

J. H. SHAW.

DOOR CHECK.

APPLICATION FILED OCT. 24, 1910.

1,123,810.

Patented Jan. 5, 1915.

3 SHEETS—SHEET 1.

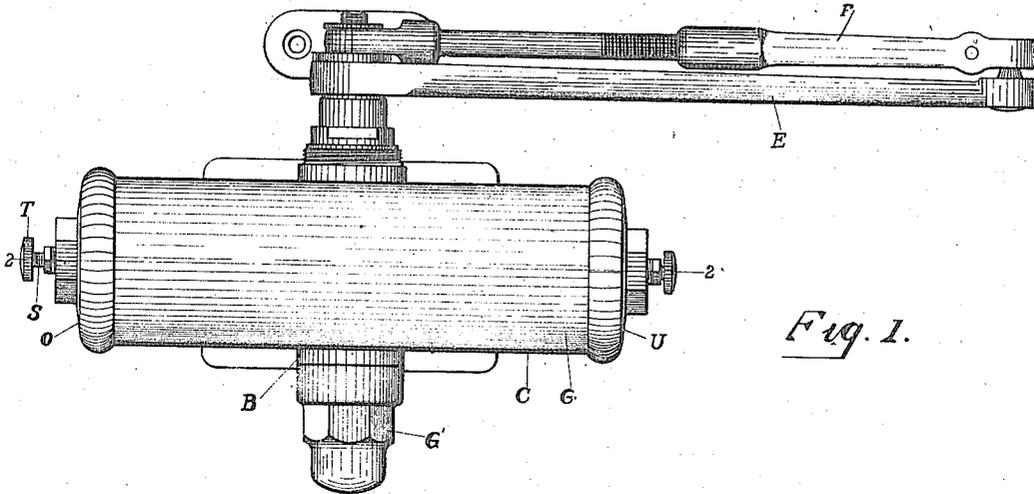
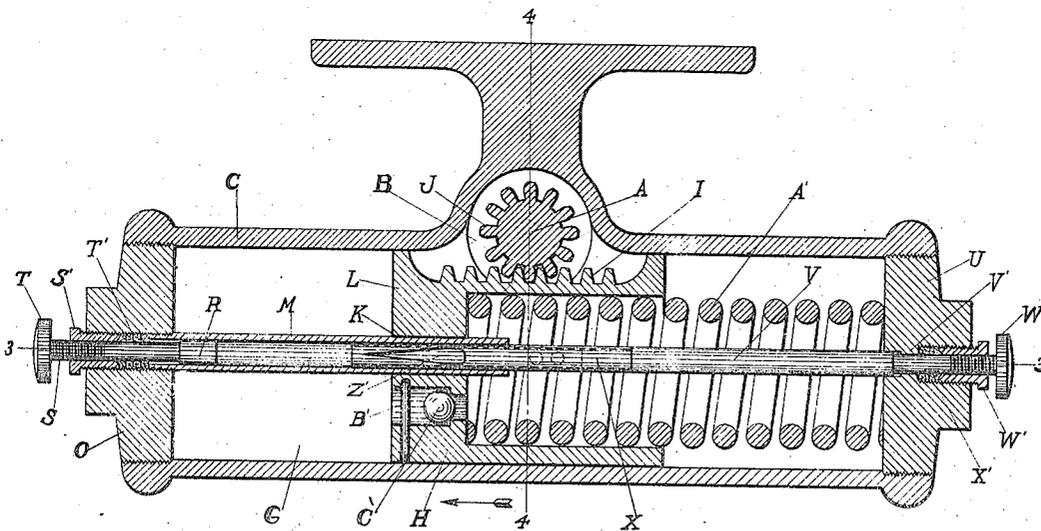


Fig. 1.

Fig. 2.



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3 SHEETS-SHEET 2.

Fig. 3.

