United States Patent

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[33] **Switzerland**
[31] **6387/68 and 17263/68**

[54] **HUMIDIFIER WITH FLOATING VAPORIZING CHAMBER**
10 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **219/272,** 219/275, 219/317, 219/333, 219/523, 261/142
[51] **Int. Cl.** **H05b 3/78,** H05b 1/02
[50] **Field of Search** ..... 219/271-—276, 362, 317, 523, 333; 261/141, 142

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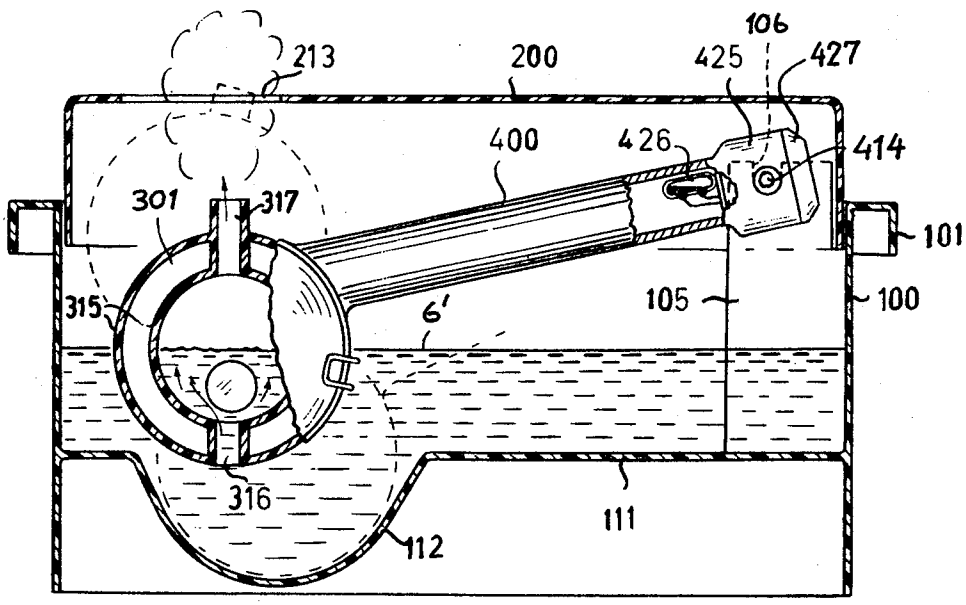
ABSTRACT: A humidifier has a vaporizing chamber floating on the water in a reservoir. The chamber is insulated from the bath for limiting heat transfer from the chamber to the bath and has a lower inlet through which water enters the chamber and an upper outlet out of which vapor issues. A heating element in the chamber serves to vaporize the water. In one embodiment the chamber is mounted on a pivotal arm and switches are provided to turn off the heater when the water level drops too low and/or too much heat builds up in the chamber.



