No. 876,869. PATENTED JAN. 14, 1908.

C. B. GARRETT.

WET PIPE ALARM VALVE.

APPLICATION FILED DEC. 31, 1904.

2 SHEETS—SHEET 1.

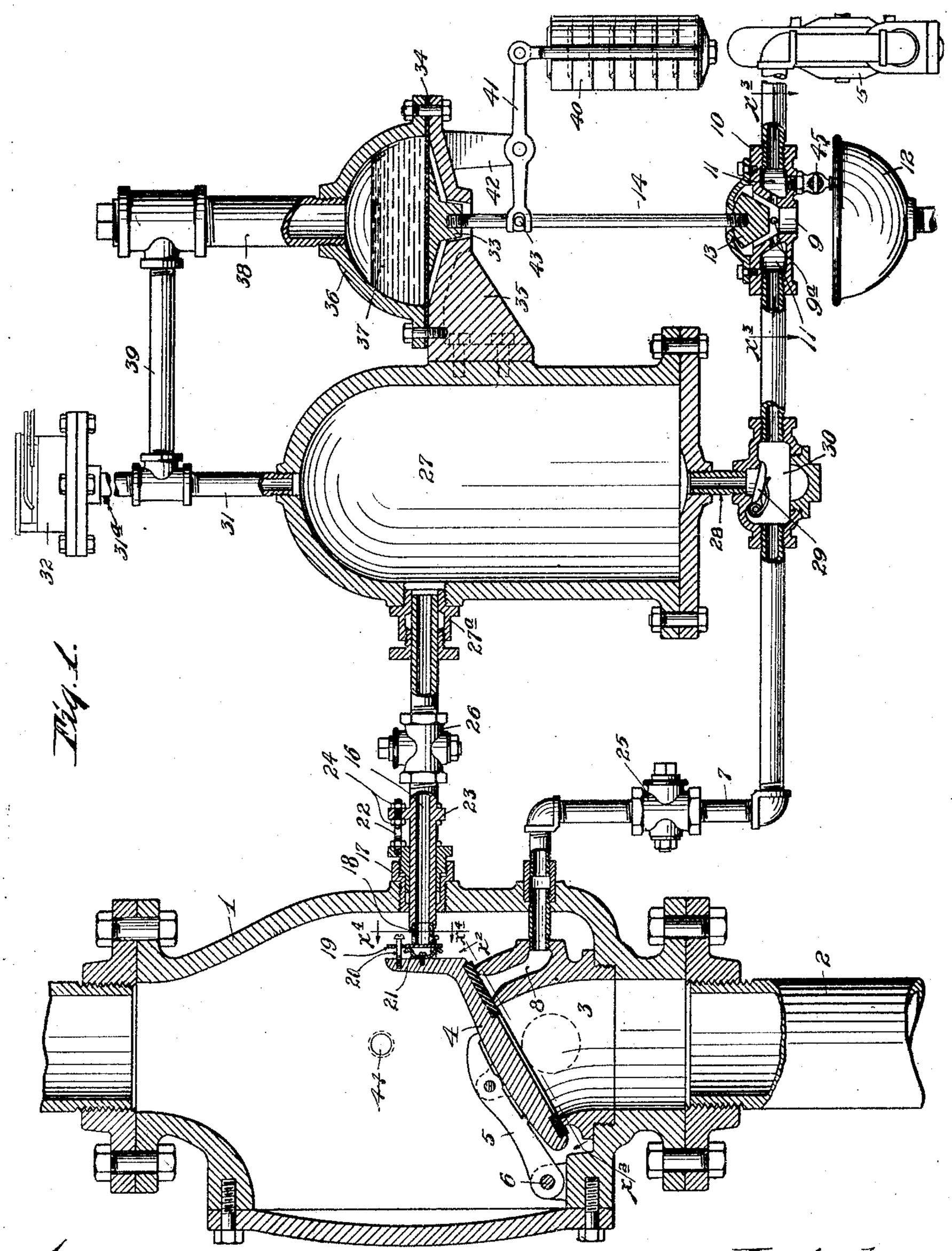

Fig. 1.

Witnesses.

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2 SHEETS—SHEET 2.

Fig. 3.

