

Jan. 25, 1938.

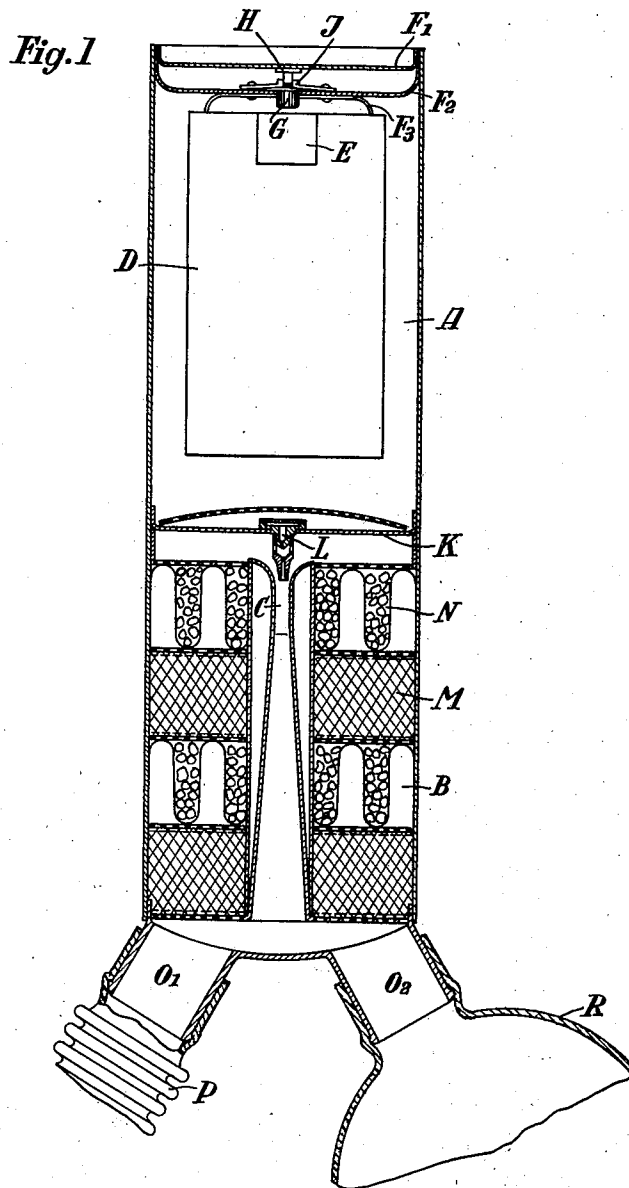
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OXYGEN EMERGENCY APPARATUS WITH CLOSED RESPIRATORY CIRCUIT

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2

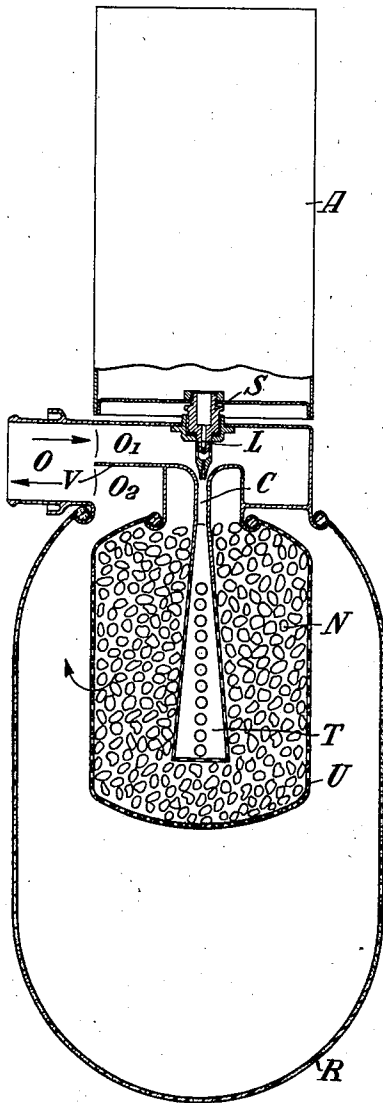
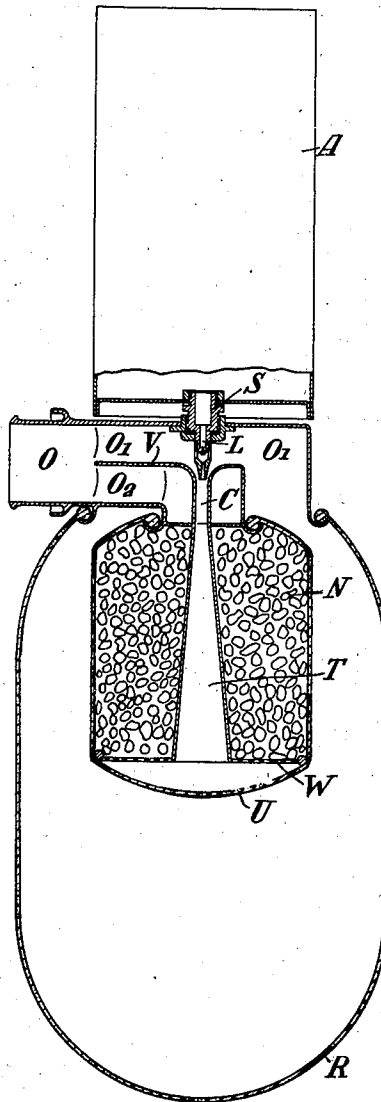


