Sept. 16, 1947. O. J. KUENHOLD, SR 2,427,359

HUMIDIFICATION

Filed Nov. 17, 1941 2 Sheets-Sheet 1

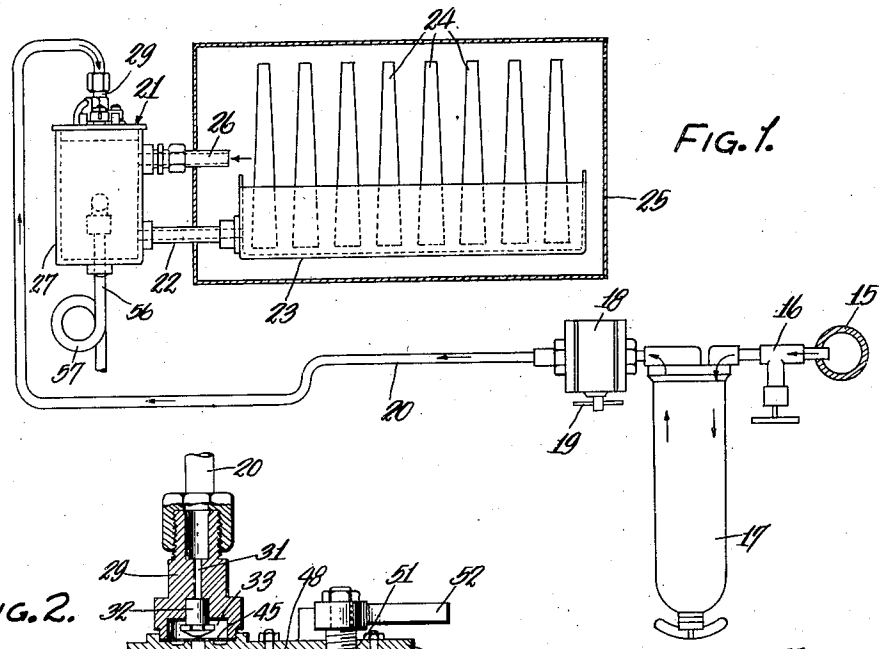

FIG. 1.

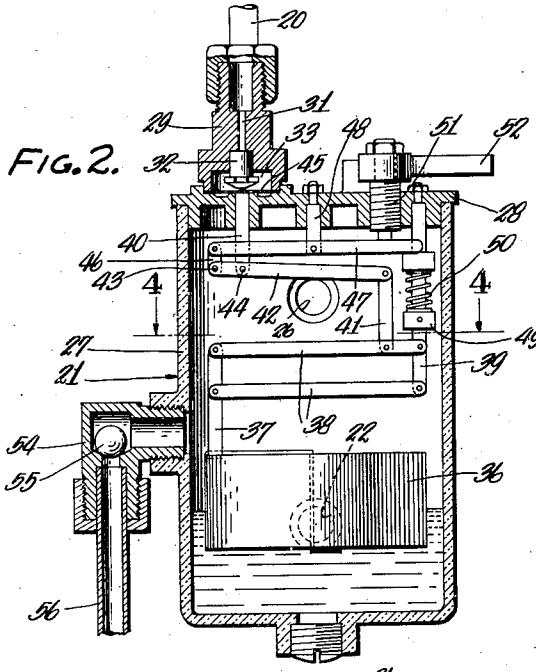

FIG. 2.

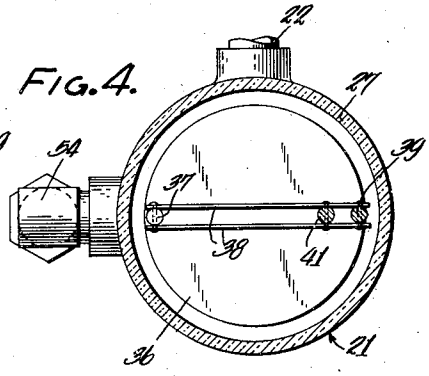

FIG. 4.

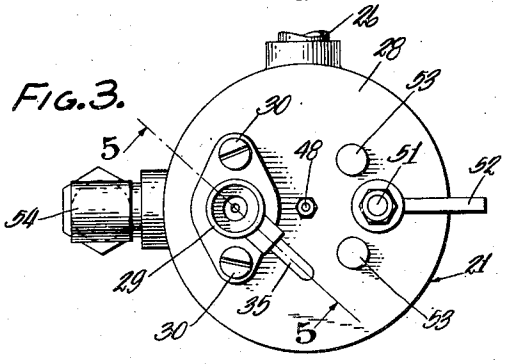

FIG. 3.

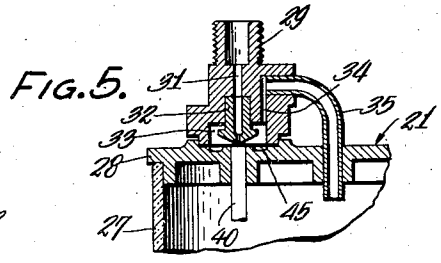

FIG. 5.

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Filed Nov. 17, 1941. 2 Sheets-Sheet 2

FIG. 6.

