

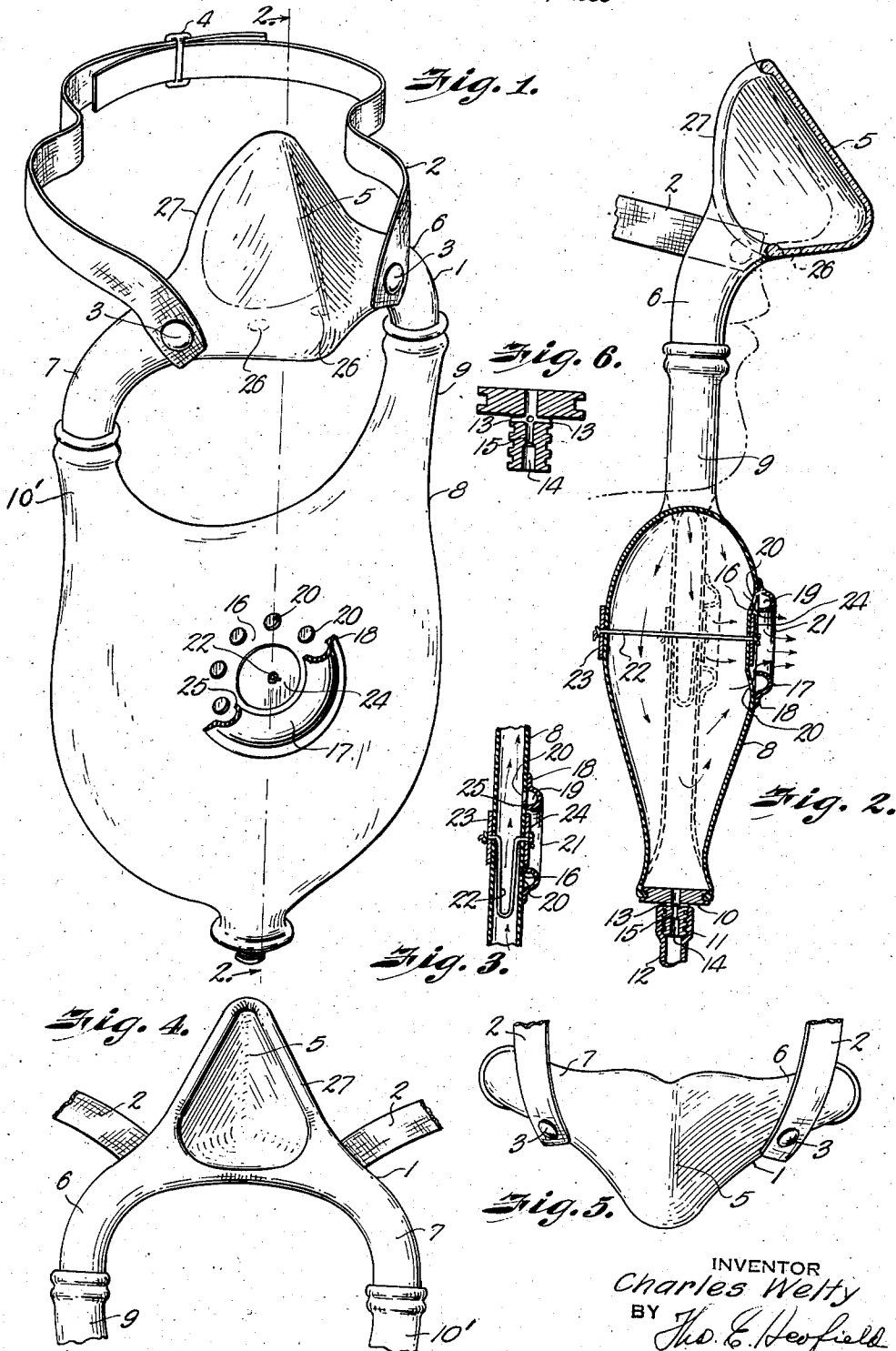
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DEVICE FOR ADMINISTERING GASES

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DEVICE FOR ADMINISTERING GASES

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My invention relates to a novel device for administering and dispensing medical gases to persons in need of the same for the treatment of diseases such as pneumonia, asthma, heart ailments, and the like.

My device may also be employed for the administration of gases under conditions of oxygen deficiency in the atmosphere, such as in airplanes.

In devices for administering gases, breathing bags have been employed, fitted with valve arrangements which have required considerable changes in pressure for their operation. These arrangements have made breathing difficult and the muscular effort thrown upon the human diaphragm makes for fatigue. This is especially deleterious in certain medical conditions.

One object of my invention is to provide a device for administering gases which may be worn by a person without physical discomfort and in which the valve of the breathing bag is operated in a novel manner.

Another object of my invention is to provide a device for administering gases in which a relief valve for the venting of exhaled breath is operated in a simple, expeditious manner, which will impose a minimum of effort upon the user.

