W. P. COSPER.

HEATING SYSTEM.

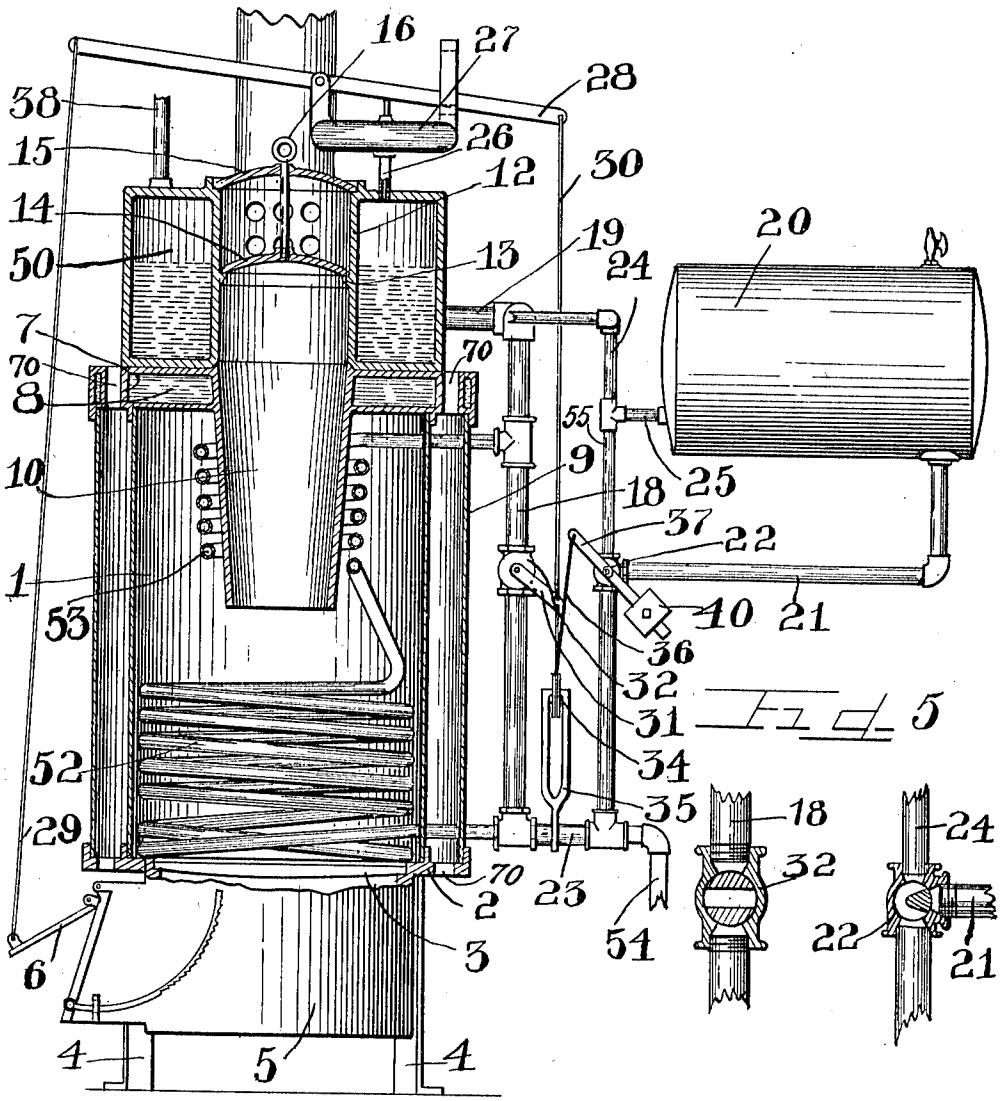
APPLICATION FILED JULY 26, 1909.

1,012,329.

Patented Dec. 19, 1911.

