

Aug. 4, 1936.

P. E. EDELMAN

2,049,899

ELECTRIC VAPORIZER AND HUMIDIFIER

Filed Sept. 24, 1935

2 Sheets-Sheet 1

Fig. 1.

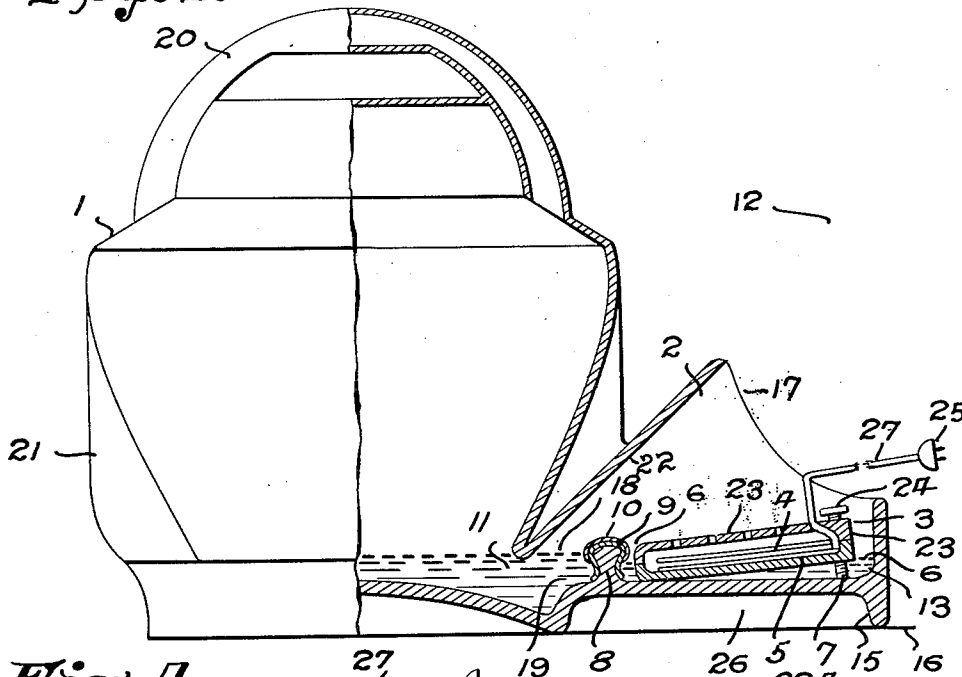


Fig. 4.

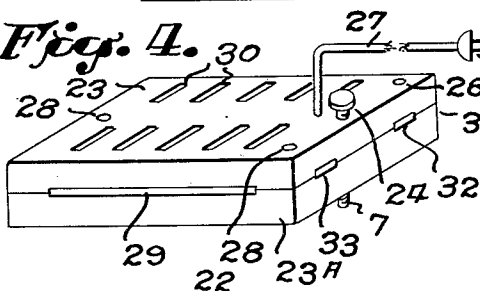


Fig. 6.

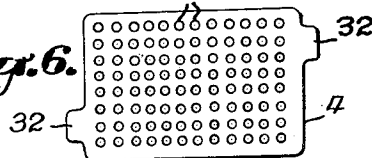


Fig. 3.

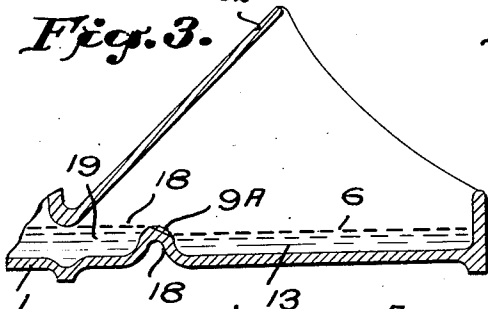


Fig. 7.

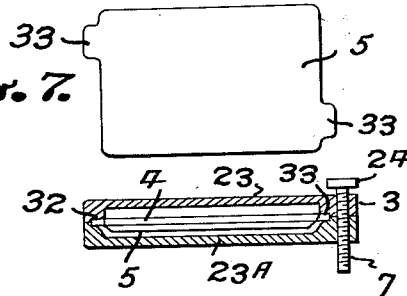


Fig. 5.

