G. VON ACH.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

APPLICATION FILED AUG. 25, 1908.

923,751.

Patented June 1, 1909.

5 SHEETS—SHEET 1.

FIG. 2

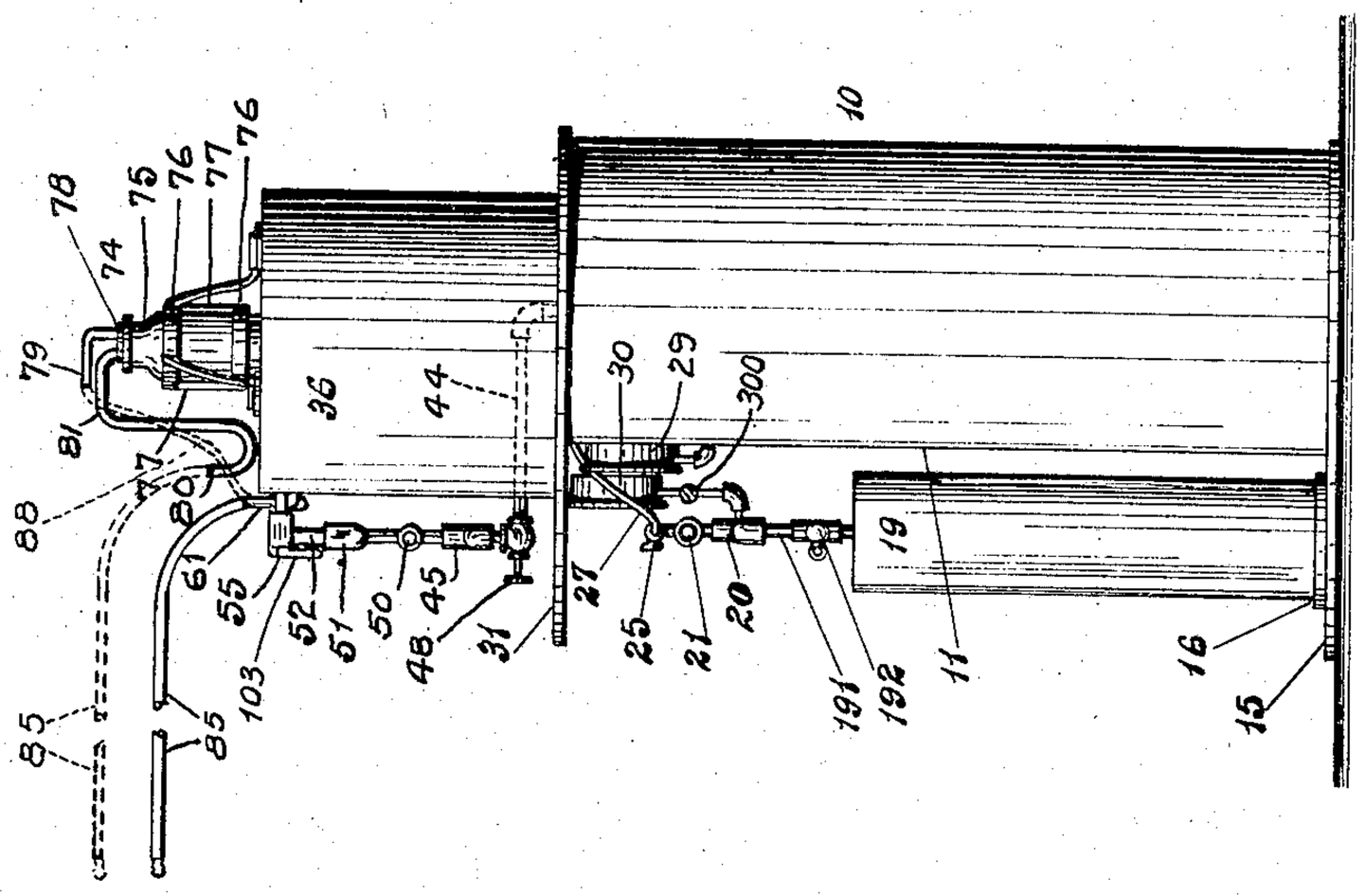
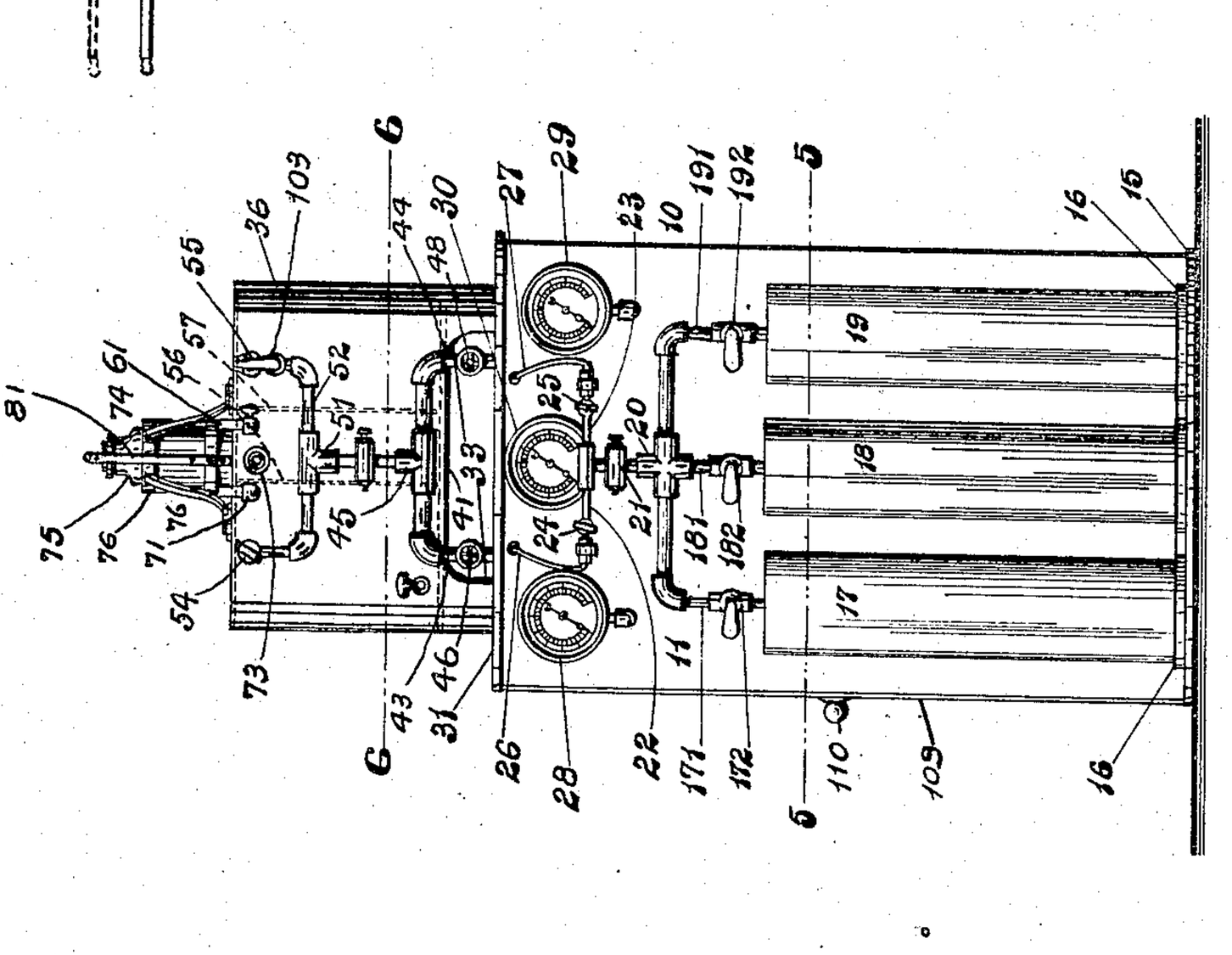


FIG. 1



WITNESSES

Frederick Gerwandt.

