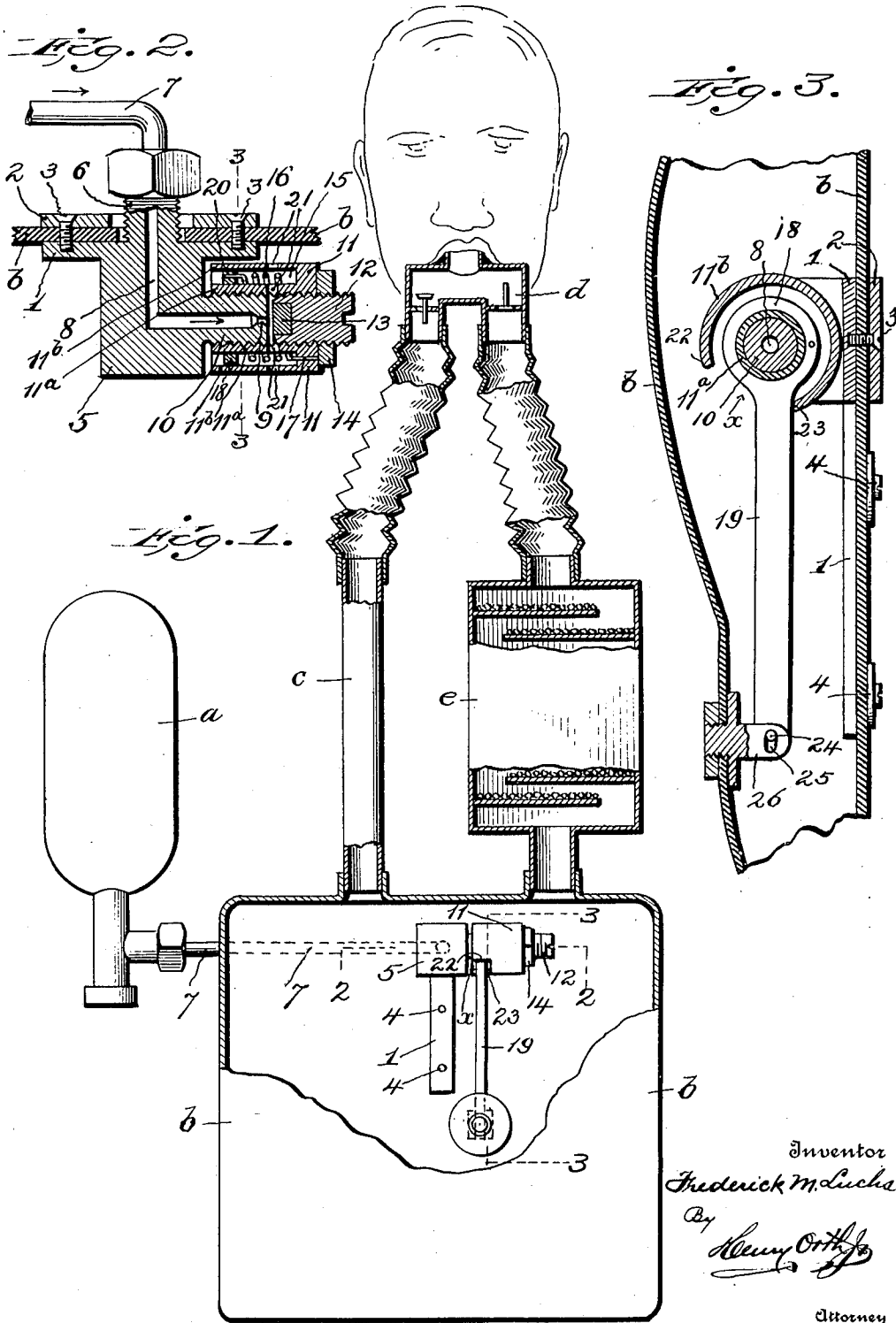


F. M. LUCHS.  
BREATHING APPARATUS.  
APPLICATION FILED JUNE 27, 1918.

1,308,599.

Patented July 1, 1919.



Inventor  
Frederick M. Luchs.  
By  
*Henry Orth*  
Attorney

# UNITED STATES PATENT OFFICE.

FRIEDRICH M. LUCHS, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO AMERICAN  
ATMOS CORPORATION, OF WILKINSBURG STATION, PITTSBURGH, PENNSYLVANIA,  
A CORPORATION OF NEW YORK.