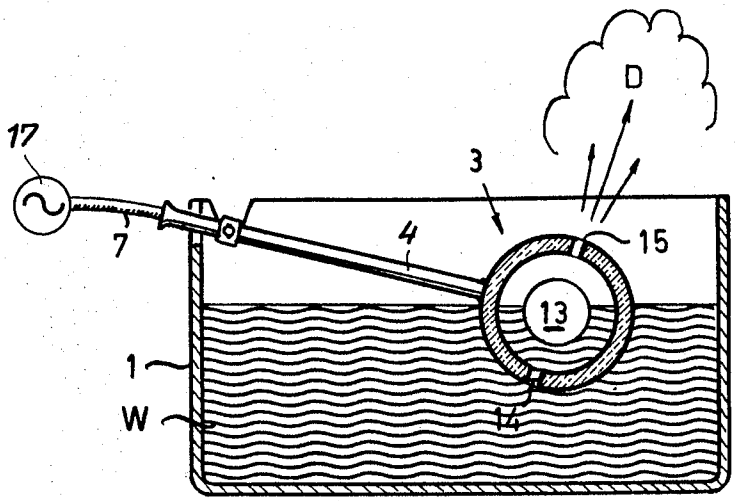


Fig. 1

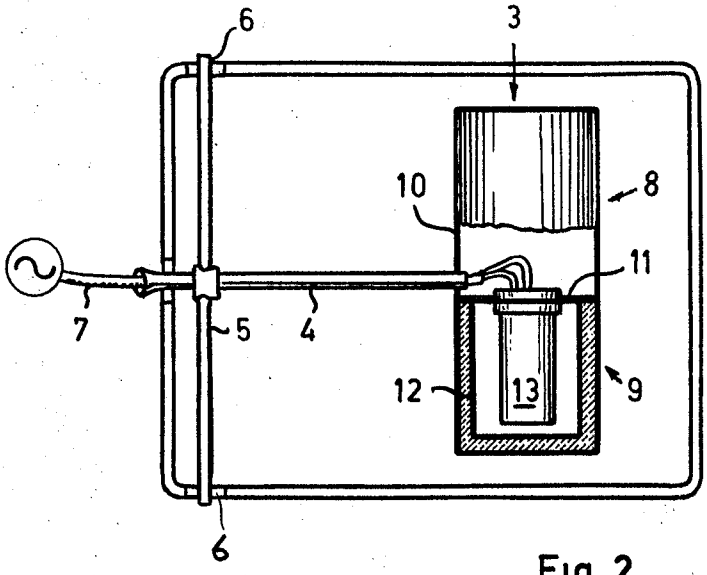


Fig. 2

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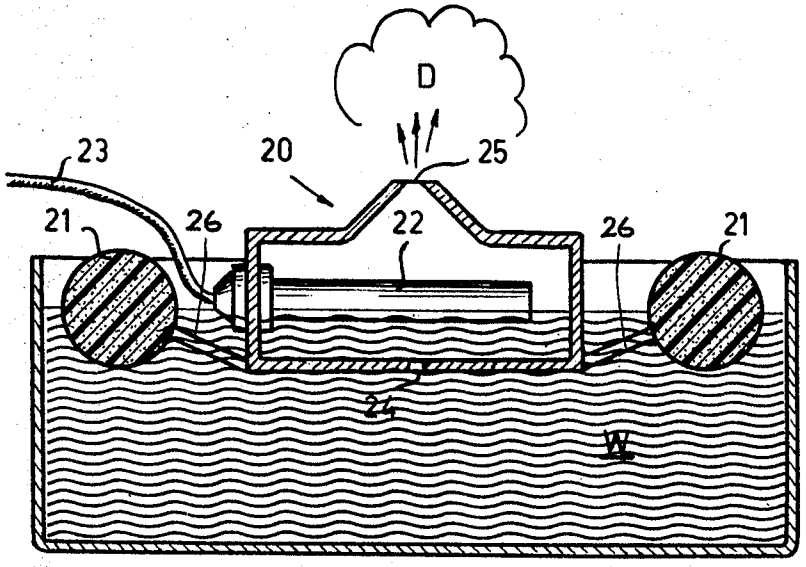

