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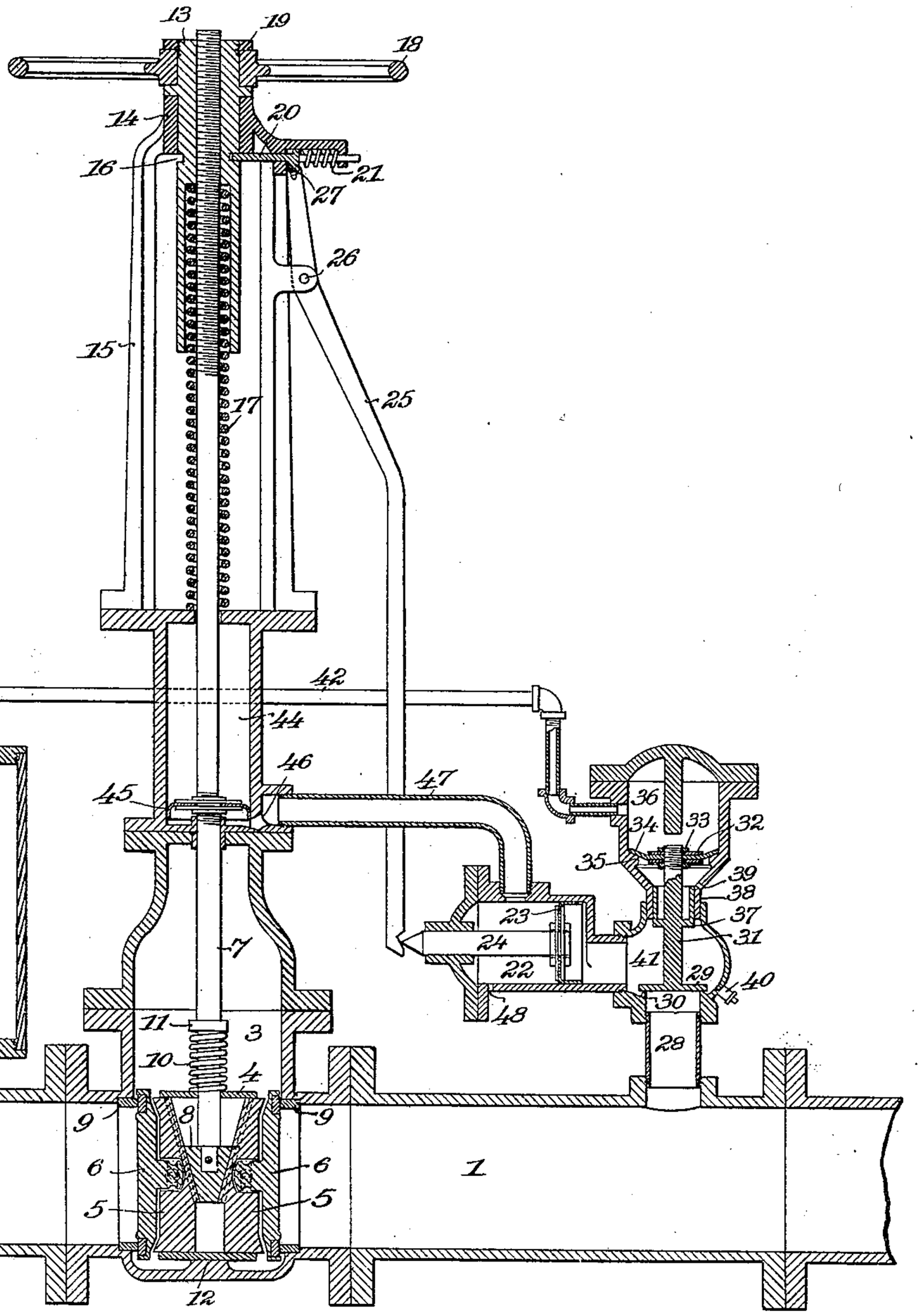
E. D. JEFFERSON.

SPRINKLER SYSTEM FOR AUTOMATIC FIRE EXTINGUISHERS.

(Application filed Jan. 13, 1902.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SPRINKLER SYSTEM FOR AUTOMATIC FIRE-EXTINGUISHERS.

SPECIFICATION forming part of Letters Patent No. 712,682, dated November 4, 1902.

Application filed January 13, 1902. Serial No. 89,552. (No model.)

To all whom it may concern:

Be it known that I, EUGENE D. JEFFERSON, a citizen of the United States, residing at Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Sprinkler Systems for Automatic Fire-Extinguishers; 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.

The present invention relates to a sprinkler system for automatic fire-extinguishers, and more particularly to what is known as the "dry-pipe" system, in which the distribution and sprinkler pipes are normally free from water.

