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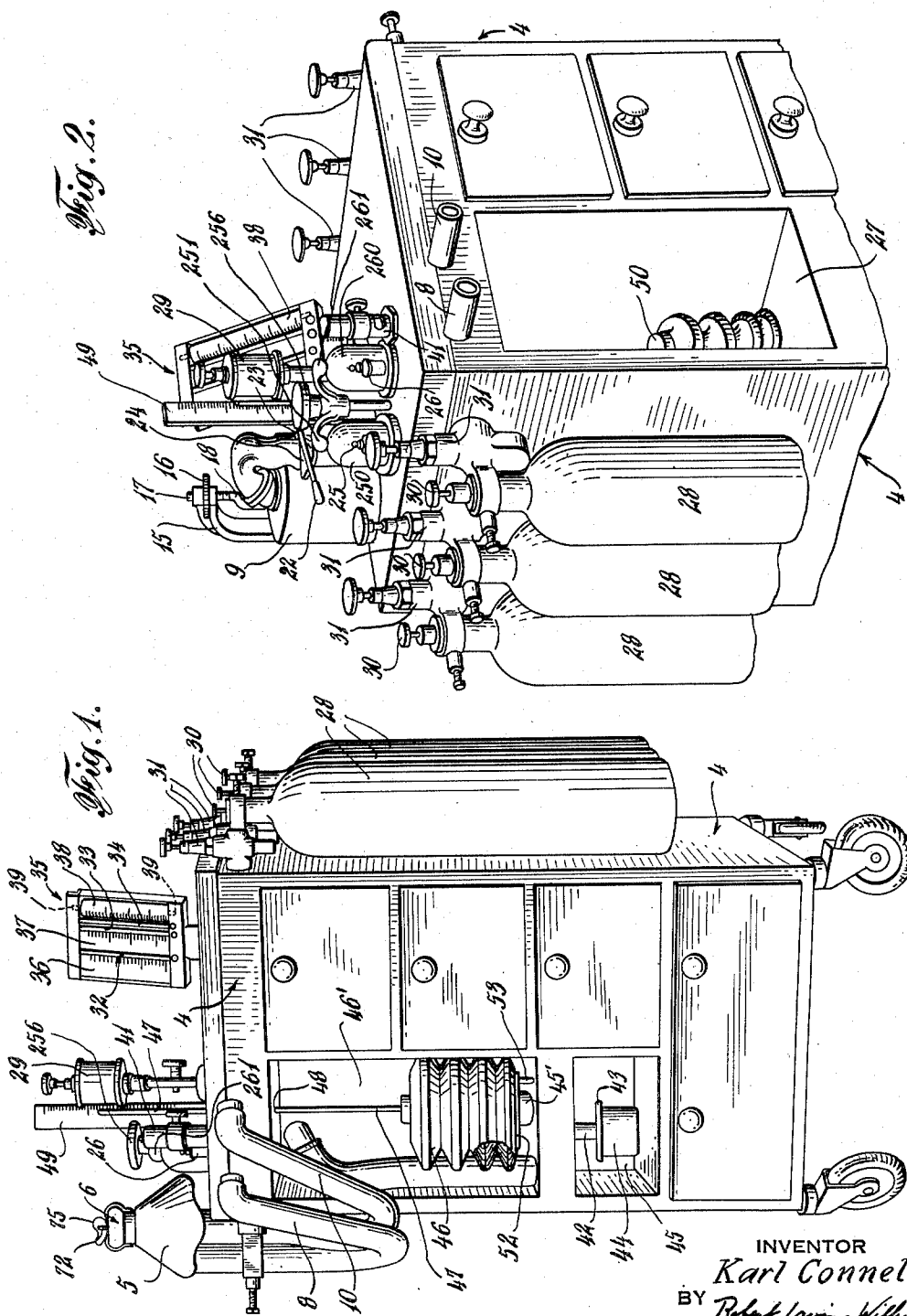
K. CONNELL

