Nov. 23, 1937. K. CONNELL 2,099,841

APPARATUS FOR THE ADMINISTRATION OF GASES

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Fig. 1

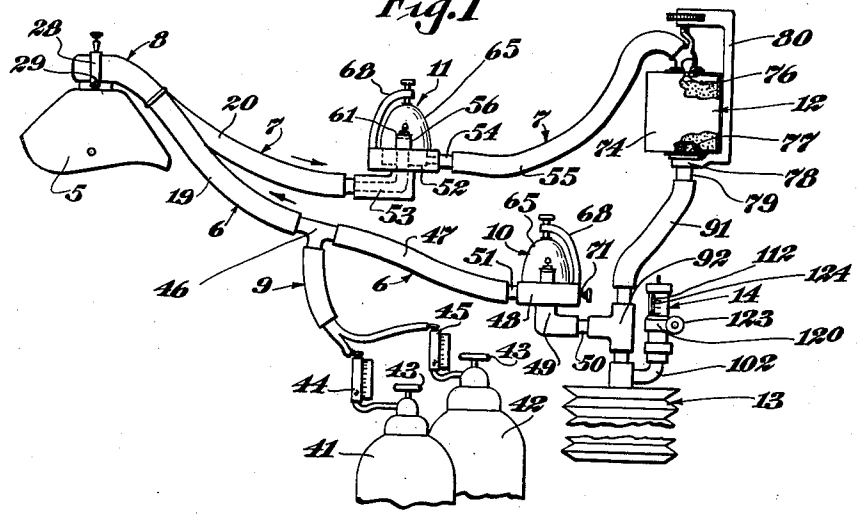


Fig. 2

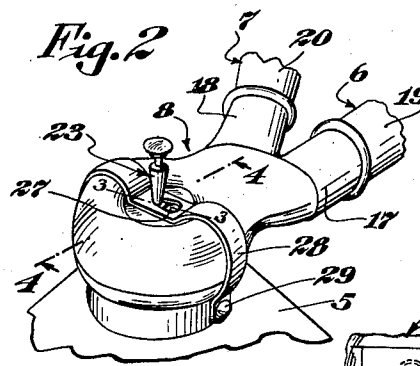
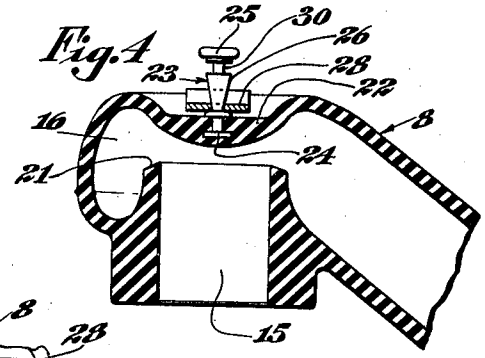


Fig. 4



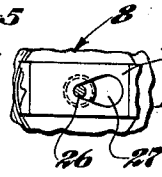


Fig. 3

Fig. 6

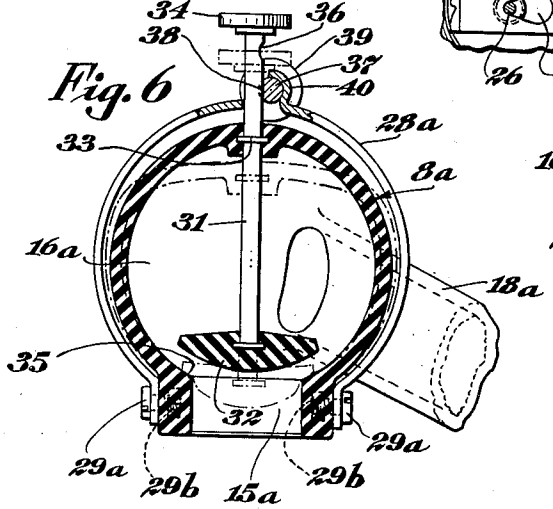
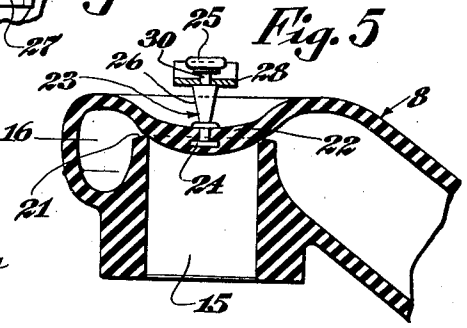


