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APPARATUS FOR VAPORIZING LIQUIDS

Original Filed Sept. 26, 1941

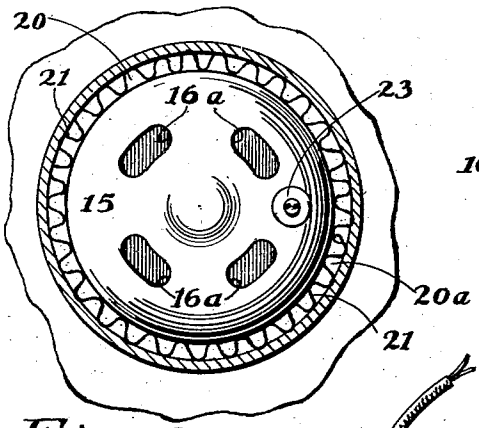


Fig. 2

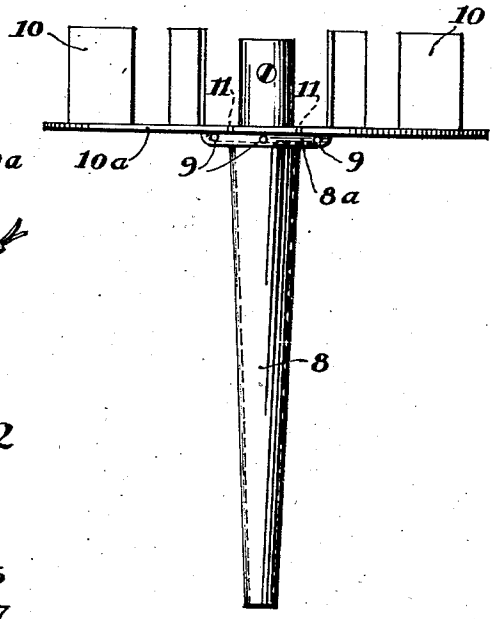


Fig. 3

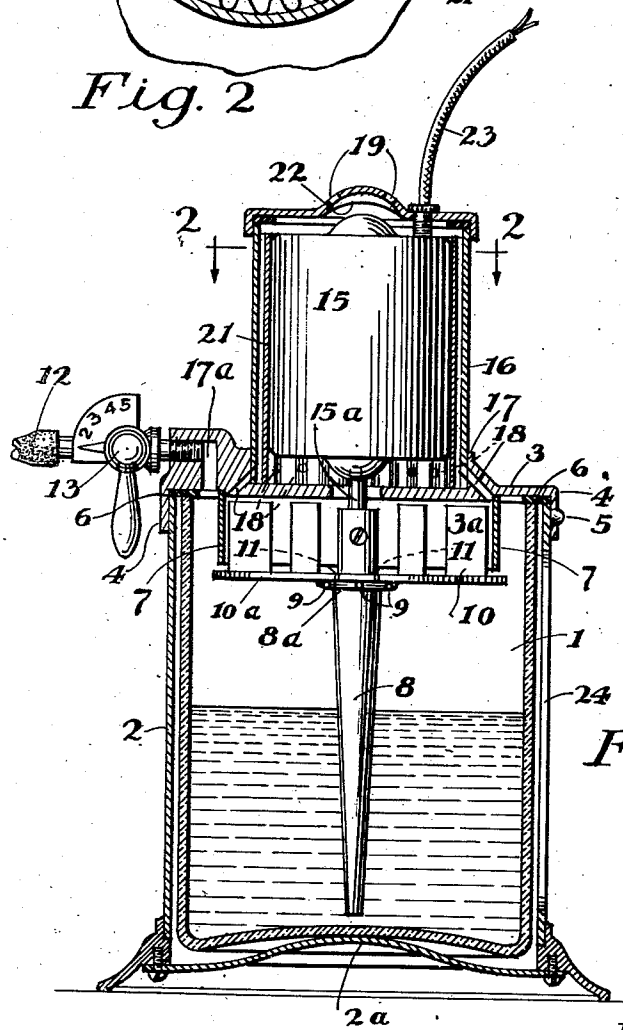


Fig. 1

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APPARATUS FOR VAPORIZING LIQUIDS

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2 Claims. (Cl. 261—91)

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This invention relates to apparatus for vaporizing liquids and is a division of my co-pending application, Serial No. 412,439, filed September 26, 1941, which case was abandoned on December 31, 1945.