John W. Kamper.

INVENTOR

George von Ach,

BY

Russell N. Everett,

ATTORNEY.

G. VON ACH.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

APPLICATION FILED AUG. 25, 1908.

923,751. Patented June 1, 1909.

5 SHEETS—SHEET 2.

FIG. 3.

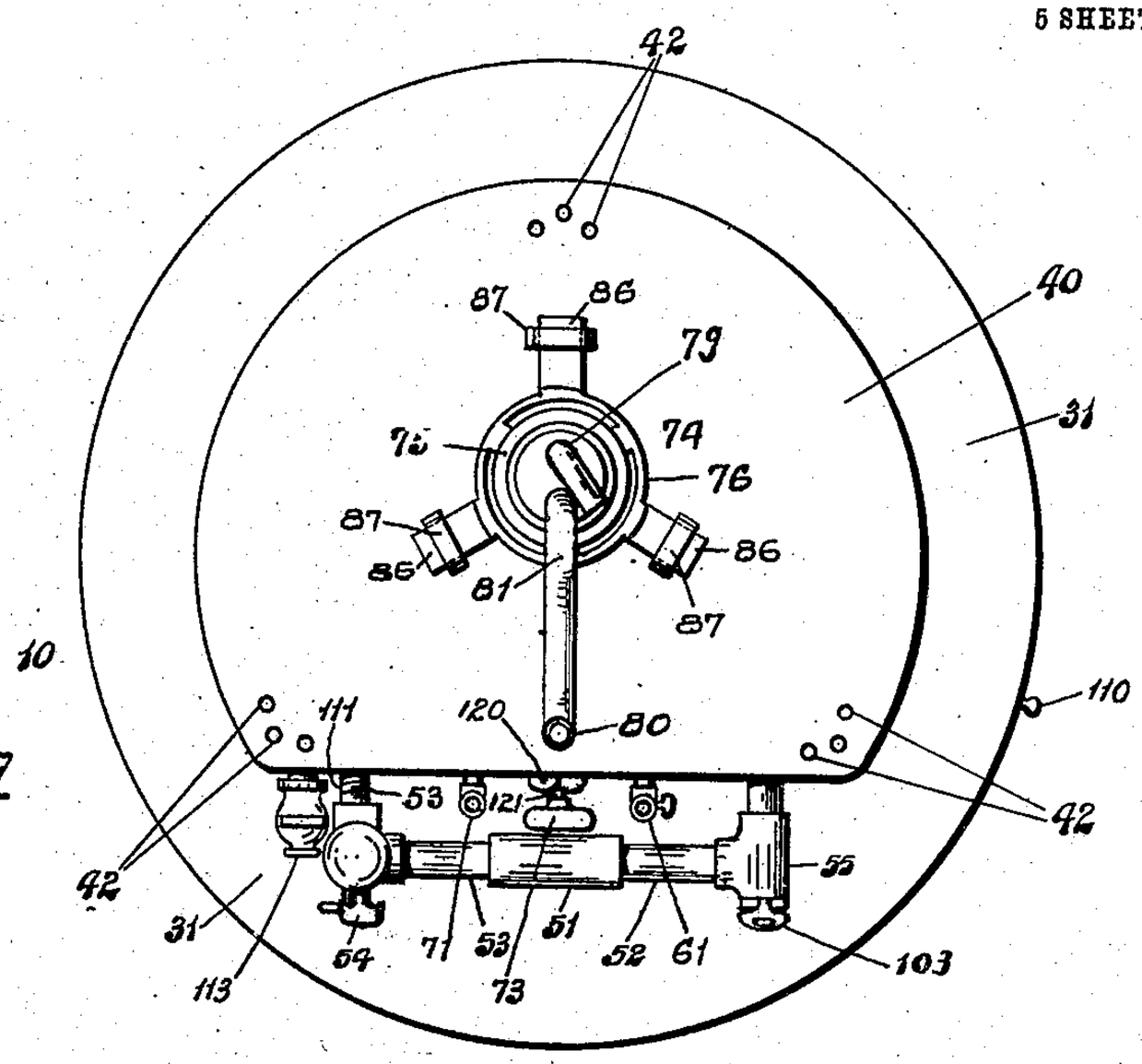
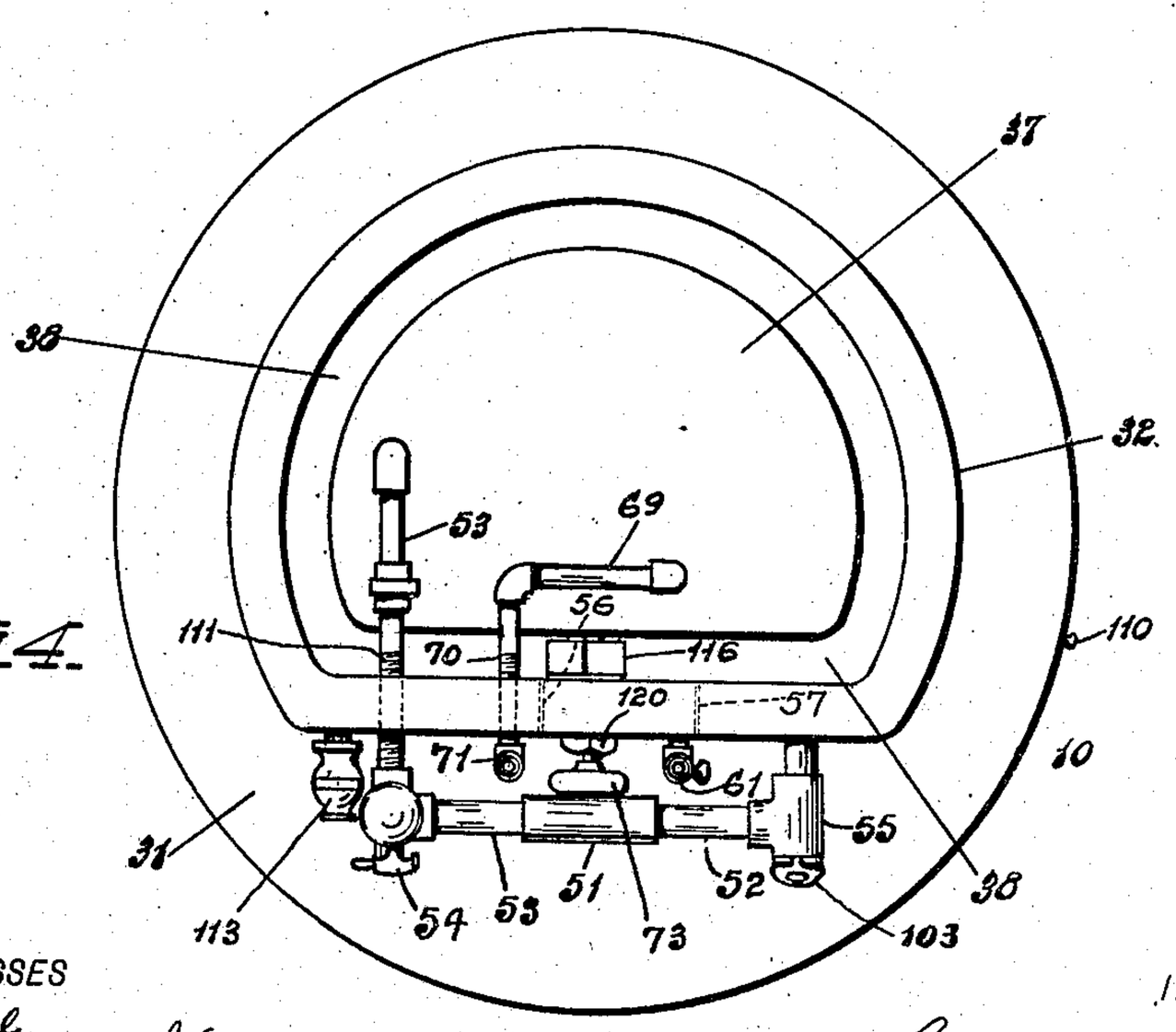