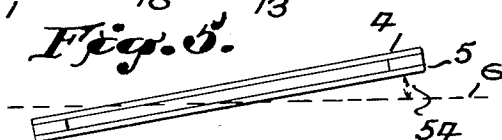


Fig. 8.

INVENTOR.

Philip E. Edelman.

BY

ATTORNEY.

Aug. 4, 1936.

P. E. EDELMAN

2,049,899

ELECTRIC VAPORIZER AND HUMIDIFIER

Filed Sept. 24, 1935

2 Sheets-Sheet 2

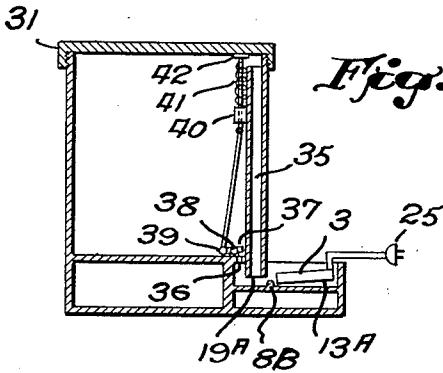


Fig. 12.

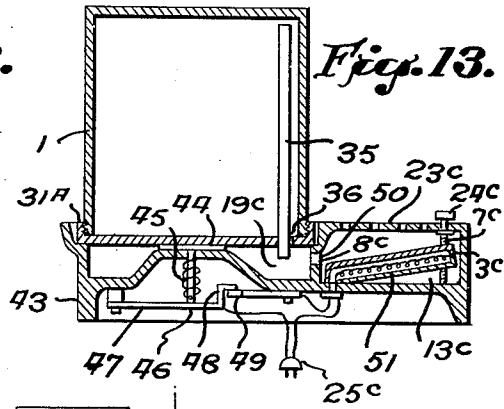


Fig. 13.

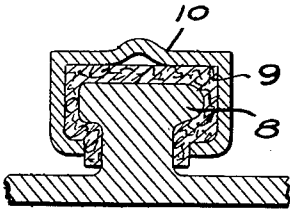


Fig. 9.

Fig. 2.

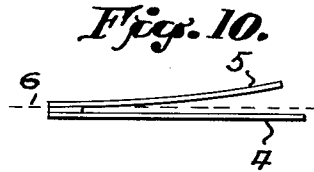
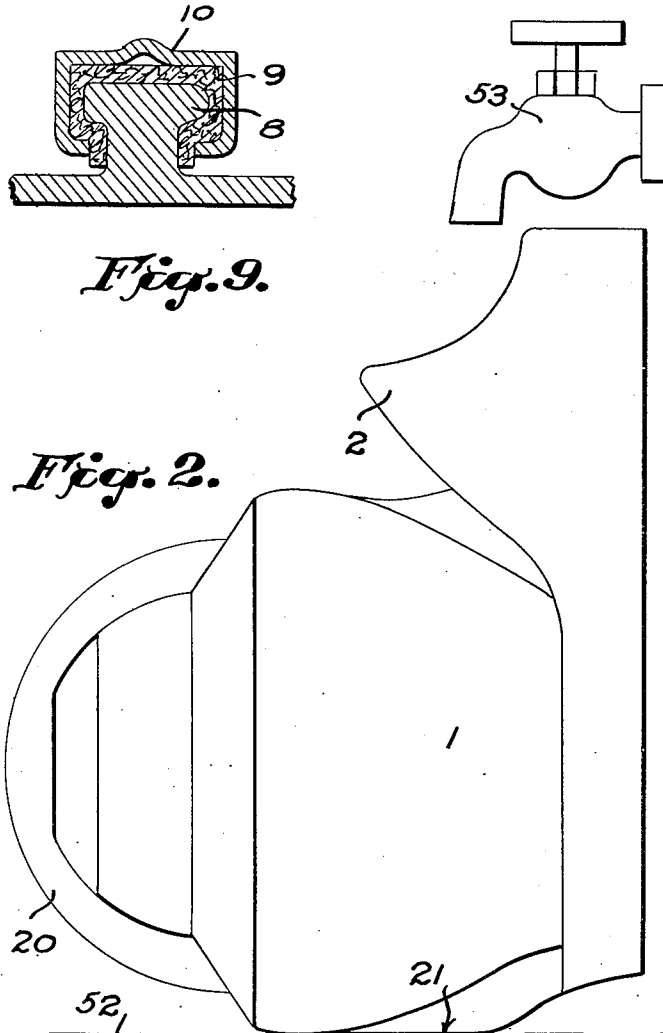


Fig. 10.