2 SHEETS—SHEET 1.

Fig. 1



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2

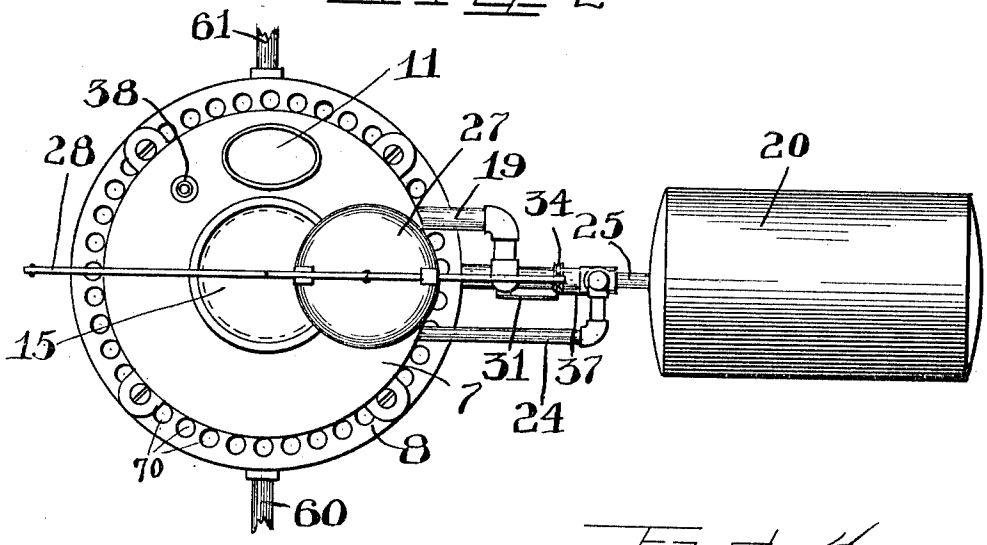


Fig. 4

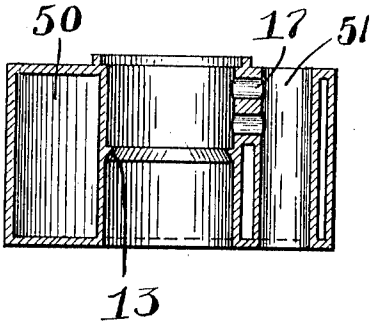
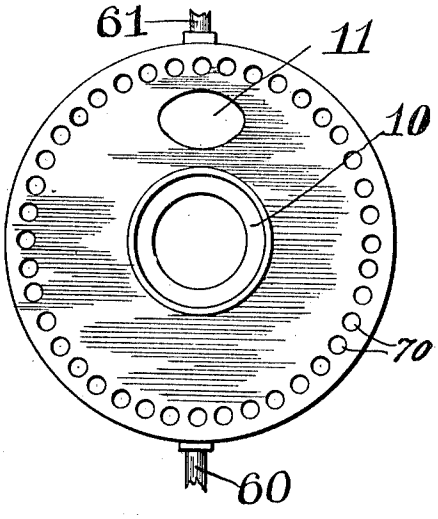


Fig. 3



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HEATING SYSTEM.

1,012,329. Specification of Letters Patent. Patented Dec. 19, 1911.

Application filed July 26, 1909. Serial No. 509,728.

To all whom it may concern:

Be it known that I, WILLIAM P. COSPER, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Heating Systems; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

In both steam and hot water heating, it is of the utmost importance to afford a construction which enables the temperature to be quickly raised to the desired point and to afford automatic regulation.

Although steam heating has been extensively employed, a much greater volume of water is usually evaporated than is necessary and the quantity of water actually used in circulation is no doubt vastly greater than would be necessary could maximum heat efficiency of the fuel be attained. This arises in part from the fact that generally speaking, all the fluid in the system must be circulated whether the heat from all the radiators is utilized or not—in consequence, much waste occurs. This is also true of hot water heating—sometimes even to a greater extent and the quantity of water in circulation in such plants must, of course, be heated in the furnace and circulated as a whole, thus frequently larger areas of radiated surface are heated than required. Furthermore, in both steam and hot water heating, and in the combined systems utilizing both steam and hot water to the extent that more water is used in circulation than absolutely necessary, lack of economy in fuel consumption of necessity results and in consequence, waste is inevitable.

