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WATER HEATING SYSTEM

2,243,144

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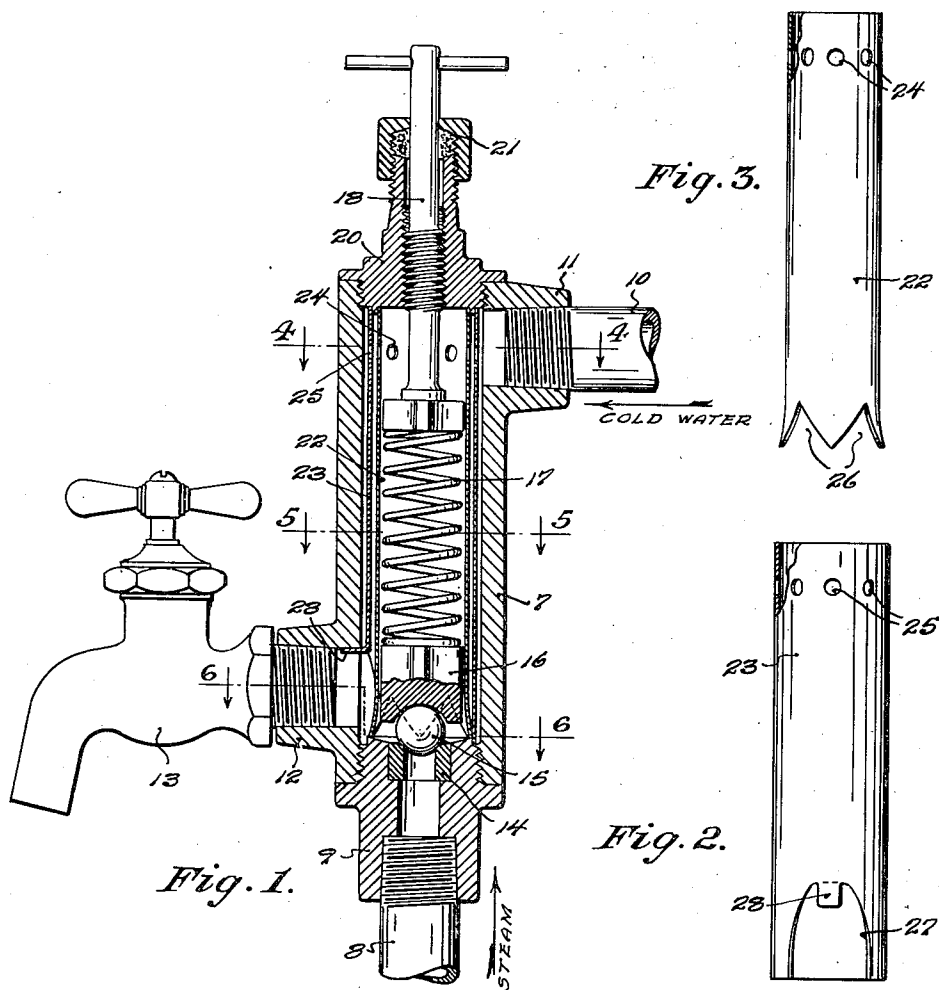


Fig. 1.

Fig. 3.

Fig. 2.

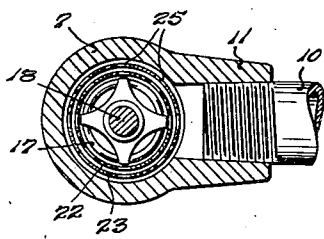


Fig. 4.

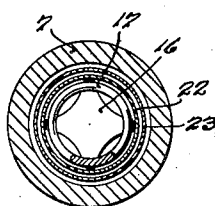


Fig. 5.

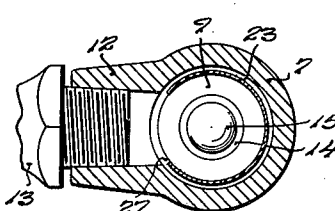


Fig. 6.

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UNITED STATES PATENT OFFICE

2,243,144

WATER HEATING SYSTEM

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6 Claims. (Cl. 261—64)

This invention relates to improvements in water heating systems and is a continuation in part of my pending application for Letters Patent of the United States filed November 5, 1938, Ser. No. 239,071.

Considered broadly, the system which I provide is one in which steam is injected into a pressure stream of water and, through the instrumentality of controlling the pressure differential which obtains between the two, the proportionate admission of steam regulated, the system being so devised that the temperature of the water is governed solely by the manipulation of the faucet valve through which the water is drawn.

