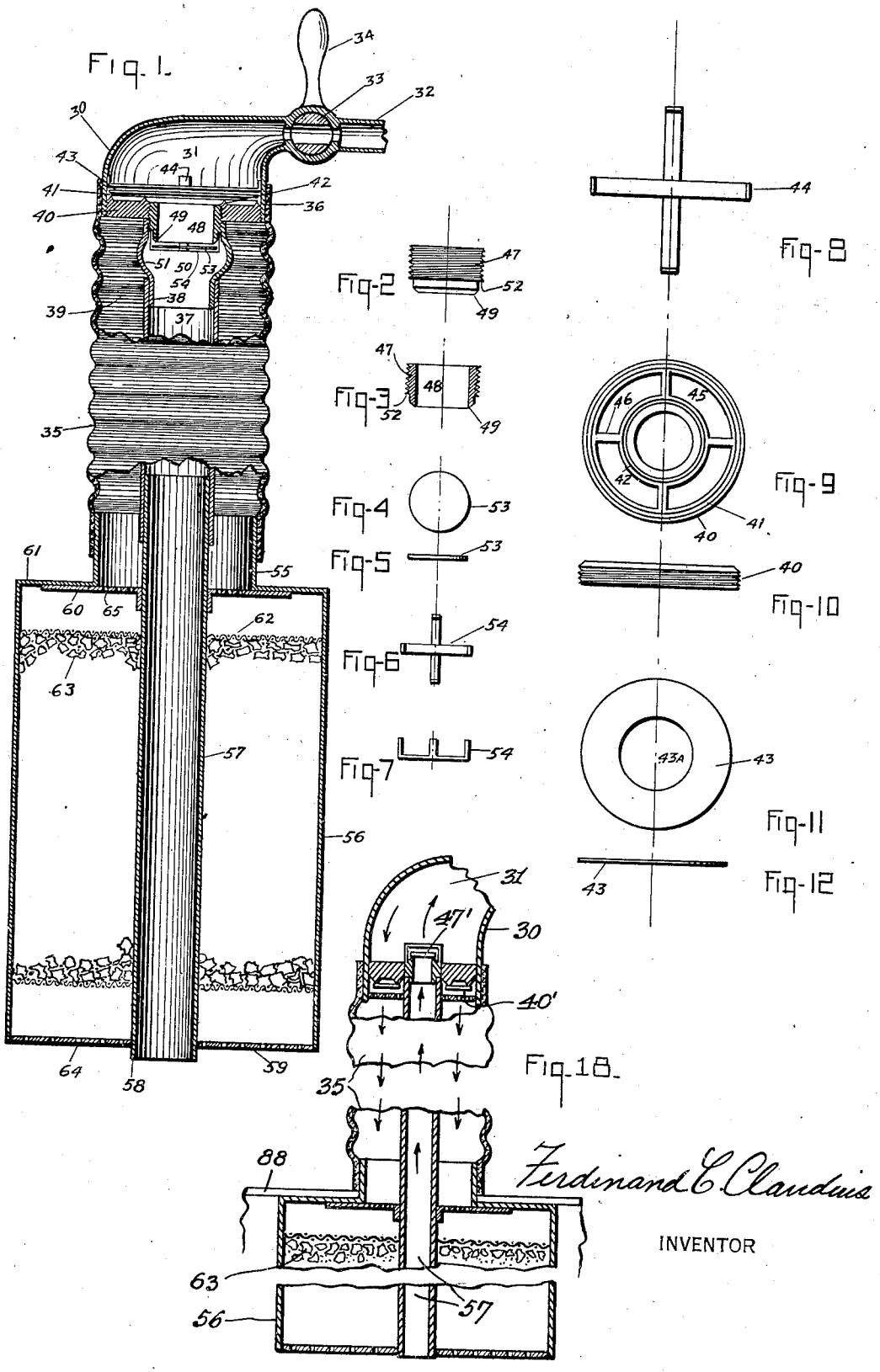
April 23, 1935. F. C. CLAUDIUS 1,999,086