FIG. 4.



WITNESSES

Frederick Germann Jr.

John W. Kamper

INVENTOR

George von Ach,

BY

Russell M. Everett,

ATTORNEY.

G. VON ACH.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

APPLICATION FILED AUG. 25, 1908.

923,751.

Patented June 1, 1909.

5 SHEETS—SHEET 3.

FIG. 5.

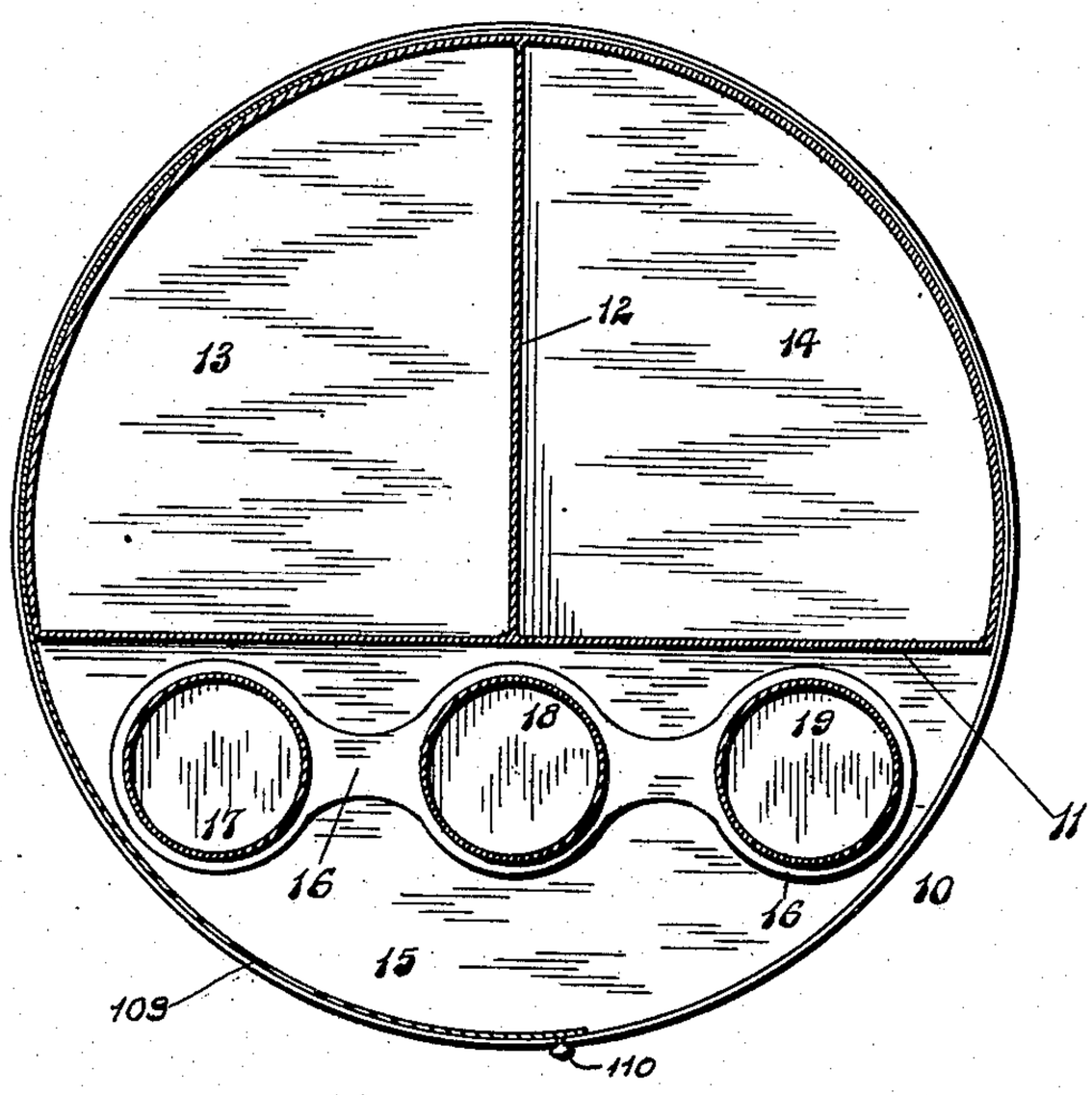
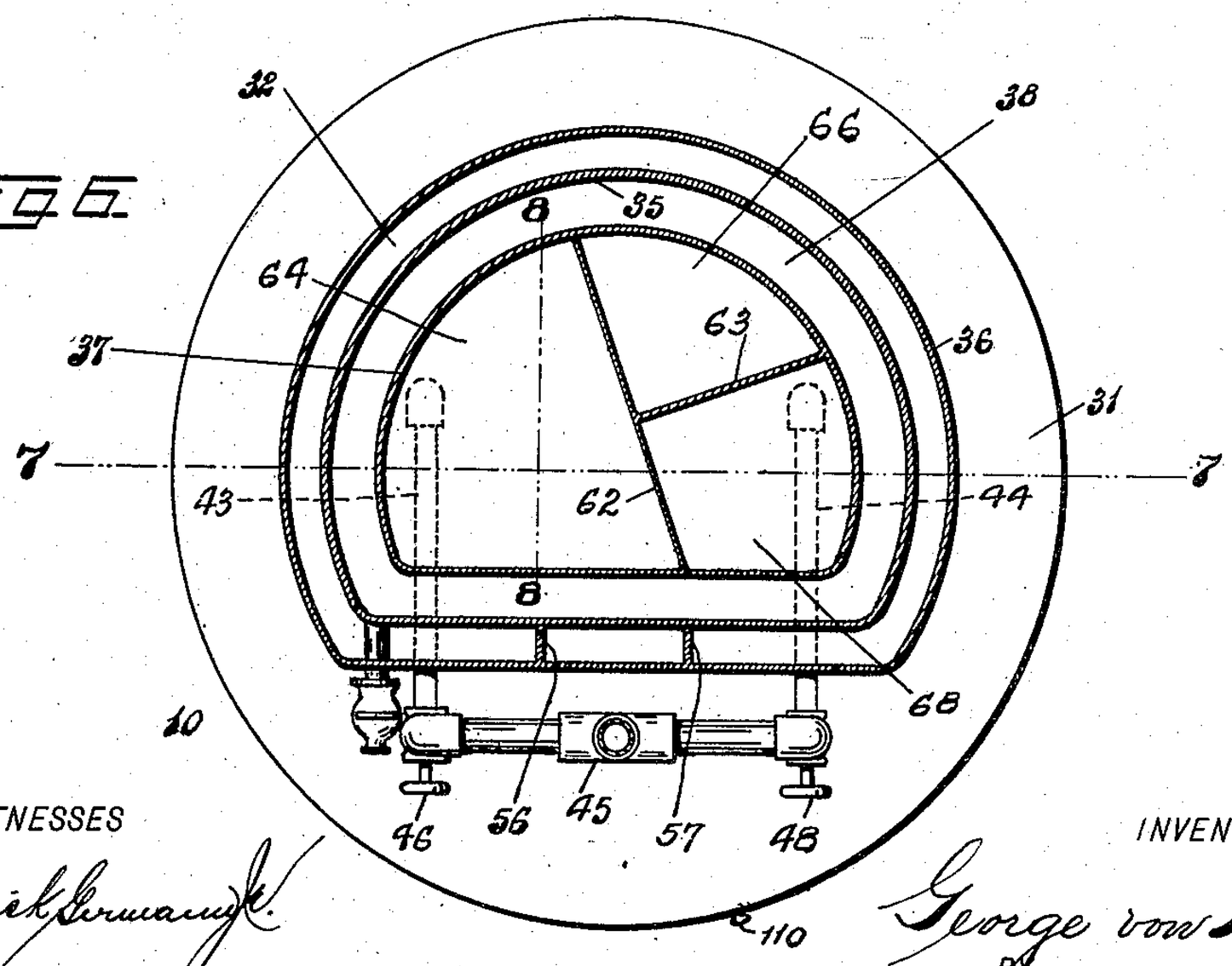


