Sept. 7, 1954 A. B. JOHNSON 2,688,686

VAPORIZER

Filed Nov. 5, 1951 2 Sheets-Sheet 1

Fig. 1.

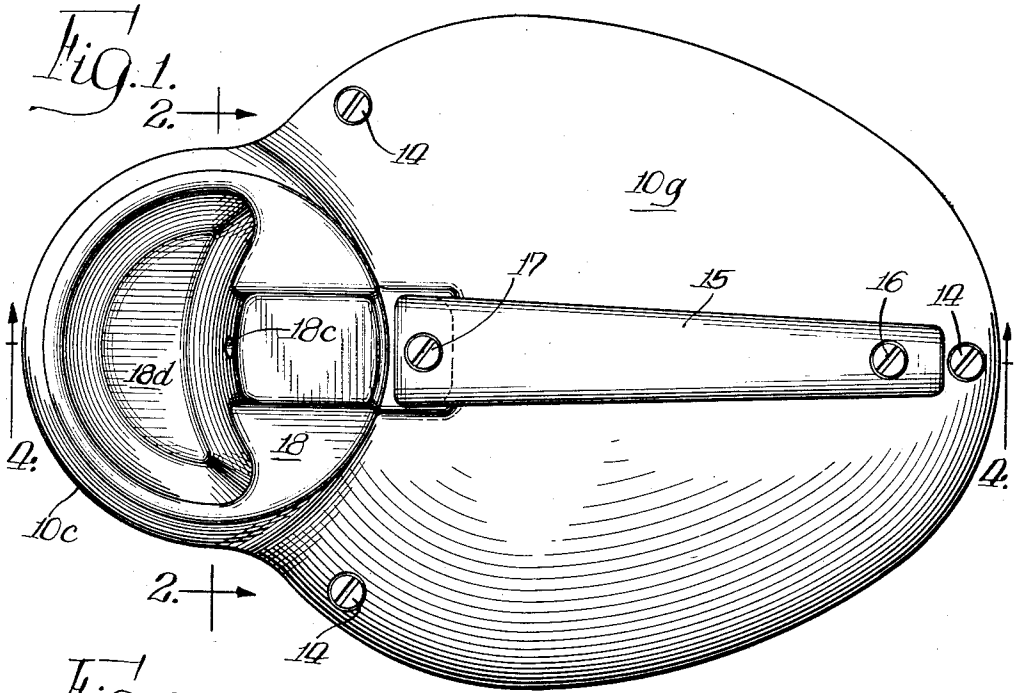


Fig. 2.

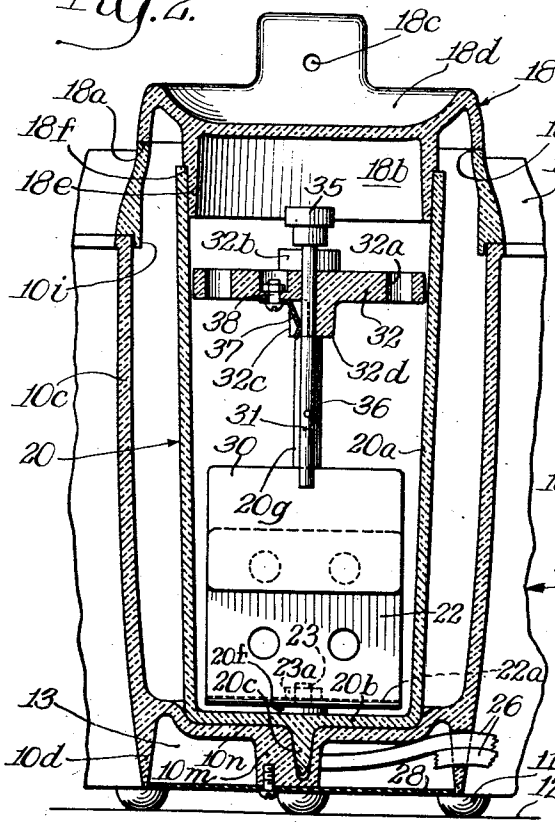
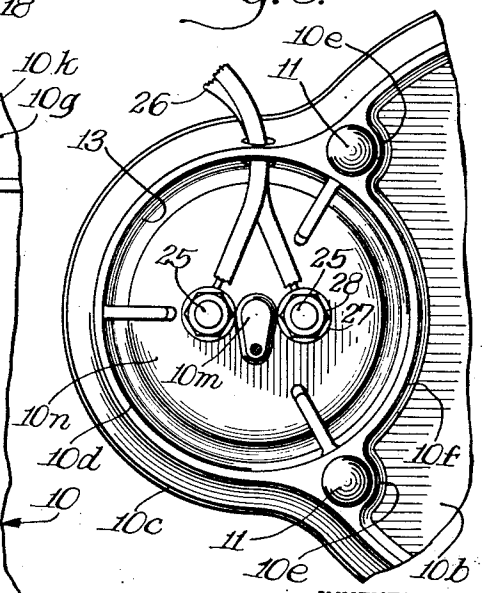