The object of this invention is to afford a steam heating system, or a hot water heating system, or a combined steam and hot water heating system in which the amount of water in actual circulation is much less than has heretofore been deemed desirable and necessary, and in which the water actually in circulation normally is heated to a much higher temperature than has heretofore been the case.

It is also an object of the invention to afford an auxiliary or reserve supply, which, when the pressure due to the excessive heating of the water has become sufficient, is automatically connected in the circuit by means of automatic valves to permit a flow of the circulating fluid from said auxiliary reservoir through the coil.

It is also an object of the invention to afford a heating system of the class described in which a portion thereof may be automatically cut out when pressure falls and automatically cut in when pressure exceeds normal, or that for which the device is set to operate.

It is also an important object of this invention to provide a device in which the return pipe for the heating system is adapted to communicate both with the intake and outlet of the heating coil and also with a by-pass to the heating, expansion or mixing tank adapting all of the circulating water from the system to pass through the heating coil or adapting part thereof to be shunted directly to the heating, expansion or mixing tank to reduce the pressure by the return water from the system thereby adapting the auxiliary tank and connections to be omitted if desired.

It is also an object of the invention to afford mechanically operated mechanism adapted to be actuated by variations in pressure and whereby, with variations in pressure, the circulating system is increased or diminished in extent.

It is finally an object of the invention to afford in a heating system in connection with a heating coil, an auxiliary reservoir connected with the coil and also to afford in connection therewith a by-pass across the coil.

The invention consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a central vertical section of a heater embodying my invention and illustrating somewhat diagrammatically the arrangement of the heating coils and circulating system. Fig. 2 is a top plan view thereof. Fig. 3 is a top plan view of the heater with the heating, expansion and mixing reservoir removed. Fig. 4 is a vertical section of the heating, expansion and mixing reservoir removed. Fig. 5 is a detail

of the valves in the by-pass pipes and the discharge pipe for the auxiliary tank.

As shown in the drawings: 1, indicates a heater or furnace comprising, as shown, an annular bottom or base plate, 2, open in the middle and in which are supported grates 3, as shown in Fig. 1. Said base 2, is supported upon legs 4, which may be of any desired number and secured below said base (and to said legs, if desired) is the ash pot 5, provided with draft ash doors 6. The side wall of said furnace may be constructed of sheet metal and may be of any suitable form, but preferably cylindric, and fitted to afford a top wall for said furnace, is a top casting or plate 7, which, as shown, is cast to afford a reservoir or chamber 8, and together with the base plate, is provided with a plurality of apertures 70 opening therethrough and near the periphery thereof. As shown, the base and top plates are each provided with peripheral flanges each faced toward the other, and adapted to receive therebetween the outer or insulating shell 9, within which may be provided a lining of asbestos or other suitable material to prevent so far as may be the loss of heat by radiation from the shell or wall of the heater.

Integral with the top plate 7, of the heater and opening downwardly therethrough is a central magazine pipe 10, which tapers downwardly and is of a size to hold a sufficient quantity of fuel to last for any required time dependent upon the use to which the system is to be applied. Also opening through said top plates is a flue aperture 11, as shown in Figs. 2 and 3. Mounted on the top of said heater is a heating, expansion and mixing chamber or tank 50. This, as shown, is constructed of cast metal, though, of course, not necessarily of that material, and is shaped to fit flat on the top plate 7, of the heater, and also is provided with a smoke flue 51, therethrough, adapted to register with the smoke flue aperture 11, in the top plate. As shown also, and integral with the mixing, expansion and heating chamber or tank, is a central cylindric magazine 12, which registers with the magazine 10, in the heater so that coal or other fuel poured into said magazine through the top of the mixing, expansion and heating tank is delivered direct to the fire chamber. Within said magazine is provided an internal peripheral rim or bead 13, adapted to support the convex cover 14, for the magazine, and as shown, a shoulder is provided at the top of the magazine to receive a corresponding cover 15, which, as shown, is connected with the lower cover 14, by means of a central bolt 16, thereby affording a double cover to prevent the escape of fumes or gases from the heater into the room where the heater is installed. Opening through the magazine chamber above the lower cover and into the smoke flue 51, are passages 17, which insure the escape of gases generated in the magazine to the flue should such gases pass the lower cover 14.