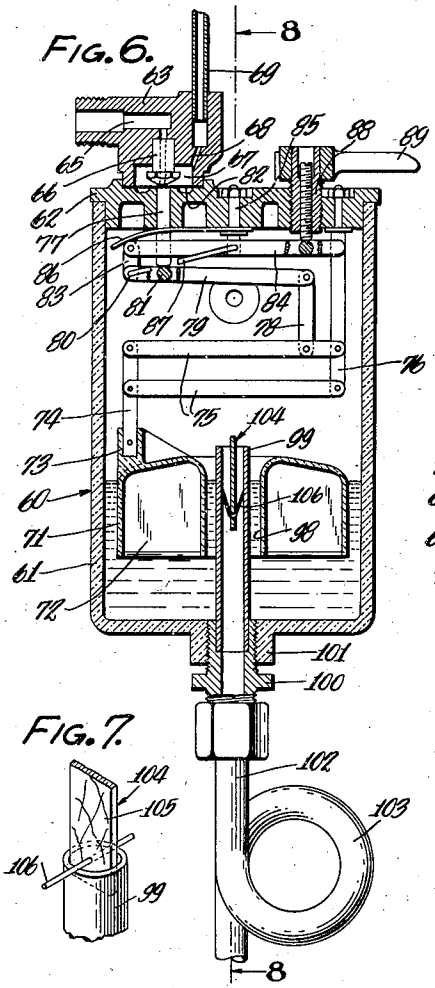


FIG. 8.

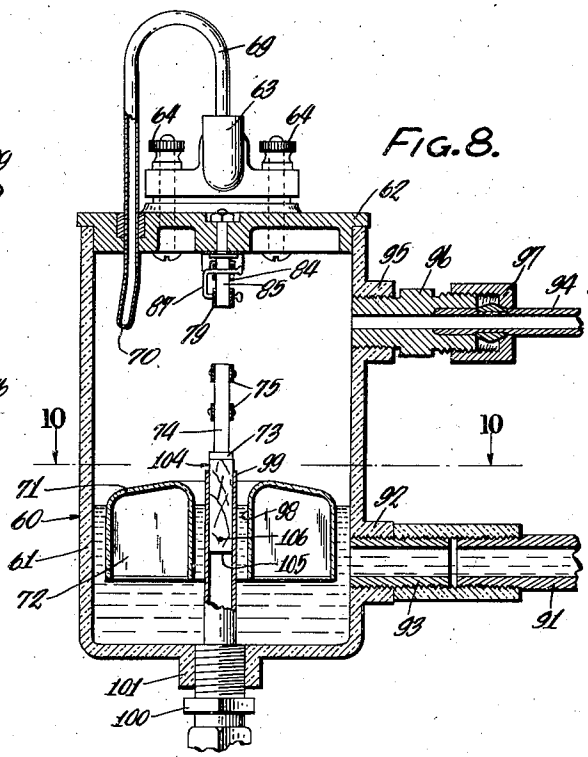


FIG. 7.

FIG. 11.

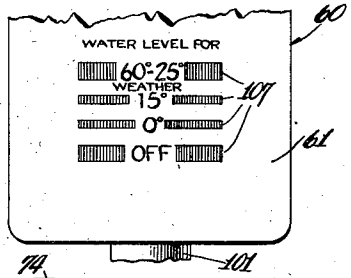


FIG. 9.

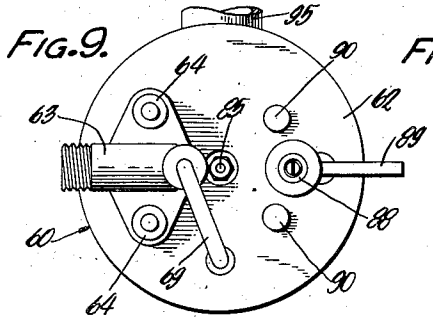
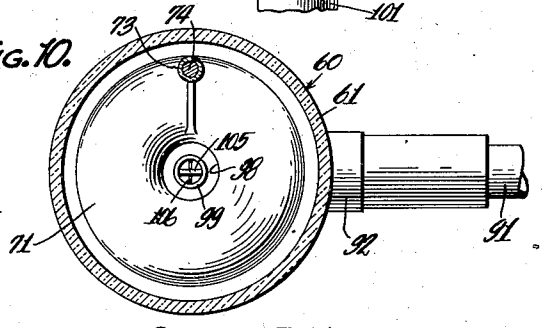


FIG. 10.



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Patented Sept. 16, 1947 2,427,359

UNITED STATES PATENT OFFICE

2,427,359

HUMIDIFICATION

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Application November 17, 1941, Serial No. 419,378

11 Claims. (Cl. 137—104)

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My invention relates to humidification, more particularly to humidification apparatus and systems for use with furnaces, especially hot air furnaces, and the principal object of my invention is to provide new and improved humidification apparatus and systems.

This application is a continuation in part of my patent application Serial Number 263,266, filed March 21, 1939 (now abandoned).