Fig. 3



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OXYGEN EMERGENCY APPARATUS WITH
CLOSED RESPIRATORY CIRCUITMax Hausmann, Berlin-Zehlendorf-Mitte, Ger-
many, assignor to I. G. Farbenindustrie Aktien-
gesellschaft, Frankfurt-on-the-Main, GermanyApplication October 21, 1936, Serial No. 106,729
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3 Claims. (Cl. 128—191)

This invention relates to oxygen emergency apparatus with closed respiratory circuit.

In closed respirators in which all the exhaled air is passed for purification through a mass absorbing carbon dioxide (potash cartridge) it has already been proposed to overcome the considerable resistance that said mass offers to the circulation of the respiratory air by causing expansion of oxygen delivered under pressure from the oxygen flask at least partly in the respiratory circuit, thus producing an injector pump action. However, when oxygen is used which has been generated from mixtures of chemical substances, for instance of such containing chlorates or perchlorates as the oxygen-yielding constituents, and from which oxygen is generated in an automatically progressive reaction after initial heating, in which case, if any, then only a slight drop in pressure due to expansion is available, the diminution of the resistance of the absorption cartridge obtained by utilizing the injector action of such oxygen is found to be inadequate.

On the other hand it has been ascertained in accordance with the present invention that it is possible to utilize the foregoing injector action with advantage for the construction of light and simple closed oxygen respirators in which the oxygen is generated in a manner known per se, (see for example, U. S. Patent 1,408,757 or British Patent 341,975) from a mass giving off a constant current of oxygen after initial heating and which respirators serve merely for use over short periods, i. e. as emergency apparatus. The invention is based on the observation that in such respirators it is not essential for the whole of the exhaled air to be passed through the carbon dioxide absorption cartridge in each respiratory period, since temporarily at least, a CO_2 concentration in the inhaled air somewhat exceeding the normal is not harmful to the wearer of the apparatus, which is merely intended to enable him to escape from the danger zone.

In accordance with the present invention therefore, the exhaled air is deliberately only partly purified, the carbon dioxide absorption cartridge being placed in the secondary current, pulsating respiration being applied, thus promoting the circulation of the volume of air in the secondary current only by the injector action of the freshly introduced oxygen. By this means it has been found possible to eliminate when necessary the customary, expensive and bulky form of construction of the CO_2 absorption cartridge with metal jacket and wire screens of various forms, which was necessitated only by the effort to re-

duce as far as possible the resistance to circulation, and to use the caustic potash poured loose into a bag permeable to air. By adopting these measures a very simple and extremely compact form of the apparatus is achieved; long respiratory passages with their known disadvantages are unnecessary, and at the same time the condition occurring in the known respirators with injector action—where there is a negative pressure in one part of the respiratory passages and in consequence harmful air from outside may be drawn in through any leakages in the respiratory passages—is avoided.

The present invention accordingly provides an oxygen apparatus with closed respiratory circuit for use over short periods, having a mass giving off a constant current of oxygen after being heated initially, in which the jet nozzle of an injector is connected direct to the receptacle for the oxygen-generating mass, the mixing nozzle of said injector passing the gas mixture into the receptacle for the carbon dioxide-absorbing mass, the suction chamber of said injector being connected either directly or indirectly via the receptacle for the carbon dioxide-absorbing mass, with the respiratory pipe and the respiratory bag.

In order more clearly to understand the invention, reference is made to the accompanying drawings, which illustrate diagrammatically and by way of example, several embodiments thereof.

First embodiment

Fig. 1 shows an oxygen-supplying device A having a potash cartridge B attached thereto and an injector C mounted thereon.

