

Oct. 1, 1963

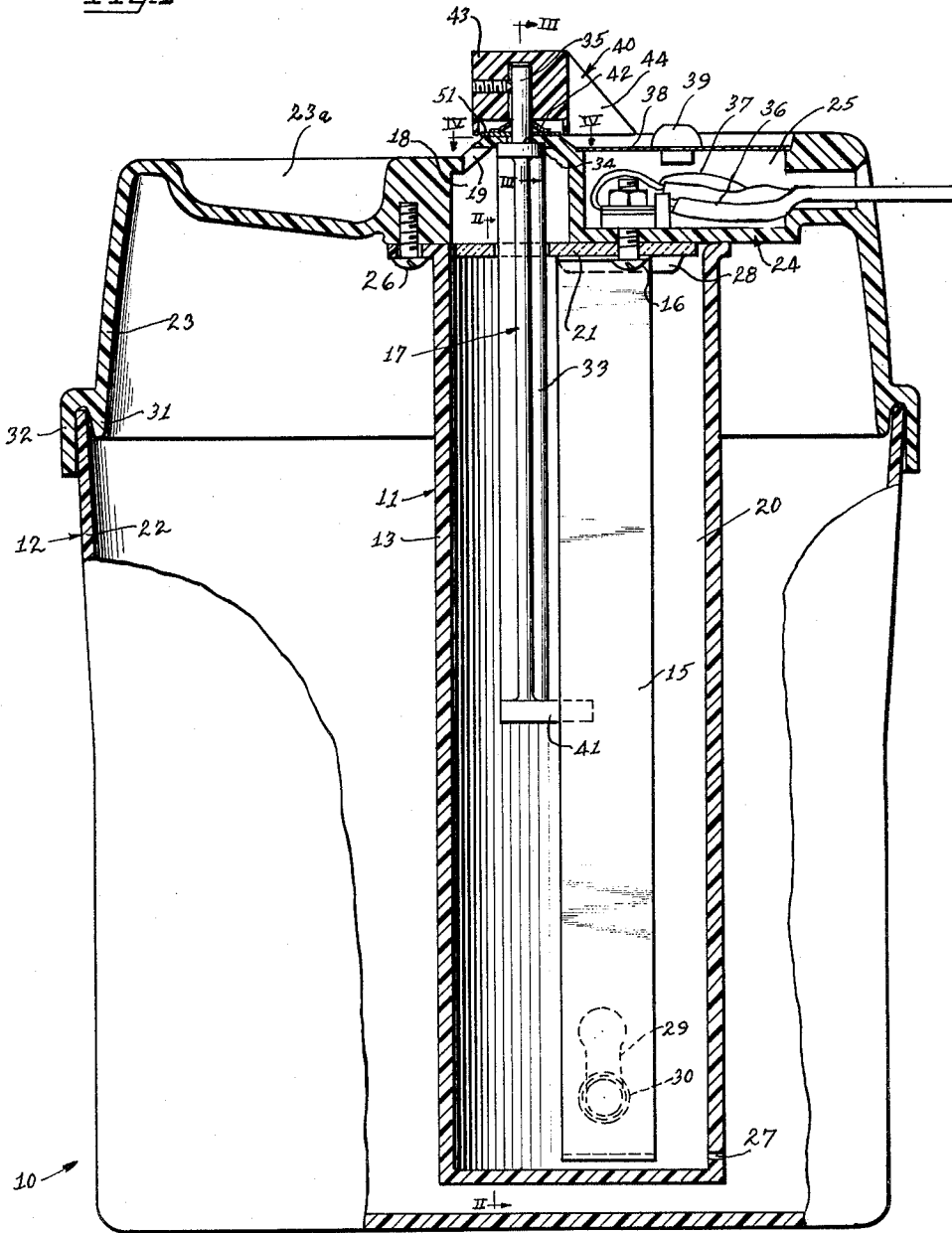
R. E. MATZ ET AL
VARIABLE SPEED VAPORIZER

3,105,894

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Fig. 1



Inventors
Richard E. Matz
Ronald W. Scheck

Hill, Sherman, Meroni, Gross & Simpson Attys.

