

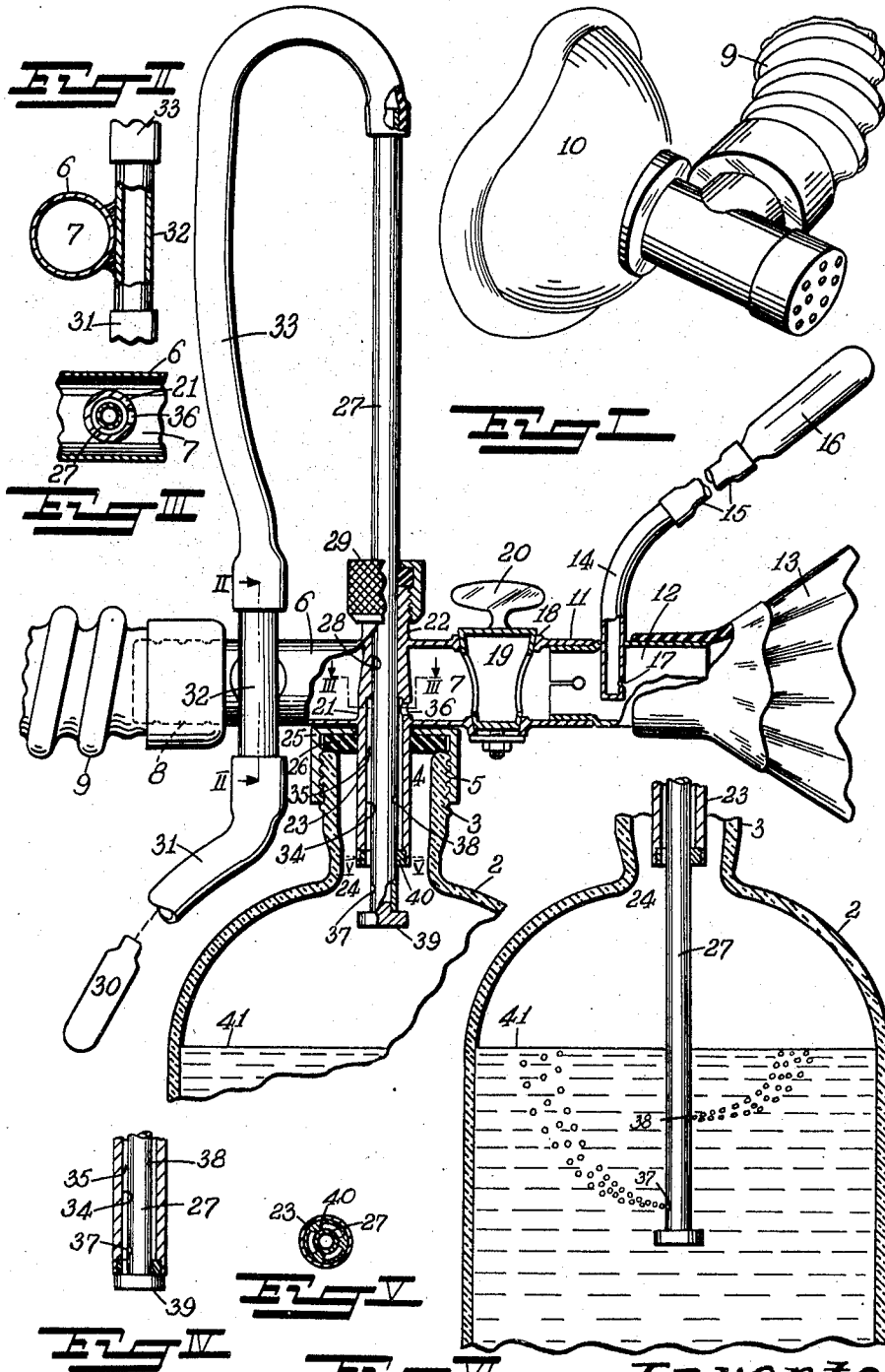
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ANESTHETIC APPARATUS

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ANESTHETIC APPARATUS

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10 Claims. (Cl. 128—188)

This invention relates to anesthetic apparatus for the production of a mixture of a respirable gas, such as oxygen, with the vapour of a readily vaporizable anesthetic liquid, such as ether, said apparatus being of the kind in which at least a proportion of the oxygen supplied to it is caused to pass into the cavity of a container, such as a screw neck bottle, on which the body of the apparatus is mounted as by means of a screw cap and which contains the liquid ether. Thereby such oxygen acquires a charge of the vapour and is then led through the body to a passage of the body to which any undiverted portion of the oxygen supply is also led and from which the mixture is conducted to the patient. Provision is made for variably controlling the ether concentration of the mixture; including means for directing the gas that passes into the container either through the vapour space of the latter above the liquid therein or through the liquid itself; the ether concentration in the latter case being greater than in the former case.

