

Specification of Moses Poole : administering the vapour of ether to the lungs for medical or surgical purposes.

Contributors

Poole, Moses.

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A.D. 1846 N° 11,503.

SPECIFICATION

OF

MOSES POOLE.

ADMINISTERING THE VAPOUR OF ETHER
TO THE LUNGS FOR MEDICAL OR
SURGICAL PURPOSES.

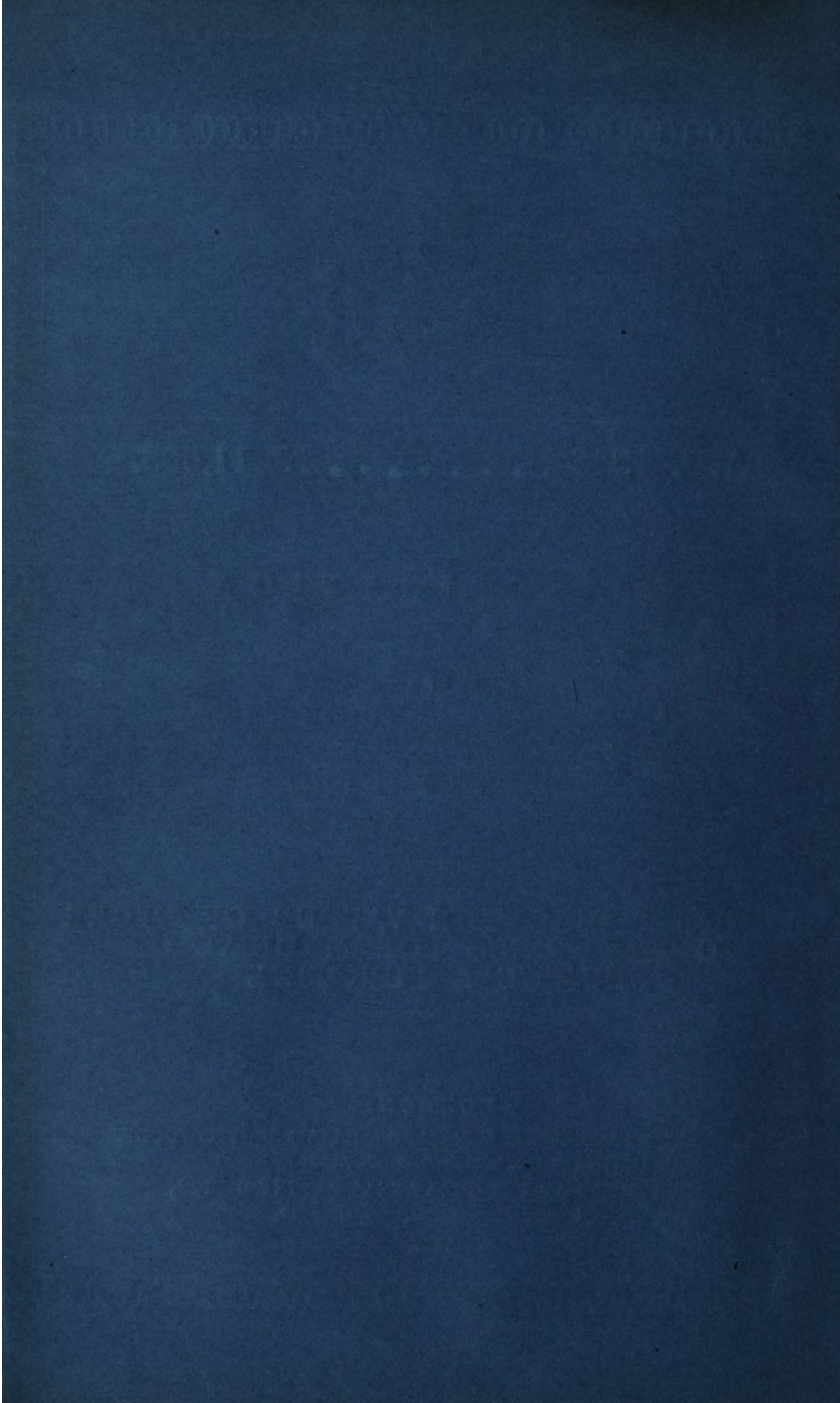
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A.D. 1846 N° 11,503.