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Fig. 2

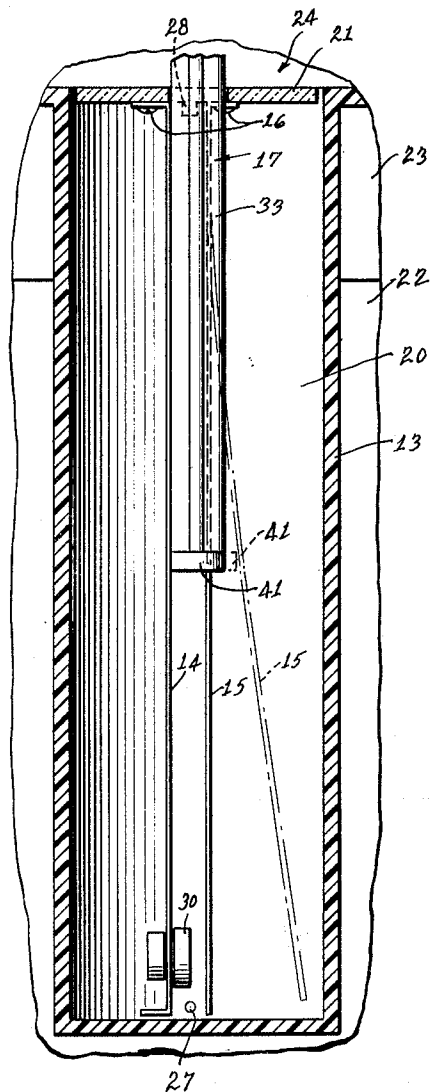


Fig. 3

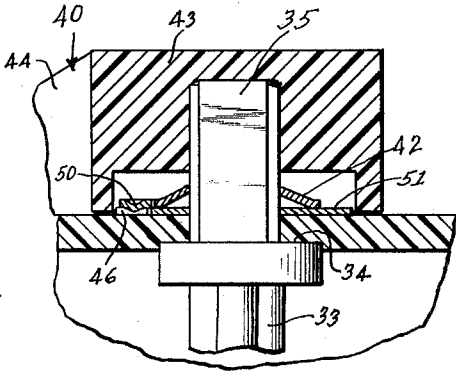
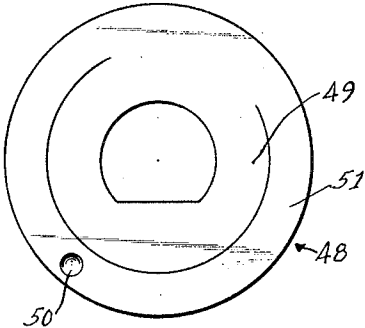


Fig. 5



Inventors
Richard E. Matz
Ronald W. Scheck

Hill, Sherman, Meroni, Lindenberg Attys.

