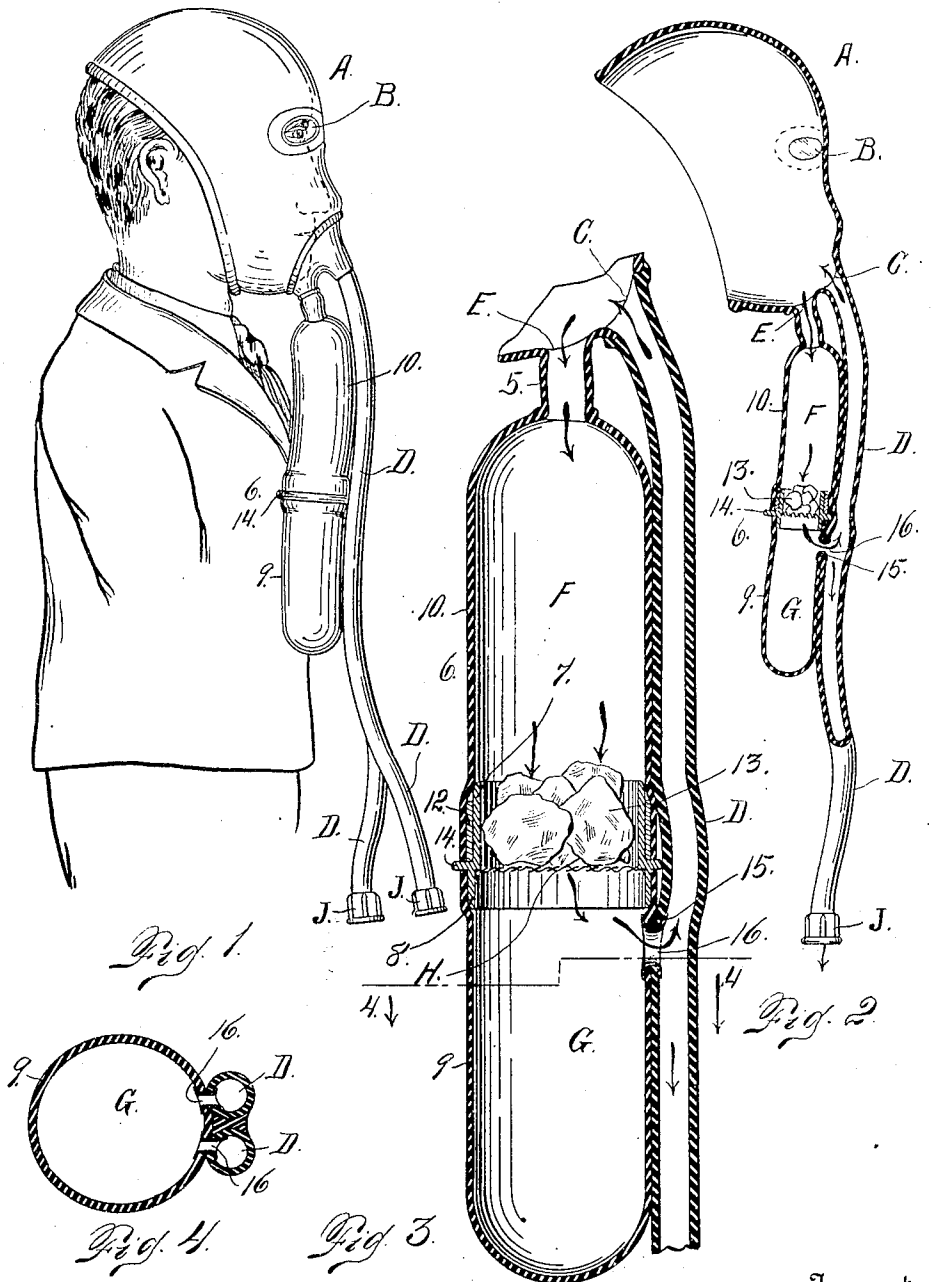


W. F. MERRYMAN.
RESPIRATOR.
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926,671.

Patented June 29, 1909.



Witnesses
Otto E. Heddick.
J. D. Thornburgh.

Inventor
W. F. Merryman.
By *[Signature]* Attorney

UNITED STATES PATENT OFFICE.

WILLIAM F. MERRYMAN, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO HENRY R. WOLCOTT, OF DENVER, COLORADO.

RESPIRATOR.

No. 926,671.

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To all whom it may concern:

Be it known that I, WILLIAM F. MERRYMAN, a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Respirators; and I do 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 the letters and figures of reference marked thereon, which form a part of this specification.

15 My invention relates to improvements in respirators, designed to protect the wearer from injury from smoke and all gases that are irrespirable or dangerous to human life.

