

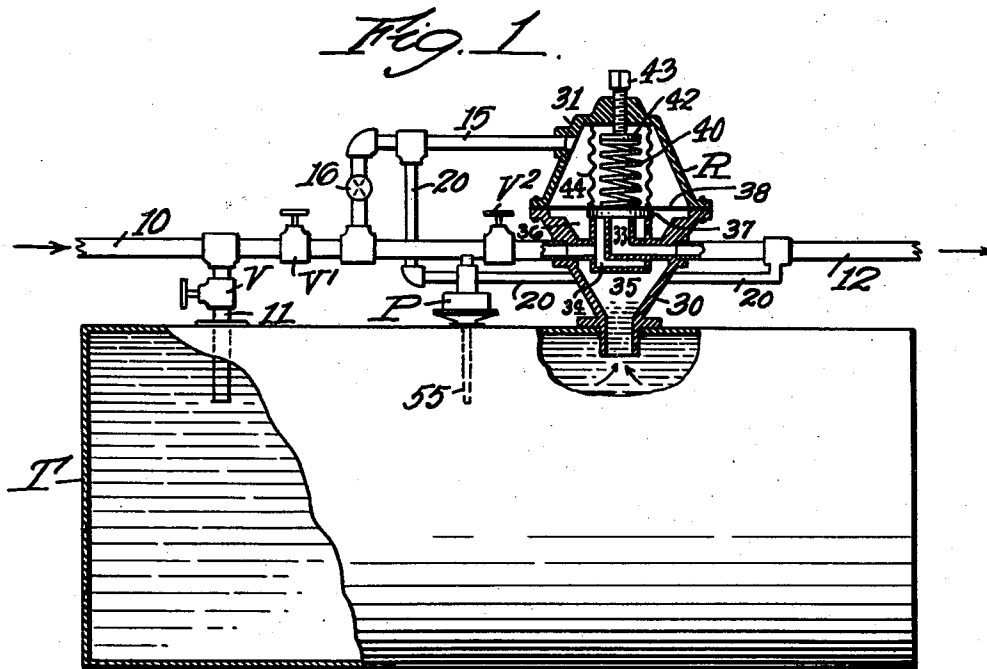
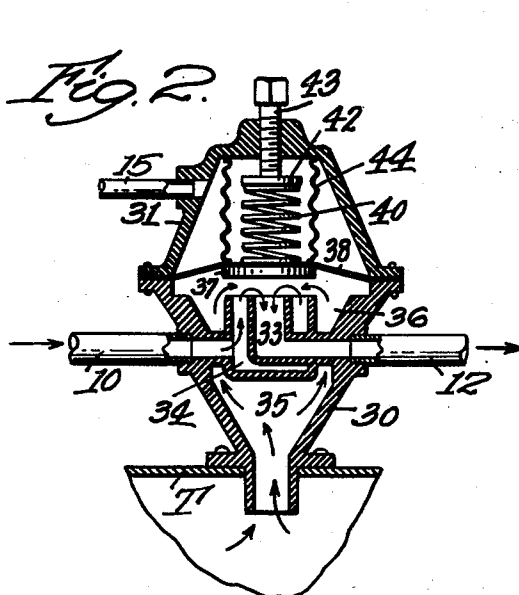
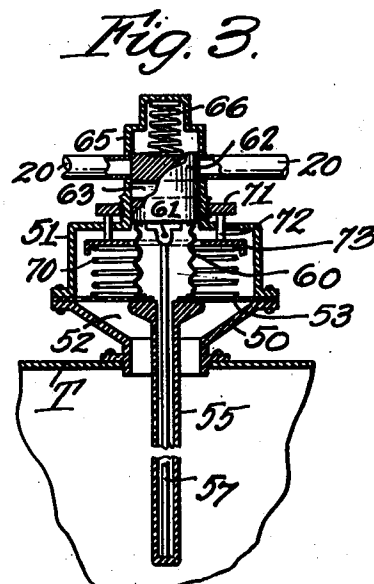
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HOT WATER STORAGE SYSTEM AND PILOT-OPERATED RELIEF DEVICE THEREFOR

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HOT WATER STORAGE SYSTEM AND PILOT-
OPERATED RELIEF DEVICE THEREFOR

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4 Claims. (Cl. 137—21)

This invention relates to hot water storage systems and to relief devices for use in such systems.