Fig. 5



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Fig. 7

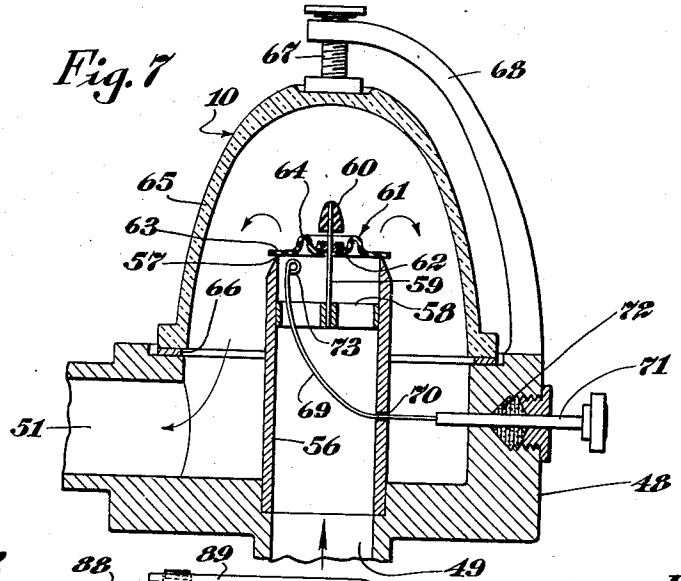


Fig. 8

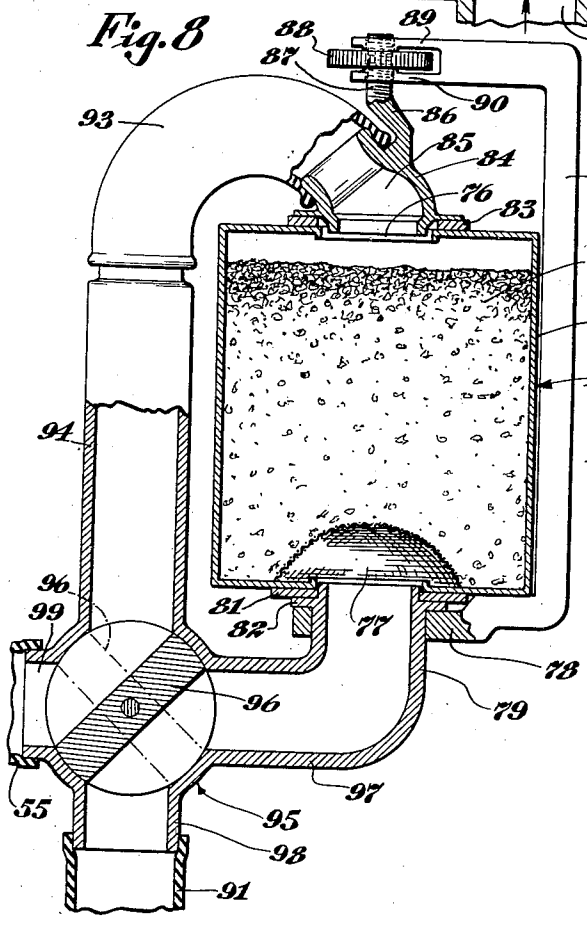
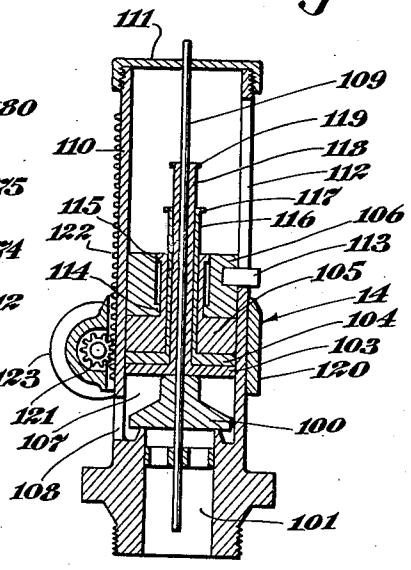


Fig. 9



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Patented Nov. 23, 1937 2,099,841

UNITED STATES PATENT OFFICE

2,099,841

APPARATUS FOR THE ADMINISTRATION OF GASES

Karl Connell, Branch, N. Y.

Application September 5, 1936, Serial No. 99,588

19 Claims. (Cl. 128—191)

This invention relates to apparatus for the administration of gases, such for instance as utilized for the administration of anesthetic mixtures and for the administration of gases for various therapeutic purposes, and embraces various correlated inventions and discoveries appertaining thereto.

An object of the invention is the provision of anesthetic apparatus and apparatus of a similar nature, which is effective in operation and simple and economical in construction, which can be operated with ease and certainty, which is adapted for use under a wide variety of conditions, and wherein the replaceable parts may be readily removed and replaced and the remaining parts will be of an enduring character.

A more specific object is the provision of an improved type of closed-circuit apparatus for the administration of anesthetic and therapeutic gases wherein satisfactory breathing conditions are maintained at all times.

A further object is the provision of apparatus which is adapted for the administration of gases and which includes various improved features of construction whereby the difficulties inherent in previous apparatus may be avoided.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a side view of a form of apparatus embodying the invention;

Fig. 2 is a certain enlarged perspective view of the connection to the breathing mask;

Fig. 3 is a further enlarged fragmentary horizontal sectional view along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged vertical sectional view along the line 4—4 of Fig. 2;

Fig. 5 is a view similar to Fig. 4 showing the shut-off mechanism in operative position;

Fig. 6 is a sectional vertical view of a modified form of connection;

Fig. 7 is an enlarged vertical sectional view of one of the flow-control means;

Fig. 8 is a vertical sectional view showing the absorption unit and the mounting therefor and includes a showing of a modified conduit arrangement; and

Fig. 9 is an enlarged vertical sectional view of the exhaust control means.