Fig. 3.



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Filed Nov. 5, 1951 2 Sheets-Sheet 2

Fig. 4.

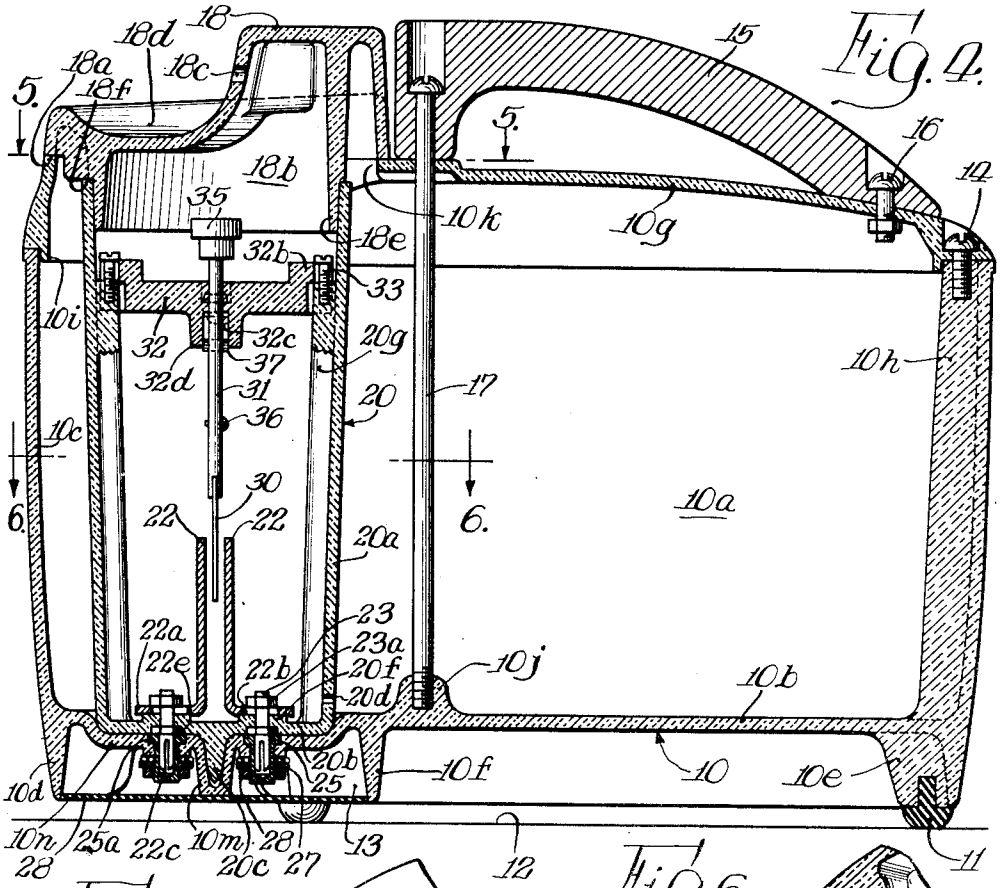


Fig. 5.

