March 16, 1937. R. P. WILLIS 2,073,915

HUMIDIFIER

Original Filed Aug. 16, 1934

Fig. 1

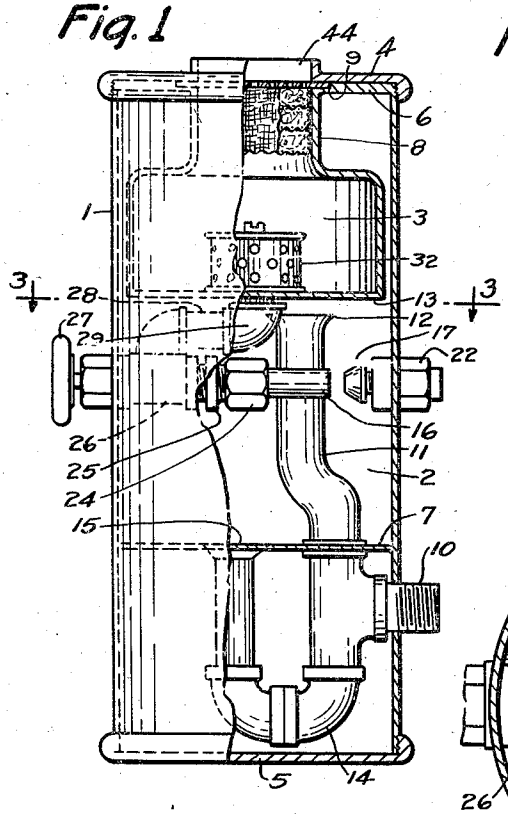


Fig. 2

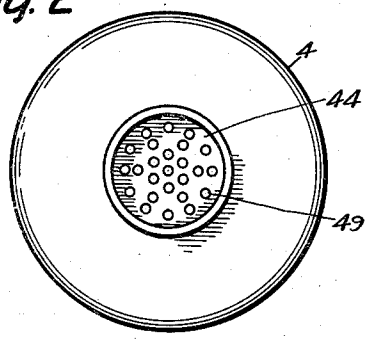


Fig. 3

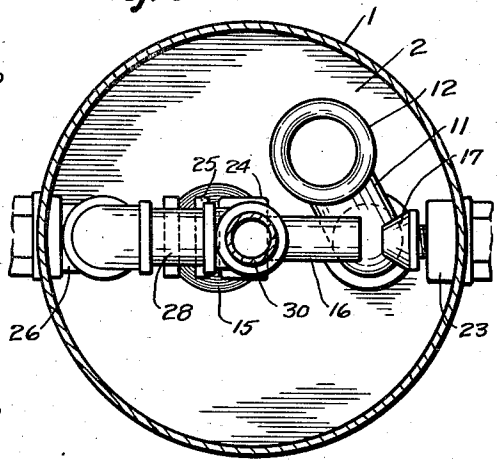


Fig. 4

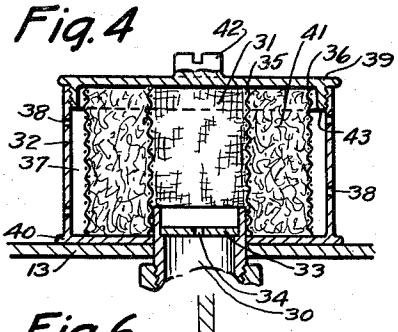


Fig. 5

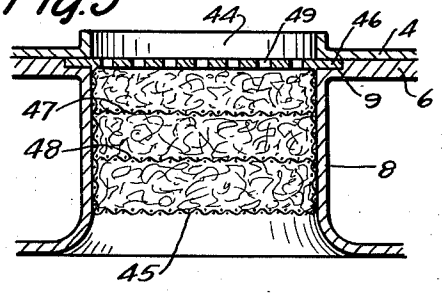
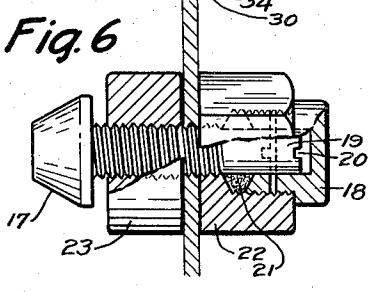


Fig. 6



INVENTOR
Ralph P. Willis
BY
James Harrison Bowen
ATTORNEY

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2,073,915

HUMIDIFIER

Ralph P. Willis, New York, N. Y.

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Renewed August 13, 1936

3 Claims. (Cl. 237—78)

The purpose of this invention is to provide means for using live steam for humidifying purposes without discharging water, without noise, and without a drain or return for condensation.

The invention is a humidifier having a casing with a live steam chamber therein and a reheating chamber within the live steam chamber, and also having means for arresting condensation at the nozzle and returning said condensation back to the reheating chamber, and also for arresting condensation in the live steam chamber and returning it to the live steam supply pipe.