Stated more particularly, the invention resides in a water heating system employing a steam valve which opens against the pressure of the source of water supply and relies for its operation upon an association of parts such that the pressure which obtains in the source of water supply is effective to hold the steam valve upon its seat, the valve opening only as a pressure differential develops favoring the steam. It may be here stated that the system illustrated and described in my above-identified pending application precluded use of the same under conditions where the pressure of the steam exceeded the pressure of the static water, this by reason of an arrangement which depended solely upon the static pressure of the water to seat the steam valve, and it is a particular object of my present improvements to provide a heater in which mechanical pressure means serve to augment the static pressure of the water and thereby assure, from the combination of the two, a pressure effective to operatively oppose the pressure which obtains on the steam even though the latter actually exceeds the pressure of the static water.

The invention is one which operates by the physical law of pressure differentials to blend steam and water to a desired temperature and essentially consists in a system so engineered as to utilize the valve of a discharge faucet as the sole agency for controlling the pressure differential, and further consists in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the drawing:

Figure 1 is a vertical sectional view with parts in elevation representing a heating plant embodying the subject matter of the present invention.

Fig. 2 is an elevational view illustrating the outer of two cylindrical shells with which the mixing chamber is partitioned for breaking up the water flow.

Fig. 3 is an elevational view illustrating the inner shell; and

Figs. 4, 5 and 6 are horizontal sections on the respective section lines 4—4, 5—5 and 6—6 of Fig. 1.

Represented by the numeral 7 in the drawing is the main body of the heater, preferably a brass casting open at both ends and forming a mixing chamber into which steam and water are admitted and from which either cold, warm or hot water is withdrawn. The steam pipe, leading from a suitable supply source, is designated by 8 and connects with a fitting 9 which threads into the lower end opening of the body. The cold water pipe, similarly leading from a suitable source of pressure supply, is designated by 10 and threads into a lateral boss 11 disposed at the upper end of the body. Also provided by the body adjacent its lower end is a lateral boss 12 internally threaded for the reception of a discharge faucet valve 13. 14 indicates a Monel metal insert for the fitting 9 functioning as a seat for a Monel metal ball 15 arranged to open in the direction of steam injection, the ball check being engaged by a keeper 16 and yieldingly influenced into closed position by a helical compression spring 17. For regulating the compression exerted by the spring, a threaded spindle 18 is provided which works in a bonnet 20 received in the upper end opening of the body, the bonnet being fitted with a stuffing box 21.

Within the mixing chamber in surrounding relation to the ball check and its controlling spring assembly are a pair of concentrically mounted inner and outer tubular casings or shells 22 and 23 which extend the length of the chamber and are spaced one from the other and from the inner wall of the chamber. Each of the shells, to accommodate the passage of water, is provided at its upper end with a series of circumferentially spaced openings, as 24 and 25. The inner of these partitioning shells, for a similar purpose, is provided at its base with a series of circumferentially spaced archways 26, and at the base of the outer partitioning shell is an outlet port 27 of major volumetric capacity adapted to be brought into register with the discharge port of the body. In order that these ports, that of the boss 12 and the port 27, may be maintained in register I provide a finger dependency 28 which is bent outwardly from the shell 23 to lodge in the outlet port of the body.

In applying the system it is essential that the flow capacity through the mixing chamber be less than that of the faucet 13, thereby to permit

the effective pressure of the water as applied to the check valve under a dynamic condition to be reduced below the pressure which obtains under a static condition of the water. There are several ways in which this end may be accomplished as, for example, by an installation providing a cold water pipe which has a fixed flow capacity less than the maximum opening of the faucet, by the employment of flow-governing means in the cold water pipe such as the key-regulated valve illustrated in my afore-mentioned pending patent application, or by the utilization of means equivalent to the shells 22 and 23 effective to interrupt the free flow of water through the mixing chamber.

It is believed that the principle of operation is best understood by considering, first, an installation in which the static water pressure exceeds the steam pressure and thereby functions, independently of the spring, to hold ball 15 upon its seat. Under such conditions the ball is relieved of the spring pressure. The initial opening of the faucet such as to provide a water discharge less than the effective flow into the mixing chamber maintains this pressure differential to permit cold water to be drawn from the faucet. The heating agent is thereafter injected as the dynamic pressure of the water, by progressive opening of the faucet, is caused to automatically fall below the steam pressure, the temperature of the withdrawn water being raised in direct proportion to the degree to which the faucet is opened. Considering, now, an installation where the pressure of the steam is greater than the static pressure of the water, it will be seen that I compensate for this adverse pressure differential by the employment of the spring 17, adjusting the tension thereof through regulation of the spindle to a point whereat the combined pressures of the spring and the static water exceed the steam pressure.