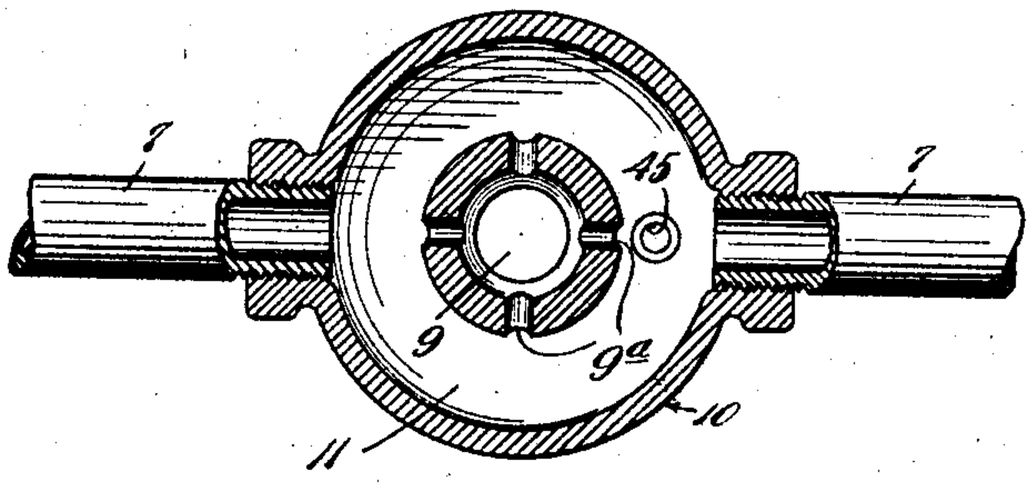


Fig. 2

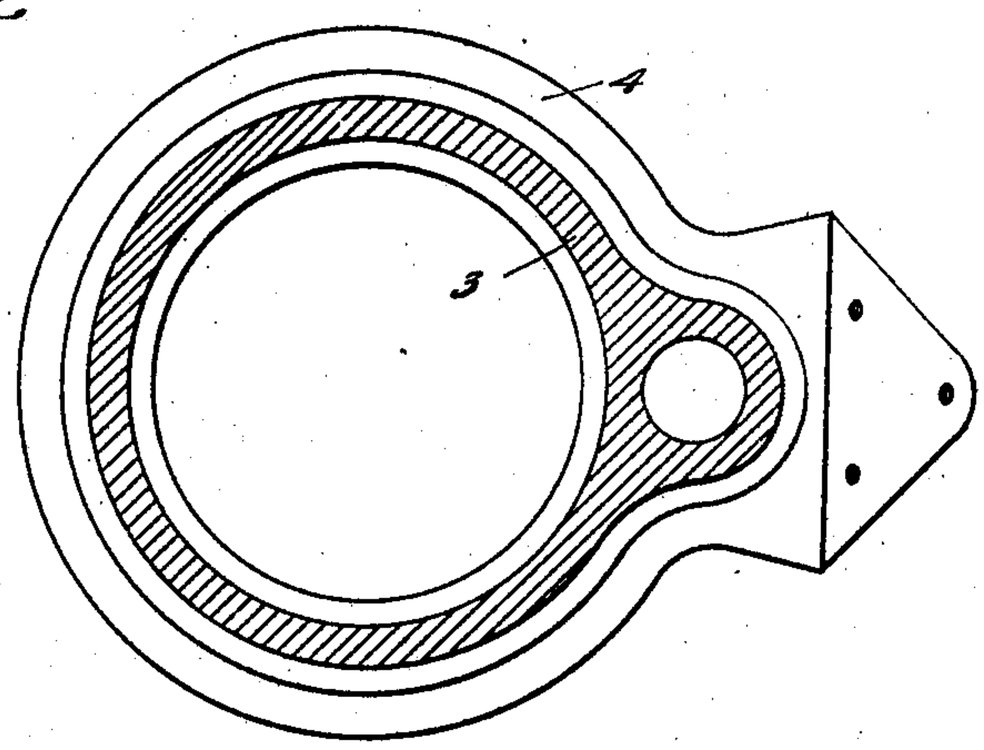


Fig. 4.

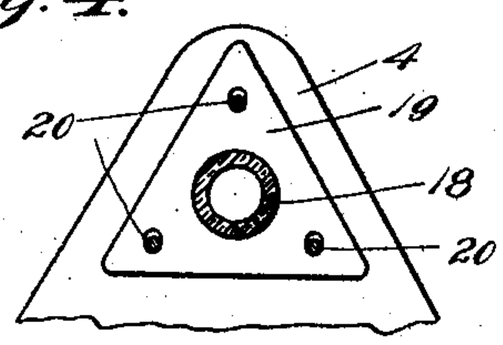
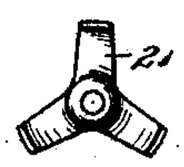


Fig. 5.