In the administration of anesthesia great economies are effected by the use of anesthetic apparatus having a closed circuit, so that such of the anesthetic gas as is exhaled is not dissipated into the atmosphere but is re-inhaled by the patient. Anesthetic apparatus of this character, however, must be particularly designed to insure safety and effectiveness of operation, and must be accurately controllable at all times to assure proper administration of gases. Simplicity of construction and ease of operation are also highly important factors. Moreover, in order to eliminate the carbon dioxide, which forms during the breathing, it is desirable that absorption means for the carbon dioxide be inserted in the circuit. There are conditions, however, wherein it is desirable that there be an extra percentage of carbon dioxide in the inhaled gas since this stimulates breathing, and the provision of means for omitting the absorption means from the circuit is desirable. In any type of apparatus for the administration of gases, moreover, it is highly desirable that complexity in the gas shut-off means be avoided, and, in those of the closed-circuit type, that there be provided control means operating with certainty and ease, and continuing to operate satisfactorily during continued use of the apparatus.

In anesthetic and similar apparatus of the type providing for the rebreathing of gases by the circular routing of the breathed gases thru an absorbent chemical, there is preferably employed a breathing member in the form of a mask or other adapter to connect the apparatus with the respiratory tract of the patient, a conduit to lead expiration into an expansile chamber, a separate conduit for return inspiration, means to control the flow thru the conduits, a container for a substance adapted to absorb carbon dioxide, one or more sources of gas to be administered, and means to spill undesired gas from the circuit. Previous apparatus of this character has, however, been subject to various drawbacks in that the various portions used were difficult to operate, inaccurate in operation, or subject to excessive wear or deterioration; or that, for other reasons, such apparatus fell short

of the optimum in effectiveness and efficiency of operation under exacting conditions.

With the foregoing in view, the present invention contemplates the provision of various improved features whereby the character and operating qualities of apparatus for the administration of anesthetic and therapeutic gases may be enhanced. Among such features are the provision of closure means utilizable when the mask or other breathing member is not seated on the patient, which closure means is simple in operation and secure in closure; check valves which open on light pressure and close securely; check valve assemblies so formed that the character of the breath current is easily observable; simple and effective means to permit exhalation and inhalation without the gas coming into contact with an absorbent means, so that the composition of the breathing mixture may be readily controlled at will; means permitting an absorption unit to be easily and quickly replaced; and, in certain instances, means permitting the replacement of an absorption unit during operation without substantial loss of gas; and means for controlling the blow-off pressure at an exhaust valve in an accurate and predetermined manner. As will be appreciated, certain of these features may be employed without the others in certain types of apparatus, and the invention is not limited to the combination of all such features or to particular forms thereof.

In the particular form of construction exemplified in Fig. 1 there is exemplified a breathing member comprising a mask **5** of a conventional type and preferably formed of rubber, which is adapted to fit over the nose and mouth of a patient, an inhalation conduit **6** and exhalation conduit **7**, an element **8** adapted to connect the mask with the conduit, a means **9** for the introduction of anesthetic or therapeutic gases into the conduit **6**, a flow-control means **10** for the conduit **6**, a flow-control means **11** for the conduit **7**, an absorption means **12**, an expansible bag **13**, and a blow-off for exhaust means **14**.

