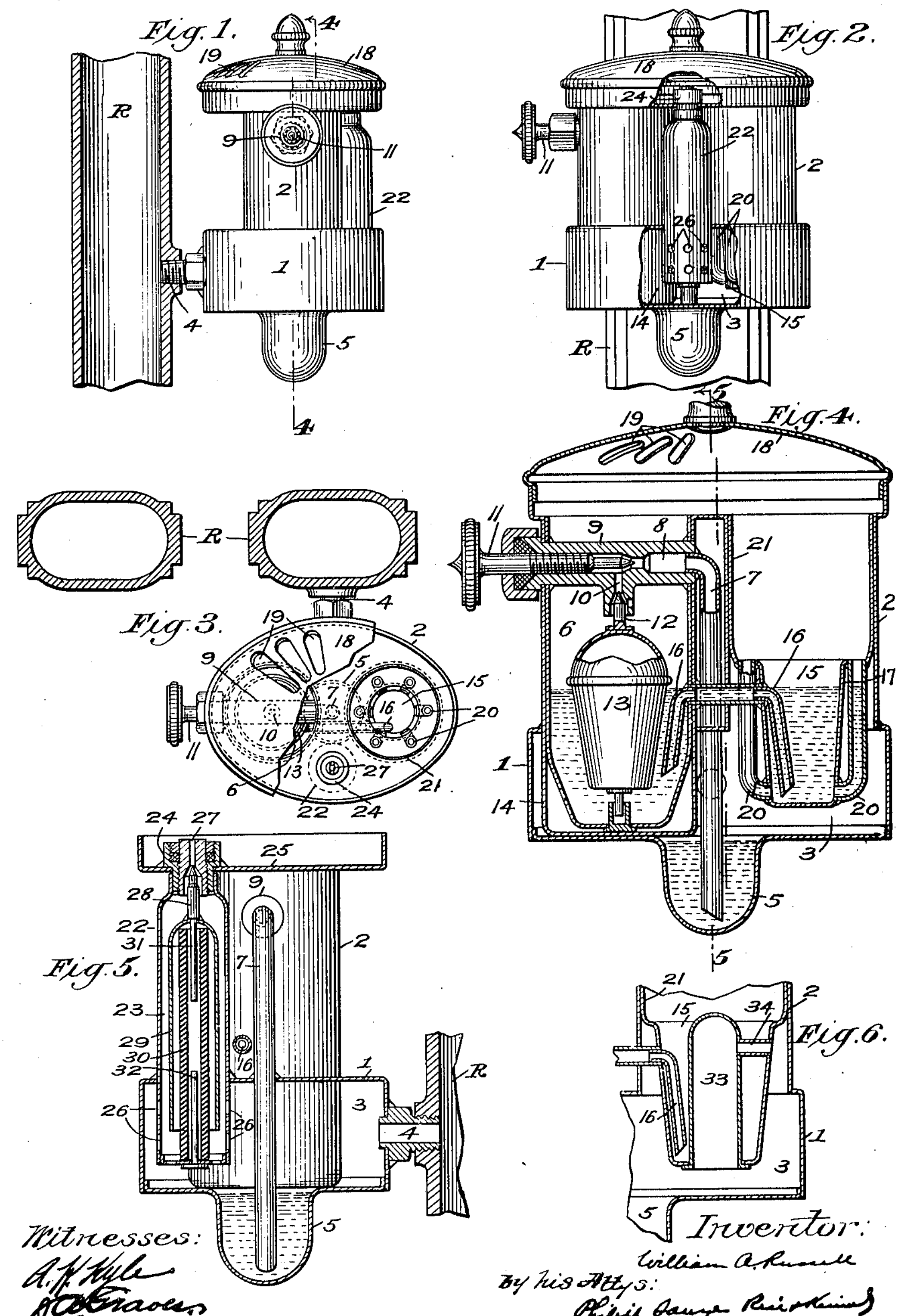
W. A. RUSSELL.

AUTOMATIC AIR MOISTENING DEVICE.

APPLICATION FILED APR. 2, 1908.

