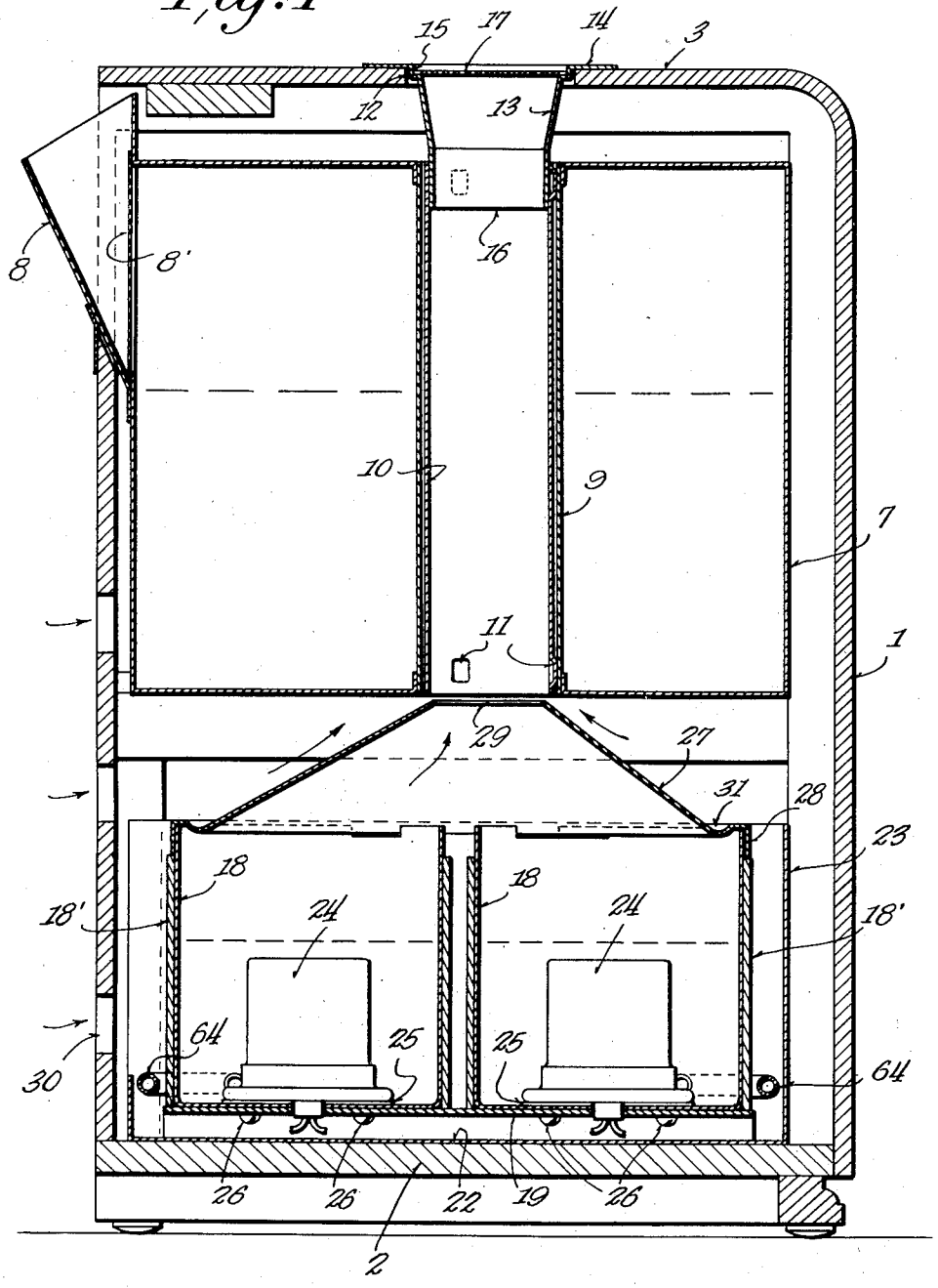
Dec. 12, 1939. J. G. ZUMMACH 2,182,836

HUMIDIFIER

Filed June 16, 1938 3 Sheets-Sheet 1

Fig. 1



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