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H. A. FISKE.

ALARM VALVE.

APPLICATION FILED FEB. 3, 1902.

NO MODEL.

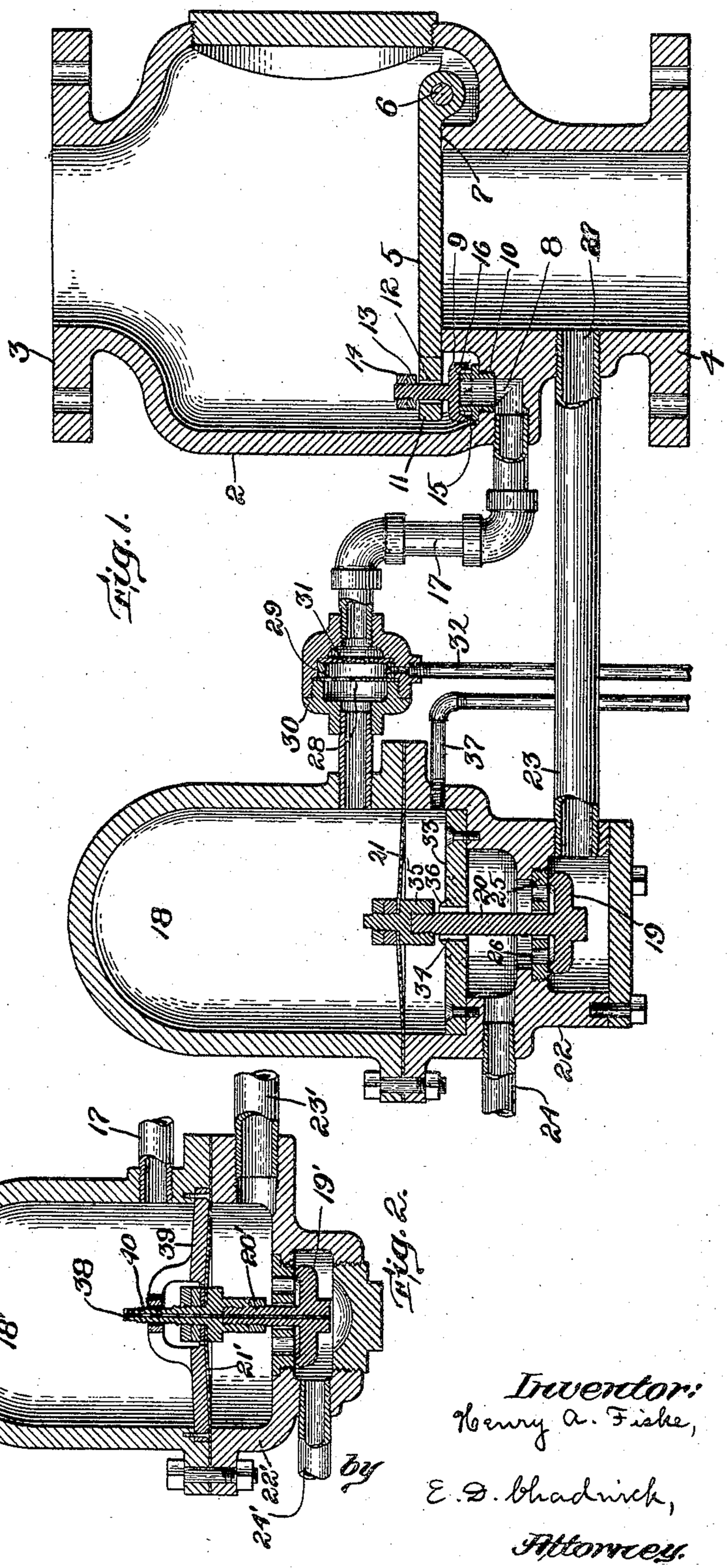

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY A. FISKE, OF NEWTON, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO EASTERN FIRE PROTECTION COMPANY, A CORPORATION OF MAINE.

ALARM-VALVE.

SPECIFICATION forming part of Letters Patent No. 767,337, dated August 9, 1904.

