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OXYGEN-DELIVERING PARACHUTE ESCAPE OUTFIT

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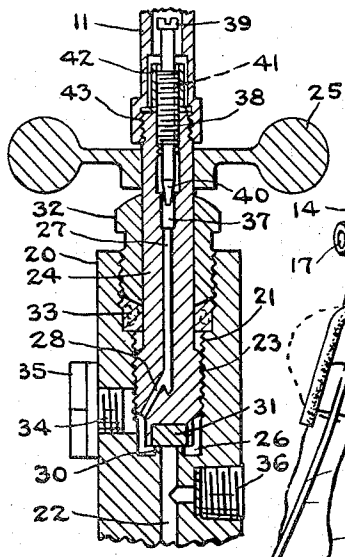

Fig.-4

Fig.-2

Fig.-1

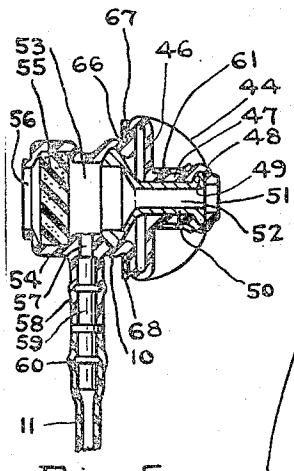

Fig.-5

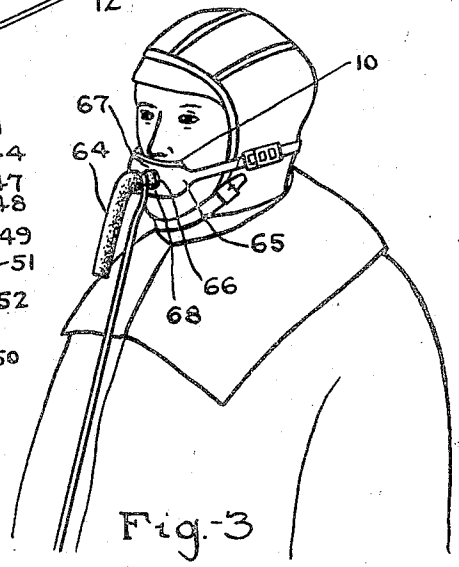

Fig.-3

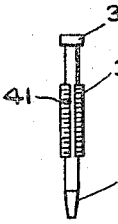

Fig.-6

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OXYGEN-DELIVERING PARACHUTE ESCAPE OUTFIT

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1 Claim. (Cl. 128—147)

Our invention relates to an oxygen-delivering parachute escape outfit and has for its object to provide aviators and others, particularly military aviators and observers who go to great heights in airplanes, with means for supplying oxygen to maintain consciousness during a period of descent when forced to bail out at such great heights because of wreckage or failure of the airplane.

It is well known that satisfactory life conditions of individuals cannot be maintained for long periods of time under barometric pressures encountered at elevations much above 10,000 feet without addition of oxygen which is delivered so as to maintain pressures in the alveolar regions of the lungs corresponding to a degree with those in normal living ranges of barometric pressure. When elevations of 15,000 feet or over are reached it is absolutely essential to fortify both alveolar pressures and oxygen supply by adding oxygen. And when barometric pressures at elevations of some 35,000 feet or over are encountered unconsciousness would ensue almost instantly (about thirty-five seconds) unless added oxygen is supplied to the lungs of a breather at such high altitudes to maintain the partial pressure of oxygen at or near to normal.

Means have been provided to furnish the aviator with an adequate supply of oxygen in suitable quantities which are, because of the necessity of conveying tanks of oxygen of considerable weight, necessarily in effect attached to and movable with the airplane itself. Hence, if the plane is wrecked or fails at high atmospheres and the aviator were to attempt to bail out it would be necessary to break the connection with the oxygen supply normally carried by the plane. Unconsciousness would immediately follow and either the aviator would fail to clear the falling plane or if he did, would probably be unable to pull the ripcord for the parachute and his destruction would follow.

To meet the conditions prevailing where, especially in military aviation, high altitudes from 20,000 to 30,000 feet and even higher and correspondingly low barometric pressures are encountered, we have devised a simple and efficient means for providing an oxygen supply for a short time such that the aviator can transfer from the oxygen supplying means of the airplane and carry with him the necessary supply of oxygen to maintain consciousness and life for the relatively short time to descend from the high altitude where bailing out becomes necessary to the lower altitudes where safe breathing of external air is possible.