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Fig. 4

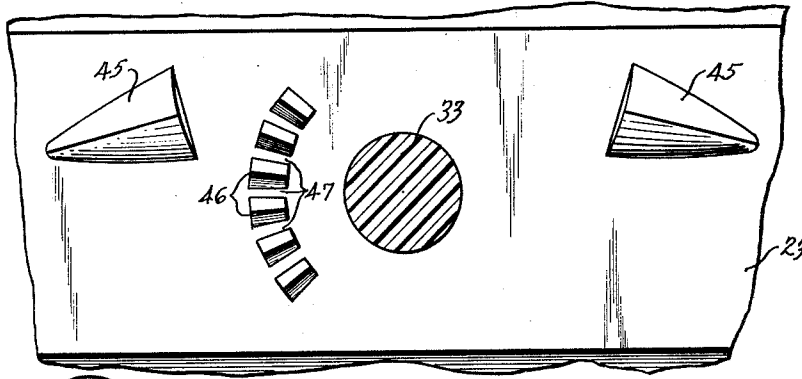


Fig. 6

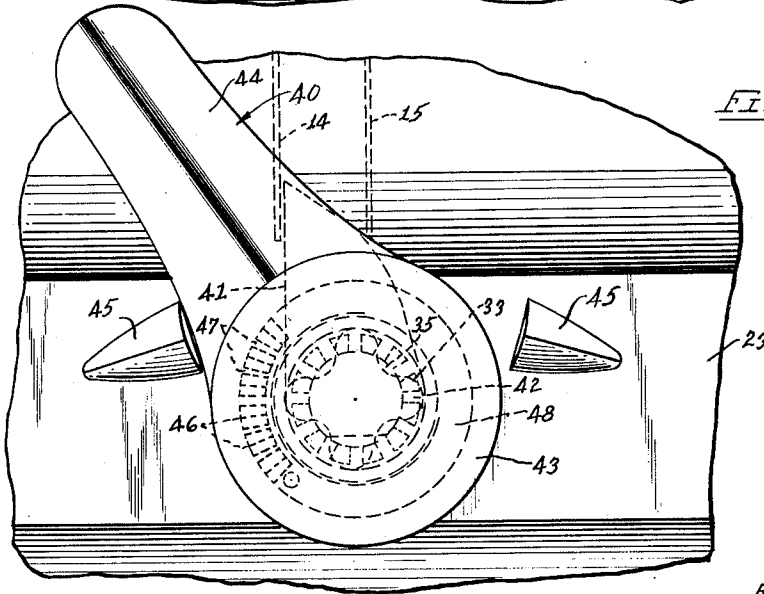
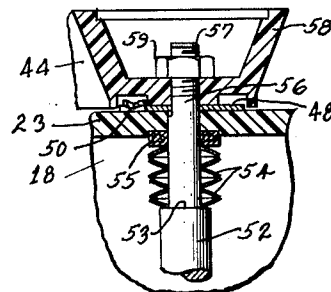
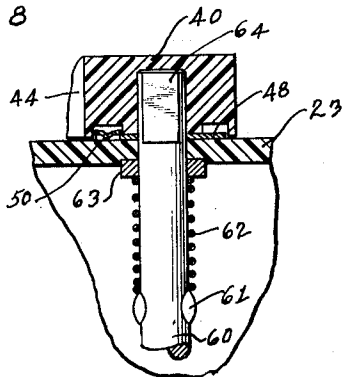


Fig. 7

Fig. 8



Inventors
Richard E. Matz
Ronald W. Scheck

by Tell, Sherman, Meroni, Graw & Simpson Attys.

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3,105,894

VARIABLE SPEED VAPORIZER

Richard E. Matz, Chicago, and Ronald W. Scheck, Arlington Heights, Ill., assignors to Northern Electric Company, Chicago, Ill., a corporation of Delaware
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11 Claims. (Cl. 219-40)

This invention relates generally to electric vaporizers, and more specifically to a vaporizer structure which is adapted to be operated at a selectable rate of water evaporation.

Although the principles of the present invention may be included in various vaporizers or humidifiers, a particularly useful application is made in vaporizers of the type which discharge water vapor across a quantity of medicant. It is frequently desired to operate such a device at a selectable rate. Variations occur in the conductivity of the water to be evaporated, and also in the applied voltage, thereby varying the rate of water evaporation. Further, the user also frequently desires to alter the rate of water evaporation even if the enumerated variables were constant. This latter factor is largely a matter of personal preference, and therefore it is highly desirable that a vaporizer be adjustable so as to allow for the various factors which contribute to the ultimate speed of water evaporation.

One structure which has been suggested includes a pair of parallel electrodes, the spacing between which is altered by pivoting at least one of the electrodes about an offset axis, the parallel relationship being maintained during such pivoting. Such a structure has proved to be unreliable in several respects. If flexible internal wiring is employed, special precautions must be taken to prevent wearing away of insulation and possible short circuiting. If a slip ring is employed, there is a likelihood that the contact resistance will increase with usage, particularly in view of the fact that the ambient atmosphere is corrosive. Further, it has been found that when the conductivity of the water in the vaporizer is low, the movable electrode can be positioned such a distance from the other electrode that steam will not be generated.

In accordance with the principles of the instant invention, a structure is provided by which a fixed electrode is deflected by bending, thereby eliminating the need for flexible wiring, or for a slip ring. Further, since an operative gap is always maintained between the electrodes, the likelihood of the movable electrode being positioned to an inoperative position is minimized.

Accordingly, it is an object of the present invention to provide an improved electrical vaporizer.

A further object of the present invention is to provide a variable speed electrical vaporizer which is reliable for a wide range of operating conditions, and which is reliable for a long period of time.