Application filed February 3, 1902. Serial No. 92,235. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. FISKE, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Alarm-Valves, of which the following is a specification.

My invention relates to devices such as are employed in connection with wet-pipe fire-extinguishing systems for causing an alarm to be given whenever water is permitted to escape from the sprinkling-pipe system by the opening of one or more sprinklers or otherwise. A form of device hitherto commonly used for this purpose consists of an ordinary check-valve located at the entrance to the system of sprinkling-pipes and normally closing both the inlet to said pipes and also a supplementary passage through which when the check-valve is caused to open by the escape of water from the sprinkling-pipes a stream of water flows to and operates an alarm attachment. It is customary to employ two independent alarm attachments in connection with each check-valve, in compliance with the requirements of the fire-underwriters, one attachment consisting of an electric alarm adapted to be operated by the pressure of the water which flows to it and the other being a "water-rotary." A water-rotary, however, requires a considerable flow of water to operate it, and inasmuch as the check-valve will be raised from its seat but slightly if opened by the flow through a single sprinkler only it has hitherto been necessary that the entrance to the supplementary passage, which is opened by the opening of the check-valve, should be of considerable size in order that the slight opening of the check-valve necessary to supply a single sprinkler may admit to said passage a flow of water sufficient to operate the water-rotary. This entrance or orifice has commonly been provided by forming an annular channel in the seat of the check-valve and leading a pipe from said channel to the alarm attachments, said orifice being normally closed by the seating of the check-valve on both sides of said channel simultaneously, and since that portion of the check-valve which covers this channel is not exposed to the pressure of the water below the valve the result has been that said valve is held to its seat by a considerable differential pressure, which not only renders the valve less sensitive, but also frequently causes the valve to hammer or pound on its seat when opened by the flow through one sprinkler only. Furthermore, the large area of this channel has been found objectionable for the additional reason that in case the check-valve is raised by an increase in pressure in the supply system below it enough water is apt to flow through said channel to operate one or both of the alarm attachments, and thus cause a false alarm to be given.

My invention is intended, primarily, to provide an alarm-valve in which the entrance to the supplementary passage above referred to may be made so small that the differential pressure tending to hold the check-valve to its seat will be inconsiderable, while at the same time the flow of water through said passage will always be sufficient to insure the proper operation of such alarm attachments as may be employed whenever a sprinkler opens, and to this end instead of causing the flow of water through said passage to operate the alarm attachments directly I cause it to exert a pressure in a supplementary chamber, and I utilize said pressure to open a valve, and thereby permit an independent stream of water to flow to and operate the alarm attachment or attachments, said stream of water being taken from any suitable source of supply sufficient to give it the necessary pressure and volume. Preferably this independent stream of water is taken from the supply system below the check-valve through a pipe or passage-way which is controlled by the valve operated as above described. In this manner I am able to employ a small supplementary orifice at the check-valve, as above stated, and by making the supplementary chamber which receives the flow through said orifice of sufficient size I can also delay the opening of the valve through which the water flows to the alarm attachments for any desired interval after the opening of the check-

valve, and thus I am able to prevent the giving of false alarms by a water-hammer or other excess pressure below the check-valve, because such pressures are temporary in their nature, and before sufficient water can flow through the supplementary orifice when opened thereby to cause an alarm to be given the check-valve will have closed again, whereupon whatever water may have accumulated in said chamber drains away through a suitable drip.

In prior valves of the type under consideration both the main passage supplying the sprinkling-pipes and the supplementary passage leading to the alarm attachments have been controlled by a single moving part—namely, the main check-valve—so that when one passage opened the other must necessarily open with it. This has been found to be disadvantageous, because it is difficult to maintain a perfectly-tight seating of the check-valve, especially on both sides of an annular channel at the same time, and with the construction above described any leakage past said seat must cause a waste of water and also tend to operate an alarm attachment, and one of the features of my present invention relates to a construction whereby these objections may be overcome. To this end I make the supplementary orifice leading to the alarm attachments or to the means which operates them independent of the seat of the check-valve, and I provide a connection between said check-valve and the closure for said orifice, which is preferably loose enough to permit the latter to remain tightly closed even though the check-valve moves slightly, with the result that with my construction it is not necessary that the check-valve shall fit its seat with any particular degree of tightness or accuracy, inasmuch as any leakage past said seat which may occur can have no effect so far as the giving of an alarm is concerned. Moreover, such a slight leakage may be desirable in order to compensate for any slight leakage from the sprinkling-pipe system.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 shows my preferred construction represented principally in central vertical section, and Fig. 2 is a similar section showing a somewhat-modified arrangement of alarm-controlling attachment.

