July 25, 1944. R. V. FOREGGER 2,354,452

ANESTHETIC APPARATUS

Filed Sept. 3, 1942 2 Sheets-Sheet 1

FIG. 2

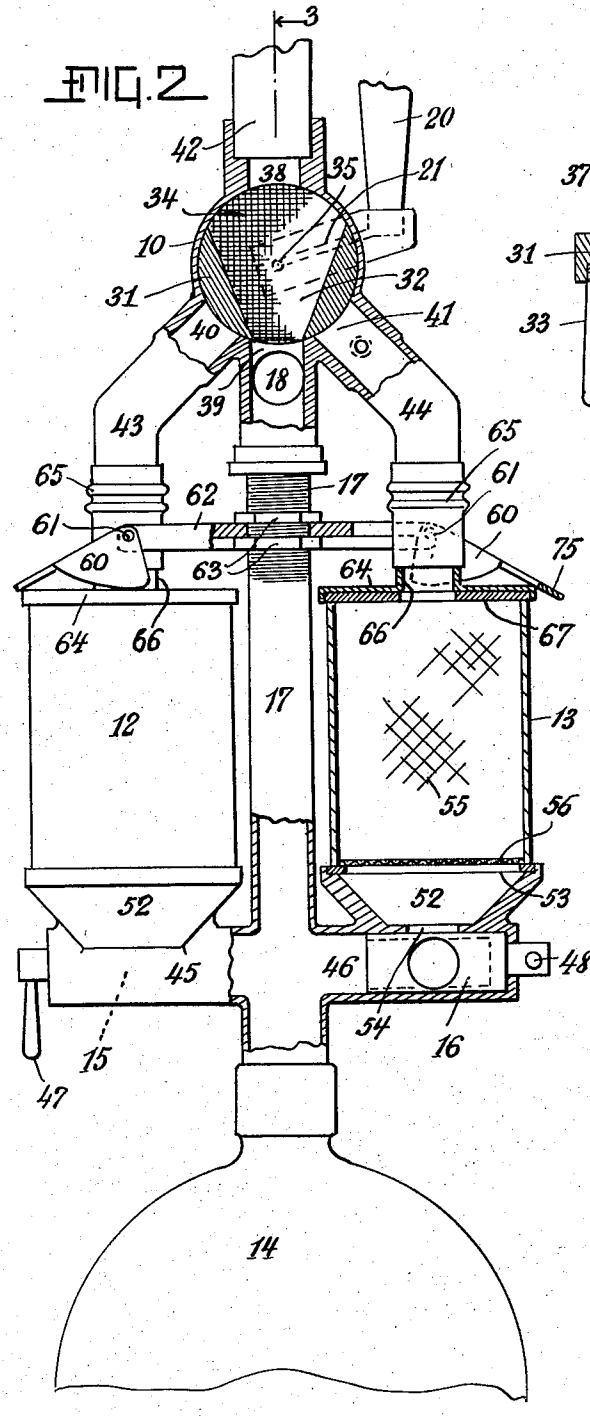
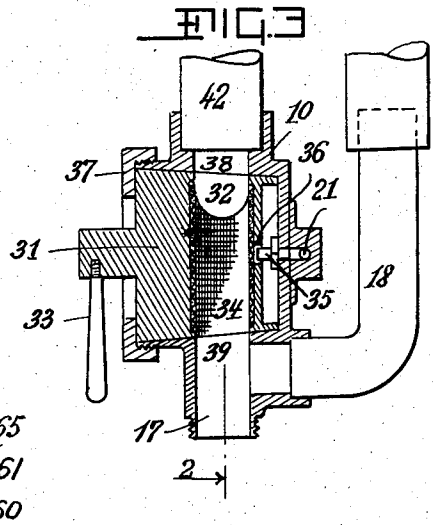


FIG. 3



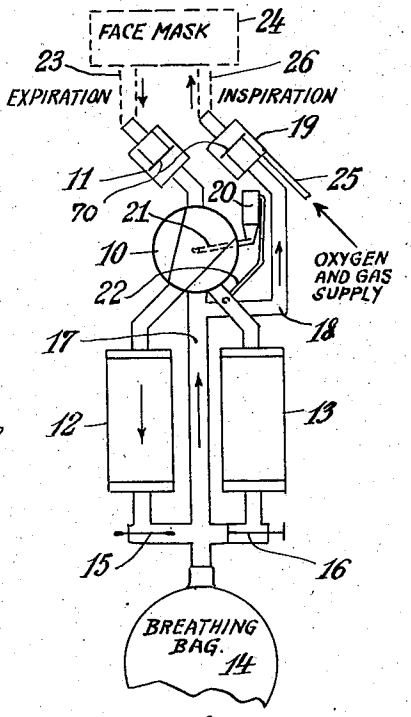


FIG. 1

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Filed Sept. 3, 1942 2 Sheets-Sheet 2