**Administering the Vapour of Ether to the Lungs for
Medical or Surgical Purposes.**

POOLE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, MOSES POOLE, of the Patent Office, Lincoln's Inn, in the County of Middlesex, Gentleman, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her
5 Royal Letters Patent under the Great Seal of the United Kingdom of Great
Britain and Ireland, bearing date at Westminster, the Twenty-first day of
December, One thousand eight hundred and forty-six, in the tenth year of
Her reign, did, for Herself, Her heirs and successors, give and grant unto
me, the said Moses Poole, my exors, admors, and assigns, Her especial
10 licence, full power, sole privilege and authority, that I, the said Moses Poole,
my exors, admors, and assigns, or such others as I, the said Moses Poole,
my exors, admors, or assigns, should at any time agree with, and no others,
from time to time and at all times during the term of years therein expressed,
should and lawfully might make, use, exercise, and vend, within England,
15 Wales, and the Town of Berwick-upon-Tweed, and in the Islands of Guernsey,
Jersey, Alderney, Sark, and Man, and in Her Majesty's Colonies and Planta-
tions abroad, the Invention of "MEANS AND APPARATUS FOR ADMINISTERING
CERTAIN MATTER TO THE LUNGS FOR MEDICAL OR SURGICAL PURPOSES," com-
municated from abroad;" in which said Letters Patent is contained a proviso
20 that I, the said Moses Poole, shall cause a particular description of the nature
of the said Invention, and in what manner the same is to be performed, by
an instrument in writing under my hand and seal, to be inrolled in Her
said Majesty's High Court of Chancery within six calendar months next and

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immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Moses Poole, do hereby declare that the nature of the said Invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the Drawing hereunto annexed, and to the figures and letters marked thereon, that is to say:—

The nature of the Invention consists in the discovery and application of safe and certain means of inducing in a patient, whether man or animal, a state of insensibility to physical pain, accompanied in most cases by a state of quiescence or relaxation of the muscles of voluntary motion, by administering the vapour of ether, suitably mixed with atmospheric air, to the lungs of the patient, so that medical or surgical operations usually attended with pain may be better performed upon the body of the patient while in such state of insensibility, which is called a state of etherisation.

William T— G— Morton, Dentist, and Charles T— Jackson, Chemist, both of Boston, in the United States of America, having discovered the power of the vapour of ether administered to the lungs to induce a state of temporary insensibility to pain, Dr. Morton succeeded, after many experiments made upon his own person, at the peril of his health and life, in finding and combining safe and certain means of applying the discovery to the most important medical or surgical uses, so that the heretofore most painful operations in surgery can, by aid of this Invention, be performed without pain to patients, with the additional advantages of greater probability and greater rapidity of their recovery from the effects of the operations. It is well known to chemists, that when alcohol is submitted to distillation with certain acids, peculiar compounds, termed ethers, are formed, each of which is usually distinguished by the name of the acid employed in its preparation. Experiments have shewn that for the purposes of this Invention ether commonly called sulphuric ether is to be preferred to all other ethers, including under this term all products of the action of acids upon alcohol possessing properties similar to those of the ethers, though other ethers will produce a state of etherisation. The basis of all the ethers is an hypothetical radical called ethule, which is represented by the formula $C^4 H^5$ and symbol A E. Pure sulphuric ether is regarded as an oxide of ethule, and is represented by the formula $C^4 H^5 O$, its symbol is, therefore, A E O. It is prepared by decomposing highly rectified alcohol by means of sulphuric acid or oil of vitriol.