While my invention is adapted to vaporize any vaporizable liquid, it is particularly well suited for use in preparing liquid anesthetics. In accordance with my invention, I continuously withdraw ether from the main body thereof by means of a rapidly rotating member having upwardly and outwardly inclined elevating surfaces. The elevated liquid ether is then thrown outwardly by centrifugal force from the rapidly rotating member to be broken up into fine particles and is vaporized by a heated fluid stream.

The heated fluid stream may be heated atomized ether. Under usual conditions, a suitable heated stream may be effected by passing a stream of ether vapor over and through the electric motor that drives the elevating member and this has the added advantage of cooling the motor. Although, heretofore, it has been considered hazardous to pass such vapors as ether over or through a motor or to have electrical equipment of any sort in proximity to air containing ether, the possibility of ignition can be eliminated by ensuring that the circulating stream is a rich mixture containing insufficient oxygen to support combustion.

In the drawings I have shown an embodiment of my invention from which its novel features and advantages will be apparent. In the drawings:

Fig. 1 is a partly sectioned view of apparatus in accordance with my invention.

Fig. 2 is a fragmentary section along the lines 2—2 of Fig. 1, and

Fig. 3 shows the fan and liquid elevating member.

My apparatus shown in the drawings consists of an ether container 1 mounted in a casing 2. A cover 3 has a flange 4 slotted to receive lugs 5 on the wall of the casing 2 to establish a bayonet lock to permit the cover 3 to be readily attached to or removed from the casing. A gasket 6 between the top of the wall of the container 1 and the cover 3 provides an air-tight seal which is maintained by the spring 2^a carried by the casing 2 which engages with the bottom of the container 1 and forces it tightly against its gasket.

An annular housing 7 for the fan 10 depends from the cover 3 and is partially closed by the fan disc 10^a. The liquid elevating member or tube 8 is connected to the disc 10^a by a dish-shaped extension 8^a which is perforated as at 9

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to provide passages through which ether is expelled below and against the lower surface of the disc 10^a. The portion of the fan disc over the extension 8^a is perforated as at 11 to permit the ether to pass up through and over the upper surface of the fan disc 10^a.

The fan 10 and the tube 8 are connected to the shaft 15^a of the motor 15 which extends downwardly through the central opening 3^a in the cover 3.

The liquid elevating member has outwardly and upwardly tapering portions so that when rapidly rotated, the liquid travels upwardly therealong under the influence of centrifugal force. While the construction of the elevating member depends on the nature of the liquid to be vaporized, it may be generally defined as of substantially V-shape. Its angularity and area are interrelated to effect the elevation of the liquid without causing too rapid rotation of the entire body of the liquid. In the embodiment of my invention shown in the drawings, the elevating member is a slightly tapered tube.

As the shaft 15^a rotates, the member 8 continuously raises ether from the main body of liquid in the container 1 and the elevated ether is expelled through the perforations 9 and 11 over the surfaces of the fan disc 10^a and is directed forcibly by centrifugal force against the container walls to atomize the ether.

The motor 15 has a housing 16 in which it is mounted to provide an annular space. The housing 16 fits within a collar 17 with which the cover 3 is formed. The cover 3 has an outlet 17^a threaded to receive the delivery line 12 having a control valve 13. The collar 17 has a plurality of passages 18 to effect communication between the annular space in the housing 16 and the interior of the fan chamber. The top of the motor housing 16 is formed with a plurality of air intakes 19.

