

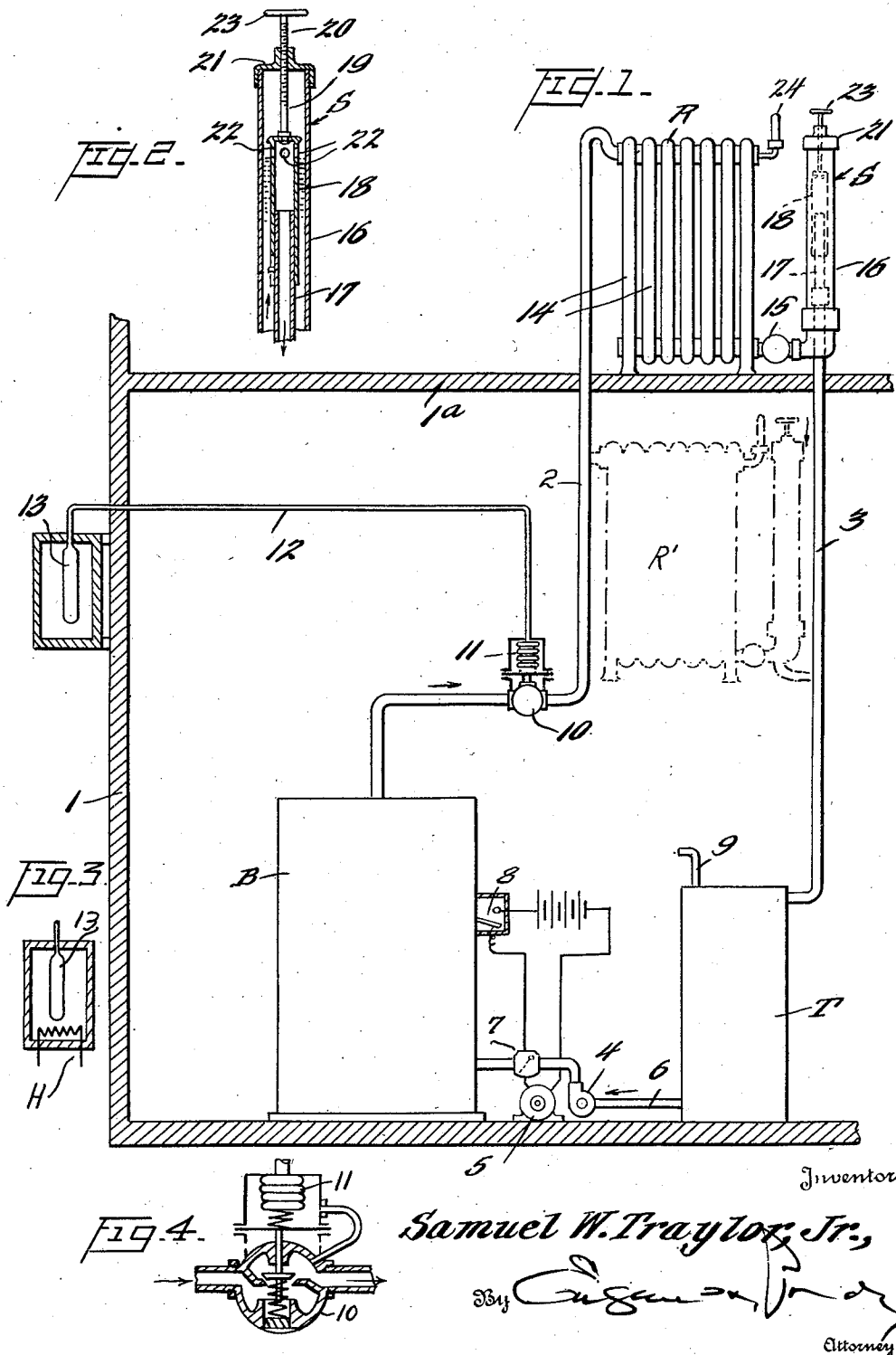
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S. W. TRAYLOR, JR.

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HEATING SYSTEM

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Inventor

Samuel W. Traylor, Jr.,

By *Cushman, Jr.*
Attorney

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HEATING SYSTEM

Samuel W. Traylor, Jr., Allentown, Pa.

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This invention relates to heating systems for homes, buildings and other enclosures, and more particularly to steam heating systems in which the steam is circulated through a radiator, or a series of radiators, for directly or indirectly heating the enclosure.