Yet another object of the present invention is to provide a vaporizer structure which cannot be misassembled during field service, thereby insuring that the full range of adjustability will not be inadvertently lost.

A still further object of the present invention is to provide a variable speed vaporizer which may be efficiently adjusted in the dark.

Yet another object of the present invention is to provide a vaporizer structure of the type described which will continue to operate, and operate in a safe manner, even if the adjusting means should inadvertently become disassociated from the parts of the vaporizer with which they normally cooperate.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the de-

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tailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

On the drawings:

FIGURE 1 is a side view of a vaporizer equipped with an adjustable vaporizer unit provided in accordance with the principles of the present invention, the view being broken away and shown partly in cross-section;

FIGURE 2 is an enlarged cross-sectional view of a portion of the structure shown in FIGURE 1, and taken along line II-II thereof;

FIGURE 3 is an enlarged sectional view taken along line III-III of FIGURE 1;

FIGURE 4 is an enlarged fragmentary view of a portion of the top of the vaporizer, taken along line IV-IV of FIGURE 1;

FIGURE 5 is an enlarged plan view of a detailed part employed in a preferred embodiment, such as illustrated in FIGURE 1;

FIGURE 6 is an enlarged fragmentary top view of the structure shown in FIGURE 1;

FIGURE 7 is an enlarged fragmentary cross-sectional view of a modified form of adjustment means for the structure shown in FIGURE 1; and

FIGURE 8 is an enlarged fragmentary cross-sectional view of a still further modified form of adjustment means for the structure shown in FIGURE 1.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in an electrical vaporizer such as illustrated in FIGURE 1, generally indicated by the numeral 10. In the vaporizer 10, there is an electrical vaporizer unit 11 disposed within a casing 12 supporting a casing extension 13 within which there is disposed a pair of electrodes 14, 15. The electrodes 14, 15 are secured to the casing 12 by supporting means 16 disposed at one end thereof, the effective spacing between the electrodes 14, 15 being adjustable by means of an adjustment mechanism indicated generally at 17 which acts on one of the electrodes remotely from the supported end thereof.

The casing 12 includes a receptacle 22 having an opening at its upper end on which a lid 23 is supported. In this embodiment, both the receptacle 22 and the lid 23 comprise plastic. The lid 23 preferably comprises plastic of the thermosetting variety and hence is inherently rigid, while the receptacle 22 preferably comprises polypropylene or other nearly rigid or slightly flexible plastic.

The lid 23 of the casing 12 is formed to define a water vapor discharge chamber 18 having a water vapor outlet 19 which is preferably directed to discharge water vapor over a medicant supported in a medicant cavity 23a.

The casing extension 13 is elongated, hollow, and generally vertically directed to define a heating chamber 20 within which the electrodes 14, 15 are disposed. A baffle 21 is supported by the means 16 and is disposed to nearly wholly isolate the discharge chamber 18 from the heating chamber 20, which otherwise would be in direct communication with each other.

A portion 24 of the upper wall of the casing lid 23 is shaped to define a terminal cavity 25 within which the electrical wiring connections are made, the means 16 isolating the same from the interior of the casing. The portion 24 of the wall which defines the terminal cavity 25 also cooperates to define part of the discharge chamber 18, and to provide a support surface on its lower side for the casing extension 13, for the baffle 21, and for the electrodes 14, 15.

The casing extension 13 is thus secured to the wall 24 such as by a group of screws 26 which holds the cas-

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ing extension 13 beneath and adjacent to the water vapor discharge chamber 18. At its opposite end, the casing extension 13 is provided with a water inlet opening 27.

As best seen in FIGURE 2, the electrodes 14, 15 are each vertically directed elongated conductors which are supported at the upper end, the electrodes 14, 15 being disposed within the heating chamber 20. In this embodiment, the baffle 21 is disposed intermediate angularly directed upper ends of the electrodes 14, 15 and the support surface 24, the baffle 21 here comprising porcelain. Thus the electrodes are supported in insulated spaced relation to each other. Preferably the baffle 21 has a downwardly extending rib 28 disposed intermediate the electrodes which serves to increase the electrical creepage distance between the electrodes. In accordance with this invention, at least one of the electrodes is movable at its free or opposite end toward and away from the other electrode. In this embodiment, this concept is effected by providing at least one of the electrodes 14, 15 of resilient material. The electrodes thus have a first position, such as shown in solid lines in FIGURE 2, which position corresponds to one limit of adjustment. As the one electrode is moved away from the other, it is apparent that the moved electrode is biased toward the other. If desired, such bias may be present at all times. The electrodes 14, 15 are precluded from direct engagement with each other by means of an insulative spacer 30 received in an aperture 29 and extending therebetween. It is apparent that if for any reason the adjusting mechanism 17 should fall out of position, the insulative spacer 30 would preclude a direct short circuit between the electrodes 14, 15.