It will of course be apparent that the source of energy on the issuing warm or hot water is the pressure of the steam, eliminating the annoying and damaging hammer which is characteristic of the bulk of steam-injection water heaters heretofore devised.

The invention and the manner of its usage should be clear from the foregoing description and while I have therein set forth in detail my preferred embodiment without reference to various modifications which readily occur without the exercise of invention, I propose no unnecessary limitations and intend that the hereto annexed claims be given a scope in their interpretation commensurate with the state of the advance in the art.

What I claim, is:

1. In a water heating system operating by the injection of a fluid heating agent into the water to be heated, the combination of a mixing chamber of relatively small volumetric capacity having a pair of admission ports leading to and a delivery port leading from the same, a pipe connecting one of the admission ports with a pressure source of cold water supply, a pipe connecting the other admission port with a pressure supply of a fluid heating agent, a check valve for the last-named admission port arranged to close against the pressure of the heating agent, and a manually regulated valve operating to govern the flow capacity of the delivery port in relation to that of the cold water admission port and acting by the degree to which the former exceeds the latter to obtain a progressive reduc-

tion in the pressure of the water within the mixing chamber below the pressure of the heating agent, thereby to control the relative opening of the check valve and proportionate admission of the fluid heating agent into the stream of cold water flowing through the mixing chamber.

2. In a water heating system operating by the injection of a fluid heating agent into the water to be heated, the combination of a mixing chamber of relatively small volumetric capacity having a pair of admission ports leading to and a delivery port leading from the same, one of said admission ports being adapted for connection with a pressure source of cold water supply and the other admission port being adapted for connection with a pressure supply of the heating agent, a check valve for the last-named admission port arranged to close against the pressure of the heating agent, and a manually regulated valve for the delivery port operating by its progressive opening to obtain a reduction in the pressure of the water within the mixing chamber from a static condition whereat the same functions to hold the check valve upon its seat to a dynamic condition whereat an effective pressure differential obtains favoring the heating agent.

3. A water heating system according to claim 2 in which an obstruction to the free flow of water between the water-admission and the delivery ports is provided within the mixing chamber.

4. In a water heating system operating by the injection of a fluid heating agent into the water to be heated, the combination of a mixing chamber having a delivery port and a pair of admission ports of which one of the latter is located relatively in immediate proximity of the delivery port and is adapted for connection with a pressure supply of the heating agent, the other of said admission ports being adapted for connection with a pressure source of cold water supply, a check valve for the first-named admission port arranged to close against the pressure of the heating agent, pressure-applying means associated with the check valve and operating to augment the pressure of the water within the mixing chamber for influencing the check valve into its closed position, and a manually regulated valve for the delivery port operating by its progressive opening to obtain a reduction in the pressure of the water within the mixing chamber from a condition whereat the combined pressures of the water and the pressure-applying means are greater to a condition whereat said combined pressures are less than the pressure of the heating agent.

5. In a water heating system operating by the injection of a fluid heating agent into the water to be heated, the combination of a mixing chamber having a delivery port in its side adjacent the bottom and a pair of admission ports of which one of the latter lies at the upper end of the chamber and is adapted for connection with a pressure supply of cold water and the other of which lies at the base of the chamber and is adapted for connection with a pressure supply of the heating agent, a ball acting as a check valve for the last-named admission port arranged to close against the pressure of the heating agent, a spring engaging said ball and operating to augment the pressure of the water within the mixing chamber for influencing the ball into its closed position, and a manually regulated valve for the delivery port operating by its progressive open-

ing to obtain a reduction in the pressure of the water within the mixing chamber from a condition whereat the combined pressures of the water and the spring function to hold the ball upon its seat to a condition whereat a pressure differential obtains favoring the heating agent.

6. In a water heating system operating by the injection of a fluid heating agent into the water to be heated, the combination of a mixing chamber having a delivery port and a pair of admission ports of which one of the latter is adapted for connection with a pressure supply of cold water and the other with a pressure supply of the heating agent, a check valve for the last-named admission port arranged to close against the pressure of the heating agent, a spring en-

gaging the check valve and operating to augment the pressure of the water within the mixing chamber for influencing the check valve into its closed position, a manual control for regulating the tension of the spring to vary the pressure exerted on the check valve, and a manually regulated valve for the delivery port operating by its progressive opening to obtain a reduction in the pressure of the water within the mixing chamber from a condition whereat the combined pressures of the water and the spring function to hold the check valve upon its seat to a condition whereat a pressure differential obtains favoring the heating agent.

WILLIAM AUCKLAND.