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E. L. THOMPSON.

AUTOMATIC SPRINKLER SYSTEM.

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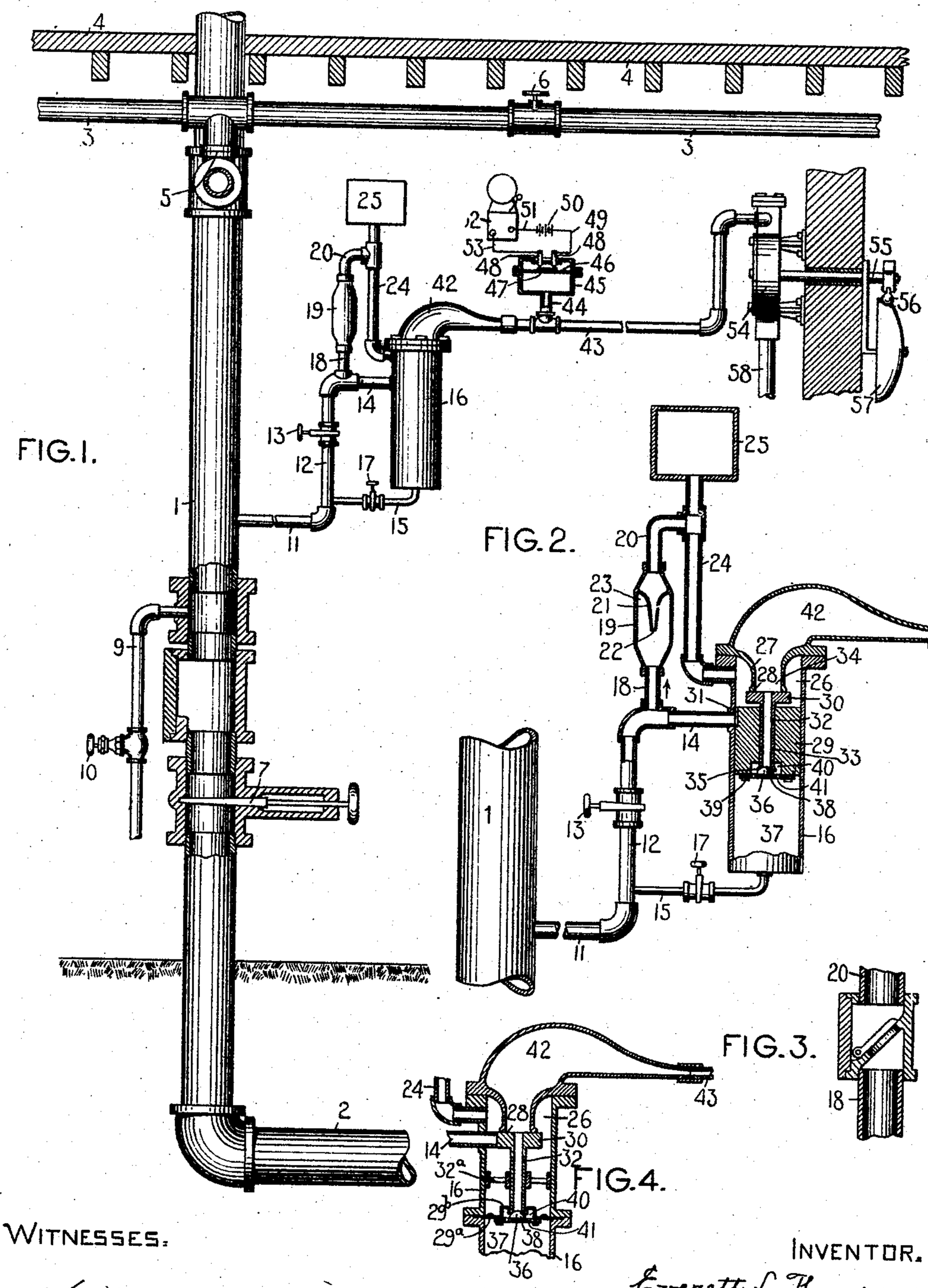

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

WITNESSES.

K. V. Donovan.

Charles E. Smith

INVENTOR.