1,019,843. Patented Mar. 12, 1912.



Witnesses:

A. J. Kyle

J. A. Graves

Inventor:

William A. Russell

By his Attys:

Philipp Sawyer Rice & Kennedy

UNITED STATES PATENT OFFICE.

WILLIAM A. RUSSELL, OF YONKERS, NEW YORK.

AUTOMATIC AIR-MOISTENING DEVICE.

1,019,843. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed April 2, 1908. Serial No. 424,779.

To all whom it may concern:

Be it known that I, WILLIAM A. RUSSELL, a citizen of the United States, residing at Yonkers, county of Westchester, and State of New York, have invented certain new and useful Improvements in Automatic Air-Moistening Devices, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements in air-moistening apparatus for use in connection with steam heating plants and to steam heating plants equipped with such apparatus, it being the object of the present invention to provide an air moistening apparatus which will automatically control or regulate the humidity of the atmosphere of the room in which it may be located, by evaporating into the room the water of condensation from the heating plant, so that as the heat from the heating apparatus is increased or decreased, respectively, the humidity of the room will be maintained at the proper point, or, by manual adjustment, at any selected point required for special purposes.

As a full understanding of the improvements of the present invention can best be given by a detailed description of an organization embodying the same, such description will now be given in connection with the accompanying drawings, in which—

Figure 1 is a sectional elevation of a radiator tube equipped with an air-moistening apparatus embodying the present invention in its preferred form. Fig. 2 is an elevation partly in section of the same looking toward the left in Fig. 1. Fig. 3 is a plan view thereof with a part of the cover of the air-moistening apparatus removed to disclose its interior construction, the tubes of the radiator being shown in section. Fig. 4 is a vertical section of the air-moistening apparatus taken on the line 4 of Fig. 1, but on an enlarged scale. Fig. 5 is a vertical section thereof on the line 5 of Fig. 4; and Fig 6 is a vertical section illustrating a modification which will be hereinafter referred to.

Referring to said drawings, R represents a radiator tube of a steam heating apparatus, to which is attached the air-moistening apparatus, which is preferably, though not necessarily, in the form of an attachment adapted to be readily attached to or detached from a steam radiator, instead of being an integral or otherwise permanent part thereof. This air-moistening apparatus comprises a base or support 1, on which is mounted a casing 2 containing, in its lower end, a chamber 3 having a short section of threaded piping 4 adapted to enter a correspondingly threaded opening in the radiator tube and to thereby connect the attachment to the radiator. The chamber 3, which will be hereinafter referred to as the "condensing chamber", and which is, of course, closed to the atmosphere while operating, communicates, through pipe 4, with the interior of the heating apparatus so as to receive steam therefrom, which is condensed therein, the water of condensation, of course, falling to the bottom of the chamber 3, which is preferably provided with a depressed portion or pocket 5 for its reception. The condensing chamber 3, it will be observed, extends entirely around the lower end of the apparatus so as to provide a large area of condensing surface. Within the casing 2, and partly within the chamber 3 thereof, there is also provided a chamber 6, hereinafter called the "receiving chamber", which is open at its upper end to the atmosphere. This receiving chamber 6 communicates with the chamber 3 through a pipe 7, the lower end of which is located near the bottom of the pocket 5 of the condensing chamber 3, so as to conduct the water therefrom to receiving chamber 6. One advantage of thus feeding the water of condensation from the bottom of pocket 5 is that the water at that level will be free from any oily odor and otherwise in the best possible condition for evaporation into the room, the oil, if any be present, of course floating on top of the water above the bottom of the pocket. Another advantage of this arrangement is that the lower end of pipe 7 forms, with the water in the pocket 5, a seal or steam trap preventing the passage of steam into the receiving chamber. Still another advantage in the use of the pocket 5 is that there is detained there, at all times, against return to the radiator, a sufficient quantity of water for feeding to the receiving chamber 6. The upper end of said pipe 7 communicates with chamber 6 through a passage 8 formed in a cross piece 9 set in the casing 2, and in the upper end of the chamber 6 and a passage 10 leading downwardly therefrom. The passage 8 is controlled by a manually operated screw threaded valve 11, by which