HUMIDIFIER

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Fig. 2

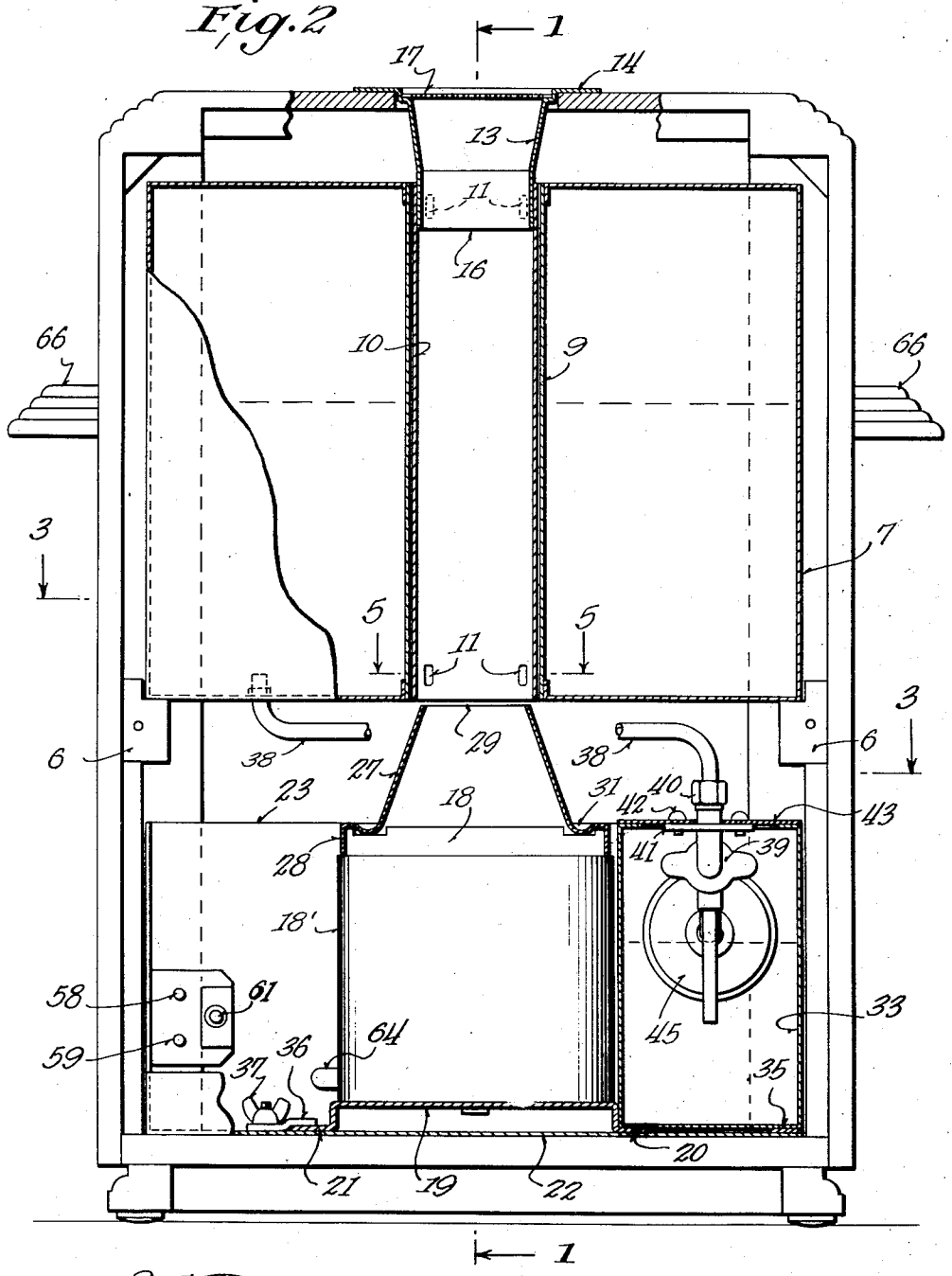
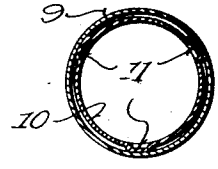