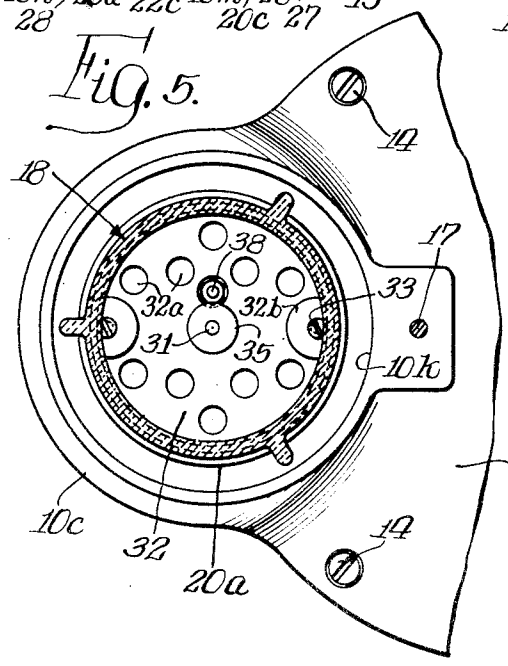
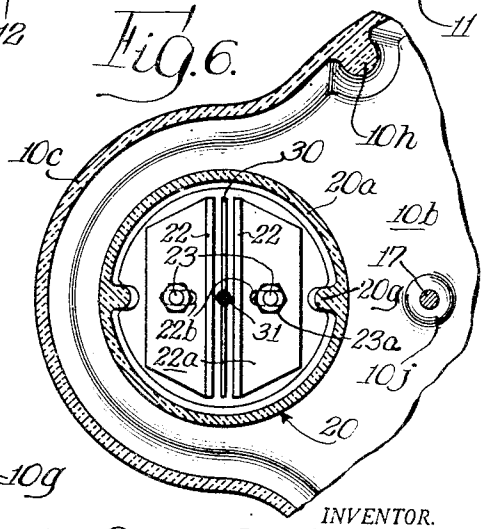


Fig. 6.



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2,688,686

UNITED STATES PATENT OFFICE

2,688,686

VAPORIZER

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11 Claims. (Cl. 219—40)

1

This invention relates to improvements in vaporizers of the type in which a quantity of water or other liquid is progressively heated and vaporized, preferably by electrical means. The heating of the liquid may preferably be effected by the passage of an electric current through the liquid between spaced electrodes, thus giving the device a definite time period of operation determined by the quantity of liquid contained therein.

In United States Letters Patent No. 2,533,794, granted December 12, 1950, on an application of Marshall W. Hanks and Arne B. Johnson, there is disclosed a vaporizer of the type to which the present invention may relate, wherein a large quantity of liquid is stored in a vessel and successive portions are progressively segregated and heated in a separate chamber, thereby giving the advantages of a quick production of steam at starting and a continued supply over a long period of time.

One object of the present invention is to provide a vaporizer having means for varying the rate of vaporization during the operation of the device. A further object is to provide a vaporizer of the liquid conductor heater type wherein a liquid is vaporized by the passage of current therethrough between spaced electrodes, in which means are provided for effecting a regulation of the effective resistance between the electrodes and thereby changing the rate of vaporization of the liquid. Still another object of the invention is to provide a vaporizer comprising a vessel for containing a liquid and a separate container removably located in said vessel and having mounted therein spaced electrodes for vaporizing portions of said liquid which have access to said container from said vessel. A further object of the invention is to provide a vessel for containing a body of liquid to be vaporized in combination with a removable container adapted to receive liquid from said vessel and having mounted therein spaced electrodes provided with means whereby they are connected in an electric circuit by the operation of inserting the container in said vessel. Another object of the invention is to provide a vaporizer comprising a vessel having mounted therein spaced electrodes connected in an electric circuit and adapted to heat the liquid in said vessel by the passage of current therethrough between said electrodes in combination with a metal member adapted to extend between said electrodes in spaced relation thereto and capable of adjustment to vary the extent of the liquid filled gaps through which the current passes between the electrodes. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

2

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment is illustrated. In the drawings,

Figure 1 shows a top plan view of a vaporizer embodying the present invention;

Fig. 2 shows a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 shows a bottom plan view of the portion of the structure which is illustrated in Fig. 2;

Fig. 4 shows a vertical section taken on the line 4—4 of Fig. 1;

Fig. 5 shows a horizontal section taken on the line 5—5 of Fig. 4; and

Fig. 6 shows a horizontal section taken on the line 6—6 of Fig. 4.

