

Oct. 21, 1952

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2,614,561

ABSORBER FOR ANESTHETIC GAS MACHINES

Filed March 15, 1950

4 Sheets-Sheet 1

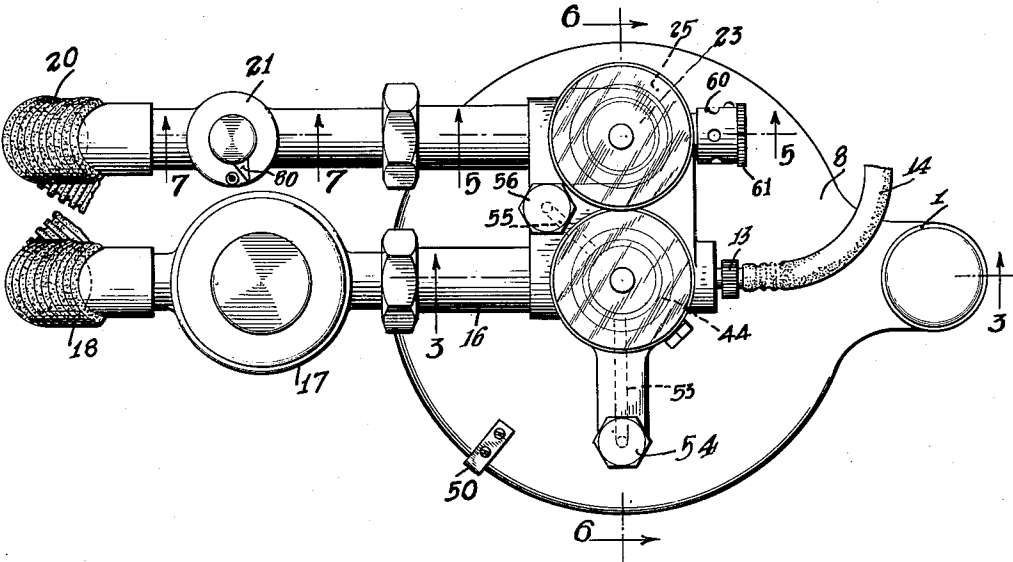