Referring to Fig. 1 of the drawings, 2 indicates a valve-casing provided with flanged ends 3 and 4, by means of which it is adapted to be bolted to the sprinkling-pipe system and to the supply system. 5 is the main check-valve, which in the construction shown is a "flapper-check" pivoted by one edge at one side of the casing, as at 6, and seating on a flat horizontal seat 7. In the valve-casing 2 is formed a supplementary passage 8, leading from the interior to the exterior of the casing 2 at one side of the valve-seat 7 and normally closed by a valve 9, seating against a valve-seat 10. The valve 9 is attached to the check-valve 5 or otherwise arranged to be operated by the operating thereof. In the arrangement shown the valve 9 is attached directly to a projection 11, extending from that edge of the check-valve which is opposite to the pivot 6, and the connection between said valves is preferably made slightly loose, so that while any material opening of the check-valve will cause the valve 9 to open slight movements of said check-valve, such as are insufficient to supply a sprinkler, will be permitted without opening said valve 9. To this end the stem of said valve 9 is formed to pass loosely through a hole 12, formed in the projection 11, and is provided with an adjustable nut 13 and a lock-nut 14, by the adjustment of which the check-valve may be given the desired amount of play without causing it to engage said nut 13 and raise the valve 9. The looseness of the stem of the valve 9 within the hole 12 also avoids the necessity of making an accurate fit at the pivot 6, said valve 9 being preferably guided to its seat by independent guides 15, formed on the valve-seat 10 and adapted to engage inclined surfaces 16, formed on the under side of the valve. The object of attaching the valve 9 to the check-valve on that side of the latter which is opposite to the pivot 6 is to multiply the opening movement of said check-valve as much as possible in order to get a maximum opening of the valve 9 when the check-valve opens slightly, and this is my reason for preferring to employ a flapper-check as distinguished from a sliding check, although the former is sometimes considered preferable for other reasons. It will be evident, however, that my invention may be applied to or embodied in a sliding check as well as a flapper-check.

With the construction just described any leakage past the check-valve 5 which may occur will evidently be of no consequence, and said check-valve may even open very slightly to an extent determined by the position of the nut 13 without permitting any flow of water through the passage 8, and inasmuch as the area of the valve 9 is or may be relatively very small the differential pressure tending to hold the check-valve 5 closed will be correspondingly small, so that said check-valve will be immediately responsive to the opening of a single sprinkler and will not hammer when but one sprinkler opens. It will be understood that the nut 13 is so adjusted that before the check-valve 5 can open sufficiently to supply even one sprinkler it will engage said nut and open the valve 9. To the outer end of the passage 8 is connected a pipe 17, through which the water admitted to said passage by the opening of the valve 9 is conveyed to a receiving-chamber 18, where it accumulates until whenever the valve 9 remains continuously open long enough a sufficient amount is col-