In the drawings accompanying this specification and forming a part of this application, there are shown, for purposes of illustration, various embodiments which my invention may assume, and in these drawings:

Figure 1 is a generally schematic view showing a humidification system embodying my invention,

Figure 2 is an enlarged vertical sectional view of a device used in the system shown in Figure 1,

Figure 3 is a top plan view of the device shown in Figure 2,

Figure 4 is a transverse sectional view corresponding generally to the line 4—4 of Figure 2,

Figure 5 is a fragmentary vertical sectional view corresponding generally to the line 5—5 of Figure 3,

Figure 6 is an enlarged sectional view of another device which may be used in the system shown in Figure 1,

Figure 7 is a fragmentary perspective view illustrating a method of assembling certain parts,

Figure 8 is a vertical sectional view corresponding generally to the line 8—8 of Figure 6,

Figure 9 is a top plan view of the device shown in Figures 6 and 7,

Figure 10 is a transverse sectional view corresponding generally to the line 10—10 of Figure 8, and

Figure 11 is a fragmentary elevational view illustrating an exterior portion of the device.

Referring particularly to Figure 1, the humidification system therein shown is connected to a source of liquid, such as the supply pipe 15. Since the liquid ordinarily used in humidification systems is largely water, for purposes of this specification, water will be considered as the liquid used, and under such circumstances it may be convenient that the supply pipe 15 lead from a city water supply, or from a well or the like.

From the pipe 15, the water passes through a shut-off valve 16, and then through a water filter 17, of any suitable construction, the filter being for the purpose of filtering out impurities suspended in the water. The filtered water then passes through a pressure regulator 18, of any

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suitable construction, but preferably of the construction shown in my Patent Number 2,249,010. As disclosed in such patent, the pressure regulator 18 is provided with a manually operable purge lever 19, which when twisted in either direction, fully opens the valve regulating the water pressure, so that water under full pressure is quickly admitted to the system, for the purpose of flushing the system of any substance tending to impair its efficiency. Under normal operating conditions, it is preferable that the pressure regulator 18 is so set that it delivers water to the humidification system at a greatly reduced constant pressure.

A conduit 20 leads from the outlet port of the pressure regulator 18, and extends to the inlet of a water-feed device 21. A conduit 22 leads from the outlet of the water-feed device 21 to evaporator means, here shown in the form of an elongated evaporator pan 23, having evaporator plates 24 extending upwardly out of the water therein. The evaporator pan 23 and the evaporator plates 24 are disposed within a chamber 25 through which air may move. The chamber 25 may form part of a heating system, and in this instance is adapted for the passage of heated air to a place in a dwelling to be heated. Since air in the chamber 25 at times is of different temperatures, the air pressure in the chamber 25 may vary, at least partly because of expansion and contraction of air.

The humidification system shown in Figure 1 is particularly designed for cooperation with a hot air furnace of the type employing an air blower to force air past the heating portion of the furnace and up into the bonnet chamber, from whence it is distributed by risers to the rooms to be heated. Of course, the air blower, in a properly designed and installed furnace, operates intermittently and forces air past the heating portion of the furnace and to the bonnet chamber only when heat is called for. Therefore, intermittent operation of the air blower causes sharp fluctuations in air pressure in the bonnet chamber, due at least partly to the inertia of the air in such chamber, and to the resistance to air flow in the risers. In hot air furnaces, the chamber 25 is preferably the bonnet chamber. In accordance with my invention, the humidification system includes a pressure equalizing means, here shown as a conduit 26 establishing air pressure communication between the chamber 25 and the interior of the device 21.

Referring particularly to Figures 2 through 5, the water-feed device 21 comprises a cup 27,

formed of transparent material, such as a suitable plastic. The upper open end of the cup 27 is closed by a cover 28, which may also be formed of a suitable plastic, and the cover 28 and cup 27 are fitted and sealed at their joint, to seal against entrance of air at this point.

The conduit 20 is threaded to an inlet fitting 29, secured to the cover by screws 30, and water from the conduit 20 passes downwardly through a passage 31, formed in the fitting 29, and through a passage in the orifice nozzle 32, the lower end of which forms a valve seat. From the orifice nozzle, the water passes into an annular space 33, formed by the fitting 29 and the cover 28, and then upwardly through a passage 34 (see Figure 5) which leads to a tube 35, the free terminal end of which extends through the cover in air-tight relation and terminates inwardly of the cup 27, so that the water dripping or flowing from such terminal end is visible from the exterior of the cup.

Within the chamber formed by the cup 27 and the cover 28, is a float 36, having an upright post 37, at one side, to which one end of parallel levers 38 are pivoted, the opposite ends being pivoted to a post 39 which is rigidly secured to the cover 28, as shown in Figure 2. The movement of the float 36 is conveyed to a plunger 40, which slides in an aperture formed in the cover 28, by means of a link 41 and lever 42. The lever 42 is fulcrumed at 43, and has a pivotal connection with the plunger 40, as seen at 44 in Figure 2.