2,216,183

APPARATUS FOR THE ADMINISTRATION OF GASES

Filed April 7, 1938

3 Sheets-Sheet 1



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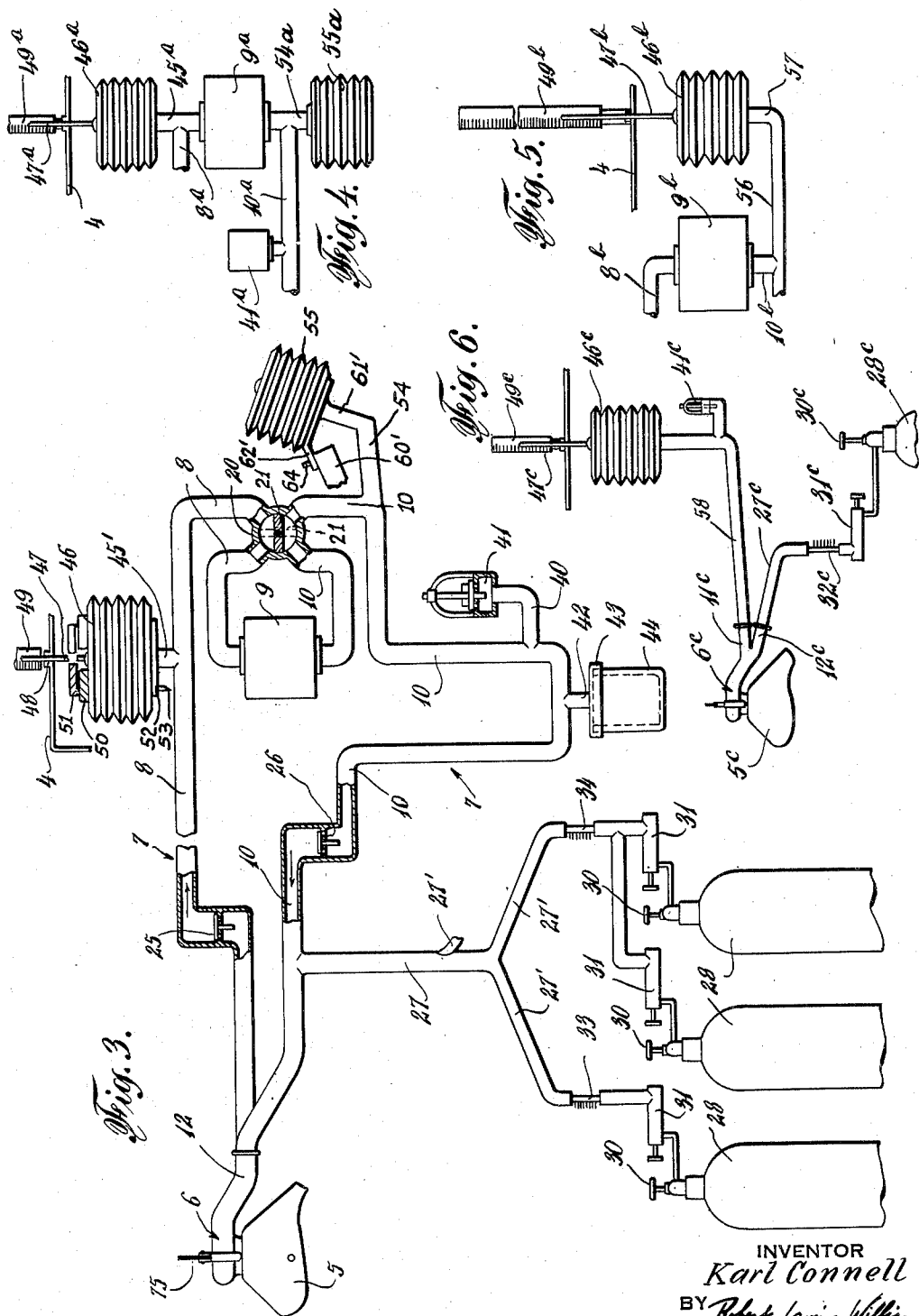
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3 Sheets-Sheet 2



