Oct. 14, 1930. W. O. THIELE 1,778,573

AUTOMATIC WARM AIR HUMIDIFIER

Filed July 29, 1929

Fig. 1.

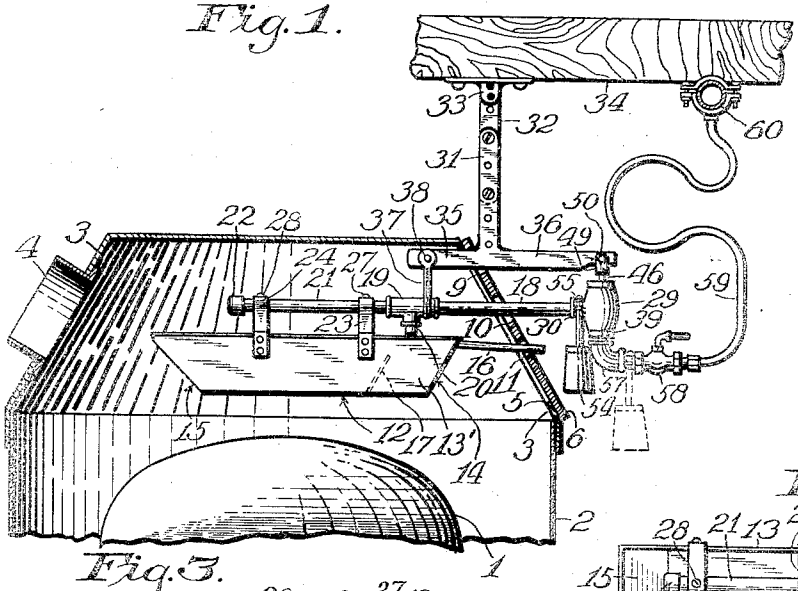


Fig. 2.

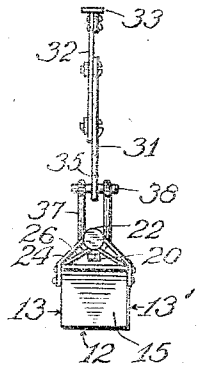


Fig. 3.

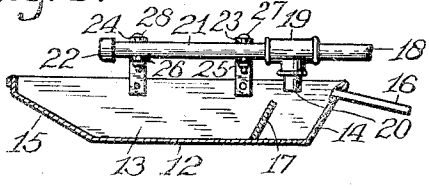


Fig. 4.

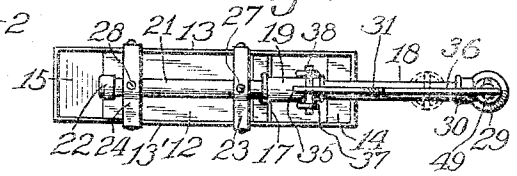


Fig. 5.

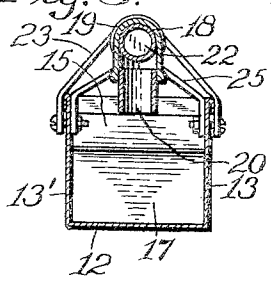


Fig. 6.

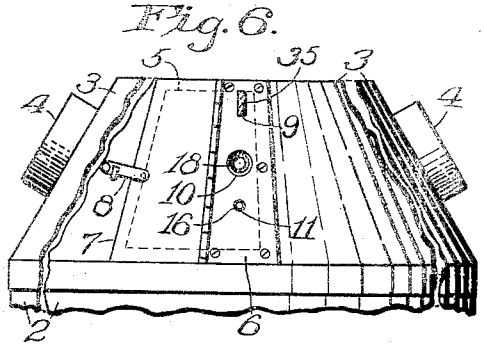


Fig. 7.