FIG. 6.



WITNESSES

Frederick Gerwanyk.

John H. Kamper.

INVENTOR

George von Ach,

By Russell M. Everett,

ATTORNEY.

G. VON ACH.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

APPLICATION FILED AUG. 25, 1908.

923,751.

Patented June 1, 1909.

5 SHEETS—SHEET 4.

FIG. 9.

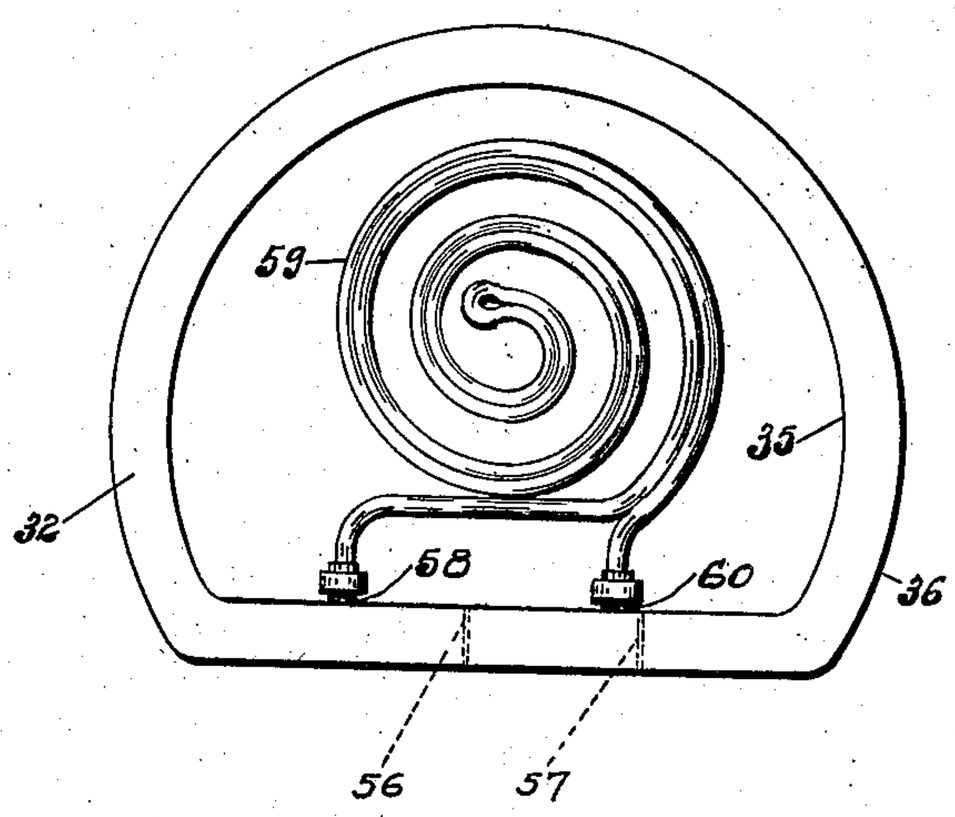


FIG. 8.