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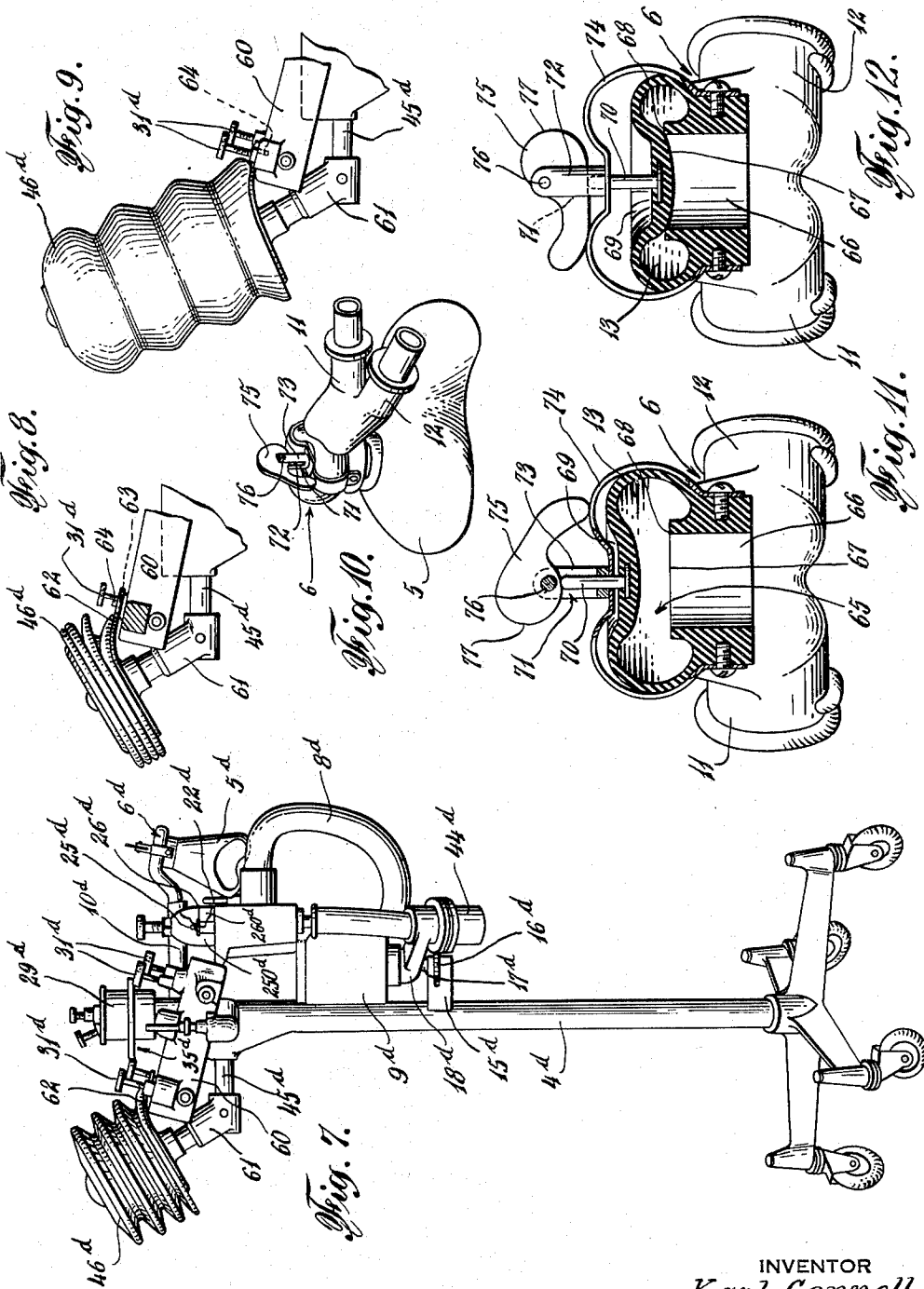
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3 Sheets-Sheet 3



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APPARATUS FOR THE ADMINISTRATION OF GASES

Karl Connell, Branch, N. Y.

Application April 7, 1938, Serial No. 200,641

14 Claims. (Cl. 128—202)

This invention relates to apparatus for the administration of gases such, for instance, as utilized for anesthesia and for various therapeutic purposes.

5 An object of the invention is the provision of anesthetic and similar apparatus of an improved character.

A more specific object is the provision of anesthetic and similar apparatus embodying reservoir means of an improved type.

10 A further object is the provision of anesthetic and similar apparatus embodying reservoir means which will enable the patient to breath with a minimum of effort.

15 Another object is the provision of anesthetic and similar apparatus embodying improved features of construction.

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

20 The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the constructions 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 front view of one form of apparatus embodying the invention;

25 Fig. 2 is a perspective view thereof, the reservoir bag being shown expanded to a lesser extent, and weights being shown on the bag;

30 Fig. 3 is a schematic view illustrating, in a form embodying an additional reservoir bag, the breathing system embodied in the device of Figs. 1 and 2;

40 Fig. 4 is a view corresponding to the right-hand side of Fig. 3 illustrating a modification;

Fig. 5 is a similar view illustrating another modification;

45 Fig. 6 is a view similar to Fig. 3 illustrating a form of the invention embodying a simpler system;

Fig. 7 is a perspective view showing a different structural arrangement embodying the system exemplified in Fig. 3;

Fig. 8 is a detail view showing the reservoir bag of Fig. 7 in a collapsed position;

50 Fig. 9 is a similar view showing the reservoir bag of Fig. 7 in a condition of substantially complete expansion;

Fig. 10 is an enlarged perspective view of the exemplified form of connecting element;

Fig. 11 is a further enlarged sectional view along the line 11—11 of Fig. 10 showing the parts in open position; and

Fig. 12 is a similar view showing the parts in closed position.

In the administration of gases for anesthesia and other therapeutic uses, it is ordinarily desired that a "closed" breathing system be provided to prevent the loss of the relatively expensive gas administered to the patient, and, when anesthetic or inflammable gases are administered, to avoid the presence of an undesirable gas in the atmosphere in which the operator works or to avoid danger of explosion. In order to provide space for the storage of inhaled gas between expiration and inspiration, expansible gas reservoirs in the form of expansible rubber bags connected with the circuit have been provided. The bags employed previously to the present invention have, however, not been fully satisfactory from the standpoint of facilitating the patient's breathing.