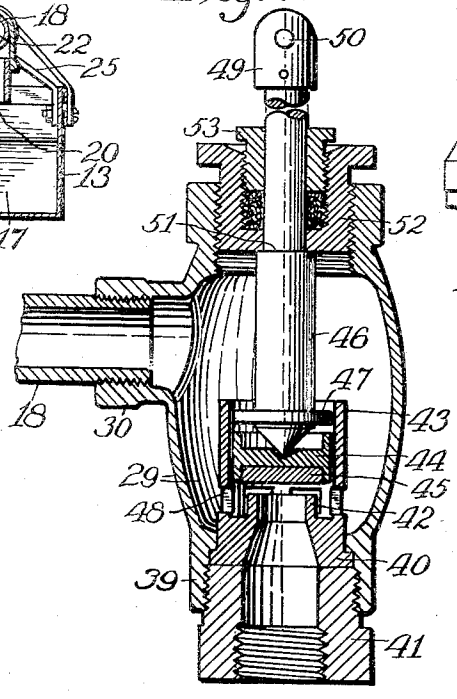


Fig. 8.

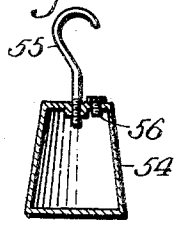
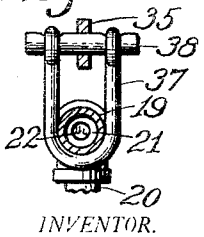


Fig. 9.



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UNITED STATES PATENT OFFICE

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AUTOMATIC WARM-AIR HUMIDIFIER

Application filed July 29, 1929. Serial No. 381,957.

This invention relates to an apparatus that is designed to be used in supplying humidity to warm air in its passage through a heating furnace to a room or rooms of a building required to be heated, the invention having reference more particularly to a warm-air humidifier of the type that is adapted to operate automatically and cause a supply of water to be constantly maintained according to the requirements for humid air, which may be varying.

An object of the invention is to provide an improved automatic air moistener or humidifier that shall be so constructed as to be adapted to automatically operate to control the supply of water for moistening air, in a furnace warm-air chamber, in accordance with the rate of evaporation of the water into passing warm air for heating purposes.

Another object is to provide an automatic warm-air humidifier that shall be of such construction as to be adapted to operate promptly and reliably, and be free of troublesome parts that might be deranged and necessitate expert adjustments or new parts.

A further object is to provide an improved warm-air humidifier of such construction as to be adapted to be manufactured and installed at low cost, of simple and reliable parts, and without requiring the use of such valves as may be liable to leak or require frequent attention or repairs.

A still further object is to provide an improved warm-air humidifier that shall be adapted to be installed in connection with either new or old warm-air furnaces of various types, which shall have a freely operating water-controlling valve, and which shall be highly efficient, durable and economical in use.

With the above-mentioned and other objects in view, the invention consists in a novel automatic air moistener or humidifier comprising novel elements and novel arrangement of elements enabling humidifying water automatically to control the supply thereof synchronously with the rate of evaporation of the water or absorption of the water by passing warm air; and further, the invention consists in the parts and in the combinations and arrangements of parts, as hereinafter particularly described and further defined in the appended claims.

Referring to the accompanying drawings, Figure 1 is a fragmentary sectional elevation of a conventional warm-air furnace having the invention applied thereto so as to illustrate the functions thereof; Fig. 2 is an end view of the humidifying apparatus separate from the furnace; Fig. 3 is a longitudinal vertical section of an improved evaporator pan and its feeder comprised in the invention; Fig. 4 is a top plan of the pan and the feeder; Fig. 5 is a transverse section of the pan and its feeder; Fig. 6 is a fragmentary elevation of the upper portion of the warm-air furnace casing from which warm air is to be distributed; Fig. 7 is a vertical central section of an improved non-sticking regulating-valve adapted to reliably control the feeding of water to the evaporator pan; Fig. 8 is a central section of a modified adjusting weight comprised in the invention, and Fig. 9 is a fragmentary detail showing on an enlarged scale the assembly of parts preferred for pivotally supporting the evaporator pan and its feeder.

Similar reference characters in the different figures of the drawings indicate corresponding elements or features of construction herein referred to in detail.

In the drawings the numeral 1 indicates the crown or upper portion of a warm-air furnace constituting a combustion chamber, and 2 the casing wall of the furnace having a conventional hood 3 thereon constituting a warm-air distributing chamber with which a suitable number of distributing pipes 4 are connected. For the purposes of the invention the hood has a suitable aperture 5 in one portion thereof through which to insert the evaporator pan and other parts of the apparatus, the aperture being covered by a suitably secured plate 6 that covers one portion of the aperture and to which a door 7 is hinged to cover the remaining portion of the aperture, the door being provided with a suitable latch 8. The cover plate 6 has openings 9, 10 and 11 therein into which parts of the apparatus may be inserted.