lected to cause the operation of a valve which controls an independent flow of water to the alarm attachments. This valve is represented at 19 and is operated from the chamber 18, preferably by securing the stem 20 of said valve to a flexible diaphragm 21, forming one wall of the chamber 18, and so arranged that upon the accumulation of a sufficient quantity of water within said chamber the weight or pressure thereof on the diaphragm will force the latter outward and cause it to open the valve 19. Said valve 19 is contained in a casing 22, provided with an inlet-pipe 23 and an outlet-pipe 24, the communication between its inlet and outlet being closed whenever the valve 19 is seated against its seat 25, which in the construction shown is provided with perforations 26, forming passages for the water, and with a central perforation in which the stem of the valve is guided. The inlet 23 leads to any suitable source adapted to supply a stream of water, which source may conveniently be the supply system itself, in which case the inlet-pipe 23 may be led into the valve-casing 2, as at 27, and the outlet-pipe 24 leads to one or more suitable alarm attachments adapted to be operated by the flow or pressure of the water, which are not shown herein, as they may be of any usual construction. Thus whenever the valve 9 is open water will flow continuously into the chamber 18, and its accumulated weight or pressure exerted on the diaphragm 21 will cause the valve 19 to open and an alarm to be given after an interval which will depend in part upon the capacity of the chamber 18, in part upon the size of the passage through which the water flows from the valve 9 to said chamber, and in part upon the pressure under which the water is forced into the same. By making the chamber 18 small and permitting an unrestricted flow of water to it when the valve 9 opens the apparatus may be caused to give an alarm which will be practically simultaneous with the opening of the check-valve 5, and this arrangement may be employed in case the supply system is not subject to water-hammers or other temporary variations in pressure; but ordinarily it will be desirable to delay the opening of the valve 19 for a certain interval after the opening of the valve 9, and such an interval of any desired length may be provided for by making the chamber 18 of the proper size and also, if desired, by providing a restricted opening through which the water must flow on its way to said chamber. I have shown such an opening at 28, consisting of a small hole passing through a plate 29, which forms a partition dividing the interior of a small casing 30, inserted in the pipe 17 between the valve 9 and the chamber 18. I prefer to provide a strainer 31, through which the water must pass before it reaches the opening 28.

In order to drain the chamber 18, not only after an alarm has been given, but also after it has been partially filled by a temporary flow, such as may be caused by a water-hammer, an open drip 32 is provided, which preferably leads from the casing 30 between the partition 29 and the strainer 31, as shown. Inasmuch as this drip is always open, its discharge capacity must be insufficient to carry off water as fast as it is supplied to the casing 30 from the valve 9 in order that a sufficient portion of the water may reach the chamber 18 to cause the opening of the valve 19, as above described.

In the arrangement shown in Fig. 1 the valve 19 is held normally closed by the pressure of the water taken from the supply system and the diaphragm 21 is given such an area that a less pressure per square inch exerted on its upper side will suffice to overbalance the pressure tending to hold said valve closed. If after the valve 19 opens the water flowing past it should reach the under side of the diaphragm 21, it would evidently act to close said valve, and in order to prevent this result the chamber formed by the casing 22 may be cut off from the space below the diaphragm by a partition 33, which is open only at its center, where the stem 20 of the valve 19 passes through it, this central opening 34 being closed simultaneously with the opening of the valve 19 by a valve formed by the seating of the hub 35, which is secured to the diaphragm 21 and carries the valve-stem 20, against a valve-seat 36, so that when said valve 19 is open the valve formed by the parts 35 and 36 is closed. Whatever quantity of water passes through the opening 34 before it is closed is drained away by an open drip 37, which also serves to drain the pipe 24 and its connections, if necessary, after the valve 19 has closed.

In Fig. 2 I have shown a somewhat-modified alarm-operating arrangement, according to which the water from the supply system or other source enters the top part of the casing 22′ above the valve 19′ through the pipe 23′, and the alarm attachments are supplied through a pipe 24′, which leads from the bottom of said casing below the valve 19′. In this case said valve is normally held closed by the pressure of the water acting on the under side of the diaphragm 21′, which pressure, owing to the size of the diaphragm, is in excess of the pressure on the top of the valve 19′, tending to open it, and said valve is opened when the pressure developed in the chamber 18′ by the entrance of water through the pipe 17 is sufficient to overbalance the differential pressure tending to hold said valve closed. The chamber 18′ may be drained by the drip 32, connected with the pipe 17, or, if desired, it may be drained through a hole 38, bored longitudinally through the stem 20′ of the valve 19′, this hole being of such size with respect to