The peripheral surface of a diaphragm 45 is clamped between the fitting 29 and the cover 28, and the central portion of the diaphragm is movable within the annular space 33, and is cooperable with the valve seat formed by the adjacent end of the orifice nozzle 32 to control flow of water through such nozzle. Upward movement of the plunger 40 flexes the central portion of the diaphragm 45 in a direction to contact the valve seat and close passage through the orifice nozzle. It will be appreciated that the multiple leverage greatly increases the lifting force of the float, so that sufficient force is provided to lift the diaphragm to closed position against any usual water pressure. Likewise, the float 36 will have considerable movement as compared to the movement of the plunger 40.

To provide for adjustment of the valve-closing action of the float 36, the fulcrum 43 of the lever 42 is in the form of a short link 46, which is connected to one end of an arm 47. The arm 47 is pivoted, intermediate its ends, to a stud 48 carried by and extending downwardly from the cover 28. The opposite end of the arm 47 straddles the post 39, as seen in Figure 2. The post 39 carries a fixed collar 49 which serves as a base for a compression spring 50. The spring 50 is arranged to urge the adjacent end of the arm 47 upwardly against the bottom of a regulating screw 51 which is threaded through a threaded aperture formed in the cover 28. The upper end of the screw 51 extends upwardly and outwardly of the cover 28 and has secured thereto a lever 52 by means of which the screw 51 may be rotated.

Movement of the lever 52 causes rotation of the screw 51, and when the rotation is in the direction to extend the screw a greater distance into the cup 27, the bottom end of the screw bears against the adjacent end of the arm 47 and moves such end downwardly, further compressing the spring 50. Opposite rotation of the screw causes its lower end to back off, permitting the spring 50 to urge the adjacent end of the arm 47 upwardly.

Thus, it will be seen that rotation of the screw 51 will cause movement of the arm 47, and such movement causes shifting of the short link 46, therefore changing the pivot point 43 of the lever 42, and consequently changing the closing point of the diaphragm valve 45. The lever 52, it will be appreciated, provides an exterior adjustment for the lever mechanism disposed within the chamber formed by the cup 27 and cover 28. The exterior surface of the cover 28 is provided with spaced-apart lugs 53, which limit movement of the lever 52, the construction herein disclosed being such that rotation of the screw 51 between the limits defined by the lugs 53 is sufficient to provide for practical adjustment of the closing point of the diaphragm valve 45.

Water is conducted from the cup 27 to the evaporator pan 23 by means of the conduit 22 which leads from a point spaced upwardly of the lower end of the cup 27. As seen in Figure 1, the device 21 and the evaporator pan 23 are relatively so disposed that a common liquid level may be established therein. The equalizer or air conduit 26 leads from the upper end of the cup 27 to the chamber 25, so that the pressure in the cup is at all times equal to the pressure in the chamber 25, thus providing that the common liquid level is not unbalanced.

Extending from the side of the cup 27, at a predetermined level, is an overflow fitting 54, containing a ball check valve 55. Normally, the ball check valve 55 engages a seat formed in the fitting 54, but if the water level rises to a point where water flows through the fitting 54, the ball will float and rise from its seat, permitting drainage of water through a drain tube 56. The drain tube 56 may be bent in the form of an air trap 57, and either or both the ball check valve 55 and trap 57 may be used to prevent admission of air to the interior of the cup 27.

Due to the provision of a blower fan or the like, in the blower type furnaces, the air pressure in the chamber 25 varies from time to time, and an increase in air pressure might result in elevating the water in the cup 27 sufficiently to cause an overflow. The equalizer or air tube 26 obviates such possibility of overflow by equalizing the back pressure at such times in the pipe 22.

The interior chamber of the device 21 is closed except for (1) water inlet (2) water feed to the evaporator pan (3) water overflow and (4) air pressure communication from the air circulating duct or chamber in which the evaporator pan is located. Of course, the water overflow is sealed against escape of air from the cup 27 by the traps 55—57, and the water feed is normally sealed by the water in the cup 27. This assures that the air pressure acting upon the water surface in the evaporator pan will always be duplicated and acting upon the water surface in the device 21, regardless of fluctuations in pressure due to the air circulation through the evaporator chamber being intermittently forced with an air blower or the like.

Without this pressure equalization, the visible water level in the control device would not coincide at all times with the water level in the evaporator pan and whenever the air blower was "on," the water level in the float chamber would be forced upward, possibly overflowing and shutting off the water feed for as long a time as the air blower was "on."

Sealing against flow of air through the air chamber has a further purpose, and that is to prevent dehydration of substances within the

cup 27. Water dripping or flowing from the tube 35, through the space above the level of the water in the cup, may splash, and if the float chamber were open to air flow, the water splashes would dry and leave objectionable deposits of substances carried by the water, such for instance as lime deposits, not only on the cup 27, but also on the float and the lever mechanism. Further, the water level marks would leave rings on the cup. Thus, if air were not precluded from flowing through the float chamber, the transparency of the cup and the operation of the float and its connections would be impaired.

However, as herein disclosed, air is precluded from flowing through the float chamber, and therefore the air in the space above the water level in the cup 27 is at all times fully saturated, thus preventing dehydration of substance within the float chamber. When the water level is above the opening of the conduit 22, the water seals the conduit 22 against flow of air therethrough. Also, either or both the ball check valve 55 or the air trap 57 prevent flow of air through the drain conduit 56 to the float chamber. Accordingly, air through the equalizer or air conduit 26 has only a slight movement before the pressures in the float chamber and the air chamber 25 are equalized, assuming that an inequality of pressure exists, and such air acts in the manner of a piston.

