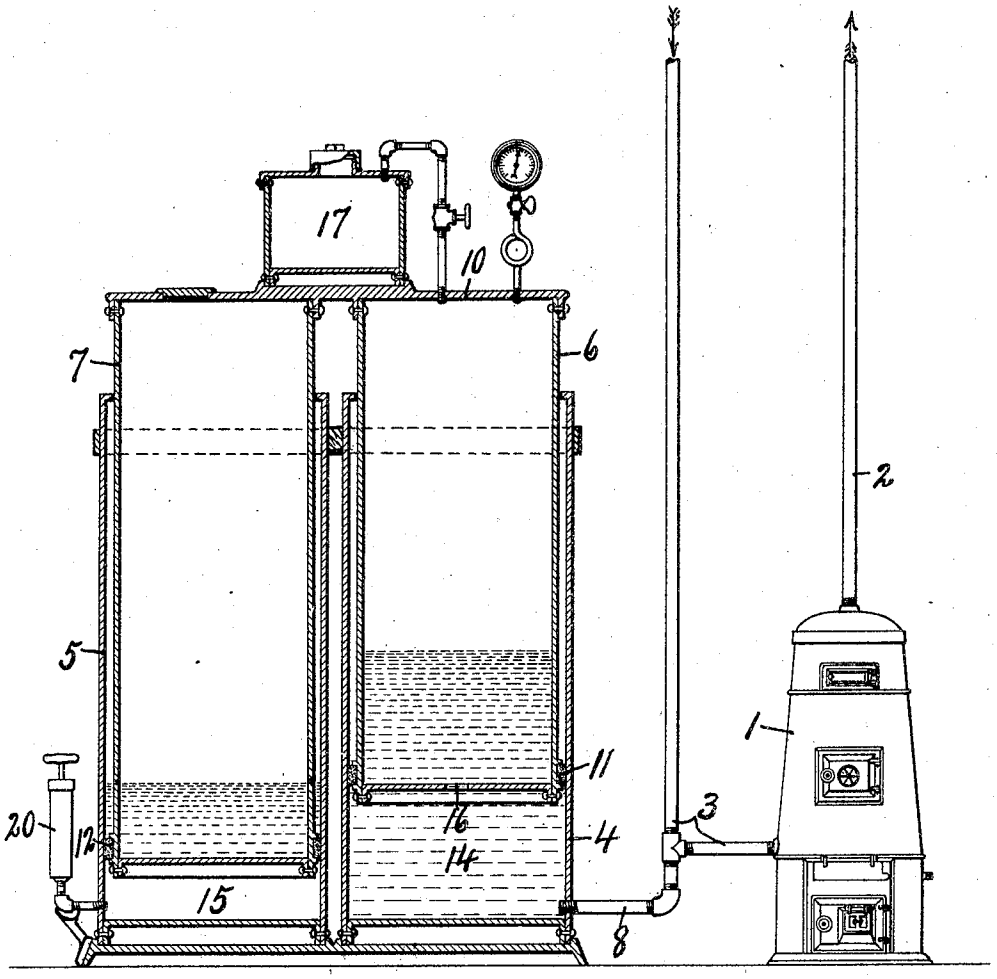
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J. P. SINCLAIR.

PRESSURE GOVERNOR FOR HOT WATER HEATING SYSTEMS.

APPLICATION FILED MAY 17, 1904.



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UNITED STATES PATENT OFFICE.

JAMES P. SINCLAIR, OF JORDAN, NEW YORK.

PRESSURE-GOVERNOR FOR HOT-WATER HEATING SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 783,145, dated February 21, 1905.

Application filed May 17, 1904. Serial No. 208,327.

To all whom it may concern.

Be it known that I, JAMES P. SINCLAIR, of Jordan, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Pressure-Governors for Hot-Water Heating Systems, of which the following, taken in connection with the accompanying drawing, is a full, clear, and exact description.

This invention relates to improvements in hot-water heating systems in which the water is distributed or circulated by expansion from a suitable heater through the radiators or pipes of the system and to any part or altitude of a building.

My object is to aid the upflow of the heated water and to hold the same in the radiators at any altitude, so that the whole heating system is filled with hot water which may be heated to a temperature considerably above the boiling-point, or 212° Fahrenheit, without generating steam.

It is well known that a body of heated water is less susceptible to chilling influences than steam and retains its heat for a longer period of time, and therefore is better adapted to maintain an even temperature than steam; but it is equally well known that in raising the heated water to high altitudes solely by its expansive force the counteracting force of gravity or inertia, which increases directly with the altitude, operates to retard the circulation and limits the height at which the expansive force is ineffective and at the same time causes an excessive pressure at the base of the system or upon the heater.

Another object of my invention is therefore to equalize the water-pressure in all parts of the system by introducing a variable counter-pressure which is automatically brought into action by and is proportionate to the gravity and expansive force of the superimposed body of water.

Other objects and uses will appear in the following description.

In the drawing I have shown a portion of a hot-water circulating system comprising a heater 1 and a pressure-equalizing apparatus, which is shown in section.

