No. 659,776. Patented Oct. 16, 1900.

J. R. WADE.

STEAM HEATING SYSTEM.

(Application filed Oct. 16, 1899.)

(No Model.)

Fig. 1.

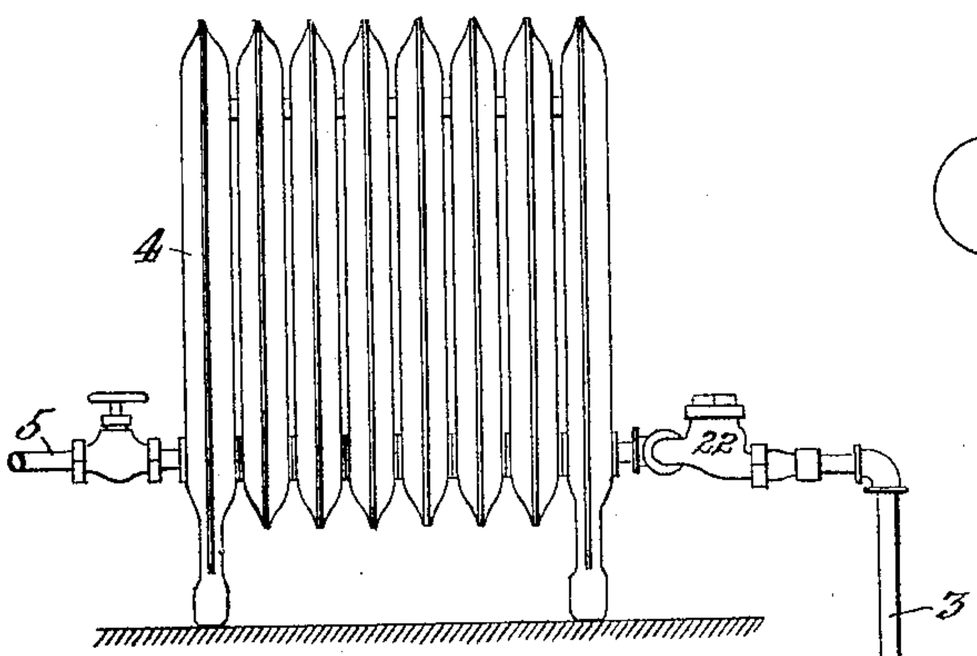


Fig. 2.