In the apparatus of this kind heretofore generally used, the ether concentration of the mixture administered to the patient is regulated by two control means. One such control means is an adjustable diverting valve which varies the proportion of the supplied gas that is diverted into the bottle. The gas thus diverted is led into the bottle cavity through a pipe having an upturned delivery end which is always above the level of the liquid in the bottle and so normally delivers the gas into the vapour space of the bottle. A rod slidable vertically through the screw cap carries at its lower end a bell, which, by lowering of the rod, can be brought over the upturned end of the pipe and with its lip submerged in the liquid, so that the gas from the pipe is caused to bubble through the liquid. The simultaneous adjustment of these two controls requires skill, especially to produce the desirable gradual increase of the ether concentration in the final out-flowing gas; and it is possible so to set the controls that they fail to co-operate.

The principal object of the invention is to provide apparatus of the kind described which is simpler in construction and operation than that heretofore used and which in particular facilitates gradual variation of the ether concentration. A further object of the invention is to provide apparatus that can be screwed onto the standard bottle in which ether is packed by the manufacturer; so that the ether can be used from the standard bottle in which it is received and without pouring it from one bottle to another.

According to the invention, apparatus of the general kind hereinbefore described, is characterized by a control member adapted to convey the gas from an outside source into the container when the latter is connected to the body, said member being supported adjustably by the body to vary the depth in such container of the delivery of the gas from said member. Such member is conveniently a plain dip tube that slides vertically along its own axis. According further to the invention the member such as the dip tube is arranged to co-operate with a part of the body structure, such as a sleeve, to act as a valve by which the flow of gas through the container can be started and stopped.

An example of the invention suitable for the production and administration of an ether-oxygen mixture is shown in the accompanying drawing in which:

Figure I is an elevation of the complete apparatus mounted on an ether bottle, parts being shown in section.

Figure II is a vertical cross-section on II—II, Figure I.

Figure III is a horizontal cross-section on III—III, Figure I.

Figure IV shows the lower end of the dip tube in its fully raised and closed position.

Figure V is a horizontal cross section on V—V, Figure I.

Figure VI shows the lower end of the dip tube immersed in the liquid ether in the bottle.

In the drawing 2 indicates a standard ether bottle, the neck 3 of which, around the mouth 4, is formed with the screw thread 5 that is standard for such bottles.

The apparatus comprises the tubular body 6 providing a passage 7 into which the gas mixture passes from the bottle. At one end of the passage 7 the body is formed with annular serrations 8 for the attachment to it of the flexible suction hose 9 connecting it to the face mask 10. At the other end it is formed at 11 for the removable attachment of the ferrule 12 to which the flexible re-breather bag 13 is secured. Said ferrule 12 further comprises a tubular inlet 14 for attachment of a flexible tube 15 to which, in turn, there may be attached an ampoule 16 containing ethyl chloride when that agent is to be used. Said inlet 14 passes within the bore of the ferrule which forms a continuation of the passage 7; and its aperture 17 is in the usual way directed towards the re-breather bag 13 so that the vapour expelled with some violence from the ampoule is directed first into said bag. Near

to the end 11, the body is shaped at 18 to form the body of a plug cock, the plug of which is indicated by 19. 20 is a handle for turning said plug, so that the cock may be closed to shut that end of the passage when the re-breather bag is not required for use.

The body 6 comprises a sleeve 21 extending transversely through the passage 7, and above and below it at 22 and 23 respectively. Portion 23 of the sleeve projects into the cavity 24 of the bottle 2 when the apparatus is mounted on the latter. The screw cap 25 for securing the apparatus to the bottle is slipped loosely on the sleeve portion 23; and is there retained by the gasket 26 which is removably secured to said portion 23 as by being retained frictionally thereon. Said gasket makes a sealed joint between itself and the sleeve portion 23, and also between the cap 25 and the bottle 2.

The dip tube is indicated by 27 and passes through the sleeve 21. The sleeve 21 has two bores including the upper bore 28 in which the dip tube is a sliding fit so that the upper portion of the sleeve functions as a support and guide for the dip tube. A stuffing box 29 on the upper end 22 of the sleeve serves the double purpose of preventing leakage of ether vapour from the bottle to the open air, and of frictionally retaining the dip tube at any position to which it is vertically adjusted.

The dip tube 27 is supplied with oxygen from a source 30, through the flexible tube 31 connecting the source 30 to an anchoring part consisting of a short length 32 of open tube soldered to the body. From said tube 32 another flexible tube 33 extends to the upper end of the dip tube 27.

The lower bore 34 of the sleeve is sufficiently larger in diameter than the dip tube to leave between them an annular passage 35, which is put into constant communication with the passage 7 by the aperture 36.

The wall of the dip tube is perforated towards its lower end by one or more holes. Conveniently there are two such holes, viz., a lower hole 37 and an upper hole 38 spaced well above the lower hole. The lower extremity of the tube bore is closed and formed as a head 39 that acts as a stop to limit the upward movement of the dip tube; and acts also as a valve member to close the lower end of the bore 34 when the dip tube is drawn up to its highest position. The dip tube is steadied in the lower end of the sleeve portion 23 by the spider 40.