It is the principal object of our invention, therefore, to provide such means which include a small tank of oxygen at suitable pressure positioned in a specially strongly reenforced pocket formed on the aviator's clothing preferably reenforced by straps over the shoulder, with valve mechanism operable by a turn of the wrist and a mask structure adapted to overlie the mouth of the aviator and having a breathing mouth turret adapted to be inserted in the mouth of the wearer and to be gripepd by his teeth.

It is a further object of our invention to provide such means having a structure such that the transfer and resulting supplying of emergency oxygen can be effected with very great speed. When once effected and the valve to the tank is opened oxygen will flow from the tank and will enter the mouth at such a rate that the alveolar pressure of oxygen will be maintained nearly normal and sufficient oxygen supplied even if the wearer may in part breathe through the exposed nasal passages, although military aviators will doubtless be trained for mouth breathing under such conditions (a nasal clamp can be used if desired but training of aviator is preferable).

It is a further object of our invention to provide simple suspension means whereby the mouth gripping mask structure may be held suspended below the mouth of a wearer where it can be instantly slipped up into position to be gripped by the teeth, and wherein the suspension means preferably adjusted as to length before ascent is flexible and will exert some degree of pull in aiding in holding the mouth gripping mask upon the face of the wearer.

It is a further object of our invention to form the mouth mask structure with laterally disposed wings and a projecting member having an elongated opening therethrough, the whole assemblage being such that once gripped by the teeth of an aviator it will normally tend to be held in place upon the aviator's face and will not easily be displaced from the mouth of the aviator.

It is a further object of our invention to provide a mask structure having an internal chamber and an elongated extension to be gripped between the teeth of the aviator with an elongated opening through said extension and into the chamber, and wherein the interior of the extended part gripped by the teeth of the aviator is strongly reenforced by a rigid member having the same general shape as the part gripped by

the teeth which will normally be composed of relatively soft rubber material.

It is a further object of our invention to provide in connection with the oxygen tank adapted to be secured in a pocket of the garment of the aviator a valve structure embodying a hollow valve stem, a tube connecting nipple extending beyond the operating handle and a limited channel through a portion of the valve stem which will determine flow of oxygen to the mask structure at a rate which, at the pressures at which the oxygen is being delivered will supply the mask structure with sufficient oxygen to maintain a safe supply thereof at safe quantities and without waste to the breather.

The full objects and advantages of our invention will appear in the detailed description thereof hereinafter given and the novel features by which the above outlined advantageous results are obtained will be particularly pointed out in the claim.

In the drawing illustrating an application of our invention in one form,

Fig. 1 is a side elevation view of our complete parachute escape mask and apparatus.

Fig. 2 illustrates the manner in which the apparatus is positioned relative to an air pilot or observer in an airplane when said pilot is being served with oxygen by devices more or less permanently attached to the airplane.

Fig. 3 shows the escape apparatus applied to the mouth of the wearer just before he bails out.

Fig. 4 is an enlarged sectional view through the valve head or neck of the specially constructed tank, for controlling delivery of oxygen to the wearer.

Fig. 5 is a sectional view taken through the structure adapted to be held in the mouth of the wearer which constitutes in effect a mask structure of the oral type.

Fig. 6 is a detail view showing the adjusted slot structure for determining rate of flow of gas to the delivery tube.

As shown herein, our parachute escape apparatus comprises a mask or mouth-piece structure 10, a connecting tube therefor 11 and a gas container 12. Under normal operative conditions the aviator or other individual is supplied with oxygen from a tank fixed in position in the airplane through a tube 13 which goes to a mask structure 14 of well known construction, held upon the face of the aviator by means of strap members 15 and wherein breathing takes place normally with added oxygen delivered through tube 13 in connection with a rebreathing bag 16 and escape valve mechanism 17.

The aviator will be provided with a pocket 18 along the trousers leg of his uniform. This pocket should be formed of very strong material and be heavily reenforced and firmly united with the garment to which it is attached and preferably will have added thereto a system of strap support (not shown) running over the shoulder of the wearer. The reason for this heavy reenforcement in supporting the tank, comes from the fact that at jumping clear of the plane the aviator will gain great speed in falling before the ripcord can be pulled and the parachute opened, and then there is a slight retardation of that descent, which, unless the tank is sufficiently held and supported as above noted, might result in its being torn loose, and so pulled away from the aviator and be rendered useless for the purpose intended. And the mouth-piece mask 10 will be conveniently supported from the neck of the aviator just below his mouth, as shown in Fig. 2, so that in case of sudden necessity to bail out at high altitudes the aviator can quickly strip off his mask structure 14, apply the mouth-piece mask 10 in place thereof, turn on the oxygen from the small tank 12, by means hereinafter described, and jump clear of the falling airplane. He then will have a supply of oxygen to maintain himself at least until he reaches such lower level as to have sufficient oxygen and a sufficiently high air pressure to maintain life.