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Five parts of alcohol, of ninety per cent., are mixed with nine parts of oil of vitriol, in a vessel of copper or iron, placed in cold water so as to cool the mixture. By elevation of the temperature and brisk ebullition the oxide of ethule is formed, and passes over in vapour. The distilled liquid may be treated
5 with an alcoholic solution of potash, to neutralise the acids which it may contain, and to render it slightly alkaline. Commercial ethers may contain sulphurous acid gas, acetic, formic, and aldehydic acids, the three latter being produced by absorption of oxygen from the air. It should then be re-distilled in a water bath, and the operation is to be arrested so soon as the ether has
10 attained a specific gravity of 0.72 at eighty degrees of Fahrenheit. The specific gravity may be still further reduced by allowing it to stand for some days over dry chloride of calcium, and then redistilling it in contact with that hygrometric substance. Its boiling point is at ninety-six degrees Fahrenheit. It has a penetrating acromatic odour, and is highly inflammable. It should
15 not change the colour of blue litmus paper. The pure vapour of ether, as thus prepared, will not support respiration, and by excluding air from the lungs, would produce complete asphyxia. Therefore the vapour should be administered mixed with a sufficient quantity of common air, to enable the lungs to perform their usual functions but slightly disturbed by the ethereal vapour.
20 In cases when symptoms of asphyxia may occur from accidents of improper administration, or from impurities of the ether employed, pure oxygen gas may be administered, which, acting upon the blood, immediately renders it arterial. Children are more easily affected by the vapour of ether than adults, and females more easily than males. In some cases a state of complete
25 insensibility to pain is produced after inhalation for a few seconds; in other cases inhalation during several minutes is requisite. Few, if any, persons, will fail to be rendered insensible to pain after inhalation properly conducted for a period of five minutes. Should a longer time than this be required, there will be reason to suspect idiosyncrasy of constitution or something wrong in the
30 mode of administration. The physiological phenomena, and their order of appearance, exhibited by patients during the process of etherisation, are not the same in all individuals, being doubtless modified in each case by the quality of ether employed, the proportion of atmospheric air mixed with it, the degree of perfection of apparatus used, and the length of time of inhalation, as well
35 as by the peculiar constitution of the patient. The state of etherisation which is considered most favorable for the performance of surgical operations may be recognized by insensibility of the skin to pain, quiescence or relaxation of the muscles of voluntary motion, the normal performance of the vital or involuntary functions, attested by deep and regular breathing and pulsation,

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at first accelerated, then restored to a natural state, apparent mental unconsciousness, a turning-up of the ball of the eye, and a general expression of the countenance as in sleep. Perfect etherisation may be described as a state of artificial sleep. The patient upon awaking usually speaks of having had agreeable dreams. If the character of dreams depends upon the thoughts and feelings in the mind of a person when entering the state of sleep, the operator may usefully avail himself of the fact by preparing the mind of the patient for a state of pleasurable reverie. The duration of the state of etherisation varies in different cases. It does not generally continue more than a few minutes after the removal of the means and apparatus employed. Should the patient begin to recover sensibility to pain before the termination of an operation, renewed inhalation will restore insensibility, which may be prolonged an indefinite length of time, at the discretion of the operator.

The state of etherisation or ether sleep may be induced by various modes of administration. All that is essential is that the patient should inhale a certain length of time vapour of ether mixed with certain proportions of atmospheric air. About equal proportions of vapour of ether and atmospheric air are considered best, though etherisation may be produced by a greater or less proportion of the vapour of ether. If air be in excess, there will be either no effect or disagreeable and useless nervous excitement; if ether be in excess, there will be danger of asphyxia. Perhaps the simplest mode of administration is to hold near the mouth and nostrils of the patient a piece of sponge, best of a concave form, or cloth or other porous or fibrous material, permeable to air, saturated or wet with ether, so that the patient shall inhale the vapour mixed with a suitable proportion of atmospheric air. This mode, which may be advantageously adopted as an auxiliary, particularly in some operations upon the mouth or face, and which may be resorted to in an emergency, is objectionable on account of its wastefulness, its requiring too much experience, care, and attention, its want of cleanliness, its uncertainty, and the difficulty or impossibility of measuring quantities or observing effects. Another mode of administration is by means of a bladder provided with a tube to be inserted into the mouth of the patient, whose nostrils are closed, so that the patient shall breathe and rebreathe the vapour of ether contained in the bladder, mixed with carbonic acid gas given off by the lungs. This mode is liable to all the objections mentioned against the ordinary use of a piece of sponge, together with another more serious one, namely, danger of asphyxia.

It is now proposed to describe the apparatus which the Inventors consider best suited to the purpose of etherisation, and the manner of employing it.