The apparatus may be used in the following manner. The re-breather bag 13 is fitted or not according to well known considerations and the cock 19, 20 open or closed correspondingly. Similarly the anesthetizing is started with or without a preliminary administration of ethyl chloride. The dip tube 27 is initially raised fully as shown in Figure IV, and at the proper time the supply of oxygen is started. At first the oxygen flows from the holes 37, 38 into the annular passage 35 and through the aperture 36 into the passage 7, without picking up ether. The dip tube 27 is now gradually lowered, the first result of which is that the head 39 opens the lower end of the dip tube bore 34, permitting a proportion of the oxygen flow to pass through the portion of the bottle cavity 24 that is above the liquid therein and that contains ether vapour, before flowing up the passage 35 into passage 7. As the dip tube is further lowered, the lower hole 27 clears the lower end of the sleeve so that the jet of gas

flowing with some force is projected directly into the vapour space 24, resulting in more ether vapour being picked up by the gas before it enters passage 7. Further steps of increase of ether concentration result from the second hole 38 being similarly exposed: hole 37 being submerged in the liquid ether 41 and the gas ejected from said hole bubbling through the liquid; and, finally, the second hole 38 also being submerged and the ether concentration then reaching its maximum. The supply of ether vapour is terminated by raising the dip tube again to its highest position.

In the earlier apparatus described above, the means for forcing the gas beneath the liquid surface, comprising the pipe with the upturned end and the dipping bell, occupied an area of considerably greater diameter than that of the neck of the standard ether bottle; and it was customary to make the screw cap 25 to fit the screwed mouth of a honey jar, into which the ether was poured from the standard ether bottles in which it is supplied. The provision according to the invention of the small diameter dip tube 27 as the sole dipping member enables the screw cap to be made small enough to fit the screw-threaded neck of the standard ether bottle.

I claim:

1. Anesthetic apparatus comprising a body providing a passage for vapour-charged gas, means for securing the body to the mouth of a container for readily vaporizable anesthetic liquid, an adjustable member for conveying gas from an external source into a container so connected, and a sleeve extending through the passage and beyond the latter at each side thereof, said sleeve forming a guide for the adjustable member and providing an annular passage between itself and said member for the passage of vapor-charged gas from the container to the passage, the lower end of the member being perforated and there being a flexible gas connection to the upper end of the member.

2. The subject-matter of claim 1, in which the adjustable member is a dip tube slidable vertically through the body and apertured at its lower end.

3. The subject-matter of claim 1, in which the body structure and the adjustable member are arranged as the fixed and movable elements respectively of a valve adapted to control the flow of the gas from the adjustable member into the container space.

4. Anesthetic apparatus comprising a body providing a passage for vapour-charged gas, means for securing the body to the mouth of a container for readily vaporizable anesthetic liquid, a sleeve carried by said body for putting the passage into communication with the interior of a container so connected, and a dip tube for conveying gas from an external source into a container so connected, said dip tube being apertured at its lower end and slidable vertically through the sleeve to vary the depth in such container of the delivery of said gas from said member, said sleeve and said dip tube being arranged as the fixed and movable elements respectively of a valve adapted to control the flow of the gas from the dip tube into the container space.

5. Anesthetic apparatus comprising a body providing a passage for vapour-charged gas, means for securing the body to the mouth of a container for readily vaporizable anesthetic liquid, the body structure providing means for putting the passage into communication with the interior of a container so connected, and a dip

tube for conveying gas from an external source into a container so connected, said dip tube being apertured at its lower end and slidable vertically through the body to vary the depth in such container of the delivery of said gas from said member, said body structure and said dip tube being arranged as the fixed and movable elements respectively of a valve adapted to control the flow of the gas from the dip tube into the container space, in which the body structure comprises a sleeve extending through the passage and beyond the latter at each side thereof, said sleeve forming a guide for the adjustable dip tube and providing an annular passage between itself and said dip tube for the passage of vapour-charged gas from the container to the passage, the lower end of the dip tube being perforated and there being provided a flexible gas connection to the upper end of said dip tube.

6. The apparatus claimed in claim 5, in which the lower end of the tube is formed with a head that closes the lower end of the sleeve when the tube is raised.

7. The apparatus claimed in claim 4, in which the sleeve extends upward from the body and is there fitted with an adjustable gland suitable to form a seal between the tube and the sleeve and to clamp the tube in the desired vertical position.

8. The apparatus claimed in claim 4, in which the sleeve extends upward from the body and is there fitted with an adjustable gland suitable to form a seal between the tube and the sleeve and to clamp the tube in the desired vertical position, and in which the dip tube is formed with a head that closes the lower end of the sleeve when the dip tube is raised.

9. The apparatus claimed in claim 4, in which the body is formed for the attachment, at one end of the passage of flexible hose through which the anesthetic mixture is conveyed to the patient, and at another point for the detachable connection of a re-breather bag to the passage, and comprising adjustable means for closing that part of the passage leading to the re-breather bag.

10. The apparatus claimed in claim 4, in which the body is formed for the attachment, at one end of the passage, of flexible hose through which the anesthetic mixture is conveyed to the patient, and comprising as a removable fitting for the end of the passage opposite to that at which the flexible hose is attached, a connection for the re-breather bag and a connection for an ampoule.

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