As illustrated in the drawings, the invention comprises a vessel 10, formed of porcelain, plastic, or other heat-insulating and electrical-insulating material, which is adapted to contain a quantity of water or other liquid to be vaporized. This vessel has an annular upright wall 10*a* which has a general egg-shaped form and which is integrally united with a horizontal bottom wall 10*b*. The wall 10*a* has a semi-circular projection 10*c* at one end and the walls 10*a* and 10*c* terminate in a continuous downwardly extending flange 10*d* which forms a cavity beneath the bottom wall 10*b*. The flange 10*d* is enlarged at intervals to form bosses 10*e* in which are secured the rubber plugs 11 adapted to rest upon a table 12 or other support. Another downwardly extending flange 10*f* is formed integrally with the bottom wall 10*b* and provides a continuation of a part of the flange 10*d*, thus forming a circular recess 13 at the end of the vessel where the projecting wall 10*c* is located.

The vessel 10 also comprises a top wall 10*g*, formed of porcelain, plastic, or other insulating material of which the body of the vessel is formed, and this top wall is secured in place by means of screws 14 which engage threaded apertures in the upper ends of enlarged ribs 10*h* formed on the inside of the wall 10*a*. The top wall 10*g* fits over the top edges of the walls 10*a* and 10*c* and has a downwardly extending flange 10*i* fitting on the insides of these outer walls. The top wall 10*g* is provided with a handle 15 which is secured thereto by a bolt 16 and by a long stud 17 having its lower threaded extremity engaging a boss 10*j* formed on the upper side of the bottom wall 10*b*. The top wall 10*g* is also provided at one end there-

of with a circular opening 10k which is concentric with the curved wall 10c and which provides an opening through which the water or other liquid may be introduced into the vessel.

The opening 10k is normally closed by a removable cover 18 also formed of porcelain or the like, which has an annular shoulder 18a adapted to seat upon the top wall 10g around the margin of the opening. This cover is hollow and has an internal chamber 18b adapted to receive the steam which is produced by the vaporization of the liquid and this steam is discharged through an opening 18c extending horizontally through a wall of the cover so that the steam is directed over a hollow cavity 18d adapted to contain a medicament to be vaporized by the action of the steam.

The vessel 10 is adapted to contain a relatively large quantity of water or other liquid, for example, a gallon or more, and in order that a portion of this liquid may be quickly vaporized when the apparatus is started in operation, a separate relatively small vaporizing container 20 is provided. This container 20 has a general cup-shaped form with an annular wall 20a and a bottom wall 20b. The wall 20a has a slight flare in an upward direction and its upper open end is closely fitted by a depending flange 18e formed on the cover 18. The bottom end of the container 20 rests within a cavity formed by a depressed portion 10n of the bottom wall of the vessel 10 and the container is adapted to be centered in this depression by means of an integral pin 20c which projects downwardly from the center of the bottom wall 20b and fits into a recess formed in the hollow downwardly projecting boss 10m formed as a part of the depressed wall portion 10n. When the container 20 has been placed in position in the depression at the bottom of the vessel with the tapered pin 20c engaging the recess or cavity in the boss 10m, the cover 18 may be placed over the opening 10k in the top wall of the vessel with the depending flange 18e thereof fitting into the upper end of the annular wall 20a and with the annular shoulder 18f of the cover extending over the top edge of the wall 20a.

The container 20 is formed preferably of porcelain, Bakelite or other nonconducting heat-insulating material and it is provided near its bottom with a relatively small aperture 20d through which the water or other liquid in the vessel 10 flows into the internal chamber of the container to be vaporized. This vaporization is effected by the passage of an electric current between two spaced electrodes 22 which are in the form of flat plates arranged parallel to each other in vertical planes. These electrodes are provided at their lower ends with transversely extending flanges 22a which seat upon projections 20f formed on the bottom wall 20b of the container and which are secured in place by the terminal posts 23. Each terminal post passes through an aperture of the bottom wall 20b and engages a slot 22b formed in the associated electrode. It is clamped in position against the projection 20f by a nut 23a engaging the upper threaded extremity thereof. These terminal posts are also provided with hexagonal portions 22e located in cavities of corresponding shape formed in the underside of the wall 20b and they are provided with lower split extremities 22c which form the terminals by which connections are made to an electric circuit. By releasing the nuts 23a the terminal posts 23 may be adjusted with respect to the slots 22b to secure the desired spaced relation of the upwardly extending parallel plates of the electrodes 22.

