J. ENDRES & W. EPPENSTEIN

ATOMIZER.

APPLICATION FILED SEPT. 22, 1915.

1,176,669. Patented Mar. 21, 1916.

Fig. 1

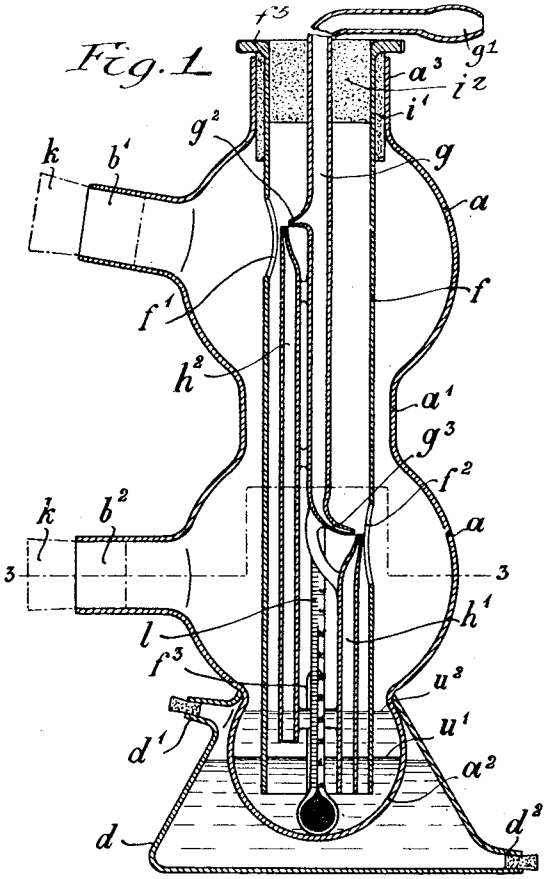


Fig. 2.