In my experiments and use of my present device I have made certain important discoveries relating to the action of air at normal atmospheric pressure, the action of respired air and oxygen, and the action of air, oxygen and carbon dioxide at both greater and less than normal temperatures and densities as applied to their use with instruments of this character.

In order that the importance and value of my discoveries may be more easily comprehended, attention is called to the well known fact that each respiration of any given individual differs in the quantity of air respired and in the rapidity with which the air is taken into and expelled from the lungs.

35 This being the case, it is evident that there is an automatic adjustment of the atmosphere at each breath by which the elasticity of the air surrounding the individual is utilized to assist respiration. In producing a respirator that shall be perfect in its action, it therefore becomes necessary to so construct the device that this elasticity of the air will be retained, and through automatic action utilized at each respiration. The device must further be so constructed that all contaminating smoke and gases will be prevented from entering the lungs and at the same time shall allow necessary portions of the expanded expired air containing carbon dioxide to escape. I accomplish these results and afford complete protection to the wearer by means of the device hereinafter described and claimed.

Generally speaking, this apparatus con-

sists of a face mask having a chamber in communication therewith, and provided with a perforated diaphragm separating the chamber into main and auxiliary compartments, the lower compartment being in communication with a pair of open-ended tubes, one extremity of each tube being in communication with the mask, while their opposite extremities are in direct communication with the atmosphere at all times. The perforated or mesh diaphragm of the chamber is adapted to support a quantity of material known to the trade as oxone, the said material being of such character that when acted on by the breath of the wearer of the device, oxygen is generated at each exhalation, the said oxygen being inhaled at the following inhalation. During the use of the instrument the oxygen generated is utilized to support respiration, while the open lower extremities of the tubes are closed or sealed so to speak, by atmospheric stops or plugs composed of atmospheric air and exhaled gas both of which are heavier than the oxygen located in the upper portion of the apparatus, thus making it practicable to breathe the generated oxygen without inhaling impurities which may be contained in the atmosphere surrounding the wearer, all of which will be hereinafter described more in detail, reference being made to the accompanying drawing in which is illustrated an embodiment of the invention.

In this drawing, Figure 1 is a side elevation of my improved device which is shown in use. Fig. 2 is a sectional view of the device shown in detail. Fig. 3 is a fragmentary sectional view with the parts shown on a larger scale. Fig. 4 is a cross section taken on the line 4-4 Fig. 3.

The same reference characters indicate the same parts in all the views.

Let A designate a mask which covers the face of the wearer. This mask is provided with suitable glasses B set into perforations formed in the mask, to permit the wearer to observe surrounding objects, when using the device. Opposite the mouth and nostrils, the mask is open as shown at C to communicate with tubes D D. Opposite the mouth is another opening E which communicates by a short tube F with the upper compartment of a chamber G, which is provided with a lower compartment H, the two compart-

ments being separated by a perforated mesh diaphragm H which is attached to the bottom of a cup or receptacle 7 provided with a depending flange 8 to which is secured in any suitable manner, the upper extremity of the wall 9 inclosing the lower compartment G, of the chamber 6. The lower extremity of the wall 10 of the upper compartment F is provided with an interiorly located circular band or ring 12 into which the cup 7 is inserted when the two separable compartments of the chamber are assembled. It will be understood that these two compartments must be separable since the cup 7 must be supplied at suitable intervals with the necessary material for generating oxygen under the influence of the exhalations of the wearer. The material which I have found entirely satisfactory for use in this connection is known to the trade as oxone, is designated in the drawing by the numeral 13, and is illustrated in Figs. 2 and 3.

The cup or receptacle 7 is provided with an exteriorly protruding flange 14 which forms a shoulder against which the upper edge of the wall 9 abuts. The upper portion of this wall may be cemented or otherwise suitably connected with the depending part 8 of the said receptacle.

The tubes D of the device are connected with the wall 9 of the lower compartment G as shown at 15, and the lower compartment communicates with the tubes by openings 16 but it is preferred that a separate orifice 16 be formed communicating with each of the tubes D. It must be understood, however, that so far as the independent respirator is concerned, a single tube D might be employed. It is, however, preferred to make the respirator with two tubes, their lower extremities being equipped to be connected with the air accumulator set forth in my previous application Serial No. 402,937 filed November 19th 1907, since the two devices are well calculated for use together.

Having thus described the mechanical features of my device I will proceed to explain its action in detail. After placing a quantity of oxone 13, upon the diaphragm H, the two compartments or the main and auxiliary chambers, designated F and G respectively, are connected by inserting the cup portion 7 of the one member into the sleeve or ring 12 of the other member. These parts should fit closely so that when connected they will retain their position whereby accidental separation is avoided.