If the level of the water in the cup should fall to uncover the opening of the water conduit 22, air flow through the float chamber is prevented, since the conduit 22 and equalizer or air conduit 26 lead to the same air chamber, and therefore air pressure through the conduits would be equal and no flow of air would take place.

Referring to Figures 6 through 11, the embodiment of the invention therein shown comprises a water-feed device 60 which may be used in the humidification system shown in Figure 1 in place of the device 21.

The device 60 comprises a cup 61, formed of transparent material, such as a suitable plastic. The upper open end of the cup 61 is closed by a cover 62, which may also be formed of suitable plastic material, and the cup 61 and cover 62 are fitted and sealed tightly at their joint, to seal against entrance of air at this point. An inlet fitting 63 is secured to the cover 62 by screw and nut assemblies 64. The inlet fitting is adapted for connection to a water conduit, such as the conduit 20 heretofore mentioned. Water from the conduit passes through a passage 65 in the inlet fitting, and through an opening in an orifice nozzle 66, the lower end of the nozzle forming a valve seat. From the orifice nozzle 66, the water passes into an annular space 67, formed by the fitting 63 and the cover 62, and then upwardly through a passage 68 which leads to a tube 69. The tube 69 extends upwardly from the fitting 63 and has a reverse bend so that the terminal end of the tube extends through an aperture in the cover, in air-tight relation, and terminates inwardly of the cup 61. The terminal end of the tube 69 is bent slightly toward the inside wall of the cup 61, and has its extremity restricted, as by rolling the extremity of the tube, to a substantially pin-point opening 70, for a purpose hereinafter explained. It will be clear that water dripping or flowing from the opening 70 is visible from the exterior of the cup.

Within the chamber formed by the cup and the cover 62, is a float 71, preferably formed of a suitable transparent material, and of inverted cup-shape as clearly seen in Figures 6 and 8. The float 71 is rendered buoyant, at least in part, by air trapped in the space 72 between its under surface and the water in the cup 61. It has been found that a float of the form shown in the drawings will trap sufficient air so that the water level extends only slightly into the interior space 72, as shown.

The float 71 is formed with a socket 73 receiving an upright post 74 to which one end of parallel levers 75 are pivoted, the opposite ends being pivoted to a post 76 which is rigidly secured to the cover 62, as seen in Figure 6. The float 71 is movable, in a substantially vertical direction, by the rise and fall of the water level in the cup 61, and its movement is conveyed to a plunger 77, which slides in an aperture formed in the cover 62, by means of a link 78 and lever 79. The lever 79 is fulcrumed at 80, and has a round cross bar 81 positioned to bear against the lower end of the plunger 77.

The peripheral surface of a diaphragm 82 is clamped between the fitting 63 and the cover 62, and the central part of the diaphragm is movable within the annular space 67. Preferably, the diaphragm is formed of one or more disks of cloth and at least the surface directed toward the outlet opening of the orifice nozzle 66 is covered with a suitable substance to prevent passage of water through the diaphragm. Good results have been obtained by coating such surface with neoprene. Upward movement of the plunger 77 flexes the central portion of the diaphragm 82 in a direction to contact the valve seat formed by the adjacent end of the orifice nozzle and to close passage through the orifice nozzle. It will be appreciated that the lever mechanism operates substantially as before described.

To provide for adjustment of the valve-closing action of the float 71, the fulcrum 80 of the lever 79 is in the form of a short link 83 which is connected to one end of an arm 84. The arm 84 is pivoted, intermediate its ends, to a stud 85 carried by and extending downwardly from the cover 62. The opposite end of the arm 84 straddles the post 76, as seen in Figure 6, for guiding purposes. Clamped between a collar formed on the stud 85 and the adjacent surface of the cover 62 is one end of a leaf spring 86, the other end being bifurcated to pass the plunger 77, the furcations bearing on that end of the arm 84 to which the short link 83 is pivoted, for the purpose of urging this end of the arm 84 in a downward direction. One of the legs of a looped wire 87 forms the pivot pin for the pivot connection between the lever 79 and the short link 83, and the other leg forms the pivot pin for the pivot connection between the stud 85 and the arm 84, so that the pivot connections are at all times held in proper relation.

The right hand end of the arm 84, referring to the position of the parts in Figure 6, is urged in an upward direction, by reason of the urging force of the leaf spring 86, and has a round cross bar bearing against the bottom of a regulating screw 88 which is threaded through a screw-threaded aperture formed in the cover 62. The screw 88 has an inner screw as seen in Figure 6, for adjustment purposes. The upper end of the screw 88 extends upwardly of the cover and has secured thereto a lever 89 by means of which the screw 88 may be rotated. Rotation of the screw 88, by means of the lever 89, causes adjustment of

the closing point of the valve, in a manner similar to that described in connection with the construction shown in Figures 1 through 5. As before, the lever provides an exteriorly disposed adjustment for the lever mechanism disposed within the float chamber, and its movement is limited by spaced-apart lugs 90.