Witnesses.
E. W. Jeppesen.
A. H. Ogsahl

Inventor.
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UNITED STATES PATENT OFFICE.

CHARLES B. GARRETT, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE GLOBE AUTOMATIC SPRINKLER COMPANY, OF MINNEAPOLIS, MINNESOTA, A CORPORATION OF MINNESOTA.

WET-PIPE ALARM-VALVE.

No. 876,869. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed December 31, 1904. Serial No. 239,065.

To all whom it may concern:

Be it known that I, CHARLES B. GARRETT, citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Wet-Pipe Alarm-Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to what is generally known as wet pipe alarm valves, which valves are used in connection with wet pipe fire extinguishing systems, for causing an alarm to be given whenever one or more sprinklers are opened, and has for its object to generally improve this class of mechanism.

The invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The requirements of the fire underwriters make necessary the use, in these alarm valve mechanisms, of two independent alarm attachments or devices, the one to be electrically actuated, and the other to be actuated by a "water rotary".

In alarm valves hitherto constructed it has been customary to actuate one or both of the alarm attachments by water supplied through a supplemental passage leading from the main valve casing, and to control this single supplemental passage and the main inlet to the valve casing, by a common check valve. In one device, also, the water rotary has been actuated by water supplied from a conduit leading from the main supply conduit, from a point below the check valve, and provided with a normally closed differential check valve arranged to be opened by water supplied through a restricted supplemental passage having a normally closed valve arranged, in turn, to be opened by the main check valve.

In my improved alarm valve mechanism, I provide two supplemental fluid passages designated as primary and secondary supplemental passages which lead from the valve casing, and are both controlled by the check valve which also controls the water inlet to said casing, and I provide an accumulation chamber which receives from the "secondary" of said supplemental passages, and drains into the "primary" supplemental passage. The said primary supplemental passage has a normally opened drain, and, where the water rotary is employed, has a by-pass leading to said water rotary. In said primary supplemental passage is a check valve which is closed, or is held closed when there is water pressure in said primary passage, thereby at such times closing the drain passage between said accumulation chamber and said primary passage. For closing the drain from said primary passage, a valve is provided which is normally held open, preferably by weight, and is preferably attached to a diaphragm exposed in a diaphragm chamber having communication with the accumulation chamber, and into which water will be forced only after there has been a predetermined accumulation of water in said accumulation chamber.

The main check valve in the valve casing of the main water conduit is preferably of the "flapper" type. The seat for said check valve should be reduced to the smallest possible area, in order to eliminate the "differential" established by all check valves, this differential of course being measured by the pressure on the area of the valve seat, plus the weight of the valve. A reduction of this differential to a minimum, minimizes the disturbance of the check valve caused by "water hammer" which, in some types of valves, causes a prolonged opening of the check valve. This prolonged opening frequently causes false alarms by allowing sufficient water to flow into the alarm actuating mechanism to throw the same into action. This is more likely to occur in systems carried to the height of four or more stories than it is in a one story system, for the obvious reason that with a high column of water, the differential on the check valve is much greater than with a low column.

In the preferred arrangement of my improved alarm valve, what I term the "primary" of the supplemental outlet passages opens directly from the main seat of the check valve, and the water escaping through it, when the check valve is opened, has two functions, to-wit, first to close, or to hold closed, the check valve which controls the drain from the accumulation chamber into said primary passage, and, second, to supply

a sufficient flow of water to actuate the water rotary or mechanical alarm: The first function is maintained in case of a prolonged flow, such as caused by the opening of one or more sprinklers, at which time water also flows through the secondary outlet passage into the accumulation chamber. The second function is maintained when, by a prolonged flow, the accumulation chamber has been filled entirely, or to a predetermined extent, and the accumulated water has been caused to act on the diaphragm and close the drain of the primary outlet, thereby causing the water which flows through said primary outlet passage to actuate the water rotary.

To actuate the electrical alarm, the accumulation chamber is provided with an escape passage through which the water will flow only after the accumulation chamber has been completely filled, or filled to a predetermined extent.