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DESCRIPTION OF THE DRAWING.

Figure 1. A represents a glass or other vessel holding about a pint, having a large mouth. *o*, a stopper for the vessel A, of brass or other material. *b*, a tube for the entrance of atmospheric air passing through the stopper *o*. *c*, a brass stop cock or tap in the tube *b*. *d*, the continuation of tube *b* into vessel A, made of pewter perforated with small holes at its lower extremity, to prevent the passage of air being obstructed by a piece of sponge. *e*, a tube with a tap *f*, and continuation *g*, all of brass, passing through the stopper *o*, intended to allow the exit of vapour of ether mixed with air from vessel A. *s, s, s, s*, ten or twelve pieces of sponge, about a cubic inch each in size, connected together by a wire, for the purpose of keeping them separated, and to hold some of them elevated in the vessel A, thereby facilitating evaporation of ether, with which they are saturated or wet. *y, y*, a little free liquid ether at the bottom of vessel A. *h, h*, a flexible tube, which is made of a spiral of wire covered with india rubber, about two feet in length, connecting the tube *e* with the apparatus. B, B, a brass double valve apparatus, it may be made of metal or other material, about an inch and a half in diameter. *i*, the entrance to apparatus B, through which the vapour of ether, mixed with air, enters from the flexible tube *h, h*, coming from the vessel A. *j*, the inhalation valve, opening towards the mouthpiece *n*, but not towards the vessel A, so that vapour may be inhaled but not exhaled through the valve *j*. *k*, the exhalation valve, opening towards the orifice *l*, which communicates with the atmosphere, but not towards the mouthpiece, so that vapour may be exhaled through the valve *k*, but air cannot be inhaled. The valves *j* and *k* are simply flaps of cloth or leather, strengthened by thin metal, the cloth or leather serving the purpose of hinges at *z, z*. *l*, an orifice communicating with the atmosphere. *m*, an orifice between valve *j* and valve *k*, in the side of apparatus B, communicating with the mouthpiece *n*, and allowing respiration to be carried on through the apparatus B. *n*, a mouthpiece, shaped like the mouthpiece of a speaking trumpet, constructed of flexible materials, for instance, a frame of pewter wire covered with india rubber, so as to be adaptable to the form of any face, the dimensions being such as conveniently to include and cover the lips of the patient. It is considered a most important and essential requisite of the apparatus that the orifices, tubes, valves, and passages should be of ample size, diameter, or bore, from the atmosphere to the respiratory organs of the patient throughout, to allow of perfectly free and easy respiration through the apparatus by a person in a state of unconsciousness. No inhaling

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apparatus in use before this Invention, possessing the other essential requisites, could be safely employed, from deficiency in this particular.

The Inventors consider it objectionable to employ any apparatus for the purpose of etherisation in which the air passages are not throughout of a bore or size equal to a circle of at least half an inch in diameter. A bore of five 5 sixteenths of an inch in diameter would suffice for very young children. Though etherisation can be induced by means of air passages of smaller bore, the patient is likely to suffer inconvenience, or incur danger from asphyxia. The operator should take especial care that air or vapour shall pass with the greatest possible freedom through the valves, and throughout the whole 10 course of the flexible tube, which should be as short as convenience of manipulation will allow. This apparatus may be modified in a great variety of ways without altering its essential character. Thus the vessel A, Figure 1, may be constructed of any rigid or flexible material impermeable to liquids not easily acted upon by ether. It may be made larger or smaller, and of any 15 convenient shape. The mouth of the vessel and the stopper *o* may be dispensed with, while the tubes or openings *b* and *e* may be placed at any parts of the top or sides of the vessel. The stopcocks or taps *e* and *f* may be dispensed with, and one or both be replaced by valves. The sponges *s, s, s, s,* may be dispensed with, and a single sponge used, or cloth or other porous 20 material permeable to air may be used; or sufficient evaporation of ether may be produced by means of artificial heat, for instance, warm water applied externally or internally to the vessel A, and the interior of the vessel A may be divided by vertical, horizontal, spiral, rectilinear, or other divisions, so as to convert the interior space into a long pipe, and thus facilitate the mixture of 25 atmospheric air with the vapour of ether in the interior of the vessel A. The free ether *y, y,* may be dispensed with, and fresh ether for evaporation be supplied in jets or otherwise as it may be wanted. The flexible tube *h, h,* may be dispensed with. The apparatus B may be dispensed with, and the inhalation and exhalation valves *j* and *k* be placed anywhere between the tube *e,* 30 leading from the vessel A, and the mouthpiece *n*; for instance, the inhalation valve *j* may be placed in the tube *e* or in the flexible tube *h, h,* in a position perpendicular to the current of air or vapour, and the exhalation valve *k* may be placed on the top or side of the tube between the valve *j* and the mouthpiece *n,* as in Figure 2. *h, h,* represents the flexible tube. *j* represents the 35 inhalation valve opening towards the mouthpiece *n,* and *k* the exhalation valve opening towards the atmosphere on the top or side of the tube *h, h.* The valves *j* and *k* may be flat or spherical or of other shapes, and various contrivances may be used to effect the same purpose, the principle being so to