The muscular effort in breathing is mainly concentrated in the inspiratory act, which expands the lung, distorting the cartilages of the chest, and displacing the viscera. The expansion of the normal lung, involving about 5 mm. pull, is expressed by 5 mm. of constant normal vacuum in the pleural cavity. Expiration is largely a recoil from these factors, supplemented, with the patient lying on his back, as in anesthesia, by the very considerable weight of the abdomen. Accordingly, inspiration is always more difficult than expiration, and these difficulties are increased under certain conditions of anesthesia. For these and other reasons, it is desirable at times to assist inspiration during the administration of gas. However, expansible bags disposed in the normal position, i. e., downwardly, tend by their weight to exert a drag during the inspiratory period of the breathing cycle, which noticeably reduces whatever assistance may be given to the patient's inspiration by other factors; and, even tho this weight-drag were overcome, there would still be no positive weight-assistance to inspiration.

With the foregoing and other considerations in view, the present invention contemplates the provision of a reservoir bag which is expansible in an upward direction, so that its weight will assist inspiration rather than constituting a drag thereagainst. Since such bags will be expanded to different extents under varying conditions of

gas administration and under varying individual conditions, the invention further contemplates the provision of an upwardly expansible reservoir bag which will have a substantially constant weight over different amounts of inspiration.

In the use of a closed-circuit anesthetic apparatus, moreover, it is ordinarily necessary to provide means for preventing an undue increase in the amount of carbon dioxide in the rebreathed gases, since an excess of carbon dioxide tends to over-stimulate, and to finally paralyze, breathing. To this end there is ordinarily provided in the circuit an absorption means—commonly consisting of a canister containing granules of soda-lime, or other absorbent chemicals. Such absorption means, however, exerts a certain amount of resistance to the breathing; and with this situation in view the present invention in certain of its aspects contemplates the provision of means tending to minimize this resistance. Since the normal breathing cycle consists of three periods of approximately equal duration, i. e., inspiration, expiration, and rest, and since resistance to gas flow varies with the square of the volume of gas passing in a given time; eight-ninths of the resistance may be avoided by spreading the flow of gas thru the resistance thru the entire breathing cycle instead of confining the flow to the expiration one-third of the cycle. In addition, the time of exposure of the gas to the absorption chemical may be increased three-fold. With such considerations in view, the present invention in certain of its aspects further contemplates the provision of suitable expansible reservoir means at both the expiration and inspiration sides of the absorption means.

It is of particular importance in many instances that the expansible reservoir bag utilized be of such character that it acts substantially uniformly under varying conditions of expansion, and to this end the invention in many of its aspects embodies the feature of employing a bag of "accordion" shape—e. g., a columnar bag of zigzag longitudinal contour (except, possibly, when fully expanded) and of substantially constant capacity per unit of excursion. The pleated portions of an accordion and the sides of a "Chinese" or "Japanese" lantern may be cited as exemplifying a pleated structure of the character which may preferably be used, it being borne in mind, however, that an "accordion bag" as the term is used herein, while having smaller and larger diameters corresponding to the zigzag, would not vary sufficiently in average diameter at any point thruout its length so as to materially vary its increase in volumetric capacity for a given increase in longitudinal extent over normal operative ranges.

Another desideratum in certain instances is that the amount of expansion of the expansible means be readily and accurately determined by the operator at any particular time, and the invention accordingly contemplates, in certain of its aspects, the provision of simple, effective, and accurate means to this end.

In certain of its aspects, moreover, the invention further contemplates the provision of apparatus embodying certain advantageous features and structural details as hereinafter exemplified, but it is to be borne in mind that the invention in its broader aspects is not limited thereto.

In the particular embodiment of the invention exemplified in Figs. 1 thru 3, there is provided a cabinet 4 which serves to support the various parts of the exemplified apparatus. This appa-

ratus is of the general character disclosed in my Patent 2,099,841, issued November 23, 1937, and includes a breathing member in the form of a mask 5 of the conventional type, such for instance, as a hollow rubber member adapted to fit over the mouth and nose of the patient. By means of a connector element 6, the mask communicates with both ends of a breathing circuit 7 which provides the breathing channel of the present exemplification. This breathing circuit, as exemplified schematically in Fig. 3, comprises an expiration passageway 8 leading to one side of an absorption means 9 whereby exhaled carbon dioxide may be taken up. This absorption means consists ordinarily of a canister containing soda lime, and it is to be noted that it constitutes a resistance to breathing. From the other side of this absorption means an expiration passageway 10 leads back to the connector element. As will be observed, the connector element comprises branches 11 and 12 at the ends of the passageways 8 and 10 respectively, these branches merging into a passageway 13 which leads to the interior of the mask 5, and which is adapted to be closed by means hereinafter to be exemplified. The canister constituting the absorption means 9 is removably held in the circuit by means such as exemplified in my said Patent 2,099,841 and comprising a bracket 15 carrying a wheel 16 threadedly connected to a post 17 extending from a connector clamp 18.