The invention also involves various other novel and important features, as will more fully appear from the following detail description.

My improved valve mechanism is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view in vertical section, some parts being shown in full elevation, and some parts being indicated in diagram only; Fig. 2 is a section on the line x^2 x^2 of Fig. 1, looking upward; Fig. 3 is a detail and horizontal section on the line x^3 x^3 of Fig. 1; Fig. 4 is a section on the line x^4 x^4 of Fig. 1, some parts being broken away; and Fig. 5 is a detail in elevation, showing a spring which is interposed between the body of the main check valve and a supplemental valve plate.

The numeral 1 indicates a valve casing which is interposed in the main water conduit or "riser" 2 of a fire extinguishing system, and is provided at its inlet with an annular valve seat 3, the face of which inclines with respect to a horizontal, and which is normally closed by a check valve 4, of the "flapper" type, said valve being, as shown, connected to the free end of an arm 5, which is pivoted at 6 within the casing.

The primary supplemental outlet passage is afforded by a pipe 7 which, at its receiving end, communicates with a port 8, that is normally closed by the body of the check valve 4. This primary pipe or passage 7 is provided with a normally opened drain 9 which is shown as formed in a tubular section 10 interposed in said pipe, and formed also with a by-pass 11 through which the water is caused to run when the said drain 9 is closed. As shown, the drain 9 has a plurality of perforations 9^a that open directly into the by-pass 11.

The numeral 12 indicates the receiving bowl of a pipe for carrying off water drained from the alarm mechanism.

The numeral 13 indicates a valve mounted in an upper web of the section 10, provided with a vertically projecting stem 14, and adapted, when pressed down, to close the drain 9, but normally held upward by means hereinafter described.

The numeral 15 indicates, diagrammatically, a "water rotary" which receives the water discharged from the primary pipe 7 when its drain 9 is closed and the check valve 4 is open.

The secondary supplemental outlet passage is afforded by a pipe or tube 16 which projects into the casing 1 through a stuffing box 17, and is provided at its inner end with a detachable tubular tip 18, which is slightly counter sunk there into, and is closed by a valve plate 19 preferably of triangular form This valve plate 19 is loosely secured to an upwardly extending projection of the check valve 4; by a plurality of headed screws 20. A spring 21, as shown, having three legs, is interposed between said valve plate 19 and the upper portion of said valve 4, and, as shown, is attached to the latter. The relations of the parts are such that when the check valve 4 is in a closed position, that is, closes the inlet 3 and the port 8, the spring 21 will tightly press the valve plate 19 against the end of the tip 18 and close the secondary outlet 16. The tip is preferably of glass, and the valve plate 19 is advisably plated with gold or other metal which will prevent corrosion.

For an important purpose, which will appear in the description of the operation, the secondary outlet tube 16 is made longitudinally adjustable, so as to vary its projection in the case 1; and, as shown, this is accomplished by a threaded bolt 22 which connects a flange 23 on said tube to one member of the stuffing box 17 and is provided with lock nuts 24.

The numerals 25 and 26 indicate normally open stop-cocks interposed in the primary pipe 7, and in the secondary pipe or tube 16. The delivery end of the secondary tube 16 delivers into an accumulation chamber 27, and projects through a stuffing box 27^a thereon; and the said accumulation chamber at its base is connected with the intermediate portion of the primary pipe 7 through a short draining tube 28, the lower end of which is normally closed by a check valve 29 mounted within a valve casing 30 interposed in said pipe 7

To actuate the electrical alarm, the accumulation chamber 27 is provided with an outlet passage at its upper portion, shown as afforded by a tube or pipe 31 which leads to the circuit-closer 32 of the electrical alarm. The circuit-closer 32 may be of the standard, or any suitable, type which is

arranged to be closed or to throw the electrical alarm into action when subjected to water pressure. 31ª indicates an air vent in the pipe 31.

In the preferred arrangement of the means for actuating the drain valve 13, its stem 14 is provided, at its upper end, with a disk-like head 33, upon which rests the intermediate portion of a buckskin diaphragm 34, which diaphragm is clamped between a supporting bracket 35 on the chamber 27 and a concave head 36, which affords a diaphragm chamber containing a body of mercury 37. The body of mercury 37 completely covers the diaphragm 34 and prevents the same from coming into contact with the water which may be delivered into the diaphragm chamber. Buckskin, as is well known, is impervious to mercury. The principal reason for the employment of the mercury is the fact that the diaphragm chamber cannot be readily drained, and that water would saturate and soon rot the buckskin diaphragm. The buckskin diaphragm is advisably employed because of its extreme sensitiveness. The diaphragm chamber afforded by the head 36 is in communication with the upper portion of the accumulation chamber 27, as shown, through a vertical tube 38 and a horizontal tube 39, the latter of which taps the tube 31.

