March 18, 1941. H. W. MORGAN 2,235,721

HUMIDIFIER VALVE

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FIG. 1.

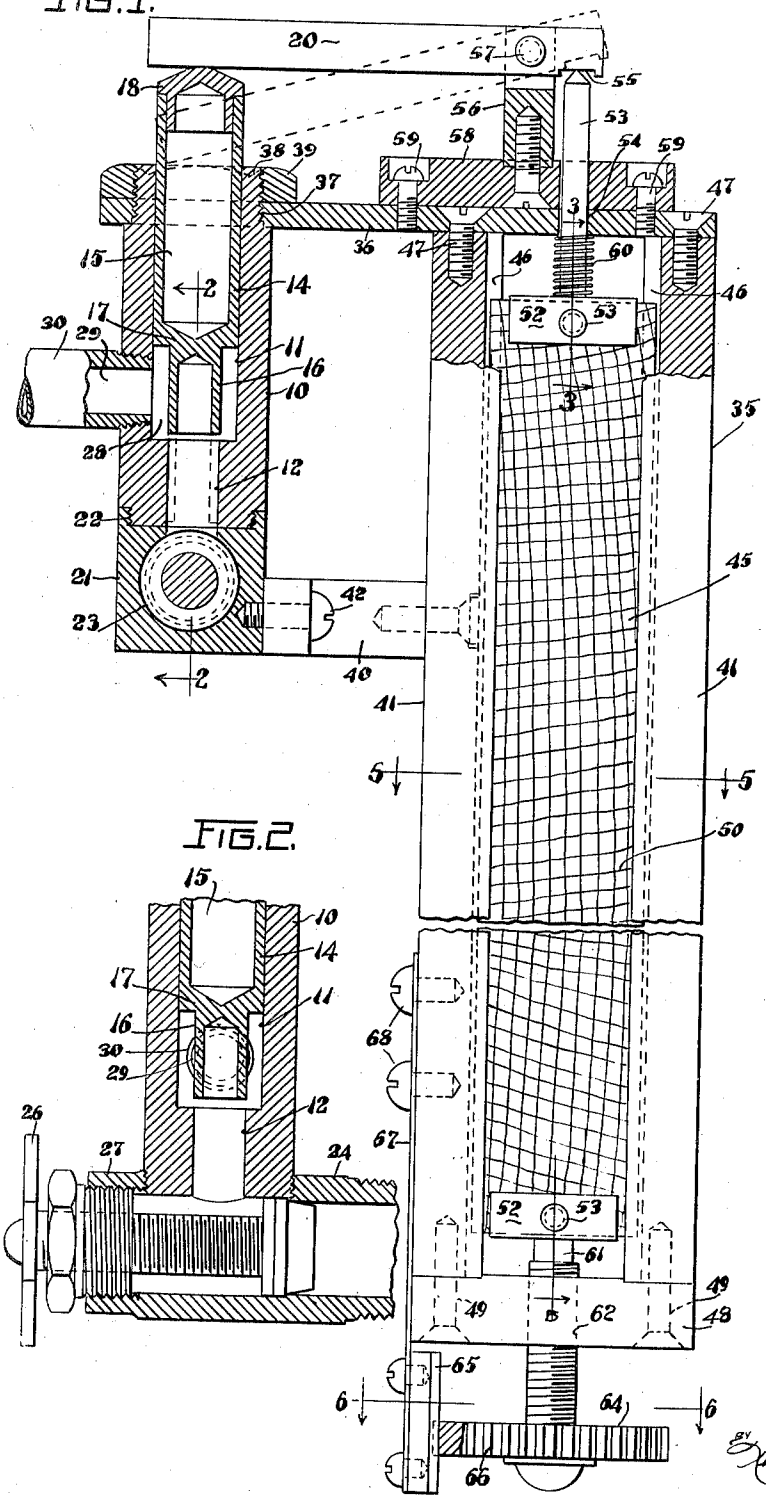


FIG. 3.

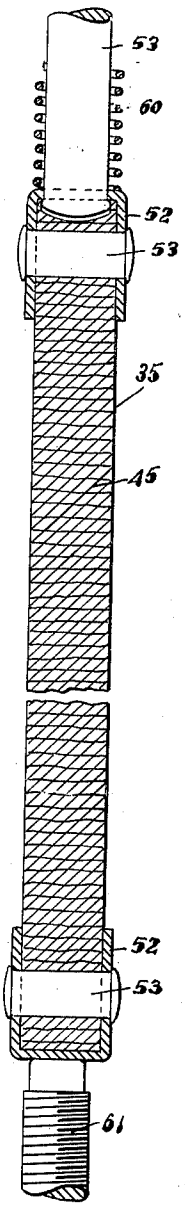


FIG. 2.