Pursuant to the invention the connecting element **8** is formed to provide a valve body bearing an annular seat pressed into the interior walls of the valve chamber, and a movable seating member attached to, or molded into, a resilient portion of the walls of the chamber, which resilient portion is opposed to the valve seat, the movable member being susceptible of being pressed against the valve seat by manual pressure and susceptible of being held against the valve seat by external locking means and of recoil to open position on release of the locking mechanism by the resiliency inherent in the resilient portion of the chamber wall. In the form exemplified in the Figs. 1–5 the connecting element **8**, which is formed of a resilient substance such as soft rubber, is constructed to provide a passageway, comprising a passageway portion **15** communicating with the interior of the mask **5** and a main chamber **16** communicating with branch conduit portions **17** and **18** in which are fitted rubber tubes **19** and **20** forming parts of the conduits **6** and **7** respectively. At the upper end of the passageway portion **15** an annular seat **21** is formed in the rubber, and the upper resilient wall **22** of the main chamber **16** is so constructed that it will close off this passageway when thrust against the seat, but will, by its own resiliency, be normally held above the seat so as to permit free communication between the mask and the inhalation and exhalation conduits. In order to effect the closure there is provided a push-rod **23** extending into the wall portion **22** and secured therein by a base member **24** which is buried in the material of the wall portion. The push-rod is formed with a head **25** and, as will be seen, when pressure is applied to this head, as by the finger of an operator, the wall portion **22** may be thrust firmly against the seat **21** so as to effectively close off the passageway **15** and prevent escape of gases from conduits **6** and **7** until such time as the administration of gas to the patient is to be commenced. In order to retain the push-rod in an inward position there is provided a retaining mechanism which, in the present instant, is of a character which facilitates the inward thrusting of the pin. To this end the push-rod is formed with a conical portion **26**, the wider upper end of which is spaced from the head **25** by a narrower portion, and is arranged to extend thru a slot **27** in a metallic bridge member **28** which is anchored to the lower portion of the body of connector member by a pair of screws, one of which is shown at **29**, and which extend into nuts molded into said lower portion. The slot **27** is generally triangular in shape with rounded ends, the smaller end of the slot being directly above the central line of the passageway **15** and of such size as to receive the lower end of the conical portion. The wider end of the slot is of such size as to permit the upper end of the cone-shaped portion to pass therethru. Because of the divergence of the side walls of the slot and of the divergence of the walls of the push-rod at its conical portion, the upper end of the push-rod will be thrust laterally as the rod is pressed downwardly until the upper end of the conical portion has passed through the slot at which time the valve surfaces of the portions **21** and **22** will be firmly in contact, whereupon the portion **30** of the rod between the conical portion and the head will be moved by the resiliency of the top of the connector body into the narrow portion of the slot so that the lower surface of the portion **22** will be held firmly against the seat **21**. The movement of the portion **28** laterally may be manually assisted if desired. When it is desired to administer anesthesia it is merely necessary to move the rod laterally in the slot to permit the passage of the conical portion thru the wider portion of the slot; whereupon the wall portion **22** will spring upwardly by its own resiliency.

It will thus be seen that there is provided a closure means of extreme simplicity which will operate with great ease and effectiveness and wherein tendencies toward improper operation, corrosion, leakage, and sticking are minimized. As above indicated the invention in its broader aspects embraces various forms of constructions other than those particularly exemplified. In order, however, to exemplify two forms of construction embodying the important feature of utilizing the resiliency of a wall of a valve body to assure the release of a closure member thereof, there is illustrated in Fig. 6 a form of construction embodying a soft rubber connecting element **8a** having a passageway portion **15a** for connection with a breathing member, such for instance as the mask **5**. This connecting element has a main chamber **16a** forming part of the passageway thru which branch conduit portions, one of which is shown at **18a**, communicate with the mask. In this instance a push-rod **31** carrying at its lower end a closure member **32** extends thru the upper wall of the chamber **16a** and is keyed thereto at **33**. When the rod is thrust

downwardly by pressure on a head 34 the valve member 32 is pressed against a seat 35 at the upper end of the passageway portion 15. Upon release of the push-rod the resiliency of the upper wall of the chamber 16a moves the push-rod upwardly and draws the valve 32 away from the seat permitting free communication between the chamber 16a and the passageway portion 15a. In order to hold the push-rod in downward position, the latter is provided with an arcuate notch 36 adapted to be aligned with a rotatable rod 37 when the push-rod 31 is in its downward position. The rod 37 is carried by a bridge 28a which is anchored by screws 29a fitting into nuts 29b which are molded into the body of the connector. The push-rod 31 extends slideably thru the bridge 28a. The rotatable rod 37 is held in place by a bracket 40 and is formed with a vertical notch 38 adapted normally to receive the push-rod 31, but is adapted when the notch 36 is aligned therewith to be rotated by the turning of a head 39 so that a portion of its arcuate periphery will extend into the notch 36. When the push-rod 31 is to be released a rotatable rod 37 is turned until the notch 38 is aligned with the push-rod, whereupon the latter will spring upwardly.

The gas supply means 9, as exemplified, is located between the control means 10 and the connecting element 8, and comprises a plurality of tanks 41 and 42 equipped with suitable decompression valves 43 on the opening of which gas will flow thru one of a pair of flow gages 44 and 45, which may be of the character disclosed and claimed in my Patent No. 1,965,333, and thence thru suitable tubing to a connection 46 which connects the tube 19 to a rubber tube 47 also forming a part of the inhalation conduit 6.

The flow-control means 10 and 11 comprise a main mounting, a flutter-valve unit, and a transparent dome-like member affording the maximum of illumination on the flutter valve and adapted for the viewing of the operation of the flutter valve from all sides and and from above. As will be appreciated, it is of the utmost importance in anesthetic and therapeutic apparatus that the various operations take place with the greatest possible degree of ease and certainty. To this end the invention provides a free-sliding tight-seating flutter valve which will open on light pressure and close securely, and will in general operate readily and effectively. It is also important that the operations be viewed to make sure that they are properly occurring, and it is highly desirable that the operations be readily viewed regardless of the position of the operator at any given time. This ready visibility is provided by the transparent dome-like portions of the present invention, and these portions have the additional advantage that because of the large amount of illumination condensations of water vapor do not tend to obscure the view of the flutter valve, as would be the case if merely a small window were provided.