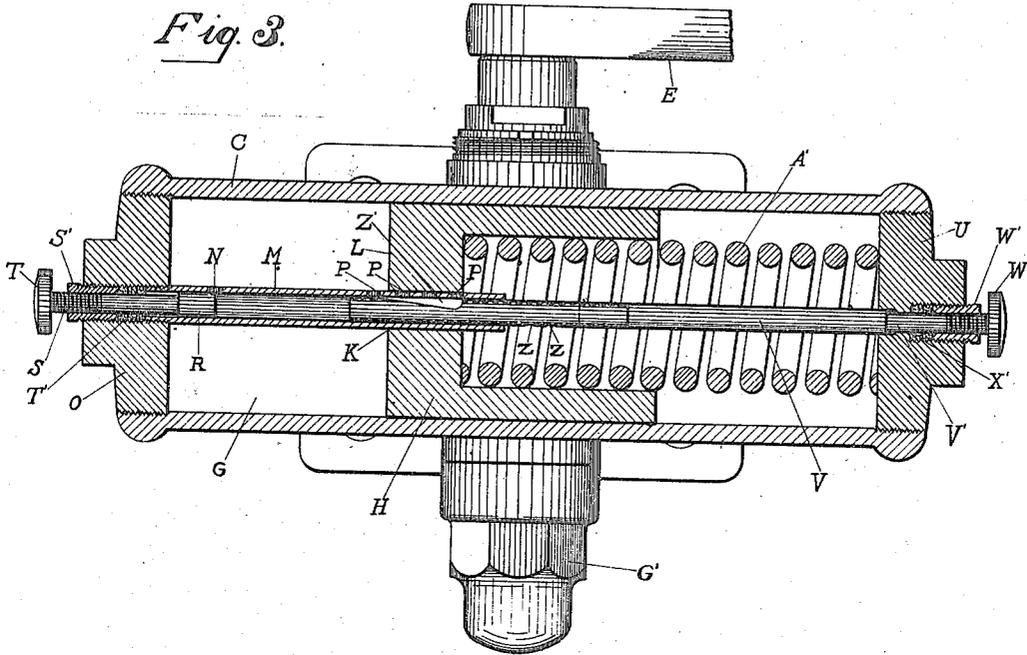
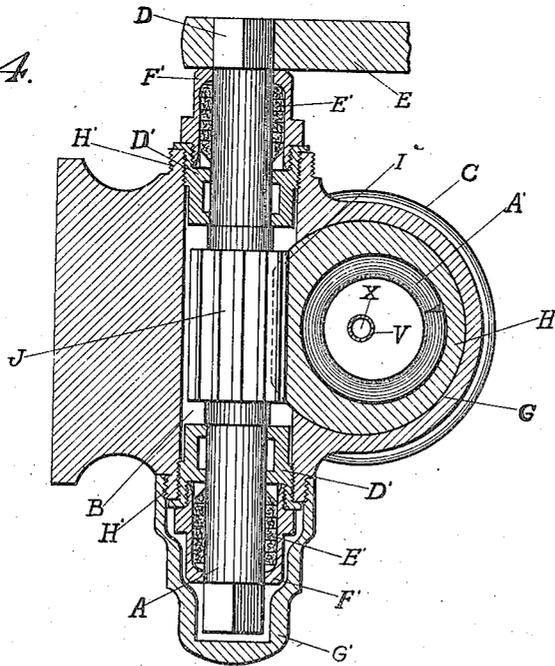


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

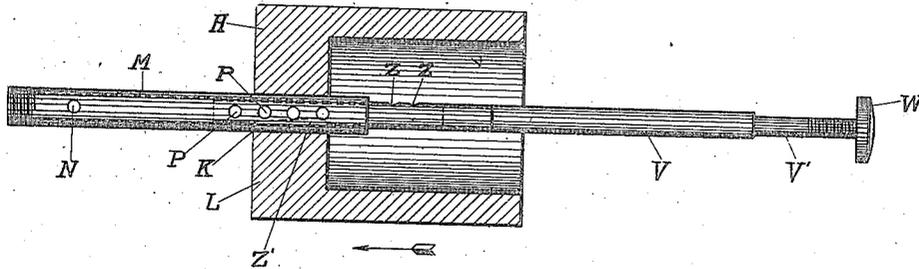


Fig. 6.