Everett L. Thompson

by Jacob Felbel

HIS ATTORNEY

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UNITED STATES PATENT OFFICE.

EVERETT L. THOMPSON, OF BENSONHURST, NEW YORK.

AUTOMATIC SPRINKLER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 782,531, dated February 14, 1905.

Application filed April 17, 1902. Serial No. 103,282.

To all whom it may concern:

Be it known that I, EVERETT L. THOMPSON, a citizen of the United States, and a resident of Bensonhurst, borough of Brooklyn, city of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Automatic Sprinkler Systems, of which the following is a specification.

My invention relates to automatically-operated means for controlling the alarm mechanisms of fire-extinguishing systems, and more particularly of wet-pipe sprinkler systems.

Heretofore it has been common to employ a check-valve in the supply-main or stand-pipe of a sprinkler system to control the operations of the alarm mechanism; but this is objectionable, first, because there is liability of a false alarm being sounded by leakage in the sprinkler system, by a varying water-pressure, or by a water-hammer; secondly, because the employment of such a check-valve offers an obstruction to the free flow of water through the main or stand-pipe which supplies the system, and, thirdly, because of the liability of such valve to stick to its seat and prevent the water from entering the sprinkler system, thus leaving the latter inoperative and useless in the event of a fire. Attempts have heretofore been made to prevent a false operation of the alarm mechanism by water-hammer or varying pressure by providing for the flow of a small quantity of water past the valve in the main or stand-pipe (insufficient, however, to actuate the alarm mechanism) and by carrying off such water through a drip-pipe; but this mode of curing the defects encountered in the employment of a check-valve in the main or stand-pipe of the sprinkler system proper is objectionable and undesirable, as it causes a constant loss of water when there is a varying pressure or where a water-hammer occurs.

One of the main objects of my invention is to dispense with the check-valve in the main or stand-pipe and to provide a simple and efficient alarm-controlling mechanism which is not open to the objections existing in other systems or constructions.

To these and other ends, which will hereinafter appear, my invention consist in the novel construction, arrangement, and combination of parts hereinafter described and claimed.

In the accompanying drawings, wherein like reference characters represent like parts in the various views, Figure 1 is a fragmentary front elevation, with parts broken away, of a wet-pipe sprinkler system illustrating my alarm system applied thereto. Fig. 2 is an enlarged detail vertical sectional view of the alarm-controlling device. Fig. 3 is an enlarged detail vertical or longitudinal sectional view of a check-valve which may be used in place of the so-called "choke-water" device, as will hereinafter appear; and Fig. 4 is a modification.

My present invention is particularly available in wet-pipe fire-extinguishing systems in which city-water or other sources of supply are employed wherein the system is subjected to water-hammer and a variation in the water-pressure is constantly occuring. It should be understood, however, that the mechanism will work with equal efficiency where the water is supplied from a tank on the roof of the building or the pressure is a constant one.

In Fig. 1, which illustrates a sufficient number of parts of a wet-pipe fire-extinguishing system to illustrate my invention in its application thereto, 1 indicates the stand-pipe, which may be supplied from a suitable supply-pipe 2, and this stand-pipe extends from the connections to the highest point in the building, where the sprinkler or distributing-pipes 3 are located. The sprinkler-pipes are supported near the ceiling 4 of each story of the building and are each connected to the stand-pipe, as indicated at 5, and suitable sprinkler-nozzles 6 are located at intervals throughout the pipes 3. A hand-operated gate-valve 7 may be employed in the stand-pipe to control the flow of water thereto from the supply-pipe 2, and a drip-pipe 9 may be connected to the stand-pipe and provided with a suitable hand-operated valve 10 to drain the system when desired. Communicating with the stand-pipe 1 is a comparatively small branch pipe 11, which in turn communicates