Many devices have been provided for injecting steam into the atmosphere for humidifying purposes, but substantially all of these devices discharge water at some time and this water is very objectionable, particularly in a room with fine furnishings. These devices also operate with a certain degree of noise caused by a reducing valve or passage of steam from one part to another, and the noise is also objectionable. Other devices have been provided having auxiliary means, such as electric heating elements for drying or reheating the steam, however, these require electric connections or some auxiliary means for supplying the heat for the reheater.

The object of this invention is, therefore, to provide a casing to which live steam will be supplied, in which the live steam will be converted into a vapor which may be discharged therewith.

Another object is to provide a humidifer that may be directly attached to a live steam supply pipe.

Another object is to provide a humidifier adapted to be connected to a live steam supply and in which a pressure control valve is provided which may be set so that the device may operate at any desired pressure.

A further object is to provide a humidifier adapted to be connected to a live steam connection and in which a shut off valve may be provided for readily turning the device off and on.

And a still further object is to provide a live steam humidifier for ejecting steam without water and in which noise is eliminated, which is of a simple and economical construction.

With these ends in view the invention embodies a casing having several compartments therein with a live steam connection at one side of the casing, a steam chamber in the upper part of the casing, a reheating chamber within said steam chamber, a restricted opening from said steam chamber to said reheating chamber, a restricted discharge opening from the reheater to the atmosphere, and suitable pressure control and shut off valves.

Other features and advantages of the invention will appear from the following description taken in connection with the drawing, wherein:

Figure 1 is a side elevation of the complete device with part broken away.

Figure 2 is a plan view of the device.

Figure 3 is a cross section on line **3—3** of Figure 1.

Figure 4 is a detail showing a cross section thru the connection between the live steam chamber and the reheating chamber.

Figure 5 is a detail showing a cross section thru the discharge opening.

Figure 6 is a detail showing a cross section thru the pressure control valve.

In the drawing the device is shown as it may be made wherein numeral **1** indicates the casing, numeral **2** the live steam chamber, and numeral **3** the reheating chamber.

In the design shown the device is made of a cylindrical shape with a circular casing, as indicated by the numeral **1**, however, it will be understood that this casing may be of any shape or design, and may be of any length in proportion to the diameter, or of any size desired. It will also be understood that it may be provided in different sizes for different size rooms or inclosures. In the design shown the casing is provided with a head **4** and a base **5**, both of which are threaded to the exterior thereof with their edges rounded, forming beads at the top and bottom of the casing. The ends, however, may be closed in any manner, and any means may be used for providing a bead or flange around the ends or at any part or parts of the casing for ornamenting the same. Inside of the head **4** is a plate **6**, which may be welded to the end of the casing, and between this plate and the lower end is an intermediate partition **7**, which may also be welded in place, however, it will be understood that the plate **6** and partition **7** may be flanged and riveted or mounted in the outer shell in any manner. The steam chamber **2** is formed between the plate **6** and the partition **7**, and the reheating chamber **3** is located at the upper end of this chamber. The chamber **3** is formed by a casing having a neck **8**, the upper end of which is connected to the plate **6**, and the plate is formed with a recess **9** around the opening of the neck **8**. The cham-

ber 3 is, therefore, positioned in the upper end of the chamber 2 and suspended from the plate 6 by the neck 8.

Steam is admitted to the chamber thru a connection 10, which enters the casing below the partition 7, and this connection passes thru the partition 7 and communicates with a pipe 11 which extends upward to a point 12 just below the base 13 of the chamber 3. The upper end of the pipe 12 may be flared outward, as shown, or shaped in any manner. The connection 10 is also provided with a goose neck connection 14 which is also connected thru the partition 7, as shown at the point 15, forming a steam trap, and it will be noted that condensation from the chamber 2 will pass downward thru the connection 14 and will be returned to the steam pipe.

The steam from the upper part of the chamber 2 will pass into a tube 16, having a valve seat in the open end, the opening of which may be controlled by the pressure control valve 17, and this valve may be set to any position by removing a cap 18 at the outer end thereof and turning the valve stem 19 by a screw driver, or the like, which may be placed in a slot 20 in the end thereof. A packing gland 21 may be provided in lock nut 22 around the valve stem 19, and this stem may also be held by nut 23 on the inside of the casing. The valve 17 may, therefore, be set to admit any amount of steam desired to the tube 16.