Water is conducted from the cup 61 to an evaporator pan, similar to the pan 23 previously referred to, by means of a conduit 91 leading from a point spaced upwardly from the lower end of the cup. As seen in Figure 8, the connection of the conduit 91 to the cup 61 includes an internally threaded boss 92 formed integral with the cup 61, the boss 92 receiving an externally threaded metallic fitting 93. A tubular internally threaded coupling joins the conduit 91 to the fitting 93, the adjacent ends of the fitting 93 and the conduit 91 preferably being in spaced-apart relation, and the coupling being preferably formed of heat-insulating material, so that heat from the evaporator pan is not conducted to the cup 61. It will be appreciated that all joints are sealed, as for instance by forming the threads as pipe threads and using a suitable sealing cement.

An equalizer or air conduit 94 leads from the space at the upper end of the cup 61 and establishes pressure communication between this space and a chamber, such as a chamber similar to the chamber 25 previously referred to. The equalizer or air conduit 94 may have a suitable connection with the cup 61, as for instance by means of an internally threaded boss 95 formed integral with the cup 61, and receiving a fitting 96, the conduit 94 being held to the fitting 96 by a cap nut 97, and here again all connections are sealed. As before, the conduit 94 insures that the pressure in the cup 61 is at all times equal to the pressure in the chamber (such as the chamber 25), so that the common liquid level in the cup 61 and the evaporator pan is not unbalanced.

The float 71 is formed with a central opening 98 through which extends an upright drain tube 99. The upper end of the tube 99 extends into the cup 61 a predetermined amount to limit the level water may assume in the cup 61. The tube 99 is carried by a fitting 100 threaded into an internally screw-threaded boss 101 formed integral with the cup 61. It will be appreciated that the position of the upper end of the tube 99 may be varied by threading in or backing off the fitting 100 with respect to the boss 101. Connected to the fitting 100 is a drain conduit 102 leading to a suitable drain. Air trap means is provided to insure against passage of air through the drain conduit 102 to the interior of the float chamber, and as here shown, the trap means comprises a trap 103 formed by a circular bend in the drain tube 102.

It has been found that with certain material, and under certain circumstances, the water in the cup 61, after it has reached the level of the upper end of the drain tube 99, will not drain immediately, but rather will build up to a level above such upper end before passing through the drain tube. This has been found especially so in tubing made of metal, such as brass, and newly installed, since the outer surface of such material at least in certain cases tends to repel water. To insure that water drains as soon as its level reaches the upper end of the drain tube, readily wetted means, such as wick means 104 are positioned to cooperate with the drain tube 99. As here shown, the wick means comprises a

capillary material, such as a strip of wood 105 as here used, the wood extending into the drain tube 99, but not blocking it. As seen in Figures 6 and 8, the strip 105 has its upper end extending a small amount outwardly of the tube in position to be wetted by the water when the water reaches the upper end of the drain tube 99.

The strip 105 may be of such width that it has a force fit with the tube 99. However, it has been found that a force fit alone will not, under all conditions, retain the strip 105 within the tube 99. For instance, if wood is used, the wood may dry and shrink, or if wood or other material is used, differential expansion and contraction will loosen the strip, permitting it either to drop into the drain conduit 102 or to float up into the float chamber, depending upon the density of the material used. Accordingly, means, in addition to the wick means and the tube are employed to secure the wick means in position. In the present instance, it has been found convenient and satisfactory to hold the wooden strip in position by a substantially V-shaped spring wire 106 which extends through an aperture in that part of the wood which is disposed within the drain tube 99, and engages or "bites" into the interior walls of the drain tube. One way of assembling the wooden strip 105 with the drain tube is illustrated in Figure 7. As there shown, the wire 106 is substantially straight, and passes through the aperture in the strip before that part of the strip is inserted within the drain tube 99. The strip is then forced into the drain tube the predetermined amount, causing the wire 106 to be bent to proper shape, and the resiliency of the wire causes the ends of its legs to firmly engage the interior surface of the drain tube, preventing any further movement of the strip 105.

Inasmuch as the float 71 is rendered buoyant at least in part by air trapped within its under space, it is desirable to insure that air is always trapped in such space. It has been found that air will leave the trapped air space, possibly because it escapes through the walls of the float, and also possibly because it is absorbed by the water. In any event, it is desirable to furnish the trapped air space with a supply of air, and in the construction herein shown, this is accomplished by the air forced into the water in the cup by the water from the tube 69. It is desirable that the outlet of the tube 69 is so positioned that water therefrom does not at least directly strike the float, so as not to interfere with float operation. This is further desirable since it permits a stream of water to issue from the outlet of the tube 69 with considerable velocity so that at least some of the air moved by such water flow is forced below the level of the water in the cup, and at least some of the air so forced, in rising, enters the trapped air space, thus replenishing the air supply in such space, and compensating for any air lost.