the feed of water of condensation from the chamber 3 to the receiving chamber 6 may be regulated or entirely shut off, as desired, while the passage 10 is controlled by a valve 12 on the upper end of a float 13 in chamber 6, which rises and falls with the supply of water in the chamber 6 and thus, through said valve, automatically regulates or cuts off the supply of water to said chamber from condensing chamber 3. To avoid boiling or undesirable heating of the water in the chamber 6 by the steam in chamber 3, which would affect the proper operation of float 13 and its valve 12, the chamber 6 is inclosed at its lower end by a casing 14 set at a suitable distance from the walls of said chamber 6 so as to provide a dead air space insulating the lower end of said chamber 6 from the heat of the steam in condensing chamber 3. The casing 2 also contains a third chamber 15, hereinafter called the "evaporating chamber", for convenience, which is open at its upper end to the atmosphere and communicates with chamber 6 by means of a pipe 16 bent downwardly at its opposite ends, and with its bent ends so related to each other in length and otherwise that, when the supply of water of condensation in the receiving chamber reaches a certain level (about that indicated), a siphon action will take place between the two chambers 6, 15 with the result that water of condensation will be fed from the chamber 6 to chamber 15. The siphon action of pipe 16 is intermittent, that is to say, when water of condensation is fed into chamber 6, the siphon action of pipe 16 will start up as soon as the water reaches about the level indicated, and will continue thereafter so long as the level of water continues above the lower end of pipe 16 in chamber 6. When, however, it falls below that level the siphon action will be interrupted and will not be resumed until the level of water again reaches the point indicated, that is, the horizontal portion of pipe 16. From this it results that as long as the chamber 6 is kept automatically supplied with water of condensation from the condensing chamber 3, such water of condensation will be automatically fed to the evaporating chamber 15, the volume and continuity of such feed being dependent upon the feed of water of condensation from chamber 3 to chamber 6, which is, of course, dependent upon the steam pressure in the radiator, and also upon the position of the manually operated valve 11. The float 13 also automatically regulates the feed of water of condensation to receiving chamber 6 and also thereby regulates automatically the feed of water from the latter to evaporating chamber 15, which latter feed is also regulated automatically by siphon pipe 16.

Evaporating chamber 15, like the other chambers of the apparatus, is made of thin sheet metal, and is, as will be observed, located mainly in that part of the casing 2 which constitutes the condensing chamber 3, the upper portion 17 of said evaporating chamber which is not within the condensing chamber 3 being set away from the wall of casing 2 so that such upper portion, like the upper portion of the evaporating chamber 15, will be exposed to the steam in condensing chamber 3 from the heating plant. The result of such exposure of the evaporating chamber 15 directly to the steam in condensing chamber 3 is that the water within it will be boiled by the steam and thus be evaporated into the room in which is located the radiator to which the attachment may be fixed, the evaporating chamber 15, as before stated, being exposed to the atmosphere at its upper end, except, of course, that the casing 2 is provided with a removable top 18 for the purpose of protecting the interior thereof from dust, dirt, etc., this top or cover, however, being provided with openings 19 for the escape into the room of the vapor from the evaporating chamber 15.

Evaporating chamber 15 is preferably provided with vertical tubes 20 communicating at their lower ends with the bottom of the evaporating chamber, and at their upper ends with the top thereof, the purpose of these tubes being to increase the area of heating surface exposed to the action of the steam in condensing chamber 3 and thus render more rapid the boiling of the water in said evaporating chamber. Another function of tubes 20 is to provide for the circulation of the water in said chamber 15 from top to bottom and through the tubes 20, the water from which spills over into the chamber 15 and is replaced by water from the bottom of said chamber entering the lower end of the tubes, thus further increasing the rapidity with which the water in said chamber is boiled, and, therefore, evaporated into the room in which the attachment is used. The casing 2 is provided interiorly with a second casing 21 constituting an upward extension of the evaporating chamber 15, the lower edge of said casing 21 being bent inwardly and connected with the upper end of the chamber 15 by a steam tight joint. This upward extension of chamber 15 avoids any liability of the water overflowing into the room.