The improved evaporator pan as preferably constructed has a flat bottom 12, vertical sides 13 and 13', slightly inclined head end 14 and a considerably inclined end 15, to provide for varying water surface area, the upper portion of one of the ends being provided with an overflow pipe 16. Preferably the pan has an inclined partitional plate 17 therein at a suitable distance from the end 14. A suitable water-supply pipe 18 is arranged above the pan and has a pipe T 19 connected thereto so that its side branch projects downwardly to discharge water into the pan, being preferably provided with a discharge nozzle 20 and so arranged as to discharge into the compartment between the end 14 and the plate 17. A beam 21, preferably composed of tubing, is secured to the T 19 so as to be in alinement with the pipe 18 and it preferably has a cap 22 on its end. Two hangers 23 and 24 are secured to the sides of the pan and are supported upon the beam, braces 25 and 26 preferably being secured also to the sides of the pan and arranged below the hangers respectively, one of the hangers and a brace being secured to the beam by means of a bolt 27, the remaining hanger and a brace being secured also to the beam by means of a bolt 28. In practice the pan is arranged in the hood 3 so as to be above the crown 1 of the furnace, and the supply pipe 18 extends through the aperture 10, the pipe 16 extending outward through the aperture 11. The pan is suitably supported to enable it to move downwardly according to weight of water that may be contained in the pan.

For feeding and controlling water so as to supply the pan as may be needed according to varying conditions involved in warm-air heating, the outward end of the pipe 18 is provided with a novel operative feed-valve apparatus adapted to be controlled upon movement of the evaporator pan when influenced by weight of water in the pan. Preferably the feed-valve apparatus comprises a casing 29 having a neck 30 that is secured to the pipe 18, and the apparatus is controlled preferably by means of a hanger member 31 adjustably secured to a hanger member 32 which is provided with a suitable head member 33 adapted to be secured to a joist 34 that may be arranged above the furnace, the hanger member 31 having lateral arms 35 and 36, the arm 35 extending through the slot 9 and pivotally supporting the pan and its supply pipe by means of a link 37 directly supporting one portion of the T 19 and connected to the arm 35 by means of a pivot 38. The valve casing has a neck 39 in which a base ring 40 is seated and secured in place by a pipe-fitting 41 screwed to the neck 39, the base ring having an upward-facing valve seat 42 thereon and also a valve cage 43 in which a valve body 44 is movably guided and provided with a renewable face part 45 adapted to operate in connection with the valve seat which in practice is carried up to the valve face, the valve being held by water pressure against the point of a stem 46 which preferably has a guide member 47 thereon arranged within the cage 43. The cage has ports 48 for the passage of water from the top of the valve seat and through the casing to the pipe 18. The stem extends through the upper portion of the casing and has a head 49 thereon that is connected to the hanger arm 36 by means of a pivot pin 50. The stem preferably has a shoulder 51 within the casing that engages the bottom of a packing box 52 adjustably screwed into the top of the casing whereby to vary the extent of opening between the valve seat and the valve, particularly to limit the downward movement of the valve casing. Preferably the packing box has a gland 53 therein to retain packing on the valve stem.

A shiftable counter-weight 54 preferably is provided and it has a hook 55 adapted to be supported on the neck 30 of the casing, or on the pipe 18 as indicated in Fig. 4, or elsewhere as may be required to counterbalance the evaporator pan, and it may be solid and support fractional weights on its top; or it may be hollow and provided with a filling plug 56 on its top into which dry sand or other weighting substance may be inserted. An elbow 57 may be connected with the lower portion of the casing 29 to which a stop-cock 58 may be connected, affording an approximately horizonal lever member to which the counterweight may be connected as indicated in Fig. 1. A suitably curved or coiled feed pipe 59 of small capacity is connected to the stop-cock and to a water service pipe 60 which may be located under and supported by the joist 34. The pipe 59 preferably is copper and being curved is sufficiently elastic to permit slight movement of the valve casing relatively to the valve stem.