As best seen in FIGURE 1, the supporting means 16 comprise a conductive screw which is in electrical contact with the upper end of one of the electrodes 14, 15. A leadwire 36 is also secured to the means 16 and is adapted to be connected to a source of current, there being a conductor for each of the screws. If desired, a small light bulb 37 may also be connected electrically across the electrodes 14, 15 at the supporting means 16, which light will glow whenever the device is energized. The terminal recess 25 is closed by a cover 38 which has a transparent colored jewel 39 through which light from the bulb 37 will pass.

When water has been filled into the receptacle 22 to a level below the top thereof, it will have flowed through the inlet 27 to a corresponding level within the casing extension 13. When a potential is applied to the electrodes 14, 15, current will flow from the one electrode to the other and will heat the water therebetween which will rise in the form of a convection current, cooler water from within the casing extension 13 taking its place to become heated. Eventually this produces steam or water vapor which flows from the heating chamber 20 into the discharge chamber 18 and out the outlet 19.

When a high rate of water evaporation is present, the baffle 21 is operative to deflect droplets moving from the electrodes 14, 15 toward the outlet 19. To this end, the baffle 21 nearly closes off the upper end of the heating chamber 20 with respect to the discharge chamber 18. The baffle 21 is adapted to pass the water vapor to the chamber 18 at peripheral portions which are out of alignment with respect to any direct line from the opening 19 to a point between the electrodes.

The lid 23 includes a pair of concentric lips 31, 32, each of which extends downwardly along one side of the upper end of the receptacle 22. The inner lip 31 serves as a seal in that it directs any drops of water back into the receptacle 22. The outer lip 32 is preferably also continuous and serves to confine and to rigidify the upper end of the slightly flexible receptacle 22.

To alter the rate of water evaporation, the adjustment mechanism 17 is positioned to achieve the desired rate. The mechanism 17 includes a shaft 33 which has an axially directed shoulder 34 integral therewith and engaging

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the lower surface of the lid 23 within the chamber 18. The shaft 33 has an upper extension 35 which extends through the casing within the chamber 18 remotely from the electrical cavity 25. A knob 40 is secured thereto for manual rotation thereof. At its opposite end, the shaft 33 is provided with a radial projection, radially projecting means, or cam 41 of insulative material which, in this embodiment, extends between the electrodes 14, 15. The shaft 33 preferably comprises plastic, such as a phenolic, since it is immersed in water at a potential of about one-half that of the line potential. Thus if the shaft 33 were made of metal and provided with a plastic cam 41, the portion 35 projecting from the casing 12 would be at a potential above ground. It is therefore clear that use of plastic is preferable.

Between the knob 40 and the shoulder 34, means are provided for producing a substantial amount of friction between the shaft 33 and the casing 12, such friction serving to hold the shaft in a selected position against the returning force of the deflected electrode. To this end, a spring 42 is provided which acts axially on the shaft 33 to bias the shoulder 34 against the lower surface of the lid 23. Thus the spring 42 is disposed externally of the casing 12 and also acts to preclude passage of water vapor through the opening through which the portion 35 projects.

In order that the user be provided with some reference as to the relative electrode spacing, the knob 40 preferably includes a hub portion 43 and a finger portion 44 which projects radially from the rotational axis of the hub portion 43. Stop means 45, 45 are provided on the casing at the upper surface thereof, and comprise integral stops or abutments against which the finger or stop portion 44 of the knob 40 may engage.