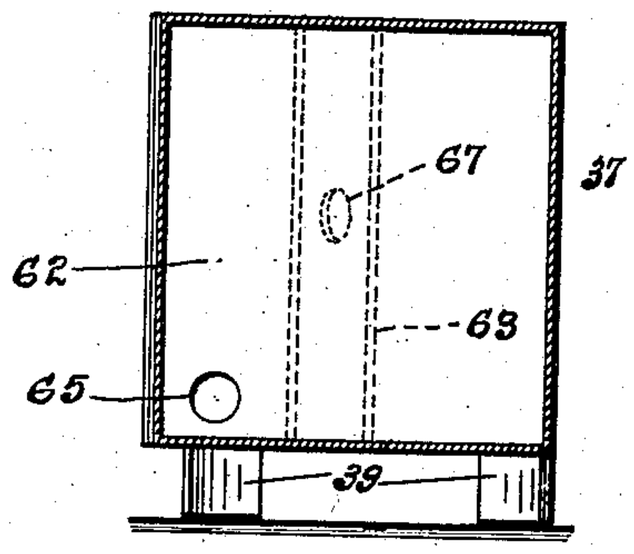
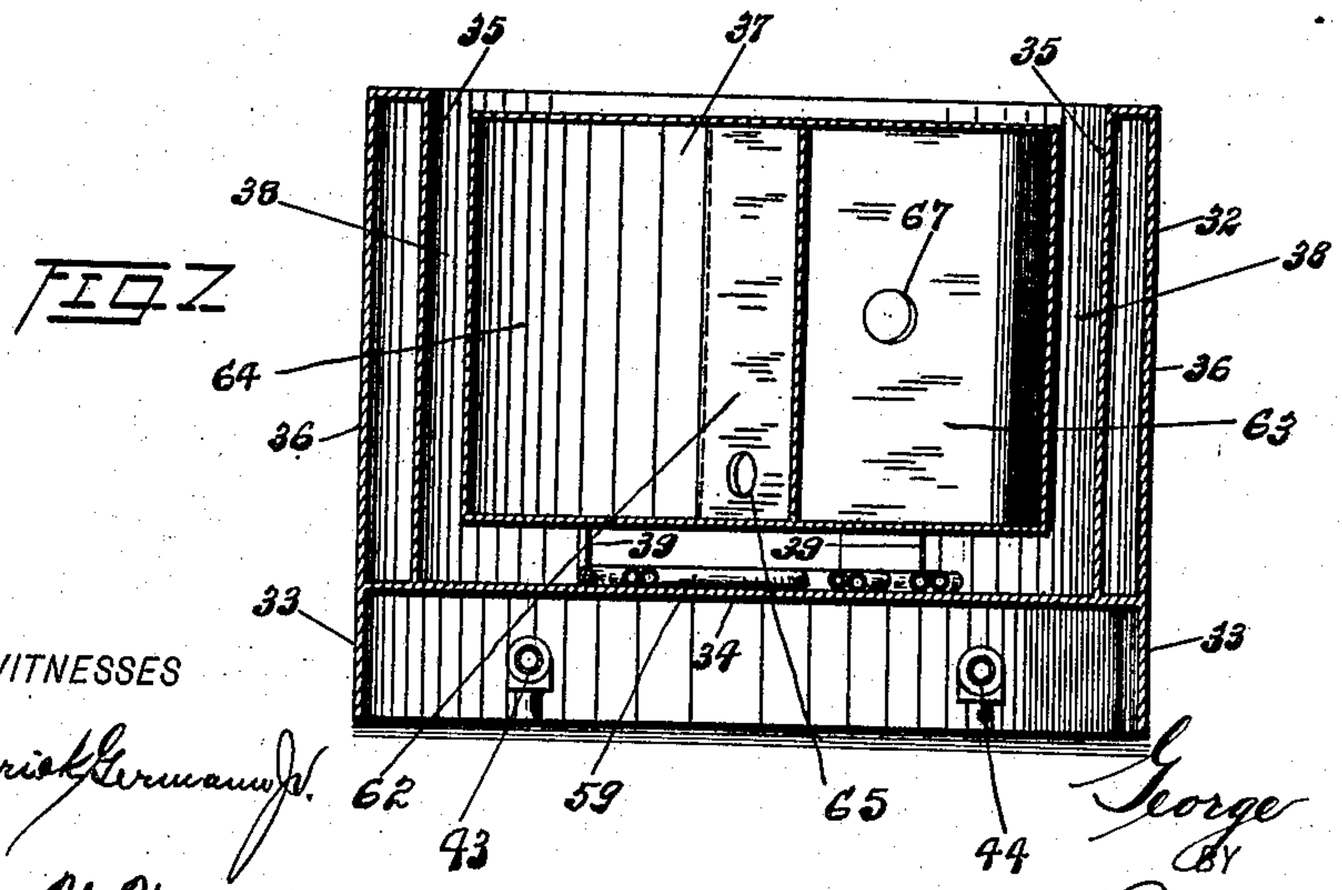


FIG. 7.



WITNESSES

Frederick Germann Jr.

John H. Kamper.

INVENTOR

George von Ach,

BY

Russell M. Everett,

ATTORNEY.

G. VON ACH.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

APPLICATION FILED AUG. 25, 1908.

923,751.

Patented June 1, 1909.

5 SHEETS—SHEET 5.

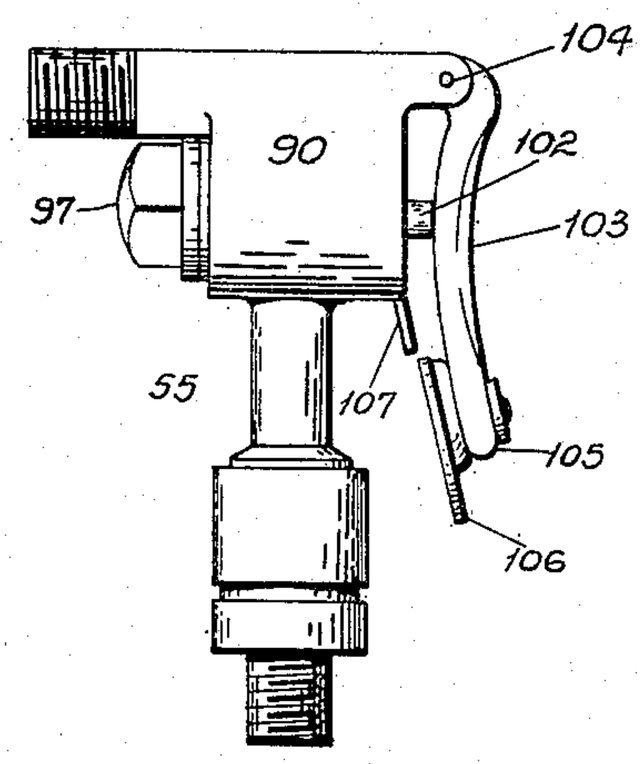


FIG. 10.

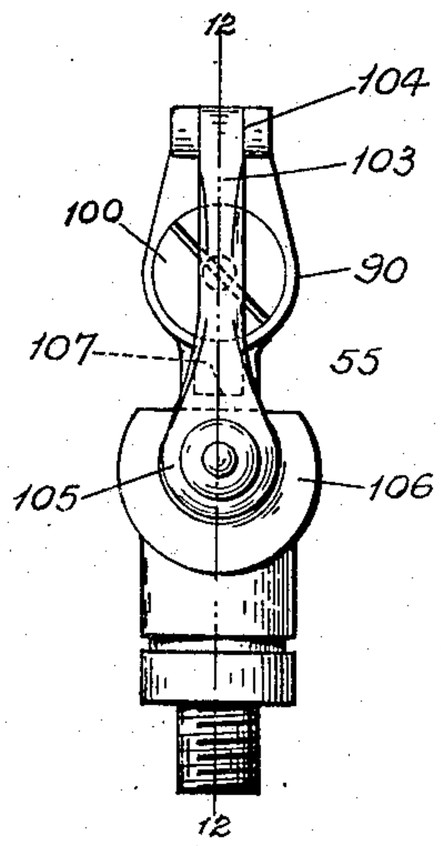


FIG. 11.