The tube 16 is connected to a ball check or vacuum valve 25, and this is connected to a valve 26, the handle 27 of which extends thru the casing so that this valve may readily be opened or closed to turn the steam on or off between the chambers 2 and 3. The valve 26 is connected by a connection 28 to the chamber 3 thru a restricting member, as shown in Figure 4, with a fitting 29 connected by a bushing 30 to an opening 31 in the center of the casing 32, in which the restricting member is formed. On the inside of the member 30 is a disc 33 having an opening 34 in the center thereof, and it will be noted that this opening retards the flow of steam, thereby increasing the velocity thereof as it passes from the chamber 2 to the opening in the restricting member. The opening 31 is surrounded by the circular screen 35, and a somewhat larger circular screen 36 is positioned around the screen 35 and spaced a short distance from the inner wall of the casing 32, leaving an open space 37 inside of the wall 32. The wall 32 is provided with perforations 38 and the upper and lower ends are closed by plates 39 and 40, however, it will be noted that the member 30 extends thru the center of the plate 40. The space between the screens 35 and 36 is filled with loose asbestos, or a similar substance, as indicated by the numeral 41, and it will be noted that as steam passes into the opening 31 it will pass thru the screen 35, thru the asbestos 41, thru the screen 36 and into the opening 37, from where it will pass thru the opening 38 to the interior of the reheating chamber. The plate 39 may be provided with a slotted lug 42 and the outer edge is formed with a threaded flange 43, by which it may be screwed into the upper end of the casing 32, and this may be screwed into or unscrewed from the casing by a screw driver in the slot in the lug 42. It will be understood, however, that this restricting member may be of any other type or design and the interior parts thereof may be arranged in any other manner.

From the chamber 3 the steam passes upward thru the neck 8 and thru an opening 44 in the head 4, and in the neck 8 the flow of the steam is retarded by a screen member 45 extending downward from a flange 46 which is mounted in the recess 9 of the upper end 6 of the casing, and it will be noted that, as the head 4 is screwed downward upon the upper end of the casing, it will lock and hold the flange 46 in the recess. In the design shown the member 45 is made of a cylindrical screen with the lower end closed and with partitions 47 and 48 formed of screens, horizontally positioned in the member 45 and with flaked or shredded asbestos between the partitions. The disc 46 is provided with perforations 49 and it will be noted that all steam or steam vapor passing out of the device will pass thru the member 45 and thru the perforations 49, and any condensation whatever of the steam will be arrested by the asbestos or the disc 46 so that it will drop backward into the reheating chamber 3, where it will be converted back into steam. It is, therefore, absolutely impossible for water to be expelled out of the upper end of the device, and even small amounts of condensation will be returned to the interior, and be re-evaporated.

It will be understood that other changes may be made in the construction without departing from the spirit of the invention. One of which changes may be in the use of a casing of any other type or design, another may be in the use of a live steam connection to the device at any other point or points, another may be in the location of the discharge opening as this may also be provided at any other point or points, and still another may be in the use of other means for restricting the flow of steam or for controlling the amount of steam passing thru the device.

The construction may readily be understood from the foregoing description. In use it will be noted that the nipple 10 may be connected to any suitable source for supplying live steam and with the steam turned on it will pass upward thru the pipe 11 so that it will be discharged against the lower end of the chamber 3, thereby maintaining the highest possible temperature in the chamber 3. The chamber 3 is completely surrounded by steam in the chamber 2 and, as hereinbefore stated, all condensation of this steam will pass downward thru the opening 15 into the connection 14, where it will come in contact with the live steam and will, therefore, be again converted into steam. The steam from the chamber 2 passes thru the nipple 16, the vacuum valve 25, the valve 26 and the connection 28 to the chamber 3, thru the restricting member in the casing 32 and, as it is expelled from this member, it passes into the reheating chamber 3 and out of the upper end thereof in the form of a comparatively dry steam vapor.

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

1. A humidifier of the type adapted to use live steam with the entrained water therein having an outer shell with closures at the upper and lower ends and a horizontal partition forming a false bottom spaced from the lower end providing a live steam chamber between the partition and the upper end, a re-heating chamber positioned in the upper part of said casing and having a neck communicating with an opening in the upper end of the casing, a live steam connection extending through the wall of the casing below the partition, extending upward

through the partition to a point just below the bottom of the re-heating chamber and also having a connection in the form of a U bend with the opposite end connected through the partition and communicating with the live steam chamber, a horizontally positioned valve in said live steam chamber and below the re-heating chamber, said valve having an opening communicating with said live steam chamber, a connection from the upper side of said valve to the bottom of said re-heating chamber, passing through the bottom thereof, a drum shaped member in said re-heating chamber covering the outlet of said connection and provided with filtering means opening through the sides thereof, and another filtering member in the neck at the upper end of said reheating chamber and adjacent the upper end thereof.

2. A device as described in claim 1 characterized in that the valve is provided with adjusting means and the opening to the valve from the exterior of the casing is provided with adjusting means, both of said adjusting means being arranged for operation.

3. A humidifier as described in claim 1 in which the drum shaped member covering the inlet connection of the re-heating chamber is formed with an inner tubular screen directly covering said connection, an outer tubular screen, suitable packing between the two screens, an outer shell having perforations therein and a suitable cover forming a closure for the upper end thereof.

RALPH P. WILLIS.