In order to permit the canister 9 to be bypassed when desired, and in order to permit the amount of flow to be controlled, the conduits 8 and 10 are brought together at a valve housing 20 in which there is disposed a valve 21 which normally serves to separate the passageways 8 and 10. When the valve is moved to the position shown in dotted lines, however, it serves to directly interconnect the passageways 8 and 10 and to shut off the canister 9 from the circuit. When in this position the canister 9 may be removed without substantial loss of gas, as brought out in my said Patent 2,099,841. Also, as is the case with the valve disclosed in my last-mentioned patent, the amount of gas passing thru the absorption means 9 may be controlled to any desirable extent by suitably moving the valve so as to partially by-pass the absorption means to a desired extent. In order to control the valve 21, there is provided a lever 22 connected with the valve stem 23 and adopted to be swung over a scale-plate 24.

In order to control the direction of the flow thru the circuit, there are provided in the passageways 8 and 10 respectively valve means 25 and 26 which are merely exemplified schematically in Fig. 3, but which, as will be seen from Fig. 2, consist of flutter valves which are of the character exemplified in my said Patent 2,099,841, and which are enclosed in glass domes 250 and 260. These domes are removably mounted and are held in place by clamps 251 and 261 operated by a screw 256.

Anesthetic gas may be supplied to the circuit thru a branch conduit 27, as from one of a plurality of gas tanks 28 or from an ether dropper 29, the gas reaching the branch 27 thru one of the plurality of sub-branches 27'. Each of the tanks is provided with a shut-off valve operated by a valve handle 30, on the opening of which gas may flow thru a decompression valve 31 which may be of the character disclosed in my Patent 2,023,915, issued December 10, 1935, and thence thru flow-gages 32, 33, and 34, which may be of the character exemplified in my Pat-

ent 1,965,333, issued July 3, 1934. These flow-gages are mounted on a bracket 35 in the present instance. Ordinary scales 36 and 37 are provided for two of these flow-gages, and for the other there is provided a scale unit 38 rotatably mounted on the frame by pins 39 and of the general character disclosed and claimed in my Patent 2,099,842, issued November 23, 1937. This scale unit, in the present instance, differs from the scale unit particularly exemplified in the last-mentioned patent by comprising two wings instead of three, and accordingly carrying only two scales.

A branch 40 from the circuit leads to a weighted escape valve unit 41 which, as exemplified, is of the character disclosed in my said Patent 2,099,841.

A branch 42 leads downwardly from the lowermost point in the circuit to a fitting 43 in which there is removably inserted a glass cup 44 which is adapted to collect any condensed moisture in the circuit. This cup is disposed within an open compartment 45 in the cabinet and since it is formed of glass the operator may readily determine the amount of moisture which is collected in it and remove and empty it when necessary.

A branch 45' leads, in the present instance, from the expiration passageway 8 and extends to the bottom of an upwardly expansible accordion bag 46 which is disposed in an open compartment 46' in the cabinet. This bag is composed of rubber, has a substantially constant collapsive weight over different amounts of expansion, and is adapted to oppose a weight of approximately one-half of a millimeter of mercury against the expiration effort. Since the bag expands upwardly, the comparatively easy expiration act will lift the weight of the bag as it expands in a direction such that it will assist inspiration. An additional advantage of a reservoir bag of the character exemplified is that, where necessary or desirable, inspiration may be assisted by the operator with the utmost ease, since the operator can cause the collapse of the upwardly expanded accordion bag by merely putting his hand against the top and pressing downwardly.

As an example of a desirable form of an accordion bag, reference may be made to a bag formed on a mold having a maximum diameter of seven inches, and having three V-shaped grooves one and one-half inches deep so as to provide a minimum diameter of four inches. This mold is dipped in rubber latex three times to build up a bag about .04 inch in thickness. A bag of this type mounted as exemplified at 46, Fig. 1 has been found to have a back pressure on upward movement of one-half mm. of Hg, and a capacity of one liter for the first two inches (approximately) of excursion, and a capacity of one additional liter each for the next two and one-half inches (approximately) of excursion and for the succeeding two and three-eighth inches (approximately) of excursion, which includes the ordinary active range. The bag will have a capacity of an additional liter for another one and one-half inches (approximately) of excursion, and thereafter a supplemental capacity under increased pressure as the pleats become distended as shown at 46d, Fig. 9. The expansion of the bag is thus very even thru the normal range of 1 to 3 liters, approaching closely 100 cc. of capacity for each one-quarter inch of upward expansion. The bag is thus excellently adapted for use as a spirometer, i. e. as a measurer of tidal volume.