Poole's Method of producing Etherisation.

arrange the valves or contrivances as to allow the passage of vapour and air from the vessel A to the lungs preventing the entrance of free atmospheric air into the lungs, and to prevent the return of exhaled vapour and air into the vessel A, allowing its passage into the atmosphere. The inhalation valve *j* 5 may be in the tube or opening *b*, by which the vessel A communicates with the atmosphere; and, as in Figure 3, the exhalation valve *k* may be in or upon a separate short pipe or tube *p*, proceeding from the mouthpiece *n*, or the valve *k* may be upon the mouthpiece *n*. The mouthpiece *n* may be enlarged so as to include the nostrils of the patient, or it may consist of a large tube of 10 glass or other material, flattened so as to suit the shape of the mouth of the patient, and provided with a flange *q*, as in Figure 4, or with a pad or cushion *r*, as in Figure 5, to press against the lips of the patient, and thereby prevent the entrance of air directly from the atmosphere to the lungs. By means of a simple contrivance analogous to the mouthpiece, 15 the patient may, if desirable, be made to respire through the apparatus by way of the nostrils exclusively. A communication may be made with the atmosphere by means of an orifice, which may be closed by a slide, valve, tap, or otherwise, in any part of the apparatus between the vessel A and the mouthpiece *n*, so that the operator may, at his discretion, 20 admit free atmospheric air directly to the lungs of the patient through the mouthpiece without removing the apparatus from the mouth of the patient. The vessel A, Figure 1, may be provided with a smaller vessel serving as a reservoir containing a quantity of ether, which reservoir placed over the vessel A, and communicating with it by a tube, may, by means of a valve, tap, 25 pneumatic pressure, or other contrivance, supply fresh ether for evaporation, in jets or otherwise, as it may be wanted. The operator should carefully notice the temperature of the apartment in which the apparatus is used; and the temperature of the apparatus for the evaporation of liquid ether increases very rapidly with the increase of temperature. It is recommended that the tempe- 30 rature of the apartment and of the apparatus should be about sixty-five or seventy degrees Fahrenheit, at which temperature the air inhaled through the apparatus above described is found to be mixed with about an equal quantity of ether vapour. The operator having opened the stopcocks or taps of the apparatus, and having applied the mouthpiece to the opened lips of the patient, 35 so that the patient can breathe easily through the apparatus, should take care that no unmixed atmospheric air enters the lungs of the patient while inhaling either by the sides of the mouthpiece or through the nostrils. The nostrils should be closed by the fingers of a discreet person, and during the administration of the ether vapour the countenance of the patient should be watched.