By reducing the size of the outlet of the tube 69, a back pressure is created extending to the valve, and this eliminates chattering and "water hammer." Also, such back pressure forces the water out of the outlet of the tube 69 with considerable velocity. Since the water stream is almost pin-point in size, the stream of such water, in striking the side of the cup 61 or in directly striking the water in the cup, will not materially disturb operation of the float. In the construction herein shown, the outlet of the tube 69 is so positioned that a stream of water flowing there-

from will strike the interior wall of the cup 61 just above the highest level of the upper part of the float 71.

It is desirable that the humidification system be set in accordance with outside weather conditions, especially temperature conditions, and actual practice has indicated that it is desirable to reduce the percentage of indoor humidity as the outside temperature drops. Since the level of water in the cup 61 corresponds to the level of water in the evaporating pan, and in the construction herein illustrated, the level of the water in the evaporating pan controls the humidification percentage, it is desirable to lower the level in the evaporator pan, and consequently in the cup, when the outside weather turns cold.

Accordingly, average water levels have been determined for particular installations and particular weather conditions. As seen in Figure 11, the cup 61 is formed with markings 107 progressing upwardly from adjacent the bottom of the cup 61, each indicating a proper average water level for a certain outside temperature. Also, each marking is identified with a legend enabling the user to set the water level by proper manipulation of the adjustment lever 89. Accordingly, the lowermost marking 107 is identified by the legend "Off," and in this position no water is delivered to the cup 61, whereas the uppermost marking 107 is identified by the legend "60°–25°" indicating the average water level for outside temperatures within that temperature range. The markings 107 and their accompanying legends may be formed by impressing in the wall of the cup, or they may be applied by a stencil or by printing, and if desired, the markings may be colored. In the embodiment herein shown, the markings have been colored red, as indicated by the hatch lines in Figure 11.

Of course, in addition to the advantages available with the construction shown in Figures 6 through 11, this construction also possesses the advantages pointed out in the remarks concerning the construction shown in Figures 1 through 5.

From the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention, and it also will be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim:

1. A liquid feed device, comprising: a receptacle, connectable to a source of liquid; valve means, for controlling the flow of liquid from the source to said receptacle; float means, adapted to be moved by the rise and fall of liquid in said receptacle, and having connection with said valve means to control operation of said valve means, said float means being of inverted cup-shape, and rendered buoyant at least in part by air trapped between its under surface and the liquid; and means so constructed and arranged that air is supplied to the air trap space from beneath the level of said liquid while said float means has at least its lower margin submerged in said liquid.

2. A liquid feed device, comprising: a receptacle, adapted to receive liquid; means for regulating the liquid level in said receptacle, comprising a float of inverted cup-shape adapted to engage the liquid in said receptacle and be moved by the rise and fall of the liquid level in said receptacle, said float being rendered buoyant at least in part by air trapped between its under surface and the liquid; and liquid feed means, having its outlet terminating above the normal liquid level in said receptacle so that liquid from its outlet falls to the liquid in said receptacle, so that at least a certain amount of the air moved by the falling liquid is forced below the surface of the liquid in said receptacle, and at least a certain amount of such air, in rising, is delivered to the air trap space of said float.

3. A liquid feed device, comprising: a receptacle, adapted to receive liquid; means for regulating the liquid level in said receptacle, comprising a float of inverted cup-shape adapted to engage the liquid in said receptacle and be moved by the rise and fall of the liquid level in said receptacle, said float being rendered buoyant at least in part by air trapped between its under surface and the liquid; and liquid feed means, having its outlet terminating above the normal liquid level in said receptacle and so constructed and arranged that liquid from its outlet falls through space at a velocity greater than that induced by gravity and thence to the liquid in said receptacle, so that at least a certain amount of the air moved by the falling liquid is forced below the surface of the liquid in said receptacle, and at least a certain amount of the air so forced, in rising, is delivered to the air trap space of said float.

4. A liquid feed device, comprising: a receptacle, adapted to receive liquid; valve means, having its inlet connectable to a source of liquid; conduit means, communicating with the outlet of said valve means, and arranged to deliver liquid to said receptacle; float means, of inverted cup-shape, adapted to engage the liquid in said receptacle and be moved by the rise and fall of the liquid level in said receptacle, said float means being rendered buoyant at least in part by air trapped between its under surface and the liquid; connection means, connecting said float means with said valve means, constructed and arranged so that movement of said float means effects operation of said valve means and regulates the liquid level in said receptacle; said conduit means terminating above the normal liquid level in said receptacle and having a restricted substantially pin-point opening so that liquid flows through space in a substantially high velocity pin-point stream, striking the liquid in said receptacle, and forcing at least a certain amount of the air moved during falling below the surface of the liquid in said receptacle without materially disturbing the liquid in said receptacle, at least a certain amount of the air so forced, in rising, being delivered to the air trap space of said float.

5. A device for controlling the feed of water to an evaporating reservoir comprising the combination of a transparent housing, a water inlet in the top wall of said housing, a diaphragm valve adapted to open and close said inlet, a constantly open outlet in the side wall of said housing, an overflow outlet in the side wall of said housing located at a point above said constantly open outlet, air trap means in said overflow outlet, a float adapted to be moved by the rise and fall of the water level in said housing, lever mechanism connecting said float to said inlet valve, and adjustable means for regulating the position of said lever mechanism whereby to regulate the

opening and closing point of said valve with respect to the movement of said float.