The drain valve 13 is normally held open against the weight of the mercury on the diaphragm 34, as shown, by a weight 40 suspended from a lever 41 pivoted at its intermediate portion to a depending lug 42 of the bracket 35, and having a pronged end engaging studs 43 on the valve stem 14. The numeral 44 indicates a normally closed outlet from the casing 1 which is of such size that when opened, by a valve or other device, it will permit a discharge equal to the discharge of one sprinkler head.

In adjusting the device, the test outlet 44 is opened and a flow will be established equivalent to the discharge of the primary outlet, the secondary outlet and one sprinkler head, and if an alarm is not thereby created, the tube 16, which affords the secondary outlet, is adjusted longitudinally until its tip 18 is carried far enough away from the valve plate 19 of the then open check valve 4 to attain that result, to-wit, the actuation of the alarm mechanism. It is of course evident that the greater the distance of the valve plate 19 from the tip 18 when the check valve is opened slightly by the opening of one sprinkler head or of the test opening 44, the greater will be the flow through the secondary supplemental passage, and hence the more rapid will be the filling of the accumulation chamber 27.

As clearly already described, the longitudinal adjustment of the tube 16 may be easily accomplished, and this without access to the interior of the valve casing. This novel method of adjustment is therefore a very important feature.

Many alarm valves fail to operate when one sprinkler head is opened, due to manipulation by employees who have been annoyed by "water hammer" alarms. It is practically impossible with my improved alarm valve mechanism for any "water hammer" to cause false alarms. Slight disturbances to the check valve 4 may cause the discharge from the primary outlet, but such discharges will find free escape through the normally open drain 9, and hence the said primary passage will be quickly drained with no other effect on the alarm controlling mechanism except to hold the check valve 29 securely closed.

A greater disturbance of the main check valve 4 may cause the opening of the secondary outlet through the tube 16, but unless the said check valve 4 is held open until the accumulation chamber is filled, the return of the check valve to its seat will cut off the flow of water both through the primary and secondary passages, and will permit the said accumulation chamber to be drained without having actuated the alarm devices. After the accumulation chamber has been partly filled, as above indicated, the primary passage will be drained before the drain check valve 29 is permitted to open. The primary passage through the pipe 7 must be given time to drain, and when this is done, the water pressure on the under surface of said check valve 29 being removed, said check valve will open and permit the water to freely run from the accumulation chamber. When, however, the main check valve 4 is held open for any considerable time, as will be the case, of course, when a sprinkler head is thrown into action, the accumulation chamber 27 will be completely filled, and the water running therefrom through the tube 31 will actuate the circuit closer 32 of the electric alarm, and will flow through the pipes 31 and 38, into the diaphragm chamber 36, thereby producing a pressure on the diaphragm 34, which, in conjunction with the mercury 37, will force the same downward and move the drain valve downward into a position to close the drain 9 of the primary passage. When the drain 9 is thus closed, all the water which flows through the primary passage, and through the by-passage 9ª thereof, must of necessity pass through, or be delivered to, the "water rotary" 15 of the mechanical alarm, thereby actuating the latter.

The diaphragm chamber 36 has no means for draining it, but when the accumulation chamber has been drained, the weight 40 will overcome the weight of the mercury and of the water which remains in the chamber 36 and pipe 38, and will restore the drain valve 13 to its normal position and open the

drain 9. The draining of the primary and secondary passages, and of the accumulation chamber, after the alarm mechanism has been thrown into action, as above described, is, as shown, accomplished by opening a drip cock 45 which is applied to the by-passage 9^a, and discharges into the catch bowl 12.

The valve mechanism above described is capable of a great many modifications and different arrangements within the scope of my invention as herein set forth and claimed. The drip check valve 29, for instance, may take a great many different forms, and, for some purposes, it might even be dispensed with. If the said check valve were dispensed with, the relative conductive passage of the drain tube 28, or other passage corresponding thereto, would of necessity be made less than that of the secondary passage between the valve casing 1 and the accumulation chamber, so that it would be possible to fill the latter while the said drain was open.