Within the heater is a lower heating coil 52, which surrounds and lies above the grate and an upper heating coil 53, which is coiled somewhat closely about the inner end of the magazine. Conveniently, the pipe of which the coils are constructed, may be of comparatively small diameter to enable the liquid therein to be exposed to such a temperature in passing through the heater as to practically insure the conversion thereof (or a considerable quantity of the water in said coil) into steam in passing through the heater.

A by-pass pipe 18, extends in close relation with the heater and alongside the same and is of a relatively large size and is connected at its upper end with the heating, expansion and mixing tank by means of the pipe 19. At its lower end it is connected with the intake end of the coil and is also connected with the upper or outlet end of the coil. Located at one side of the mixing, expansion and heating chamber or tank is an auxiliary tank 20, of considerably larger capacity than the mixing, expansion and heating chamber or tank. As shown, said auxiliary tank 20, is connected at its discharge end by means of a pipe 21, regulating valve 22, and pipe 23, with the lower or inlet end of the by-pass pipe 18, so that the water from said auxiliary tank may discharge directly into the coil and by-pass. Said auxiliary tank is also connected with the heating, expansion and mixing tank 50, by means of pipes 24—25, and as shown, a short by-pass pipe 55, is adapted to afford communication between the pipes 24 and 23 by medium of the valve 22, and therefore is adapted to short circuit the circulation and cut out the auxiliary tank or vice versa. The return end of the circulating pipe 54, from the radiators or heating system, is also connected to discharge into pipe 23, and thereby communicates with the heating coil and also through the by-pass 18, communicates directly with the heating, expansion or mixing tank 50.

Mounted on the top of the heating, expansion and mixing chamber or tank and communicating therein by means of a pipe 26, is a diaphragm regulator 27, of familiar type and which acts to operate a tilting lever 28, with the variation of pressure within the heating, expansion and mixing chamber or tank. At one end of said lever 28, the draft door 6, is connected by means of a suitable cable 29, and at the other end of said lever is secured a cable 30, which is connected to a lever 31, which actuates the regulating valve 32, in the by-pass pipe and as shown, a sheave 34, is supported upon a

suitable bracket 35, adjacent the heater and a line 36, passes therethrough, one end thereof being connected on the lever 31, and the other connected on the weighted lever 37, so that as pressure in the heating, expansion and mixing tank varies, the valves are operated simultaneously.

The circulating pipe 38, leads from the top of the heating, expansion and mixing reservoir to the radiators wheresoever situated; of course, where hot water heating is used only, said heating, expansion and mixing tank and the radiating pipes and radiators are at all times filled with water circulated by the heater and in that case, of course, an expansion tank is employed which is not shown but which is located as usual above the highest radiators in the system.

Pipe 60, opens from the chamber 8, and supplies hot water for the sinks or lavatories and a pipe 61, supplies water to said chamber.