It is desirable as a safety measure that all hot water storage systems be vented on the occurrence of an excessive rise of either temperature or pressure. Difficulty has been encountered in venting such storage systems, however, particularly in parts of the country where the water has a considerable lime content. If hot water containing lime is discharged to the atmosphere at high temperature, the lime content will be deposited in and about the outlet of the discharge pipe or other orifice and will eventually choke and close the opening.

Another difficulty arises from the fact that known temperature relief valves are not adapted for use in large sizes, on account of the excessive load then imposed on the thermal element.

It is the general object of my invention to provide an improved hot water storage system in which hot water will be released on excessive rise of either temperature or pressure.

A further object is to provide means to cool or temper the hot water before it is discharged to atmosphere, thereby avoiding possible lime deposit about the discharge opening.

I also provide a new and improved form of relief valve, and an improved pilot valve therefor which is responsive to both pressure and temperature variations.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawing, in which

Fig. 1 is a side elevation, partly in section, of my improved hot water storage system;

Fig. 2 is a sectional side elevation of the relief valve; and

Fig. 3 is a sectional side elevation of the pilot valve.

Referring to the drawing, I have shown a hot water storage tank T, a cold water supply pipe 10, a feed pipe 11 for the tank T, a relief valve R, a pilot valve P, and a discharge pipe 12. The supply pipe 10 is connected through a pressure pipe 15 to the upper part of the relief valve R, and a device 16 is inserted in the pipe 15 to restrict the flow through said pipe.

A vent pipe 20 is connected at one end to the pressure pipe 15 between the device 16 and the relief valve R, and is connected at the other

end to the discharge pipe 12 beyond the relief valve R.

The pilot valve P is responsive to variations in either temperature or pressure in the tank T and controls the flow through the vent pipe 20, as will be hereinafter described. Valves V, V' and V² also regulate the flow through the various pipes described and may be set at any desired openings.

The relief valve R is of the special construction shown in Fig. 2 and comprises a lower portion or base 30 and a head 31. The base 30 is cored to provide a central port 33 connecting to the discharge pipe 12 and an annular port 34 connecting to the supply pipe 10. The base 30 also contains a chamber 35 open at its lower end into the tank T and connecting in its upper part to an outer annular channel 36 surrounding the parts in which the ports 33 and 34 are formed.

A disc 37 is seated above the ports 33 and 34 and closes both of these port openings when in the normal position shown in Fig. 1.

The disc 37 is mounted below a diaphragm 38 secured between the base 30 and the head 31. A spring 40 is mounted in the head 31 and is disposed between the disc 37 and a washer 42 on the inner end of an adjusting screw 43. A bellows seal 44 excludes water from the spring 40, while at the same time permitting free movement and adjustment thereof.

The operation of the system, as thus far described, is as follows:

Under normal conditions, the disc 37 is seated, closing both of the ports 33 and 34 in the base 30, and is held in position by the pressure of the spring 40 and by the cold water pressure above the diaphragm 38. The combined pressure of the spring and the water above the disc is sufficient to overcome the pressure of the water in the port 34 against the lower side of the disc 37 and the water in the chamber 35 and channel 37 against the lower side of the diaphragm 38.

If now the vent pipe 20 is opened by the pilot valve P, water will escape from the pipe 15 and head 31 through the vent pipe 20 to the discharge pipe 12. As water can flow out through the pipe 20 much faster than it can flow in through the restrictive device 16, the pressure in the head 31 will drop rapidly, allowing the pressure against the under side of the disc 37 and diaphragm 38 to move the disc to the position shown in Fig. 2.

With the disc raised, hot water from the tank T flows through the chamber 35 and channel 36

to the central discharge opening or port 33, and at the same time cold water from the pipe 10 flows through the port 34 to the discharge port 33. Consequently, the temperature of the hot water is substantially decreased and it will be discharged at a temperature of 125° F. or less, at which temperature lime will not be deposited.