In the case of the flow-control means 10 the main mounting member 48 provides an inflow passageway 49 which is connected to a tube 50, and an outflow passageway 51 which is connected to the tube 47. In the case of the flow-control means 11 there is provided a main mounting member 52, the inflow passageway 53 of which is connected with the tube 20, and the outflow passageway 54 of which is connected to a rubber tube 55. In the case of both flow-control means a metallic tube 56 extends upwardly from the inflow passageway and terminates in a valve seat edge 57 (see Fig. 7). Each tube 56 carries a bridge member 58 which supports a guide rod 59 at the top of which is a stop 60. On each guide rod is a flutter valve 61 which is adapted to be lifted by the inflowing gas to permit gas flow therethru in one direction, but which is adapted to be pressed firmly on the seat edge 57 by even slight excess of pressure in the outlet conduit to prevent flow in the other direction. In accordance with the invention each flutter valve 61 is composed of a small central disk 62 of silver which is slidably mounted on the guide rod and about the periphery of which there is molded an inner portion of a thin disk-like member 63 composed of soft rubber. As will be observed from Fig. 7, the rubber does not extend inwardly to the guide rod, so that easy movement of the valve on the rod is assured. By the formation of the central disk of silver, or other corrosion-resistant metal, tendencies for the flutter valve to stick on the guide rod due to corrosion are avoided. In order to assure a firm, even seating of the flutter valve each of the rubber members 63 is formed with an annular corrugated portion 64 which assures a slight upward bending of the circumferential portion of the rubber, the downward pressure of which will effectuate a secure closure on all portions of the seat. Surrounding the valve unit in each case and affording easy visibility thereof both laterally and downwardly from all sides is a dome-like member 65 which may be composed of glass or other suitable transparent material, and which is movably clamped against a gasket 66 resting on the main member 48 or 52, as the case may be. As will be seen, the side wall of the dome-like member decreases in diameter upwardly. The clamping means in each instance comprises a threaded member 67 extending thru a threaded bore in a bracket 68, and preferably having a yieldable base. By unscrewing the threaded member 67 the dome-like member may be readily removed for cleaning or for the adjustment or replacement of the valve.

In usual operation it is desirable that the carbon dioxide exhaled by the patient be removed from the gas flowing thru the circuit by causing the gas to flow thru a suitable chemical in an absorbent unit such as 12. There are a number of instances, however, wherein it is desired temporarily to build up the amount of carbon dioxide expired so as to effectuate a desired therapeutic action. In such instances it is desirable that no flow occur thru the absorbent unit. Valve means may be provided to by-pass this absorbent unit, as for instance in the manner hereinafter exemplified, but in instances where such valve means are not required for other purposes it is desirable to eliminate the same because of lack of certainty of operation of such valve means in some cases, tendencies for common valve means to corrode, and additional complexity in the apparatus. In order, therefore, to provide a simple and permanently effective means for enabling breathing to continue without the passage of gas thru an absorbent unit, the flow-control means 10 is provided with means to permanently hold its flutter valve 61 open when desired. In accordance with the invention this means comprises manually operable means adapted to bear against the check valve to hold the same open, and, as exemplified, comprises a flexible wire 69 extending thru a suitably packed bore 70 in the side of the conduit 56 and connected to a plunger 71 mounted in the main member 48, packing 72

being provided to assure against leakage. By pushing the plunger 71 inwardly the upper end 73 of the wire 69 is thrust against the flutter valve 61 so that it cannot close. Accordingly, due to the resistance of the absorption unit to gas flow, all or the major fraction of the expired gas will flow thru the inspiratory conduit 6 instead of thru the expiratory conduit 7. Both expired and inspired gas will thus pass thru the inspiratory conduit as long as the flutter valve in the flow-control means 10 is held open, and the amount of carbon dioxide rebreathed can thus be built up to any desired extent,—for instance until the breathing rhythm of the patient reaches the desired point. The absorption means 12 in the present instant comprises a canister 74 having openings 76 and 77 at its ends, and containing a suitable absorbent chemical 75, such for instance as the soda lime mixture commonly used for the absorption of carbon dioxide. In accordance with the invention this canister is mounted for easy removal from the circuit and replacement, there being provided in the exemplified construction a mounting means, shown in Fig. 1 and illustrated in particular detail in Fig. 8, in which figure the mounting means is the same as that shown in Fig. 1, although a modification of the tubing arrangement is illustrated. This mounting means which may itself be supported in any desired manner, comprises a supporting ring 78 carrying a conduit portion 79, and also comprises a bracket 80. The canister 74 rests upon a gasket 81 supported in the present instance on a flange 82 on the tubular portion 79. Resting upon a gasket 83 carried by the top of the canister is a connection 84 providing a passageway 85 which, when the connection is in place, leads to the opening 76. The connection 84 carries an arm 86 having a threaded post 87 at its upper end. Threadedly mounted on this post is a wheel 88 held against vertical movement by arms 89 and 90 on the bracket 80, the arms being formed to permit free vertical movement of the post. The wheel is mounted in any suitable manner for free rotative movement. Upon the rotation of the wheel 88 the connector 84 will be lifted so as to permit the ready removal and replacement of the double-ended canister 74. In the form of construction illustrated in Fig. 1 the end of the rubber tube 55 is mounted on the free end of the connector, and a rubber tube 91 serves to connect the tubular portion 79 with a T-shaped connection 92, one branch of which communicates with the pipe 50 so as to complete a circuit from the connector 8. It will thus be seen that there is provided a double-ended canister which is effectively included in the circuit for the removal of a required amount of carbon dioxide formed during breathing, and which is removable and replaceable with the utmost ease, and is also held in place with particular effectiveness during use.

