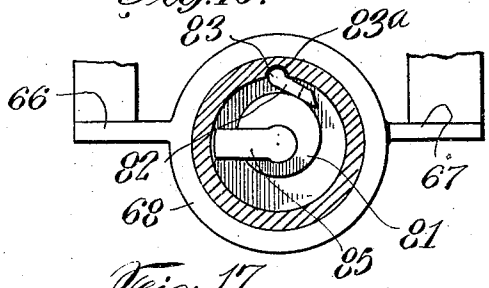


Fig. 17.

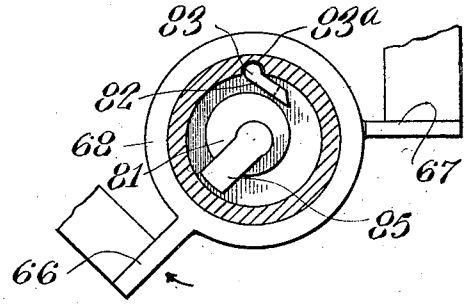
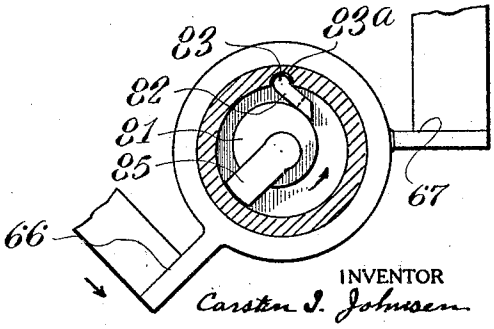


Fig. 18.



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UNITED STATES PATENT OFFICE

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DOORCHECK

Application filed June 5, 1928. Serial No. 283,014.

This invention concerns an improvement in hinges.

In the use of doors and other swinging objects where hinges have been employed hitherto, it is usually necessary to employ door checks of one kind or another when the motion of the swinging element is to be controlled, especially the closing movement of a door which would otherwise slam shut under the action of the usual spring hinge. To thus employ extra appliances adds to the expense of the equipment and generally makes an unsightly inartistic arrangement because when one company supplies hinges and another the door checks artistic harmony of design is generally impossible.

It is the object, therefore, of this invention to provide a simple and efficient device which will serve not only as a hinge but as an accurate and regulable door checking means. Thus extra hardware will not be required and the hinge members used can be designed of any artistic material to harmonize with the associated hardware on the door or other swinging element.

The invention, stated only in general terms, comprises a hinge member having the usual swing plates adapted to be fastened to a door and a door jamb, or to any two other similarly related surfaces. Instead of the usual pin or shaft connecting the hinge plates by passing through their aligned sleeves, I provide a cylindrical barrel which acts as the connecting member. Within the barrel is contained a fluid which acts as a checking or dampening medium. Means within the barrel and associated with one or both of the hinge plates is set into operation by the relative motion of the plates to compress the fluid, and means related to and controlled by the other plate and the relative plate positions regulates the degree of compression and consequently the degree to which the door is checked from one point to another in its travel.

More particularly the barrel contains a piston connected to one plate and movable therewith to tend to compress the fluid and a valve means within the barrel to control the fluid escape from compression, the position of the valve at any instant being controlled by means acting in response to the relative movement between the hinge plates.

Illustrative embodiments of the invention are disclosed in the drawings of which

Fig. 1 is an elevation of a spring hinge with the barrel in section showing the interior arrangements;

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1;

Fig. 3 is an elevation of a hinge door check with the barrel in section showing the interior arrangement;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3 through the lock nut and spindle;

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 3 through the packing bushing and spindle;

Fig. 6 is a horizontal section taken on the line 6—6 of Fig. 3 through the valve spring;

Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 3 through the spindle, its wing and the valve cam;

Fig. 8 is a diagrammatic view showing the door check parts in the positions occupied when the door is half open and moving to close;

Fig. 9 is a similar view showing the parts when the door is 45° open and moving to close;

Fig. 10 is a similar view showing the door almost closed;

Fig. 11 is a similar view showing the parts in position with the door closed and about to move to open;

Fig. 12 is a similar view showing the door in a 90° position and opening;

Fig. 13 is a similar view showing the door wide open;

Fig. 14 is an elevation of a hinge combining in one housing the spring and the door check with the barrel in section showing the interior arrangements;

Fig 15 is a diagrammatic view showing the relative position of the parts for this form of the invention with the door closed;

Fig. 16 is a similar view showing the parts as disposed when the door is wide open;

Fig. 17 is a similar view with the door opening and almost wide open;

Fig. 18 is a similar view showing the door closing; and

Fig. 19 is a diagrammatic view of my spring and door checks as applied to a double swinging door.