The operation is as follows: In starting the device, as, for instance, for steam heating only, the coil, by-pass pipe and auxiliary reservoir are filled with water and a sufficient amount of water is admitted into the heating, expansion and mixing chamber. Inasmuch as there is no pressure in the mixing, expansion and heating chamber or tank the weight 40, on the end of the valve lever 37, acts to pull the lever 28, down, at the same time closing the valve 32, in the by-pass pipe 18, and closing the communication between the coil and auxiliary reservoir, but opening communication between pipes 24 and 23, by means of by-pass pipe 55, thus affording a short circuit between the heating, mixing and expansion tank and coil and cutting the tank 20, out of the circulation. The large volume of water in the auxiliary tank is therefore prevented from entering the circulation and the water from the expansion tank is exposed to the heat of the furnace and quickly raised to a high temperature, converted into steam, and, as saturated steam, discharged into the expansion, heating and mixing tank. As pressure augments within the heating, expansion and mixing tank, the first effect, of course, is to flow into the circulating pipes and radiators and as the temperature augments in said circulating pipes and radiators, pressure also increases in the heating, expansion and mixing tank until the pressure is sufficient to actuate the diaphragm regulator 27, with the effect of tilting the lever 28, to close the door 6, thereby lessening the draft which lowers the fires and lessens the coal consumption. The lever shifts the valve 32, and opens the valve 22, opening communication between the auxiliary tank and pipe 23, and closes by-pass pipe 55. The circulation is now from the heating, mixing and expansion tank 50, through the pipe 24, to tank 20, from tank 20 through pipe 21, to inlet pipe 23. This brings the entire volume of water into circulation part of which passes from pipe 23, into the heating coil and the remainder passes into by-pass 18 and is carried therethrough into the heating, mixing and expansion tank as a result of the reduction in pressure caused by the flow of the steam and hot water from the heating coil which discharges into the upper end of by-pass pipe 18. The larger body of colder water thrown into the circulation (a large part of which passes through the by-pass pipe directly to the expansion tank) reduces pressure in the heating, expansion and mixing tank, inasmuch as water so introduced into the circuit is colder than that in the expansion, mixing and heating tank and coil, in consequence, the pressure in the expansion, heating and mixing tank soon begins to fall and when the same has fallen sufficiently the lever 40, again acts to shift the relative arrangement of the valves again closing the by-pass pipe 18, and closing pipe 21, from the auxiliary reservoir, at the same time, of course, opening communication between pipes 23 and 24, and opening the draft damper. This again restores the short circuit cutting out a large volume of relatively cool water and permits the temperature and pressure to rise in the heating, expansion and mixing chamber or tank until the cycle is repeated. Of course, it is not necessary that the valves close or open to their full extent in each instance, for obviously, owing to the sensitiveness of the diaphragm regulator a sufficient degree of regulating and closure may be afforded to permit both circuits to a limited extent, to be in operation at the same time. This will occur in many instances in which the valves will be very nearly open and balance the degree of opening or closing of each, momentarily and constantly varying with the effect of maintaining a uniform pressure in the heating, expansion and mixing chamber or tank.

Of course, I have shown but one (and that a somewhat diagrammatic view) of an installation embodying my invention. Numerous ways will suggest themselves in which a by-pass or a plurality of by-passes across the heating coil may be operated to accomplish the desired results. I therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art, but desire to broadly claim the invention.

I claim as my invention:

1. In a device of the class described a heating system embracing a source of heat, a heating coil, a heating, mixing and expansion tank communicating with the coil at each end thereof, an auxiliary reservoir connected with the heating coil and said tank, a by-pass connected across the coil, valves serving to cut out the auxiliary

reservoir and to open and close the by-pass and means for operating said valves.

2. A device of the class described embracing a source of heat, a coil, a heating, expansion and mixing tank with which the discharge end of the coil is connected, a pipe connecting the tank and inlet end of the coil, an auxiliary reservoir communicating with said pipe, a by-pass pipe leading across the coil, valves in the by-pass pipe and first named pipe and means for operating said valves.

3. The combination with a heater of a coil therein, a heating and mixing tank with which the discharge end of the coil is connected, an auxiliary reservoir connected with the heating and mixing tank and with the inlet end of the coil, a by-pass pipe connected with both ends of the coil and with the heating and mixing tank, valves arranged to open the by-pass pipe and open the discharge pipe from the auxiliary reservoir and vice versa and mechanical means for operating said valves.

4. In a device of the class described a heating system, embracing a source of heat, a heating coil, a heating, mixing and expansion tank communicating with each end of the coil, an auxiliary reservoir connected with the heating coil and tank, a by-pass connected across the coil, valves for stopping the circulation through the by-pass and directing the circulation through the auxiliary tank and means for operating the valves.

5. In a device of the class described an expansion tank, a heating coil, a pipe affording communication between the tank and inlet end of the heating coil, a by-pass pipe leading across the coil communicating with said pipe between the tank and inlet end of the heating coil, said by-pass pipe communicating with the outlet end of the heating coil and with the tank and pressure regulated mechanically operated means for opening and for closing said by-pass pipe.