FIG. 2

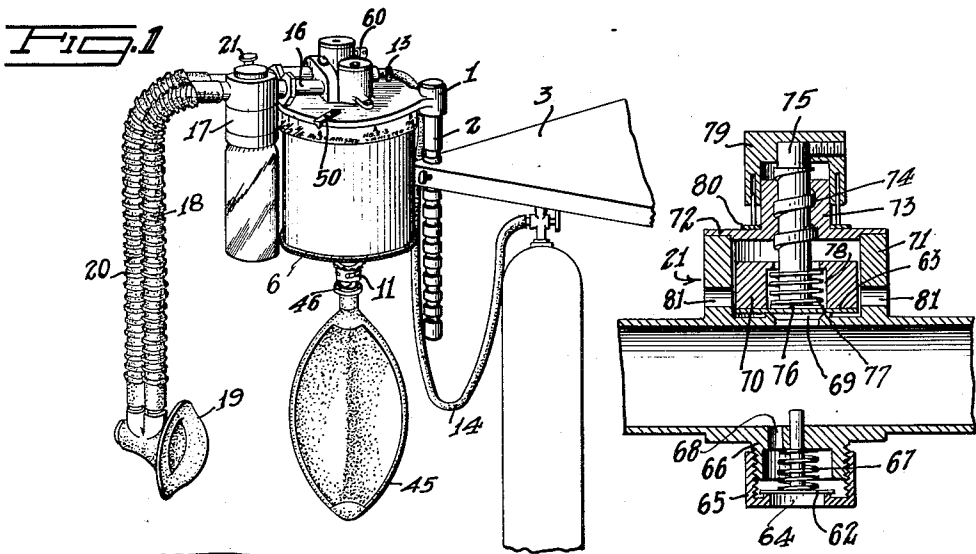


FIG. 7

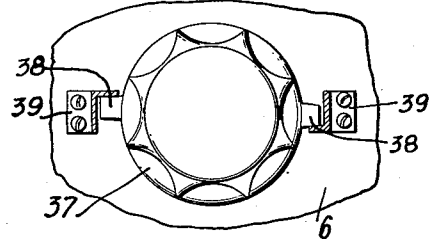


FIG. 8

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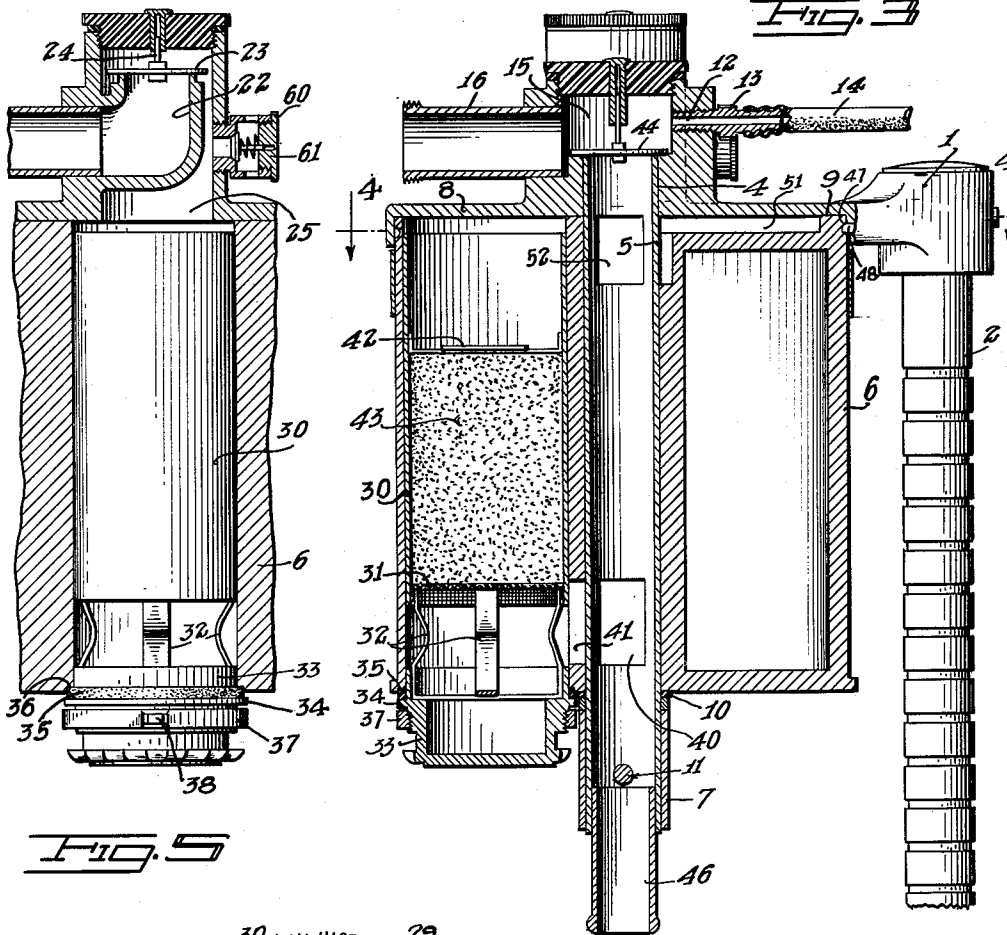