The heat from the motor is usually sufficient to warm the vapor to the desired temperature. In order that this heat may be readily absorbed by the circulating vapor, I place in the annular space between the motor 15 and its housing 16, a baffle 21 in the form of a corrugated metal sheath (Fig. 3). The ether vapor, rising from the fan housing 7 through the passages 20^a (outside of the baffle 21) to the top of the motor housing and then is forced downwardly through the passages 20 (between the motor 15 and the baffle 21). There are openings 16^a in the top and bottom of the motor through which ether vapor also travels downwardly. The returned vapor passes through the opening 3^a into the fan housing 7, the heat

of the motor being dissipated by the evaporation of the ether when the valve 13 is in an open position, and by the circulation of the liquid ether contacting both surfaces of the fan disc 10a, the heat being conveyed to the reservoir of liquid ether in the container 1. When the valve 13 is closed, evaporation of the ether nearly ceases, but the heat is distributed as above described.

The possibility of ignition of the ether vapor is avoided in my apparatus because the ether vapor within the device is always maintained with too small a proportion of oxygen to support combustion. According to my method, there is a rich ether mixture in the passages 20 and 20a, about the motor, and elsewhere in the apparatus before the motor is connected into the electric circuit. This mixture, as it rises about the motor, expels any air through the ports 19 that it does not absorb. When the motor is running with the valve 13 closed, any excess vapor escapes through the ports 19. When the valve 13 is in an open position, a small amount of air is drawn into the stream of circulating vapor as it passes the ports 19. By circulating the ether vapor over the warm motor and past the ports 19, not only is the heat lost by vaporization restored, but also the air necessary for vaporization is provided and the motor is cooled. As a further safeguard, the motor is of the shaded pole, induction type, and a safety screen 22 is mounted between the motor and the intake ports 19 to provide a baffle against vapor loss and a protection in case of a break in the cord 23 outside the housing 16 and close to the ports 19.

Since I employ the heat developed by the operation of the motor to warm the vapor, recirculation is desirable to ensure the maintenance of a rich mixture about the motor.

As the shaft 15a rapidly rotates, the centrifugal force on the liquid within the tube 8 overcomes the force of gravity and forces the liquid upwardly over the wall of the tube and through the perforations 9 and 11 and is atomized by contact with the wall of the container 1. The atomized ether is rapidly vaporized by the heated stream and is thus prepared for delivery to the patient through the valve controlled delivery line 12.

The casing 2 has a window 24 to permit the liquid supply to be watched as it is necessary to maintain a sufficient supply of vapor to ensure a rich vapor mixture. Before the machine is used,

a minute or more should be allowed for the ether vapor to expel or absorb any air inside the machine. If cold, the machine may be shaken slightly to accelerate vaporization before the circuit to the motor is completed.

It will thus be appreciated that I have provided safe and efficient means for vaporizing ether or other vaporizable liquids.

What I therefore claim and desire to secure by Letters Patent is:

1. Apparatus for vaporizing ether or the like, comprising a container for the ether, a closure for said container having a depending annular flange, a centrally disposed aperture, and an outlet port between said flange and the wall of said container, a housing supported by said closure, an electric motor mounted in said housing in spaced relation to said housing, rotatable means connected to said motor through said aperture, said means comprising a member extending downwardly into the ether and having upwardly and outwardly inclined surfaces along which ether travels under the influence of centrifugal force as the member rotates and a fan housed by said flange to define a fan chamber, elevated ether being delivered to said disc member and outwardly therefrom against the wall of said container and against said flange to break up the elevated ether into fine particles, and said closure having passages leading from said fan chamber to said housing so that ether particles may flow upwardly into said housing to be heated by said motor and downwardly through said aperture.

2. The apparatus of claim 1, in which a baffle separates the motor from its housing to define two sets of passages, one of which communicates with the passages and the other of which communicates with the aperture.

JOHN J. RICHARDS.

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