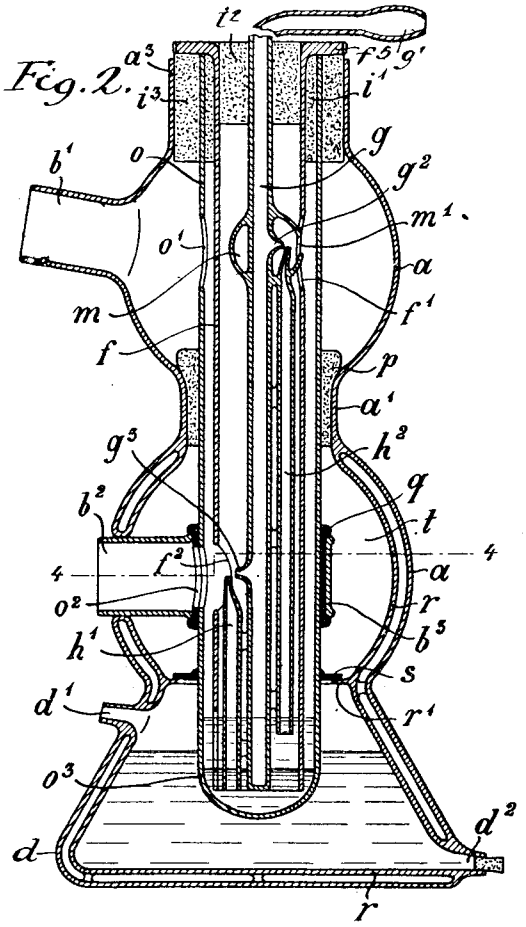


Fig. 3

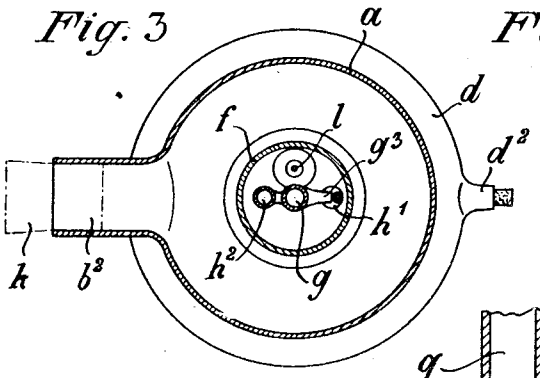


Fig. 4

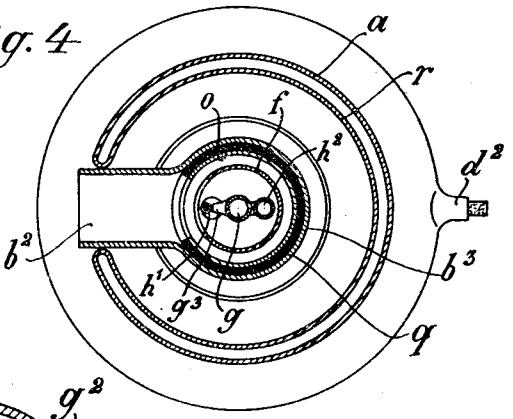
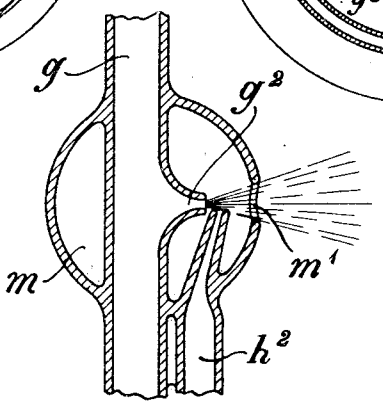


Fig. 5



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ATOMIZER.

1,176,669. Specification of Letters Patent. Patented Mar. 21, 1916.

Application filed September 22, 1915. Serial No. 52,064.

To all whom it may concern:

Be it known that we, JOSEPH ENDRES, of 59 Taunusstrasse, Wiesbaden, Germany, merchant, and WILLY EPPENSTEIN, of 12 Blücherstrasse, Berlin, Germany, author, have invented certain new and useful Improvements in Atomizers, of which the following is a specification.

Our invention relates to atomizers or apparatus for reducing liquids or liquid-vapors, and more especially medicinal liquids for inhaling purposes to a spray containing more or less moisture.

The particular object of our invention is to provide an atomizer capable of effecting a far-reaching atomization and of imparting to the spray to be produced the right temperature in order to obtain the very best medical or other desired effect.

In the drawings affixed to this specification two modifications of an atomizer according to the present invention are represented.

Figures 1 and 2 are vertical sections of the two modifications, Fig. 1 representing a simpler form and Fig. 2 a somewhat more complicated form of the atomizer. Fig. 3 is a horizontal cross-section on the line 3—3 of the modification represented in Fig. 1, and Fig. 4 is a horizontal cross-section on the line 4—4 of the modification represented in Fig. 2. Fig. 5 is a section of a detail, drawn to a larger scale.

Both modifications represented in the drawings are hand-atomizers, but we wish it to be understood that our invention is by no means limited to such hand-apparatus.

Like numerals of reference indicate corresponding parts in each figure.

Referring to Fig. 1, two superposed globes a connected by a short tube a' are provided with side-necks b' and b^2 respectively. The upper globe is further provided with a vertical neck a^3, while a smaller globe a^2 serving as a liquid receptacle replaces the bottom of the lower globe a. Globe a^2 is surrounded by a container d provided with inlet d' and outlet d^2, said container being designed to be filled with a hot liquid such as a salt solution for heating the liquid to be atomized. In the case of the whole device being made of glass the upper edge of said container may be fixed to the part connecting the tubes a^2 and a by fusion.

A protecting tube f is arranged in the upper neck a^3 by aid of a stopper i'. Within said tube f a double-acting atomizer tube g, h', h^2 is fixed by means of a stopper i^2, the lower ends of the tubes h' and h^2 dipping in the liquid contained in globe a^2. In order to be able to observe and regulate the temperature of the liquid a thermometer l is connected with the lower end of the atomizer g, which may easily be kept under observation through the glass walls of the protecting tube f and the globe a^2.