the hole 28 or other opening through which the water reaches the chamber 18′ as to cause an accumulation of pressure in said chamber, as previously described. If desired, both of the drips 32 and 38 may be employed, in which case the chamber 18′ will fill more slowly and will empty faster than it fills, a result which may be desirable as tending to prevent an operative accumulation of water in said chamber, due to a rapid succession of water-hammers. Similarly, in the construction shown in Fig. 1 a second drip, similar in function and mode of operation to the drip 38, may be provided by drilling a small hole through the diaphragm 21, if desired. In the modification shown in Fig. 2 the diaphragm 21′ is constantly subjected to pressure, and hence I prefer to provide for it a backing composed of a spider 39, which may also form a guide for the stem 20′ of the valve 19′, as shown at 40. The arrangement shown in Fig. 1 is my preferred arrangement, however, principally because the diaphragm 21 is not normally under pressure and because it provides a drip for draining the alarm attachments which is closed while said attachments are being operated, thus preventing the waste of water.

I do not consider my invention to be limited to any specific arrangement for causing an independently-supplied passage to the alarm attachments to be opened upon the opening of the main check-valve, since, so far as I am aware, I am the first to devise an alarm-valve in which the flow of water caused by the movement of the check-valve is not used to operate the alarm directly, but is used to establish communication with an independent source of supply adapted to deliver a greater volume and thus to operate the alarm attachments with certainty and promptness. So, too, my invention may be used for operating devices other than alarms, if desired, whenever there is an escape of fluid under pressure from a chamber or a system of pipes, and the arrangement of check-valve and supplementary passage herein shown and described may be replaced by other arrangements without affecting the operation of the rest of the apparatus. Furthermore, the arrangement of the supplementary passage leading from the main valve-casing may be employed independently of the rest of the apparatus described and connected directly to one or more alarm attachments, if desired, and any suitable form of device for delaying the flow of water to the alarm attachments or other devices may be employed in connection therewith.

I claim as my invention—

1. The combination of a valve-casing having a supply-inlet, a main outlet and a supplementary outlet, a main valve normally closing the supply-inlet, a supplementary valve normally closing the supplementary outlet, and connections between said valves arranged to cause the opening of the main valve to begin to open the supplementary valve after the former valve has opened slightly.

2. The combination of a valve-casing provided with a main supply-passage and with a supplementary outlet-passage, a check-valve normally closing said supply-passage, and a supplementary valve carried directly by said check-valve itself and normally closing said supplementary passage.

3. The combination with a casing and a normally closed check-valve contained therein, of a supplementary passage leading from the interior to the exterior of the casing and terminating within the casing in a valve-seat which is distinct from the seat of the check-valve, a valve normally seated against the valve-seat of said supplementary passage and connections between said valves arranged to cause the opening of the main valve to begin to open the supplementary valve after the former valve has opened slightly.

4. The combination with a valve-casing provided with a main supply-passage and a supplementary passage, said passages being respectively surrounded by distinct valve-seats, of a check-valve normally closing the main supply-passage, an independently-seating valve normally closing said supplementary passage, and adjustable connections between said valves permitting a slight opening of the check-valve before the other valve begins to open.

5. The combination with a casing and a normally closed, pivoted check-valve contained therein, of a supplementary passage leading from the interior to the exterior of the casing and terminating within the casing in a valve-seat which is distinct from the seat of the check-valve and is located on the opposite side thereof from the pivot on which the check-valve turns, a valve normally seated against the valve-seat of said supplementary passages and provided with a stem passing loosely through the extended edge of the check-valve, and an adjustable nut on said stem.

6. The combination with a valve-casing provided with an inlet and an outlet, of a normally closed supplementary outlet leading therefrom, means operated by a flow of fluid through said casing for opening said supplementary outlet, a passage leading from a fluid-supply and adapted to be connected to an alarm, a valve normally closing said passage, and means operated upon the opening of said supplementary outlet for opening said valve.

7. The combination with a passage leading from a fluid-supply and adapted to be connected with an alarm, and a valve controlling said passage and normally held closed by the pressure of said fluid-supply, of a chamber provided with a movable wall connected to said valve, and an independent, normally closed supply-passage leading to said chamber, the

delivery capacity of said supplementary passage being small relatively to the receiving capacity of said chamber.

8. The combination with a casing normally containing fluid under pressure and a normally closed check-valve contained therein, of a chamber provided with a movable wall or partition, a passage leading from a fluid-supply and a valve normally closing the same, said valve being connected to said movable wall or partition, and means for admitting fluid to said chamber upon the opening of the check-valve.