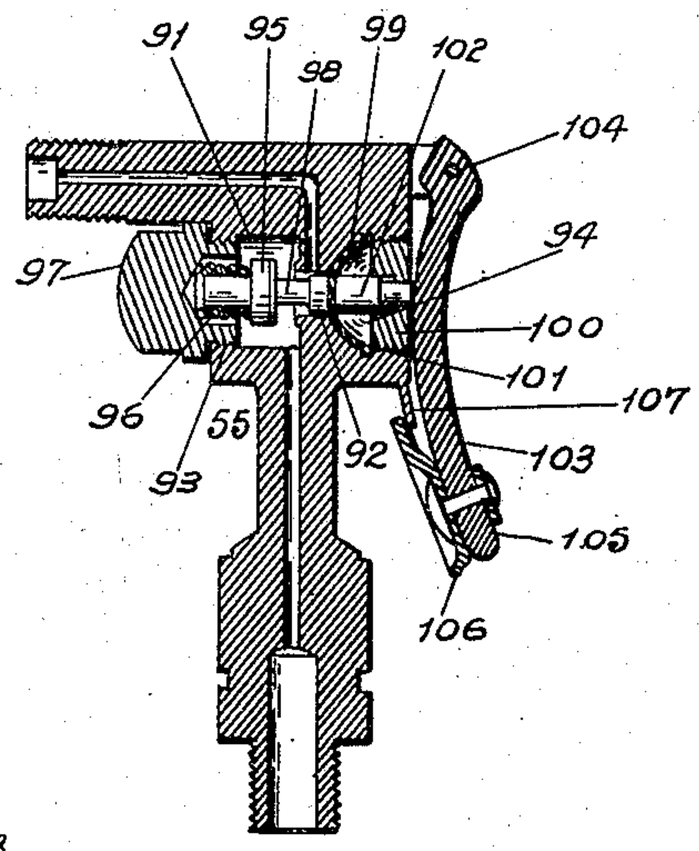


FIG. 13.

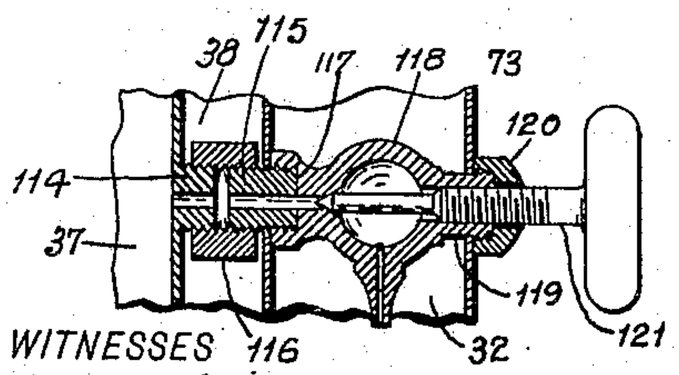


FIG. 12.

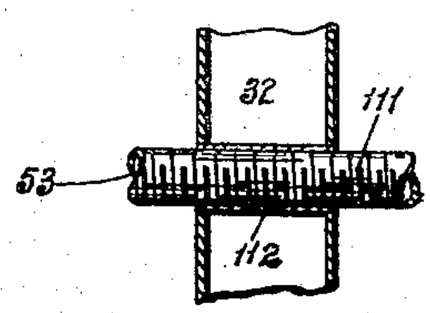


FIG. 14.

Frederick Germanyk.

John W. Kamper.

INVENTOR

George von Ach,

BY

Russell M. Everett,

ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE VON ACH, OF NEWARK, NEW JERSEY.

APPARATUS FOR MIXING AND ADMINISTERING GASES.

No. 923,751. Specification of Letters Patent. Patented June 1, 1909.

Application filed August 25, 1908. Serial No. 450,151.

To all whom it may concern:

Be it known that I, GEORGE VON ACH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Mixing and Administering Gases, of which the following is a specification.

This invention relates to apparatus of the same general character as shown in my prior application Serial No. 439,693, filed June 22, 1908, and in Patent No. 890,484 issued to me June 9, 1908.

The objects of the present improvements are to enable a number of different kinds of gases to be handled and administered together; to secure a perfect mixture of any desired number of said gases; to obtain exactness and accuracy in handling the gases, and the greatest possible convenience, and to secure other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate the same parts in each of the several figures, Figure 1 is a front elevation of an apparatus of my improved construction, and Fig. 2 is a side view of the same; Fig. 3 is a plan of the apparatus complete, Fig. 4 is a plan with a certain top cover removed; Fig. 5 is a horizontal cross-section on line 5—5, Fig. 1, showing a certain door partly closed; Fig. 6 is a cross-section on line 6—6, Fig. 1, showing certain inner and outer reservoirs, and Fig. 7 is a vertical section of the same parts on line 7—7, Fig. 6; Fig. 8 shows the inner reservoir removed and in vertical section on line 8—8, Fig. 6, Fig. 9 is a plan of the outer reservoir with the inner one removed; Fig. 10 shows in side elevation a certain delivery control valve, Fig. 11 is a front view of the same, and Fig. 12 is a central section on line 12—12, Fig. 11. Fig. 13 is a section through a certain valve adapted to connect the outer and inner reservoirs, and Fig. 14 is a similar detail section of a portion of the inlet duct to the inner reservoir.

In said drawings, 10 indicates a gasometer formed in the shape of a cylinder with a longitudinal portion cut from its front so as to leave a flat surface 11. This gasometer is suitably constructed in any usual manner of sheet metal, and is preferably divided by a central partition 12 into chambers 13, 14 adapted to hold gases. The circular base of the gasometer 10 projects front of the flattened side 11, as at 15, and affords seats 16 for a plurality of gas cylinders, said seats being of rubber or other cushioning material, in order to allow slight relative adjustment of the cylinders in height.

I have shown for purposes of illustration three gas cylinders, 17, 18 and 19, and from the top of each leads an outlet pipe 171, 181 or 191, provided with a valve 172, 182 or 192. Said outlet pipes connect by a union 20, and beyond said union is a pressure reducer or regulator 21, to control the high pressure in the cylinders. Beyond said reducer 21 are branch pipes 22, 23, each valved as at 24 or 25, and connected to the interiors of the chambers 13, 14, respectively, by tubes 26, 27, which are preferably of rubber pressure hose to allow relative movement of the connected parts. Thus it will be observed that gas can be taken from any one of the three cylinders, and led through the pressure reducer 21 into either one of the chambers 13, 14 of the gasometer.

Each chamber 13, 14 of the gasometer 10 is provided at a convenient point with a pressure gage 28 or 29, and similarly a pressure gage 30 is mounted upon the union 20, so as to show the reading for any one of the three cylinders 17, 18 or 19 which is opened. This gage 30 is normally shut off by a valve 300, which is opened only when it is desired to ascertain the volume of gas in the cylinder or any one of them.

The top 31 of the gasometer 10 is preferably circular, as shown, so that it projects out over the flattened front of the gasometer, and upon said top 31 stand certain devices for administering the gases to a patient and which will next be described.

An outer reservoir 32, of sheet metal, has a flange 33 to hold its bottom 34 up from the top of the gasometer, and above said bottom the side walls of said reservoir are double, as at 35, 36, so as to form an annular chamber and which chamber is closed at its top. This outer reservoir 32 is preferably the same shape in plan as the gasometer 10 beneath,—that is, flattened at its front to afford space for certain connections hereinafter described. Inside the said outer reservoir 32 is an inner reservoir 37, which provides a closed chamber and is separated on all sides from the outer reservoir by a considerable space 38. Feet 39 hold this inner reservoir up from the floor of the outer reservoir, and preferably the top of the said inner

reservoir is a little lower than the top of the outer reservoir, so as to provide space between said top of the inner reservoir and a cover 40 placed upon the outer reservoir. The space 38 between the outer and inner reservoir is adapted in the use of the apparatus to be filled with water, and this water can if desired be heated by a lamp or burner (not shown) set upon the top of the gasometer 10 under the bottom of the outer reservoir. An opening 41 in the flange 33 permits the introduction of such a lamp or burner, and holes 42 in the cover 40 provide a vent for steam or the like. Hot water and steam can thus circulate entirely around the inner reservoir.

