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AUTOMATIC PUMPING SPRINKLER SYSTEM.
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Be it known that I, JOHN R. HAMILTON, a citizen of the United States, residing at Yonkers, Westchester county, State of New York, have made a certain new and useful Invention Relating to Automatic Pumping Sprinkler Systems, of which the following is a specification, taken in connection with the accompanying drawing, which forms part of the same.

This invention relates especially to wet pipe automatic sprinkler systems, that is, fire extinguishing apparatus in which the distributing system is normally charged with non-freezing or other extinguishing liquid which is automatically supplied thereto in amounts to make up for leakage or the like by an automatic pumping mechanism which may be actuated by liquid under pressure from the city main or other main water pipe connected to the extinguishing system. In case a city connection or other municipal water system connection is used for this purpose, the pumping device may be of such type as to be actuated intermittently whenever a water hammer impulse or other pressure fluctuation occurs in the main so as to keep the distributing system always pumped up to the desired pressure.

In the accompanying drawings showing in a somewhat diagrammatic way illustrative embodiments of this invention,

Fig. 1 is an elevation partly in section through one form of apparatus; and

Fig. 2 is a similar view showing another arrangement.

The distributing system of any desired style and arrangement may comprise the riser 1 and one or more sprinkler lines 2 connected therewith and carrying automatic sprinkler heads or other distributing devices 3 arranged at the desired points throughout the building to be protected. The riser may be connected to the casing 63 of the main differential or alarm valve and this entire distributing system is preferably charged under the desired pressure with extinguishing liquid, which for some purposes is non-freezing; such for instance as a suitable solution of calcium chloride. The alarm valve may be of any desired construction and may comprise the valve 7 mounted on the arm 10 so as to swing about the pivot 11 in the casing and this valve may cooperate with the seat 9 controlling the passage 24 to the main water pipe 23, the valve also controlling through the yieldable washer or connection 8 the outer valve seat communicating with the differential or drip chamber 12. In this way the valve has the desired differential closing action, so that the desired proportionate increase of pressure must be exerted below before the valve will open. This drip chamber may be provided with a ball check drip valve 25 controlling the discharge from the drip pipe 26 and it is desirable for some purposes to have the steam connection communicate with this drip chamber, for which purpose the Siamese type connection 5 having the check valves 6 may communicate with this chamber 12. Under fire emergency conditions when fluid is discharged from the sprinkler heads the alarm valve opens, thus admitting liquid to the differential drip chamber which promptly forces the ball check valve 25 shut. This liquid can then exert pressure through the alarm connection 27, 28 so as to raise the diaphragm 29 and the connected electric contact 30 actuating the bell or other alarm signal 32 by the battery 31, for instance. Under these condition liquid also flows through the alarm pipe 34 so as to actuate the rotary gong 33 before this liquid escapes from the discharge 35 of the gong.

It is desirable in some cases to have a shut-off valve, such as 22, arranged below the differential or alarm valve, and if desired this shut-off valve may be of the automatic locking type described in greater detail in the Hamilton Patent 1,922,997, of April 10, 1917. This shut-off valve may have the stem 21 actuated by the valve operating wheel or handle 18 to which a locking ratchet 17 may be connected. Under normal inoperative conditions the closing movement of this wheel or operating handle is prevented by the locking pawl engaging this ratchet and mounted on the lever 16 connected as by the link 20 with a flexible control diaphragm 15 in the chamber 14. Under emergency conditions, however, the pressure in the drip chamber is transmitted through the control pipe 13 so as to raise this diaphragm 15 and release the locking pawl from the ratchet so that the shut-off valve may be manually closed as long as the system is in this emergency condition.
although this locking mechanism being enclosed in the chamber 19 cannot be manually released and this prevents the closing of this shut-off valve so long as the system remains in its normal charged inoperative condition.