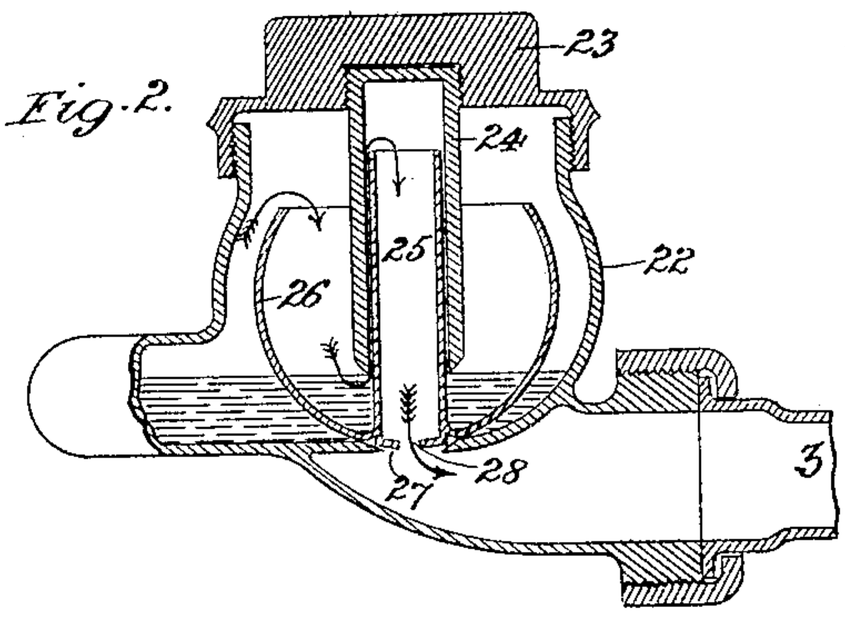
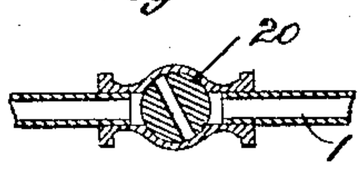
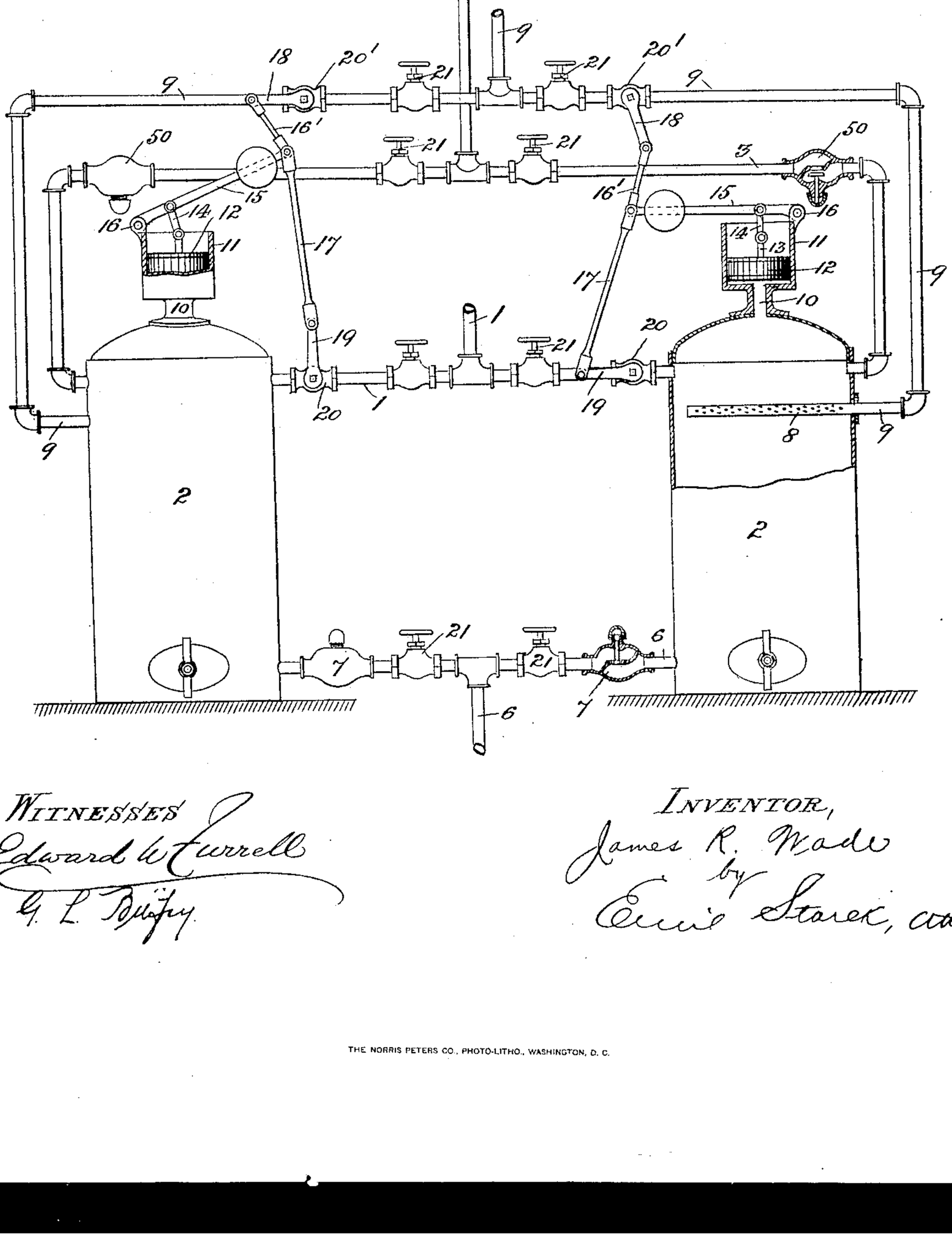


Fig. 3.





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STEAM-HEATING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 659,776, dated October 16, 1900.

Application filed October 16, 1899. Serial No. 733,803. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. WADE, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Steam-Heating Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in steam-heating systems; and it consists in the novel arrangement and combination of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a general elevation of my system. Fig. 2 is a vertical middle section of the outlet-valve of the radiator, and Fig. 3 is a transverse section taken through one of the faucets or plugs interposed in the steam and water pipes.

The invention relates to that class of heating systems in which exhaust-steam from an engine or other machine is employed to circulate through a radiator and its system of connecting pipes, one object of the present improvement being to dispense with the use of injectors and steam-pumps to exhaust the air contained in the radiators in order to create the necessary rarefaction or vacuum in such radiators and pipes for the free circulation of such exhaust-steam. The latter, as is well known, exhausts with a pressure only slightly above the atmospheric pressure, and to insure free circulation through the pipes and radiators these must be in a measure exhausted to assist this low-pressure or exhaust steam to flow radially through them. Under the systems in vogue, where injectors and steam-pumps are used, much live steam is wasted in their operation, and another object of my present invention is to reduce this waste of live steam to a minimum, my present plan being to create a vacuum by the combined means of steam and cold water, the exhaust or low-pressure steam rushing into this vacuum, and thus thoroughly and readily circulating through the pipes and radiators.