The lower split extremities 22c of the terminal posts are somewhat resilient and are adapted to fit tightly into cup-shaped socket members 25 which are secured in apertures formed in the portion 10n of the bottom wall of the vessel 10 and which are provided at their upper ends with enlarged outwardly extending flanges 25a. These socket members 25 are externally threaded and are connected to the bare ends of flexible insulated conductors 26 leading from a source of supply of electric current, such as the ordinary 110-volt household circuit. The bare ends of these wires are looped around the portions of the socket members 25 which extend beneath the bottom wall of the vessel and these portions of the conductors are then clamped in place by washers 27 and nuts 28 which engage the lower threaded ends of the socket members. The supply conductors 26 lead to the cavity 13 through an aperture formed in the flange 10d, as shown in Fig. 3. With the foregoing arrangement, the socket members 25 are connected in the electric circuit by means of the conductors 26 and their cavities are open to the interior of the vessel 10 so that, when the container 20 is lowered to its operating position with the guide pin 20c engaging the cavity in the boss 10m, the container may be rotated until the split extremities 22c of the terminal posts are in alignment with the socket members 25, whereupon the container 20 may be thrust downwardly to cause the terminal posts to engage the socket members and thus complete the connection with the electric circuit. The cavity 13 in which the connections with the conductors 26 are made is normally closed by a plate 28 of fibreboard or the like, which is attached by a screw to a boss formed on the bottom wall 10n.

When the container 20 has been inserted in the vessel 10 with the terminal posts 23 engaging the socket members 25, the liquid in the vessel 10 will enter the container 20 through the aperture 20d and thus establish a connection between the spaced electrodes 22 so that, if the conductors 26 are then connected in a circuit, current will flow between the electrodes 22 and thereby heat and vaporize the water in the space between them. The cover 18 being than in place upon the upper end of the container 20, the steam or vapor rising from the contents of the container 20 will pass upwardly and discharge through the opening 18c. The vaporizer may be used with or without a medicament but if a medicament is placed in the cavity 18d, it will be vaporized by the passage of the steam thereover so that a mixture of steam and vapor is produced for medicinal use.

In order that the rate of vaporization of the liquid in the container 20 may be regulated to suit the requirements, a conducting plate 30 is mounted for movement in a vertical plane parallel to the planes of the electrodes 22. This plate 30 is adapted to be equally spaced from the electrode plates 22 and the extent to which it is lowered between the electrodes will determine the rate at which the liquid is vaporized by the passage of current between the electrodes, inasmuch as the presence of the plate 30 will reduce the resistance to the passage of current in the area in which the plate 30 overlaps the electrodes 22. In order that the extent of this overlap may be varied to cause the desired variation

in the rate of vaporization, the plate **30** is mounted on the lower end of a rod **31** which is slidably mounted in an aperture formed in the center of a bearing plate **32**. This plate **32** is formed of porcelain or the like and is provided with a series of apertures **32***a* through which the steam or vapor may escape upwardly from the region of the electrodes. The outer margin of the plate **32** is spaced slightly from the wall **20***a* of the container and the plate is secured in place by outwardly projecting flanges **32***b* engaged by screws **33** which enter threaded apertures formed in the upper ends of ribs **20***g*. These ribs are formed as integral parts of the annular wall **20***a* of the container and are preferably extended downwardly to the bottom wall **20***b*. The rod **31** is provided at its upper end with a knob or handle **35** which may be engaged by the fingers of the operator, after removing the cover **18**, to move the rod **30** upwardly or downwardly and thereby vary the extent to which the plate **30** extends between the electrodes **22**. The extent to which the plate **30** may be withdrawn is limited by pin **36** which is secured in the rod **31** and the rod is adapted to be held in any desired position through the frictional engagement therewith of a leaf spring **37**. This spring is secured to the plate **32** by a bolt **38** and its free extremity enters a slot **32***c* which is formed in the central boss **32***d* of the plate to contact with the side of the pin **31**, as shown particularly in Fig. 2. With this arrangement, it is possible to adjust the position of the plate **30** during the operation of the device, merely by removing the cover **18** and operating the rod **31** through the handle **35**.