6. A liquid level control device, comprising: a receptacle, for receiving liquid; valve means, controlling flow of liquid to said receptacle; float means, adapted to be moved by the rise and fall of the liquid level in said receptacle; arm means pivotally carried by said receptacle; lever means, movable about an adjustment pivot carried by said arm means, and having connections with said float means and said valve means, said connections being so constructed and arranged that said valve means is moved to closed position when the liquid level in said receptacle rises to a predetermined level; said arm means being so constructed and arranged that by pivotal movement thereof said adjustment pivot may be shifted so as to regulate the closing point of said valve means with respect to the movement of said float means, so as to provide for adjustment of the liquid level in said receptacle; resilient means biasing said arm means in one direction about its pivot; stop means for holding said arm means in a given position against said biasing means; and said stop means being adjustable and so constructed and arranged that by adjustment of said stop means in one direction said arm means is moved in a given direction against the force of said biasing means and by adjustment of said stop means in its opposite direction said biasing means moves said arm means in the direction opposite to said given direction.

7. A liquid feed device, comprising: a receptacle, adapted to receive liquid; valve means, having its inlet connectable to a source of liquid, and having a single outlet; means for regulating the liquid level in said receptacle, including a float of inverted cup-shape adapted to engage the liquid in said receptacle and be moved by the rise and fall of the liquid level in said receptacle, and including operating connection means from said float to said valve means, said float being rendered buoyant at least in part by air trapped between its under surface and the liquid; and liquid feed means connected to said single outlet, said feed means having a discharge opening above the normal liquid level in said receptacle and so constructed and arranged that a back pressure of liquid is created at said outlet of said valve means to minimize chattering of said valve means and so that liquid discharged from said opening falls through space at a velocity greater than that induced by gravity, and thence to the liquid in said receptacle so that at least a certain amount of the air moved by the falling liquid is forced below the surface of the liquid in said receptacle, and at least a certain amount of the air so forced, in rising, is delivered to the air trap space of said float.

8. A liquid feed device, comprising: a receptacle, adapted to receive liquid; valve means, having its inlet connectable to a source of liquid; conduit means, communicating with the outlet of said valve means, and arranged to deliver liquid to said receptacle; float means, of inverted cup-shape, adapted to engage the liquid in said receptacle and be moved by the rise and fall of the liquid level in said receptacle, said float means being rendered buoyant at least in part by air trapped between its under surface and the liquid; connection means, connecting said float means with said valve means, constructed and arranged so that movement of said float means effects operation of said valve means and regulates the liquid level in said receptacle; said conduit means terminating above the normal liquid level in said receptacle and having a restricted substantially pin-point opening so that liquid flows through space in a substantially high velocity pin-point stream and is so directed that it first strikes the wall of said receptacle above the liquid level therein and then strikes the liquid in said receptacle, and forces at least a certain amount of the air moved during falling below the surface of the liquid in said receptacle without materially disturbing the liquid in said receptacle, at least a certain amount of the air so forced, in rising, being delivered to the air trap space of said float.

9. A liquid feed device, comprising: a closed housing, for receiving liquid; valve means, having its inlet communicating with a source of liquid and its outlet communicating with the interior of said housing, for controlling flow of liquid from the source to said housing; float means, engaging the liquid in said housing, and movable by the rise and fall of the liquid level in said housing; connection means, at least in part within said housing and above said float means, connecting said float means to said valve means, so constructed and arranged that movement of said float means effects operation of said valve means; said housing having a liquid delivery opening and having liquid overflow outlet means for limiting the liquid level therein; and means precluding the flow of air through said outlet means thereby to prevent flow of air through said housing and thereby maintaining the air in said housing in saturated condition and preventing dehydration within said housing of any substance carried by the water.

10. A liquid feed device, comprising: a housing, for receiving liquid, having a liquid inlet adjacent its top and having a liquid delivery opening and liquid overflow outlet means limiting the liquid in said housing to a predetermined level short of the top of said housing, providing an air space between said top and the level of the liquid; valve means for controlling the flow of liquid into said liquid inlet; float means in said housing; means, connecting said float means to said valve means, so constructed and arranged that movement of said float means effects operation of said valve means; said housing having means providing for communication of said air space with an air space external to said housing but being closed to communication with air at all other places including at said liquid overflow outlet means so that air flow through said housing is precluded.

11. A device for controlling the feed of water to an evaporating reservoir, said device comprising: a housing including wall means atmospherically sealing an upper end of said housing; a water inlet valve seat mounted on said wall means; said wall means including a flexible diaphragm engageable with said valve seat and for movement toward and away from said seat to control the flow of water into said water inlet; a water outlet adjacent the lower end of said housing; water overflow outlet means for limiting the water level in said housing to a predetermined level between said water inlet and water outlet; float means adapted to be moved by the rise and fall of the water level in said housing; connection means disposed above said float means and coacting between said float and diaphragm to control said inlet; and means accessible from the exterior of said housing for adjusting said connection means whereby to regulate the opening and closing point of said diaphragm with

respect to the movement of said float means so as to adjust the water level in said housing.

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