A further object is to provide the outlet of each radiator of my system with a valve which will automatically drain the radiator of its water of condensation, thus preventing any interruption in the operation of my system or in any wise interfering with the manner of creating the rarefaction above referred to, the valve acting as a water seal for the contents of the radiator under ordinary conditions.

In detail the invention may be described as follows:

Referring to the drawings, 1 represents a steam-pipe leading to any source of steam-supply (not shown) and communicates with a vacuum-tank 2. From the upper portion of the latter leads a pipe 3, which communicates with the delivery end of any prevailing form of radiator 4, the latter being provided with a valve-controlled inlet steam-supply pipe 5, as usual. From the lower portion of the tank 2 leads a pipe 6 for the discharge of the waters of condensation of the tank 2, the pipe 6 being provided near the tank with a check-valve 7, normally closed by gravity. Through the upper wall of the tank 2 there enters a spray-pipe 8, the same being the lower terminal of a pipe 9, leading to any source of cold-water supply. Mounted on a hollow neck or stem 10 on top of the tank 2 is an open cylinder 11, within which operates a piston 12, provided with a centrally-projecting rod 13, pivotally connected by a link 14 to a weighted lever 15, whose one end is pivoted between lugs 16, formed with the cylinder-walls. The free end of the lever is pivotally connected to the meeting ends of a couple of links 16′ 17, which in turn are respectively and pivotally connected to the free ends of the arms 18 19, projecting from the spindles of the oscillating faucets or rock-valves 20 20′, located, respectively, in the paths of the pipes 1 and 9. The pipes 1 3 6 9 are provided additionally with screw-valves 21 of ordinary pattern for obvious purposes.

At the outlet end of the radiator is located a valve-casing 22, to the upper open end of which is secured a cap 23, from the center of the inner face of whose top depends a guide-tube 24, designed to receive the central tubular stem 25 of a cup or float 26, adapted to be normally seated about the edge of the opening 27, formed at the bottom of the casing. The tapering bottom of the hollow stem 25 is provided with an opening 28 for the free passage of the currents, as seen by the arrows in Fig. 2. Under ordinary circumstances the waters of condensation incidental to the op-

eration of the system will mechanically lodge and in a short time fill the cup up to the lower edge of the tube 24, the water in the casing corresponding to the same level. The condensation-water by thus filling the cup to the lower edge of the tube 24 acts as a seal against a too-violent draining of the radiator under the action of the vacuum in the tank 2, as will presently appear, it being understood that said condensation-water is maintained at this level in the cup, any excess being carried off mechanically by the currents induced as a result of the vacuum formed in the tank 2. The water thus carried off passes from the radiator into the cup, thence upward through the space between the stem 25 and guide-tube 24, and thence down through the stem 25 and opening 28 into the tank 2 by way of pipe 3. Should the condensation take place more rapidly than the currents could carry off the same mechanically, the water which would thus accumulate around the cup would raise the latter off its seat, permitting the water to discharge through the opening 27 into pipe 3 and eventually into tank 2.

In the operation of my device steam is first admitted through the pipe 1 into tank 2, the valve 20 being open and valve 20′ closed, (this being the actual condition so far as the right-hand tank in Fig. 1 is concerned.) The steam thus admitted almost immediately acts on the piston 12, raising the weighted lever 15 (see left-hand side in Fig. 1) and simultaneously closing valve 20 and opening valve 20′, back pressure into the radiator being prevented by check-valve 50 in pipe 3. The valve 20′ permits the flow of cool water through pipe 9 and spray-pipe 8 into the tank, the spray suddenly condensing the steam in tank 2, thus creating a vacuum into which the air and steam from the radiator 4 (and heating-pipes) rushes through the pipe 3, thus permitting the exhaust or low-pressure steam, which serves as the heating medium, to flow freely through such radiator and system of pipes communicating therewith and forming part of the system. When the pressure in the tank becomes restored to its normal condition, the weighted lever controlling the piston in one direction again drops, thus again opening the steam-valve 20 and closing valve 20′, the operation repeating itself as often as the system is in operation. It is to be understood that immediately upon the formation of a slight degree of vacuum in the tank 2 (after the piston 12 has been raised) the piston begins to fall, but does not open the steam-valve 20 (nor close the valve 20′) until it reaches its lowest limit, thus allowing plenty of time for the reduction of pressure in the tank to be communicated to the radiator 4, for it is obvious that when the piston has once been raised (as seen on the left of Fig. 1) the arm of the rock-valve 20 and link connected thereto are nearly in the same straight line; necessitating considerable pull on the part of the piston to restore them to their original position. So it is apparent that sufficient time will be given for the reduction of pressure in the tank to be communicated to the radiator before the piston actually descends. Furthermore, the steam never rushes into the vacuum, but simply flows, the screw-valves by which the steam is admitted being adjusted or opened to permit a mere flow, and not a rush, into the tank. The relative positions of the valves 20 20′ are fully indicated in the drawings by the directions of the arms 18 19, either valve being open when its arm is in line with the pipe by which the valve is carried, and as these valves are of the ordinary faucet type well known from time immemorial in the market no specific illustration thereof is made herein, their action being well understood by the most ordinary mechanic. By closing one series of valves 21, so as to disconnect one of the tanks 2, one tank can be always closed and the other tank kept in operation, the present system showing two tanks 2, (the right-hand tank showing the piston in its lowest position, while the left tank shows the corresponding part in its highest position.) While I have shown two tanks, it is to be understood that they are not to be used simultaneously, but independently, the one being in use while the other is being cleaned, and while the position of the parts in the left-hand tank is the reverse of those in the right-hand one they were so illustrated to avoid the necessity of showing the same parts in dotted position in the right-hand tank for purposes of avoiding confusion in the matter of illustration. The waters of condensation are driven out of the tank 2 with each fresh influx of steam thereinto, the latter being prevented from escaping out of the tank with the waters of condensation from the fact that by the time such a contingency would happen the piston will have been actuated sufficiently to shut off such steam by the closing of valve 20. With each efflux of the condensation-water it is apparent, of course, that the check-valve 7 is unseated.

