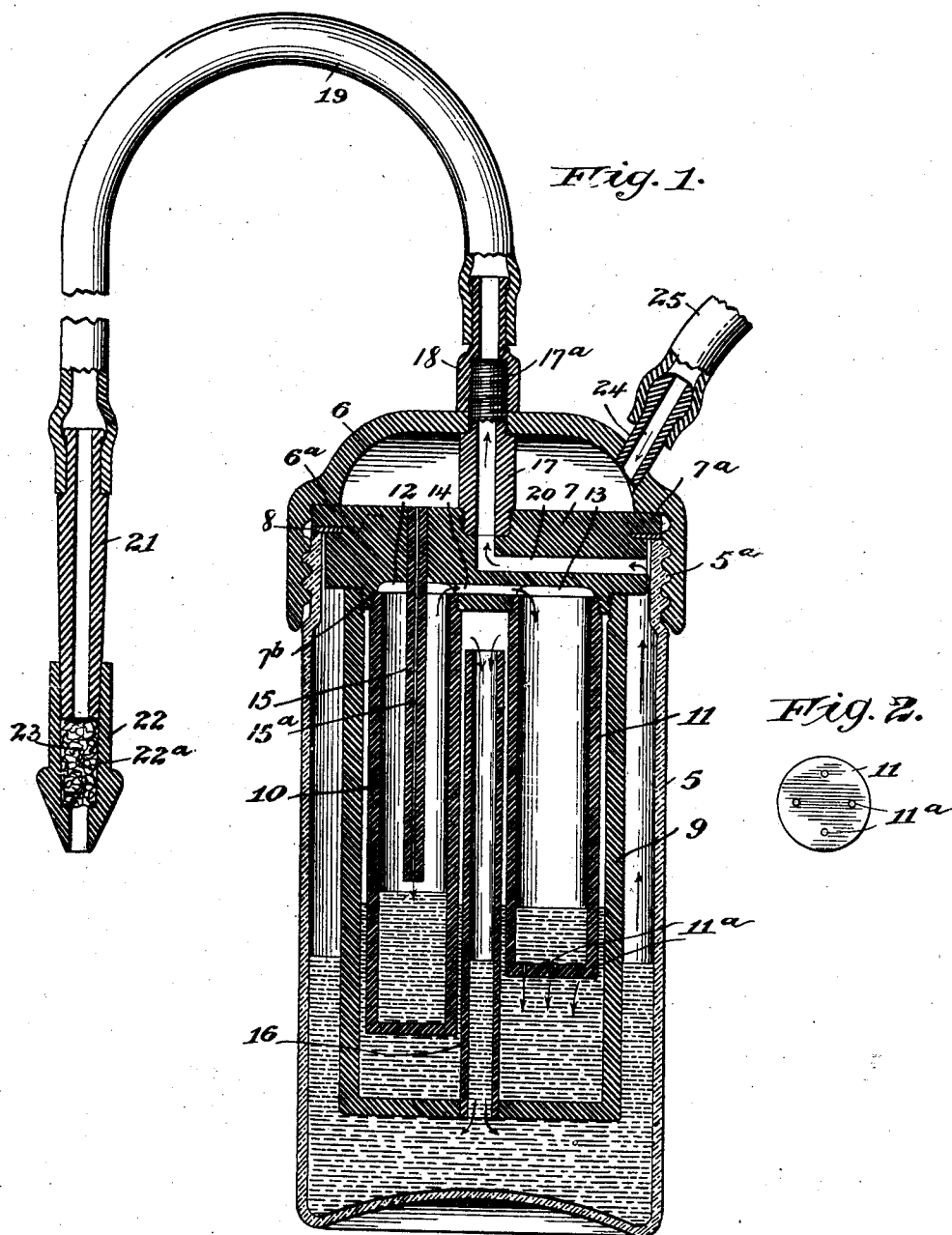


No. 830,626.

PATENTED SEPT. 11, 1906.

J. E. VAN NESS.
VAPORIZER.

APPLICATION FILED FEB. 23, 1905.



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UNITED STATES PATENT OFFICE.

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VAPORIZER.

No. 830,626.

Specification of Letters Patent.

Patented Sept. 11, 1906.

Application filed February 23, 1905. Serial No. 246,960.

To all whom it may concern:

Be it known that I, JAMES E. VAN NESS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Vaporizers, of which the following is a specification.