6. The combination with a heater and its coil of a mixing and heating tank mounted upon the heater, a reservoir connected with the inlet end of the coil and also connected with the heating and mixing tank and below the same, as by-pass pipe of relatively large size connecting the ends of the coil and opening into the mixing and heating tank and a valve for opening and for closing said by-pass pipe.

7. A device of the class described embracing a heating coil for fluid circulation, a by-pass across the coil adapted to shorten the circuit and mechanical means operated in part by gravity for opening and closing the by-pass pipe.

8. A device of the class described embracing a heater, a heating coil for fluid circulation, a by-pass across the coil adapted to shorten the circuit, mechanical means operated in part by gravity for opening and closing the by-pass pipe, and a draft door operated simultaneously with the means for opening and closing the by-pass.

9. In a device of the class described a heating coil, a tank, an auxiliary reservoir communicating with the heating coil and tank, a pipe adapted to afford direct communication between the tank and heating coil, a by-pass for short circuiting the heating coil, valves for cutting the auxiliary tank in or out of the circulation and for controlling the flow through the by-pass and means for operating the valves.

10. The combination with a coil of an expansion or mixing tank above the coil, an auxiliary reservoir communicating with the tank and coil, a by-pass communicating with the mixing and expansion tank, the auxiliary reservoir and coil, a valve adapted to permit the flow to be diverted from and also through the auxiliary reservoir, a valve for closing and opening the by-pass and means for operating the valves.

11. In a device of the class described a heating coil, an expansion or mixing tank, an auxiliary tank, a circulating pipe connecting the heating coil and expansion or mixing tank, a by-pass pipe communicating with the expansion or mixing tank and with the circulating pipe above the discharge end of the circulating pipe into the coil and said by-pass communicating with the discharge end of the coil, an inlet and a discharge pipe affording communication between the circulating pipe and auxiliary tank, valves in the by-pass pipe and the circulating pipe and means for operating the valves.

12. The combination with a heater of a coil therein, a heating and mixing tank with which the discharge end of the coil is connected, means affording communication between the mixing and heating tank and heating coil, an auxiliary reservoir connected with the heating and mixing tank and with the inlet end of the coil, a by-pass pipe connected with both ends of the coil and with the heating and mixing tank, valves arranged to open and close the by-pass pipe across the coil and open and close the communication between the auxiliary supply reservoir, and coil and means for operating said valves.

13. A device of the class described embracing a heating coil for fluid circulation, an expansion and mixing tank, an auxiliary reservoir, a circulating pipe connecting the tank and heating coil and with which the auxiliary reservoir communicates, a by-pass across the auxiliary reservoir adapted to reduce the supply to the heating coil and shorten the circuit of the circulating fluid, valves for controlling the passage through

the by-pass and the circulating pipe, and mechanical means operated in part by gravity for operating said valves.

14. A device of the class described embracing a heating coil for fluid circulation, a tank communicating with the heating coil, an auxiliary reservoir communicating with the tank and the heating coil adapted to increase the supply, a by-pass communicating with the tank, the reservoir and the heating coil adapted to shorten the circuit of the circulating fluid, valves for controlling the circulation, and mechanical means connected with the valves and operated by the pressure in the tank.

15. A device of the class described embracing a heating coil for fluid circulation, an expansion tank, a circulating pipe connecting the same and coil, an auxiliary supply reservoir communicating with the circulating pipe, a by-pass pipe across the coil adapted to increase or reduce the supply of the circulating fluid to the heating coil, valves in the by-pass pipe and the circulating pipe for controlling the circulation and means for operating the valves.

16. A device of the class described embracing a heating coil for fluid circulation, a plurality of supply tanks above the same communicating with each other and with the heating coil, a by-pass pipe for cutting out one of the tanks for reducing the supply and shortening the circuit of the circulating fluid and valves for controlling the circulation.

17. In a heating system an expansion tank, a heating coil, a circulating pipe delivering water from the tank to the coil, a by-pass connected to said pipe and discharging into the tank, a pipe affording communication between the discharge end of the coil and the by-pass and an automatically operated valve in the by-pass.