Fig. 5



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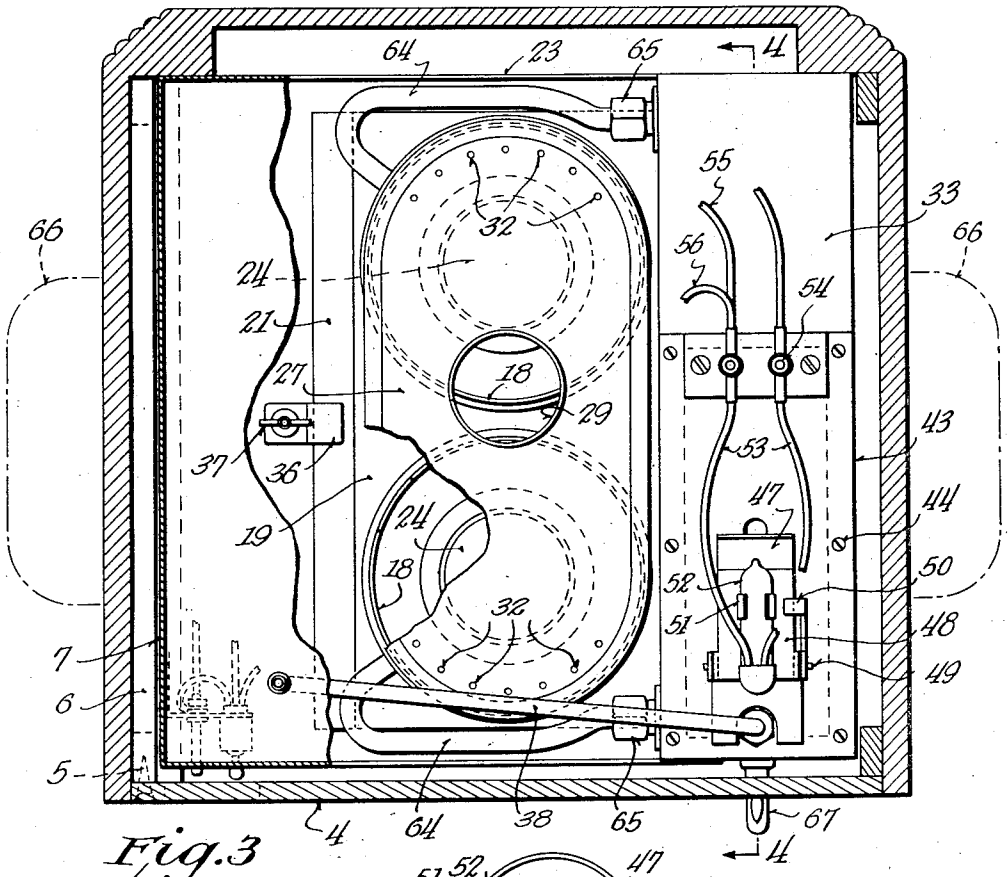