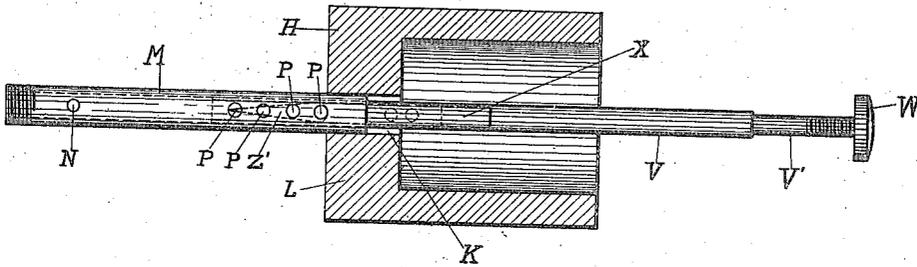


Fig. 7.

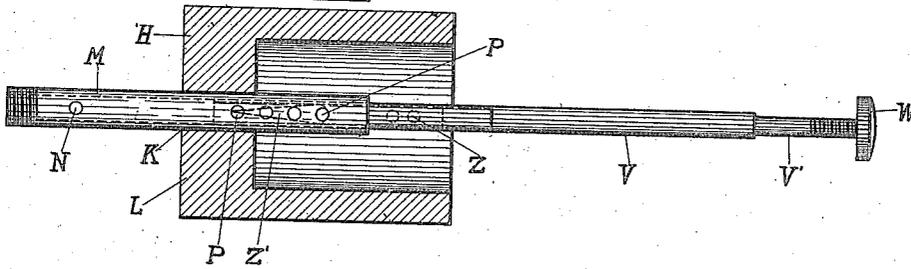
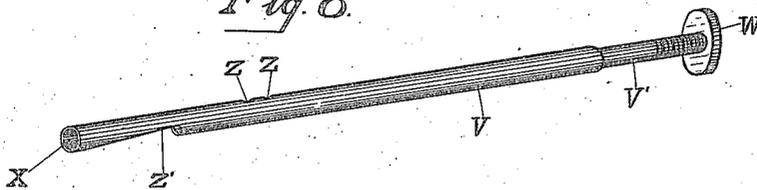


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN H. SHAW, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO SARGENT & COMPANY,
OF NEW HAVEN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

DOOR-CHECK.

1,123,810.

Specification of Letters Patent.

Patented Jan. 5, 1915.

Application filed October 24, 1910. Serial No. 588,719.

To all whom it may concern:

Be it known that I, JOHN H. SHAW, of the city and county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Door-Checks, of which the following is a full, clear, and exact description.

This invention relates to door checks, and more particularly to liquid door checks having door closing springs.

One of the primary objects of the invention is to provide improved means for regulating the rapidity of movement of the plunger or piston during the closing movement of the door, at a plurality of different points. More especially, it is intended to provide a door check wherein the initial movement of the plunger during the closing of the door can be accelerated to a variable degree by regulating means, adjustable from the exterior of the check, and including means for opening and closing one or more intermediate inlets to a passage through which the liquid moves from one side of the plunger to the other.

Another object of the invention is to provide a door check having in combination with the means for retarding the plunger movement at any desired point in the initial closing movement of the door, a second controlling means which may be adjusted to control the passage of liquid from one side of the plunger to the other during the last part of the door closing stroke so that, if desired, the last part of the door closing movement may be very slow in order to prevent slamming of the door.

By providing the two controls above mentioned, the check is adapted for use on inside doors, doors opening in off the street, etc., where it is desirable to move the door quickly to a point five or six inches from the closed position, and to then check or retard it during the remainder of its travel (to prevent slamming); also on doors where the closing movement is assisted by a strong draft, *e. g.*, outwardly opening entrance doors, where it is desirable to check or retard the door substantially throughout the closing movement; and likewise on doors where the closing movement is resisted by a strong draft, or otherwise, and where it is desirable to move the door forcibly to closed position during the last few inches of the closing movement.