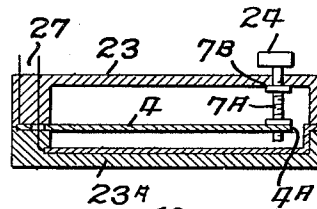


Fig. 11.

INVENTOR.

Philip E. Edelman.

ATTORNEY.

UNITED STATES PATENT OFFICE

2,049,899

ELECTRIC VAPORIZER AND HUMIDIFIER

Philip E. Edelman, Chicago, Ill.

Application September 24, 1935, Serial No. 41,917

13 Claims. (Cl. 219—40)

An object of the present invention is to provide a reliable automatic efficient humidifier. A further object is to evaporate a small portion of water at approximately a constant rate. A further object is to effect the evaporation commencing at and from the surface or water level. A further object is to prevent back circulation of the water from the vicinity of evaporation to the vicinity of water supply. A further object is to suppress noise during operation. A further object is to facilitate and safeguard use of the vaporizer by unskilled persons. Various other objects will presently appear and the invention is defined in the appended claims.

It is recognized that it is beneficial to add water vapor to a heated room during cold weather when there is a natural lowering of the relative humidity. There are various other uses for a vaporizer of the kind described. The device relates more particularly to the electrical class of vaporizers and the invention resides in a new and useful co-acting arrangement of elements providing not only steady efficient operation but also the added utility of convenient and safe use.

A suitable exemplification of the invention is shown in the accompanying drawings in which:—

Fig. 1 is a front elevation, partly sectioned, showing the vaporizer,

Fig. 2 is a diagram indicating the manner of filling the vaporizer of Figure 1 with a supply of water,

Fig. 3 is a section view of a modification of the spout 2 of Figure 1,

Fig. 4 is an isometric view of the electrode or heating element 3 of Figure 1,

Fig. 5 is a diagram showing the relationship of the electrodes 4 and 5 to the water line or surface 6 of Figure 1,

Fig. 6 is a plan view of the top electrode 5 of Figure 1,

Fig. 7 is a top view of the lower electrode 4 of Figure 1,

Fig. 8 is a sectional view of a modification of the heating element 3 of Figure 1,

Fig. 9 is an enlarged section of the blocker portion 8 of Figure 1, showing the relationship of the wick 9 and holding clip 10,

Fig. 10 is a diagram of a modification of Figure 5 with the lower electrode 4 fixed and the upper electrode 5 movable at an angle thereto and with respect to the water line 6,

Fig. 11 is a sectioned view of a modification of Figure 8 to afford the relationship of the electrodes 4 and 5 to water line 6 as shown in Figure 10,

Fig. 12 is a sectioned front elevation of a modification of the vaporizer of Figure 1 to permit filling of the container 1 and the top, and

Fig. 13 is a sectioned front elevation of another modification of the vaporizer of Figure 1 to afford operation on direct current electricity supply.

In this specification and the appended claims the term "spout" is to be understood in its general accepted usage and dictionary sense as, for example, an inclined tube opening to the air capable of directing the vapor emission, or for filling and emptying purposes as in a tea-pot, etc.

Referring now to Figure 1, the container 1 is closed except at its portion 11 opening into spout 2. Container 1 is preferably made unitary in one piece with spout 2 of suitable material such for example as pottery or bakelite. Spout 2 serves for filling container 1 with water as indicated in Figure 2 and also serves as means for emitting vapor 12 from spout compartment 13.

Container 1 may for example be ornamentally constructed to hold a gallon or two of water which may be evaporated daily. Compartment 13 of spout 2 may for example be arranged to hold one eighth pint of water at a time and continuously at a constant water level 6 as long as the supply of water in container 1 lasts. Suitable feet or a rim 15 serves to hold compartment 13 of spout 2 spaced away from the base line or table top 16 to protect same from heat.