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Should the patient feel an irresistible propensity to cough, which sometimes is the case at the commencement of inhalation, the nostrils may be momentarily released, or the apparatus removed for an instant without harm, though, inhalation once having been commenced, it is best to proceed to complete etherisation with as little interruption as possible. The quantity of ether requisite to induce a state of etherisation very rarely, if ever, exceeds two ounces; generally a much smaller quantity suffices; in some cases less than a drachm will effect the purpose. Various aromatic or narcotic vapours may for special purposes be administered in small proportion, in combination with the vapour of ether, without interfering materially with the process of etherisation. As ether vapour employed as above described is a medical agent of great power, it is evident that no one but a member of the medical and surgical profession, or a person properly instructed, should in ordinary cases venture to administer it. It is impossible to define the limits within which etherisation may be advantageously employed in medicine and surgery. Whenever it is desired to induce a state of insensibility to pain, or of relaxation or quiescence of the muscles of voluntary motion, or of mental unconsciousness, or of artificial sleep, the physician or surgeon, being determined by the peculiar circumstances of each case, will decide as to the suitability of etherisation. The Inventors have named the process of etherisation "the Lethéon," and call the apparatus "Letheonic Apparatus."

Having thus described the nature of the Invention, and the manner of putting it into operation, it is not claimed that any one of the parts employed in this invention, taken singly, is new. There is novelty neither in the manufacture nor in the preparation of the ether employed, nor in the simple principle of the administration of the vapour of ether to the lungs, nor in the use of apparatus for the inhalation of vapours, nor in any one of the essential parts of a good letheonic apparatus, taken alone. The invention is one of novel combinations, proportions, and methods, as the novelty of the results obtained unequivocally attests.

First, I claim the so combining the vapour of ethers as herein mentioned with atmospheric air, together with a porous material or apparatus with a tubular mouth or nose piece, that the vapour and air may be administered to the lungs of a person in such manner as to obtain to the person insensibility to physical pain, for medical or surgical purposes.

Secondly, in respect to apparatus, having in the above description explained four important particulars among the parts or conditions of means and apparatus for administering vapour with atmospheric air to the lungs, namely:—First, sponge, cloth, or other porous material offering a large evaporating

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surface, and permeable to air. Second, a mouth piece or other contrivance, so adapted to the breathing passages of the head as that a person in a state of unconsciousness, the nostrils being closed, or included under the contrivance, would necessarily breathe through the apparatus. Third, a sectional dimension
5 or bore of air passages in their whole course from the atmosphere through the apparatus to the mouth or nostrils of the patient equivalent in size to a circle of not less than five sixteenths of an inch in diameter. Fourth, a system of inhalation and exhalation valves or contrivances so arranged as to compel the expulsion of vapour once inhaled into the atmosphere, either without returning
10 into the vessel generating or containing the ether, or returning in part into that vessel without passing through it to the atmosphere.

I claim as the second part of my Invention the making or combining of means and instruments as follows:—

I claim the combining of apparatus generally which shall possess the four
15 particulars above mentioned, or any three of them together.

I also claim the combination of the first-mentioned particular with any one of the other three particulars.

I also claim the combination of the second-mentioned particular with the fourth-mentioned particular. And

20 I also claim the combination of the third-mentioned particular with the fourth-mentioned particular.

In witness whereof, I, the said Moses Poole, have hereunto set my hand and seal, this Eighteenth day of June, in the year of our Lord One thousand eight hundred and forty-seven.

25

MOSES (L.S.) POOLE.

AND BE IT REMEMBERED, that on the Eighteenth day of June, in the year of our Lord 1847, the aforesaid Moses Poole came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written.

30 And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Enrolled the Twenty-first day of June, in the year of our Lord One thousand eight hundred and forty-seven.

ROSE.

LONDON :

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Printers to the Queen's most Excellent Majesty. 1857.

in permeable to air. Second, a mouth piece or other contrivance so
 the breathing passages of the head as that a person in a state of
 as the mouth being closed or included under the contrivance,
 readily breathe through the apparatus. Third, a sectional diaphragm
 air passages in their whole course from the atmosphere through the
 to the mouth or nostrils of the patient equivalent in size to a circle of
 an sixteenth of an inch in diameter. Fourth, a system of im-
 exhaust valves or contrivances so arranged as to compel the
 of vapour once inhaled into the atmosphere, either without returning
 vessel containing or containing the ether, or returning in part into
 without passing through it to the atmosphere.

as the second part of my invention the making or composing of
 instruments as follows:—

the combining of apparatus generally which shall possess the four
 above mentioned, or any three of them together.

that the combination of the first-mentioned particular with any one
 or three particulars.

than the combination of the second-mentioned particular with the
 second particular. And

than the combination of the third-mentioned particular with the
 second particular.

than whereof, I, the said Moses Foot, have deposited my
 and seal, this eighteenth day of June, in the year of our Lord

one thousand eight hundred and forty-seven.