FIG 4

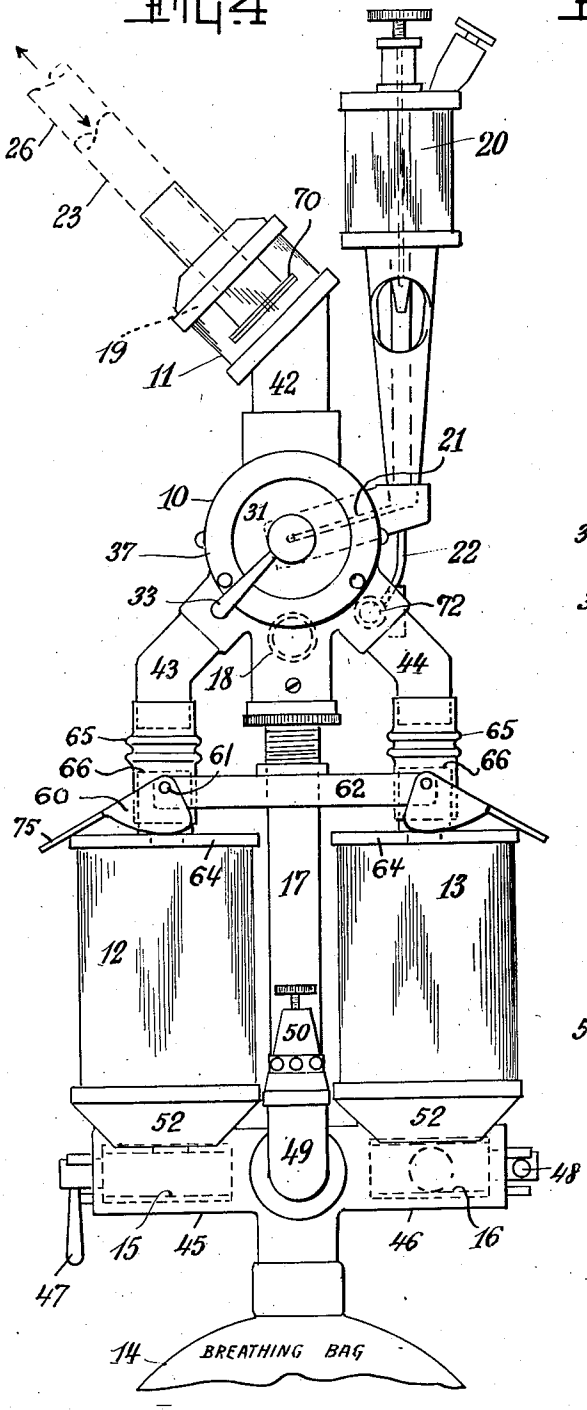
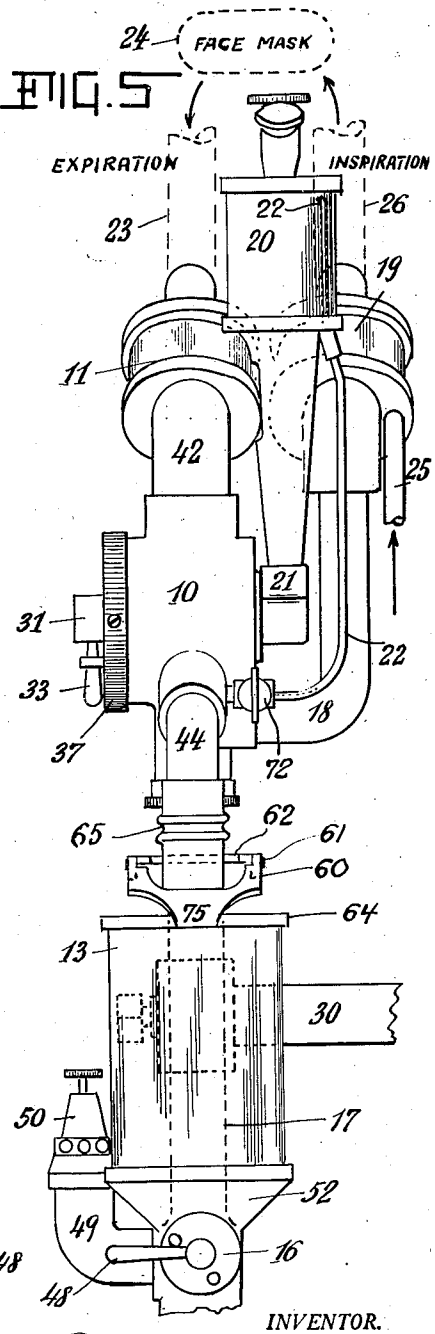