RESPIRATORY PROTECTIVE APPARATUS

Filed Jan. 24, 1933 3 Sheets-Sheet 1



April 23, 1935. F. C. CLAUDIUS 1,999,086

RESPIRATORY PROTECTIVE APPARATUS

Filed Jan. 24, 1933 3 Sheets-Sheet 2

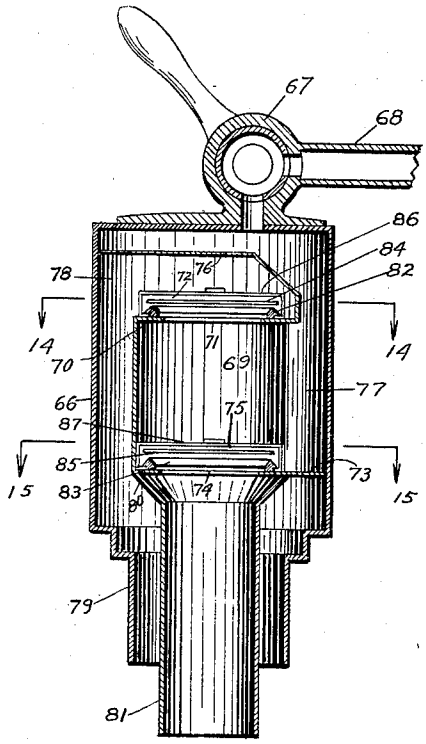


Fig-13

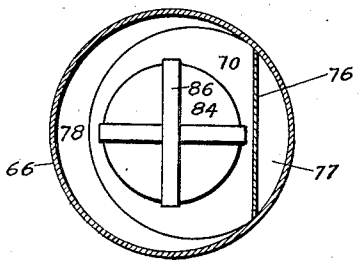


Fig-14

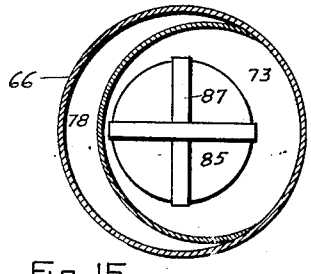


Fig-15

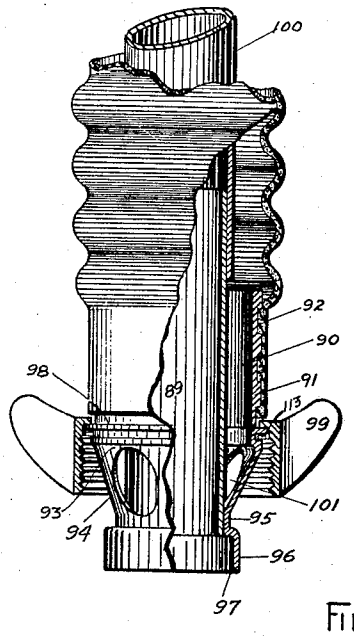


Fig-16

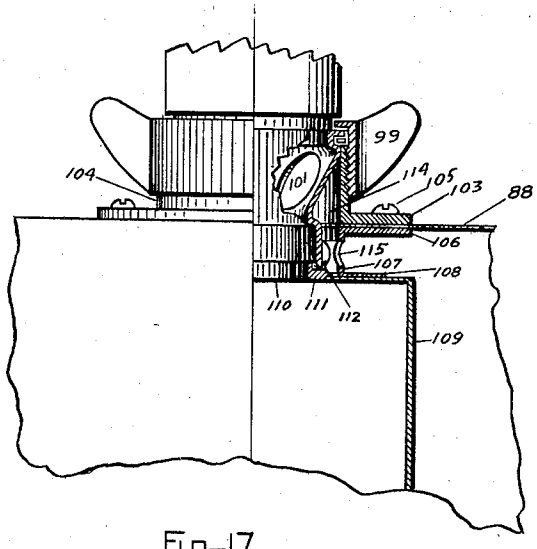


Fig-17

Ferdinand C. Claudius
INVENTOR

April 23, 1935. F. C. CLAUDIUS 1,999,086

RESPIRATORY PROTECTIVE APPARATUS