The tank 12 is provided with a neck member 20 which is shown somewhat in detail in Fig. 4. This neck member has a central opening 21 which is connected at its bottom with a channel 22 leading to the interior of tank 12 for gas passage. Threaded at 23 to the interior of chamber 21 is a valve stem 24 having thereon a valve handle 25 by which the valve stem is rotated, such rotation causing it to move to and from the opening of channel 22 into a bottom chamber 26 below passageway 21. The valve stem 24 has a channel or bore 27 extending through it which opens through a bore such as indicated at 28 into chamber 26.

Surrounding the opening of passageway 22 into chamber 26 is a valve seat 30 which is engaged by the face of valve member 31 fast on valve stem 24. A nut 32 surrounds valve stem 24 and operates upon stuffing box 33 to seal valve stem 24 against escape of gas in any of its positions. An opening 34 is normally closed by a cap member 35 and provides a way of filling the tank, being there connected by means not shown with a source of supply of dry oxygen gas under pressure so that when valve 31 is taken off of valve seat 30 and the opening 27 is closed by means hereinafter described a supply of oxygen may be admitted into tank 10. A safety plug 36 prevents the tank 12 being charged with an excessive pressure which might result in explosions. For safe operation of this device at the very low temperatures (often minus 50°) at which it will be used, requires that the oxygen stored in the tank shall be absolutely dry.

The channel 27 in valve stem 24 is expanded at its upper part into a larger channel 37 in which is threaded a member 38, Figs. 4 and 6, provided with a screw head 39 by means of which the member 38 may be advanced or retracted to cause a needle valve closure 40 to enter or leave the upper part of channel 27 whereby it may be sealed during such period as it is desirable to add oxygen to the tank. The member 38 is provided with a channel 41 along one side, Fig. 6, and is indicated in dotted lines on Fig. 7. This constitutes a limit port fixing the rate of flow of oxygen from the tank. Obviously this rate of flow will be greatest when the pressure of the tank is highest which will be at the high elevation when the escape apparatus is first put into use. The pressure within the tank and the consequent rate of flow will fall as the wearer descends; but since he is constantly going into areas of higher and higher barometric pressure this fall in oxygen pressure and rate of delivery to the aviator will be fully compensated. A lock nut 42 holds the member 38 in its final adjusted position. As shown in Fig. 4 this position is that in which the channel or bore 27 is not blocked and the apparatus is in condition to be opened up for delivery of oxygen. This is effected, of course, merely by turning valve handle 25, one turn of the wrist being sufficient.

The tube 11 is connected with the valve stem

27 by being in effect screwed on to the threaded end 43 thereof, this semi-permanent form of attachment being essential to prevent jerking loose of the tube under stress and excitement of the application of the apparatus in a falling airplane.

The mask mouth-piece 10 is shown in detail in Figs. 1 and 5. It comprises a body of rubber or similar material formed with a pair of wings 44 and 45 with an intervening plateau portion 46 and a mouth turret 47 formed with a bulge 48 which overlies an annular rim 49 formed on a rigid member 50, of metal, Bakelite or the like, but strong enough to resist any compressive pressure of the jaws and teeth when the device is held in the mouth of the wearer. The opening 51 in mouth turret 47 is a flat oval in form as shown in Fig. 1 and overlies an opening 52 through rigid member 50 of the same general shape.

An opening 52 goes into a chamber 53 in which extends a turret member 54. This turret member 54 preferably will have attached thereto a tube 64 which extends some distance downwardly—perhaps as much as six inches from the mask body 10, and which provides a certain amount of reservoir and rebreathing capacity for escaping oxygen. In place of the tube 64 under certain conditions the turret 54 may be formed as shown in Fig. 5 and may be provided with a sponge rubber control valve 55 across an opening 56 going to atmosphere. It is preferred, however, not to use the sponge rubber disc arrangement for the reason that at excessively low temperatures where the device may be used there is danger of ice forming on the disc, which would hamper or prevent respiration.

The chamber 53 has an opening 57 extending therefrom and a tubular extension 58 which receives a hollow connector member 59. The tube 11 is united at 60 with the connector member 59. A band indicated at 61, Fig. 5, composed of relatively soft rubber is applied to the neck of the turret extension 47 providing a body of soft material to be gripped by the teeth.