The operation of the apparatus, as thus far described, is as follows: Steam from the radiator tube R will enter chamber 3, and, condensing therein, will be deposited in the bottom thereof, as indicated in Fig. 4. With valve 11 unseated, as shown in said Fig. 4, this water of condensation will be forced by the pressure of the steam above it upwardly through the pipe 7 and thence through passages 8, 10, into the receiver chamber 6. When the water in said chamber 6 has

reached about the level shown in said Fig. 4, it will pass from said chamber through the pipe 16 into the evaporating chamber 15. The water thus fed into the evaporating chamber 15 will be boiled by the steam in the condensing chamber 3 and thus be evaporated into the room through the openings 19 in the cover 18, or, if no such cover be used, directly into the room from the top of said chamber 15. As the water accumulates in the chamber 6, float 13 rising therewith will, through its valve 12, gradually and automatically shut off the supply of water from condenser chamber 3, and, if the accumulation of water in said chamber 6 should, by reason of a failure to properly adjust the valve 11 or for any other reason, be more rapid than the feed from said chamber to the evaporating chamber 15, the float valve 12 will, of course, at the proper time, entirely close the passage 10 and thus entirely shut off the supply of water to chamber 6 from the condensing chamber 3, this condition continuing until the level of water in said chamber 6 has fallen to such an extent that the float 13, following with it, will reopen passage 10.

With the apparatus just described, it will be apparent that the humidity of the atmosphere of the room in which it is located may be perfectly regulated or controlled, so that it may be maintained at the point required by the health or comfort of the occupants or for the preservation of those parts or contents of the room which are damaged by variations in humidity, and may also be maintained at any other point necessary for special purposes. It will also be apparent that by reason of such automatic regulation or control of humidity a great saving in fuel is effected, the fact being, as heretofore indicated, that, with the proper degree of humidity maintained in heating, greater warmth and comfort are secured with a low degree of heat, and therefore less fuel, than is possible with a much higher degree of heat, and therefore more fuel, where such degree of humidity is not maintained.

Another advantage of the apparatus described is that the water which it evaporates into the atmosphere is, in effect, distilled water and therefore in the best possible condition for the purpose. If desired some fluid or solid substance having an agreeable odor may be introduced into chamber 15.

The attachment is also equipped with an air valve 22. This air valve may be of any desired construction, but, as shown, it consists of a cylindrical chamber 23 set at its lower end in the condensing chamber 3, and at its upper end on a plug 24 set in the top plate 25 of the casing 2. Chamber 23 communicates with condensing chamber 3 through openings 26 in the lower end of said chamber 23 and with the atmosphere through a passage 27 in the plug 24, which passage is controlled by a valve 28 in the upper end of an inverted cup-shaped member or bell 29 resting on an expansible plug 30, preferably of hard rubber, loosely mounted on pins 31, 32, secured to the bottom of chamber 23 and to the top of member 29 respectively. Air from the radiator entering condensing chamber 3 in advance of the steam therefrom, will escape to the atmosphere through openings 26, chamber 23 and passage 27, in the normal position of the member 29. As soon as the air is exhausted from chamber 3 plug 30 will be expanded by the steam and member 29 raised thereby, with the result that passage 27 will be closed by valve 28, and the escape of steam through said passage into the room prevented. The escape of air from condensing chamber 3 is, of course, necessary for the proper operation of the air-moistening apparatus, and the air valve described provides for this and at the same time performs the function of an ordinary air valve in freeing the radiator of air.

The modified form of apparatus illustrated in Fig. 6 differs from that of the preceding figures merely in the construction of the evaporating chamber 15. In this case the water circulating tubes 20 of the preceding figures are omitted, and the bottom of the chamber is punched up so as to provide a central chamber 33 open at its lower end to condensing chamber 3 and also connected therewith at its upper end by a pipe 34, with the result that the area of the heating surface in contact with the steam in chamber 15 is materially increased, and the circulation of steam through chamber 33 also provided for, both of which features aid in the rapid boiling of the water in chamber 15.