with an upright pipe 12, in which a hand-operated gate-valve 13 is located. Communicating with the pipe 12 are laterally-extending branch pipes 14 and 15, the pipe 15 being comparatively small. These pipes 14 and 15 are located upon opposite sides of the valve 13 and communicate with a cylinder 16, and the branch pipe 15 has a hand-controlled gate-valve 17 therein, by means of which communication can be shut off between the stand-pipe and the cylinder through the pipe 15. Extending upwardly from the pipe 14 and communicating therewith is a pipe 18, which communicates with a so-called "choke-water" device that comprises a shell or casing 19, connected at its lower end to said pipe 18 and at its upper end to a pipe 20. This casing is of larger diameter than the pipes 18 and 20, with which it is connected, and contains a tapering nozzle 21, that is projected in the direction from which water is received from the stand-pipe. This nozzle cuts off communication between the pipes 18 and 20 except through the contracted opening 22 therein. It will be observed that a chamber 23 is formed between the outer surface of the nozzle and the inner surface of the shell 19 to form an air-chamber or pocket to counteract the tendency of a variation of pressure or a water-hammer to unseat the automatically-operated controlling-valve in the cylinder 16. The upper end of the pipe 20 communicates with an upright pipe 24, that is connected at its upper end with a storage pressure-tank 25, and the lower end of said pipe communicates with the upper end of the cylinder 16 at that portion thereof in which a chamber 26 is formed by the walls of the cylinder, the extension 27 of the valve-seat 28, and the double valve. This double automatically-operated controlling-valve comprises a main piston-valve 29 and an auxiliary valve 30. The main valve 29 is adapted to move up and down in the cylinder, and when the valves are closed, as indicated in Fig. 2, the main valve covers the port or opening where the branch pipe 14 communicates with the cylinder 16. A very small groove 31 (which for clearness' sake is shown exaggerated in Fig. 2) may be provided in the outer surface of the main piston-valve 29 at that portion thereof which covers the pipe 14, so that water can leak or pass slowly to the chamber 26 from the stand-pipe through the pipes 11, 12, and 14 and from the chamber 26 to the pressure tank or chamber 25; but if the groove or passage 31 be omitted water will pass to the pressure-tank 25 through pipe 18, the small opening 22 in the choke-water device and pipe 20. Various other methods of permitting water to flow slowly from the stand-pipe to the pressure-tank 25 may, however, be adopted—as, for instance, the main piston-valve 29 may be fitted sufficiently loose in the cylinder to permit a very small flow of water around and past it from beneath the piston-valve or past it from the pipe 14 or from both sources, it being understood in any event that the water which passes the main valve and flows through the chamber 26 to the pressure-chamber 25 proceeds from the stand-pipe 1. Then, again, the stem 32 of valve 30 may be fitted sufficiently loose within the main valve to permit a small flow of water through the chamber 26 to the storage-tank 25. Any one or more of these means may be employed for this purpose; but when the choke-water device is employed, as shown, there is no necessity of resorting to any of the other methods shown and described for storing the tank 25 from the main system, and in that event it might be preferable to omit the groove or channel 31, so that the main valve may fully and efficiently block the outlet of the pipe 14 when the valves are seated and receive the full force of any variation of water-pressure or water-hammer which might come against the side of the main valve. When any of the sources or means pointed out above other than the check-valve or choke-water device are relied upon to permit water to flow to the storage-tank from the main system, the pipes 18 and 20 and intermediate choke-water device or check-valve may be omitted, and hence there will be no connection between the pipes 14 and 24 excepting through the cylinder 16. The hollow stem 32 of the auxiliary valve 30 is contained within a central bore 33 of the main valve and extends to opposite sides of the said valve. The face of the auxiliary valve is adapted to bear on the valve-seat 28 and cut off communication between the chamber 26 and the opening 34 through said valve-seat. The lower end of the stem 32 of the auxiliary valve is provided with a valve-seat 35, which is adapted to coöperate with the valve-face 36 to cut off the flow of water from the chamber 37 in the cylinder beneath the main piston-valve through the hollow stem. The valve 36 is on a plate 38, which is secured at 39 to the under face of the piston-valve over a recess 40 therein. The plate 38 has a series of openings 41 for the free passage of water therethrough. The outwardly-extending flange on the valve-stem 32, which is formed by the valve-seat 35 at the lower end thereof, is effective to limit the movement of the main and auxiliary valves with relation to each other in one direction, whereas the contact between the valve-face 36 and the valve-seat 35 limits the relative movement of the main and auxiliary valves in an opposite direction. The opening 34 through the valve-seat 28 leads through a chamber or outlet 42, which communicates with a pipe 43, that leads to the various alarm devices. Thus upon reference to Fig. 1 it will be seen that the pipe 43 communicates by a branch pipe 44 with a chamber 45, having a diaphragm 46, that carries a contact 47, adapted to bear upon the two