A preferred arrangement is to provide a door with two hinges as usual, one of them, for instance, the upper, being a spring hinge of the form shown in Fig. 1 and the lower one being a door check hinge of the form shown in Fig. 3.

The spring hinge shown in Figs. 1 and 2 comprises hinge plates 20 and 21 with aligned sleeves 22 and 23 and attached respectively to a door and jamb 24 and 25. The upper sleeve 22 and the lower sleeve 23 are each provided with at least three notches, such as 26, into one of which tongues 27 and 28 on lock nuts 29 and 30 project. Lock nut 29 has a bore to receive a squared portion 31 of stem 32 on spring nut 33. The upper end of stem 32 is threaded to receive cap knob 34.

The spring nut 33 is threaded into the upper end of barrel 35 loosely disposed within hinge sleeves 22 and 23, and has an aperture to receive one end of a spring 36 coiled within the barrel 35. The other end of spring 36 is received in a similar aperture in spring nut 30 loosely disposed in the bottom of barrel 35. This nut has a stem, the outer portion 37 of which is threaded to receive a cap knob 38 and an intermediate portion 39 is square to lie in a bore in lock nut 30. The tension of the spring 36 can be adjusted as desired by turning the lock nuts 29 and 30 and then disposing their tongues 27 and 28 in the desired notches 26 in sleeves 22 and 23. To all appearances this looks like an ordinary hinge and can be given any architectural metal finish to match adjoining hardware.

The door and jamb 24 and 25 are also provided, preferably at a lower point, with a hinge-like door check as shown in Fig. 3 et seq. This comprises, as above, the hinge plates 20 and 21, with sleeves 22 and 23; also lock nuts 29 and 30 with their tongues 27 and 28 adjustable in one of the notches 26 in said sleeves. The lock nut 29 in this form however, has a bore to receive a squared portion 40 of a spindle 41. The upper end of spindle 41 is threaded to receive cap knob 34 as before. The spindle 41 extends down through barrel 35 and is enlarged at its lower end 42 to lie in a recess in the lower closed end 43 of barrel 35. This barrel here has a head 44 to engage nut 30 and a stem 37 threaded to receive cap knob 38, with a squared portion 37^a engaging nut 30.

Beneath nut 29 is a packing bushing 45 screwed into the upper end of barrel 35. Packing 46 is disposed beneath this bushing 45 and above a packing washer 47. This washer rests on a spring bushing 48 which is provided with a peripheral vertical tongue 49 (see Fig. 6) to lie in a corresponding groove in the wall of barrel 35, which prevents the bushing 48 from turning. This groove extends all the way to the bottom of barrel 35. The bushing is supported by resting on enlarged portion 50 of the spindle 41 lying in a central bottom opening bore 51 in the bushing 48. The upper end of the bushing 48 is recessed to receive a valve spring 52 (see Fig. 6), one end of which is fastened to the bushing and the other end to the upper end 53 of a valve stem 54 which extends down along one edge of barrel 35 and seats in a notch therein at its lower end. The outer edge of this valve stem 54 lies in a groove in wall of barrel 35 corresponding to the groove in which tongue 49 of bushing 48 lies as above described. It is evident that the bushing 48 and spring 52 and valve stem 54 can be moved 180° if desired, since the above-mentioned grooves lie opposite each other. As will be apparent hereafter, this permits the parts to be adjusted for a right or left hand door check.

The valve stem 54 has a valve plate or wing 55 thereon, extending substantially from beneath the bushing 48 to the bottom of barrel 35. This valve plate has an outer bevel edge 56. Thus the valve plate 55 is in effect a partition fastened to the barrel 35, only instead of being a fixed partition or abutment, as is usually the case, it is pivoted for movement in either direction from a neutral position, and its movement is controlled both by cam action and by the force of the contained fluid within the barrel 35. The spindle is provided with a laterally extending wing piston 57 formed integral therewith, or otherwise fastened thereto as desired. Fastened to the spindle 41 near its middle is a cam plate 58 which, as the spindle turns, is adapted, under certain conditions, to act on valve plate 55, as will be later described. This cam can be adjustably fastened to spindle 41 by means of a set screw 59. The upper half of the spindle 41 is provided with a bore 60 in which a stem 61 of a needle valve 62 lies. This needle valve 62 controls the flow of fluid through a transverse passage 63 extending through the spindle 41 to opposite sides of the wing piston 57. The upper end of the spindle bore is threaded to receive threaded portion 64 of needle valve stem 61. A head 65 on the end of stem 61 beneath cap knob 34 permits adjustment of needle valve 62 to control the fluid flow.