Spout 2 is open at its end 17 so that water can pass from 17 and thru opening 11 in container 1 during filling of container 1. Orifice 11 is positioned with respect to spout 2 so that spout compartment 19 receives a substantially constant supply of water at level 18, with surface level 18 slightly above water level 6. A difference of only $\frac{1}{16}$ th inch in these said two water levels is found satisfactory. Orifice 11 for example may be approximately $\frac{1}{8}$ ths inch by 2 inches wide so that compartment 19 will receive a small portion of water up to level 18 which is preferably $\frac{1}{8}$ ths inch high adjacent to blocker element 8 between compartments 13 and 19. Then level 6 to which water flows from compartment 19 into compartment 13 may suitably be $\frac{3}{16}$ ths inch high in compartment 13. A constant one way flow of water from compartment 19 into compartment 13 is preferably obtained by means of a small wick 9 held by a spring clip 10 against blocker element 8. This wick may appropriately be a piece of ordinary lamp wick about one inch wide, one sixteenth inch thick and one inch long. By the said arrangement the water level 6 normally is one sixteenth inch below the water level 18

and can never become higher than level 18. Blocker element 8 prevents back flow or re-circulation of water from compartment 13 into compartment 18. If means to prevent or obstruct such back circulation is not provided, then water level 6 will vary during heating of water in compartment 13 and may rise and overflow as well as heat the supply of water in container 1. With the aforesaid arrangement however water in container 1 does not become heated and water in compartment 19 normally remains near room temperature so that no appreciable evaporation of the water in compartment 19 results. Also the water in compartment 19 is thereby steadied from bubble agitation so as to afford a reliable substantially constant level at 18. Level 18 is governed entirely by dimensions of orifice 11 as the water in container 1 becomes air-locked and will only feed into compartment 19 when a bubble of air is allowed to pass back thru orifice 11 from the top of compartment 19. The only time this can occur is when level 18 is temporarily reduced slightly as water passes from compartment 19 into compartment 13. This tends to afford automatic feed of water at a definite level 18 from container 1 into compartment 19.

Container 1 is provided with a suitable handle 20 which may be hollow and is also provided with a flatted portion 21 so that container 1 may rest on 21 as a filling base, as indicated in Figure 2.

Spout 2 thus has a plurality of compartments, 19 and 13 arranged so that the water level in compartment 13 is normally lower than that in compartment 19 and cannot become higher than in compartment 19. Spout 2 has its top portion 22 arranged at a suitable angle to permit free flow of air to water level 18, as for example in the range 30 to 60 degrees from base line 16. Blocker element 8 which divides the two compartments 19 and 13 extends across the spout 2, and serves to prevent waste of electric power which would otherwise heat the water supply in container 1 by circulating hot water back into container 1. The end 29 of spout 2 may appropriately be of height in the range one to one and one half inches above base line 16 so that no water will spill either during use or when container 1 is carried by means of its handle 20. The spout opening portion 17 is made of suitable size to permit easy insertion and removal of heater element 3 as well as the convenience of adjustment of position of element 3 in compartment 13. The perforated insulated top 23 of element 3 normally remains well above water line 6 in compartment 13 so that adjustment knob 24 may be safely manipulated by the user as required, and for a desired rate of evaporation from compartment 13. Vapor 12 is free to pass from spout 2 thru its top opening portion 17 and the angular positioning of spout portion 22 substantially avoids condensation of appreciable water drops upon the exterior of container 1 because the vapor 12 is directed away from container 1. During filling, as indicated by Figure 2, spout 2 serves as a funnel to prevent spilling of water.

There is thus provided an air-locked supply of water in container 1 with automatic release to a predetermined level 18 from which a small supply is fed in one direction into compartment 13 to a substantially constant level 6. Then as water is evaporated from level 6, replenishment is automatically and steadily maintained via element 9 over the top of element 8. It is found that in handling container 1 after filling according to

method indicated in Figure 2, no water is spilled when container 1 is carried by its handle 20, but that sufficient motion is afforded so that compartment 13 receives an initial supply of water to its level 6, which level is thereafter maintained as hereinbefore set forth. This affords reliable uniform operation. During operation the temperature in compartment 13 is found to remain below 182 degrees F. but evaporation from level 6 is found to start within a few seconds after alternating current is supplied to attachment plug 25 and to proceed at a steady rate thereafter governed by the adjustment knob 24, leaving water in compartment 19 only slightly warm and water in container 1 at room temperature.