The temperature of the discharged water may be controlled by the setting of the valves V and V². The valve V will control the flow of cold water to the tank T and will thus determine the amount of hot water which will flow out through the chamber 35 and channel 36. The valve V² will control the amount of cold water which will flow through the port 34 and mix with the hot water from the channel 36 to reduce its temperature.

When the excess temperature or pressure is thus relieved, the pilot valve P will close the vent pipe 20, pressure will build up again in the head 31, the disc 36 will be seated, and the system will thus be restored to normal operation.

In Fig. 3 I have shown a construction of temperature and pressure relief valve adapted to vent the pipe 20 on excessive rise of either temperature or pressure.

The valve P comprises a base 50 and head 51. The base 50 contains a chamber 52 freely open at its lower end to the tank T and closed at its upper end by a diaphragm 53. A tubular member 55 is secured to the under side of the diaphragm 53 and extends downward into the hot water in the tank T.

A rod 57 is loosely slidable in the member 55 and is seated thereon at its lower end. At its upper end, the rod 57 extends through a bellows member 60 and is connected at 61 to the lower end of a valve piston 62 having a cross passage 63 and slidable in an upward extension 65 of the cap 51. A spring 66 presses downward on the piston 62.

The tubular member 55 and bellows member 60 are filled with a fluid which expands on rise in temperature, pushing the piston 62 upward. On excessive rise in temperature, the cross passage 63 will be partly or wholly aligned with the vent pipe 20, which is thus opened to relieve the cold water pressure in the head 31 of the relief valve R.

A large coil spring 70 engages the upper face of the diaphragm 53 and in conjunction with the spring 66 determines the maximum pressure in the tank T. If this pressure is exceeded, the diaphragm 53 will be lifted, carrying with it the member 55, rod 57, and valve piston 62, and opening the pilot valve with the previously described results. Upon subsequent decrease of the excessive temperature or pressure, the parts will return to their initial position.

The spring 70 may be adjusted by turning a threaded collar 71 engaging pins 72 projecting

upward from a plate 73 engaging the upper end of the spring 20.

The relief valve R may be made of any desired size, as no part of this valve is thermal-operated, and the pilot valve P need be only large enough to vent the pipe 20, which pipe may be relatively small. It is also non-essential that the relief valve be immediately adjacent the storage tank, as it will operate satisfactorily if within any reasonable distance thereof.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. Hot water storage and control apparatus comprising a tank, means to supply cold water thereto, a relief valve in communication with said tank and normally maintained closed by the pressure of water from the cold water supply, and temperature-operated pilot means to reduce the cold water pressure on said relief valve on the occurrence of an excessive rise in temperature of the hot water in said tank, whereon said relief valve will be opened by the pressure of the hot water in said tank on said valve and hot water will be discharged.

2. Hot water storage and control apparatus comprising a tank, means to supply cold water thereto, a relief valve in communication with said tank and, a restricted connection from the cold water supply means to said relief valve, the pressure in said connection normally maintaining said relief valve closed against the hot water pressure in said tank, and temperature-operated pilot means to vent said restricted connection on the occurrence of an excessive rise in temperature in said storage tank, whereby said relief valve is rendered operative to discharge hot water from said tank.

3. In a hot water storage system, a relief valve comprising concentric cold water and discharge ports, a hot water channel surrounding said ports, a member movable to open or close said ports and to thereby admit hot and cold water simultaneously to said discharge port, said member being mounted on a diaphragm exposed to hydraulic pressures on both sides, and being responsive to changes in the differential of the said hydraulic pressures.

4. In a hot water storage system having a tank, in combination, a relief valve having concentric passages for hot water, cold water and discharge, closing means for two of said passages, and a spring for said closing means which opposes but does not equal the normal water pressure in said tank, means to apply hydraulic pressure to said closing means additional to said spring, and means to reduce said hydraulic pressure on the occurrence of an excessive rise in pressure or temperature in said tank.

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