contact insulated studs 48, one of which is connected to a wire 49, that leads to one pole of an electric battery 50, a wire 51 leading from the other pole of the battery to an electric bell or alarm device 52. A wire 53 extends from the other contact-stud 48 to the electric alarm device 52 and completes the circuit. This alarm is sounded when water is admitted to the chamber 45 and moves the diaphragm so as to bring the contact 47 thereon to bear upon the contact-studs 48, and thus close the circuit. The pipe 43 leads to a suitable water-motor 54, which is adapted to rotate the shaft 55, that carries a bell-hammer 56, and the hammer during the rotation of the shaft strikes a bell 57, and thus mechanical means are provided for sounding an alarm in addition to the electric means already described when water flows through the pipe 43. After the water passes the water wheel or motor it may be conveyed off through a pipe 58.

When the system is to be set or prepared ready for operation, the valve 17 will be opened and the valve 13 closed. The valve 7, which controls the admission of water from the source of supply to the stand-pipe, is then opened to admit water thereto. Water will then fill all of the sprinkler-pipes 3 and will flow through the pipes 11 and 15 to the cylinder 16 beneath the piston-valve 29, and the pressure of water thereon will force it upwardly, together with the auxiliary valve 30, thus bringing the valve-face of the latter against its seat and closing communication between the chamber 26 and the alarm mechanism. During this seating movement of the duplex or compound valve the valve-face 36, carried by the main valve, will be brought to bear on the valve-seat 35 of the auxiliary valve, thereby cutting off communication through the hollow stem of the auxiliary valve between the chamber 37 in the cylinder and the chamber 42, which leads to the alarm mechanism. It will thus be seen that the fluid-pressure on the valves maintains them seated and cuts off all communication between the stand-pipe or the system proper and the alarm mechanism. The valve 13 may now be opened, and water will flow into the choke-water or water-hammer destroying device and through the small opening 22 therein to the pressure-tank 25, when such device is employed, and may also flow from pipe 14 very slowly past the main piston-valve through the chamber 26 and into the pressure-chamber 25 when such means are relied upon to store pressure in the chamber or tank 25. It will be seen that the water-pressure upon opposite sides of the double controlling-valve is equal after sufficient water has flowed to the pressure-tank to balance the pressure in the rest of the system. At this time a uniform water-pressure will exist throughout the entire system. It should be understood, however, that the surface area of the double valve exposed within the chamber 26 (when the valves are closed) is less than that presented within the chamber 37 or at the lower side of the piston-valve, so that the valves are positively maintained on their seats. When a fire occurs and one or more of the nozzles 6 are opened, water will flow therefrom, and there will be a reduction of pressure in the entire system proper of, say, five pounds. This reduction of pressure will result in a corresponding reduction of pressure in the chamber 37 beneath the piston-valve 29, because this chamber is in open communication with the system proper. The choke-water device and the piston-valve 29, which at this time closes the port by which the pipe 14 communicates with the cylinder, will prevent a corresponding reduction of pressure above the valve 29, so that as the pressure is reduced in the chamber 37 beneath said valve 29 the stored pressure in the pressure-chamber 25 will be exerted upon the upper face of this valve through the pipe 24 and chamber 26 and move said valve downwardly. The downward movement of the main valve will move the valve-face 36 off the seat 35 of the auxiliary valve, and water will flow freely from chamber 37 through the hollow stem of the auxiliary valve and through the chamber 42 to the alarm mechanism. This flow of water through the valve-stem has the effect of further reducing the pressure in the chamber 37 beneath the piston-cylinder, and the pressure exerted from the pressure-tank will therefore be effective to move the piston-valve down farther and withdraw the valve 30 from its seat and uncover the port in the cylinder which communicates with the pipe 14, thus permitting a large body of water to flow from the stand-pipe and from the pressure-tank 25 through the opening in the valve-seat 28 and thence through the chamber 42 and pipe 43 to the alarm devices, where it will actuate both the electrical and mechanical alarms.