## BREATHING APPARATUS.

1,308,599.

Specification of Letters Patent.

Patented July 1, 1919.

Application filed June 27, 1918. Serial No. 242,179.

*To all whom it may concern:*

Be it known that I, FRIEDRICH M. LUCHS, a citizen of Switzerland, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, United States of America, have invented certain new and useful Improvements in Breathing Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to breathing apparatus, mine rescue apparatus and any apparatus in which high pressure gases are to be instantly supplied at reduced pressure.

My improvement consists in the correlation of the high pressure gas supply valve and the pressure equalizing or breathing bag of such apparatus.

As is well known, different individuals have different breathing capacities and respiration periods, and where the supply of oxygen to the breathing apparatus is regulated to a constant flow through a reducing valve to the apparatus, the supply of oxygen may be considerably in excess of that required by the particular individual using the apparatus; or the requirements of the individual may be above the average, when the supply will be too small.

It has been a problem to supply the oxygen to the apparatus in quantities required for the individual for the time being using the apparatus. I believe that I have solved this problem by operating a supply valve in accordance with the volume of gas of reduced pressure in the apparatus, and directly from the breathing bag, the control being automatic and by the breathing of the person using the apparatus.

The form of apparatus which I have constructed, and which is preferred by the purchasing public, I have illustrated in the accompanying drawings, and in which like parts are similarly designated.

Figure 1 represents a breathing apparatus partly in section, the absorber and mouth-piece being diagrammatic.

Fig. 2 is a longitudinal central section, on an enlarged scale, of the supply valve, taken on line 2—2 of Fig. 1.

Fig. 3 is a cross section, enlarged, taken on line 3—3 of Fig. 1.

The breathing apparatus comprises the customary oxygen container *a*, the inflatable pressure equalizer or breathing bag *b*, the cooler tube *c*, the mouth piece *d*, with inlet and outlet valves, and the carbonic acid absorber or regenerator *e*. These parts are of well known construction, and need no explanation.

Attached to one wall, preferably the back wall, of the flexible breathing bag *b* is a plate 1, preferably but not necessarily inside the bag. The attachment is made by an outer plate 2 through which and the wall of the bag pass screws 3 screwed into the plate 1, and by additional screws and washers 4. On this plate 1 is a valve body 5 having a threaded nipple 6 for connection by a tube 7 with the oxygen container *a*. A passage 8 leads through the nipple 6 and body 5 to a contracted outlet opening 9 in a threaded valve seat 10 projecting from the body 5 parallel or substantially parallel with the rear wall of the bag *b*.

In threaded engagement with the valve seat 10 is a cylindrical valve carrying member 11, carrying the valve 12. The valve 12 is in the form of a screw, having a non-combustible seating portion 13, which is removable in case of wear. The obturating element or screw valve 12 is held in place by a lock nut 14, which structure permits take-up for wear.

The member 11 has an annular end-groove 15 in which is placed a coil spring 16 surrounding the threaded portion 11<sup>a</sup> of the valve carrying member 11 and included between the portions 11<sup>a</sup> and 11<sup>b</sup> thereof. One end of the spring 16 is secured to the member 11, as at 17, and the other end is secured in an eye 18 at one end of an actuating lever 19, as at 20. The member 11 is also provided with ports 21.

The cylindrical portion 11<sup>b</sup> of member 11 is cut away, as shown at *a*, Fig. 3, forming two abutments 22 and 23 for the lever 19, whereby the valve 12 may be positively opened and closed directly by said lever 19. The other end of lever 19 carries a pin 24 operating in slot 25 in a stud 26 secured to the other (front) wall of the breathing bag.

The operation is as follows, assuming the oxygen flow from container *a* has been turned on and the bag contains the normal amount of air, inhalation and exhalation will alternately collapse and expand the bag. After a short time the normal volume of gas in the circuit of the apparatus will be noticed to decrease, the bag will not be as full as before. This is due to the conversion of the oxygen content into carbonic acid by the lungs of the user and the absorption of this poisonous gas in the absorber.

The collapse of the bag opens the supply valve and permits oxygen to enter it from container *a*, inflating the bag, and thereby closing or partially closing the valve again according to requirements.