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

In the accompanying drawings, Figure 1 is a front elevation of a door check embodying my improvements, Fig. 2 is an enlarged section on line 2—2 of Fig. 1, Fig. 3 is a section on line 3—3 of Fig. 2, Fig. 4 is a section on line 4—4 of Fig. 2, and Figs. 5-8 inclusive are details hereinafter described.

In the drawings, C designates a door check having a horizontally disposed piston chamber G and an upright spindle chamber B.

A designates the spindle of the door check which is arranged vertically in the spindle chamber B. The chamber G is closed at its respective ends by heads O and U. The spindle chamber opens into the fluid chamber G in which is a reciprocatory piston or plunger H, having a rack I, adapted to mesh with a pinion J on the spindle A. By this construction, the rotation of the spindle moves the plunger to the right or left in the fluid chamber. On the upper squared extremity D of the spindle is mounted the usual arm E adapted to carry the link F, which is secured by means of a suitable bracket to the door casing in the usual manner. A tube M is fixedly mounted in the head O of the check casing or checking cylinder. The tube M extends through an opening in the head L of the plunger, and the plunger is adapted to slide on said tube. Near the inner face of the head O, the tube M is provided with an opening N, and to the right of the opening N (Fig. 3), the tube is provided with a longitudinal row of perforations or openings P. A plug-R, having a shank S, projects into the tube M through the head O, and is provided with an adjusting head T. The shank S of the plug is provided with screw threads which engage corresponding threads in a bushing S' in the head O, so that as the adjusting head T is turned in one or the other direction the plug R may be moved to open or close the port N. Suitable packing T' is provided between the end of the tube M and the bushing S'. Projecting through the other head U of the cylinder is a tube V, having its inner end formed to fit snugly within the inner end of the tube M. This tube V is reduced at its upper end, as shown

at V', and the reduced end portion is provided with an adjusting head W. A bushing W' surrounds the reduced portion V', and holds in place suitable packing X' to prevent the escape of liquid around the tube V. The tube V need be of tubular form only at its inner end portion, where it is provided with perforations or openings Z, and with a substantially triangular opening Z' adapted to come into alinement with the row of ports P in the tube M. A spring A' within the cylinder bears against one end of the cylinder, and against the head of the plunger H, and tends to move the piston in the direction of the arrow (Figs. 2 and 5). The head of the plunger is provided with a perforation B' controlled by a ball valve C' adapted to be closed when the plunger is moved in the direction of the arrow (Fig. 2), and to be opened when the plunger is moved in the reverse direction.

The spindle chamber B is closed at the top and bottom respectively by threaded plugs D', which have bearings for the spindle A. The ends of the spindle are surrounded by packing E' held in place by collars or bushings F', which are adapted to be screwed into plugs D', as shown. A cap G' is adapted to be screwed on the lower end of the spindle chamber so as to cover the end of the spindle, and the spindle bearing. Both ends of the spindle chamber are provided with screw threads for engaging the interior threads of the cap G', and both ends of the spindle A are squared to fit the socket in the arm E, whereby the check may be changed from a righthand check to a lefthand check, or vice versa, by placing the arm E on the opposite end of the spindle and screwing the cap G' on the opposite end of the spindle chamber, as will be understood.

The operation of my improved door check is substantially as follows: The opening of the door rotates the spindle A and thereby moves the piston or plunger H to the right with reference to Fig. 2. As the plunger moves in this direction, the valve C' is permitted to open, and the liquid on the right hand side of the plunger may therefore pass freely to the right hand side of the plunger through the valve opening or seat B'. The liquid also passes through the openings Z, the tubes V and M, and the opening N. When the door has been opened, the spring A' tends to move the plunger in the reverse direction, and thereby to rotate the spindle A in the opposite direction so as to close the door. As the plunger H moves toward the left of Fig. 2, the valve C' is closed. Suppose that the tube V has been so adjusted by means of the manipulating head W that a solid portion of the tube is opposite the openings P, as shown in Fig. 5, the liquid at the left of the plunger is obliged to pass

into the passage in the tube M by way of the port N only, whence it passes through the tube M and tube V out of the ports Z. Of course the closing of the openings by means of the tube V does not throttle the flow of liquid through the passage in the tube M. When the tube V is in such a position that the triangular opening Z' thereof is in register with the ports P (see Figs. 6 and 7), the liquid will pass freely during the initial closing movement, through the ports P into the intermediate portion of the passage or by-pass. Thus the initial closing movement will be quicker than in the case of the adjustment first mentioned. As the plunger moves toward the left (Fig. 6), the head of said plunger will pass successively over the ports P so that they will be successively closed.