This invention relates to vaporizing and nebulizing devices of that class which are used in the administration of medicine in the form of a medicated vapor or nebule to diseased organs, more especially those of the nose, throat, and lungs; and the invention has for its leading object to provide an improved device of this class whereby a much stronger gas or vapor can be generated than has heretofore been possible and whereby also the essential oils of the medicine employed can be taken up and carried over in such strength and highly-divided form as to be of practical value and efficiency through local application in contradistinction to many vaporizers and inhalers now in use which deliver merely a current of air or weak vapor impregnated with little more than the odors of the medicinal agents used therein.

The device of this invention, in common with many similar devices now in use, employs an outer vessel containing a pungent solution, such as ammonia, and an inner vessel containing an acid solution, such as hydrochloric acid, with means for forcing a current of air into said inner vessel, then conducting the acid fumes therefrom over into the outer vessel in contact with the ammonia solution therein, and thence conducting the resultant ammonium-chlorid gas through a suitable discharge tube or nozzle to the affected organs of the patient; but the present invention is distinguished from prior devices of this class in several important respects, as follows: First, in the employment of a special construction of the air and vapor conducting tubes of the device, whereby the air introduced to the acid solution is caused to carry over more acid fumes and of greater strength than have heretofore been possible of attainment, thus permitting the use of a stronger ammonia solution, and whereby the acid fumes are caused to act similarly upon the ammonia solution in the generation of a strong ammonium-chlorid gas or vapor; second, in the employment of a flexible discharge-tube having a medicated sponge located in

an interchangeable delivery-nozzle directly in the path of the pure gas or vapor emitted by the device, whereby said gas or vapor takes up and carries over the essential oils containing the principle of the medicine employed without requiring the globule or globules to travel through said discharge-tube, to which it is likely to adhere; third, in the employment of a glass or jar surrounding the gas-generating devices and containing a water-bath in which the gas or vapor generated in the vaporizer is thoroughly washed and relieved of any impurities or excess of either agent prior to its discharge and subsequent medication, this feature being especially designed for the apparatus as used by physicians; in which case the entire apparatus may be conveniently packed in a portable case; fourth, in the employment of vapor-conducting tubes and other parts of hard rubber as distinguished from the glass tubes heretofore used in such devices.

The invention also includes as an important feature contributing to its simplicity of construction a cored closure or stopper which affords a passage for the acidified gas directly to the tube leading to the ammonia solution and also a passage for the gas generated from the interior of the containing vessel to the discharge-tube.

My invention in its preferred form is illustrated in the accompanying drawings, wherein—

Figure 1 is a vertical sectional view with the air-inlet and gas-discharge tubes shown partly in elevation, and Fig. 2 is a bottom plan view of the acid-gas-conducting tube of the device.

Referring to the drawings, 5 designates an outer vessel, preferably in the form of a glass jar, having an externally-threaded top portion 5^a, to which is adapted to be screwed a cap 6, preferably of hard rubber. The upper end of the jar 5 is occupied by a stopper-plate 7, consisting, preferably, of a hard-rubber circular disk of considerable thickness which is provided at its upper end with a horizontally-extending flange 7^a, resting upon the upper end of the jar through an interposed packing ring or gasket 8 and a depending externally-threaded flange 7^b. The cap 6 has an internal annular shoulder 6^a formed thereon, which when the cap is screwed onto the jar securely clamps the

stopper 7 to its seat on the upper end of said jar.

5 Secured to the depending flange 7^b is an inner vessel 9, into which extends a pair of
tubes 10 and 11, both of which are screwed
at their upper ends into internally-threaded
recesses or sockets 12 and 13 in the lower face
of the stopper-plate 7. The upper ends of
10 tubes 10 and 11 are in free communication
with each other by means of a horizontal
duct 14, formed in and through the stopper-
plate 7 between the recesses 12 and 13. Se-
cured in the stopper-plate 7 and extending
from the upper face thereof a considerable
15 distance into the tube 10 is a smaller tube 15,
which is provided with a minute axial bore
15^a, substantially capillary in size. The
lower end of tube 10 is closed, while the lower
end of tube 11 is provided with one or a series
20 of minute apertures or perforations 11^a, Fig.
2. Secured in the bottom of the vessel 9,
preferably centrally thereof, is an upstand-
ing gas-discharge tube 16, open at both ends
and extending to something less than the
25 full height of the vessel 9. Secured to the
upper face of the stopper-plate 7, centrally
thereof, is a short tube 17, having a reduced
externally-threaded upper portion 17^a passed
through the cap 6 by an air-tight joint, to
30 which is attached, by means of a nipple 18, a
flexible discharge tube or hose 19. Cored in
the stopper-plate 7 is a rectangular duct 20,
the short vertical portion of which registers
with the bore of the tube 17 at its lower end,
35 while the horizontal portion leads to and
through the annular marginal surface of the
stopper-plate, communicating freely at that
point with the interior of the outer jar 5.
To the remote end of the hose 19 may be
40 connected through a suitable axially-bored
connection piece or stem 21 a nipple 22, hav-
ing its bore somewhat enlarged to provide a
chamber 22^a, adapted to contain a medi-
cated sponge 23.