Filed Jan. 24, 1933 3 Sheets-Sheet 3

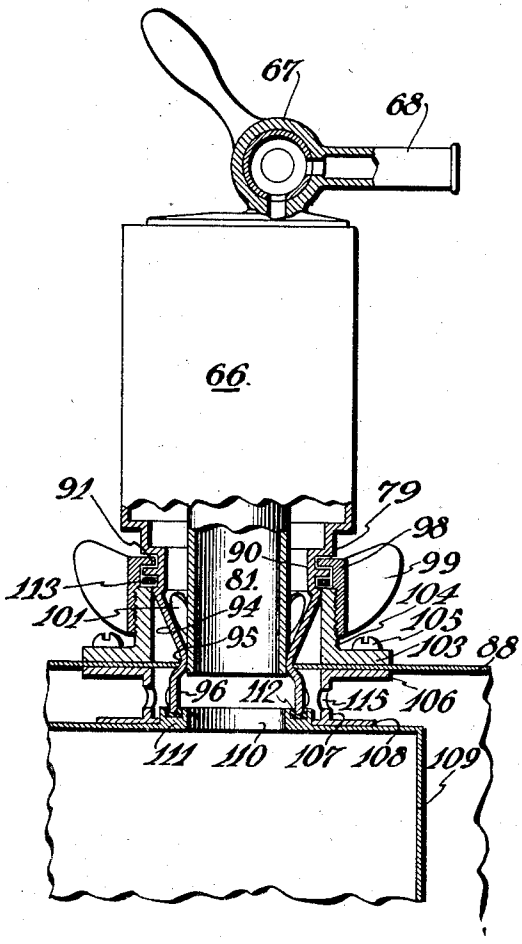


Fig. 19.

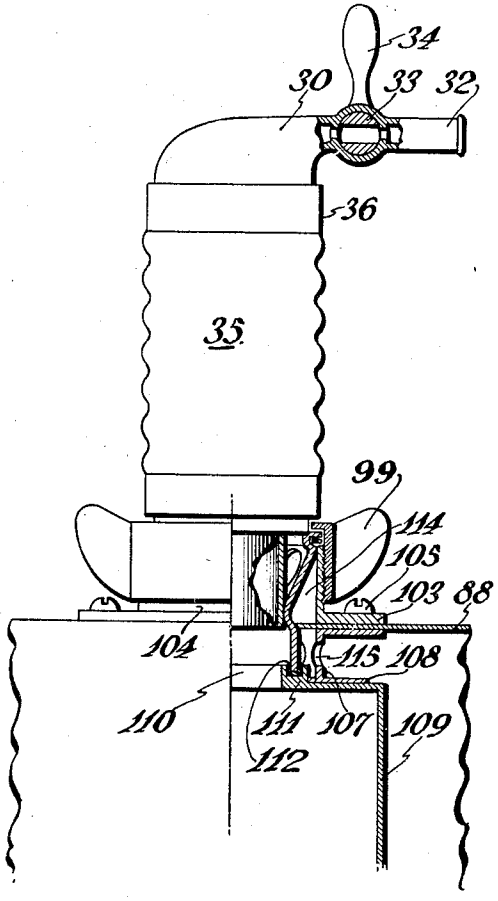


Fig. 20.

Ferdinand C. Claudius Inventor

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1,999,086

UNITED STATES PATENT OFFICE

1,999,086

RESPIRATORY PROTECTIVE APPARATUS

Ferdinand C. Claudius, Philadelphia, Pa.

Application January 24, 1933, Serial No. 653,317

13 Claims. (Cl. 128—191)

My invention relates broadly to a respiratory protective apparatus and more particularly to an apparatus for use in vitiated or rarified atmosphere.