A band 65 of elastic material has an opening therein indicated at 66 so that portions of the band 67 and 68 lie on either side of the plateau extensions 46. As shown in Fig. 2, the band will be adjusted to the weather so that under normal operation when applied to the neck of the wearer it will hold member 10 just below the chin of the wearer where it can be quickly brought to the mouth when the normal mask 14 is taken off.

The advantages in operation of our escape device are, or course, primarily that it provides a certain and safe adjunct to an aviator's equipment which will enable him to leave the airplane and its oxygen supply secured thereto and to maintain himself during parachute descent from high elevations and consequent low barometric pressures.

It may be assumed that the aviator is in the position of Fig. 2 employing the mask for providing the regular oxygen supply from the tank carried in the airplane when, either from enemy action or from other cause, the airplane is put out of commission and begins to fall. The aviator has, of course, strapped to him in the customary manner, a parachute and to save himself he must get clear of the falling plane and descend by the well known support of the parachute. Practically with a single movement he will thrust off the mask structure he is wearing and place the mouth-piece of the emergency mask structure between his teeth where the grip of his teeth and the hold of the straps back of his neck will secure it in position. He will have accomplished this exchange with his right hand, and at the same moment, using his left hand, he will turn the valve handle to permit full flow of oxygen from the tank in the pocket of his trousers uniform and then will proceed to make other necessary preparations to jump. As mentioned before, the aviator has at most thirty-five seconds of consciousness at the barometric pressure of 35,000 feet of elevation if the regular oxygen supply is cut off, therefore his first concern in preparing to bail out must be to establish feed of emergency oxygen, and our apparatus is particularly designed to enable him to do this, that is, to shift from the normal oxygen supply of the airplane to the emergency supply in the shortest possible time.

This whole procedure will take hardly a second more than jumping without the emergency oxygen supply. Of course when the aviator is free from the plane he will pull the rip-cord and the parachute will become distended and his descent under parachute support will take place. This descent will be at a more rapid rate in higher altitudes where barometric pressures are low than as the aviator gets farther down. He will have a supply of oxygen in the small tank to last him for something like 14 minutes, at the expiration of which period he may have landed on the ground, and very certainly would have reached an atmosphere of safe barometric pressure where the mouth-piece mask can be discarded and normal breathing resumed.

The valve structure is such that a single turn of the valve handle will produce delivery of oxygen at maximum volume for the tank pressure when the valve is opened. The limit groove connected with the valve stem opening and the relatively large valve area opened by turning of the valve stem insures this. And as already stated, the high pressure of oxygen in the tank at the start will increase delivery of oxygen at the beginning of descent where greater volume of oxygen and more pressure in the alveolar regions of the lungs are desirable. The descent from higher to lower elevations and consequent increasing barometric pressure will accompany the gradual decrease of pressure from the oxygen tank, and will about compensate one another. The aviator under normal conditions will breathe exclusively through the mouth and will rebreathe exhalation and draw back oxygen tending to escape through and filling the tube 64. Even though at the start temperatures are extremely low there is nothing to freeze shut provided dry oxygen has been used in filling the tank. Once the descent has safely begun it will continue without incident until the aviator makes a successful landing on the ground.

The structure of the entire apparatus is very simple yet of such a nature that it cannot fail in operation. The gauge 65 on the side of the tank neck is provided so that whenever the aviator puts the oxygen tank in the trousers pocket he will be informed that the pressure is up to a required minimum. The tank can conveniently and readily have oxygen gas added thereto to build up pressure as desired by attachment to any larger tank of dry oxygen having gas stored at adequate pressure.

But before his take-off the aviator must be trained to be as careful of the emergency oxygen supply as he is of his parachute. Each aviator should be trained to see personally that the emergency tank is filled with dry oxygen and

that the entire apparatus is in working order whenever he enters a plane that will ascend to above 30,000 feet.

We claim:

In a parachute escape device adapted to be substituted quickly for normal means of supplying oxygen in an airplane at high elevations, a tank of oxygen secured in a pocket of the aviator and being of a size and having the oxygen at a pressure to provide a sufficient quantity of oxygen as delivered to the aviator to supply oxygen for safe descent with a parachute from such high elevation, a mouth mask structure adapted to be quickly inserted in the mouth to be gripped by the aviator's teeth to hold it in position therein and to permit breathing therethrough having means to resist collapse from the grip of the teeth, said mask being connected with the oxygen tank and being normally supported upon the person of the aviator in convenient position quickly to be inserted in his mouth, a valve on the tank having a handle adapted to open the valve for delivery of full maximum flow of oxygen to the mask resulting from a single turn of the valve handle, and an exhaling valve and extended discharge tube leading therefrom and providing a heating reservoir and partial rebreathing chamber.

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