The provision of the inner container **20**, in which the vaporization takes place, makes it possible to segregate a relatively small quantity of the water or other liquid which is contained in the vessel **10** so that this small quantity is quickly vaporized by the passage of the current between the spaced electrodes **22** and, as the vaporization takes place, this quantity of liquid in the container **20** is gradually replenished through the opening **20***d*. By suitably adjusting the position of the plate **30** the rate of vaporization may be regulated when the device is started in operation or during its subsequent performance. The mounting of the electrodes within the container **20** has the advantage of permitting the adjustment of the rate of vaporization which has just been referred to and also the advantage that the electrodes may be removed with the container **20** when desired so that they may be readily cleaned outside of the vessel **10**. When the cleaning has been completed, the container **20** may be readily replaced in the vessel, located in proper position by means of the pin **20***c*, and then forced downwardly after rotating the container until the terminal posts **23** register with the socket members **25**.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various embodiments without departing from the scope of the appended claims.

I claim:

1. A vaporizer comprising a vessel adapted to contain a quantity of liquid, electrical means comprising plate electrodes mounted in parallel spaced relation in said liquid in said vessel for vaporizing said liquid by the passage of current therethrough, a metal plate mounted in spaced relation to and having relative movement with respect to both of said electrodes, a rod attached to said plate, a supporting member in which said rod is slidably mounted, and means for frictionally holding said rod in adjusted position in said member.

2. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container movable into and out of said vessel through said opening and having an aperture through which said liquid may flow into said container when said container is in said vessel, and a pair of spaced electrodes located within and carried by said container.

3. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container movable into and out of said vessel through said opening and having an aperture through which said liquid may flow into said container when said container is in said vessel, a pair of spaced electrodes located within and carried by said container, and means for connecting said electrodes in an electric circuit when said container is mounted in said vessel.

4. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container movable into and out of said vessel through said opening and having an aperture through which said liquid may flow into said container when said container is in said vessel, a pair of spaced electrodes located within and carried by said container, terminal posts carried by said container and connected to said electrodes, and means connected in an electric circuit and carried by said vessel for detachably forming conections with said terminal posts when said container is moved into said vessel.

5. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container movable into and out of said vessel through said opening and having an aperture through which said liquid may flow into said container when said container is in said vessel, a pair of spaced electrodes located within and carried by said container, terminal posts carried by said container and connected to said electrodes, socket members mounted in the wall of said vessel and adapted detachably to receive said terminal posts when said container is moved into said vessel, and means for connecting said socket members in an electric circuit.

6. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container removably mounted in said vessel opposite said opening and having an aperture through which said liquid may flow, a pair of spaced electrodes located within and carried by said container, and a metal plate adjustably mounted between said electrodes.

7. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container removably mounted in said vessel opposite said opening and having an aperture through which said liquid may flow, a pair of spaced electrodes located within and carried by said container, a metal plate movable between and parallel to said electrodes, and means for holding said plate in an adjusted position.

8. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container removably mounted in said vessel opposite said opening and having an aperture through which said liquid may flow, a pair of spaced electrodes located within and carried by said contanier, said vessel having a cavity in its wall, and a pin carried by said container

for engaging said cavity to position said container when said container is mounted in said vessel.

9. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container removably mounted in said vessel opposite said opening and having an aperture through which said liquid may flow, a pair of spaced electrodes located within and carried by said container, said vessel having a cavity in its wall, a pin carried by said container for engaging said cavity to position said container when said container is mounted in said vessel, a pair of terminal posts connected to said electrodes and extending from said container parallel to said pin, socket members mounted in the wall of said vessel and adapted to receive said posts, and means for connecting said socket members in an electric circuit.

10. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container movable into and out of said vessel through said opening and having an aperture through which said liquid may flow into said container when said container is in said vessel, a pair of spaced electrodes located within and carried by said container, and a cover for said opening having a detachable engagement with the end of said container.

11. A vaporizer comprising a vessel adapted to contain a quantity of liquid, said vessel having an opening, a container removably mounted in said vessel opposite said opening and having an aperture through which said liquid may flow, a pair of spaced electrodes located within and carried by said container, and a cover for said opening having a detachable engagement with the end of said container, said cover having a cavity in its outer side for holding a medicament and having a vapor discharge aperture over said cavity.

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