The tube M forms a passage or by-pass adapted to establish communication between the spaces at opposite sides of the plunger. On the closing movement of the door, the port N serves as the end inlet to the passage, and the ports P serve as inlets intermediate of the ends of the passage. The ports Z at the opposite end of the passage serve as an outlet for the by-pass at the end opposite the port N. The intermediate inlet ports P are regulable by means of the member V, which acts as a valve to control the said ports, and when the latter are opened to a greater or less extent by means of such valve the initial part of the plunger movement on the closing of the door is accelerated correspondingly until the ports P are closed by the plunger. The valve or plug R, or its equivalent, forms a primary controlling means for varying the flow of liquid from one side of the plunger to the other at the end of the stroke as the door is closed, and the valve rod V, in connection with the ports P, constitutes a secondary controlling means for accelerating or retarding the plunger during the initial part of said stroke.

It will be evident that the ports P, if open, increase the capacity of the by-pass considerably beyond what such capacity would be if the port N alone were open. In the embodiment illustrated, the valve rod V does not open or close all of the ports P simultaneously, as the form and arrangement of the opening Z' make it possible to cut off said ports successively. With the ports shown in Fig. 6, the turning of the valve rod to a slight extent in either direction will cut off entirely the port P at the extreme left before the next port is cut off, and said next port will be entirely cut off as the rod is turned to a greater extent, slightly before the following port is cut off, and so on. This result follows from the taper given to the walls of the opening Z', which forms in conjunction with the bore of the member

V, a longitudinally disposed tapered groove located within the tube or sleeve M, but obviously the same effect might be produced in other ways. It will be obvious of course that if the port P at the extreme right of Fig. 6 were the only one left open by the valve V, this would be closed or cut off by the plunger early in the stroke as the door is closed, and, consequently, the retarding action of the liquid would commence early in the stroke. If the next adjacent port P were open at the same time as the first port P, the initial movement of the plunger would be faster, and it would not be checked until both of said ports were covered by the plunger, so that the retarding action would take place later in the stroke. If the third port P were left open at the same time as the first two ports, the initial movement of the plunger would be still faster, and the checking action would be still further delayed, and if all four of the ports P were left open, as shown in Fig. 6, the initial plunger movement would be even quicker, and the retarding action would occur comparatively late in the plunger stroke, so that the door would only be checked during the last few inches of its closing movement. Obviously, the number of the intermediate ports may be varied as desired, likewise the means for controlling said ports.

By screwing in the plug R until it almost covers the port N, the last part of the closing movement of the door may be very much retarded. During the last few inches of its movement, the door may be caused to move very slowly indeed so as to prevent slamming. The controlling mechanism V, P may be adjusted to give a very quick closing movement during a large or a small part of the stroke, but the final part of the stroke, corresponding to the last few inches, of the closing movement of the door, is controlled solely by the controlling means R, N, so that if the ports P are all open, and the port N is considerably throttled, a very quick initial checking movement will be followed by a very slow final checking movement. The combination of the two controls, therefore, provides a check which will close the door very quickly without slamming, and this is, of course, a very desirable feature.