18. The combination with a heater of a radiating system, a heating and mixing tank above the heater, an auxiliary supply chamber communicating with the heating and mixing tank and with the return end of the radiating system, the return end of the radiating system connecting with both the inlet and outlet of the heater and the heating and mixing tank above the heater and means for regulating the flow of water from the auxiliary supply chamber to the heater.

19. In a device of the class described a heating coil, an expansion tank, an auxiliary reservoir, a circulating pipe connecting the tank and inlet end of the heating coil, a pipe discharging from said circulating pipe into the reservoir, a pipe discharging from the reservoir into the circulating pipe, a valve in the circulating pipe adapted in one adjustment to cut the reservoir out of the circulation and in another adjustment to include the reservoir in the circulation, a by-pass pipe communicating with the discharge end of the heating coil, and affording direct communication between the circulating pipe and tank, and a valve in the by-pass pipe.

20. A heating system embracing a heating coil, an expansion tank, a pipe for supplying water to the coil from the tank, a circulating pipe connecting the tank and the inlet end of the heating coil, an outlet from the tank for the circulating pipe, an inlet pipe opening from the circulating pipe into the supply pipe and a by-pass adapted to deliver part of the return water from the circulating pipe directly to the tank.

21. A heating system embracing a heating coil, an expansion tank, a circulating pipe, a pipe for supplying water to the coil from the tank, an outlet from the tank for the circulating pipe, an inlet pipe opening from the circulating pipe into the water supply pipe, a by-pass adapted to deliver part of the return water from the circulating pipe directly to the tank, and means for automatically controlling the flow of water through the by-pass controlled by the pressure in the system.

22. In a device of the class described a heater, an expansion tank, a supply pipe, a circulating pipe, a by-pass pipe connected with the supply pipe adjacent the discharge end of the supply pipe, and connected with the tank and into which the heater discharges, a return pipe for the circulating pipe adapted to discharge into the supply pipe and a valve in the by-pass pipe.

23. In a device of the class described a heater, an expansion tank, a supply pipe, a circulating tank, a by-pass pipe connected with the supply pipe adjacent the discharge end of the supply pipe and connected with the tank and into which the heater discharges, a return pipe for the circulating pipe adapted to discharge into the supply pipe, a valve in the by-pass pipe, and means for automatically operating the valve in the by-pass pipe operating in part by gravity and in part by steam pressure in the tank.

24. In a device of the class described a tank, a heater, a circulating pipe, a pipe for supplying water from the tank to the heater, a pipe for discharging the return water from the circulating pipe into the supply pipe, a by-pass pipe adapted to deliver part of the return water directly to the tank, and means adapted to automatically close the by-pass pipe to necessitate all the water passing through the heater.

25. In a device of the class described the combination with a heater of a radiating system, and means for increasing or diminishing the volume of circulating fluid passing through or over the heating surface in

the heater and decreasing or increasing the temperature and pressure in the radiating system respectively.

26. The combination with a heater of a radiating system, a heating and mixing tank above the heater, an auxiliary supply chamber connected therewith above the heater and with the return end of the radiating system, means for regulating the flow of circulating fluid from the auxiliary supply chamber to the heater and means for shunting a portion of the circulating fluid into the heating and mixing tank.

27. In a device of the class described a heating coil, an expansion tank, pipes connecting the expansion tank and heating coil, an auxiliary reservoir for containing a supply of water and mechanism for admitting the volume of water from the auxiliary tank into the system when the pressure in the system raises and vice versa.

28. In a device of the class described a heater, an expansion tank communicating therewith, an auxiliary supply of water and mechanism for admitting the auxiliary supply of water, part to the heater and the remainder into the expansion tank when pressure in the system becomes too great.

29. In a heating system a heater, a tank communicating therewith, a pipe connecting the return end of the radiating system with the heater and mechanism adapted to automatically admit a large volume of water into the system and cutting said volume of water out of the system.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

WILLIAM P. COSPER.

Witnesses:
K. E. HANNAH,
CHARLES W. HILLS, Jr.