After the mask is applied to the face the wearer proceeds to breathe in a natural manner. At the first exhalation the moisture of the breath acting on the oxone causes it to decompose and begin to throw off oxygen, and the resulting caustic soda produced by the chemical action, absorbs the carbon dioxide thrown off from the lungs. The ani-

mal heat of the body causes the expired air to expand to a considerable degree so that if it were unconfined, it would occupy more space than did the air which was inhaled, which expansion is further augmented and its volume increased by the chemical heat created, in generating the oxygen from the oxone; the result of this increase in volume being that the pressure in all parts of the device becomes greater than that of the air surrounding the individual; the surplusage escaping through the lower ends of the tubes D. This surplusage consists of a mixture of expired air and carbon dioxide and perhaps a small quantity of oxygen. The lower ends of the tubes D from the point of their communication with the auxiliary chamber or compartment G at 16, to their extreme ends at J J, are now filled with a mixture of expired air and carbon dioxide, forced into them by the pressure of exhalation; thus creating a more dense, cooler and heavier atmosphere than is contained in the upper portions of the tubes D, the oxygen compartment F and the auxiliary compartment G, all of which have now become filled with regenerated air produced by the action of the oxone, in sufficient quantities to again fill the lungs. This regenerated air is not only nearer, but is also lighter than the mixed atmosphere in the lower ends of the tubes D. Consequently it is more easily lifted, the inhalation being assisted by the collapsing of the oxygen compartment F and the auxiliary chamber G through atmospheric pressure, which action creates a current throughout the compartments F and G, and the upper portions of the tubes D without disturbing or moving the dense, cooler and heavier atmosphere contained in the lower portions of the tubes D. This dense, cool and heavy atmosphere contained in the lower portions of the said tubes, therefore, during inhalation, acts as automatic atmospheric stops or plugs, preventing the ingress of smoke, air or gases, allowing none of them to reach the lungs of the wearer as he has filled his lungs with regenerated air before the mixed and heavier atmosphere contained in the lower portions of the tubes D has started to move toward him; though during exhalation these atmospheric stops do not prevent the free egress of expired air; thus maintaining an automatic adjustment of the atmosphere at each breath of the wearer without destroying or disturbing the elasticity of the air surrounding him.

It may be well to state that the chamber 6 is composed of flexible material, preferably rubber, whereby the walls thereof are adapted to collapse as the wearer inhales the regenerated air from the said chamber. By virtue of this feature, the exterior pressure of the atmosphere aids the wearer of the device in the performance of the act of inhalation.

Having thus described my invention what I claim is:

1. The combination with a face mask, of an oxygen chamber in communication with the mask, and a tube having one extremity in communication with the mask, and the other extremity open directly to the atmosphere, the said tube intermediate its extremities being in communication with the oxygen chamber.

2. The combination of a mask, a chamber in communication therewith, the said chamber being divided by a perforated or mesh diaphragm into upper and lower compartments, and a tube having one extremity communicating with the mask while the other extremity is open directly to the atmosphere, the said tube being in communication intermediate its extremities with the lower compartment of the chamber.

3. A respirator comprising a mask, an oxygen chamber having one extremity in communication with the mask, the chamber being provided with an open work diaphragm, separating it into two compartments, an open-ended tube communicating at one extremity with the mask while the other extremity is open directly to the atmosphere, the tube intermediate its extremities being in communication with the lower compartment of the chamber, the upper compartment of the chamber being provided with a quantity of material for generating oxygen under the influence of the exhaled breath of the wearer, substantially as described.

4. The combination with a face mask, of a collapsible chamber in communication with the mask at one extremity, the said chamber being composed of two separable members one of which contains a cup having an open work bottom adapted to support a quantity of material adapted to generate oxygen un-

der the influence of the breath, the other member having a ring or sleeve adapted to receive the cup when the two members are assembled, and an open ended tube communicating with the mask at one extremity and open directly to the atmosphere at its opposite extremity, the said tube being in communication intermediate its extremities with the lower member of the chamber for the purpose set forth.

5. The combination in a respirator, of a face mask, an oxygen generating chamber in communication with the mask and open ended tubes communicating with the mask at one extremity, their opposite extremities being open directly to the atmosphere, the tubes intermediate their extremities being in communication with the oxygen generating chamber, substantially as described.

6. The combination of a face mask, a collapsible chamber in communication with the mask and a tube having one extremity in communication with the mask and the other extremity open directly to the atmosphere, the said tube intermediate its extremities being in communication with the collapsible chamber.

7. The combination of a face mask, a collapsible chamber in communication with the mask, and an open ended tube in communication with the mask at one extremity, the said tube intermediate its extremities being in communication with the collapsible chamber, the extremity of the tube remote from the mask being open directly to the atmosphere.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM F. MERRYMAN.

Witnesses:

LOUISE COSNER,

A. EBERT O'BRIEN.