FIG. 5

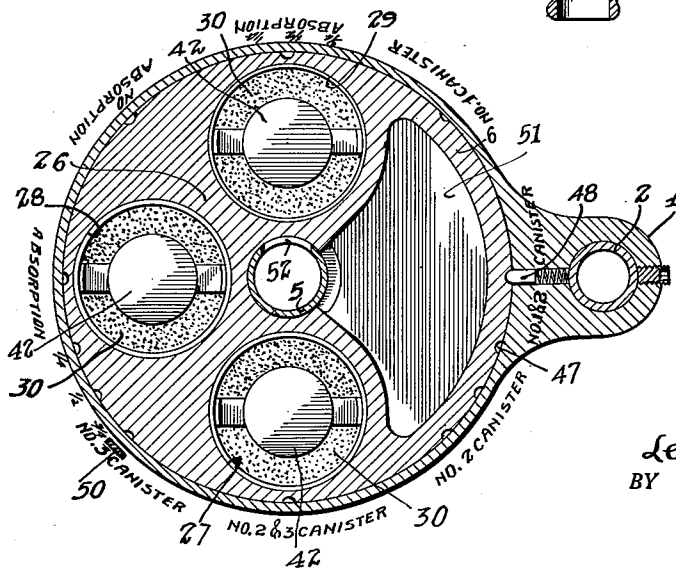


FIG. 4

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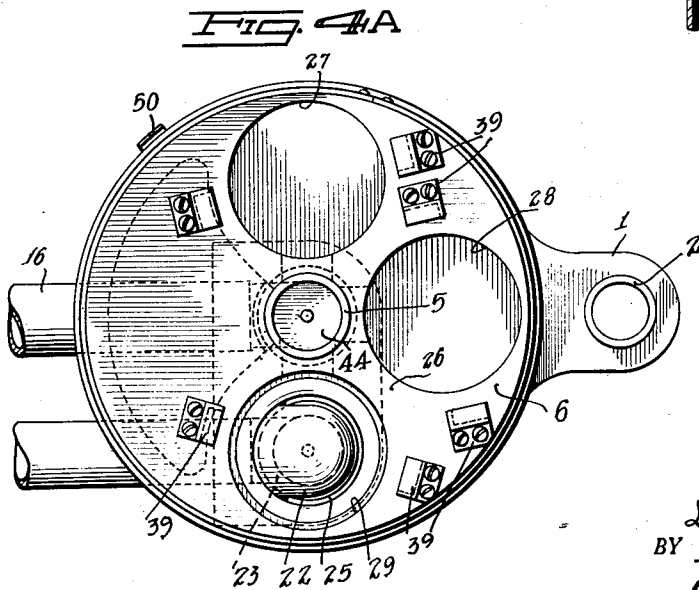
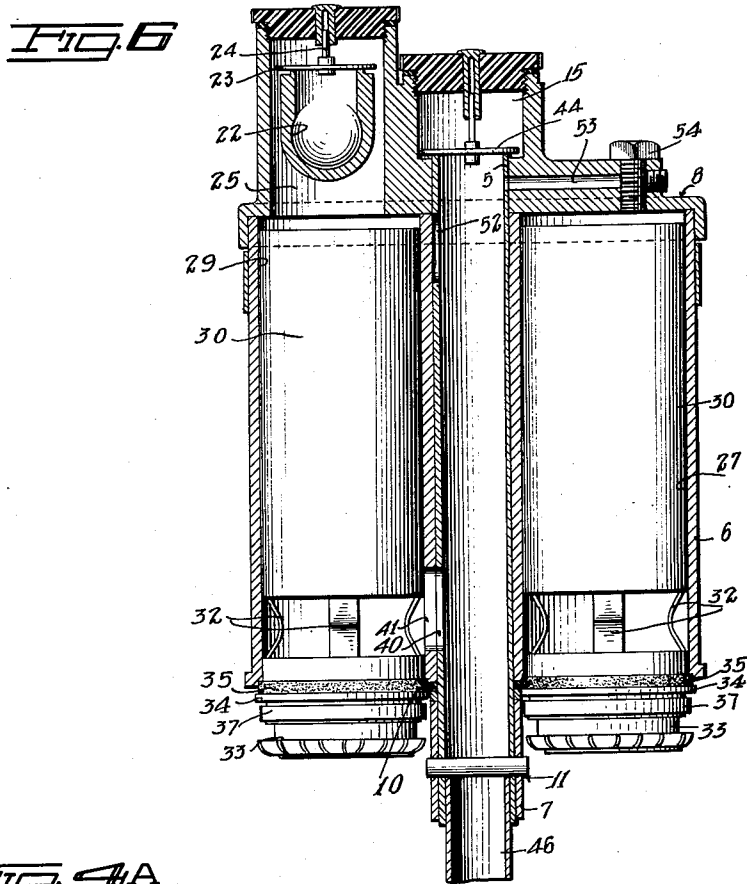
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ABSORBER FOR ANESTHETIC GAS MACHINES