In order to assure that the bag when expanded will not lean to one side, there are provided means to restrain the bag from falling sidewise. This means, in the present instance, consists of a rod 47, the lower end of which is secured to the top of the bag and which extends thru a guide hole 48 in the top of the cabinet. This rod also serves as an indicator member, there being provided a vertical scale 49 mounted on the top of the cabinet at the rear of the rod. It is to be noted in this connection that, while the initial expansion of the bag imparts only a slight lift to the rod, and while the bag tends to swell sidewise rather than vertically when it approaches its point of complete expansion, during the central two-thirds of its capacity and travel range (which would embrace its ordinary operative range) the upward movement of the top of the bag is substantially uniform for given changes in capacity, since when the lesser-circumference portions of the bag are expanding the larger-circumference portions of the bag are contracting. Because thru the greater part of its range the bag has a constant degree of excursion thru a given change in volume, the movement of the rod will directly indicate the substantial change of volume of gas in the bag thruout the central two-thirds or more of its movement, but the scale may be calibrated to indicate the movement accurately during the entire expansion range. The rod also serves to provide a weight which tends to prevent the bulging upwardly of the top surface of the bag, and which adds to the collapsive weight of the bag itself.

In order to increase the effective weight of the bag and to assist the difficult inspiration act, one or more weights 50 and 51 may be provided on top of the bag, as exemplified in Figs. 2 and 3. These weights may be of the character commonly employed in scales and may be slipped over the top of the bag and past the rod or its mounting so that the amount of weight on the bag may be adjusted to suit the requirements of any particular situation. The provision of a fairly wide weight directly on top of the bag, as exemplified, also assists in flattening out this surface and rendering the initial expansion of the bag more uniform. The first weight has this effect whether or not additional weights are employed. Such a weight desirably has a diameter approximately two-thirds the diameter of the upper surface of the bag, and when so formed will tend to ride more steadily and have less tendency to tip than when the weight is concentrated on the center of the bag.

In order to carry the weight of the exterior portions of the bottom of the bag, there is provided a halo 52 mounted on a post 53 and disposed beneath the bottom of the bag. The outer diameter of this halo is preferably about two-thirds of the diameter of the bottom of the bag.

In Fig. 4 there is exemplified a form of device which is similar in all respects, with the exception noted below, to the device of Figs. 1 thru 3, and wherein similar parts are designated by similar reference numerals differentiated by the subscript *a*. This form of device is designed to facilitate the breathing of the patient, and to extend the time of exposure of gas to the absorptive agent, to a maximum degree. In this form of construction there is provided, besides the upwardly extending bag on the expiration side of the circuit, an additional bag which is connected in the side of the circuit behind the absorption

means 9a. As exemplified, a branch 54a extends from the inspiration passageway 10a to an accordion bag 55a. By the provision of such a bag, the bag 46a may be expanded during the exhalation third of the cycle, a portion of the gas passing thru the resistance 9a at this time, however, into the bag 55a. During the "rest" third of the breathing cycle, the weight of the bag 46a and its collapsive force will cause gas to pass thru the resistance at 9a and to additionally expand the bag 55a. During the inspiration third of the cycle, gas may be drawn from the bag 55 and then pass thru the passageway 10a without encountering the resistance at 9a. During this third of the cycle, however, the bag 46a because of its collapsive weight and the weight of the rod 47a will ordinarily continue to collapse and force gas therefrom thru the resistance. Thus, instead of gas being forced thru the absorption means during only one-third of the breathing cycle, it may be forced therethru during the entire breathing cycle, and the effect of the resistance will be reduced eight-ninths, and the time of exposure to absorptive action lengthened about three-fold.

In the form of construction exemplified in Fig. 4, the branch 54a is disposed at the lower-most part of the circuit, and the cup 44 is omitted, since whatever condensation occurs will drain into the bag 55a where it can do no harm. The bag 55a is, however, mounted so that it can be removed and emptied if this should become necessary. If, however, it is desired to utilize the advantages of an upwardly expanding bag, the bag 55 may be arranged as shown in Fig. 3, or similarly to the bag shown in Fig. 5 and suitable moisture-collection and/or moisture-removing means, such as shown at 44, or such as a drain cock, may be provided. As shown in Fig. 3, the bag 55 does not extend directly upwardly, but has its axis inclined at an angle to the vertical, being supported by an arm 61' of an elbow-shaped branch conduit 54, and being provided with a tab 62' which extends from a circular piece of rubber vulcanized to the bottom of the bag and is formed with a hole adapted to extend over an upwardly extending pin carried by a supporting member 60', all as more particularly exemplified in the construction shown in Figs. 7, 8 and 9 in connection with the bag 64d, and designed to prevent the bag from falling sideways, to restrain it against vibration, and to draw the bag toward the vertical.