45 Tapping the cap 6 is a nipple 24, to which
is attached a hose 25, through which com-
pressed air may be supplied from a hand
bulb, pump, or any other suitable or con-
venient source of compressed air.

50 The outer vessel 5 is designed to be par-
tially filled with water. The tube 10 is filled
to a level slightly below the lower end of the
inner tube 15 with a suitable acid, such as
hydrochloric acid, and the vessel 9 is filled,
55 preferably to a level slightly above the lower
end of the tube 11, with a neutralizing agent,
such as strong ammonia-water. The sponge
23 is loaded with the essential oil of any
suitable medicinal drug, so as to impart
60 to the gas forced therethrough an agreeable
aroma or medicinal quality, or both, as may
be desired.

In the operation of the device compressed

air introduced through the tube 25 and nip-
ple 24 fills the chamber between the cap 6 65
and stopper 7, from which such compressed
air flows in an attenuated stream, but with
considerable speed and force, through the
capillary bore of the tube 15, issuing from the
lower end of the latter in a fine jet, which im-
pings upon and penetrates the upper portion 70
of the acid contained in tube 10, producing a
bubbling and boiling of such acid and gener-
ating acid fumes or gas in greater volume and
of greater strength than where the air-cur- 75
rent merely passes over the surface of the
acid. These rise through the tube and flow-
ing through the communicating duct 14 en-
ter and fill the tube 11 and by their pres-
sure expel the ammonia-water in the latter 80
tube through its lower end and issuing in
fine jets or sprays through the series of aper-
tures 11^a thoroughly mix with the ammonia-
water, rising therefrom into the upper part of
the vessel 9 in the form of a strong ammonium- 85
chlorid gas, which gas flowing downwardly
through the tube 16, is thoroughly washed
and cleansed of all impurities in the water
surrounding the lower end of the vessel 9, be-
ing relieved therein also of an excess of either 90
acid or ammonia and rising therefrom in a
smooth and perfectly-neutralized condition.
The purified gas, filling the outer vessel 5
above the water, finds its way through the
duct 20 of the stopper-plate to the discharge- 95
tube 17 and thence through the connection
18, tube 19, connection 21, and medicated
sponge 23 in the nipple 22 to the point of ap-
plication.

The capillary bore of the air-conducting 100
tube 15 is so fine as to produce a strong air-
jet of an almost needle-like character well
adapted to pierce the underlying body of
acid liquid and effect the generation of acid
fumes of great strength. Similarly the finely- 105
divided and jet-like condition in which the
said fumes are sprayed into the ammonia-
water effects a perfect combustion and neu-
tralization of the acid by the ammonia, for
which purpose a very strong solution of am- 110
monia, on account of the strength of the acid
fumes, must be used. The increased strength
of chemicals employed thus gives an in-
creased strength of resultant ammonium
chlorid. The location of the entire vaporiz- 115
ing apparatus within the inclosing vessel or
jar containing a washing and cleansing liquid
makes a simple and compact device wherein
the cleansing fluid is capable of being re-
newed by simply unscrewing the cap 6 and 120
lifting out the stopper-plate and its attached
parts. In some cases it is desirable to ad-
minister the gas in a warm state, and this
may easily be effected in the present appar-
atus by supplying hot water as the gas-cleans- 125
ing liquid. The provision of a considerable

space between the cap 6 and the stopper-plate 7 affords an air-reservoir at such point, which is of considerable importance as contributing to the uniformity and steadiness of the flow of compressed air into and of gas from the device.