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4 Sheets-Sheet 3



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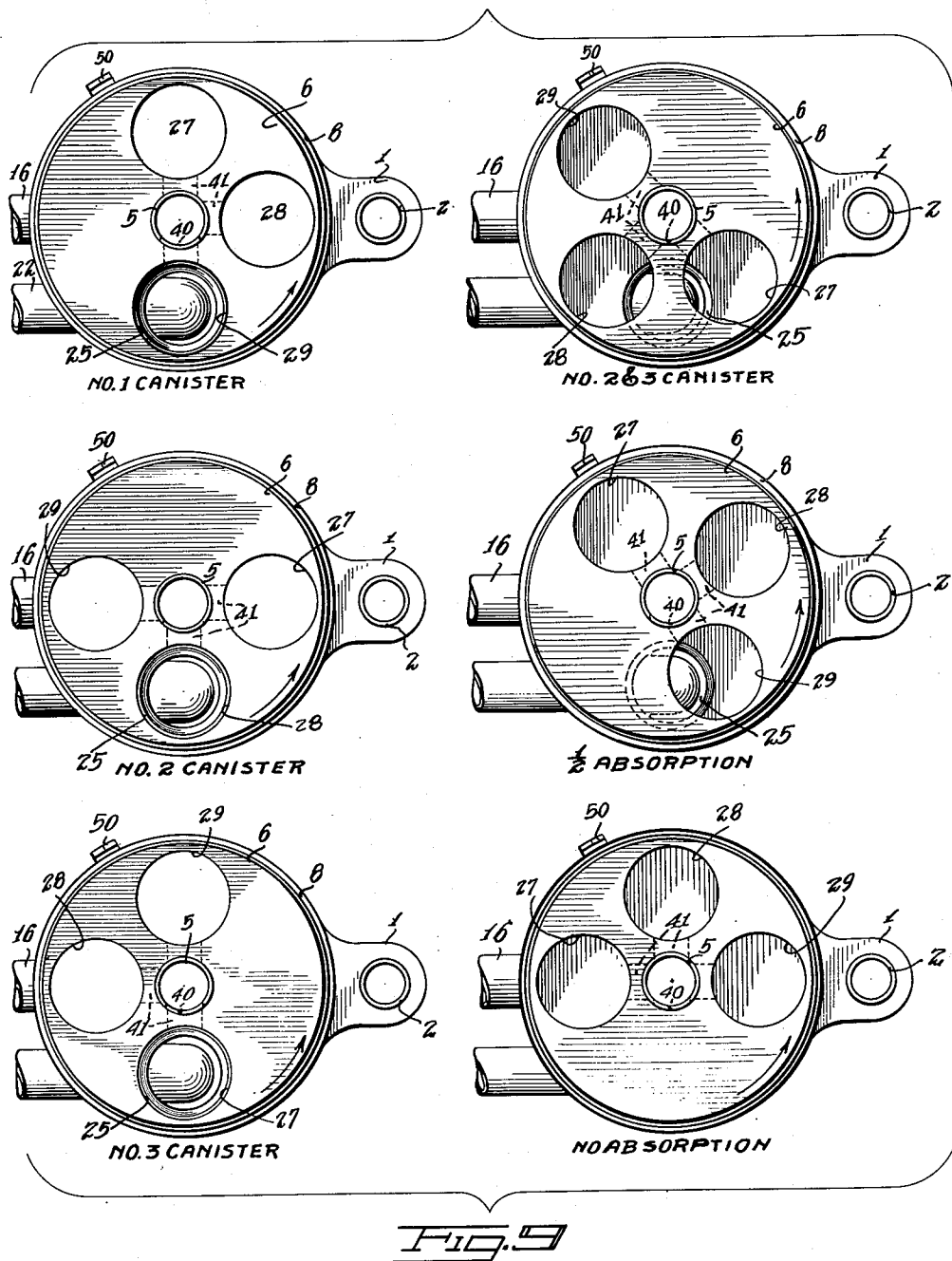
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ABSORBER FOR ANESTHETIC GAS MACHINES

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4 Sheets-Sheet 4



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2,614,561

ABSORBER FOR ANESTHETIC GAS MACHINES

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16 Claims. (Cl. 128—191)

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My invention relates to an absorber for an anesthetic machine used in the administration of gas anesthesia to patients in hospitals.

An anesthetic machine is usually used which administers gas anesthesia through a closed mask system to the patient's lungs. The purpose of my invention is to place an absorber in the system between the anesthetic machine and the mask to absorb the CO₂ from the exhalations of the patient. As the system from the gas anesthetic machine to the patient's lungs is a closed circuit, the exhalations are contained in this line and it is often desirable to remove some or all of the CO₂ exhaled by the patient.