While I have pointed out that a small channel 31 may be employed in the piston-valve 29, it should be understood that when the parts are in the normal or closed position (illustrated in Fig. 2) the said piston-valve practically closes or blocks the port or opening to the pipe 14 and that any sudden variation of water-pressure or a water-hammer has no effect upon the upper side of the double controlling-valve and cannot be exerted to dislodge it from its seat, the impact of a water-hammer being received against the side of the piston-valve through the pipe 14. When the choke-water device is employed, the impact will be received and destroyed thereby and the valves will remain closed. The choke-water device, however, acts as a means for retarding or checking the backflow of water from the pressure chamber or tank 25 when the sprinkler-nozzles are opened and a reduction of the pressure in the system takes place,

so as to enable the pressure maintained in the tank 25 to be exerted upon the upper face of the double controlling-valve and assist in the opening or unseating movement thereof when a reduction of pressure takes place on the opposite side of the valve or within the chamber 37 of the cylinder. Instead of this choke-water device I may, however, employ any ordinary check-valve, such as is illustrated in Fig. 3, the valve closing against the pressure in the tank—that is to say, the valve will open when water flows from the stand-pipe to the pressure-tank through the pipes 11, 12, 18, and 20, but will be seated by a pressure exerted in the opposite direction.

Various changes in details of construction and arrangement may be made without departing from the spirit of my invention. Broader claims are made in a companion case based on a specifically different construction and arrangement.

Referring now to Fig. 4, it will be observed that a diaphragm-valve is used instead of a piston-valve and that the inlet-pipe 14 terminates at the side of the auxiliary valve 30, so as to destroy the effect of water-hammer or excessive pressure in the main system; but in other respects it will be noted that the structure is substantially the same as that exhibited in the remaining views. The diaphragm 29^a may be made of suitable size and sufficiently flexible to get the necessary amount of motion and carries at its under side the plate 38, which is perforated at 41, so as to admit water into the chamber or recess 40, formed by the raised and flanged portions 29^b of the diaphragm. The plate 38 carries the valve 36, which is adapted to seat against the lower end of the auxiliary valve-stem 32, which latter in this instance may be guided by the hub of a spider 32^a within the cylinder 16, which in this case is preferably made in two parts with flanges so as to clamp the edge of the diaphragm. The action or mode of operation of the construction shown in Fig. 4 is substantially the same as that shown in Fig. 2—that is to say, briefly, when pressure in the chamber 37 is reduced or relieved the pressure above the diaphragm will first unseat the valve-face 36 and enable a flow of water through the hollow stem of the auxiliary valve, but subsequently as the downward motion of the center of the diaphragm increases the flange 29^b, acting against the flange at the lower end of the valve-stem where the valve-face 36 seats, will move the auxiliary valve 30 downwardly, so as to uncover its port and also the inner end of the pipe 14, whereupon the water may flow from the latter and from the pipe 24 through the outlet 42 to the alarm devices.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a sprinkler system, of a compound valve, means for maintaining a fluid-pressure on opposite sides thereof, means for enabling one member of the valve to move when the pressure on one side thereof is reduced, and means for simultaneously enabling a portion of the fluid to flow past the other member of the valve before it is unseated.

2. The combination with a sprinkler system, of a compound valve, means for maintaining a fluid-pressure on opposite sides thereof, alarm mechanism, an outlet thereto from said valve and which normally is closed by one member thereof, means for enabling the other member of said valve to move when there is a reduction of pressure on the side of said member opposite said outlet, and means for simultaneously permitting a portion of the fluid to move into said outlet past the valve member controlling the same before the unseating thereof.

3. In a sprinkler system, the combination with the said system, of a compound valve arranged exteriorly thereof, means communicating with said system and said valve for maintaining a fluid-pressure on opposite sides of said valve, means for enabling one member of the valve to move ahead of the other when there is a reduction of pressure in the system, and means for enabling part of the fluid to escape past said other valve member before it moves and for the purpose of enabling it to unseat more rapidly.