I do not limit myself to a construction in which the primary controlling means R, when adjusted to close partially the port N, throttles the flow of liquid through the passage or by-pass, during the entire stroke, so long as said controlling means is adapted to throttle a passage or by-pass through which the liquid moves from one side of the plunger to the other during the final closing movement in order to prevent slamming. In some cases, however, a forcible final closing movement of the door is desirable, as where the closing of the door is opposed by

a strong draft, or by a poorly adjusted latch, and in such a case the plug R will be moved to a position wherein it will not throttle the liquid, whereby the closing spring is permitted to act with considerable force on the plunger and door during the last few inches of the closing movement. When, however, the check is attached to an inside door, or a door opening in off the street, it is generally desirable to adjust the check so that the door will move quickly to a point approximately six inches from closed position, after which it will be checked or retarded during the remainder of its travel, so that it will move slowly and smoothly into closed position without slamming. In this case, the valve or plug V would be adjusted to leave all of the ports P open, or at least most of them, and the valve plug R would be adjusted to throttle considerably the liquid passing into the tubular member M by way of the end inlet N. When the check is attached to a door swinging outwardly, where a strong draft tends to close the door, it is, of course, desirable to check or retard the door earlier in its travel, and before it acquires very much momentum, which would cause excessive stress and strains on the door and check, if the checking action were too long delayed. In this case, the adjustment of the valve plug R, which has been just mentioned, would be retained, but the valve plug V would be adjusted to close all, or most of the intermediate ports P. The point at which the checking action should be initiated varies, of course, with the strength of the draft encountered.

I have not attempted to illustrate and describe the numerous modifications of the construction which may be adopted within the scope of the invention as defined in the claims.

Various changes in the details of the device may be made without digressing from the scope of my inventive idea.

What I claim is:—

1. In a liquid door check, a checking cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, means regulable from the exterior of the check to control the flow of liquid between said spaces, and other means regulable from the exterior of the check for causing the retarding action of the liquid on the piston to commence at any of a plurality of points in the path of the piston; substantially as described.

2. In a liquid door check, a checking cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, means in said passage to control the flow of liquid between said spaces, and other means in said passage regulated from the outside of the check to cause the retarding action of the liquid on the piston to begin

at any of more than two intermediate points in the path of the piston; substantially as described.

3. In a liquid door check, a cylinder, a piston therein, a primary controlling means for varying the rate of flow of the liquid from one side of the piston to the other, and a secondary controlling means for causing the retarding action to begin at any of a plurality of points in the path of the piston; substantially as described.

4. In a liquid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, means to control the flow of liquid between said spaces, and means controllable manually, and automatically controlled by the movement of the piston, to cause the retarding action of the liquid on the piston to commence at any of a plurality of points in the path of the piston; substantially as described.

5. In a liquid door check, a cylinder, a piston therein, a by-pass connecting the spaces at opposite sides of the piston, means to adjust the effective capacity of said by-pass, and means whereby the retarding action of the liquid on the piston may be increased at any of a plurality of intermediate points in the path of the piston; substantially as described.

6. In a fluid door check, a cylinder, a piston therein, an adjusting device at one end of the cylinder for varying the rate of flow from one side of the piston to the other, and a second adjusting device at the opposite end of the cylinder for causing the retarding action to begin at different points in the path of the piston; substantially as described.

7. In a fluid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, a device at one end of the cylinder for controlling said passage at one point, and a second device at the opposite end of the cylinder to control said passage at another point; substantially as described.

8. In a fluid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, a primary controlling means cooperating with said passage at one end of the latter, and a secondary controlling means for opening and closing the intermediate portion of the passage; substantially as described.

9. In a fluid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, a controlling means accessible at one end of the cylinder and cooperating with the inlet of said passage, and a second controlling means accessible at the opposite end of the cylinder for opening the intermediate portion of said passage to the interior of the cylinder or

closing it off therefrom; substantially as described.

10. In a fluid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, a primary controlling means for varying the rate of flow between said spaces, comprising a valve plug directed axially of the cylinder at one end, and a secondary controlling means, for determining the point in the path of the piston at which the retarding action begins, comprising a valve plug directed axially of the cylinder at one end thereof; substantially as described.

11. In a fluid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston, controlling means accessible at the exterior of the cylinder and cooperating with said passage to throttle the flow of fluid through the same, and a second controlling means accessible at the exterior of the cylinder, for opening the intermediate portion of said passage to the interior of the cylinder or closing it off therefrom without throttling the flow of fluid through said passage; substantially as described.