The spring 16 allows a certain movement of lever 19, to correspond to the inflation and deflation of bag *b* without opening the valve 12, or to but a very small extent.

An amount of movement greater than that taking place in a normally filled bag, as when the user is doing hard physical work, will cause the valve to open by an excessive collapse of the bag at the inhalation period.

Should the spring become too weak, or broken, or the obturating member 12 of the valve stick, then lever 19 will actuate the valve directly by striking the abutments 22 and 23.

My valve takes the place of the customary reducing valve, and while these reducing valves supply gas constantly at a lower pressure than that in the supply container, my valve does not give a constant supply, but the supply is variable with the consumption, consequently I am able to materially reduce the weight of breathing apparatus by dispensing with the heavy casings and parts of the reducing valve.

The bag itself may be lighter, as it does not have to sustain such heavy pressure due to the constant supply of gas from a reducing valve. Furthermore, when using reducing valves the entire content of the oxygen cylinder will not be delivered through the reducing valve, so that the gas below about 100 pounds is not used, and in fact the gas below about 200 lbs. is not properly discharged. The consequence is that much gas is wasted.

With my device the gas is consumed until the pressure in the oxygen cylinder falls to atmospheric pressure. By reason of this the

breathing apparatus will operate for a longer time than when using a reducing valve, or I may lighten the weight of the apparatus by using a smaller oxygen cylinder that will deliver the same quantity of gas.

My invention is not limited to breathing apparatus but may be used in any art where high pressure gas is delivered to an inflatable pressure equalizer and the discharge of the gas into the equalizer is controlled in accordance with the consumption.

I claim—

1. The combination with an inflatable equalizing chamber, of a conduit to admit respired air thereto, a valve for high pressure gas discharging only within said chamber, said chamber having two movable walls and said valve actuated for both opening and closing by the movement of either or both of said walls.

2. The combination with an inflatable equalizing chamber having two flexible walls and a pressure gas supply; of a valve for said supply having a seat member and an obturating member, each member connected to a wall, whereby the movement of either or both walls will actuate the valve.

3. The combination with an inflatable equalizing chamber having two flexible walls and a pressure gas supply; of a valve for said supply discharging directly into said chamber and having a seat member and an obturating member, each connected to one of the walls, a spring for controlling the normal operation of said obturating member and means to positively open and close said valve.

4. The combination with an inflatable equalizing chamber having a pair of flexible walls and a pressure gas supply; of a valve for said supply contained within said chamber having its seat member connected to one flexible wall and its obturating member connected to the other flexible wall, whereby the movement of either or both walls will actuate said valve.

5. The combination with an inflatable equalizing chamber and a pressure gas supply; of a valve interposed therebetween, the valve seat connected to one wall of said chamber, a valve actuating lever connected to another wall of said chamber, and a spring interposed between said valve and lever to permit a limited movement of the chamber walls without actuating the valve.

6. The combination with an inflatable equalizing chamber and a pressure gas supply; of a valve interposed therebetween, the valve seat thereof connected with one wall of said chamber, a valve operating lever connected with the opposite wall of said chamber, a spring interposed between said lever and the obturating member of said valve, and abutments connected with the obturating member of the valve arranged in the path

of movement of said lever, whereby said member may be positively actuated by said lever.

5 7. The combination with an inflatable equalizing chamber and a pressure gas supply; of a valve interposed therebetween and discharging into said chamber, the valve seat connected with one wall of said chamber and having a threaded portion, a cylindrical ported valve carrying member in  
10 threaded engagement with said seat, said member having a co-axial groove in one end, and the outer cylindrical portion cut away for a portion of its periphery to form abut-  
15 ments, an obturating screw in said member, a lever having an eye at one end loose in said groove and projecting through said cut-away portion, a spring in said groove in-

terposed between said eye and member, and means to operatively pivot the opposite end 20 of the lever to the opposite wall of said chamber.

8. The combination with the flexible walls of a breathing bag and a bottle containing oxygen under high pressure; of a valve 25 within said bag comprising an obturating member connected to one flexible wall of said bag and a seat member connected to another flexible wall of said bag, the movements of the walls of the bag operating to open and close said valve and control the admission of high pressure oxygen directly into the bag. 30

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

FRIEDRICH M. LUCHS.