Other and further objects of my invention will appear from the following description.

In the accompanying drawing which forms part of the instant specification and is to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views;

Figure 1 is a perspective view of a device for administering gases showing one embodiment of my invention, with part of the valve assembly broken away.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1 showing the valve in full lines in open position, and in closed position in dotted lines.

Figure 3 is a fragmentary sectional view taken along the line 2—2 of Figure 1, showing the position of parts during inhalation of the wearer, that is, with the valve in closed position.

Figure 4 is a rear elevation of the nasal mask of the assembly.

Figure 5 is a top plan view of the nasal mask of the assembly.

Figure 6 is a detail view showing the gas inlet plug on an enlarged scale.

More particularly referring now to the drawing, the device comprises a nasal or face mask 1, made of any suitable material such as plastic

substance which is molded into a shape most comfortable for the wearer. An adjustable means 2 which may be made of elastic material, is secured to the mask by lugs 3. The flexible, adjustable means 2 may pass around the head of the wearer, a buckle 4 being provided to secure the holding means 2 in any desired position. The portion 5 of the face mask is adapted to fit over the nose of the wearer. A pair of ducts 6 and 7 communicating with the nasal portion 5 extend outwardly to the sides of the face. A breathing bag 8 is provided with a pair of extensions 9 and 10' adapted to be secured to the arms 6 and 7 of the face mask. The breathing bag 8 may be made out of any suitable material such as latex, rubber impregnated fabric, or the like. It is sufficiently flexible and light in weight to inflate and deflate with normal respiration. The bottom of the bag is provided with an opening into which a plug 10 is adapted to fit. The plug 10 is provided with a nipple 11 to which a tube 12 is secured. The tube 12 communicates with a suitable gas which is to be administered. If it is desired, for example, to administer oxygen, the nipple 11 may be provided with a plurality of openings 13, providing communication between the duct 14 of the nipple and the atmosphere. In this manner, air is drawn into the gaseous mixture, the air passing into the breathing bag through the openings 13. The bore 14 is provided with a portion of reduced cross sectional area 15 which acts to reduce the pressure of the gases passing into the breathing bag. The jetting of the gases past the restriction 14 serves to induce a flow of atmospheric air through the ducts 13. The arrangement is such that a proper concentration of oxygen will pass into the breathing bag 8.

The bag is fitted with a relief valve 16, normally seated upon the annular member 17, the outer edge 18 of which is cemented or otherwise secured to the bag 8. In the region 19 of the annular member 17, the breathing bag proper is provided with a plurality of openings 20, communicating with the interior of the breathing bag. When the valve is in a closed position, as shown in Figure 2, the interior of the bag is not in communication with the opening 21 formed by the interior periphery of the annular member. To the valve 16, I secure one end of a flexible member such as a cord or string 22. The other end of the cord 22 is secured to a disk 23 at the opposite side of the bag 8 from the valve side. It will be noted that the valve 16

comprises a disk 24 adjacent a portion of the bag proper, the circular portion of the bag surrounding the disk being adapted to seat upon the inner edge of the annular member 17.

In use, gases are fed to the breathing bag through the tube 12, it being understood that a proper plug for the gaseous mixture being administered is fitted and the arrangement is such that a proper mixture of gas and air passes to the breathing bag 8. During inspiration, it being understood that the mask is fitted over the nose of the user, the rate of flow is such that the bag will not be inflated and the normal inhalation will be somewhat in excess of the rate at which gases pass into the breathing bag. The capacity of the breathing bag should be approximately half of the normal lung capacity of a person breathing. This capacity, however, is not critical. During inspiration, since the breathing bag 8 is not inflated, the valve 16 will be normally seated.

During the pause which follows inspiration and just before expiration, gases will continue to pass into the bag partially inflating it. As soon as expiration begins, the bag will immediately inflate, it being understood, as pointed out above, that the bag is made of very light material, preferably rubber latex. The inflation of the bag will move the parts to the position shown in Figure 2 in full lines, lifting the valve 16 from its seat and permitting the expired breath to flow out of the bag as shown by the arrows in Figure 2. A small portion of the gas being administered will also be vented. The point at which the valve will be lifted off its seat will require such a slight pressure that it is not discernible by a user, imposing a very slight effort upon the diaphragm. Substantially no pressure will build up inside of the breathing bag. It will be noted that the valve is lifted by the mechanical action of inflation of the breathing bag, due to the simultaneous passage of the expired breath and the gases being administered into the breathing bag. The point at which the valve will lift can be easily controlled by adjusting the length of the string or flexible member 22. The action is entirely automatic. By lengthening the string slightly, the proportion of rebreathed gas is increased as the valve will lift at a later time. By shortening the string slightly, the proportion of rebreathed gas is decreased and indeed can be substantially completely scavenged by exhausting a portion of the fresh gases being administered. The presence of a small amount of rebreathed gas, which will contain carbon dioxide, is not deleterious.