Prior to my invention a canister containing soda lime was placed in the gas circulation so as to absorb the CO₂. When the soda lime had become saturated with CO₂ it would be necessary either to stop the anesthesia to put in a new canister or to dilute the gas mixture with air while a new canister of soda lime was being placed in the line. By the use of my absorber a plurality of canisters is always available to be used either individually or in combination to remove the CO₂ from the anesthetic gas without at any time stopping the administration of the anesthesia to the patient or without any danger of air getting in and diluting the anesthetic gas.

By the use of my machine it also is possible to vary the amount of absorption of CO₂ so as to leave some of it in the anesthetic gas.

It also is possible to stop at any time the entire removal of CO₂ from the anesthesia and to allow all of it to remain in the closed circuit.

Other objects and advantages of my invention will be apparent from the following description of the preferred embodiments thereof.

In the drawings:

Figure 1 is a perspective of my invention as used in an absorber for an anesthetic gas machine.

Figure 2 is a top plan view thereof.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a sectional line taken on the line 4—4 of Figure 3.

Figure 4A is a view similar to Figure 4 showing a bottom view of my absorber.

Figure 5 is a section taken on the line 5—5 of Figure 2.

Figure 6 is a section taken on the line 6—6 of Figure 2.

Figure 7 is a section taken on the line 7—7 of Figure 2.

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Figure 8 is a bottom view of the locking means for the canisters.

Figure 9 is a diagrammatic view showing my absorber in its various operating positions.

An absorber constructed in accordance with my invention has a head 1 suspended on a post 2, which is adapted to be held by the control table 3 of an anesthetic machine.

The head 1 has a central bore 4 in which is supported a tube 5 by means of a driven fit. Rotatively positioned on the tube 5 is a barrel 6 which is held in position by a sleeve 7. The undersurface 8 of the head 1 is machined to make an airtight connection with the periphery 9 of the barrel 6. The sleeve 7 is adapted to engage a rubber O-ring 10 and by means of the dagger slots 11 to compress the O-ring 10, support the barrel 6 and hold the surfaces 8 and 9 in an airtight position.

A port 12 has an attachment 13 threaded therein to which is connected a line 14 from the gas anesthetic machine. The port 12 permits gas from the line 14 to enter the chamber 15 in the head 1 and to be ported therefrom through the pipe 16 to the common ether vaporizer 17, and from it to the flexible line 18 and to the gas mask 19. Thus there is formed a continuous line for the anesthesia to pass from the anesthetic machine through the head 1 and through the vaporizer 17 and gas mask 19 into the patient.

Upon exhaling, the patient's breath passes out through the mask 19, through the line 20, past a valve 21, to be hereinafter described, into a passage 22 in the head 1. Passage 22 is closed by a flat valve 23 to prevent gas from being taken from my absorber through the passage 22 and line 20 during the inhalation of the patient's breath, but upon the exhalation the valve 23 lifts on its stem 24, allowing exhalations to pass into the chamber 25 in the head 1.

The barrel 6 is divided into a plurality of cylinders 27, 28 and 29 by a spider 26. In each of these cylinders is positioned a canister 30 having a bottom of wire mesh 31 in which is supported a quantity of soda lime. Usually in the administration of an anesthesia 400 cc. of soda lime are placed in the canister. The canisters 30 are supported by legs 32 on a cap 33. The cap 33 has a flange 34 adapted to compress a rubber O-ring 35 against a shoulder 36 on the barrel 6 to form an airtight seal. The O-ring 35 is compressed by means of a ring 37 threaded upon the cap 33 and having thereon lugs 38 adapted to engage under dogs 39 on the bottom surface of the barrel 6. When the lugs 38 are engaged

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under the dogs 39 the cap 33 may be rotated to tighten the lugs 38 against the dogs 39 and compress the O-ring 35.

The tube 5 has a slot 40 which is adapted to open into a passage 41 in the spider 26 to port gas from the bottom of the canisters 30 past the legs 32 into the tube 5. The exhalations of the patient pass from the chamber 25 when my absorber is set to absorb CO₂ in the canister 30 in the cylinder 27 directly down through the canister past a dispersing baffle 42 through the soda lime 43 out through the wire mesh 31 and into the tube 5 where it flows upwardly until it contacts the flat valve 44. When the patient is exhaling the back pressure in the chamber 15 holds the valve 44 in closed position, but upon inhalation the valve 44 is open, allowing the gases passing through the canisters 30 to pass into the chamber 15 and to be mixed with any additional anesthesia administered through the port 12.