The arrangement described is especially adapted to actuate two different and distinct alarms. Nevertheless, most of the mechanism described would be necessary in order to actuate a single alarm. If, for example, the mechanically actuated alarm should not be desired, the primary passage through the pipe 7 should be plugged outward of the drain 9. If, on the other hand, the electrically actuated alarm should not be required, the tube 31 should be plugged upward of the branch pipe 39.

The spring 21 interposed between the valve plate 19 and the valve 4, holds said valve plate against the tip 18, and hence assists in keeping the secondary supplemental passage 16 closed under slight openings of said check valve.

The drain check valve 29, as illustrated in the drawings, is normally pressed closed by a light spring, the tension of which is only sufficient to overcome the weight of the valve and normally hold the same closed, so that it cannot become clogged by sediment or dirt. The main drain check or valve 13 may also take a great many different forms, and may be actuated in a great many different ways.

What I claim and desire to secure by Letters Patent of the United States is as follows:—

1. In an alarm valve, a casing forming part of a water conduit, two supplemental fluid passages leading from said casing, a check valve within said casing directly controlling the inlet thereto and said two supplemental fluid passages, and means coöperating with said supplemental passages to cause an alarm, substantially as described.

2. In an alarm valve, a casing forming part of a water conduit, two supplemental fluid passages leading from said casing, a check valve within said casing directly controlling the inlet thereto, and said two supplemental fluid passages, liquid-actuated means coöperating with said supplemental passages, to cause an alarm when said check valve opens a predetermined amount for a predetermined time, substantially as described.

3. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, a check valve in said casing controlling the inlet thereto and the said two supplemental passages, an accumulation chamber receiving from said secondary passage and discharging into said primary passage, and means actuated by a predetermined accumulation of water in said accumulation chamber, to cause an alarm, substantially as described.

4. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, said primary passage having a normally open drain, and an accumulation chamber receiving from said secondary passage and draining into said primary passage, and a valve actuated by a predetermined accumulation of water in said accumulation chamber, to close the drain of said primary passage, substantially as described.

5. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, a check valve within said casing controlling the inlet thereto, and said two supplemental outlet passages; a normally open drain leading from said primary outlet passage, an alarm device, an independent outlet leading from said primary supplemental passage to said alarm device, an accumulation chamber receiving from said secondary passage and draining into said primary passage, and a valve for closing the drain of said primary passage, itself arranged to be moved to close said drain, by a predetermined accumulation of water in said accumulation chamber, substantially as described.

6. In an alarm valve, a casing forming part of a water conduit, primary and secondary outlet passages leading from said casing, a check valve in said casing controlling the inlet thereto and said two supplemental passages, an accumulation chamber receiving from said secondary passage and discharging into said primary passage, a check valve arranged to close the passage between said accumulation chamber and primary passage, a normally open drain in said primary passage, a valve for closing said drain, means actuated by a predetermined accumulation of water in said accumulation chamber, for moving said valve to close said

drain, and means for giving an alarm or signal, when the drain of said primary passage is closed, substantially as described.

7. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, an accumulation chamber receiving from said secondary passage and discharging into said primary passage, a valve closing communication between said accumulation chamber and primary passage under pressure from within said primary passage, a normally open drain leading from said primary passage, a valve for closing said normally open drain, a diaphragm connected to said drain valve and in communication with said accumulation chamber through a passage arranged to deliver water thereto only after a predetermined accumulation has taken place in said chamber, and means cooperating with said supplemental passages and parts noted, to cause an alarm, substantially as described.

8. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, said primary passage having a normally open drain, an accumulation chamber receiving from said secondary passage and draining into said primary passage, a normally open drain valve for closing the drain of said primary passage, a diaphragm chamber in communication with said accumulation chamber at its upper portion, a diaphragm exposed in said diaphragm chamber and connected to said drain valve, for closing the same, and a body of mercury in said diaphragm chamber covering said diaphragm and holding the water out of contact therewith, substantially as described.

9. In an alarm valve, a casing forming part of a water conduit, two supplemental fluid passages leading from said casing, the one being afforded by a longitudinally adjustable tube, a check valve within said casing controlling the inlet thereto, and said two supplemental fluid passages, and means coöperating with said supplemental passages to cause an alarm, substantially as described.