While the arrangement of the bag 46 is a particularly simple one, and while the two-bag arrangement of Figs. 3 and 4 gives the maximum assistance to breathing, there are instances wherein the use of two bags is not desired, but wherein it is desirable to eliminate all possible resistance between the bag and the mask or other breathing member. With such an end in view there may be provided a construction such as exemplified in Fig. 5 wherein the parts, with the exceptions noted below, are similar to the parts exemplified in Figs. 1 thru 3 and are designated by similar reference numerals distinguished by the subscript b. In this form of construction, the branch 45' is omitted and a branch 56 having an upwardly extending end 57 extends from the inspiration passageway 10b, and the accordion bag 46b is connected with the upper end of the portion 57 of this branch.

As will be understood, the invention in various of its aspects may be embodied in a number of types of breathing systems other than the type

heretofore exemplified. In Fig. 6 there is exemplified a particularly simple form of closed breathing system embodying the invention. In this form of construction no breathing circuit is provided, but the breathing channel consists of a single conduit 58 with which there are associated certain parts similar to the parts exemplified in Figs. 1-3 and designated by similar reference numerals distinguished by the subscript c. These parts include a mask 5c, connector element 6c, upwardly expansible accordion bag 46c, rod 47c, scale 49c, and weight-controlled escape valve 41c. The conduit 58 extends from the bag 46c to one branch of the connector member, and a conduit 27c to the other branch of the connector member in the present instance. Any suitable number of tanks may be connected with the conduit 27c, but as exemplified a single tank 28c is connected therewith thru the medium of a decompression valve 31c and a flow gage 32c.

It will also be understood that an apparatus of the general character exemplified in Figs. 1-3 may be embodied in various types of machines. In Fig. 7, for example, there is exemplified a machine embodying a breathing circuit of the general type exemplified in Fig. 3. In this form of construction the support is in the form of a standard 4d which carries the tubing and is hollowed out to provide passageways which in conjunction with the tubing provide a circuit such as shown in Fig. 3, including control valves 25d and 26d. The ends of the circuit communicate with a connector member 6d similar to the connector member 6 and associated with a mask 5d similar to the mask 5. A soda lime canister 9d is provided in the circuit, being held in place by a connector member 18d operated by a release nut 16d, mounted on the bracket 15d and operating a post 17d extending from the connector member. The passageways 8d and 10d in the particular form of construction exemplified are brought together in a valve housing which may be similar to the valve housing 20, and which contains a by-pass valve which may be similar to the valve 21. The by-pass valve is operated by a lever 22d. At the lowermost part of the circuit a glass cup 44d similar to the cup 44 and similarly mounted is provided. Tanks (not shown) similar to the tanks 28 are carried by a supporting member 60 forming part of the standard 4d and supply gas thru the medium of decompression valves 31d. A bracket 35d carries flow gages and associated scales. This form of apparatus exemplifies a type of bag which, while expansible in a generally upward direction, is expansible at a considerable angle to the vertical. As shown, the branch 45d, on which it is carried, is in the form of an elbow, one arm 61 of which extends at an angle of about 30° from the vertical and serves to mount the bag 46d. The bag is not equipped with a rod or with a supporting halo, as in the construction of Figs. 1-3; but, in order to restrain the bag from falling sideways, to restrain it against vibration, and to draw the bag toward the vertical, there is provided a tab 62 extending from a circular piece of rubber vulcanized to the bottom of the bag and formed with a hole 63 adapted to fit over an upwardly extending pin 64 carried by the member 60. Figs. 8 and 9 exemplify the action of this tab when the bag is collapsed and substantially fully expanded, respectively.

Further in accordance with the invention, there is provided a connector element which is similar to the connector elements exemplified on my

said Patent No. 2,099,841. The construction of the connector elements exemplified is illustrated in the enlarged views of the connector element 6 shown in Figs. 10, 11, and 12. This connector element is formed of rubber and provides a main passageway 13 which connects the passageways in the branches 11 and 12 with the interior of the mask 5. A portion 66 of passageway 65 extends from the interior of the mask to an opening 67 which is surrounded by an annular seat 68. Opposite this seat is a resilient wall portion 69 which is so constructed that it will close off the passageway 66 when placed against the seat, but will, by its own resiliency, be held away from the seat so as to permit free communication thru the passageway 13, when not so pressed. In order to close the opening 67 there is provided a pin 70 mounted in the wall portion 69. This pin extends into a channel 71 between uprights 72 and 73 which are supported on a bracket 74. A cam lever 75 is pivoted at 76 and has a cam surface 77, which is adapted to press against the pin 70 when the cam lever is swung from the position shown in Fig. 11 to the position shown in Fig. 12 so as to move the wall-portion 69 against the seat 68.

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.

I claim:

1. Apparatus for the administration of gases, comprising a breathing channel, an expansible reservoir bag connected with said channel and expansible in a generally upward direction, and a weight removably disposed on said bag and tending to maintain the upper surface of the bag relatively flat, said weight having a diameter not substantially less than two-thirds of the diameter of the upper surface of the bag.