In certain instances it is desirable to provide for a minimum gas loss in situations where, due to emergency conditions or other cause, it is necessary to remove and replace the canister while the apparatus is in use. In such a case there may be provided, in accordance with the invention, an arrangement wherein the absorption means may be by-passed and the absorption means excluded from the circuit at a point in proximity to the absorption means, and there is illustrated in Fig. 8 one arrangement for this purpose. In this form of construction a rubber tube 93 extends from the free end of the connector 84 to one branch 94 of a four-way pipe 95 containing a rotatable valve member 96 at the meeting point of the branches. Another branch 97 leads to the conduit portion 79, a third branch 98 is connected with the tube 91, and the fourth branch 99 has the tube 55 fastened thereto. As will be apparent, when the valve member 96 is in the full-line position gas will flow from the tube 55 thru the branches 99 and 94, the tube 93, and the connector 84, thru the chemical 75 in the canister 74, and thence thru the tubular portion 79, the branches 97 and 98, to the rubber tube 91, so as to complete a circuit similar to the circuit provided by the construction exemplified in Fig. 1. When, however, the valve 96 is in the dotted line position gas will flow directly from the branch 99 to the branch 98 and thence to the tube 91, so that the branches 94 and 97 will be cut out of the circuit, and when the connector 84 is lifted by the rotation of the wheel 88 the canister may be removed and replaced without permitting the escape of any gas except that contained in the branches 94 and 97, and the parts extending therefrom. Also, as will be apparent, when the valve reaches a horizontal position (Fig. 8) in its clockwise movement from its full-line position to its dotted-line position (or when it reaches a vertical position in its counter-clockwise movement), the canister will be by-passed without closing off the passageways thereto; and, as the valve is moved in a clockwise direction from its full-line position to a horizontal position (or in a counter-clockwise direction to a vertical position) it will, toward the end of such movement, first open a small by-pass circuit and then a progressively larger by-pass circuit until it reaches a horizontal position (or a vertical position, as may be the case). Accordingly, as will be seen, the valve serves to progressively open a by-pass breathing circuit while flow of gas thru the canister is permitted to continue, so that the proportion of gas flowing thru the canister may be regulated,—the proportion of gas flowing thru a small by-pass opening and thru the canister, respectively, depending upon the size of the by-pass opening and the resistance of the granules in the canister. In this manner, the amount of carbon-dioxide rebreathed by the patient may be readily controlled.

One branch of the T-shaped connector 92 is connected to the expansible bag 13 which is arranged to take up excess gases from the circuit, and, after a given pressure is built up, to permit escape of excess gas thru the exhaust means 14. In accordance with the invention this exhaust means provides a gravity control of a type wherein pressure at which exhaust means will function may be readily regulated, so that the apparatus may be adapted for effective use under conditions requiring varying pressures. In anesthesia it is desirable that the exhaust or spill be susceptible of regulation to blow off at a pressure of 3 mm. of mercury when gas is continuously administered and to blow off only at much higher pressures under special conditions. For instance, for artificial distention of the lungs, as in artificial respiration, it is desirable that the blow-off pressure sometimes be as high as 26 mm., and under certain conditions of thoracic surgery that pressure of 6 or 12 mm. be maintained. Spring valves which have been utilized to provide such pressures have proven unreliable. With the foregoing in view, therefore, the invention contemplates the provision of gravity means which is