The several vapor-conducting tubes of the apparatus and, in fact, all the parts thereof except the outer jar 5 and the inlet and discharge tubes 25 and 19 are by preference made of hard rubber, the benefits and advantages of this material residing in the elimination of the expense and waste incurred where such parts are made of glass, as is the common practice at present, and in the facility of coring the several parts, the sizes of the ports and passage-ways therein being capable of greater accuracy and uniformity in their manufacture in a molded material like rubber than in a drawn material such as glass.

I claim—

1. In a vaporizer of the type described, the combination with a vessel adapted to contain ammonia and provided with a gas-discharge tube opening through its base, of a closure for said vessel having an acid-containing tube depending therefrom and an acid-gas-conducting tube also depending therefrom, said latter tube communicating at its upper end with said acid-containing tube through a passage cored in said closure and having its lower end provided with one or more contracted discharge-apertures, an air-inlet tube leading into said acid-containing tube, and means for discharging the ammonium-chlorid gas communicating with said discharge-tube of the ammonia vessel, substantially as described.

2. In a vaporizer of the type described, the combination with a vessel adapted to contain ammonia and provided with a gas-discharge tube opening through its base, of a closure for said vessel, a cap surmounting said closure and providing between the latter and itself an air-reservoir, an air-inlet tube communicating through said cap with said reservoir, an acid-containing tube depending from said closure, an acid-gas-conducting tube also depending from said closure, the latter tube communicating at its upper end with said acid-containing tube through a passage cored in said closure and having its lower end provided with one or more contracted discharge-apertures, an air-inlet tube having a contracted air-passage communicating at its upper end with said air-reservoir and dipping into said acid-containing tube, and means for discharging the ammonium-chlorid gas communicating with said discharge-tube of the ammonia vessel, substantially as described.

3. In a vaporizer of the type described, the combination with an outer vessel adapted to contain a gas-washing liquid, of a cored plate

covering the upper end thereof, a vessel depending from said plate adapted to contain an ammonia solution, a tube secured in the base of said ammonia vessel extending inwardly thereof and open at both ends, an acid-containing tube depending from said plate within said ammonia vessel, an air-inlet pipe leading to the interior of said acid-containing tube, an acid-gas-conducting tube depending from said plate into said ammonia vessel communicating at its upper end with said acid-containing tube by a cored passage in said plate and at its lower end delivering into said ammonia vessel through one or more contracted apertures, and a gas-delivery tube communicating through a duct in said plate with the interior of said outer vessel, substantially as described.

4. In a vaporizer of the type described, the combination with an outer vessel adapted to contain a gas-washing liquid, of a cored plate covering the upper end thereof, a hollow cap secured to the upper end of said outer vessel serving to clamp said cored plate thereto and providing between itself and the latter an air-reservoir, an ammonia vessel depending from said cored plate within said outer receptacle, a discharge-tube opening through the base of said ammonia vessel, an acid-containing tube depending from said cored plate within said ammonia vessel, an air-inlet tube having a contracted air-passage secured in said cored plate communicating at its upper end with said air-reservoir and at its lower end with the interior of said acid-containing tube directly over the surface of the acid therein, an acid-gas-conducting tube depending from said plate into said ammonia vessel communicating at its upper end with said acid-containing tube by a cored passage in said plate and at its lower end delivering into said ammonia vessel through one or more contracted apertures, an air-supply tube tapping said cap, and a gas-delivery tube passed through said cap and air-reservoir and communicating with the interior of said outer vessel through a suitable duct in said cored plate, substantially as described.

5. In a vaporizer of the type described, the combination with a vessel adapted to contain an ammonia solution, and a cover therefor, of an acid-containing tube depending from said cover, an air-conducting tube also depending from said cover and entering said acid-containing tube, and a conducting-tube for the acid fumes also depending from said cover, said air and acid conducting tubes being made of hard rubber and provided with minute perforations for the discharge there-through of air and acid gas in minute streams directly into the adjacent liquids, substantially as and for the purposes described.

6. In a vaporizer of the type described, the

combination of an outer vessel adapted to contain a gas-washing liquid, of a plate covering the upper end thereof, a vessel depending from said plate adapted to contain an ammonia solution, an acid-containing tube depending from said plate within said ammonia vessel, an air-inlet pipe leading to the interior to said acid-containing tube, an acid-gas-conducting tube provided with minute perfora-

tions establishing communication between the acid-containing tube and the ammonia vessel, and means to conduct the gas through the washing liquid. 10

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