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FIG. 5.

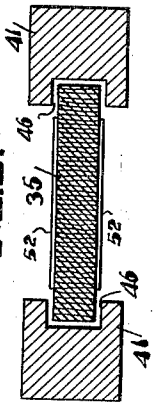


FIG. 6.

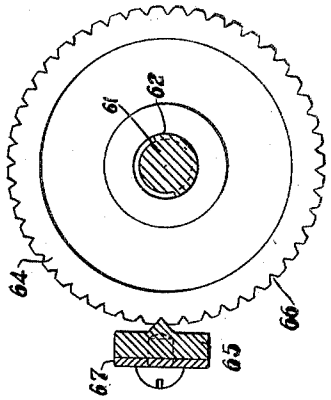
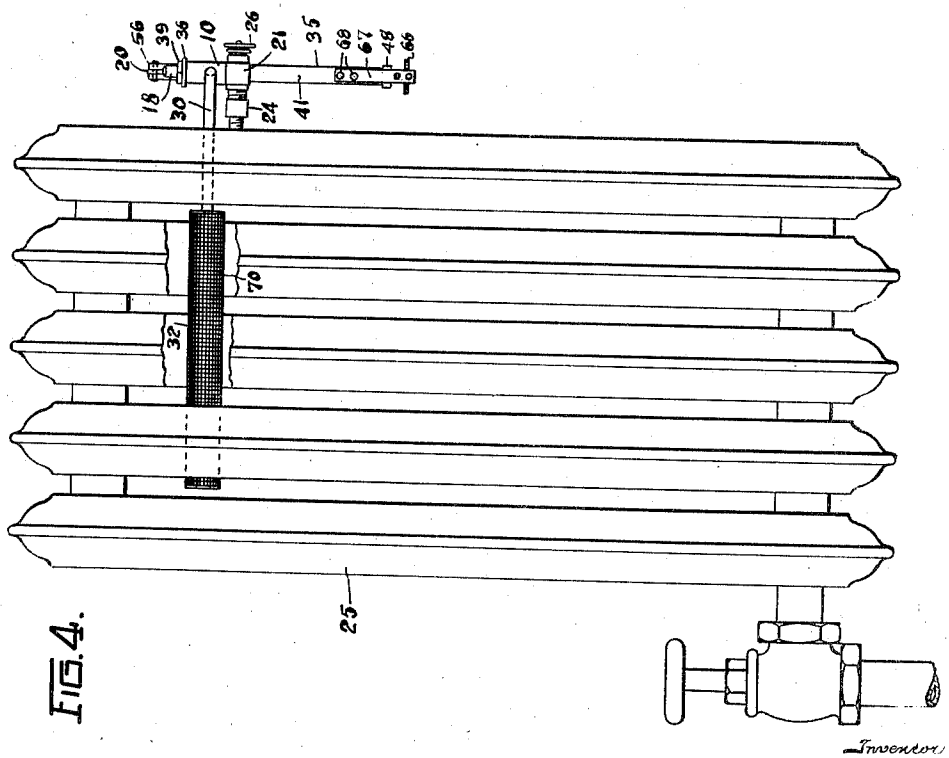


FIG. 4.



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UNITED STATES PATENT OFFICE

2,235,721

HUMIDIFIER VALVE

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Application October 13, 1939, Serial No. 299,394

4 Claims. (Cl. 236—44)

My invention relates to a humidity regulator and more particularly an improved humidifier valve which is especially adapted for use with the conventional heating systems to regulate the amount of water or water vapor introduced into the atmosphere or evaporator means.

Generally mechanisms heretofore devised for humidifying the air of rooms, homes, offices and factories provide for the addition of water vapor to the air by means of evaporating water or by allowing steam to escape into the atmosphere, but there is no provision, other than manual, for controlling the amount of vapor added. In order to provide for automatic control an intermediate control system has been utilized comprising electrically or compressed air operated mechanism. Further, use has been made of a motor and fan for atomizing water to be rapidly absorbed by air in controlling the humidity of the atmosphere. The cost of such automatic control mechanism is relatively high and the installation and maintenance are very expensive. My invention overcomes the above disadvantages and there is provided a simple, low cost, direct acting, automatic humidifier device using steam as the humidification medium.