Fig. 3

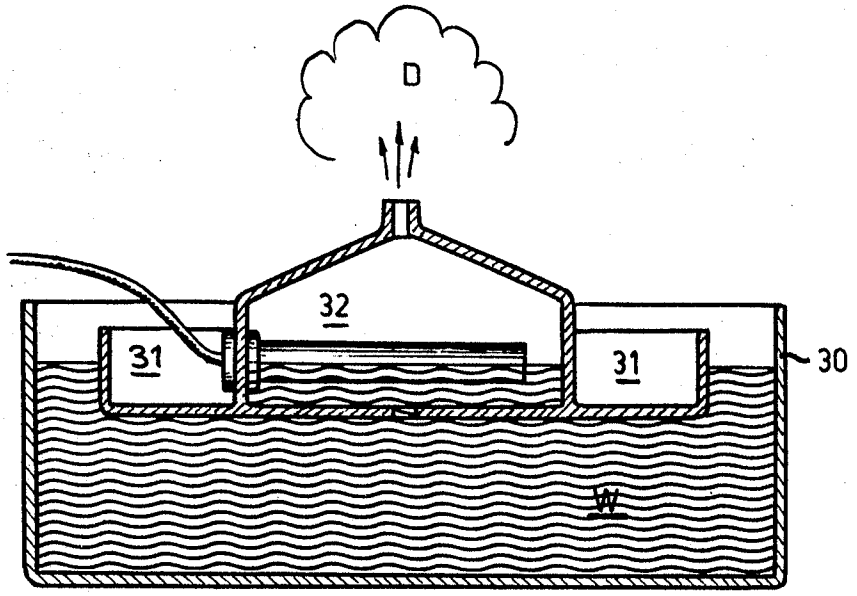

Fig. 4

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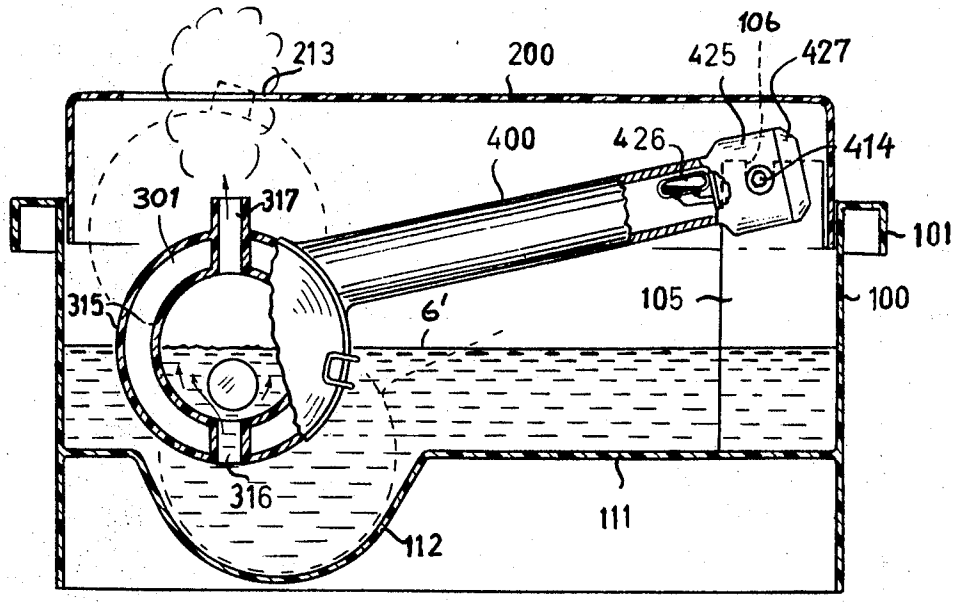