From the top of each compartment 13 and 14 of the gasometer 10, a pipe 43 or 44, leads outward beneath the bottom of the outer reservoir 32, through the opening 41 of the flange 33, and bending upward the two pipes enter opposite ends of a T-connection 45 at the flattened front of the reservoirs. Each pipe 43 or 44 has a valve 46 (48) for controlling the passage of gas therethrough, and at the top of the T-connection 45 is a pressure regulator or reducer 50. Beyond said regulator 50 the pipe divides again by another T-connection 51, into branches 52 53, one of which as 52 opens through the front of the outer reservoir into its chamber near the top thereof, and the other of which as 53 passes through the outer reservoir near its top edge, and extending in over the top of the inner reservoir opens downwardly thereinto. Each of these branches 52 and 53 is provided with a valve 54 or 55, at the front of the outer reservoir, as shown in the general views of the drawings, the one 55 of said valves, on the branch pipe 52 which opens into the outer reservoir, being an automatic valve as and for the purposes hereinafter more fully described.

The outer reservoir 36 has at its front parallel vertical interior partitions 56 and 57, spaced a short distance apart, and the pipe 52 described opens into the outer reservoir at one side of these two partitions, as shown, whereby entering gas must pass around the back part of the reservoir and come up against the other partition 57. Adjacent to this other partition, and at the bottom of the outer reservoir chamber, a pipe 58 leads therefrom, as at 59, and is coiled in the space beneath the inner reservoir 37, as shown, opening again into the outer reservoir between the partitions 56 and 57, as at 60. The gas thus arrives at the bottom of that portion of the outer reservoir between said partitions 56 and 57, and if desired is taken from the top thereof by a discharge nipple 61 to which a delivery tube 85 may be connected as shown in full lines in Fig. 2.

The inner reservoir 37 has interior vertical partitions 62 and 63 dividing it into three compartments through which gas from the inlet pipe 53 described must pass in succession. Said inlet 53 opens into the top of the first compartment 64, and an opening 65 in the bottom of the partition 62 leads into the second compartment 66; from this second compartment 66, another opening 67 in the middle of the partition 63 communicates with the third compartment 68, and from this compartment a pipe 69 leads through the top of the inner reservoir along over the same and extends through the upper edge of the reservoir, as at 70, to a discharge nipple 71 at the front of said outer reservoir, and to which the delivery tube 85 may be attached when gas is administered from the inner reservoir.

Between the partitions 62 and 63 of the outer reservoir, a connection is provided between the two reservoirs, opening into the first compartment 64 of the inner reservoir, and controlled by a valve 73 accessible at the front of the outer reservoir. This valve is normally closed, but by opening it, and closing the discharge nipple 61, gas may be passed around through the inner reservoir after its passage through the outer reservoir, and finally issue at the discharge 71, having circulated through both reservoirs.

Upon the center of the top of the cover 40 for the reservoirs, is a support 74 for a wash bottle 75, comprising rings 76 held horizontal by braces 77. These braces are resilient and provided at their lower ends with feet 86 adapted to removably slip under cleats 87 on the top 40; thus by pressing the braces near their lower ends toward the bottle, the feet 86 are freed and the whole support may be detached, releasing the bottle. The wash bottle itself is of usual construction with a tube 78 extending to the bottom of the bottle on its inside and having outside an end 79 adapted to receive a connection 88, as shown dotted in Fig. 2, with either of the discharge nipples 61 or 71. This connection may be by rubber tubing, as commonly done, and the outer end 80 of the other tube 81 in the bottle is adapted to receive the delivery tube 85 when gas is administered through the bottle, the inner end of said tube 81 terminating in the top of the bottle.

In the use of my improved apparatus, it will be understood, gas from any one of the cylinders 17, 18 and 19, or a mixture from two or more of them, can be obtained in each of the compartments 13 and 14 of the gasometer, to any desired volume and pressure. Then from either compartment, the gas therein can be led to either one of the outer and inner reservoirs 32 and 37, or it can be led through both said reservoirs, as described, or gas can be led from one compartment to one reservoir and from the other compartment to the other reservoir, simultaneously. From said reservoirs, the gas can be admin-

istered cold dry, hot dry, cold moist or hot moist, as desired, and according to whether the heating means between the reservoirs and the wash bottle upon their top, or either of them, is employed as described. In practice, it is common to have the cylinders 17, 18 and 19 contain, for example, nitrous oxid, purified air and oxygen, respectively, and the two chambers of the gasometer contain the first and last named, respectively, either or both diluted to any desired extent by the purified air. The nitrous oxid is then administered through the inner reservoir 37, and the oxygen through the outer reservoir 32.

The oxygen may frequently be taken from the outer reservoir by a patient himself, and when this is done it is important to guard against waste of the gas by failure of the unskilled operator to shut off the supply. For this reason, the valve 55 in the branch pipe 52 is as above mentioned, made to automatically close, as will next be described in detail, especial reference being had to Figs. 10, 11 and 12.

The valve body 90 provides at one point of its longitudinal passage, a transverse chamber having end portions 91, 92 of materially different diameters and opening one out through each side of the valve body. The end sections 93 and 94 of said passage lead into each of said portions 91 and 92 of the transverse chamber, and a valve 95 adapted to seat against the shoulder between said two portions controls communication between the said end sections and thus flow through the valve. A spring 96 normally holds the valve 95 seated to shut off flow, and a plug 97 closing the outer end of the large chamber portion 91 holds the outer end of said spring in place. A stem 98 of the valve projects into the smaller chamber portion 92 and rests against a diaphragm 99 held by a screw ring 100 in the enlarged outer end 101 of the chamber. A pin 102 outside said diaphragm and in alinement with the stem 98, projects through the screw ring 100 to transmit motion from a lever 103 on the outside of the valve body to the valve 95 to open it away from its seat against the spring 96. The said lever 103 is of the second class, fulcrumed as at 104, and providing at its opposite end a finger piece 105 which can be pressed toward the valve body to open the valve, and when released is instantly thrown outward again by the closing of the valve. The valve must therefore be positively held open, and loss of gas by its inadvertent escape cannot occur.

To enable the lever 103 to be retained in depressed position when the apparatus is being used by a physician or skilled operator, I provide upon the under side of its finger piece 105 a rotatable segmental disk 106, and upon an adjacent point of the valve body a projection 107 approximately parallel to the lever 103 and under which the segmental disk 106 will project when turned into certain position, as shown in Fig. 12. With its cut-away part 108 next the projection 107, as shown in Fig. 11, said parts do not engage and the lever stands outward unless pressed by the finger, and the valve closed.