The atomizer g is provided with a rubber pipe junction g' and two air nozzles g^2, g^3 arranged at different levels corresponding to the levels of the side-necks b' and b^2 of the globes a, which may, if necessary, be closed by stoppers k. The suction tubes h' and h^2 are connected with each other and with the atomizer tube g by suitable webs in order to insure the necessary stability of the atomizing device proper and to keep the suction nozzles in position close to the blow nozzles. In order to be able to regulate the degree of moisture of the spray the protection tube f is arranged so as to be turned within stopper i' and is further provided with a milled flange f^5, the protecting tube in being turned causing also the atomizer arranged therein to be turned, so that the spray can always pass through the apertures f' and f^2 of the protecting tube into the globes a and from there directly through one of the side necks b' and b^2 provided the parts are either in the position shown in Fig. 1 of the drawings or in the opposite position. In these cases the spray escaping directly through one of the side necks will contain a certain amount of moisture, while the spray escaping from the other nozzle, meeting the wall of the globe, will be freed from the drops of moisture and after having passed through the connection a' into the other globe a will escape through the same side neck together with the moist spray.

The suction tube h' of the lower atomizing device is immersed deeper into the liquid contained within the globular container a^2 than the suction tube h^2 of the upper atomizing device. Therefore, if the container a^2 is filled with two liquids having a different specific weight, it will be feasible to arrange the level of the heavier liquid, such as a salt solution, for instance at u'

and to superpose above said solution up to the level u^2 the liquid having the lower specific weight, such as for instance eucalyptus oil, thus allowing the suction tube h^2 to lift the lighter liquid, while the suction tube h' is lifting the heavier liquid, which however need only be lifted a far smaller distance than the lighter liquid. The relative depth of immersion of the tubes h' and h^2 can be varied according to the desired composition of the spray, for instance by means of auxiliary tubes being placed in telescope fashion upon the ends of the suction tubes, which render it possible also to lift the lighter liquid through the shorter tube h' and the heavier liquid at a far slower rate through the longer tube h^2.

Referring to the modification shown in Fig. 2, the protecting tube f is arranged by aid of a stopper i' in a tube o fixed in the neck a^3 of the apparatus by means of another stopper i^3, the tube f being adapted to be turned with the stopper i'. The tube o is provided with apertures o', o^2 located at the level of the side necks b', b^2 and ends in a liquid container o^3. The lower globe a of the apparatus is here directly connected with the heating liquid receptacle d and both are provided with a double wall r forming an insulating jacket which may be exhausted, the distance between the two walls being kept up if necessary by suitable webs which are however rendered superfluous in most cases, the edge of the opening provided for the passage of side neck b^2 and the inlet d' and outlet d^2 serving as distance holders. The interior of the receptacle d which is preferably cone-shaped and has a flat bottom, may be separated from the interior of the lower globe a by a flange r' allowing the tube o to pass through, a rubber ring s or the like fixed to said tube serving as a packing. In this case the interior of the lower globe a all around tube o may be filled with a heat insulating material such as Iceland moss or the like. The side neck b^2 projecting in a more or less tight manner through an aperture in the double wall of globe a is fastened to tube o by means of a ring joint b^3 and rubber packing q or the like, thus keeping the aperture o^2 safely posted in front of a corresponding opening of the ring joint leading to the side neck b^2. In this way the spray is prevented from entering the lower globe a, a stopper p preventing the entrance of the spray or of any condensation liquid formed within the upper globe a.

In order to render it possible to obtain an exceptionally fine spray by aid of one of the atomizing devices (for instance the device g^2, h^2), the said device may be provided with a jacket, preferably a globular jacket m provided with a side opening m' of a diameter corresponding to the diameter of the spray in the plane of the opening (Fig. 5). By this arrangement a partial vacuum is created within the globular jacket m which is thus filled with liquid lifted through tube h^2, so that the spray in passing through the liquid suffers an exceptionally fine atomization.