Fig. 3

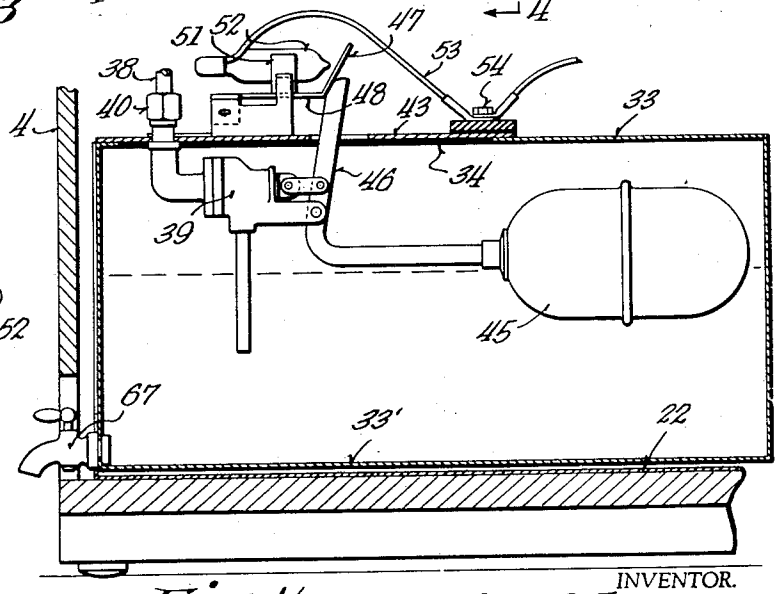


Fig. 4

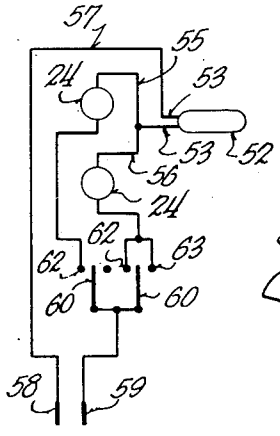


Fig. 6

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HUMIDIFIER

John G. Zummach, Racine, Wis.

Application June 16, 1938, Serial No. 214,109

9 Claims. (Cl. 219—38)

This invention relates to humidifiers.

Objects of this invention are to provide a novel form of humidifier which is so made that electrical heating means heats only a small portion of the water at a time, and in which this small portion of heated water is thermally insulated from the body of the water or main supply so that only a small amount of heat is required, the main body of the water remaining cool until it is supplied to the boiler or heating portion of the device.

Further objects are to provide a humidifier which is noiseless in its operation, which has no fan or similar member for causing circulation of the air, which instead causes the circulation of the air by the rising of the warm air and water vapor through a chimney like structure, discharging the moisture-laden air into the room from the upper portion of the device, preferably through the top.

In greater detail, further objects of this invention are to provide a humidifier in which a stack is employed passing centrally through a water reservoir located in the upper portion of the humidifier cabinet, the stack however being spaced from the inner wall of the reservoir to prevent cooling of the stack by the water of the reservoir and thus to minimize condensing, means being provided, however, for catching any condensation that may occur in the stack and preventing the condensation from running along the bottom of the reservoir and instead returning the condensation directly to the boiler or boilers. By having the stack pass through the reservoir though spaced from the inner wall thereof, a very compact construction is obtained and bulkiness is thus avoided.

Further objects are to provide a construction in which an ornamental cabinet with a removable back, for example, may be employed, in which the several parts are arranged in two main units—one, the reservoir unit including the stack, and the other, the bottom pan or bottom unit—both of the units being freely slidably removable from the cabinet when the back is removed and giving free and easy access to all of the parts for repair or inspection.

Further objects are to provide a humidifier in which an elevated reservoir is provided, in which a float tank is connected through a float control valve with the reservoir, in which electrical heating means is provided in a separate boiler or boilers fed from the float tank, and in which safety cut off means are provided which cuts off the heating unit or heating units in the event the water level within the boiler or boilers falls below a predetermined point, to thus prevent burning out or excessive heating of the heating units.

Further objects are to provide a humidifier having the above noted characteristics in which switching means is employed for throwing in one or more boilers and heating units, in which the safety control means controls whatever number of heating units may be in service, and in which a simple change-over switch is employed for throwing in one or more of the heating units or for cutting out all heating units when the operation of the humidifier is not required.

A further object is to provide a humidifier which will operate on either alternating or direct current.

Further objects are to provide a humidifier which has a very attractive appearance, which is composed of a relatively small number of easily accessible removable parts, and which may be economically constructed.