In practical use, the stop-cock 58 being opened, water slowly passes under pressure to the valve in the casing which is lifted and held by water pressure against the valve stem 46, the weight of the valve casing and connections exceeding the weight of the evaporator pan when empty; and as the water flows from the casing through the pipe 18 and into the pan in proximity to the end 14, the level of the water rises and flow occurs over the top of the plate 17 so that the pan becomes nearly filled, while the weight of the water gradually causes tilting of the pipe 18 and upward movement of the valve casing until the valve seat is carried into contact with the valve face 45 and the flow of water thereby stopped, any surplus water entering the pan being carried away by the overflow pipe 16. As warm air rises in the furnace it passes under and about the evaporator pan from which moisture is taken up by the air which

in a humidified state passes onward through the distributing pipes into the building. The effective "lift" of the valve 44 may be varied by adjustment of the device 52, and proper counterbalancing may be effected by shifting the counter-weight 54 or by changing the density and weight thereof. As the water in the pan evaporates and decreases in volume and consequently in weight the beam-like pipe 18 tilts on its support because of the weight of the valve casing and counter-weight, resulting in slight descent of the valve casing so as to effect an opening of the passage therethrough to supply the requisite volume of water that may be required, the feeding of water occuring automatically according to conditions to be met in accordance with volume of heating air supplied and the temperature of the air. The ultimate result desired follows proper adjustments of the apparatus with respect to the proper operation of the heating furnace to meet the required conditions, so that properly humidified heating air is supplied to the building.

What is claimed is:

1. A warm-air humidifier having a pivotally supported supply pipe and an evaporator pan, and a water-regulating valve apparatus to supply water to the pan comprising a movable valve casing secured to and controlled by the pipe and a relatively stationary valve to co-operate with the casing for controlling flow of water through the casing, the casing having controlling connection therefor through the pipe with the pan.

2. A warm-air humidifier including a hanger, a supply pipe tiltingly supported by the hanger and having a valve casing fixed on one end thereof, an evaporator pan having hangers secured to the supply pipe in proximity to the opposite end thereof, the pan being under the pipe to receive water therefrom, a valve stem pivoted to the hanger and extending into the valve casing, and a valve movably arranged in the casing to be seated therein or to be unseated against the valve stem.

3. A warm-air humidifier including a hanger having two opposite lateral arms, a link pivoted to one of the lateral arms, a supply pipe supported by the link to tilt thereon and having a beam on one end thereof, the pipe having also a discharge nozzle on its under side, an evaporator pan provided with hangers secured to said beam, a portion of the pan being under said nozzle, a valve casing secured to the opposite end of the supply pipe and having an upward-facing seat therein, a valve to co-operate with said seat, and a valve stem pivoted to the remaining one of said lateral arms and extending into the top of the valve casing to stop said valve.

4. In a warm-air humidifier, the combination of an evaporator pan, a valve casing, a supply pipe connected with and carrying the casing and the pan, a pivotal support for the pipe, a valve movable in the casing to regulate flow therethrough, a valve stem stationarily supported to stop the valve in open position, and a flexible feed-pipe having connection with the casing.

5. In a warm-air humidifier, the combination of a hollow rocking beam, a pan on one end portion of the beam to receive water therefrom, a valve casing fixed on the opposite end portion of the beam to conduct water thereto and having a valve movable therein to regulate feeding of the water responsively to movements of the beam, and a valve stem to be supported outside the casing and extending into the casing to stop movement of the valve.

6. In a warm-air humidifier, the combination of a supply pipe having an evaporator pan on one end and a valve casing on the opposite end thereof, a hanger pivotally supporting the supply pipe, a regulating valve in the casing stationarily supported relatively to the casing, the casing having a valve seat movable thereby relatively to the valve, an elbow on the lower portion of the casing, a stop-cock connected with the elbow, a flexible feed-pipe connected with the stop-cock, and a counterweight having a device to connect it to the supply pipe.

In testimony whereof, I affix my signature on the 24th day of July, 1929.

WILHELM O. THIELE.