It is an object of this invention to provide a humidifier device, which preferably can be attached to the outlet or opening of a steam radiator, which is also provided for an air vent. In this instance, no pipe is required and the installation is accomplished by merely screwing out the air vent valve or plug ordinarily on the radiator, and screwing in the humidifier control of my invention. My device may also be installed on any conventional pipe line by means of standard fittings having a suitable sized tapped outlet.

It is another object of this invention to provide a novel humidifier valve that can be readily attached to the conventional steam or hot vapor radiator in a heating system and which, when properly adjusted, will operate automatically to supply the required amount of moisture to a suitable evaporator connected therewith.

Another object is to provide an improved valve for a humidifying device which can be connected to a heat radiator system, utilizing steam, to introduce into the atmosphere a sufficient quantity of water vapor to insure the desired atmospheric humidity.

Another object is to provide a humidifier regulating device which may be easily and quickly attached to any conventional steam radiator and adjusted to control the flow of steam discharged therefrom for introducing moisture into the atmosphere.

Another object is to provide a device of this character which, when the heating system is steam, vapor or hot water, may be arranged to utilize the heating medium to supply the moisture for raising the humidity of the atmosphere or may, if desired, be supplied with a separate source of moisture supply and adapted to operate irrespective of the particular kind of heating medium used in conjunction therewith.

Another object is to devise a humidifier attachment for steam radiators having an improved valve for regulating the passage of steam therefrom which automatically controls the discharge of steam and condensate into an evaporator or other suitable dispensing means so that it will be rapidly absorbed by the air to vary the moisture content thereof.

Another object is to devise an improved humidifying device for regulating the humidity of the atmosphere which will operate in a substantially noiseless manner.

Another object is to provide an improved humidity regulator device for attaching to steam radiators, which is sturdy, highly efficient in operation and can be manufactured at a low cost.

These and other objects and advantages will be readily apparent to those skilled in the art, as the description proceeds.

In the accompanying drawings, which illustrate the preferred embodiment of my invention:

Figure 1 is a vertical section taken through the preferred embodiment of my device;

Figure 2 is a fragmentary detail sectional view taken on the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 with certain parts broken away to show the construction of the hygroscopic element;

Figure 4 is an elevation view showing a radiator with my humidifying valve attached thereto and connected to a steam dispersing evaporator unit;

Figure 5 is a fragmentary detail sectional view taken on the line 5—5 of Figure 1, looking in the direction of the arrows;

Figure 6 is a detail plan view of the means for setting the device taken on the line 6—6 of Figure 1, looking in the direction of the arrows.

Referring to the drawings in detail, in which like numerals indicate similar parts throughout, in Figures 1, 2 and 3, at 10, there is shown a valve body forming the humidity regulator device of

this invention having an enlarged cylinder bore 11 and communicating reduced bore portion 12. Mounted for reciprocation in the cylinder bore 11 is a piston or plunger 14 comprising an elongated hollow upper portion 15 and a lower narrow diameter depending tubular extension 16 which is adapted to slidably fit in the reduced cylinder portion 12. A central solid web section 17 separates the two sections of the piston, and a conical shaped cap 18 is fitted to the upper end of the piston 14. This cap is adapted to provide a suitable contact member for the piston actuating lever 20.

Attached to the opposite end of the valve cylinder 17 is a tubular fitting 21 which may be threaded or otherwise secured to the cylinder 10 as at 22. The tubular fitting 21 comprises a passageway 23 which communicates with the cylinder bore portion 12 beneath the piston 14 and is connected to a source of steam supply which causes the piston to be lifted thereby when pressure is applied to the passageway 23, for instance a steam radiator 25, as illustrated in Figure 4. The nipple 24 is utilized for connecting these parts.

For shutting off the steam when the humidity regulator is not in use, there is provided a standard hand operated shut off valve member 26 which is suitably fitted into the nipple portion 27, as shown in Figure 2. Steam entering the cylinder chamber 28 of the cylinder bore 11 is discharged through the opening 29 to which is connected the pipe 30 which in turn is connected to a suitable steam dispensing or evaporator unit, generally designated 32, as illustrated in Figure 4.

The piston and valve parts may be made of any suitable material; preferably, however, the piston is made of German silver hollowed out, as illustrated in Figure 1, so that it can be raised by low pressure steam or wet vapor, yet will slide back freely by the force of gravity to normally close the valve when the heating system is turned off or is under vacuum. The particular construction of the valve, as shown in Figures 1 and 2, provides a sharp cut-off and maximum opening with a relatively small piston travel.