The primary object of my invention is to provide a breathing device with a simplified mouthpiece having a combined intake and exhaust arrangement from the purifying canister, that not only reduces resistance to breathing but also eliminates to a great extent the dangers of fouling, becoming twisted or entangled with foreign objects.

The conventional type of breathing apparatus has a mouthpiece in which intake and exhaust valves control the directional flow of inspired and respired air in separate conduits. Such mouth pieces and conduits are cumbersome, heavy and large in size, and very difficult to assemble or repair. The valves in this type of device are permanently affixed and it is necessary to cut the entire mouthpiece to get at the valves. It is therefore another object of my invention to provide a mouthpiece for a respiratory apparatus that is comparatively small and of light weight, and one that can be easily assembled and repaired. The valves being accessible can be replaced when necessary.

Another object of my invention is to provide in a respiratory apparatus means whereby the atmosphere to be inhaled is warmed by the exhaled atmosphere and/or vice versa.

A further object of my invention is to provide a single conducting unit which may be utilized for two or more purposes, that is, as passage-ways for two or more types of fluid such as atmosphere for inhalation and respired atmosphere.

Still a further object of my invention resides in constructing a respiratory apparatus of simple operation, having low resistance, easy to manufacture, assemble and effect replacement of parts without detriment to its efficiency as a part of respiratory apparatus.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts as will be described more fully hereinafter.

Referring to the drawings in which similar numerals refer to similar parts throughout the several views, and in which—

Figure 1 is a detailed sectional view of my improved device.

Figures 2 to 7 are details of the exhaust valves of my improved device.

Figures 8 to 12 are details of the inhalation valve of my improved device.

Figure 13 is a sectional view of a modified mouthpiece for my improved device.

Figure 14 is a view on line 14—14 of Figure 13.

Figure 15 is a view on line 15—15 of Figure 13.

Figure 16 is a detail view of a portion of the multiple passage member with securing means of my improved device.

Figure 17 is a view, partly in section, showing the passage member of my improved device secured to a canister in a breathing bag.

Figure 18 is a detailed sectional view of a part of my improved device showing the airflow opposite to that of Figure 1.

Figure 19 shows the mouthpiece member secured to a canister and breathing bag by my improved connection.

Figure 20 shows the mouthpiece and passage member of my improved device connected to a canister and breathing bag of my improved connection.

Referring more particularly to the drawings, 30 indicates a mouthpiece member having chamber 31 from which extends at right angles the mouthpiece conduit 32, that has suitably inserted in it a stopcock 33 adapted to be regulated by handle 34. A multiple passage member 35 having its outer wall 36, preferably the wall of a flexible corrugated conduit or hose, secured to the lower end of the member 30 is an inner or exhaust passage 37, preferably straight hose, secured to a nipple 38. The space between passage 37 and the hose 36 forms an intake or inhalation passage 39.

Threaded into the bottom of member 30 is an inhalation valve seat insert 40 that has in chamber 31, outer knife edge valve seat 41 and the inner knife edge valve seat 42 onto which seats valve disk 43, having a discharge aperature 43a. To limit the upward movement of disk 43, spiders 44 are secured to the walls of the chamber 31.

Between the inner and outer valve seats 42 and 41 are a number of passages 45 formed by connecting webs 46. Also in the center of the insert 40 is a threaded aperture into which is screwed an exhalation valve insert 47 having an intake passage 48 to chamber 31. The insert 47 is provided with knife edge valve seat 49 projecting into a chamber 50 formed by bulging or protruding a portion 51 of the nipple 38 that is threaded onto the insert 47 between the underside of the insert 40 and a shoulder 52 cut into the insert 47 adjacent valve seat 49. A valve disk 53 adapted to seat on knife edge 49 is held by spiders 54 that abut against shoulder 52 and are secured to the lower part of the insert 47.