4. The combination with a sprinkler system, of a compound valve, means for affording a fluid-pressure on opposite sides of said valve when it is closed, means for affording a storage of fluid-pressure when the valve is seated, and means for affording an initial movement of fluid past said valve before it is unseated and when pressure on one side of the valve is reduced and for exerting the stored pressure to assist in unseating the valve.

5. The combination with a sprinkler system, of a valve, means for affording a fluid-pressure on opposite sides of said valve when it is closed, alarm mechanism, a source of fluid communication to said alarm mechanism which is adapted to be closed by said valve, means for affording a storage of fluid-pressure when the valve is seated, and means for affording an initial movement of fluid past said valve before it is unseated and when pressure on one side of the valve is reduced and for exerting the stored pressure to assist in unseating the valve, and to actuate the alarm mechanism when the valve is unseated.

6. The combination with a sprinkler system, of a valve, means for affording a fluid-pressure on opposite sides of said valve when it is closed, alarm mechanism, a source of fluid communication to said alarm mechanism which is adapted to be closed by said valve, a storage-tank in which fluid-pressure is stored when the valve is seated, means for affording an initial movement of fluid past said valve before it is unseated and when pressure in the sprinkler

system is reduced and for exerting the stored pressure to assist in unseating the valve, and to actuate the alarm mechanism when the valve is unseated, and means for affording a flow of fluid from the sprinkler system to the alarm mechanism when said valve is unseated to assist in actuating the alarm mechanism.

7. The combination with a sprinkler system, of a combined double valve and means for unseating one valve by a direct water-pressure thereon when pressure is reduced on one side of the valve and causing it to act to unseat the other valve.

8. The combination with a sprinkler system, of a double valve, means for maintaining an equal fluid-pressure on opposite sides of said double valve, means for unseating one valve when pressure is reduced on one side thereof and permitting fluid to pass it and thereby assist in the automatic unseating of the other valve.

9. The combination with a sprinkler system, of a double valve, means for maintaining an equal fluid-pressure on opposite sides of said double valve, a storage-tank in which fluid is stored when both valves are seated, means for unseating one valve when pressure is reduced on one side thereof and permitting an initial flow of fluid to pass it to assist in the automatic unseating of the other valve, and means for enabling the stored pressure to assist in unseating the second-mentioned valve.

10. The combination of alarm mechanism, two valves one carried by the other, means for maintaining an equal fluid-pressure on opposite sides of said valves when they are seated, means for unseating one valve when pressure is reduced on one side thereof and permitting fluid to pass it to assist in unseating the other valve, and means for enabling a free flow of fluid to the alarm mechanism when said last-mentioned valve is unseated.

11. The combination with a sprinkler system, of alarm mechanism, two valves, one carried by the other, means for maintaining an equal fluid-pressure on opposite sides of said valves when they are seated, a storage-tank in which fluid-pressure is stored when both of said valves are seated, means for unseating one valve when pressure is reduced on one side thereof and permitting fluid to pass it and thereby assist in unseating the other valve, and means for enabling a free flow of fluid to the alarm mechanism from the storage-tank and from the sprinkler system when said last-mentioned valve is unseated.

12. The combination with a sprinkler system, of a fixed valve-seat, two valves one working within the other and having a limited movement relatively thereto, and one of said valves being adapted to be seated on the fixed valve-seat and to act as seat for the other valve.

13. The combination with a sprinkler system, of an automatically-operated piston-valve, an auxiliary valve carried by and coöperating therewith, means for affording an independent relative movement of said valves when pressure is reduced on one side thereof.

14. The combination with a sprinkler system, of an automatically-operated main valve having an opening therethrough, an auxiliary valve carried by and coöperating therewith to close the opening through said main valve when the valves are seated and means for affording an independent relative movement of said valves when pressure is reduced on one side thereof and for permitting a free flow of water through the opening in the main valve.

15. The combination with a sprinkler system, of a piston-valve, having an aperture extending therethrough, and a second valve having a hollow stem which extends through the aperture in said first-mentioned valve and which is adapted to be closed by a valve-face on the piston-valve.

16. In a sprinkler system, the combination with a cylinder and a fixed valve-seat therein, of a piston-valve having an aperture extending therethrough, a second valve adapted to said fixed seat and having a hollow stem which extends through the aperture in said first-mentioned valve and is adapted to be closed by a valve-face on the piston-valve.