The object of the present invention is to provide a sprinkler system of the above class with a valve normally closing the main water-supply which shall be quick and certain in action to permit the water in the main supply-pipe to enter the distribution and sprinkler pipes upon the presence of an abnormally high temperature at any point covered by the system.

To the above end the present invention consists, broadly, in the combination, with a water-supply pipe, a distribution-pipe, and a valve located between and connecting said pipes, of a mechanical device for opening the valve, a detent for holding the mechanical device from operation, and means for tripping the detent.

My invention also consists in certain other devices and combinations of devices hereinafter described and claimed.

While my invention is not limited to a sprinkler system embodying any particular form of valve for closing the main water-supply pipe, I prefer to employ in this connection a valve of the type shown in the accompanying drawings, which is located between the supply and distribution pipes, as will be now more fully described.

1 represents the water-supply pipe, and 2 the distribution-pipe, to which are connected the various sprinkler-pipes leading to the sprinkler-heads. Located between the supply-pipe and the distribution-pipe is the valve, which is normally held closed, but which is arranged to be opened by means of a heavy spring, as will hereinafter be described.

3 represents the valve-chamber, within which the carrier 4 is arranged to be moved. Mounted within the carrier are the valve-actuating members 5, to which are connected by a pin-and-groove connection the valves 6.

7 is the valve-spindle, to the lower end of which is secured the wedge-block 8. This block is provided with grooves which engage correspondingly-shaped projections on the members 5, the arrangement being such that when the spindle, with its block 8, is raised or lowered the members 5 and their valves 6 will be moved toward or from each other to be unseated or seated upon their valve-seats 9. A spring 10, engaging at one end the collar 11, secured to the valve-spindle, and at the other the top of the carrier 4, prevents the carrier from rising during the first portion of the upward movement of the spindle 7, thus insuring the withdrawal of the valves from their seats before they are raised with the carrier in the valve-chamber 3. This spring also prevents the valves from being moved outward until the bottom of the carrier engages the stop or abutment 12 at the bottom of the valve-chamber when the spindle is depressed.

Although in the illustrated embodiment of my invention I have shown a coiled spring for actuating the valve, I do not limit myself thereto, as any other suitable equivalent mechanical device may be employed. In the construction shown in the drawings the valve-spindle is raised to open the valve in the following manner: Upon the left-hand screw-threaded upper portion of the valve-spindle is mounted the internally-threaded sleeve 13, which is arranged to be rotated and moved longitudinally in a bearing 14 in the upper end of the frame 15. This sleeve is provided with a groove or slot 16 and is preferably counterbored, as shown, to receive one end of a heavy coiled spring 17, the other end engaging a fixed abutment. A hand-wheel 18 is secured upon the squared end of the sleeve by means of a nut 19. A detent 20, mounted to slide in bearings in the frame 15, is normally pressed inward by the spring 21 and engages the groove 16 in the sleeve 13 to hold the valve closed. When the detent is with-

drawn, the sleeve 13 will be forced upward in its bearing 14 by the spring 17, carrying with it the spindle 7 and opening the valve.

My invention also contemplates the employment, in conjunction with the mechanical devices for actuating the valve, of a hydraulic device acting as a dash-pot for checking the opening movement of the valve when the mechanical device acts to open the valve and by means of which hydraulic device the water-pressure in the supply-pipe may be availed of to actuate the valve in case the mechanical actuating device fails to work, as will be hereinafter described.

While my invention contemplates the use of any automatic mechanism for withdrawing the detent to open the valve, I prefer to employ in this connection mechanism controlled by the air-pressure in the distribution and sprinkler pipes and actuated by the water-pressure in the water-supply pipe. Such means in the illustrated embodiment of my invention consist of a cylinder 22, within which is mounted the piston 23 and piston-rod 24, operatively connected with a lever 25, pivoted to the frame 15 at 26 and connected to the detent 20 by a pin-and-slot connection 27, said lever being actuated by the end of the piston-rod 24 to withdraw the detent to open the valve. The piston 23 is actuated by the water-pressure in the supply-pipe 1 through a connection 28. Located between the cylinder 22 and connection 28 is the valve 29, which is normally held in contact with its seat 30 to close the connection 28. Mounted upon the upper end of the valve-spindle 31 and between the metal washer 32 and securing-nuts 33 is the flexible piston or diaphragm 34. This diaphragm engages near its edge the flange 35 on the wall of the air-chamber 36. The area of the diaphragm is so proportioned with respect to the area of the valve 29 that the total downward pressure exerted by the air on the diaphragm shall exceed the total upward pressure of the water on the valve 29, so that the valve will normally be held closed. In the drawings the area of the diaphragm is somewhat more than four times the area of the valve 29, as the water-pressure is supposed to be eighty pounds per square inch and the air-pressure twenty pounds per square inch. The valve is guided in its vertical movement by means of the cylindrical guide 37 and bearing 38. An aperture 39 is formed in the wall of the air-chamber 36 to carry off any water which may leak between the guide 37 and bearing 38 when the valve is opened, as it is desirable that the piston or diaphragm 34 be kept dry. An automatic drip-cock 40 is provided, which is normally open to drain off the water from the cylinder 22 and valve-chamber 41, but which closes under the full water-pressure when the valve is open. The air-chamber 36 is connected with the distribution-pipe 2 by the connection 42, an air-chamber 43 being provided, which will prevent water from being carried into the air-chamber 36 when the distribution-pipe is filled with water under the full pressure.