An embodiment of the invention is shown in the accompanying drawings, in which:

Figure 1 is a vertical sectional view through the device, such view corresponding to a section on the line 1—1 of Figure 2.

Figure 2 is a rear view of the device with the back panel removed and with parts broken away and in section.

Figure 3 is a sectional view approximately on the line 3—3 of Figure 2 with parts broken away.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view on the line 5—5 of Figure 2.

Figure 6 is a diagrammatic view of the wiring.

Referring to the drawings, it will be seen that the humidifier comprises a cabinet which has front and side walls 1, a bottom 2 and a top 3. This cabinet is preferably made ornamental and may be made of wood or any other suitable material. It is provided with a removable back panel 4 which is temporarily held in place in any suitable manner, as by means of the screws 5, see Figure 3, which pass through the back panel and into the ends of the guides 6 which extend from adjacent the rear of the panel to adjacent the front thereof and constitute supporting means.

A reservoir 7 for the water is provided and approximately fits the upper half of the cabinet. It is a rectangular box like structure of metal and is slidably carried on the slides or supporting members 6, such members 6 securely holding the reservoir against lateral shifting, as is apparent from an examination of Figure 2.

The reservoir 7 may be supplied through a chute or hopper 8 which may project upwardly and outwardly through an aperture in the back panel so that the reservoir may be readily filled. It is preferable to provide a fine wire mesh screen 8' to prevent foreign material passing into the reservoir 7.

The reservoir is provided with a central tube 9 which extends completely through the reservoir and is securely soldered or otherwise secured to the top and bottom walls of the reservoir. An inner tube or stack 10 is carried in spaced relation within the tube 9 so that an air space is formed between these two tubes. The tube 10 may have outwardly pressed indentations 11 at its upper and lower portions which may be soldered to the tube 9 to thus hold the tube 10 permanently spaced from the tube 9 and to prevent the cold water in the reservoir 7 from chilling the tube 10 and causing needless condensation therein.

The top 3 of the cabinet is provided with a centrally located opening 12 through which a slightly flaring funnel like end portion 13 is freely passed. The portion 13 may have different forms, but a convenient way is to provide it with an upper flange 14 which is adapted to rest upon the top 3 of the cabinet and with a shouldered portion 15 to correctly position it within the aperture 12. The lower portion of the member 13 is provided with a short tubular sleeve 16 which slidably fits within the tube 10 and in effect constitutes a continuation thereof. An ornamental grating 17 may be positioned within the shouldered portion 15 to allow the free passage therethrough of air and moisture.

The lower portion of the cabinet carries the boilers or vaporizers and one or more of these units may be employed. In the form shown two of such units are used. They may be employed singly or jointly, depending on how much evaporization is required, and a suitable switch for changing it from single to double operation may be employed, as will appear hereinafter.

Each unit comprises a cylindrical container 18 which may be surrounded with asbestos 18' for the major part of its side walls, and each of the containers for the boilers has its bottom resting upon a channel shaped support 19 having outturned feet 20 and 21 which rest upon the bottom 22 of a box or pan like member indicated generally at 23. Each boiler is provided with an electrical heating unit 24 whose outlet portion passes through an aperture formed in the support 19 and in the bottom wall of the boiler. A sealing gasket 25 is positioned beneath each heating unit and screws 26 pass upwardly through the supporting base 19 and hold the heating units in place.

An oval-shaped, funnel like hood 27 fits over both of the boilers and has a downwardly extending marginal flange 28 and rests upon a portion of the top margin of each of the boilers. This hood converges towards a centrally located upper opening 29 slightly smaller than and located immediately below the bottom of the stack or inner tube 10, see Figure 1, so as to guide the water vapor from the boilers upwardly into the stack.