MOSES (L.S.) FOOT.

IT IS REMEMBERED, that on the eighteenth day of June, in the
 year 1847, the aforesaid Moses Foot came before our said High

Court in Her Majesty and acknowledged the specification aforesaid,
 and every thing therein contained and specified, in form above written.

The specification aforesaid was stamped according to the tenor of
 the Statute in that behalf made, as follows:—

That the Twenty-first day of June, in the year of our Lord One
 thousand eight hundred and forty-seven,

the said Moses Foot, did deposit in our said High Court, a certain
 specification in writing, in and to the effect following, to wit:—

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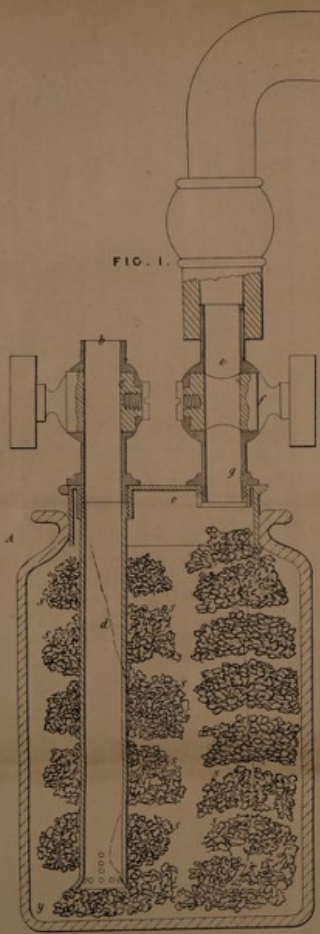
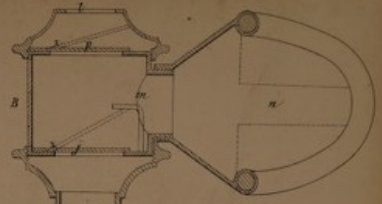
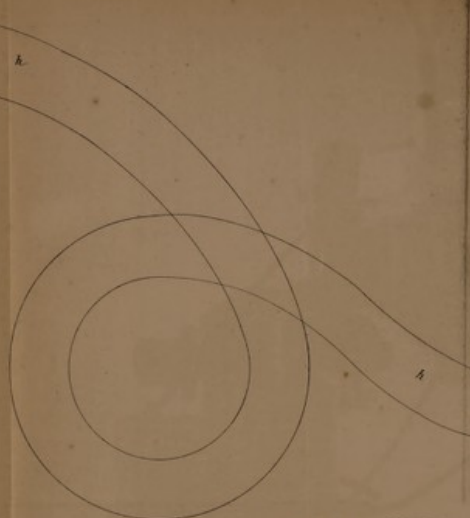


FIG. 1.



Sectional Plan of
Apparatus B

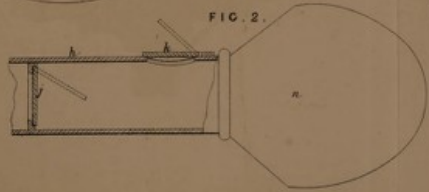


FIG. 2.



FIG. 4.

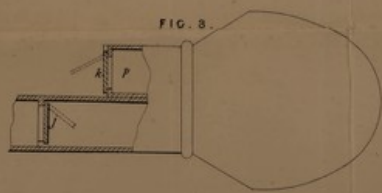


FIG. 3.

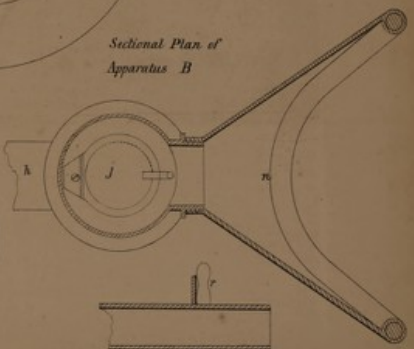


FIG. 5.

Enrolled drawing is colored.

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