Any suitable pump may be connected to the distributing system to supply thereto further amounts of the desired non-freezing or other extinguishing liquid from time to time to make up for slight leakage and so forth, and for this purpose it is highly desirable to have an automatic pump which will keep the distributing system properly charged without requiring frequent inspection or attention. A suitable pump for this purpose, which may be automatically operated by the usual pressure fluctuations or water hammer impulses occurring in city water mains may comprise any suitable power chamber and cooperating pumping chamber in which may be arranged one or more connected pistons, so that an impulse in the power chamber acts through these connections and devices to cause a pumping impulse or action in the pumping chamber. An illustrative form of such pump is shown in Fig. 1 as comprising a bracket 47 on which is mounted the expanding power chamber 50 of flexible or resilient corrugated sheet metal or other suitable material so that the pump piston or diaphragm 49 may thus move up and down in accordance with the pressure variations in this chamber. An opposed similarly constructed pumping chamber 48 is arranged above this piston and rigidly supported by the bracket 46, a suitable differential or return spring 70 being, if desired, arranged above this piston so as to normally force the same down with the desired differential pressure. A liquid supply tank, such as 37, containing the desired non-freezing extinguishing liquid 38, which may be supplied through the venting aperture 36 may be connected through the supply pipe 59 with the pumping chamber, a check valve 40 and control valve 41 being, if desired, arranged in this pipe. A supply connection, such as the pipe 45, may connect the pumping chamber with any desired part of the distributing system, such as the valve casing 63, a similar check valve 43 and control valve 44 being, if desired, arranged in this connection. The fluid to actuate the pump may be supplied thereto through the pump connection 51, 52. The inevitable water hammer impulses and other pressure fluctuations occurring in a city or similar water system to which the sprinkler apparatus may be connected through the main water pipe 28 are, of course, transmitted to the pump and act in the expanding power chamber to raise the piston or diaphragm whenever the pressure increases appreciably and this correspondingly reduces the volume of the pumping chamber so as to force therefrom into the distributing system a corresponding amount of non-freezing or other extinguishing liquid. When this momentary pressure increase in the water main ceases the pressure in the power chamber 50 correspondingly decreases and allows the pump piston 49 to fall so that a corresponding amount of liquid is withdrawn from the supply tank 37 past the check valve 40 and into the pumping chamber. The check valves 40, 43, determine the direction of flow of this liquid and the amount delivered at each pressure fluctuation in the water main may be more or less accurately controlled by adjusting the control valves 41 or 44 which throttle the passage of liquid and may be used to correspondingly decrease the amount pumped where the pressure fluctuations are undesirably frequent. This is, however, automatically taken care of in most instances by the fact that the resilience of the parts of the pump or the action of the differential return spring, or both combined, may be relied upon to stop the automatic pumping action when the pressure in the distributing system reaches the desired proportion of the pressure in the main water pipe. When this desired distributing system pressure has been reached pumping action stops until through leakage or otherwise the pressure in the distributing system decreases which again starts the pump. It is of course understood that the pumping chamber contains considerable additional extinguishing fluid which can be forced therefrom into the distributing system to supply leakage therefrom and keep this system largely or substantially up to the desired pressure where the differential spring is not used, even if the supply pipe 39 or its valves fail or if the connected tank is not used, for instance, and this action is caused by the static pressure in the main water pipe regardless of momentary fluctuations. For some purposes it is desirable to provide a pump operating valve, such as 53, in the pump connection to effect the operation of the pump when said valve is open, or when the valve is shut to stop this pumping action altogether and shut off the liquid supplied to the pump in case of repairs or inspections, for instance, and if desired, a suitable waste valve 55 and waste valve 54 may communicate with the power chamber of the pump so that it may be drained whenever desired. These valves may also be operated manually to operate the pump or to secure a special pumping action under some conditions; since specially large volume pumping impulses may be effected by alternately shutting the waste valve 54 and opening the pump valve 53 which puts the power chamber under full pressure and then shutting the pump valve and opening the waste valve
54 which reduces this pressure in the power chamber to practically that of the atmosphere and thus allows the return spring or other resilient parts to move the pump piston through a considerable vertical distance and deliver a correspondingly large volume of liquid to the distributing system in pumping it up to pressure originally, for instance.

Another type of automatic pump is shown for this general purpose, as shown in Fig. 2, this pump 59 being of the same general type of hydraulically actuated pump generally used as a beer pump. This pump may be connected to the liquid supply tank 57 containing the non-freezing or other extinguishing liquid 66 to be supplied to the distributing system and this liquid may pass to the pump through the supply pipe 58 which may have a control valve 67 therein and then be delivered to the distributing system through the supply connection 66 communicating therewith at any suitable point and having the control valve 68. The pump may be actuated by the pressure of the liquid in the main water pipe 29 or connected passage 28 with which may communicate the pump connection 60 leading to the valve chamber of the pump and provided, if desired, with a pump operating valve 61 to effect the operation of the pump. The water discharged from this power chamber of the pump may pass through the waste pipe 62, 63, in which may be arranged a sight connection 64 indicating the extent to which the pump is operating. This pump 59 is so constructed and proportioned especially in the relative size of its power and pumping cylinders or parts that, when the distributing system has been pumped up to the desired pressure, the pump automatically stops because the pressure of the water in the main water pipe is no longer able to overcome the resulting increased back pressure in the pump.

This invention has been described in connection with a number of illustrative embodiments, forms, arrangements, proportions, parts, materials and methods of operation, to the details of which disclosure the invention is not, of course to be limited, since what is claimed as new and what is desired to be secured by Letters Patent is set forth in the appended claims:

1. In fire extinguishing apparatus, a distributing system comprising automatic sprinkler heads and charged with non-freezing extinguishing liquid under pressure, a main water pipe connected to a water system under varying pressures to supply additional extinguishing liquid to said distributing system in fire emergency conditions, a differential alarm valve between said distributing system and said water pipe and comprising a drip chamber and alarm devices connected thereto, a valved steamer connection communicating with said system through said drip chamber, an automatic locking shut-off valve between said main water pipe and said alarm valve and an automatic pump to force additional amounts of non-freezing liquid into said distributing system to maintain the desired pressure therein, said pump comprising an expanding power chamber and an opposed pumping chamber formed of corrugated resilient material and a diaphragm pump piston between said chambers, a differential return spring acting on said pump piston, a valved pump connection between said power chamber and said main water pipe, a valved waste pipe communicating with said power chamber, a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system, a liquid supply tank and a connection having a check valve between said tank and said pumping chamber.