It will be noted that a sliding semi-cylindrical door 109 is arranged in ways upon the base 15 and top 31 of the gasometer, so that when desired the cylinders 17, 18, and 19 and connections above the same can all be inclosed. This door stands vertical, it will be understood, and is slid open or shut by means of a handle 110.

The inlet pipe 53 to the inner reservoir is, where it passes through the outer reservoir 32, threaded as at 111 so as to screw into a transverse sleeve 112 of said outer reservoir and make a tight joint against leakage from the water jacket 38 between the outer and inner reservoirs, all as shown in Fig. 14. The outlet pipe 69 of the inner reservoir extends in the same manner through the outer reservoir, as at 70 in Fig. 4. A drain cock 13 enables the water jacket to be emptied when desired.

In Fig. 13 I have shown a preferred detail construction of the valve 73 which establishes communication between the outer and inner reservoirs. Nipples 114, 115 at the adjacent walls of the reservoirs project into the water jacket 38 to receive a union 116. To the end 117 of the nipple 115, which is within the outer reservoir 32 is screwed one end of the body portion 118 of a valve like a pressure gage cock, the other end 119 of said body projecting outside the outer reservoir to receive a clamping and packing nut 120. The valve stem 121 can thus be conveniently operated from the outside to establish communication between the two reservoirs, but the body part of the valve lies entirely inside the reservoir.

Having thus described the invention, what I claim as new is:

1. In an apparatus for mixing and administering gases, the combination of a gasometer having its opposite end walls extending outward from its body at one side thereof, gas cylinder seats upon the lower of said extensions, pipe means for connecting such cylinders and gasometer located between said projecting ends inside the direct lines between their peripheries, and gas administering means on top of the upper gasometer end.

2. In an apparatus for mixing and administering gases, the combination of a gasometer, a plurality of gas cylinders, valve branch ducts leading from said cylinders, a main duct receiving said branch ducts and leading to the gasometer, a pressure regulator in said main duct, and gas administering means removably mounted on the top of said

gasometer and communicating with the same.

3. In an apparatus for mixing and administering gases, the combination of a gasometer providing a plurality of chambers, a plurality of gas cylinders, valved branch ducts leading from said cylinders, a main duct receiving said branch ducts, a pressure regulator in said main duct, other branch ducts leading from said main duct to the said chambers of the gasometer, and gas administering means removably mounted on the top of said gasometer and communicating with the same.

4. In an apparatus for mixing and administering gases, the combination of a gasometer having an extended base providing seats for gas cylinders, valved branch ducts adapted to connect to said cylinders, a main duct receiving said branch ducts, a pressure regulator in said main duct, other branch ducts leading from said main duct to the said chambers of the gasometer, and gas administering means removably mounted on the top of said gasometer and communicating with the same.

5. In an apparatus for mixing and administering gases, the combination of a gasometer providing a plurality of gas chambers, pipe means adapted to connect a plurality of gas cylinders to said chambers and establish communication of each gas cylinder with any one of the chambers, and gas administering means removably mounted on the top of said gasometer and communicating with the same.

6. In an apparatus for mixing and administering gases, the combination of a gasometer providing a plurality of gas chambers, pipe means adapted to connect a plurality of gas cylinders to said chambers and establish communication of each gas cylinder with any one of the chambers, gas administering devices mounted on said gasometer and providing a plurality of reservoirs, and means for connecting each of said chambers with any one of said reservoirs.

7. In an apparatus for mixing and administering gases, the combination with a gasometer, of outer and inner reservoirs providing a water space between themselves, a coiled pipe between said reservoirs in communication at its ends with the outer reservoir, a partition in the outer reservoir between said ends of the coiled pipe, gas supply and discharge means at opposite sides of said partition in the outer reservoir, and other gas inlet and discharge means for the inner reservoir.

8. In an apparatus for mixing and administering gases, the combination with a gasometer, of a reservoir, a water jacket for said reservoir, a coiled pipe in said water jacket communicating at its opposite ends with the reservoir, a partition in the reservoir between said ends of the coiled pipe, and gas supply and discharge means at opposite sides of said partition in the reservoir leading from the gasometer.

9. In an apparatus for mixing and administering gases, the combination with a gasometer, of a reservoir, a water jacket inclosing said reservoir, partitions in said reservoir dividing the same into separate compartments and having openings at different heights, one partition between two compartments being imperforate, and means for supplying gas to and discharging it from the two compartments on opposite sides of said last mentioned partition.

10. In an apparatus for mixing and administering gases, the combination with a gasometer, of outer and inner reservoirs providing a water space between themselves, a coiled pipe in said water space communicating at its opposite ends with the outer reservoir, a partition in said outer reservoir between said ends of the coiled pipe, means for supplying gas to and discharging it from said outer reservoir at opposite sides of said partition, other partitions in the inner reservoir dividing its interior into compartments and having openings at different heights, one partition being imperforate, means for supplying gas to and discharging it from the inner reservoir on opposite sides of said last mentioned partition, and means for placing the two reservoirs in communication.

11. In an apparatus for mixing and administering gases, the combination with a gasometer, a reservoir mounted upon said gasometer, pipe connections between said gasometer and reservoir, cleats upon the top of said reservoir, a wash bottle between said cleats, bands around said wash bottle, resilient feet on said bands adapted to slip at their ends beneath said cleats, and means for connecting said bottle with the reservoir.

12. In an apparatus for mixing and administering gases, the combination of a gasometer, a reservoir, pipe connections adapted to place said gasometer and reservoir in communication, means for delivering the gas from said reservoir, an automatically closing valve controlling such delivery, and means for holding said valve open.

13. In an apparatus for mixing and administering gases, the combination of a gasometer, a reservoir, pipe connections adapted to place said gasometer and reservoir in communication, means for delivering the gas from said reservoir, an automatically closing valve controlling such delivery, a lever for opening said valve, and projections upon the valve body and lever, one adapted to be moved into engagement with the other to hold said lever with the valve open.

14. In an apparatus for mixing and ad-

ministering gases, the combination of a gasometer, a reservoir, pipe connections adapted to place said gasometer and reservoir in communication, means for delivering the gas from said reservoir, an automatically closing valve controlling such delivery, a lever for opening said valve, a rotatable segmental disk on said lever, and a projection upon the valve body adapted to be engaged by said disk when the lever is in position to open the valve.

15. In an apparatus for mixing and administering gases the combination with a gasometer, outer and inner reservoirs separated by a water space, and means for supplying gas to and discharging it from said reservoirs, of means for establishing communication between said reservoirs comprising nipples on adjacent walls of said reservoirs, a union in the water space on said nipples, a valve body in the outer reservoir having communication with said nipples and also with the interior of said outer reservoir and projecting outside the outer reservoir, and a valve proper in said valve body with its handle outside the outer reservoir.

16. In an apparatus for mixing and administering gases, the combination with a gasometer in the form of a cylinder cut away along one side and having complete circular bases, of gas cylinders upon one base at the cut away side of the cylinder, pipe connections above said cylinders between the gasometer and said cylinders, and a curved door sliding between said bases in the line of the cylindrical surface of the gasometer.

GEORGE VON ACH.

In the presence of—
ETHEL B. REED,
FREDERICK GERMANN, JR.