adapted to be readily and accurately regulated for controlling the pressure at which the exhaust will operate. As exemplified in detail in Fig. 9, this exhaust means comprises a soft-seated, light-weight, movable member 100, which is preferably composed of rubber and which serves to close the upper end of a passageway 101 leading to a tube 102 connected with the expansible bag 13, and also comprises a chain of adjustable weights 103, 104, 105, and 106 which normally bear on the member 100, but which may be successively lifted by manually operable means to a point wherein they will not weigh on it. The weights are of such heaviness that pressures of the desired amount for a number of varying conditions may be exerted. In the present instance the weights 103—106 are adapted to be lifted by an excess pressure of 26 mm. of mercury, the weights 103, 104, and 105 by an excess pressure of 12 mm., the weights 103 and 104 by an excess pressure of 6 mm., and the weight 103 by an excess pressure of 3 mm. When the pressure in the circuit and in the expansible bag 13 is sufficient to lift whatever of the weights 103—106 are superposed on the member 100, gas will escape thru the passageway 101 into the chamber 107 from which it may flow away freely thru an opening 108. In the present instance the member 100 and the weights 103, 104, 105, and 106 are slidably mounted on a guide rod 109, and are disposed in a casing 110 having a removable cover 111 and formed with a vertical slot 112 thru which a pin 113 on the weight 106 extends. The weights 106 and 105 carry respectively spaced lugs 114 and 115 so that when the weight 106 is lifted more than a given distance it will lift with it the weight 105; and the weight 104 is formed with a stem 116 carrying lugs 117 in the path of movement of the weight 105 so that after the latter has moved a given distance the weight 104 will also be lifted. Similarly, the weight 103 has a stem 118 carrying lugs 119 in the path of movement of the stem 116 so that after the weight 104 has been moved a given distance the weight 103 will also be moved. Accordingly, by lifting the pin 113 the weight 106 may be moved into a position where it does not bear upon the weights below it, by raising the pin 113 further, both of the weights 106 and 105 may be taken out of operation, and by moving it still further all the weights except the weight 103 may be rendered ineffective, so that only a very small pressure in the system will be necessary to cause the escape of gas. If desired, even this weight may be lifted by moving the pin still further, so that there will be practically no resistance to the flow of gas out of the passageway 101. In order to effectuate the raising of the pin, a slideable collar 120 extends about the casing 110 and carries a pinion 121 meshing with a vertical rack 122 on the casing, a hand wheel 123 being provided for the rotation of the pinion. By moving the collar upwardly by the rotation of the pinion it will contact with the pin 113 and raise it to a desired distance, a scale 124 being provided along the slot 112 so that the number of weights carried out of action may be readily determined. The collar 120 fits against the casing 110 sufficiently tightly so that it will be frictionally held in any position to which it is moved. Thus the number of effective weights at the exhaust means, and consequently the pressure in the circuit, may be regulated with a high degree of ease and effectiveness.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which as a matter of language might be said to fall therebetween.

The invention claimed is:

1. Apparatus for the administration of gases, comprising a breathing member, a plurality of conduits, an element adapted to connect said breathing member with said conduits and having a passageway therein which extends from said breathing member and which terminates in an interior opening and also having a resilient wall portion opposite said opening and movable toward the same, means providing a surface which will close said opening when said wall portion is moved inwardly, a flow-control means in one of said conduits for permitting gaseous flow away from said breathing member and preventing flow toward said breathing member, gas-absorption means at the end of said conduit, flow-control means in the other of said conduits for permitting flow of gas to said breathing member and normally preventing flow of gas away from said breathing member, means connecting said gas-absorption means with said other of said conduits, each of said flow-control means comprising an annular valve seat and a disk-like flutter valve composed of rubber and adapted to engage said seat and to yield when drawn or pressed against the same and carrying a central slide ring engaging a guide rod, transparent means to house each of said flutter valves, adjustable means operative upon the flow-control means in said other of said conduits to cause gas to pass both to and from said breathing member thru said other of said conduits, means to releasably maintain said absorption means in place, an expansible chamber connected with said other of said conduits, escape means for said expansible means, gravity means to control said escape means, and means to adjust said gravity means.

2. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means and having a passageway therein, said passageway having a portion terminating in an interior opening, said connecting element having a resilient wall portion opposite said opening and movable toward the same, and means providing a surface which will close said opening when said wall portion is moved inwardly.

3. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means and having a passageway therein, said passageway having a portion terminating in an interior opening, said connecting element having a resilient wall portion opposite said opening and movable toward the same, means providing a surface which will close said opening when said wall portion is moved inwardly, and means to releasably retain said wall portion in an inward position.

4. Apparatus for the administration of gases comprising a breathing member, gas-conducting

means, an element adapted to connect said breathing member with said conducting means, said connecting element having a passageway therein, and means to project a wall of the connecting element inwardly to close said passageway.

5. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means, said connecting element having a passageway therein, and means to project a wall of the connecting element inwardly to close said passageway, said wall being resiliently pressed outwardly.

6. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means, said connecting element having a passageway therein, means to project a wall of the connecting element inwardly to close said passageway, said wall being resiliently pressed outwardly, and means to releasably retain said wall and said projecting element in an inward position.

7. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means, said connecting element having a passageway therein, and means to project a wall of the connecting element inwardly to close said passageway, said connecting element being composed of resilient rubber.

8. Apparatus for the administration of gases comprising a connecting element having a resilient wall portion, a push-rod seated in said resilient wall portion, means for effecting a closure when the push-rod is projected, and a fixed member having a slot therein thru which said push-rod extends, said slot being formed with diverging edges and said push-rod being formed with diverging surfaces terminating short of its free end, whereby the push-rod will be moved laterally when it is projected and will be held within the narrow portion of said slot when in projected position.

9. Apparatus for the administration of gases comprising a gas passageway and flow-control means in said passageway, said flow-control means comprising an annular valve seat, a disk-like flutter valve composed of rubber and adapted to engage said seat and to yield when drawn or pressed against the same and carrying a central slide ring, and a guide rod extending thru said slide ring.