Fig. 5

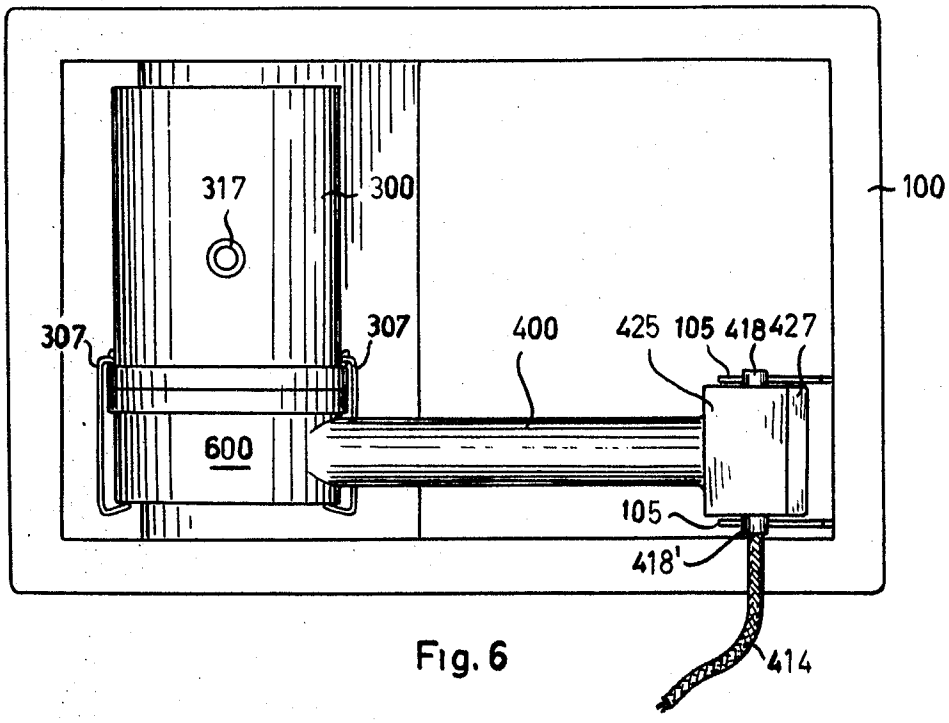

Fig. 6

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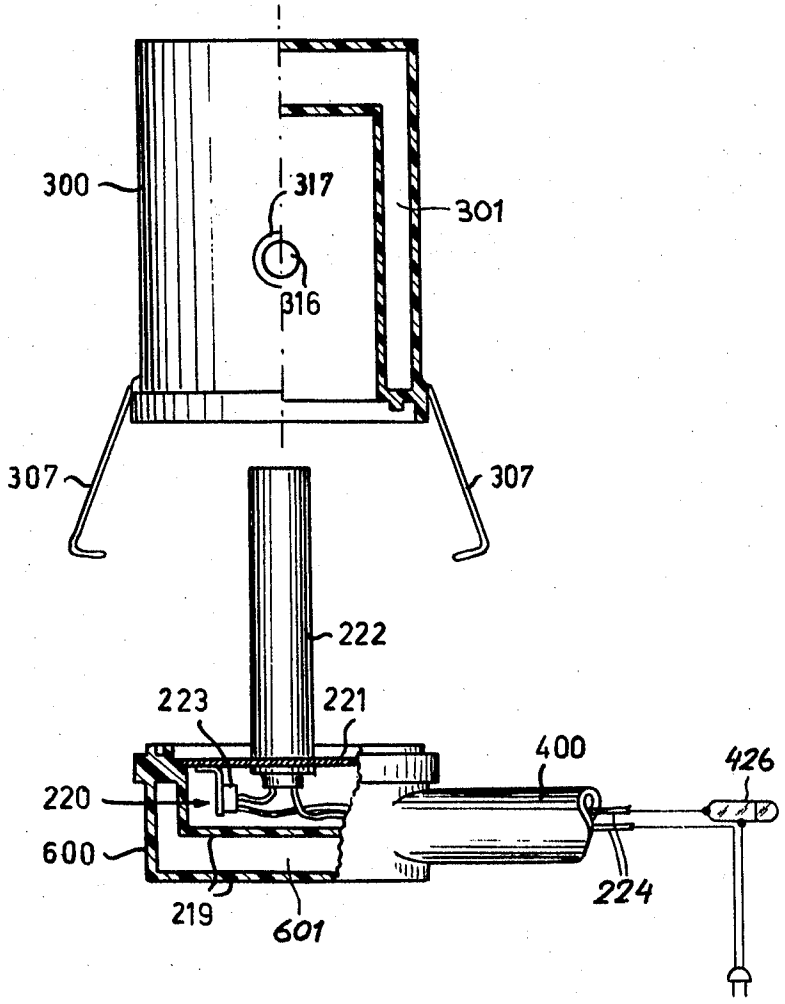

Fig.7

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HUMIDIFIER WITH FLOATING VAPORIZING CHAMBER

My invention relates to a vaporizer and, more particularly, to a humidifier used to raise the humidity or moisture content of the air.

It is often desirable to raise the humidity of living quarters and work areas. Humidity in such places often drops to uncomfortable and even unhealthy levels during winter months when central heating is effective. In addition, low humidity levels are especially undesirable for persons suffering from some respiratory ailment.

Humidifiers have been proposed to eliminate this problem. The prior art humidifiers usually consist of a reservoir holding a relatively large supply of water and an associated smaller chamber communicating therewith in which a heating element boils, and therefore vaporizes, the water.

A principal difficulty with such devices has been to control precisely the level of water in the smaller vaporizing chamber. If this level is too high, the need to heat the large body of water greatly cuts the efficiency of the device, whereas if the liquid level is too low the heating element is liable to overheat locally and burn out. Thus the liquid level in the vaporizing chamber must be maintained as nearly constant as possible for best results. Complicated systems using float-operated valves, overflows, etc. have been proposed to regulate the level in such systems.

However, these arrangements do little more than vary the quantity of water in the chamber between certain limits. Furthermore, they are overly complicated, expensive and prone to breakdown.

It is therefore a principal object of my invention to provide an improved vaporizer usable as a humidifier.

More specifically, an object of my invention is to provide a humidifier which overcomes the above-mentioned drawbacks.

I attain the above and other objects, in accordance with the present invention, by providing a humidifier in which the vaporizing chamber floats in a reservoir of vaporizable liquid, usually water. This chamber communicates with the bath of vaporizable liquid in the reservoir through a lower inlet port and expels vapor, usually steam, from an upper outlet port. The chamber is, furthermore, partly below the surface of and partly filled by the liquid and mounts a heating element which vaporizes it by boiling.