The percentage of air in the administered gases can be controlled as pointed out above, by the substitution of suitable plugs 10. The different plugs contain different sized and different numbers of holes 13, as well as different sized restrictions 15.

If desired, I may provide the nose piece 5 with a pair of holes 26 adjacent the nostrils of the wearer. These holes permit a portion of atmospheric air to enter the mixture of gases during inspiration. This air is drawn directly against the nostril and the mucous membranes of the nose. Atmospheric air will be less humid than that drawn from the breathing bag. The air of less humidity will cause a partial evaporation of air from the mucous membranes, having a cooling effect which will make the mask more comfortable to the wearer. Furthermore, a portion of the expired air from the lungs will pass out of

the holes 26. This permits me to further control the concentration of the medical gases. The holes may be blanked off by pieces of adhesive tape and adjustable closure or different sized holes may be provided for different masks.

It will be understood, of course, that the periphery 27 of the mask is flattened. The top of the nose piece has a gentle curvature resting over the bridge of the nose and is formed with gently rolling edges. The sides of the nose piece press into the soft muscle on each side of the nose below the bridge and bear on the muscles, thus forming a suitable seal. The arch which fits against the upper lip, seals against the soft muscular tissue. The under side of each arm 6 and 7 is flattened and fits against the cheeks pressing against the maxilla permitting this bone structure to form a firm foundation for the mask.

It will be seen that I have accomplished the objects of my invention. I have provided a novel device for administering gases which operates at a lower pressure than any valve known to the art. By eliminating pressure for the operation of a valve for the venting of exhaled gases from the breathing bag, I have provided a device which may be worn by patients of low tolerance and by aviators for long periods of time at high altitudes, without discomfort. The exhausted gases are vented with substantially no pressure and but very slight increased effort on the part of the diaphragm of the user. I am enabled in a simple and expeditious manner to control the admixture of air with the gases being administered.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, I claim:

1. A device for administering medical gases, including in combination a bag of flexible material, means providing communication between the interior of said bag and the respiratory passages of a user, means providing communication between the interior of said bag and a source of medical gases, said bag being formed with a vent opening providing direct communication between the interior of said bag and the atmosphere, a valve normally closing said opening, means within said bag having a portion thereof secured to said bag opposite said opening and having another portion thereof secured to said valve, the construction being such that upon the inflation of said bag said means will lift said valve from its seat to vent the bag.

2. A device for administering medical gases including in combination a bag of flexible material, means providing communication between the interior of said bag and the respiratory passages of a user, means providing communication between the interior of said bag and a source of medical gases, said bag being formed with a vent opening providing communication between the interior of said bag and the atmosphere, a valve normally closing said opening, flexible means within said bag having one end thereof secured to said valve and the other end thereof secured to said bag opposite said opening, the length of said flexible

means being such that upon the inflation of said bag it will become taut and lift said valve from its seat.

3. In a device for administering medical gases, a flexible breathing bag, means providing communication between the interior of said bag and the respiratory passages of a user, said bag being formed with a gas inlet opening, a plug normally closing said opening, said plug being provided with a passageway communicating with a source of medical gases, said passageway being formed with a restriction, a duct providing communication with said passageway above said restriction and the atmosphere whereby a flow of medical gases will induce an inward flow of atmospheric air through said duct for admixture with said medical gases, and means for venting said bag directly to the atmosphere upon its inflation to a predetermined point.

4. A device for administering medical gases including in combination a breathing bag, means providing communication between said breathing bag and the respiratory passages of a user, means providing communication between said breathing bag and a source of medical gases, said bag being formed with an opening, an annular hood having its periphery of larger diameter secured to the exterior of said bag over said opening, a portion of said bag normally seated against the smaller diameter periphery of said hood, a flexible member disposed within said bag having one end secured to said bag adjacent said annular hood and its other end secured to said bag opposite said annular hood, said flexible member being of

such length that upon the inflation of said bag it will become taut to lift the portion of the bag seated upon the smaller diameter periphery of said annular hood from its seat to permit communication between the interior of said bag and the atmosphere.

5. In a device for administering medical gases, a breathing bag of flexible material; said bag being formed with a vent opening, a gas inlet opening communicating directly with the atmosphere and a pair of separated gas outlet openings; a mask formed with a pair of gas ducts; means providing communication between the outlet openings of said breathing bag and said mask ducts; means providing communication between said gas inlet opening and a source of medical gases; a valve normally closing said vent opening; means operated by the inflation of said bag to a predetermined amount for lifting said valve from its seat and means providing communication between said mask and the respiratory passages of a user.

6. A device as in claim 5 in which said means for providing communication between the respiratory passages of a user and said mask is an enlarged portion provided with an opening adapted to seat over the nose of a user, said enlarged portion being formed with an opening communicating with the atmosphere adjacent a user's nostril.

7. A device as in claim 5 in which said mask is provided with flexible means adapted to pass around the head of a wearer.

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