The auxiliary device to insure the opening of the valve if the spring 17 should fail to act for any reason consists of a cylinder 44, through which the spindle 7 of the valve passes. Secured upon the spindle is the piston 45, to the under side of which the water from the supply-pipe is applied through a port 46 and connection 47 with the cylinder 22. As shown in the drawings, this connection enters the cylinder through a port located at such a point that the water can enter this connection only after the piston 23 has been moved to the left far enough to actuate the lever 25 and withdraw the detent 20 from the groove 16 in the sleeve 13. Thus the auxiliary valve-actuator is never rendered operative until the valve is free to be raised. An aperture 48 in the lower wall of the cylinder 22 is provided, through which the water may flow out of the cylinder 22, connection 47, and cylinder 44. This aperture also permits air to be drawn through cylinders 22 and connection 47 into cylinder 44 when the piston 45 is forced upward by spring 17.

The air-pressure in the distribution and sprinkler pipes is maintained at the desired amount in any suitable manner, preferably by an automatic pump such as is commonly used with devices of the class to which the present invention relates.

The operation of the illustrated embodiment of my improved sprinkler system is as follows: Assuming the parts to be in the position shown in the drawings, with an air-pressure of twenty pounds per square inch in the distribution and sprinkler pipes and a water-pressure of eighty pounds per square inch in the water-supply pipe, the valve will be held closed as long as air-pressure is maintained. When, however, one of the sprinkler-heads is opened by the abnormal heat, due to the presence of a fire, the air-pressure in the sprinkler and distribution pipes, as well as in the air-chamber 36, at once drops. The upward pressure upon the valve 29 now exceeds the downward pressure upon the flexible piston or diaphragm 34 and the valve is opened and the water from the water-supply pipe enters the valve-chamber 41 and cylinder 22 and forces the piston 23 and piston-rod 24 to the left to actuate the lever 25 to withdraw the detent 20 from the groove in the sleeve 13. The spring 17 at once carries the sleeve 13 and spindle 7 upward, withdrawing the valves 6 from their seats and then raising the carrier and valves from between the supply and distribution pipes. As the spindle 7 rises the piston 45 is carried upwardly in cylinder 44, free communication between the bottom of the cylinder and the open air being maintained through the port 46, connection 47, cylinder 22, and aperture 48. When the valve is raised, the water at once fills the distribution and sprinkler pipes and escapes

through whatever sprinkler-heads may have been opened by the heat from the fire. The water in the distribution-pipe rises in the chamber 43, compressing the air in the chamber, connection 42, and the air-chamber 36 until the air-pressure equals the water-pressure, when the air-chamber 43 shall be about two-thirds filled with water. As soon as the pressure in the air-chamber 36 reaches twenty pounds the spindle 31 will be forced downward and the valve 29 closed. The pressure in the valve-chamber 41 and cylinder 22 will fall owing to leakage until the automatic drip-cock 40 is opened. When it is desired to close the valve between the supply and distribution pipes—that is, after the fire has been extinguished—the main or hydrant valve (not shown) in the supply-pipe 1 is closed, the water is drained off from the distribution and sprinkler pipes, and the normal air-pressure is reëstablished. The piston-rod 24 and piston 23 are then pushed back manually until they occupy the position shown in the drawings, the lower end of the lever 25 being still retained in its left-hand position as the detent 20 engages the sleeve 13 at some point below the groove 16. The hand-wheel is then rotated to the left, screwing the sleeve 13 down upon the threaded spindle 7 as the latter is held from upward movement by the collar 11, which engages the top of the valve-chamber 3. As soon as the groove 16 comes opposite the detent 20 the latter will be moved into the groove by the spring 21, at the same time swinging the lever 25 until its lower end is in engagement with the piston-rod 24. By rotating the sleeve 13 in the opposite direction—that is, to the right—the spindle 7 will be forced downward as the sleeve is held from upward movement by means of the detent 20. The continued downward movement of the spindle 7 after the carrier strikes the abutment 12 will force the valves outwardly into engagement with their respective valve-seats. The downward movement of the spindle, and with it the piston 45, forces out from the cylinder 44 through the port 46 and connection 47 any water which may have entered the cylinder, and this water will be drained off from cylinder 22 through the aperture 40. The main or hydrant valve (not shown) is then opened, and the apparatus is ready to operate again upon the breaking out of a fire. If for any reason the spring 17 failed to raise the spindle 7 after the detent 20 has been withdrawn from the groove 16 in the sleeve 13, the auxiliary actuating device is rendered operative, and the full water-pressure in the supply-pipe 1 will be applied to the piston 45 in the cylinder 44 as soon as the piston 23 in the cylinder 22 has uncovered the port of the connection 47, and the spindle 7 will be raised and the main valve opened with only a short delay.