9. The combination of a chamber containing a flexible diaphragm, a valve connected to said diaphragm, a passage leading from a supply system and normally closed by said valve, a casing normally containing fluid under pressure and also containing a normally closed check-valve, an independent passage leading from the casing to the chamber, and means for opening said passage upon the opening of the check-valve.

10. The combination with a casing and a normally closed check-valve contained therein, of a chamber containing a movable member, a normally closed supplementary passage leading from the valve-casing to said chamber, and means for opening said passage upon the opening of the check-valve, an independent passage leading from said casing and a valve normally closing the same, and connections between said valve and movable member.

11. The combination with a casing and a normally closed check-valve contained therein, of a chamber, a supplementary passage leading thereto from the valve-casing, a valve normally closing said passage and loosely connected to the check-valve, and means operated by a flow of water to said chamber for causing the operation of an alarm.

12. The combination with a valve-casing and a normally closed check-valve contained therein, of a chamber containing a movable member, a supplementary passage leading from the interior of the valve-casing to said chamber, a valve normally closing said passage and loosely connected to the check-valve, an independent passage leading from a fluid-supply and adapted to be connected to an alarm, and a valve connected to said movable member and normally closing the latter passage.

13. The combination with a chamber having a wall which is movable by fluid-pressure exerted therein, of a passage leading from a fluid-supply, a valve connected to said movable member and normally closing said passage, said valve being held closed by the fluid-pressure in said passage, an independent, normally closed supply-passage leading to said chamber, and means for opening the latter passage.

14. The combination with a chamber having a wall which is movable by fluid-pressure exerted therein, of a passage leading from a fluid-supply, a valve connected to said movable member and normally closing said passage, said valve being held closed by the fluid-pressure in said passage, an independent supply-passage leading to said chamber, a normally closed valve controlling the latter passage and means for opening the same, and means for draining said chamber and its connections upon the closing of the latter valve.

15. The combination of a valve-casing, a chamber containing a flexible diaphragm, a passage leading from the valve-casing to the chamber and a valve normally closing the same within the casing, means for opening said valve, a casing included in said passage and provided with a restricted opening and an open drip, and a flow-controlling valve connected to said diaphragm.

16. The combination with a chamber of a normally closed supply-passage leading thereto, an open drip leading from said chamber, a second open drip leading from said supply-passage, and means operated by an accumulation of water in said chamber for causing a flow of water to an alarm.

17. The combination with a chamber having its bottom formed by a flexible diaphragm, and a normally closed supply-passage leading to said chamber, of a casing located below said diaphragm and separated therefrom by a perforated partition, said casing being provided with an inlet and an outlet, a valve located between said inlet and outlet and connected to said diaphragm, a second valve arranged to close the perforation in said partition when the first valve opens, and an open drip leading from the space between said partition and diaphragm.

18. The combination of a valve-casing provided with a main supply-passage and with a supplementary outlet-passage, a check-valve normally closing said supply-passage, a supplementary valve normally closing said supplementary outlet-passage, and connections between said valves whereby the latter is opened by the opening of the former, a chamber connected to said supplementary outlet-passage and provided with a movable wall, a casing having an inlet and an outlet and a normally closed valve separating the same, said valve being connected to the movable wall of said chamber, and connections between said inlet and a source of fluid-supply under pressure.

19. The combination of a valve-casing provided with a main supply-passage and with a supplementary outlet-passage, a check-valve normally closing said supply-passage, a supplementary valve normally closing said outlet-passage and means for causing the same to open upon the opening of said check-valve, a chamber having a movable wall, pipe connections between said chamber and supplementary outlet-passages, said pipe connections

being provided with a restricted opening and an open drip, a casing having an inlet and an outlet and a normally closed valve separating the same, said valve being connected to the movable wall of said chamber, and connections between the inlet to said casing and a source of fluid-supply under pressure.

In testimony whereof I have hereunto subscribed my name this 28th day of January, 1902.

HENRY A. FISKE.

Witnesses:

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