10. In an alarm valve, a casing forming a part of a water conduit, primary and secondary supplemental outlet passages leading from said casing, said secondary supplemental passage being formed of a longitudinally adjustable tube, a check valve within said casing controlling the inlet thereto, and the said two supplemental passages, an accumulation chamber receiving from said secondary passage and draining into said primary passage, and means actuated by a predetermined accumulation of water in said accumulation chamber to cause an alarm, substantially as described.

11. In an alarm valve, a casing forming part of a water conduit and having a check valve seat surrounding its inlet passage, a primary supplemental passage leading from said check valve seat, a secondary supplemental passage leading from one side of said casing, a check valve in said casing the body of which normally closes the inlet to said casing and the said primary supplemental passage, said check valve having a yielding valve plate or section that normally closes said secondary supplemental passage, and means coöperating with said supplemental passages to cause an alarm, substantially as described.

12. In an alarm valve, a casing forming part of a water conduit, primary and secondary supplemental passages leading from said casing, the former having a normally open drain, and the latter having a detachable tubular tip within said casing, a check valve within said casing controlling the inlet thereto and the said two supplemental passages, said check valve having a yielding valve plate that normally engages the tip of said secondary passage, to close the same, and means coöperating with said supplemental passages to cause an alarm, substantially as described.

13. The combination with an alarm valve and an alarm actuating device, of a casing forming part of a water conduit, two supplemental fluid passages leading from said casing, the one thereof having a normally open drain and a by-pass leading to an alarm actuating device, a normally open drain valve for closing said drain, and means actuated by the flow through said secondary supplemental passage to move said drain valve, close said drain and cause the water to flow through said by-pass and actuate the alarm mechanism, substantially as described.

14. The combination with an alarm valve and an alarm actuating device, of a casing forming a part of a water conduit, primary and secondary supplemental passages leading from said casing, the former having a normally open drain, and the latter being connected to an alarm actuating device and having a drain controlled by the flow through said primary passage, a normally open drain valve coöperating with the drain of said primary passage, and means controlled by the flow through said secondary passage for moving said drain valve to close the drain of said primary passage and cause the flow through said secondary passage to produce an alarm, substantially as described.

15. The combination with an alarm valve and an alarm actuating device, of a casing forming part of a water conduit, primary and secondary supplemental passages leading from said casing, a check valve in said casing controlling the inlet thereto and said two supplemental passages, an accumulation chamber receiving from said secondary passage and draining into said primary passage,

said primary passage having a normally open drain and a by-pass leading to an alarm actuating device, a second alarm actuating device connected by a passage with the upper portion of said accumulation chamber, a diaphragm chamber and coöperating diaphragm connected by a passage to the upper portion of said accumulation chamber, a drain valve coöperating with the drain of said primary passage and connected to said diaphragm, and a weight acting on said valve and diaphragm to normally hold said valve open, substantially as described.

16. In an alarm valve, a casing forming a part of a water conduit, a supplemental passage leading from said casing, a check valve in said casing controlling the inlet thereto and said supplemental passage, and means extending to the exterior of said casing for changing the adjustment of the inner extremity of said supplemental passage with respect to said valve, substantially as described.

17. In an alarm valve, a casing forming a part of a water conduit, a supplemental passage leading from said casing, a check valve in said casing controlling the inlet thereto and said supplemental passage, and which supplemental passage is afforded by a tube that projects into said casing and is provided with means for adjusting it from the exterior of said casing, substantially as described.

18. In an alarm valve, the combination of an alarm mechanism, of a casing forming part of a water conduit, three valve seats in said casing, a valve arranged to open and close on two of said valve seats, means incorporated in said valve for opening and closing the third valve seat, and means for actuating said alarm mechanism when one of said valve seats is opened substantially as described.

19. In an alarm valve, a casing forming part of a water conduit, three main valve seats in said casing, a valve arranged to open and close on two of said valve seats, and a supplemental valve yieldingly connected to said main valve for opening and closing the third valve seat, substantially as described.

20. In an alarm valve, a casing forming part of a water conduit, three valve seats within said casing, one of which seats is obliquely disposed with respect to the other two, a main valve arranged to open and close on two of said valve seats, and a supplemental valve yieldingly connected to said main valve for opening and closing the third valve seat, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES B. GARRETT.

Witnesses:

ROBERT C. MATEY,

F. D. MERCHANT.