Inserted into and secured to the lower end of

hose 36 is a nipple 55 which is an integral part of a purifying canister 56, and inserted into and secured to the end of passage 37 is an exhaust conduit 57 that passes through the canister 56 and has its exhaust end 58 adjacent to the bottom 59 of the canister. A plate 60 sweated to the underside of top 61 of the canister 56 holds the top portion of the conduit 57 firmly in place. Suitably positioned in the canister by screens 62 is a purifying agent 63. Both the bottom 59 and the plate 60 have perforations 64 and 65 respectively to permit fluid, such as air, to pass therethrough.

In the practical operation of my improved device, the suction caused by the inhalation of an operator not only unseats disk 43 and seats disk 53 but also draws air into canister 56 through perforations 64. The air then passes through the purifying agent 63, out perforations 65, into passages 39 and 45, around valve disk 43, into chamber 31 and then to the operator through valve 33 and conduit 32. On exhalation, or when inhalation is stopped, the disk 43 seats on knife edges 41 and 42, and disk 53 drops onto the spiders 54, thus the exhaled breath is forced through conduit 32 into chamber 31, then through passage 48, around disk 53 into and through nipple 38, passage 37 and conduit 57 to the atmosphere.

In Figure 13, I show a modified mouthpiece member comprising a casing 66 on the top of which is secured a stopcock 67 having mouthpiece conduit 68 extending therefrom. Suitably positioned and affixed to casing 66 is a valve compartment 69 that has sweated to the upper side of its top 70, around an aperture 71, an exhaust valve 72 and sweated to the inner side of its bottom 73, around an aperture 74, is an intake valve 75. A baffle partition 76 which is an integral part of top 70 and which, for manufacturing purposes, is soldered to casing 66, forms not only passage 77 from chamber 69 to the stopcock 67, but also the top wall of an exhaust passage 78 that leads from exhaust valve 72 and follows around compartment 69 to an inwardly stepped flanged hose nipple 79, an integral part of casing 66. This nipple 79 can be easily inserted in and cemented to the wall 36 of the conducting unit 35 shown in Figure 1. Positioned in the casing 66 and sweated to bottom 73 around aperture 74 is a flared end 80 of an intake nipple 81 that can be inserted in and secured to intake passage 37, Figure 1. The valves 72 and 75 are arranged in parallel relation to each other and have corresponding parts; namely, knife edge seats 82 and 83, disks 84 and 85 mounted on seats 82 and 83, and spiders 86 and 87 for limiting the movement of disks 84 and 85 respectively. These valves are positive in action, in that, both are normally closed when not in use and only become operative when an operator breathes.

In this construction on inhalation, the suction opens intake valve 75 and permits purified air to pass from nipple 81 around the intake valve disk 85 into compartment 69, through passage 77 to stopcock 67 and then to operator through conduits 68. When there is no inhalation suction, valve 75 is closed, and on exhalation, the force of the exhaled atmosphere keeps disk 85 on seat 83 but raises disk 84 from seat 82, thus permitting the respired air to flow into passages 78 and out nipple 79.

In Figure 16 I show the upper portion of a modified connection for use between the conduit unit and the purifying canister which may be enclosed in a breathing bag 88, as shown in Figure 17. This connection has an inner nipple member 89 and an outer nipple member 90. The top section 91 of member 90 is inserted in and secured to wall 92 of the conducting unit, and the lower section 93 comprises a slanting or converging portion 94, straight portion 95 and a flared base 96 having knife edge 97. Intermediate sections 91 and 93 is an outwardly extending flange 98 on which is rotatably placed a wing nut 99. The inner nipple member 89 has its upper end inserted in and secured to passage 100 of the conducting unit and its lower end which terminates at the top of base 96 is soldered to the straight portion 95 of nipple member 90. Outlets 101 are cut into the slanting portion 94.

In Figure 17, I show my improved connection wherein the upper portion, as described above for Figure 16, is connected with a canister and breathing bag. Placed on top of bag 88 around an aperture is a flange 103 of a threaded nipple 104 that is secured by screws 105 to a flange 106 of a ring 107 inside bag 88. Ring 107 has also a lower flange 108 to which is affixed canister 109 having outlet port 110 around which is placed flanged gasket seat 111 with gasket 112.