FIG 5



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UNITED STATES PATENT OFFICE

2,354,452

ANESTHETIC APPARATUS

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Application September 3, 1942, Serial No. 457,120

3 Claims. (Cl. 128—202)

The object of this invention is to provide a generally improved anesthetic apparatus of the type disclosed in my U. S. Patent 2,041,406, May 19, 1936, which shows a closed circle breathing apparatus for carbon dioxide absorption. In that apparatus the development of heat of reaction in the soda lime canister as well as the possibility of early exhaustion of the absorbing capacity of the soda lime during an operation due to specific toxic conditions in the patients' expiration were found to be disadvantageous. Soda lime has the property of recuperation when at rest and in order to take advantage of this fact and eliminate the disadvantages referred to above, the present invention provides two—instead of only one—soda lime canisters in the apparatus together with novel means for easily and quickly including either one of them in the breathing circuit and excluding the other canister, which can then be changed. It is thought that this feature is broadly novel together with the use of transparent soda lime canisters whereby the use of a novel soda lime called "indicative" is made possible and practical. Such indicative soda lime changes its color when approaching the stage of saturation with CO_2, see Anestheciology, vol. 2, No. 1, page 13, January 1941. Other features and objects of the invention are a more compact, simple and easily operated apparatus including improved valve mechanisms for controlling the operation. Accordingly my invention is embodied in an anesthetic apparatus arranged and constructed as hereinafter described and as illustrated in the accompanying drawings in which

Fig. 1 is a diagram of the apparatus.

Fig. 2 is a front view of the valve mechanisms and soda lime canisters, with parts broken away and with parts in section on the line 2 of Fig. 3.

Fig. 3 is a sectional view of the three way valve taken on the line 3 in Fig. 2.

Fig. 4 is a front view of the apparatus with parts broken away.

Fig. 5 is a right side view of the apparatus with parts broken away.

Referring first to the diagram in Fig. 1 the apparatus comprises a centrally disposed three way valve 10 having its inlet side connected to the expiration flutter valve 11 and two outlet ports connected to the two soda lime canisters 12 and 13. The latter are at their bottoms connected with the breathing bag 14 by way of cut off valves 15 and 16 respectively. From the breathing bag a to and fro breathing tube 17 and a connection 18 lead up to the inspiration flutter valve 19. The tube 17 is also directly connected with the valve 10. The numeral 20 denotes an ether supply cup which connects with the valve 10 through a connection 21 and a pressure equalizing tube 22 also leads from the cup 20 to a point in the breathing circuit below the valve 10. The two flutter valves are connected in the usual manner by tubes 23 and 26 with the face mask 24. These parts are indicated in dotted lines. The gas and oxygen are supplied to the inspiration side of the circuit at 25. In the diagram the flutter valves are drawn in offset relation for the sake of clearness. The cut off valve 15 is shown open, the other valve 16 is shown closed.

During an anesthesia the inspiration circuit is from the breathing bag 14, through the tube 17 and connection 18 to the inspiration flutter valve 19 and the face mask. Fresh supply of gas and oxygen through the tube 25 mixes with the inhaled supply only after the latter has passed through the flutter valve 19. The expiration circuit is from the face mask to the expiration flutter valve 11, through the valve 10 to the canister 12, through the soda lime therein and through the open valve 15 to the breathing bag. During the operation ether may be supplied to the breathing circuit from the cup 20 and is vaporized in the valve 10. When it is desired to change the soda lime during the operation it may be done by merely operating the valve 10 to exclude the canister 12 and include the canister 13 in the circuit. A canister may be removed from the apparatus by first closing the cut off valve below such canister. Straight to and fro breathing without the soda lime is provided for through the tube 17 by placing the valve 10 in central position.

Referring now to the other figures of the drawings the anesthetic apparatus is supported on an arm 30, Fig. 5, which may be part of an anesthetic or operating table or the like. The centrally disposed breathing tube 17 is adjustably carried by the arm 30 as shown. At the top the tube 17 is connected to and carries the three way valve 10. The latter has a conical valve plug 31 with a through port 32 and an operating handle 33. The port is lined with a screen 34 which fits the walls of the port and serves to break up the ether vapors entering the valve to facilitate vaporization. The connection 21 from the ether cup 20 communicates with the valve port by way of a short tube 35, the port having a central opening 36 to admit the tube, Fig. 3. A ring 37 secures the valve plug in the valve. The latter has four ports marked 38 to 41 inclusive. The upper central port 38 leads to the expiration flutter

valve 11 by way of a tube 42. The lower central port 39 connects with the breathing tube 17. Port 40 leads to a tube 43 which connects with the canister 12 and port 41 connects with a tube 44 which leads to the other canister 13. The connection 18 from the inspiration flutter valve 19 connects with the tube 17 directly below the valve 10 as shown. The tube 17 connects at its bottom above the breathing bag with two lateral branch tubes 45 and 46 which contain the cut off valves 15 and 16 respectively having valve handles 47 and 48. Forwardly of the tube 17, Figs. 4 and 5, the latter connects via a branch pipe 49 with a respiratory valve 50 above the bag 14.