The tube 5 is open at its bottom and has an expansion diaphragm 45 connected thereto by the nipple 46. The excess gas in the patient's exhalations passes into the bag 45 and expands the same. Upon inhalation this gas flows up the tube 5 past the valve 44 into the chamber 15 to be mixed with any additional anesthesia administered through the port 12.

Upon the head 1 is a pointer 50 and upon the periphery of the barrel 6 are positioned indications of which one of the cylinders 27, 28 or 29 is in position underneath the chamber 25. When the indication for Canister No. 1 is in line with the pointer 50 the canister 30 and cylinder 29 are directly below the chamber 25; when the barrel 6 is rotated until the pointer 50 and the legend "No. 2 Canister" are in registry, then the cylinder 28 with its canister is directly below the chamber 25; when the "No. 3 Canister" is in line with the pointer 50 the canister 30 and cylinder 27 are directly below the chamber 25.

As can be seen, each of the three canisters can be positioned directly below the chamber 25 and used to absorb the CO₂ in the closed system without in any way interfering with the administration of the anesthesia. When it is desired to have more absorption of the CO₂ than is possible from one canister, the pointer 50 is pointed, for example, to the legend "No. 2 and No. 3 Canisters." In this position the cylinders 28 and 29 are each positioned to receive one-half of the gas from the chamber 25 and the passages 41 at the bottom of the cylinders 28 and 29 each port one-half to the slot 40. When the pointer 50 is in registry with the legend "No. 1 and No. 2 Canisters" then one-half of the gas passes through the canisters in the cylinders 27 and 28. When it is desired to stop the absorption of the CO₂, then the barrel 6 is rotated until the pointer 50 is in registry with the legend "No Absorption" and in this position none of the cylinders 27, 28, 29 can secure any gas from the chamber 25, but the passage 51 in the spider 26 ports the gas directly from the chamber 25 to the slot 52 in the tube 5, thus completing the circuit and there will be no absorption of CO₂.

When it is desired to have a portion of the CO₂ absorbed, by rotating the barrel 6 the pointer 50 can be positioned to any one of the legends reading "1/4," "1/2" or "3/4 Absorption" for either the No. 3 Canister or the No. 1 Canister. In these positions, for example, the "1/2 Absorption, No. 1 Canister" positions the cylinder 27 and the passage 51 each below the chamber 25 so that

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one-half of the gas passes through the canister 30 in the cylinder 27 and the half passes through passage 51 directly to the tube 5. Thus there will be only a fifty percent absorption.

Around the periphery of the barrel 6 adjacent each of the above mentioned legends are notches 47 which are adapted to receive the spring-loaded pawl 48 carried by the head 1 to hold the barrel 6 in its proper registry during operation.

The head 1 has a port 53 which has a screw plug 54 normally closing the same, but by removal of the screw plug 54 a pressure gauge can be threaded therein to permit the reading of the pressures in the system. A port 55 normally closed by a screw plug 56 permits the attachment of an ordinary ether dropper when it is desired to add ether to the gas from the anesthetic machine.

To prevent excessive pressures in the line a spring valve 60 is positioned to port the gases from the chamber 25 to the atmosphere and the screw cap 61 is adjustable to place tension upon the spring valve 60 so that it can be set from 0 to 30 cc. of water.

Another pressure regulating valve which can be used in place of the spring valve 60 is the valve mechanism 21 which comprises two valves 62 and 63, both being flat plate valves. The plate valve 62 is adapted to close a port 64 in a threaded cap 65, which is threaded upon a boss 66 of the valve mechanism 21.

A spring 67 causes the valve 62 to seat against the opening 64. However, when the pressure in the valve mechanism 21 drops below a set minimum the ports 68 permit a drop in pressure in the cap 65 to open the valve 62 and allow air to enter the anesthetic system. By moving the cap 65 on its threads the tension on the spring 67 can be adjusted.

The flat plate valve 63 is adapted to close a port 69 from the interior of the valve mechanism 21 and is held closed by an adjustable weight 70. A housing 71 forms a chamber and the cover plate 72 has thereon a boss 73 which is interiorly threaded as shown at 74 to engage a threaded bolt 75. The threaded bolt 75 has on its lower end a flange 76 to engage and hold a spring 77 in a bore 78 in the weight 70. When the bolt 75 is threaded upwardly as displayed in Figure 7 it will compress the spring 77 and remove a portion of the weight 70 from the flat valve 63. A knurled hand screw 79 is attached to the upper end of the bolt 75 to rotate same and has an indicator dial 80 thereon to show the amount of weight on the valve plate 63. When the pressure in the valve mechanism 21 passes a set maximum it will cause the valve plate 63 to lift along with the weight 70 and port the gas out through the ports 81.