To secure the connection so as to align the passages properly, wing nut 99 is threaded onto nipple 104 until its upper edge abuts gasket 113 making an air-tight joint, and, at this point, knife edge 97 of base 96 seats in gasket 112 also making an air-tight connecting passage from canister 109 to passage 100 through nipple 89. A secondary passage 114 is formed between nipple 104 and ring 107 forming the outer wall and lower section 93 of the connection forming the inner wall. Holes 115 are cut into ring 107 to permit a fluid to pass from passage 114 into bag 88. With this connection attaching parts of my improved apparatus, the purified air passes from canister 109 through nipple 89 to the intake passage 100 and the exhaled air passes from the mouthpiece member, through conduit unit into nipple member 90, out ports 101 into passage 114 and then through holes 115 into the reservoir or breathing bag 88. By this arrangement the exhaled air in passing through the conducting unit to the bag surrounds the intake passage, aids in keeping the purified air to be utilized for inhalation warm while passing through conduit 100.

In Figure 19, the canister 109 and bag 88 are fastened directly to the mouthpiece member by means of my improved connection. In this figure, all parts are identical as set out for Figures 16 and 17 except, that the top section 91 of outer nipple member 90 is an integral part of nipple 79, Figure 13, and inner nipple is replaced by intake nipple 81 of the mouthpiece member 66 which is provided, as shown in Figure 19, with the stopcock 67 and conduit 68.

In Figure 20, I show how the mouthpiece member 30 and the passage member 35, shown in Figure 1, can be easily connected with the breathing bag 88 and canister 109 by means of the modified connection of my improved device shown in Figure 17.

By arranging the intake conduit and the exhaust conduit together in a single conducting unit, the inhaled air which is warmed by passing through the purifying agent keeps the exhalation conduit warm enough to prevent the freezing of water vapor present in the exhaled atmosphere, and, in like manner, the warm exhaled atmosphere aids in keeping a portion of the intake conduit warm.

Although, I set out in the above description that the inhaled air passes through the purify-

ing device and the exhaled atmosphere is discharged exterior to the purifying device, I do not want to limit myself to this particular mode of operation but desire it to be understood that the exhaled air can be passed through the purifying agent in the canister into the bag and the purified air utilized for inhalation can be taken into the passage described as the exhalation conduit as shown in Figure 18. This can be easily done by reversing the arrangement of the valves so that 40' is the exhalation valve member and 47' is the inhalation valve member.

It will be understood that the above description and accompanying drawings comprehend only the general and preferred embodiment of my invention, and that various changes in construction, proportions and arrangement of parts may be made within the scope of this invention and appended claims without sacrificing any of the advantages of my invention.

What I claim is:

1. A respiratory apparatus comprising a mouthpiece member having an inhalation valve and an exhalation valve inserted in the center of said inhalation valve, an air purifying device, a conducting unit consisting of a center passage to the exhalation valve and an outer or surrounding passage to the inhalation valve, and securing means attaching said unit to the purifying device whereby exhaled atmosphere is discharged exterior to and does not pass directly through the purifying device and inhaled atmosphere passes through the device.

2. A respiratory apparatus comprising a breathing bag, a mouthpiece member, a single conduit consisting of a plurality of passages therein secured to the mouthpiece member, an air purifying device, and a unitary attaching means for securing the conduit to the bag and purifying device, said attaching means having passages connecting with said conduit passages so that at least one of said connected passages discharges exhaled atmosphere exterior to the purifying device and directly into the bag.

3. A respiratory apparatus comprising a mouthpiece member, an air purifying device, an intake conduit and an exhaust conduit combined one within the other in a single unit, and means for connecting said unit to the purifying device, said connecting means having a plurality of passages corresponding to the passages of the unit and one or more discharge ports from one of said passages adapted to discharge exhaled atmosphere exterior to said purifying device.