Each of the lateral pipes 45 and 46 has formed in its upper wall a canister seat 52 provided with a rubber gasket 53. The communicating port from the cup to the pipe is controlled by the cut off valve underneath. The canisters are transparent cylinders 12 and 13. They may be made of a transparent plastic, for instance. The top of the canister is open to receive the soda lime crystals and the bottom of the canister cylinder consists of a screen 56 to support the crystals while admitting the passage of air as will be understood. The canisters are held in airtight relation upon the gaskets 53 by covers 64 under pressure by cams 60 pivoted at 61 upon a cross bracket 62 adjustably secured to the tube 17 by nuts 63. The cams engage the covers 64 which are suspended from the tubes 43 and 44 by axially telescopic rubber nipples 65, 65 carried by the tubes 43 and 44 to connect them with upstanding nipples 66 on the covers 64, Fig. 4. The nipples 66 open into the covers through rubber gaskets 67 therein. When it is desired to remove a canister the cam 60 above it is swung upward to release the cover. Then the operator grasps the canister and lifts it and the cover a distance sufficient to permit the canister to be released from its seat. The lifting movement is made possible by the telescoping of the rubber nipple as will be understood. When the canister has been removed the cover hangs suspended from the rubber nipple. When the canister is replaced the cam is swung down upon the cover and presses the rubber gasket 67 airtightly against the upper edge of the canister and at the same time presses the bottom edge of the canister airtightly against the gasket 53. The cams are operated by finger grips 75, the telescopic tube being automatically extended during this movement.

The flutter valves are rubber valves 70 contained within transparent valve cages 11 and 12. The valves 70 open only in the direction of the breathing circuit as is known. In the inspiration flutter valve 19 the supply tube 25 communicates with the inspiration breathing circuit outside the rubber valve 70 as indicated in Fig. 1. The thin tube 22 from the ether cup 20 leads from above the level of the ether to one of the breathing channels in this case the tube 44, Fig. 4, through a pet cock 72. The tube serves the purpose of establishing uniform pressure above and below the valve 10. The pet cock is open only when ether is supplied. The ether vaporizes quickly in the valve 10 by means of the screen 34 and due to the rise in temperature caused by the reaction of exhaling.

When the port 32 in the valve 10 is in its central position, Fig. 2, it connects the face mask directly with the bag 14 via the tube 17 for to and fro breathing without soda lime. When the valve is turned to align the ports 32 and 40, left side in Fig. 2, the canister 12 is included in the circuit on the expiration side and the canister 13 is automatically excluded from the circuit. When the valve 10 is turned to align the ports 32 and 41, right side in Fig. 2, the canister 12 is excluded and the canister 13 is automatically included in the circuit.

The cut off valves 15 and 16 are always open except when a canister is to be replaced or left in position to recuperate. When the canister 12 is to be replaced the valve 15 is closed and opened after a fresh canister has been inserted in the circuit and likewise valve 16 is closed when the canister 13 is to be replaced.

The canisters are transparent and the operator can thus observe when the color of the soda lime changes during an operation. He is thus warned and can switch from one canister to the other without interrupting the anesthesia. Having switched to a fresh canister, the other one may be removed and a fresh one inserted. Thus a continuous supply is assured. The respiratory valve 50 is opened to eliminate excess carbon dioxide or oxygen or to change the mixture in the breathing bag. The apparatus is compactly and efficiently designed and constructed with all parts in plain view and easily accessible.

I claim:

1. In an anesthetic apparatus, a unit of the character described comprising a vertically disposed breathing tube, alined horizontal breathing tubes extending from said vertical tube to both sides thereof in communication therewith, an apertured container supporting seat on each of said horizontal tubes and communicating therewith, a valve mechanism at the top of said vertical tube, telescopic connections extending from said valve mechanism in vertical alinement with said horizontal tubes, apertured container covers suspended from the ends of said telescopic tubes, a container for absorber material placed upon each container supporting seat and cover closing means for airtightly closing said covers on said containers and connecting the latter airtightly with said horizontal tubes upon said seats, said valve mechanism controlling the passages through all of said flexible tubes and said containers.

2. In an anesthetic apparatus according to claim 1 in which said containers are transparent for the purpose described.

3. In an anesthetic apparatus according to claim 1 including a cut off valve in each of said horizontal tubes between the containers and said vertical tube for closing the passage between the latter and the containers.

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