12. In a liquid door check, a cylinder, a piston therein, a by-pass connecting the spaces at opposite sides of the piston and having a plurality of intermediate ports, and valve mechanism arranged to open all of said ports and close them successively; substantially as described.

13. In a liquid door check, a cylinder, a piston therein, a by-pass connecting the spaces at opposite sides of the piston and having a plurality of intermediate ports controlled by the travel of the piston, and valve mechanism associated with said ports to close the same successively; substantially as described.

14. In a liquid door check, a cylinder, a piston therein, a by-pass connecting the spaces at opposite sides of the piston and having a plurality of intermediate ports disposed at different points in the length of said by-pass, said ports being successively covered by the piston, and valve mechanism associated with said ports to regulate the point in the length of the by-pass at which the piston cuts off direct communication between the intermediate portion of the by-pass and the interior of the cylinder; substantially as described.

15. In a liquid door check, a cylinder, a piston therein, a fixed by-pass for the passage of liquid from one side of the piston to the other, and means to open the intermediate portion of the by-pass to the interior of the cylinder and close it off therefrom, without throttling the flow of liquid through the by-pass; substantially as described.

16. In a liquid door check, the combination with the checking cylinder, of a plun-

ger or piston mounted to move therein, a by-pass for permitting the passage of liquid from one side to the other of said piston, a series of intermediate inlets to said by-pass adapted to be closed in succession by the movement of said piston, and a single means accessible from the outside of said cylinder for closing directly all of said inlets; substantially as described.

17. In a liquid door check, a cylinder, a piston therein, a fixed by-pass connecting the spaces at opposite sides of the piston and having an intermediate piston controlled port to establish communication with the interior of the cylinder, and a manually controlled valve cooperating directly with said port to open the intermediate portion of said by-pass to the interior of the cylinder and close it off therefrom without throttling the flow of liquid through the by-pass; substantially as described.

18. In a liquid door check, a cylinder, a piston therein, a passage connecting the spaces at opposite sides of the piston and having intermediate of its ends a plurality of ports to establish communication between the intermediate portion of said passage and the interior of the cylinder, and a single device cooperating with said ports directly to control such communication; substantially as described.

19. In a liquid door check, the combination with the checking cylinder, of a plunger or piston mounted to move therein, a by-pass for permitting the passage of liquid from one side to the other of said piston, means for varying the flow of liquid through said by-pass during the movement of said piston, and mechanism for regulating from the outside of said cylinder the flow of liquid through said by-pass and for checking the operation of said flow varying means; substantially as described.

20. In a liquid door check, the combination with a checking cylinder, of a plunger or piston mounted to move therein, a tube projecting through said piston and having inlets and outlets for the passage of liquid from one side to the other of said piston, a series of said inlets to said tube closed in succession by the movement of said piston, and a plug accessible from the outside of said cylinder for opening or closing said inlets; substantially as described.

21. In a liquid door check, the combination with a checking cylinder, of a plunger or piston mounted to move therein, a tube projecting through said piston and having an inlet and outlet for the passage of liquid from one side to the other of said piston, a series of inlets in said tube adapted to be closed in succession by the movement of said piston, and a supplementary tube adapted when turned in one direction to permit the flow of liquid through said inlets, and when

turned in another direction to prevent the same; substantially as described.

22. In a liquid door check, the combination with a checking cylinder, of a plunger or piston mounted to move therein, a tube projecting through said piston having a series of openings for the passage of liquid from one side to the other of said piston, means accessible from without one end of said cylinder for regulating the flow of the liquid through said tube, and means accessible from without the other end of said cylinder for regulating the flow of the liquid through said tube; substantially as described.

23. In a door check, the combination of a fluid chamber, a plunger arranged therein, a member provided with a longitudinally disposed tapered groove mounted to project through the head of said plunger, a sleeve surrounding said member and provided with a series of perforations adapted to register with said groove, and means for moving the plunger longitudinally of the sleeve, the speed of the plunger being gradually decreased as the egress of the fluid in front of the plunger is retarded by the diminution in size of said tapered groove; substantially as described.