While I have described the preferred embodiments of my invention, I am not limited to any of the details of construction herein set forth except as described in the following claims.

I claim:

1. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister

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in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, and an expandable diaphragm closing the lower end of said tube.

2. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, and an expandable diaphragm closing the lower end of said tube, a valve in said chamber adapted to open and release gas from said tube into said chamber.

3. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, an expandable diaphragm closing the lower end of said tube, and a valve normally closed in said passage adapted to open and pass gas from said passage into said cylinder.

4. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, a valve in said chamber adapted to open and release gas from said tube into said chamber, and a valve normally closed in said passage adapted to open and pass gas from said passage into said cylinder.

5. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing

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mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, an expandable diaphragm closing the lower end of said tube, and a passage in said spider positioned to be moved into position in relation to said head passage to port all or a portion of the gas to said tube.

6. In an absorber for an anesthetic machine, a head having a chamber, a port to said chamber for admitting an anesthetic, an outlet from said chamber adapted to be connected to a breathing mask, a barrel, a tube adapted to rotatively support said barrel in airtight relation to said head, said tube opening into said chamber, a spider in said barrel forming a plurality of cylinders open at their lower ends, canisters adapted to support a CO₂ absorber positioned in said cylinder, means for detachably supporting a canister in said cylinder, a passage in said head to port gas from said breathing mask, said passage being positioned to port air into one or more of said cylinders depending upon the position to which said barrel is rotated, means for porting the bottom of said cylinders into said tube, an expandable diaphragm closing the lower end of said tube, said canisters being removably positioned in said cylinder to permit refilling with CO₂ absorber when the head passage is closed to the canister to be refilled.

7. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, and expansible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask.

8. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expansible means for porting said exhaled gas from said canister to said porting means to return said exhaled gases to said breathing mask, and valve means to cause said gas to flow in one direction.

9. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expansible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, and means to close off all or a portion of said exhaled gas from said canisters and to pass said exhaled gas into said expansible means.

10. In an absorber for an anesthetic machine, a head having porting means for passing an

anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, means to close off all or a portion of said exhaled gas from said canisters and to pass said exhaled gas into said expandible means, and valve means to cause said gas to flow in one direction.

11. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, and means to indicate which of said canister is passing said exhaled gas.

12. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, means to close off all or a portion of said exhaled gas from said canisters and to pass said exhaled gas into said expandible means, and means to indicate which of said canisters is passing said exhaled gas.

13. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, and valve means to prevent excessive positive or negative pressure in said absorber.

14. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from

said canister to said porting means to return said exhaled gas to said breathing mask, means to close off all or a portion of said exhaled gas from said canisters and to pass said exhaled gas into said expandible means, and valve means to prevent excessive positive or negative pressure in said absorber.

15. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, and a valve mechanism connected to said chamber comprising an adjustable spring loaded plate valve adapted to open and port air inwardly when the pressure in said mechanism drops below a set minimum, a second plate held closed by a weight means for adjusting said weight said valve adapted to open when the pressure in said mechanism rises above a set maximum to port the gas therein to the atmosphere.

16. In an absorber for an anesthetic machine, a head having porting means for passing an anesthetic gas from an anesthetic machine to a breathing mask, a plurality of canisters detachably supported by a rotating barrel, a passage in said head to port exhaled gas from said breathing mask to one or more of said canisters, expandible means for porting said exhaled gas from said canister to said porting means to return said exhaled gas to said breathing mask, means to close off all or a portion of said exhaled gas from said canisters and to pass said exhaled gas into said expandible means, and a valve mechanism connected to said chamber comprising an adjustable spring loaded plate valve adapted to open and port air inwardly when the pressure in said mechanism drops below a set minimum, a second plate held closed by a weight means for adjusting said weight said valve adapted to open when the pressure in said mechanism rises above a set maximum to port the gas therein to the atmosphere.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,450,338	Heidbrink	Sept. 28, 1948
2,507,607	Miller	May 16, 1950