An important object of my invention is to provide in a heating system of the above character, means for controlling the heating effect of the radiator by varying the effective heating surface of the radiator in accordance with the pressure of the steam admitted to the radiator, the effective heating surface being determined by the level of the steam condensate within the radiator.

Another object of my invention is to provide in a heating system of the above character, means responsive to outdoor weather conditions for regulating the pressure of steam in the radiator.

A further object of my invention is to provide control means for the temperature within the enclosure that are of simple construction and composed of comparatively few parts so as to permit their installation in heating systems of the general type now in common use without excessive expense either for labor required for making the change-over or for additional equipment.

Other objects and advantages will be apparent from the following detailed description of a preferred embodiment of the invention, reference being had to the accompanying drawings, in which:

Figure 1 is a schematic view of a conventional steam heating system for a home or building incorporating the novel control features;

Figure 2 is a view in vertical cross-section of a standpipe associated with a radiator; and

Figure 3 is a schematic view of a modified form of housing for the outdoor thermostat; and

Figure 4 is a diagrammatic view of a thermostatically controlled pressure regulating valve employed in the system.

In Fig. 1 of the drawings is illustrated a steam heating system comprising a boiler B, located within a building, one of the enclosing walls of which is indicated at 1. A steam line 2 leads from the boiler through a floor 1a and connects with one side of a room radiator R. Adjacent the radiator and in circuit therewith is a standpipe S, the condensate from the radiator flowing through the standpipe and into a return line 3

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discharging at its lower end into a surge tank T which serves as an accumulator for the water condensing in the system as well as a storage tank for water supplied to the boiler. A pump 4 driven by an electric motor 5 delivers water from the surge tank into the boiler through a pipe 6 in which is interposed a check valve 7 to prevent reverse flow of steam or water from the boiler to the surge tank. A float-operated switch 8, schematically represented, and responsive to the level of the water in the boiler, controls the operation of the motor to maintain an adequate supply of water in the boiler. A relief vent 9 is provided in the top of the surge tank opening to the atmosphere. The structure so far described is conventional and requires no detailed description.

Interposed in the steam line 2 intermediate the boiler and the radiator is a pressure-regulating valve 10 adjustable by the expansion and contraction of a metal bellows 11 so as to regulate the pressure of the steam supplied to the radiator. The bellows communicates through a capillary tube 12 with a bulb 13 enclosed within a box located outside the building and exposed to outdoor temperature conditions, the bulb, tube and bellows being filled with a gas or liquid such that expansion or contraction of the fluid in the bulb transmits its pressure to the bellows to contract or expand the bellows and, consequently, adjust the valve 10. A valve of this general type is disclosed in Fig. 3 of Patent No. 2, 231,696 of Kenneth R. D. Wolfe, dated February 11, 1941.

The radiator R is of the well-known sectional type comprising a series of hollow interconnected rectangular units 14 disposed vertically and made of metal to provide an efficient transfer of heat by direct radiation from the steam circulated through the radiator to the surrounding atmosphere. The steam line 2 connects with an inlet port in the upper end of the first radiator section and the condensate passes from an outlet in the bottom of the last section of the radiator into a coupling 15 which may or may not contain a thermostatic trap so far as my invention is concerned. The coupling opens into the bottom of a vertical standpipe 16 and extending centrally upward within the standpipe, as best shown in Fig. 2, is an overflow pipe 17 forming an extension of the upper end of steam return line 3. Telescoping over the upper end of the over-

flow pipe is a tubular cap 18 which is slidable up and down along the pipe by means of a stem 19. The cap 18 is provided with escape ports 22 a spaced distance below its top so as to allow condensate to spill over from the standpipe into the overflow pipe 17. The stem 19 is swivelly connected at its lower end to the top of the cap and is screw-threaded throughout an intermediate portion of its length, as indicated at 20, for cooperative threaded engagement with an opening in a cover 21 closing the upper end of the standpipe 16. For rotating the stem, and consequently raising and lowering the cap 18 to vary the vertical position of the escape ports 22 (and hence the level of the water in the standpipe), a hand wheel 23 is secured to the end of the stem which projects beyond the standpipe cover 21. An air vent 24 of conventional type is associated with the radiator to permit the escape of air therefrom. This vent may be operated thermostatically, as is well-known in the art, to release air from the radiator until the temperature of the steam is obtained, and then closes to prevent further escape of either air or steam.