2. Apparatus for the administration of gases, comprising a breathing circuit, an accordion-shaped reservoir bag connected with said circuit and expansible in a generally upward direction, said bag being formed with a central boss on its upper surface, and a weight centrally recessed to receive said boss and disposed upon said upper surface and having a diameter not substantially less than two-thirds of the diameter of said upper surface.

3. Apparatus for the administration of gases, comprising a breathing channel, an accordion-shaped reservoir bag connected with said channel, and generally annular means bearing downwardly upon the top of the bag and tending to flatten the same and having an external diameter not substantially less than two-thirds the diameter of the upper surface of the bag.

4. Apparatus for the administration of gases, comprising a breathing channel, a support, a reservoir bag connected with said breathing channel and adapted to expand in a generally upward direction, and means extending from said bag at a point near the bottom thereof and attached

to said support for maintaining a generally upright position to said bag.

5. Apparatus for the administration of gases, comprising a breathing circuit, a support, a tubular member connected with said circuit and carried by said support at an acute angle to the vertical, a reservoir bag extending in a generally upward direction from said tubular member and having a tab extending toward said support and secured thereto in a manner to draw said bag toward the vertical.

6. Apparatus for the administration of gases, comprising a breathing circuit, means for directing gas flow thru said circuit, a resistance in said circuit, a gas reservoir expansible in a generally upward direction and connected with the portion of said circuit thru which gas flows toward said resistance on expiration, and an expansible gas reservoir connected with the portion of said circuit thru which gas flows away from said resistance on inspiration.

7. Apparatus for the administration of gases, comprising a breathing circuit, a support, an annulus carried by said support, an expansible bag supported on said annulus for expansion in a generally upward direction, and means extending thru said annulus to connect said bag with said circuit.

8. Apparatus for the administration of gases, comprising a breathing member, a closed breathing system connected with said breathing member, a reservoir bag forming part of said system and expansible in a generally upward direction and having a substantially constant collapsible weight over different amounts of expansion, means to supply to said system a controlled amount of gas to be administered, and means to permit escape of gas from said system when pressure therein reaches a predetermined point.

9. Apparatus for the administration of gases, comprising a breathing member, a closed breathing system connected with said breathing member, a reservoir bag forming part of said system and expansible in a generally upward direction and having a substantially constant collapsible weight over different amounts of expansion, means to supply to said system a controlled amount of gas to be administered, means to permit escape of gas from said system when pressure therein reaches a predetermined point, and cam-controlled valve means for preventing escape of gas from said system thru said breathing member when gas is not being administered.

10. Apparatus for the administration of gases, comprising a breathing member, a breathing circuit, means whereby expired gases will be caused to flow unidirectionally thru said circuit from said breathing member and back thereto, gas-absorption means in said circuit, an accordion-shaped reservoir bag connected to said circuit and mounted so as to be expansible in a generally upward direction, means to restrain said bag from falling sidewise, and removable means to collect moisture condensed in said circuit.

11. Apparatus for the administration of gases, comprising a breathing member, a breathing circuit, means whereby expired gases will be caused to flow unidirectionally thru said circuit from said breathing member and back thereto, gas-absorption means in said circuit, an accordion-shaped reservoir bag connected to said circuit and mounted so as to be expansible in a generally upward direction, means to restrain said bag from falling sidewise, means to assist the collapse of said bag, means to indicate the amount

of expansion of said bag, and removable means to collect moisture condensed in said circuit.

12. Apparatus for the administration of gases, comprising a breathing member, a breathing circuit, means whereby expired gases will be caused to flow unidirectionally thru said circuit from said breathing member and back thereto, gas-absorption means in said circuit, an accordion-shaped reservoir bag connected to said circuit at the expiration side of said absorption means and mounted so as to be expansible in a generally upward direction, means to restrain said bag from falling sidewise, means to assist the collapse of said bag, means to indicate the amount of expansion of said bag, removable means to collect moisture condensed in said circuit, an element providing a connection between said breathing circuit and said breathing member and having a passageway therein providing an interior opening, said connecting element having a resilient wall portion opposite said opening and moving toward the same, means providing a surface which will close said opening when said wall portion is moved inwardly, and rotatable cam means adapted to move said wall portion inwardly so that said opening will be closed by said surface to shut off said circuit from said breathing member.

13. 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 providing 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 cam means adapted to move said wall portion inwardly so that said opening will be closed by said surface.

14. Apparatus for the administration of gases comprising a breathing member, a breathing circuit including absorption means and providing a conduit from said breathing member to said absorption means and a conduit from said absorption means to said breathing member, means to direct the flow of gas thru said circuit in a direction such that it will flow thru said first-mentioned conduit to said absorption means and thence thru said second-mentioned conduit, and a reservoir bag expansible in a generally upward direction and having substantially constant collapsible weight over different amounts of expansion and connected with the first-mentioned conduit, and a collapsible gas reservoir bag connected to the second-mentioned of said conduits.

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