Since heating by electricity is somewhat expensive it is important to minimize wasteful heat loss. This is in part accomplished by preferably using insulation material for compartment 13, spout 2, compartment 19 and container 1, providing a dead air space 26 between compartment 13 and base line 16; and is further accomplished by a novel method of or arrangement of the heater element 3 with respect to the water level 6 whereby evaporation starts substantially from the surface line 6. This minimizes bubbles during operation. Bubble noise is further suppressed either by perforating the top 23 of element 3 or perforating at least the top electrode 6, or both, permitting bubbles to be broken up with escape of vapor 12 so that considerable water is carried from compartment 13 by entrainment with escaping vapor 12 in the form of minute sized particles of water. This increases the efficiency of operation and minimizes the heating current required to be supplied to plug 25. A rubber covered electric cord of good quality is used for connector 27 contacting respectively with electrodes 5 and 6, preferably above water line 6.

Such gum rubber covered wire is found to operate reliably in this apparatus. Electrodes 5 and 6 are insulatively mounted in element 3 and preferably spaced a fixed distance apart, such for example as one eighth of an inch. One or both electrodes 5, 6 is perforated with uniformly spaced holes. The holes may be one sixteenth to one eighth inch in diameter or equivalent slots, spaced about one fourth inch apart. The electrodes are to be rigidly held in this relationship preferably in housing 3, such that they are normally located in compartment 13 adjacent to or at the water level 6. As pottery castings vary somewhat during production processing and shrinkage, and also in order to permit desired adjustment of rate of evaporation, adjusting means are afforded to arrange the desired relationship of housing 3 with its electrodes 4 and 5 in compartment 13 of spout 2. Such adjustment also provides correction for water supply of varying conductivity and purity. Preferably this adjustment is accomplished by a screw 7 of fixed length movable in housing 3 by means of an insulating knob 24 so that housing element 3 may be raised or lowered at will at one end to adjust its angular relationship to water level line 6. This permits part of the electrodes 4-5 respective areas to operate below and part above the water line 6. This discovery is a fact and may be explained as follows. It is experimentally demonstrated that when in normal operation the electrodes 4, 5 are positioned close to the surface line 6 of the water and the electrodes are inclined normally at a small angle with respect to water line 6, most of the evaporation

occurs above the water line 6. The water is observed to climb upwards between electrodes 4, 5 so that operating current passes between electrodes 4, 5 thru this water which is above the water line 6 and rapidly causes vapor to be emitted. This requires latent heat of vaporization to be supplied and the heat is drawn in part from the water supply below water line 6 so that the temperature of the water in compartment 13 is observed to remain below 182 degrees F. although the boiling point is substantially 212 degrees F. This makes for economy of operation. The water climbs upwards between electrodes 4, 5 partly by surface tension and probably in part by expansion caused by the electric current in heating and vaporizing the water. It is an advance in this art to economize on current consumption by this departure in vaporizing a major portion of the water above the water line 6 as set forth, a fact that can readily be observed during observation of the apparatus while it is in operation. Usually there will be a range of angular inclination of electrodes 4, 5 which affords maximum evaporation with minimum current consumption due to this discovery. If on the other hand the electrodes 4, 5 were to be immersed in the water in compartment 13 below the water line 6 the entire water supply in compartment 13 would be boiled and require a much larger current consumption for the same amount of vapor emission.