In order to provide intermediate reference points, as best seen in FIGURE 4, the upper surface of the casing lid 23 is provided with a series of nodes or projections 46 which define a series of notches 47 therebetween. The nodes and notches 46, 47 are arranged in an arc about the axis of the shaft 33. To cooperate therewith, there is provided a resilient member 48 shown in FIGURE 5. The member 48 has a central portion 49 which is clamped by the spring 42 directly against the upper surface of the casing lid 23. The portion 49 is generally annular and has a D-shaped opening for insuring proper registration with the shaft 33, the portion 35 of which has a similar cross-sectional configuration. A node or projection 50 is carried by a resilient peripheral portion of generally semi-annular extent, identified by the reference numeral 51. Thus the node 50 is yieldably supported by the resilient member for cooperation with the nodes and notches on the casing. Thus as the knob 40 is rotated, the node 50 registers successively with various notches 47 to define intermediate shaft positions. It is to be noted that the hub portion of the knob obscures the resilient member 48 as well as the various notches and nodes 46, 47 on the casing lid 23 from view.

Referring to FIGURE 7, there is shown a modified form of means by which friction is produced between the shaft and casing to hold the shaft. In this form, a shaft 52 is provided with an upwardly directed shoulder 53 on which is seated a plurality of Belleville springs 54 surmounted by a frictional washer 55 which engages the lower face of the casing lid 23. The upper end of the shaft 52 is indicated by the numeral 56 and is rotatably supported by the lid. The upper end 56 has an eccentric threaded portion 57 which extends through a knob 58 and is secured thereto by a nut 59, whereby the knob 58 is oriented angularly with respect to the cam or radial projection at the lower end of the shaft, such as shown in FIGURE 1. The nut 59 is tightened at assembly until the desired degree of squeeze occurs between the knob 58 and the washer 55 on the cover or lid 23, which squeeze is maintained by the resiliency of the springs 54. It is to be understood that the structure shown in

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FIGURES 5 and 4 as well as the knob stop or finger portion 44 forms a part of this modification.

Referring now to FIGURE 8, there is shown a still further means for producing friction between the shaft and casing. In this figure, a shaft 60 is adapted as at 61 to receive the axial thrust of a spring 62 which also acts on the casing lid 23 through a washer 63 to provide a frictional drag between the shaft and the casing. The upper end of the shaft 60 is rotatably supported by the lid 23, and projects upwardly therethrough as at 64 to receive the knob 40. It is to be understood that the structure shown in FIGURES 4 and 5 forms a part of this embodiment.

In the form shown in FIGURES 7 and 8, each of the washers 55 and 63 defines an axially directed shoulder which engages the lid 23 within the chamber 18. Further, the springs 54 and 62 act axially on the shaft and bias the corresponding shoulder against the casing, not only to hold the shaft angularly, but to minimize or eliminate the escape of vapor about the shaft.

Although various minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

1. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for bending movement in water toward and away from the other electrode; and a rotatably supported axially-fixed shaft extending generally parallel to said electrodes and having a radial cam projection operative to bend said one electrode in response to rotation of said shaft.

2. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for bending movement in water toward and away from the other electrode; and a shaft extending generally parallel to said electrodes and rotatably supported in an axially fixed position by said casing, and having radially projecting cam means abutable against said one electrode remotely from said one end for bending said one electrode in response to rotation of said shaft.

3. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being resilient for bending deflection at the unsupported end toward and away from the other electrode, and for assuming a first submerged position in water defining one limit of adjustment; a manually rotatable shaft extending generally parallel to

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said electrodes and rotatably supported in axially fixed position by said casing, said shaft having radially projecting cam means engageable with said one electrode remotely from said one end for bending the unsupported end of said one electrode away from said first position by a selectable amount to a second submerged position in water; and friction producing means acting between said axially fixed shaft and said casing and urging said shaft axially, and operative to hold said shaft at every angular position.

4. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into the water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being resilient for bending deflection in water toward and away from the other electrode, and being biased of its own resilience toward said other electrode; a manually rotatable shaft extending generally parallel to said electrodes and rotatably supported in axially fixed position by said casing, said shaft having radially projecting means of insulative material extending between said electrodes and engageable with said one electrode remotely from said one end for bending the other end of said one electrode away from said other electrode by a selectable amount; and friction producing means acting between said axially fixed shaft and said casing, and operative to hold said shaft at every angular position.

5. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each secured at one end to said casing in electrically insulated and spaced relation to each other, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being resilient for deflection toward and away from the other electrode, and being biased of its own resilience toward said other electrode; a manually rotatable shaft supported by said casing, said shaft having radially projecting means of insulative material extending between said electrodes and engageable with said one electrode remotely from said one end for deflecting the other end of said one electrode away from said other electrode by a selectable amount; an insulative spacer carried by one of said electrodes remotely from said one end thereof and extending between said electrodes for insuring a minimum spacing therebetween; and friction producing means acting between said shaft and said casing, and operative to hold said shaft in a selected position.

6. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet, and having means defining a cavity for receiving all electrical wiring connections; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized; means for connecting said one end of each of said electrodes to electrical wiring to effect a current flow therebetween through water to be vaporized, said means extending into said cavity; at least one of said electrodes being deflectable remotely from said one end for bending movement in water toward and away from the other electrode; and a manually rotatable shaft extending generally parallel to said electrodes, said shaft being rotatably supported in axially fixed position by said casing and extending through remotely from said cavity, said shaft having radially projecting cam means engageable with said one

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electrode remotely from said one end for bending said one electrode in response to rotation of said shaft.

7. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each secured at one end to said casing in electrically insulated and spaced relation to each other, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for movement toward and away from the other electrode; a rotatably supported shaft extending generally parallel to said electrodes and having a radial projection operative to deflect said one electrode in response to rotation of said shaft, said shaft extending through said casing for manual access and having an axially directed shoulder operatively associated therewith in engagement with said casing; and spring means acting axially on said shaft, and biasing said shoulder axially against said casing to prevent escape of water vapor about said shaft and to hold said shaft in a selected angular position.

8. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each secured at one end to said casing in electrically insulated and spaced relation to each other, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for movement toward and away from the other electrode; a rotatably supported shaft extending generally parallel to said electrodes and having a radial projection operative to deflect said one electrode in response to rotation of said shaft, said shaft extending through said casing for manual access and having an axially directed shoulder integral therewith in engagement with the interior of said casing; and spring means carried by said shaft externally of said casing, and acting between said shaft and said casing, and biasing said shoulder axially against said casing to prevent escape of water vapor about said shaft and to hold said shaft in a selected angular position.

9. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for bending movement in water toward and away from the other electrodes; a rotatably supported axially fixed shaft extending generally parallel to said electrodes and having a radial cam projection operative to bend said one electrode in response to rotation of said shaft, said shaft extending through said casing for manual access; a knob carried on said axially fixed shaft and having a stop portion radially offset from the axis of said knob; and stop means on said casing and engageable by said stop portion for limiting the possible angular movement of said shaft.

10. A structure for an electric vaporizer comprising

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in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each fixedly secured at one end to said casing in electrically insulated and spaced relation to each other and supported to extend substantially coextensively into water to be vaporized, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for bending movement in water toward and away from the other electrode; a rotatably supported axially fixed shaft extending generally parallel to said electrodes and having a radial cam projection operative to bend said one electrode in response to rotation of said shaft, said shaft extending through said casing for manual access; a knob carried on said axially fixed shaft and having a finger portion extending radially therefrom; and means integral with said casing defining abutment stops, said finger portion being engageable with said stops to define the limits of possible angular adjustment of said shaft.

11. A structure for an electric vaporizer comprising in combination: a casing having a water vapor outlet; a pair of generally vertically disposed elongated electrodes each secured at one end to said casing in electrically insulated and spaced relation to each other, said electrodes being adapted at said one end to be connected to a source of current for effecting a current flow therebetween through water to be vaporized, at least one of said electrodes being deflectable remotely from said one end for movement in water toward and away from the other electrode; a rotatably supported shaft extending generally parallel to said electrodes and having a radial projection operative to deflect said one electrode in response to rotation of said shaft, said shaft extending through said casing for manual access and having an axially directed shoulder integral therewith in engagement with the interior of said casing; spring means carried by said shaft externally of said casing and acting between said shaft and said casing, and biasing said shoulder axially against said casing to prevent the escape of water vapor about said shaft and to hold said shaft in a selected angular position; a knob carried on said shaft and having a finger portion extending radially therefrom; and means integral with said casing defining abutment stops, said finger portion being engageable with said stops to define the limits of possible angular adjustment of said shaft.

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