The heater 1 may be of any suitable construction capable of receiving and heating water and is provided with the usual upflow and return pipes 2 and 3, leading, respectively, to and from the radiators. (Not shown.) The pressure-equalizing apparatus may also be of any suitable construction for receiving the water from the heater or other parts of the circulating system and counteracting its gravity and expansive forces; but I preferably employ two separate upright metal tanks or cylinders 4 and 5, in which are movable, respectively, hollow metal floats or pistons 6 and 7. The water from the base of the heating system is introduced into the base of the tank 4 through a suitable conduit 8 and has a free flow from the heater and return-pipes into the base of the tank 4, which tends to elevate the floats 6 and 7. The upper ends of both tanks 4 and 5 are open to receive and guide their respective floats 6 and 7, which have their upper ends closed and yoked together by a plate 10, while their lower ends are provided with packing-rings 11 and 12 and constitute pistons for forming air and water tight compartments 14 and 15 in the lower ends of the tanks 4 and 5, respectively. The bottom of the float 6 has an aperture 16 through which the water from the compartment 14 may pass and trap the air or gas in the upper part of the float 6, which is hollow and is connected to a suitable gas-generating apparatus 17, presently described. It now appears that the floats 6 and 7 are yoked together to move vertically and simultaneously in their respective tanks and that their combined weight, together with any load which they may carry, tend to counteract the back pressure of the water from the heating system. This weight of the movable parts of the apparatus may be termed the "normal counterbalancing-weight;" but it is usually insufficient to hold the water at high altitudes in the system, and in order to compensate for the difference the air may be wholly or partially exhausted from the compartment 14 by means of a suitable exhaust-pump 20, whereby an atmospheric pressure proportionate to the degree of vacuum in the compartment 15 is added to the normal weight to counteract the upward pressure of the water in the compartment 14, which in turn op-

erates to hold the water at the desired altitude in the heating system. For instance, suppose the normal weight of the floats and parts carried thereby to be ten pounds per square inch. Then by exhausting practically all of the air from the compartment 15 an additional atmospheric pressure of substantially fifteen pounds per square inch is added to this normal weight, making a total of twenty-five pounds per square inch in the compartment 14. Now if the cross-sectional area of each of the upflow and return pipes is four square inches the resultant upward pressure in each pipe would be practically one hundred pounds (100). This example serves merely to demonstrate the theory of my apparatus; but in practice the atmospheric pressure in the compartment 15 may be reduced at will to produce a corresponding increase in upward pressure per square inch of area in the heating system to hold the water at the desired altitude. The tendency of the heated water in the heater 1 to expand upwardly in the upflowing-pipe 2 and to return in the pipe 2 is the same as in the ordinary hot-water heating system, and the lifting-pressure produced by my attatchment is substantially the same in both the upflow and return pipes, and therefore the use of this attachment is principally to hold the water at higher altitudes, thereby relieving the heater from excessive hydrostatic pressure This additional lifting-pressure may be accomplished, if desired, by introducing or expanding gas in the upper part of the float 6, and I have therefore shown a gas-reservoir 17 as discharging into the said float above liquid-level. This gas may be held under pressure in the reservoir and admitted under pressure into the float 6, or it may be produced by chemical action in the float to create sufficient pressure to depress the water in the compartment, and thereby elevate it considerable distance in the pipes of the heating system, it being understood that in either case, whether by atmospheric or gas pressure, the downward pressure of, say, one inch of the water-head of, say, one hundred square inches would elevate a column of water having an area of four square inches a distance of twenty-five inches. It is therefore seen that when the pressure of the float 6 on the water-head in the compartment 14 is sufficient to hold the water in the distributing system against the backflow to said compartment any additional downward pressure exerted upon the float 6, as by further exhausting air from the compartment, would depress the water-level in the compartment 14, and thereby elevate the water in the system a distance very much greater than the amount of such depression.

In the operation of my invention, assuming that the water is in circulation in the heating system, but fails to reach certain altitudes, then it is simply necessary to exhaust part of the air from the compartment 15 until the excess gravity-pressure of the water in the system is overcome or at least balanced by the atmospheric pressure on the floats, and if the water then fails to expand to the desired altitude additional air may be exhausted from the compartment 15 to cause the depression of the floats, which in turn causes a rise of water in the system.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a hot-water heating system, two cylinders yoked together each having a piston, one cylinder connected to the base of the system and receiving water against its piston and means to exhaust air from the other cylinder, whereby the inequality of air-pressure causes both pistons to move downwardly to counteract the gravity of liquid in said system.

2. In a hot-water heating system, a tank having a movable piston, means to exhaust air from the tank at one end of the piston whereby the piston is actuated by atmospheric pressure and means brought into action by said piston to counteract the gravity and expansion of the water in said system.

In witness whereof I have hereunto set my hand this 2d day of May, 1904.

JAMES P. SINCLAIR.

Witnesses:
H. E. CHASE,
HOWARD P. DENISON.