It will be understood that the essential relationship of the electrodes to the water level is not exactly critical but best determined empirically by moving the area of the electrodes which is active so as to be in such part above the water level as will afford the maximum emission of vapor with minimum heating and no boiling, and for this there is provided suitable means to adjust the electrodes so that a major portion of the working area thereof may be located above the water level line 6. The portion of the electrodes area above water line 6 arranged by said adjustment is effective in evaporation because bubbles of water are carried up above water line 6 by surface tension of the water on the electrodes 4, 5 so that some evaporation may be effected to start at as well as above water line 6. Since heat travels upwards, this tends to keep temperature of water in compartment 13 below 182 degrees F. although the boiling point of water is substantially 212 degrees F. Also when less evaporation is desired, screw 7 may be adjusted to raise electrodes 4, 5, so that part of the opposed areas of these electrodes is exposed only to air and ineffective in evaporation in such case. Excessive immersion of the electrodes is avoided as this is wasteful of power supply and takes increased heating time. Use of ordinary house alternating current prevents noticeable gassing or polarization. An electrode area of 2 by 3 inches for each element 4, 5 is found ample to evaporate up to 2 gallons of water per day on 110 volt A. C. supply to plug 5. Operation on direct current is found to be accompanied by polarization, so that the modification of Figure 13 is preferred for direct current operation. Alternating current supply is the universally used power where the vaporator is to be operated in the majority of cases, so that the arrangement of Figure 1 is the preferred form.

As for the electrode material for elements 4, 5, sheet Monel metal or sheet nichrome metal is found satisfactory for long usage. Sheet brass is not desirable, nor is iron, zinc or steel. The

thickness found suitable is in the range 26 to 20 gage (U. S.). While carbon may be used, it is less satisfactory to perforate and handle and tends to flake off in particles in service.

It is found that different water supplies have different conductivity and evaporate at different rates, but adjustment knob 24 is able to compensate for a wide range of variation to secure the desired rate of evaporation of water supplied to compartment 13. The preferred size of container 1 in the range one to two gallons capacity necessitates frequent or daily re-filling. This circumstance and the stated arrangement is utilized to afford cleaning out or washing out of water scale deposits or droppings due to salts and suspensions in water supply used. The refilling operation indicated in Figure 2 permits material dropping to bottom of compartment 13 to be flushed out daily at the time of refilling container 1.

The arrangement also is safe for unskilled persons as it is necessary to remove element 3 from spout 2 before container 1 can be refilled, thus preventing possibility of shock to user. Housing 3 can be safely handled because of insulation material which dries quickly. Also all handling can be conveniently accomplished by holding cord 27 in removal and insertion of element 3 in compartment 13 of spout 2. Wick 9 does not clog up because it normally stays wetted at all times in use. If desired for perfumery or medication effect, essential medicated addition agent or the like may be added either to water supplied in container 1 or by suspending same from or holding same in spout 2. Thus the medication or odor agent may be mixed with the emitted vapor 12. Condensation of undesired droplets is avoided as vapor 12 emits from spout 2 at sufficient rate to carry the water vapor well above the top of container 1 and at an angle away therefrom.

Figure 2 indicates how the vaporizer can be re-filled by supporting container 1 on its flatted portion 21 in a sink 52 having tap water faucet 53. Or water can be carried to the location of container 1 and poured into spout 2 while element 3 is removed during the pouring.

Referring now to the modification of Figure 3, obstruction 8 is cast homogeneous with spout 2 to afford compartments 19 and 13 as in Figure 1, but instead of wick element 9 an inclined notch 9A is provided in element 8 for similar purpose. This notch or groove 9A should be dimensioned to permit water level 6 to drop just slightly below water level 18 during operation, though at other times the two levels tend to even up. However, even when levels 6 and 18 become even, element 8 prevents level 6 from rising above level 18 and tends to obstruct re-circulation of heated water from compartment 13 back thru compartment 19 to container 1. In operation the modification of Figure 3 serves nearly as well as the preferred arrangement of Figure 1 but non-uniformity of production and operation tends to afford slight gradual warming up of the water supply in container 1 to approximately eighteen degrees F. above room temperature. If obstruction 8 were omitted this temperature rise in container 1 would increase to about 150 degrees F. which is wasteful and objectionable. As regards efficiency of operation, it is less desirable than the arrangement of Figure 1. Even in devices which drive unheated water particles into the air, vaporization nevertheless takes heat from the surrounding air as the latent heat of evaporation must be supplied.

As shown in Figure 4, element 3 may preferably comprise two pieces 23 and 23A held together by suitable fasteners 28 so that slots 28 permit flow of water into the housing 3 so formed. The top 23 at least should be perforated as indicated by numeral 30, and the bottom piece 23A may also be similarly perforated. The pieces 23 and 23A enclose the heater or electrodes 5, 6 of Figure 1 so that adjustment may be effected by screw 7 and its knob 24. This arrangement permits the electrodes to be rigidly squeezed in position inside of housing 3. The pieces 23 and 23A may be of glazed porcelain or "Bakelite" material. Vapor can escape thru perforations 30 as well as via slots 29.