10. Apparatus for the administration of gases comprising a gas passageway and flow-control means in said passageway, said flow-control means comprising an annular valve seat, a disk-like flutter valve composed of rubber and adapted to engage said seat and to yield when drawn or pressed against the same and carrying a central slide ring, and a guide rod extending thru said slide ring, said slide ring being composed of silver.

11. Apparatus for the administration of gases comprising a gas passageway and flow-control means in said passageway, said control means comprising an annular valve seat, a central guide rod, and a disk-like flutter valve composed of a yieldable material and formed to provide an outer portion adapted to engage said seat and an annular portion disposed inwardly of the outer portion and providing a bend for increasing the flexibility of the valve, said disk-like member carrying a central metallic slide ring fitting on said guide rod.

12. Apparatus for the administration of gases comprising a breathing member, an outlet conduit from said breathing member, flow-control means in said outlet conduit, an inlet conduit, flow-control means in said inlet conduit, and means to supply an anesthetic gas to said inlet conduit between said breathing member and the flow-control means in said inlet conduit, each of said flow-control means comprising an annular valve seat, a central rod, and a disk-like flutter valve composed of yieldable material adapted to engage said valve seat and carrying a central slide ring fitting on said guide rod.

13. Apparatus for the administration of gases comprising a breathing conduit and flow-control means for said conduit, said flow-control means comprising a guide rod, a disk-like flutter valve movable on said guide rod and adapted to engage said seat, a flexible wire extending thru said conduit beyond said valve and adapted to be projected against said valve to render the same inoperative in the open position, and manually-controlled means to project said wire.

14. Apparatus for the administration of gases, comprising a gas passageway having a vertical portion providing an annular valve seat at its upper end, a central guide rod carried by said portion, a disk-like flutter valve slideably mounted on said guide rod and adapted to engage said valve seat, and a dome-like element surrounding said flutter valve, said passageway also having a portion aranged to communicate with the bottom of said dome-like element, and said dome-like element being composed of transparent material.

15. Apparatus for the administration of gases comprising a breathing member, a gas passageway extending from said breathing member, expansible means connected with said passageway, escape means for said expansible means, gravity means for controlling said escape means, said gravity means comprising a series of weights, and adjustable means whereby a desired number of said weights may be rendered inoperative in the control of the escape of gases from said expansible member.

16. Apparatus for the administration of gases comprising a breathing member, an absorption unit having openings in its ends, means providing a gas passageway from said breathing member to one end of said absorption unit and providing a gas passageway from said breathing member to the other end of said absorption unit, said means including at least one movable conduit portion adapted to extend to one of said openings, means to removably retain said absorption unit in the circuit provided by said passageways, said retaining means comprising an external mounting for said absorption means and including an adjustable portion adapted to move said movable conduit portion away from said opening to permit removal and replacement of said absorption unit, and means to interconnect said passageways in proximity to said mounting means in a manner which will by-pass said absorption unit and to prevent communication with said absorption unit of the portions of said passageways remote from said absorption unit to limit the escape of gas from said passageways during the replacement of said absorption unit.

17. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means

and having a passageway therein, said passageway having a portion terminating in an interior opening, said connecting element having a resilient wall portion opposite said opening and movable toward the same, and means providing a surface which will close said opening when said wall portion is moved inwardly, the last mentioned means forming a part of said wall portion.

18. Apparatus for the administration of gases comprising a breathing member, gas-conducting means, an element adapted to connect said breathing member with said conducting means and having a passageway therein, said passageway having a portion terminating in an interior opening, said connecting element having a resilient wall portion opposite said opening and movable toward the same, and means providing a surface which will close said opening when said wall portion is moved inwardly, the last mentioned means comprising a closure member and a stem connecting said closure member with said wall portion.

19. Apparatus for the administration of gases comprising a breathing member, absorption means, a valve in proximity to said absorption means, a housing for said valve, means providing a pair of gas-flow passageways from said breathing member to said housing, means providing gas-flow passageways from said housing to one of said absorption means and from the other side of said absorption means to said housing, and means to removably secure said absorption means in place; said passageway-providing means and said valve and said housing being so constructed and arranged that at one position of said valve one of the first-mentioned passageways will be connected with one of the last-mentioned passageways and the other of said first-mentioned passageways will be connected with the other of said last-mentioned passageways and inter-communication of said first-mentioned passageways except thru said last-mentioned passageways prevented to provide a breathing circuit in which all the flow is thru said absorption means, and that at another position of said valve said first-mentioned passageways will be interconnected and flow therefrom into said last-mentioned passageways prevented to provide a breathing circuit by-passing said absorption means and having no communication therewith so as to permit the removal of said absorption means without loss of gas from said first-mentioned passageways, and that during at least a portion of the movement of said valve from said one position to said other position said by-passing breathing circuit may be progressively opened while flow of gas thru said absorption means is permitted to continue so that the proportion of gas flowing thru said absorption means may be regulated.

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