24. In a door check, the combination of a checking cylinder, a plunger movable therein, means affording a passage from one side of the plunger to the other, said passage having a plurality of intermediate ports adapted to serve as inlets for the liquid during the initial part of the door closing movement, means associated with said passage for opening and closing said ports, and thereby varying the initial closing movement, and other means associated with said passage to throttle regulably the flow of liquid during the final closing movement so that such final closing movement may be retarded to the desired extent; substantially as described.

25. In a door check, the combination of a checking cylinder, a plunger movable therein, a fixed tube extending freely through the plunger and affording a passage through said plunger, said tube having a port serving as an end inlet to said passage during the closing movement of the door, and being further provided with a plurality of intermediate ports adapted to serve as additional inlets, means for opening and closing said intermediate inlets, and means for regulating the flow of liquid into said passage by way of said end inlet; substantially as described.

26. In a door check, the combination of a checking cylinder, a plunger movable therein, a fixed tube extending freely through the plunger and having a port near one end of the cylinder adapted to serve as an end inlet to the passage through the plunger

during the final closing movement of the door, said tube also having an intermediate inlet, means cooperating with said intermediate inlet to control the speed of the initial closing movement, and means cooperating with said end inlet to control the flow of fluid into said passage during the final closing movement; substantially as described.

27. In a door check, the combination of a checking cylinder, a plunger movable therein, means affording a passage from one side of the plunger to the other, adjustable means cooperating with said passage to hasten or retard the initial closing movement of the door, and adjustable means cooperating with said passage to retard the final closing movement of the door to the desired extent; substantially as described.

28. In a door check, the combination of a checking cylinder, a plunger movable therein, means affording a passage from one side of the plunger to the other, said passage having an end inlet adjacent one end of the cylinder through which inlet the fluid passes during the final closing movement of the door, said passage also having an intermediate inlet, means cooperating with said intermediate inlet to vary the speed of the initial closing movement, and means cooperating with said end inlet to retard the final closing movement in order to prevent slamming, or to permit a strong closing movement of the door during the last few inches of its travel; substantially as described.

29. In a door check, the combination of a checking cylinder, a plunger movable therein, a tubular member extending through the plunger, and affording a passage for the liquid in moving from one side of the piston to the other, said tubular member having an end inlet for the passage of fluid during the final closing movement, and being also provided with a plurality of intermediate inlets, means in said tubular member cooperating with said intermediate inlets to vary the initial movement of the door and means in said passage cooperating with said end inlet to throttle the flow of fluid into the passage during the last few inches of the travel of the door, so as to retard the final closing movement, said last named means being adjustable to permit a free movement of the

fluid into said passage by way of said end inlet during the final movement so that the door will be forcibly moved into its closed position during the last few inches of its travel; substantially as described.

30. In a door check, the combination of a checking cylinder, a plunger movable therein, a fixed tubular member extending freely through the plunger, said tubular member having a row of perforations in its wall adapted to serve as inlets during the closing movement of the door, means cooperating with a plurality of intermediate inlets to open or close the same and thereby control the initial closing movement, and means to control the flow of fluid into the tubular member by way of the end inlet during the final part of the closing movement; substantially as described.

31. In a door check, the combination of a fluid chamber, a plunger movable therein, means adjustable from the exterior of the check to vary the speed of the initial part of the door closing movement, and another means, cooperating with said first means, and likewise adjustable from the exterior of the check, to retard the final part of the closing movement to the desired extent; substantially as described.

32. In a door check, a fluid chamber, a plunger movable therein, means adjustable from the exterior of the check to cause the retarding action of the fluid to begin at any of a number of points in the path of the plunger, said means including a fixed tubular member extending freely through the plunger and having a plurality of ports, and a device for controlling at least one of said ports; in combination with means, likewise adjustable from the exterior of the check, for varying the speed of the final part of the closing movement said last named means including an element cooperating with another of the ports in said tube; substantially as described.

In witness whereof, I have hereunto set my hand on the 7th day of October, 1910.

JOHN H. SHAW.

Witnesses:

CUSTIS P. WILLIAMS,
BERTHA RAY.