In the diagram of Figure 5 the relationship of electrodes 4, 5 to water line 6 is shown. Adjustment of angle 54 is effected as hereinbefore set forth so that the electrodes 4, 5 are at the surface line or partly above line 6 as desired. Water tends to adhere to electrodes 4, 5 by its surface tension and some expanding in form of bubbles tends to climb along the electrodes upwards and become converted to vapor starting above water line 6. The electrodes 4, 5 may thus be operated horizontally or at an angle near the surface line 6.

A suitable arrangement of the top electrode 4 is shown in Figure 6. A multiplicity of spaced perforations 32A is provided in electrode 4 and tabs 32 are integral therewith to be held by the pieces 23, 23A of Figure 4. A similar electrode 5 is shown in Figure 7 and may or may not be perforated as desired. Its similar tabs 33, are bent so as to secure a spacing between electrodes 4 and 5 as set forth.

In Figure 8 the adjusting screw 7 is positioned further near an end of element 3. Tabs 32 and 33 do not protrude outside of casing 3. This is true for Figure 4 also, as the tabs are held but confined inside the outer portion of shell 3.

Figure 9 shows an enlarged view of the wick 9 clipped against obstruction 8 by spring metal clip 10. Clip 10 may be of spring brass or phosphor bronze. Any suitable absorbent material may be used for the element 9.

In Figure 10, electrode 4 is held horizontally and electrode 5 is movable at an angle with respect thereto and to water line 6. Means for accomplishing this are indicated in Figure 11. A fixed length screw 7A has a collar 7B and knob 24. 7A screws into nut 4A mounted on electrode 4 and fitted to slide with respect to electrode 4.

In the modification of Figure 12, water may be filled into container 1 from the top by removing air tight screw cap 31. When cap 31 is removed striker pin 42 is pulled up by spring 41 to close valve cap 37 against small orifice 36 at the bottom edge of container 1. This is accomplished via linkage 40, 39 and fulcrum mounting 38 so that orifice 36 is open when cap 31 is screwed down on container 1. With cap 31 removed, water can be poured into container 1. An air pipe 35 extends thru container 1, reaching near to its top end, and opening into compartment 19A to limit the water level in 19A supplied via small orifice 36. Obstruction 8B permits water to flow over its top from 19A into compartment 13A. Back flow of heated water is prevented and a constant level of supply water is maintained in compartment 13A to be vaporized by element 3 as hereinbefore set forth. Air tube 35 must be at least $\frac{1}{2}$ inch in diameter or like cross section to be reliable. Orifice 36 need not be over $\frac{1}{8}$ inch diameter. Water becomes air-

locked in container 1 and is released under control of the water level of compartment 19A. It is possible to arrange container 1 in such position that water will trickle down from orifice 36 along the exterior of tube 35 to just maintain the level of water in compartment 19A even with the end of tube 35.

A modification is shown in Figure 13 with the container 1 reversed, to be filled from the top and turned over to position shown with cap at bottom after turning. Container 1 and its cap 31A are supported on base 43. The weight of container 1 with its supply of water forces down striker 44 against spring 45 to operate arm 47 on link 46 and close contact 48 against contact 49. Upon exhaustion of water in container 1 the weight of container 1 and its cap 31A is insufficient to hold striker 44 down and spring 45 is arranged so that contacts 48 and 49 are opened in such case.

An electrical heater coil is mounted in housing 3C and connected in series with contacts 48, 49 and plug connector 5C. It operates when water surrounds casing 3C and contacts 48 and 49 are closed. Obstruction 8C between compartment 19C and compartment 13C permits water to pass from 19C to 13C via an orifice 50 in obstruction 8C. A perforated cover 23C mounts an adjusting knob 24C on screw 7C to raise or lower one end of casing 3C with its wire heater 51. This modification can be used on direct current supply to plug 5C as well as on A. C. supply. Since a quart of water weighs two pounds, the difference in weight of the water container when full and when empty affords reliable operation of the said automatic shut off means. The automatic shut off of the current is also certain in the preferred form of Figure 1 because as soon as there is no more water available to contact between electrodes 4 and 5, no more current can flow. This occurs promptly due to the stated positioning of the electrodes 4, 5 which requires a minimum amount of water for operation. In either case it is seen that the water itself by its own physical properties initiates the shut off operation. Water must be present for operation. Otherwise no current can flow thru the apparatus.