At this point it is to be noted that the back panel is provided with a plurality of openings 30 so that air may freely enter and circulate around the boilers upwardly through the hood 27 and into the stack 10 as the boilers will be hot and will heat the air and cause a fairly rapid circulation of air and a draft upwardly through the pipe 10, thus sweeping the entrained water vapor along with the air and causing a continuous discharge of moisture-laden air from the device outwardly through the grating 17.

Any condensation that may occur on the tube 10 will finally drip from the bottom edge of the tube, as it is spaced from the tube 9, and will not run across the bottom of the reservoir 7 but will fall on the outer surface of the hood 27. This hood is provided with a marginal channel 31 which extends completely around the bottom of the hood and this channel is provided with a plurality of discharge openings 32 over each of the boilers so that any water that may drip back onto the hood, will be guided into position over the boilers and returned to the boilers, thus keeping the device dry.

A float chamber or container 33 is carried within the pan 23 and may consist of a rectangular box having an open portion 34 through its top wall and having its bottom wall 33' spaced from the bottom 22 of the pan 23. Preferably a spacing strip 35, see Figure 2, is located between the outer bottom edge of the float chamber or box 33 and the bottom wall 22 of the pan 23.

The right-hand end of the pan 23, see Figures 1 and 3, is omitted and the float chamber has its front and rear walls soldered or otherwise secured to the pan 23. Also the spacing strip, the float chamber 33, and the bottom wall 22 are soldered together. The foot 20 of the support 19 for the boilers is slipped beneath the left-hand bottom edge of the float chamber 33 and the other foot 21 is secured by a finger or any other suitable means 36 removably held in place by a thumb nut 37 so that the thumb nut and finger may be removed and the boiler slipped to the left, as viewed in Figure 2, to withdraw the foot 20 from beneath the float tank 33. Thereafter the boiler may be removed from the pan 23 for repair or inspection.

The float chamber 33 is supplied with water from the reservoir 7 by means of a small copper pipe 38 which passes through and is firmly joined to the bottom wall of the reservoir 7. The lower end of the copper pipe is joined to the valve structure 39 of the float valve by means of a removable union 40 so that when it is desired to separate these parts, it is merely necessary to unscrew the union and spring the pipe 38 slightly upwardly, see Figure 2, thus completely detaching the float chamber from the reservoir. Thereafter both the reservoir and the bottom pan with the heaters and float chamber may be slid rearwardly from the cabinet for inspection or repair, thus giving the utmost freedom of access to the parts in a very simple and efficacious manner.

The float valve structure 39 may be provided with a pair of ears 41 which are secured by screws 42 to a top plate 43 resting upon the top of the float chamber 33 and positioned over the cut-out 34 of such float chamber. This top plate may be removably held in place by screws or in any other suitable manner as indicated at 44 in Figure 3.

A float 45 controls the level of the water in the float chamber 33 and preferably holds such level at about the point indicated by the dotted line. The float is connected with an L-shaped arm 46 pivotally supported from the valve structure and controlling such valve and also having an upwardly extending arm which bears against the angularly set arm 47 of a small metal plate 48. The plate 48 is pivotally mounted as indicated at 49 and an upper stop in the form of an overhanging finger 50 is provided which limits the upward motion of the plate. This pivoted plate is provided with spring fingers 51 which hold the mercury switch 52, the mercury switch 52 being connected

by flexible conductors 53 with terminal posts 54. Conductors 55 and 56 extend from one of the posts and lead to the two heating units 24, see Figure 6. A conductor 57 extends from the other terminal post to one of the prongs 58, see Figures 6 and 2. The other prong 59 extends to a double pole switch whose arms 60 are adapted to be controlled by the lever 61, see Figure 2, in the usual manner.

In one position of the switch, the arms 60 engage the contacts 62 and connect the two heating units 24 in parallel. In the other position, one of the arms 60 engages the contact 63 and connects only one heater in the circuit. The mercury switch, however, retains control of the heaters irrespective of whether one or both heaters are employed. The mercury switch cuts off the current to the heater when the water falls to a dangerously low level within the float chamber 33, it being noted that the float chamber 33 is connected adjacent its lower portion with the lower portion of the two boilers by means of the pipes 64. Preferably the pipes 64 are joined to the float chamber 33 by means of removable unions 65 so that the boilers may be freely detached from the float chamber when desired.