4. A respiratory apparatus comprising an intake conduit and an exhaust conduit combined one within the other in a single unit, a mouthpiece member secured to one end of said unit, valve means in said mouthpiece for controlling the flow of fluid from the intake and exhaust conduits, a canister, and means connecting the other end of the unit to the canister, said connecting means having a plurality of passages corresponding to the passages of the unit and discharge ports in the passage connected with the exhaust conduit, whereby exhaled atmosphere is discharged exterior to the canister and inhaled atmosphere is taken directly from the canister.

5. In a mouthpiece member comprising a chamber, a mouthpiece conduit connected with the chamber, an inhalation valve member having an aperture therein, positioned in said chamber and an exhalation valve member positioned in the aperture and secured to the inhalation valve member.

6. A respiratory apparatus comprising a mouthpiece member, an air purifying device, and means securing said purifying device directly to the mouthpiece member, said securing means consisting of an inner intake conduit, an outer conduit surrounding the intake conduit, and ports in said outer conduit for discharging exhaled atmosphere exterior to said purifying device.

7. A respiratory apparatus comprising a breathing bag, a canister, means having exhaust ports securing the canister inside the bag, a mouthpiece member having inhalation and exhalation valves, passages to said valves and securing means for attaching the mouthpiece member to the bag, said securing means having an intake nipple connecting the canister port to the inhalation valve passage, and a passage formed around said intake nipple connected with and adapted to discharge exhaled atmosphere through the ports in the canister securing means.

8. In a respiratory apparatus a mouthpiece member, an air purifying device comprising a chamber for a purifying agent, a passage member through said device and chamber and an intake port from said chamber, and a single conduit having an inner passage connected with the passage member through the device and an outer passage connected to said intake port.

9. In a mouthpiece member comprising a chamber, an inhalation valve seat with an aperture in the center thereof positioned in said chamber, a disk adapted to seat on said valve seat and having an aperture corresponding to the aperture in the seat, an exhaust valve seat positioned in the aperture of the inhalation seat and a disk adapted to seat on said exhaust valve seat.

10. A respiratory apparatus comprising a mouthpiece member having an intake valve consisting of a valve seat and disk, each having an aperture in the center thereof and an exhaust valve inserted in the aperture of said intake valve seat, said exhaust valve consisting of a valve seat and a disk member, a single unit conduit having a passage to said intake valve and a passage to said exhaust valve, an air purifying device and means securing said conduit to the purifying device so that exhaled atmosphere is discharged exterior to the purifying device and inhaled atmosphere passes through the device.

11. In a respiratory apparatus, comprising a breathing bag, a canister, a mouthpiece member having inhalation and exhalation valves, passages to said valves, and securing means attaching said mouthpiece as a single unit directly to the exterior of the bag and said canister inside said bag in alignment with the mouthpiece, said securing means having an intake passage for connecting the intake passage of the mouthpiece to a port of said canister and an exhaust passage connected with the exhalation passage of the mouthpiece for discharging exhaled atmosphere into said bag exterior to the canister.

12. In a respiratory apparatus comprising a breathing bag, a canister, means securing the canister inside the bag, a mouthpiece member having a valve compartment with an intake and an exhaust valve, passages in said mouthpiece to and from said valves respectively, and securing means for attaching the mouthpiece member as a single unit directly to the bag, said securing means connecting the intake valve passage to a passage to the canister and forming a by-pass

adapted for discharge of exhaled atmosphere from the exhaust passage into the bag.

13. In a respiratory apparatus, a breathing bag, a canister, means securing the canister inside the bag, a mouthpiece member having inhalation and exhalation valves, passages to said valves, and securing means for attaching the mouthpiece member to the bag, said securing means connecting and aligning the inhalation passage to a passage from the canister, and a passage formed by said canister securing means and the mouthpiece securing means for discharging exhaled atmosphere from the exhaust valve passage directly into the breathing bag.

FERDINAND C. CLAUDIUS.