By my system it will thus be seen that the steam is only used spasmodically and only in sufficient quantities to effect the vacuum or corresponding reduction of the pressure in the system of pipes or radiators constituting the heating system. The object of drawing on the radiator intermittently is to allow the exhaust-steam circulating in the same ample time to part with its heat units before the air and waters of condensation are drawn into the vacuum-tank. It is apparent, of course, that minor changes can enter into the construction without departing from the spirit of my invention. Under ordinary conditions of condensation within the radiator the waters of condensation will be drawn mechanically with the current induced as a result of the condensation in the tank 2, the drawing off of the waters being such as to leave in the cup 26 and casing 22 a quantity represented

substantially in Fig. 2. Should the condensation exceed the capacity of the induced current to carry off the condensed water, the latter will raise the cup or float off its seat and automatically drain itself into the pipe 3.

While the specific construction of the cup 26 here set forth freely allows the air and waters of condensation to be mechanically drawn off with the induced current referred to and, furthermore, allows any excess of water to be freely drained into the tank 2 as above described, I wish it to be understood that I do not limit myself to this construction of cup, but may substitute therefor any form of valve capable of accomplishing the same results under the circumstances.

While only one radiator 4 is here illustrated and referred to, it is apparent that I may couple any number of radiators together and to the tank 2.

I do not wish to confine my present invention to heating systems, but may apply the principle to vacuum-pans, stills, or, in fact, to any system where low-pressure steam is employed for purposes of circulation, boiling, or heating.

Having described my invention, what I claim is—

1. In a heating system, one or more tanks, having connections with a steam-supply, a water-supply, and with a radiator-heating system respectively, valves simultaneously controlling the steam and water connections to alternately inject steam and water into the tanks and produce a vacuum, thereby permitting the air of the radiator system to be intermittently drawn into the tank, the parts operating substantially as and for the purpose set forth.

2. In a heating system, one or more tanks or vessels adapted to be connected with the radiator of a steam-heating system, a source of steam-supply and water-supply communicating with said tank or tanks, and devices interposed between such sources and the tank or tanks for automatically and intermittently reducing the pressure in said tank or tanks, and correspondingly exhausting the air and condensation-waters from the radiator, substantially as set forth.

3. In a steam-heating system, a radiator, a tank, a pipe connecting the upper portion of the tank with the discharge end of the radiator, a water-pipe terminating in a spray-pipe within the tank, a steam-pipe leading to the upper portion of the tank, a cylinder mounted on top of the tank, a piston in said cylinder, a weighted pivoted lever coöperatively connected to said piston, rock valves or faucets mounted in the steam and water pipes respectively, linked connections between the stems of said valves and the weighted lever, and a check-valve leading from the bottom of the tank, the parts operating substantially as and for the purpose set forth.

4. In a heating system, one or more tanks having connections with a steam-supply, a water-supply, and with a radiator-heating system respectively, valves simultaneously controlling the steam and water connections to alternately inject steam and water into the tanks and produce a vacuum, thereby permitting the air and steam of the radiator system and the waters of condensation to be intermittently drawn into the tank, a valve at the outlet end of the radiator adapted to permit of the free passage of the air and steam within the radiator, and also the free passage of the waters of condensation into the tank upon the formation of a vacuum in the latter, the same valve being adapted to drain the radiator of waters of condensation in excess of those drawn into the tank by the vacuum, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES R. WADE.

Witnesses:
EMIL STAREK,
G. L. BELFRY.