The cabinet may be provided with outwardly projecting ornamental portions 66, see Figure 2, which may constitute handles whereby the cabinet may be lifted or moved from place to place.

It is preferable to provide a drain 67 in the lower portion of the float chamber, such drain projecting through an aperture in the back panel 4 so that when the device is not to be used for a material length of time, the water may be drained from the float chamber and consequently the device may be drained as the float chamber communicates with the reservoir and with the boilers.

It is preferable to support the plug and switch combined unit directly from the pan 23, see Figures 2 and 3, so that there is no need for interrupting the wiring when the pan 23 with its contained parts is removed for inspection or repair.

It is also to be noted that if the humidifier is not needed, the switch 60 may occupy its neutral position, as shown in Figure 6, and that either one or both heaters may be employed by suitably manipulating the switch 61.

There is no need for a fan or other air circulating means in this device as the rising hot air entrains the vapor and sweeps it upwardly through the stack 10 and outwardly from the device.

It is to be particularly noted that the stack is thermally separated off from the adjacent wall of the reservoir and that therefore there is substantially no cooling effect on the stack from the unheated water in the reservoir.

The humidifier is so constructed that only a very small body of water is maintained in the heated condition by the heater or heaters, and if the level of the water in the float tank, which is the same as the level in the boiler or boilers, falls below the upper portion of the heaters, the mercury switch is operated from the float and cuts off the electrical current to the heaters, thus furnishing an automatic safety device to prevent burning out of the heaters in the event there is no further supply of water.

Further than this it is apparent that the utmost accessibility of the parts is obtained, that the parts are simple, easy to construct, and cheap to manufacture.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. A humidifier comprising a cabinet having a discharge opening at its upper portion, a reservoir in the upper part of the cabinet, a boiler in the lower portion of the cabinet, said boiler comprising a tank like member and a heater therein, means for supplying water from the reservoir to the boiler, automatic means for maintaining a predetermined water level in the boiler, a stack passing upwardly from adjacent said boiler and adapted to entrain heated air and water vapor, said stack leading to said discharge opening and being open at its top and bottom for the free upward passage therethrough of heated air and water vapor, whereby rising air through said stack will entrain water vaporized by said boiler and discharge the moisture-laden heated air from the upper portion of said cabinet.

2. A humidifier comprising a cabinet having a discharge opening at its upper portion, a reservoir in the upper part of the cabinet, a boiler in the lower portion of the cabinet, said boiler comprising a tank like member and a heater therein, means for supplying water from the reservoir to the boiler, automatic means for maintaining a predetermined water level in the boiler, a stack passing upwardly from adjacent said boiler and adapted to entrain heated air and water vapor, said stack leading to said discharge opening, said stack passing through said reservoir and being thermally separated therefrom, whereby rising air through said stack will entrain water vaporized by said boiler and discharge the moisture-laden heated air from the upper portion of said cabinet.

3. A humidifier comprising a cabinet, a reservoir located in the upper portion of said cabinet and constituting an upper unit, a lower unit located in the lower portion of said cabinet below said reservoir, said lower unit having a boiler and means for supplying water from said reservoir to said boiler, and a stack leading upwardly from adjacent said lower unit and adapted to discharge heated air and water vapor from the upper portion of said cabinet, said stack being open at its top and bottom for the free upward passage therethrough of heated air and water vapor, said reservoir and said lower unit being independently removable from said cabinet.

4. A humidifier comprising a cabinet having a discharge opening in its upper portion, a reservoir for water located in the upper portion of said cabinet, a boiler located in the lower portion of said cabinet and supplied with water from said reservoir, heating means for said boiler for vaporizing water in said boiler, a stack leading to said discharge opening of said cabinet and spaced from said boiler and adapted to conduct heated air upwardly to said discharge opening of said cabinet, said stack being open at its top and bottom for the free upward passage therethrough of heated air and water vapor, and means for guiding water vapor from said boiler to a point adjacent the lower end of said stack, whereby water vapor will be entrained by the rising hot air and discharged from the said discharge opening.