Examining Fig. 8 it is observed that the door is half open but moving to close. The wing piston 57 is moving counter clockwise and forcing the fluid ahead of it. The valve plate 55 in this movement of the hinge is held by spring 52 against the cam 58. Therefore an opening is formed between the edge of valve plate 55 and the spindle 41, which how-

ever gets smaller as the door continues to close, as seen in Fig. 9, where the cam has permitted the edge of valve plate 55 to almost close the opening. This restricts the flow of fluid and checks the door. Of course some fluid will flow through passage 63 past the needle valve 62, but this is regulated as desired. In Fig. 10 the opening between valve plate 55 and spindle 41 is practically closed, and the door motion is very slow, depending on the opening of the needle valve 62.

Examining Fig. 11, it will be seen that the door is about to open. The wing piston 57 moves clockwise and the valve plate 55, for this movement, is moved into the position shown, not only by the action of the cam 58 but also by the force of the fluid as it is impelled in front of the wing piston 57, and this position is assumed against the action of the spring 52 which tends to hold the valve plate 55 in a normal position. This assumed position permits the opening between the valve plate or movable partition and the wing piston to be as large as possible, whereby practically no fluid resistance is offered to the opening of the door. As soon as the door is wide open, as shown in Fig. 13, and starts back, then the force of the fluid in the opposite direction forces the valve plate 55 against the cam 58 and the closing cycle of operations is repeated.

In the form shown in Fig. 14 and the diagrams of Figs. 15 to 18, the spring hinge and door check are contained in one hinge casing. In this form the hinge plates 66 and 67 have sleeves 68 and 69 embracing the barrel 70. These sleeves, as before, have notches to receive tongues 71 and 72 on lock sleeves or nuts 73 and 74. Nut 73 is fastened to barrel 70 by set screw 75. A cap knob 76 is threaded on to barrel 70. The spindle 77 at its lower end is a support for a valve cam plug 78 held on by lock nuts 79 and 80. The upper end of this plug carries a cam 81 movable with spindle 77 to vary the position in barrel 70 of valve plate 82 carried by valve stem 83 supported between the bottom of the barrel and bottom spring end plug 84. This valve stem 83 lies in a groove 83ª in wall of barrel 70, as seen in Figs. 14–18 inclusive. Spindle 77 is provided along its lower end with a piston wing 85. Plug 84 is supported on enlargement 86 on spindle 77, and receives the lower end of spring 87, the upper end of which is seated in plug 88 having a slotted upper end 89 to receive a key 90. This key also lies in a slot in lock nut 74. The spindle 77 is pinned to this key. A nut or plug 91 is screwed into the upper end of barrel 70. The upper stem of spindle 77 is threaded to receive cap knob 92 held thereon by set screw 93.

In Fig. 15 the door is closed and the valve plate 82 lies close to spindle 77. As the door swings open the cam 81 engages the lower end 94 of the valve plate 82 and gradually moves it away from the spindle 77. In the full open position shown in Fig. 16, the fluid in the barrel has free flow and is not restricted. In Fig. 17 the door is not quite open and the valve is partly closed. In Fig. 18 the door is commencing to close and the cam 81 is permitting the valve plate 82 to lie closer to the spindle 77. This is augmented by the pressure of the fluid against the valve plate 82 as it flows in the direction of the arrows in Fig. 18.

In Fig. 19 I show a diagram wherein double-swing door 95 is hingedly supported above and below by double hinges 96, 97, and 98, 99. Hinge 96 is a spring hinge and 97 is a door check for one direction of swing. Hinge 98 is a spring hinge and 99 is a door check for the opposite direction of swing.

While the operation of the device will probably be apparent from the above detailed description, it should be noted that as one hinge plate is moved relative to the other, the piston will tend to force the fluid in front of it and at the same time the cam associated with the piston will engage the wing valve to vary its position with respect to the spindle, so that the opening therebetween will change and the flow of the fluid correspondingly altered. By adjusting the relative position of the cam on the spindle with regard to the relative position of the plates at any instant, the progressive checking of the door can be varied at will. The provision of a manually set needle valve in the spindle controlling a passage therethrough to opposite sides of the piston will insure that the flow of fluid will not be completely shut off and the door arrested before it is closed, although of course if it should be desired to stop the door before it is completely closed, it is merely necessary to close the needle valve entirely. This provides one way of maintaining the door open without using any auxiliary door stops.