2. In fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe connected to a water system under varying pressure to supply additional extinguishing liquid to said system under fire emergency conditions, a differential alarm valve between said distributing system and water pipe and comprising a drip chamber and alarm devices connected thereto, a valved steamer connection communicating with said system through said drip chamber, an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and an opposed pumping chamber, a valved waste pipe communicating with said power chamber, a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system, a liquid supply tank and a connection having a check valve between said tank and said pumping chamber.

3. In fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe connected to a water system under varying pressure to supply additional extinguishing liquid to said system under fire emergency conditions, a differential alarm valve between said distributing system and water pipe and comprising a drip chamber and alarm devices connected thereto, a valved steamer connection communicating with said system through said drip chamber, and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and an opposed pumping chamber.
5. A valved pump connection between said power chamber and said main water pipe, a waste pipe communicating with said power chamber, a supply connection comprising a control valve between said pumping chamber and said distributing system, a liquid supply tank and a connection between said tank and said pumping chamber.

4. In fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a differential valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and a pumping chamber, a connection between said pumping chamber and said main water pipe and a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system.

5. In automatic sprinkler fire extinguishing apparatus, a distributing system comprising automatic sprinkler heads and charged with non-freezing extinguishing liquid under pressure, a main water pipe connected to a municipal water supply system to supply additional extinguishing liquid to said system under fire emergency conditions, a differential valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber connected with and receiving its power from the water supply for the system and a pumping chamber and a supply connection between said pumping chamber and said distributing system.

8. In fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe connected to a municipal water system to supply additional extinguishing liquid to said system under fire emergency conditions, a differential valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and a pumping chamber, a connection between said pumping chamber and said main water pipe and a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system.

9. In fire extinguishing apparatus, a distributing system comprising automatic sprinkler heads and charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a differential alarm valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and a pumping chamber, a supply connection between said power chamber and said main water pipe, a-valved waste pipe communicating with said water supply system and a liquid supply tank and a connection having a check valve between said tank and said pumping chamber.

6. In fire extinguishing apparatus, a distributing system charged with non-freezing extinguishing liquid under pressure, a main water pipe connected to a municipal water system to supply additional extinguishing liquid to said system under fire emergency conditions, a differential valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and an opposed pumping chamber, a valve between said pumping chamber and said main water pipe, and a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system.

7. In fire extinguishing apparatus, a distributing system charged with non-freezing extinguishing liquid under pressure, a main water pipe connected to a municipal water system to supply additional extinguishing liquid to said system under fire emergency conditions, a differential valve between said distributing system and water pipe and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and a pumping chamber, a connection between said power chamber and said main water pipe, a-valved waste pipe communicating with said power chamber and said main water pipe.
chamber, a supply connection comprising a control valve between said pumping chamber and said distributing system, a liquid supply tank and a connection having a valve between said supply tank and said pumping chamber.

11. In fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a valve between said distributing system and water pipe and an automatic pump to force additional amounts of non-freezing liquid into said distributing system to pump said distributing system up to the desired pressure and then automatically stop such pumping action, said pump comprising a power chamber and a pumping chamber, a valved pump connection between said power chamber and said main water pipe, a waste pipe communicating with said power chamber, a supply connection between said pumping chamber and said distributing system, a liquid supply and a connection between said supply and said pumping chamber.

15. In fire extinguishing apparatus, a distributing system comprising automatic sprinkler heads and charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a valve between said distributing system and water pipe, and an automatic pump to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pump comprising a power chamber and a pumping chamber, a valved pump connection between said power chamber and said main water pipe, a liquid supply and a connection between said supply and said pumping chamber.

16. In automatic fire extinguishing apparatus, a distributing system comprising automatic sprinkler heads and charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a valve between said distributing system and water pipe, and a supply connection comprising a check valve and control valve between said pumping chamber and said distributing system.

17. In automatic fire extinguishing apparatus, a distributing system charged with extinguishing liquid under pressure, a main water pipe to supply additional extinguishing liquid to said system under fire emergency conditions, a valve between said distributing system and water pipe, and a pumping device to force additional amounts of liquid into said distributing system to maintain the desired pressure therein, said pumping device comprising a power chamber and a connected expandible pumping chamber containing additional extinguishing liquid, a valved pump connection between said power chamber and said main water pipe, a liquid supply and a connection between said supply and said pumping chamber.
desired pressure therein, said pumping device comprising a power chamber communicating with said water pipe and a connected expansible pumping chamber connected to said distributing system and containing additional extinguishing liquid.

19. In fire extinguishing apparatus, a distributing system charged with non-freezing extinguishing liquid, a main water pipe connected to a water system to supply additional extinguishing liquid to said system under fire emergency conditions, a valve between said distributing system and water pipe and an automatic pump to supply additional amounts of liquid to said distributing system to maintain the desired quantity therein, said pump comprising a power chamber connected with and receiving its power from the water supply for the system and an opposed pumping chamber, and a supply connection comprising a check valve between said pumping chamber and said distributing system.

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Witnesses:

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