5. A humidifier comprising a cabinet having a discharge opening in its upper portion, a reservoir for water located in the upper portion of said cabinet, a boiler located in the lower portion of said cabinet and supplied with water from said reservoir, heating means for said boiler for vaporizing water in said boiler, a stack leading to said

discharge opening of said cabinet and spaced from said boiler and adapted to conduct heated air upwardly to said discharge opening of said cabinet, said stack being open at its top and bottom for the free upward passage therethrough of heated air and water vapor, and means for guiding water vapor from said boiler to a point adjacent the lower end of said stack, whereby water vapor will be entrained by the rising hot air and discharged from the said discharge opening, said humidifier having means for receiving any water that may drip from said stack and for discharging such received water back into said boiler.

6. A humidifier comprising a cabinet having a discharge opening in its upper portion, a reservoir for water located in the upper part of said cabinet and having a pipe passing therethrough from the lower to the upper portion of said reservoir, a stack positioned within said pipe and spaced from said pipe and leading to said discharge opening, said stack having an open lower end, a boiler located below said reservoir, means for supplying water from said reservoir to said boiler, said boiler having a heating unit therein, and means spaced from the lower portion of said stack for conducting water vapor from said boiler to a point in the immediate vicinity of the lower portion of said stack, whereby the water vapor will be entrained by rising hot air passing upwardly through said stack.

7. A humidifier comprising a cabinet having a discharge opening in its upper portion, a reservoir for water located in the upper part of said cabinet and having a pipe passing therethrough from the lower to the upper portion of said reservoir, a stack positioned within said pipe and spaced from said pipe and leading to said discharge opening, said stack having an open lower end, a boiler located below said reservoir, means for supplying water from said reservoir to said boiler, said boiler having a heating unit therein, a hood positioned over the top of said boiler and converging to a point adjacent said stack, said hood having an opening immediately below the bottom of said stack, said hood having a channel portion for collecting any water that may drip from said stack and for leading said water back to said boiler.

8. A humidifier comprising a cabinet, a reservoir for water located in the upper portion of said cabinet, guide means for slidably supporting said reservoir, a lower unit located in the bottom portion of said cabinet below said reservoir, said lower unit including a float chamber supplied with water from said reservoir, a float, a valve controlled thereby for controlling the height of the water level in said float chamber, a detachable pipe connection between said reservoir and said float chamber, said lower unit having boiler means communicating with said float chamber and said boiler means having a water vapor discharge opening, said lower unit and said reservoir being bodily slidable from the rear of said cabinet, said cabinet having a removable rear portion to permit the outward sliding of said lower unit and reservoir and having openings for the admission of air to a point adjacent said boiler means, and a stack for conducting heated air from adjacent said boiler means, said stack having a lower portion opening in proximity to the point of discharge of the water vapor from said boiler means for entraining water vapor from said boiler means.

9. A humidifier comprising a cabinet, a water reservoir located in the upper portion of said cabinet and having a pipe extending through the reservoir from the lower portion of the upper portion, said cabinet having a discharge opening located above said pipe, a stack leading to said discharge opening and passing through said pipe and spaced from said pipe, a lower unit removably positioned in the lower portion of said cabinet and including a boiler having a hood spaced from the lower end of said stack and provided with a discharge opening adjacent the lower end of said stack, said boiler being supplied with water from said reservoir, automatic means for maintaining a predetermined water level in said boiler, said cabinet having air inlet openings for admitting air to adjacent said boiler, an electric heater within said boiler, electric terminal means carried by said lower unit and connected to said electric heater, and a switch carried by said lower unit and controlling said electric heater, said boiler being detachable from said lower unit.

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