So far as I am aware of the prior art I am the first to provide a sprinkler system for automatic fire-extinguishers with a gate-valve located between the supply and distribution pipes in which the valves are first withdrawn from their seats and are then raised bodily from between the valve-openings. By the use of such a valve I am enabled absolutely to prevent all leakage, providing a free and uninterrupted passage of the water from the supply to the distribution pipes and at the same time making the valve easy to actuate, as there are no sliding parts held in close contact by the pressure of the water, thus insuring quickness and certainty in operation.

Although, as shown and described, the distribution and sprinkler pipes normally contain air under pressure which controls the operation of the sprinkler system, nevertheless my invention is not limited to such a construction, as it may be employed in other connections and with different forms of sprinkler systems.

Although I have shown and described my invention as embodied in a sprinkler system in which a positive air-pressure is maintained in the pipes, it is not limited thereto, as it is within the scope of my invention to maintain a negative pressure—that is, partial vacuum—therein, the necessary changes being clearly within the skill of the average mechanic skilled in this art.

Wherever in the specification and claims I have used the term "mechanical means" or "mechanical device" as descriptive of the means for actuating the main valve I intend thereby to define such means as operating mechanically, as under the influence of a spring or equivalent device, in contradistinction to hydraulic devices.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States—

1. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, a detent for holding the mechanical device from operating, and means for tripping the detent actuated by the water-pressure in the supply-pipe, substantially as described.

2. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, a detent for holding the mechanical device from operating, and means for tripping the detent actuated by the water-pressure in the supply-pipe and controlled by the air-pressure in the distribution-pipe, substantially as described.

3. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, and an auxiliary hydraulic device for opening the valve acting as a dash-pot for checking the opening movement of the valve when the me-

chanical device acts to open the valve, substantially as described.

4. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, a detent for holding the mechanical device from operating, means for tripping the detent, and means for applying, after the detent has been tripped, the water-pressure in the water-supply pipe to assist in opening the valve, substantially as described.

5. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, said valve comprising a threaded valve-spindle, an internally-threaded sleeve mounted thereon, a spring engaging at one end the sleeve and at the other a fixed abutment, means for rotating the sleeve, a stop on the valve-spindle, a detent for the sleeve, and means for tripping the detent, substantially as described.

6. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a spring for opening the valve, a detent for holding the spring from operating, a hydraulic device for opening the valve, and a device for tripping the detent and for actuating the hydraulic device, substantially as described.

7. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, a detent for holding the mechanical device from operating, a hydraulic device for opening the valve, and means controlled by the air-pressure in the distribution-pipe for tripping the detent and for actuating the hydraulic device, substantially as described.

8. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, a mechanical device for opening the valve, an auxiliary hydraulic device for opening the valve and a common actuating means for said devices, substantially as described.

9. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a valve located between and connecting said pipes, valve-actuating mechanism comprising a cylinder and a valve-spindle provided with a piston in said cylinder, connections normally closed between the cylinder and the water-supply pipe, a spring for opening the valve, a detent, and automatic mechanism for actuating the detent and for opening the connection between the cylinder and the water-supply pipe, substantially as described.

10. A sprinkler system for automatic fire-extinguishers, having, in combination, a water-supply pipe, a distribution-pipe, a gate-valve between said pipes provided with valve-seats and retractable valve members, valve-opening means acting positively first to withdraw the valve members from their seats and then to lift them from between the pipes, and devices actuated by the water-pressure in the supply-pipe acting automatically to throw the valve-opening means into operation, substantially as described.

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

EUGENE D. JEFFERSON.

Witnesses:
FRED O. FISH,
ALFRED H. HILDRETH.