The operation of the heating system just described is as follows: Steam generated in the boiler B rises in the line 2 where it passes into the radiator R. The water condensed from the steam accumulates in the radiator and the standpipe S, and passes into the overflow pipe 17 from which it returns through the line 3 to the surge tank T. The arrows indicate the course of travel of the steam and water through the system. In order to escape, the condensate formed in the radiator must be forced upwardly through the standpipe S until it spills through the ports 22 into the overflow pipe 17 communicating with the return line 3. If the pressure in the steam supply line is low enough, the radiator will fill completely with water. This will be the condition in warm weather. However, as the weather grows cooler, the valve 10, under the influence of the bulb 13 located outside the building, will open, allowing increased pressure of steam to enter the radiator which acts to force the level of the water downward and enlarge the effective heating area of the radiator. In very cold weather the radiator may be almost entirely evacuated of water and filled with steam so that practically the entire surface of the radiator is effective for the radiation of heat. Since the rate of loss of heat from an enclosure is a factor dependent mainly upon the difference in temperatures inside and outside the enclosure, any changes in the weather will be promptly reflected in the heat emission rate of the radiator. As a consequence the control of the radiator will "run ahead" of actual temperature conditions within the enclosure and maintain the temperature of the enclosure substantially uniform, while avoiding abrupt fluctuations such as occur when a room thermostat is solely relied upon for temperature control.

By adjusting the height of the ports 22 in the cap 18 by means of the hand wheel 23—and consequently the level to which the condensate water is required to be raised by the steam pressure in order to escape through the overflow pipe 17—the heating capacity can be regulated as desired to best suit the individual comfort of the occupant of the room served by the radiator.

The surge tank T is not essential to the successful operation of the heating system just described. If it is not desirable to return the condensate from the radiator to the boiler, the surge

tank may be eliminated, the condensate being vented from overflow pipe 17 into a suitable drain. When the surge tank is provided, it is substantially filled with water in cold weather and the radiator substantially filled with steam. In warm weather the reverse is true, the surge tank being nearly empty and the radiator substantially filled with water.

While only one radiator has been shown and described, manifestly additional radiators R might, and ordinarily will be, placed in communication with the steam line 2, each radiator being provided with standpipes and overflow pipes and feeding into return line 3. An additional radiator R' unit has been indicated in phantom lines in Fig. 1.

The box enclosing the bulb 13 of the embodiment of Fig. 1 may also be provided with a heating element H in the same manner shown in the embodiment of Fig. 3, so as to reflect changes in temperature due to wind velocity. Also additional auxiliary structure may be included in both of the heating systems described above in accordance with recognized practice and as may be found necessary or desirable.

Manifestly various changes in the construction and arrangement of the parts of the heating system above-described may be made by those skilled in the art without departing from the spirit of my invention as defined in the following claims:

I claim:

1. A heating system comprising a plurality of radiators each located within an enclosure and connected to a source of steam pressure through a common steam pressure regulating valve for regulating the pressure of steam admitted to the radiators, thermostatic control means located outside said enclosure and responsive to the rise and fall of outdoor temperature conditions for actuating said valve to decrease and increase respectively the steam pressure supplied to said radiators, a condensate overflow outlet for each radiator extending upwardly from the bottom of each radiator to an elevation substantially above the bottom of the radiator, whereby variation in steam pressure will vary the level of condensate in the radiator to vary the heating effect of the radiator, and manual means for each radiator to adjustably vary the height of the overflow outlet, whereby the relative heating effects of the separate radiators may be varied individually.

2. A heating system according to claim 1 including a housing enclosing said thermostatic control, and heating means for normally maintaining the temperature within the housing higher than the temperature surrounding the housing.

3. A heating system comprising a boiler for generating steam, a radiator located within an enclosure, a steam supply line extending between the boiler and the inlet side of the radiator, a standpipe connected to the outlet side of the radiator, an overflow pipe communicating with the upper end of the standpipe at an elevation substantially above the bottom of the radiator, a surge tank, a steam return line extending between the overflow pipe and said surge tank, a pump for delivering water from the surge tank to the boiler, a control for operating the pump in accordance with the level of water in the boiler, a valve for regulating the pressure of steam admitted to the radiator from the steam supply line, thermostatic control means located outside of said enclosure for actuating said valve, a housing enclosing said thermostatic control

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means and heating means for maintaining the temperature within said housing higher than the temperature surrounding said housing.

SAMUEL W. TRAYLOR, JR.

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