The normal position of the plunger or piston 14 closes the passageway 12 when no steam pressure is present in the radiator, but when steam pressure is on the radiator 25 the piston 14 is controlled in its open position by the lever 20 which is actuated by the cooperating expansion and contraction member generally designated 35 the piston being forced upwardly by the steam pressure against the lever 20. The member 35 is suitably attached near the upper end to the valve body 10 by means of the plate 36 which is tapped at 37 to receive the threaded uppermost portion 38 of the valve body 10. The plate and valve body 10 are secured together by means of the nut 39 which is threaded onto the end of the valve portion 38, as shown in Figure 1. A lower bracket 40 suitably fastens the member 21 and adjacent wall portion 41 of the member 35 together as by means of the tap screws 42, so as to rigidly hold the valve and actuating member together.

The expansion and contraction actuated member 35 comprises an elongated moisture-sensitive element 45 which is arranged to slide longitudinally in the grooves 46 of the upright guide wall members 41. Guide members 41 are preferably made of heat insulating material such as Bakelite or the like fabricated structure which will not warp and has sufficient tensile strength to support the associated parts. The grooved guide members 46 are spaced apart and connected at their upper ends to the plate 36 by means of the set screws 47. The opposite ends of the guides are secured together by means of the plate 48 and attaching screws 49.

The member 45 comprises a hygroscopic element which may be made of suitable material which has the property of absorbing moisture from the air and expanding when the relative humidity of the air increases, and of giving up the moisture to the air and contracting when the relative humidity of the surrounding air decreases. The expansion and contraction of the material are proportional to the amount of water absorbed or evaporated therefrom and this proportional change in length is utilized in actuating the lever 20 to reciprocate the valve piston member 14. Preferably a wood strip is employed as the moisture-sensitive material 45. This wood element utilized as member 45 comprises a strip having cross grained structure 50. This is provided for by cutting the wood across the grain from a large diameter log so as to get the maximum expansion and contraction with changes in the humidity of the air or surrounding atmosphere.

Other materials may be used in place of wood, such as hair, "Cellophane," surgical gut, parchment, paper, silk, linen, cotton cord or rope and silkworm gut. Various types of wood may be used, but I prefer to employ a maple block cut from the tree so as to provide a suitable strip comprising cross grain structure. When the block is cut in this way the maximum expansion is obtained as well as a wood product which is substantially free of warping and splitting. The wood block is ordinarily cut with its longest direction tangential to an annual growth ring at least eight inches from the center of a straight grained clear log. The short dimension thickness of the block is parallel to the length of the fiber in the wood, that is, in a vertical plane of the tree and should be as small as is consistent with the required strength and stability. A thickness of from ⅛ to ½ inch, depending upon the size of the valve, may be utilized as the moisture-sensitive member. The width of the member 45 can obviously be of any suitable dimension, also depending upon the size of the valve.

The member 45 is provided with U-shaped reinforcing end plate members 52 which are suitably secured thereto by means of the rivets 53. Attached to the upper end of the member 45 centrally of the plate 52 is a pin 53 which extends through the aperture 54 of the plate member 36 and is adapted to engage the end of the lever 20, at 55, as shown in Figure 1. The valve actuating lever 20 is suitably fulcrumed to the member 56, by means of the pin 57. Member 56 is attached to the plate 58 which in turn is secured to the plate 36 by the tap screws 59. A compression spring means 60 is positioned on the lower portion of the pin 53 between the member 52 and the plate 36 so as to yieldably force the member 45 downward against the adjusting stop pin member 61. The stop pin 61 is threaded in the opening 62 of the plate member 48 and is provided on the lower end with a knurled wheel 64. By turning the wheel 64 the hygroscopic element 45 can be adjusted to effect operation of the valve at the desired relative humidity value. A suitable knife-like stop means 65, as shown in Fig. 1, is provided for cooperating with

the knurled wheel teeth portion 66 to prevent the inadvertent turning of the adjusting wheel 64 after it is set in the desired position. The depending knife-like stop means 65 is suitably supported on the side wall 41 by means of the plate 67 and screws 68.