If the diameters of the globe m and the opening m' are made such that the outer part of the spray can no more pass through said opening, the spray in meeting the wall of the globe m will whirl around within said globe, deposit part of the moisture which will collect in the lower part of the globe in order to be then whirled around also by the spray reflected from the globe wall and be converted into a fine spray in its turn.

A globular jacket such as described need only be provided at the atomizer fed with the liquid which shall predominate in the spray, whereas the other liquid may be atomized by an ordinary atomizer consisting of a blowing and a suction nozzle.

In order to carry the liquid collected within the upper globe a back into the tube o, the stopper p may be provided with a side channel leading toward the center in an oblique position, and the tube o may be provided with a slot lying at the level of the lower part of said channel so as to prevent small turning or displacing movements of the stopper from exerting a detrimental influence upon the correct operation of the device.

The upper atomizer may further be adapted to be turned relatively to the lower one, thus allowing the sprays from both atomizers to be expelled simultaneously through both side necks b' and b^2 which may be connected by a suitable connecting pipe carrying at its free end a mouth- or nose-piece, thus allowing different liquids to be atomized in a moist spray. It is possible, in this way, to regulate at will the degree of moisture of the spray obtained from different liquids, one independently of the other.

In order to provide for a still better heat insulation the air jacket between the double walls a and r may be exhausted after the manner of Dewar vessels, but in this case it is preferable not to arrange a silver layer on the walls, but to keep the whole apparatus transparent in order to be able to observe the liquids contained therein as well as their temperatures and also the process of atomization carried on within it.

If necessary, a thermometer may be arranged within each spraying nozzle, the temperatures of the sprays differing widely in accordance with the vaporization temperature of the different liquids, although the liquids contained within the receptacles a^2 and o^3 may have one and the same temperature at the beginning.

The thermometers are preferably arranged within the side necks b' and b^2.

We claim:

1. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper ends of said tubes lying at different levels, nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

2. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper ends of said tubes lying at different levels and the lower ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

3. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, said pressure nozzles being directed in opposite directions, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

4. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, said protecting tube, suction tubes and nozzles being adapted to be turned around the axis of said tubes within said receptacle, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

5. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, said pressure nozzles being directed in opposite directions, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, said protecting tube, suction tubes and nozzles being adapted to be turned around the axis of said tubes within said receptacle, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

6. In an atomizer for inhaling purposes, in combination, a liquid receptacle, a water jacket around said receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles, and side-openings in the liquid receptacle at the levels of said nozzles.

7. In an atomizer for inhaling purposes, in combination, a liquid receptacle, a water jacket around said receptacle, an air jacket adapted to be exhausted around said receptacle and said water jacket, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

8. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suction tube, a globe surrounding at least one of the pressure nozzles and upper suction tube ends, an aperture in said globe in front of said nozzle, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

9. In an atomizer for inhaling purposes, in combination, a liquid receptacle, two suction tubes in said receptacle, the upper nozzle ends of said suction tubes lying at different levels, a pressure nozzle arranged in proximity to the nozzle end of each suc-

tion tube, means for passing a pressure medium through said nozzles, a protecting tube within said receptacle surrounding said suction tubes and nozzles, said protecting tube, suction tubes and nozzles being adapted to be turned around the axis of said tubes within said receptacle, a globe surrounding at least one of the pressure nozzles and upper suction tube ends, and an aperture in said globe in front of said nozzle, apertures in the protecting tube in front of said nozzles and side-openings in the liquid receptacle at the levels of said nozzles.

In testimony whereof we affix our signatures in presence of two witnesses.

JOSEPH ENDRES.
WILLY EPPENSTEIN.

Witnesses for Joseph Endres:
MORITZ WETZEL,
HEINRICH LUSTIG.

Witnesses for Willy Eppenstein:
WOLDEMAR HAUPT,
HENRY HASPER.