What I claim is:—

1. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, substantially as described.

2. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged

relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam in the condensing chamber, substantially as described.

3. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and means for automatically regulating the feed from the receiving chamber to the evaporating chamber, substantially as described.

4. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and means for automatically regulating the feed of the water of condensation, substantially as described.

5. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and means for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

6. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and means controlled by the water in the receiving chamber for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

7. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, and evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and means, including a float in the receiving chamber, for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

8. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, connections between the two for feeding water of condensation from the former into the latter, means for automatically regulating such feed, an evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and a siphon connection between the receiving and evaporating chambers whereby water of condensation is automatically fed from the former into the latter, substantially as described.

9. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, connections between the two for feeding water of condensation from the former into the latter, means controlled by the water in the receiving chamber for automatically regulating such feed, an evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and a siphon connection between the receiving and evaporating chambers whereby water of condensation is automatically fed from the former into the latter, substantially as described.

10. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing cham-

ber, a receiving chamber, connections between the two for feeding water of condensation from the former into the latter, means, including a float, in the receiving chamber for automatically regulating such feed, an evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, and a siphon connection between the receiving and evaporating chambers whereby water of condensation is automatically fed from the former into the latter, substantially as described.

11. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, the connections between the condensing and receiving chambers comprising a trap for the steam in the former, substantially as described.

12. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, said connections between the condensing and receiving chambers comprising a trap for the steam in the former, and means, controlled by the water in the receiving chamber, for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

13. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, said connections between the condensing and receiving chambers comprising a trap for the steam in the former, and means, including a float in the receiving chamber, for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

14. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, an automatic air valve for the escape of air from said condensing chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, substantially as described.

15. In an automatic air moistening apparatus for steam heating systems, the combination of a closed steam condensing chamber, a receiving chamber, an evaporating chamber, an automatic air valve for the escape of air from said condensing chamber, and connections between said chambers whereby water of condensation is fed from the condensing chamber into the receiving chamber and thence into the evaporating chamber, said evaporating and condensing chambers being so arranged relatively to each other that the exterior of said evaporating chamber is exposed to and the contents thereof heated by the steam of the system, said connections also providing for automatic regulation of the feed from the receiving chamber to the evaporating chamber, substantially as described.

16. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and connections between the receiving and evaporating chambers providing for automatic regulation of the feed from the former to the latter, substantially as described.

17. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and connections between the receiving and evaporating chambers providing for automatic regulation of the feed from the former to the latter, the evaporating cham-

ber being so disposed relatively to the condensing chamber that it will be exposed exteriorly to and its contents thus heated by the steam in the latter, substantially as described.

18. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and means for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

19. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and means for automatically regulating the feed from the condensing chamber to the receiving chamber, the evaporating chamber being so disposed relatively to the condensing chamber that it will be exposed exteriorly to and its contents thus heated by the steam in the latter, substantially as described.

20. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and means, including a float in the receiving chamber, for automatically regulating the feed from the condensing chamber to the receiving chamber, substantially as described.

21. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and means, including a float in the receiving chamber, for automatically regulating the feed from the condensing chamber to the receiving chamber, the evaporating chamber being so disposed relatively to the condensing chamber that it will be exposed exteriorly to and its contents thus heated by the steam in the latter, substantially as described.

22. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and an automatic air valve for the escape of air from the condensing chamber, substantially as described.

23. An automatic air moistening attachment for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, and said evaporating chamber being provided with water circulating tubes or passages communicating at their opposite ends with said chamber, substantially as described.

24. An automatic air moistening apparatus for steam heating systems, comprising a closed steam condensing chamber, a receiving chamber, and an evaporating chamber, all mounted on a common support and communicating with each other in the order named, the connections between the condensing and receiving chambers including a trap for the steam in the former, substantially as described.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

WILLIAM A. RUSSELL.

Witnesses:
J. A. GRAVES,
PHILIP N. TILDEN.