It is also apparent that by moving the wing valve to the opposite side of the valve and readjusting the cam, the hinge can be adapted for doors swinging in the opposite direction. This invention therefore in its various forms is adapted to be used either as a door check or as a combined spring hinge and door check, and when associated, as shown in Fig. 19, with spring hinges, is adapted for efficient use in connection with double swing doors.

What I claim is:—

1. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel positively connected to one of said plates, fluid within said barrel, a rotatable wing piston in said barrel and connected to the other plate and adapted to move the fluid, and a pivoted wing valve fastened to the barrel and having its axis of movement parallel to and substantially coextensive with the length of the piston, said valve action

acting as a partition, its position with respect to the piston determining the rate of flow of the fluid and being controlled in part by the flow of the fluid and by the relative position of the plates.

2. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel positively connected to one of said plates, fluid within said barrel, a rotatable wing piston in said barrel and connected to the other plate and adapted to move the fluid, and a pivoted partition fastened to the barrel and acting as a valve, its edge spaced parallel and coextensive with the wing piston, its position in part determined by the flow of the fluid, and means operated by and connected to the piston to at times positively determine the position of the valve to control the flow of fluid.

3. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel positively connected to one of said plates, fluid within said barrel, a spindle in said barrel and connected to the other plate, a wing piston and a cam on said spindle, said piston having its edge extending parallel and substantially coextensive with the length of the barrel said piston adapted to move the fluid and a valve plate within the barrel and engaged by said cam to vary the size of the opening between the spindle and the valve in accordance with the relative position of the plates the edge of the valve being spaced from and parallel to the edge of the piston.

4. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel being positively connected to one of said plates, fluid within the barrel, a spindle in said barrel and connected to the other plate, a wing piston and a cam on said spindle, said piston having its edge extending parallel and substantially coextensive with the length of the barrel said piston adapted to move the fluid, a valve plate within the barrel and engaged by said cam to vary the size of the opening between the spindle and the valve in accordance with the relative position of the plates, the edge of the valve being spaced from and parallel to the edge of the piston, said spindle having a passage therein connecting the opposite sides of the piston, and a manually set needle valve to control the size of said passageway.

5. A door checking hinge comprising a barrel, a rotatable piston within the barrel having its edge parallel to and coextensive with the length of the barrel, fluid within the barrel to be moved by said piston, a pivoted partition plate within the barrel and fastened thereto and acting as a valve to control with the piston the flow of the fluid, the edge of the partition being parallel to and coextensive with the length of the piston, and a cam on the piston and acting on the partition to determine at times its position with respect to the piston and control the flow of the fluid from one side of the piston to the other.

6. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel positively connected to one of said plates, fluid within said barrel, a piston in said barrel and connected to the other plate and adapted to move the fluid, a movable imperforate partition within and fastened to the barrel for unbiased movement therein, the motion of the partition within the barrel being controlled entirely by either the flow of the fluid or by the relative motion of the plates whereby the flow of the fluid from one side of the piston to the other is controlled.

7. A hinge comprising swingable plates, a barrel disposed between said plates, said barrel positively connected to one of said plates, fluid within said barrel, a rotatable wing piston in said barrel and connected to the other plate and adapted to move the fluid, a pivoted imperforate partition acting as a valve within and fastened to a barrel for unbiased movement therein, the motion of the partition within the barrel being controlled entirely either by the flow of the fluid or by the relative motion of the plates whereby the flow of the fluid from one side of the piston to the other is controlled.

8. A door checking hinge comprising a barrel, a rotatable piston within said barrel, fluid therewithin to be moved by said piston, a pivoted imperforate partition plate within and fastened to the barrel and acting as a valve to control with the piston the flow of the fluid to the means operated by the piston to, at times, determine the position of the partition plate with respect to the partition, the movement of said partition being determined only by said means or by the flow of the fluid.

9. A door checking hinge comprising a barrel, a rotatable piston within the barrel having its edge parallel to and co-extensive with the length of the barrel, fluid within the barrel to be moved by said piston, a pivoted imperforate partition plate within and fastened to the barrel and acting as a valve to control with the piston the flow of the fluid, said partition being mounted for unbiased movement within the barrel, the edge of the partition being parallel to and co-extensive with the length of the piston, and means operated by the piston to, at times, determine the position of the partition plate with respect to the piston, the position of the partition being controlled entirely either by said means or by the flow of the fluid.

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