The invention thus provides a practical vaporator convenient and safe for use, steady and reliable in operation, adjustable to variable conditions of water supply and desired use, also efficient in operation.

I claim:

1. An electric humidifier comprising a water container, a combined filling and vapor emitting spout therefor based near the lower portion of said container, and heating means inclinably mounted in said spout.

2. In a humidifier, a fluid container closed except at a filling spout extending from its bottom portion, a fixed level compartment in said spout, and a second compartment arranged to hold water at a lower level with respect to said fixed level in said spout, means to feed a small amount of fluid from one compartment to the other, and means to vaporize the fluid in the lower level compartment.

3. In a humidifier, a closed water container having a combined filling and vapor omitting spout at its bottom portion, a vaporizing compartment in said spout, means to vaporize water therefrom, and means to prevent back flow of water from the spout into the container during said vaporization.

4. In a humidifier, a closed container having a spout opening, a water vaporizer located in said spout opening, means to feed water automatically from said container into said spout opening, and means to limit back flow of water from said spout opening into said container.

5. In a vaporizer, a combined container and vapor emitting spout comprising a unitary structure, means to lock water in said container, automatic means to feed water from said container into said spout, means to vaporize water from a portion of said spout, and means to limit reverse circulation of water from said spout into said container.

6. In a vaporizer, a container for an air-locked supply of water, a vaporizing compartment, automatic means to release a small amount of water from said container into said compartment to maintain an approximately constant water level therein, electrodes in said compartment mounted approximately adjacent to said water level, and means to adjust the relation of said electrodes to said water level whereby water may be evaporated in part below said water level and in part above said water level.

7. In a vaporizer, a unitary air-locked water container and spout opening therefor, means to release water into said spout at a substantially constant water level, electrodes mounted in said spout in adjustable relation to said water level whereby vaporization may start above said water line, and means to move at least one of said electrodes so that it is located in part above said water level.

8. In a vaporizer, an air-locked water container, a water feed opening therefor, an automatic air release tube extending upwards in said container, a small substantially constant water level compartment co-acting with said air release tube to receive water from said opening, electrodes in said compartment, means to adjust said electrodes whereby evaporation is effected substantially near said water level commencing approximately at the surface of said water, and means for re-filling water into said container.

9. A vaporizer comprising a water supply container, a vaporizing compartment based at said container, automatic means to feed water from said container into said compartment at ap-

proximately a constant water level, substantially horizontally mounted water heating means in said compartment, an adjuster to incline said water heating means at an angle with respect to said water level to vary the rate of vaporizing from said compartment, and means to automatically shut off said water heating means when the water supply in said container is exhausted.

10. A humidifier comprising a water supply container having an outlet therefrom, a water receiver based at a lower level to receive water therefrom, means to limit the water level in said water receiver below said outlet, electrodes at and adjustable with respect to the surface of said water level in said water receiver, and a perforated insulating housing for said electrodes fitted into said water receiver.

11. A humidifier comprising an electrical water heater, a perforated housing therefor, means to surround a part of said housing with a substantially constant level water supply, means to move said heater angularly with respect to said constant level water supply, means to shut off said water heater when said water supply becomes exhausted, and means to suppress bubble sound emission during vaporization of said water.

12. A humidifier comprising an automatic water feeding container, a smaller container based to receive a constant water level supply therefrom, electrodes positioned at the surface of the water in said smaller container, means to move part of at least one of said electrodes above said water level, and means to suppress bubble noise when electricity is supplied to said electrode.

13. An electric humidifier comprising a container, a cooperating water compartment connecting therewith to receive water therefrom, a fixed obstruction element intermediate said container and said compartment to prevent back-flow of heated water from said compartment into said container, and adjustable vaporizing means positioned in said compartment partly below and partly above the water level in said compartment to vaporize part of said water above said water level.

PHILIP E. EDELMAN.