17. The combination with a sprinkler system, of a valve having an opening extending therethrough, a second valve having a hollow stem which extends through and works loosely in the aperture of the first-mentioned valve, and a valve-seat on one end of said hollow stem which is adapted to be closed by a valve-face on the other valve.

18. In a sprinkler system, the combination with a cylinder and a fixed valve-seat therein, of a piston-valve having an opening extending therethrough, a second valve adapted to said fixed seat and having a hollow stem which extends through and works loosely in the aperture of the first-mentioned valve, a valve-seat on one end of said hollow stem and a valve-face on the piston-valve.

19. In a sprinkler system, the combination with a sprinkler system, of a plurality of automatically-operated coöperating controlling-valves, means for maintaining pressure upon opposite sides of said valves when they are seated to maintain the valves on their seats, and means for affording a relatively freer movement of the fluid on one side of the valves than on the other, to unseat the valves successively when there is a reduction of pressure in the system.

20. The combination with a sprinkler system, of a plurality of coöperating automatically-operated controlling-valves, means for maintaining a substantially equal pressure upon opposite sides of said valves when they are seated to retain the valves on their seats, means for affording a relatively freer movement of the fluid on one side of the valves than on the other to unseat the valves succes-

sively when there is a reduction of pressure in the system, alarm mechanism, and means for admitting a flow of fluid to the alarm mechanism to actuate it when the valves are unseated.

21. The combination with a sprinkler system, of a main valve, an auxiliary valve carried thereby, fluid-pressure for maintaining said valves on their seats, means which enable a movement of said valves from their seats when the pressure on one side of the valves is reduced, means for storing fluid-pressure when the valves are seated and for utilizing the stored pressure to assist in the unseating of the valves.

22. The combination with a sprinkler system, of a main valve having a differential surface area on opposite sides, an auxiliary valve carried thereby, fluid-pressure on opposite sides of said valves, means which effect an opening of said valves when pressure on one side thereof is reduced, and means for storing fluid-pressure when the valves are seated.

23. The combination with a sprinkler system, of a cylinder, a compound valve which is maintained seated by fluid-pressure, branch pipes which lead from the system and which connect with the cylinder one on one side of the valve and the other transversely thereof and so as to be covered when the valve is on its seat, means for storing fluid-pressure when the valve is seated, and means which enable the valve to unseat when the pressure in the system is reduced and to uncover the transverse branch pipe.

24. The combination with a sprinkler system, of an alarm mechanism, a waterway leading thereto, a fixed valve-seat, a valve adapted thereto and to control said waterway, a piston surrounding the hollow stem of the first-mentioned valve and having a valve adapted to a seat on said stem, a valve-cylinder, a pipe entering said cylinder below the piston-valve, another pipe entering said cylinder transversely thereof, both said pipes being in open communication with the sprinkler system, a pressure-storage tank, a pipe leading therefrom to the upper portion of said cylinder above said valves, and means between said tank and said pipes which are in open communication with the sprinkler system proper for checking or holding the pressure in said tank when the pressure in the cylinder below the valves is reduced or relieved by the opening of one or more sprinkler-heads.

25. The combination with a sprinkler system, a pipe as 11 leading therefrom, pipes as 14 and 15 communicating with said outlet-pipe, a valve-cylinder, a piston having at its lower end a recess, a valve and openings to said recess and at its upper end a groove or recess opposite the inlet-pipe 14, a second valve having a hollow stem which at its lower end is formed or provided with a valve-seat, a fixed valve-seat for said second valve, an outlet through said valve-seat, alarm mechanism connected with said outlet, a pressure-storage tank, a pipe leading therefrom to the upper end of said cylinder and above the valves, a passage-way between said last-mentioned pipe and the pipe 14, and means in said passage-way for checking or holding the pressure in said tank when there is a reduction of pressure in the system and in the lower end of the valve-cylinder.

Signed in the borough of Manhattan, city of New York, in the county of New York and State of New York, this 15th day of April, A. D. 1902.

EVERETT L. THOMPSON.

Witnesses:
K. V. DONOVAN,
E. M. WELLS.