The steam dispersing unit 32 preferably consists of a tubular screen member 70 made of a rust-resisting material, such as copper or the like, and is connected to the outlet of the regulator valve through the pipe 30. This dispersing unit or evaporator member 32 is positioned so as to extend between the coils of the radiator 25, as shown in Figure 4. The end of the tube or pipe connection 30 is closed and is provided with holes along the side walls through which steam is allowed to escape into the screen-like tubing. Around the interior of the screen 70 are arranged several thicknesses of cloth, such as cheesecloth or porous cotton cloth, which is adapted to absorb the condensate which is emitted from the pipe 30 during operation of the device. It will be understood that other suitable means for collecting the condensate from the humidity regulating valve of my invention may be utilized, it being only necessary to provide a means for dispersing and evaporating the condensate emitted from the pipe 30 so that it does not drip onto the floor or coverings therebeneath.

In the operation of my device it will be understood that as the humidity of the air increases the length of the strip 45 increases, moving the pin 53 upward against the end of the lever 20, which motion is transferred to the valve piston through the other end of the lever so as to move the piston 14 downward closing off the passage of steam through the valve to the dispersing unit 32. When the humidity of the atmosphere around the member 45 decreases, the length of the member 45 decreases which retracts the pin 53 allowing the steam to raise the piston 14 opening the regulator valve so as to permit steam to enter the dispersing unit 32 to thereby raise the humidity of the atmosphere. The humidity may be controlled by adjusting the screw 61 up or down by turning the knurled handle 64. By positioning the fulcrum 57 of the lever 20 closely adjacent to the point 55 of the contacting pin 53, the movement of the other end of the lever 20 is greatly magnified so that a small movement of the pin 53 effects a considerable movement of the other end of the lever 20 so as to move the piston of the valve a sufficient distance to shut off the steam.

It will be understood that my invention is not to be limited to the particular construction illustrated and there is comprehended to be within my invention such modifications as are necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A humidifying valve arranged to be connected to a vapor type heating radiator, comprising in combination, a high pressure chamber, means for connecting said chamber to said radiator, a low pressure chamber, means connecting said low pressure chamber to the atmosphere, a passageway interconnecting said chambers, a freely slidable gravity affected piston valve arranged for reciprocation in said passage, said valve having a position in said passage controlled by gravity actuation thereof to close said interconnecting passage when pressure is low in said high pressure chamber, said valve being capable of actuation in said passage to open the same upon pressure being applied to the high pressure chamber from the radiator, and means responsive to the changes in relative humidity of the atmosphere in which said valve is positioned for controlling the quantity of vapor discharged from said valve by controlling the open position of said piston valve with respect to said interconnecting passage.

2. A humidifying valve arranged to be connected to a vapor type heating radiator and comprising a body having an inlet chamber adapted to be connected to said radiator and an outlet chamber in communication with the atmosphere, a passage interconnecting said chambers, a gravity operated piston valve arranged for reciprocation in said interconnecting passage, said gravity operated valve closing the interconnecting passage by gravity operation when pressure is low in said inlet chamber and opening said passage when vapor pressure is admitted to the inlet chamber, said valve being controlled in its open position by means of a humidity responsive device whereby said valve controls the relative humidity of the atmosphere within which said valve is located.

3. A humidifying valve comprising in combination, an inlet and an outlet chamber, means for connecting said inlet chamber to a vapor type heating radiator and the outlet chamber to the atmosphere, a passageway interconnecting said chambers, a freely slidable valve arranged for reciprocation in said interconnecting passage, said valve being arranged for closing said interconnecting passage by gravity operation thereof when pressure is low in said inlet chamber and opening said passageway upon admission of vapor pressure to the inlet chamber, a humidity responsive device associated with said valve, said humidity responsive device being arranged to control the open position of said piston valve, and means operatively interconnecting said humidity responsive device with said piston valve, said means operatively engaging said piston valve to close the same only when the relative humidity surrounding the humidity responsive device raises above a predetermined relative humidity.

4. A humidifying valve comprising in combination, an inlet and an outlet chamber, means connecting said inlet chamber to a vapor type heating radiator and the outlet chamber to the atmosphere, a passageway interconnecting said chambers, a freely slidable valve arranged for reciprocation in said interconnecting passage, said valve being arranged for closing said interconnecting passage by gravity operation thereof when pressure is low in said inlet chamber and opening said passageway upon admission of vapor pressure to the inlet chamber, and a humidity responsive device associated with said valve for regulating the degree of opening of said valve upon variation in relative humidity of the atmosphere surrounding said humidity responsive device.

HOWARD W. MORGAN.