According to another feature of my invention, the chamber is insulated from the surrounding water in the bath. This insulation may take the form of thickened insulating walls or a double-wall structure. Thus, the only route for heat to take to reach the liquid in the bath is through the inlet port; however, there is always a slight current up into this port which inhibits heat conduction in the opposite direction.

In accordance with a further feature of my present invention the chamber is pivoted on a hollow arm which serves as lead-in for the wires of the heating element.

Yet further features of my invention are the provision of thermostatic and position switches to turn off the heating element in case of overheating or a reduction in water level in the reservoir below a predeterminable minimum operational level.

Thus my invention provides the advantages of great simplicity and low construction cost. The chamber is always ensured of an exact and constant water level by means which can hardly malfunction.

The above and other objects, features, and advantages of my present invention will come more readily apparent from the following description reference being made to the drawing, in which:

FIG. 1 is a vertical sectional view of a first embodiment of my invention;

FIG. 2 is a top view of the embodiment of FIG. 1;

FIGS. 3, 4, and 5 are vertical sectional views of second, third, and fourth embodiments, respectively, of my invention;

FIG. 6 is a top view of the FIG. 5 embodiment with the cover removed; and

FIG. 7 is an exploded view of a detail of the embodiment shown in FIGS. 5 and 6.

As shown in FIGS. 1 and 2 a humidifier comprises a reservoir 1 in which a bath of water W is held. A float 3 is mounted on a tubular arm 4 in turn mounted on a crossmember 5 journaled in notches 6 in the side of the reservoir.

The float 3 consists of a vaporizing chamber 9 and a float chamber 8 commonly enclosed by a cylindrical housing 10 and separated by a partition wall 11. Insulation 12 in the vaporizing chamber 9 prevents the heat generated therein by a heating element 13 from being conducted through the walls to the water W in the bath. A wire 7 leading to a source 17 is connected to the heater 13 and led out through the tubular arm 4.

The chamber 9 drawn in water W through a lower inlet port 14, boils it by means of the heater 13, and expels steam D through an upper outlet port 15. The level L of water in the chamber 9 is always at a constant height relative to the heater 13, submerging it about half or slightly more than half its diameter at all times. Both the heater 13 and cylindrical housing 10 are coaxial and centered on an axis A to achieve this effect.

FIG. 3 shows a reservoir 27 with a water bath W on which a vaporizing chamber 20 is supported by two expanded-polystyrene floats 21. The chamber 20 has a housing 28 connected to the floats via outriggers 26. A heating element 22, fed electricity through a cable 23, is mounted horizontal in the chamber 20 such that water W entering through an inlet port 24 can be vaporized and expelled through an outlet port 25 as steam D.

The embodiment of FIG. 4 is quite similar in principle to that of FIG. 3 except that here a reservoir 30 with a bath of water W floats a vaporizing chamber 32 whose cylindrical housing 34 is integrally formed with a surrounding toroidal hollow 31 serving as float. Once again water W is vaporized by an element 33 and transformed into steam D.

FIGS. 5 through 7 illustrate an embodiment of my invention in much more detail according to the principles of FIGS. 1 and 2.

Here a rectangular plastic housing 100 formed with a lifting lip 101 has a removable cover 200 and contains a bath of water at a level L'. A vaporizing chamber 300 held to end piece 600 is floated on the water in the reservoir 100 which has a floor 111 formed with a semicylindrical depression 112 in which the chamber 300 and end 600 can be partially received.

The end piece 600 is unitarily formed of plastic with a tube 400 having an end portion 425 carrying two pins 418 and 418' journaled in plates 105 mounted on the reservoir 100. These pins 418 and 418' rest only in the bottom of notches 106 in the plates 105 so that the whole arm 400 may be lifted out of the reservoir 100.

The chamber 300 is double walled with an air space 301 serving to buoy it up. A lower inlet port 316 below the level L' of the water and an upper outlet port 317 above this level L' are formed through this double wall to permit water intake and steam output. The air space 301 is fully enclosed and water tight.

The end piece 600 mounted on the arm 400 is also formed with two walls 219 defining between them a sealed air space 601. A metal plate 221 mounted on one end of the end piece 600 defines a compartment 220 into which leads 224 are lead from the tubular arm 400. A heating element 222 is also mounted on this wall 221 and a thermostatic switch 223 is connected in series with it and the leads 224. A mercury switch 426 is mounted in the upper regions of the arm 400 and is also connected in series with the element 222 to cut the supply of current to this latter when the inclination of the arm 400 indicates that the level L' has dropped too low. A cable 414 led out through the pin 418' is connected to a source of electricity (not shown).

This device is filled with water simply by pouring it in an opening **213** in the cover **200**. Before the device can be switched on the chamber **300** must be high enough, lifted out of the depression **112**, to close the circuit formed by the mercury switch **426**. Then water can flow in the port **316**, be boiled by the element **222** and exit through the extended port **317** as steam. This steam passes easily out through the opening **213**.

In order to clean mineral deposits out of the chamber **300** and off the element **222**, one need merely remove the cover **200** and the arm **400**. Then the clips **307** can be disengaged to unseal the chamber **300** from the end piece **600** and the cleaning be carried out. Once the arm **400** is removed, the reservoir **100** can also be easily scrubbed with no fear of creating an electrical shock hazard.

Should the water level L' drop below a predetermined limit, indicating that practically all of the water has been vaporized, the mercury switch **426** will open the circuit and switch off the element **222**. In addition, should for some reason this switch **426** fail or the element **222**, which is advantageously of the fully insulated type, overheat, the thermostatic switch **223** will switch off the current to the element **222** automatically. This redundancy ensures a virtually fail-safe device.

I claim:

1. A vaporizer for a humidifier comprising:

a reservoir for a bath of water;

means forming a vaporizing chamber floating on and communicating with said bath, said chamber extending at least partially below the surface of said bath and being at least partially filled with said water; and

heating means in said chamber at least partially submerged in said water therein for vaporizing same;

said reservoir being formed as an upwardly open container having a mouth extending substantially over the full horizontal cross section of the container, a removable cover mounted on the mouth of said container and formed with an opening to one side thereof, and a well formed in the floor of said container at said side;

said means forming said chamber including a substantially cylindrical closed-ended receptacle having a horizontal axis and receivable in said wall, and a hollow arm extending from said receptacle toward the other side of said container, said receptacle being formed with a lower inlet port communicating between said chamber and said bath and with an upper outlet port substantially aligned with said opening for discharging steam therethrough, said chamber being of generally cylindrical configuration and receiving water from said bath to substantially half its height;

said vaporizer further comprising pivot means between said container and the free end of said arm for swingably mounting said chamber on said container about an horizontal axis parallel to the axis of said receptacle;

said pivot means being constructed and arranged to permit withdrawal of said chamber from said container upon removal of said cover; and

said heating means including a horizontally oriented rod-shaped electrical heating element mounted in an end wall of said chamber, and electrical conductor means connected to said heating element and running through said arm.

2. The vaporizer defined in claim **1**, further comprising insulating means between said chamber and said bath.

3. The vaporizer defined in claim **2** wherein the means forming said chamber includes a double-wall partition separating said chamber from said bath and defining a space between the walls of said partition and forming at least partly said insulating means.

4. The vaporizer defined in claim **1** wherein said heating means is an electric heater, said vaporizer further comprising thermostatic switch means for switching off said heating means when heat therein exceeds a predetermined limit.

5. The vaporizer defined in claim **1** wherein said heating means is electric, said vaporizer further comprising switch means for switching off said heating means when the water level in said bath drops below a predetermined limit.

6. The vaporizer defined in claim **1** wherein said receptacle is formed with a double-wall partition separating said chamber from said bath and hermetically sealed to form an air-filled compartment around said chamber.

7. The vaporizer defined in claim **6** wherein said receptacle has two axially separable portions including a first portion mounted on said arm and carrying said heating element, said heating element projecting into the other portion whereby separation of said portions exposes said heating element, said second portion being formed with said ports and with catch means for detachably connecting said portions.

8. The vaporizer defined in claim **7**, further comprising a thermostat switch received in said first position and connected in series with said heating element for cutting off said heating element upon an excessive rise in the temperature in said chamber.

9. The vaporizer defined in claim **8**, further comprising a mercury switch mounted in said arm and connected in series with said heating element and said thermostat switch for cutting off said heating element upon tilting of said arm about said pivot means indicative of a fall in level of the water in said reservoir below a predetermined minimum operational level.

10. The vaporizer defined in claim **1**, further comprising means for leading an electrical conductor from said arm through said pivot means parallel to said horizontal axis.