The device A supplying the oxygen contains the oxygen generating composition in the form of a compressed body D disposed in a thin sheet iron receptacle. E represents a cavity to hold an igniting composition. The oxygen-generating mass is separated on all sides from the metal walls and from the base of the receptacle by a jacket of heat insulation and filtering material, which consists for example of barium hydroxide, impregnated pumice powder, asbestos, silica gel or the like. The top of the container is closed by a lid, preferably threefold, (F_1 , F_2 , F_3). The lid F_2 carries the percussion cap G, on which the pointed percussion pin H is loosely mounted in a guide I. The thin lid F_1 , which can also be furnished with grooves, lies on the percussion pin H. The ignition is effected by striking the lid F_1 , the blow being transmitted to the percussion pin H and igniting the percussion cap. Between the container A and the potash cartridge B is dis-

posed a sheet metal partition K at the centre of which is mounted the nozzle L of the injector C. Said injector projects into the potash cartridge in which are disposed wire sieves M to hold the caustic potash N. Two pipe connections O₁ and O₂ are provided at the opposite end of the potash cartridge of which O₁ is joined by the tube P to the mouthpiece or mask, while O₂ carries the respiratory bag R. The mouthpiece, mask and the excess pressure valve are not shown in the drawings.

The method of working is as follows: After the generation of oxygen from the mass D has been started, the oxygen passes under pressure out of the nozzle L, through the injector C and is inhaled through the tube P or stored as surplus in the bag R. As a result of the injector action air is drawn out of the potash cartridge by the oxygen flowing out at L and forced through the jet pump. The air drawn off is supplemented by fresh air containing carbon dioxide, so that there is a constant flow through the potash cartridge and therefore absorption of the carbon dioxide.

Second embodiment

Fig. 2 shows an oxygen-supplying device A, the construction of which is the same as in Fig. 1. In contradistinction to the latter it is however not permanently attached to the potash cartridge B, but is screwed thereto. The screw coupling S carries in the middle the nozzle L which projects into the outer injector tube C. The lower extremity of the latter is continued in the form of a funnel T furnished with apertures, which is surrounded by the material N absorbing the carbon dioxide; to hold the funnel T and material N use is made of a sheath or casing U which is permeable to air. R represents the respirator bag. O represents the pipe connection to which the respiratory pipe leading to the mouthpiece or mask is attached. The pipe connection is divided by the partition V into two respiratory pipes O₁ and O₂.

The oxygen emerging from the device A supplying the oxygen, through the nozzle L, after said device A has been put into operation, draws the exhaled air through the pipes O₁ and O into the carbon dioxide absorption device and there forces it through the material N and the sheath U into the respirator bag R, from which the regenerated air is inhaled through O₂ and O.

Third embodiment

Referring to Fig. 3, A represents the mass supplying the oxygen, S the screw coupling with the nozzle L, C the injector with the funnel T, the latter in this case having no apertures, N the material absorbing the carbon dioxide, which is placed on the perforated plate W which is permeable to air and enclosed in the sheath or casing U which is not permeable to air. R represents the respirator bag, O the respiratory pipe connection, which is again divided into two respiratory pipes O₁ and O₂ by the partition V.

The oxygen emerging from A through the nozzle L draws the exhaled air through the pipes O₁ and O and passes it through the funnel T into the chamber filled with the material N absorbing the carbon dioxide. After passing through this chamber the air, in this way made fit for breathing again, passes through O₂ into the pipe O, from where it is inhaled.

I claim:—

1. An oxygen emergency apparatus with closed respiratory circuit comprising a gas chamber, a chemical mixture adapted to generate oxygen on being initially heated disposed therein, an absorption chamber containing a chemical adapted to absorb carbon dioxide adjacent to said gas chamber, an injector device comprising a nozzle and a mixing tube surrounding said nozzle and extending beyond the mouth thereof, projecting from said gas chamber into said absorption chamber, a duct for leading at least part of the air exhaled by the user into said absorption chamber, said duct being so disposed in relation to said injector nozzle as to enable the oxygen passing through the latter to produce a suctional effect on the air passing through said duct, another duct leading away from said absorption chamber, and a mouth piece connected with both said ducts and adapted to be fitted to the mouth of the user.

2. An oxygen emergency apparatus with closed respiratory circuit comprising a gas chamber, a chemical mixture adapted to generate oxygen on being initially heated disposed therein, a perforated absorption chamber containing a chemical adapted to absorb carbon dioxide adjacent to said gas chamber, an injector device comprising a nozzle and a mixing tube surrounding said nozzle and extending beyond the mouth thereof, projecting from said gas chamber into said absorption chamber, the carbon dioxide absorbing chemical being disposed around said mixing tube, a respiratory bag surrounding said absorption chamber, a duct for leading at least part of the air exhaled by the user into said absorption chamber, said duct being so disposed in relation to said injector nozzle as to enable the oxygen passing through the latter to produce a suctional effect on the air passing through said duct, another duct leading away from said absorption chamber, and a mouth piece connected with both said ducts and adapted to be fitted to the mouth of the user.

3. An oxygen emergency apparatus with a closed respiratory circuit comprising a gas chamber, means for generating oxygen in said chamber, a carbon dioxide absorption chamber adjacent said gas chamber, a nozzle attached to said gas chamber, a mixing tube surrounding and extending beyond the end of said nozzle, means disposed around said mixing tube for holding carbon dioxide absorption chemicals, a duct for leading at least part of the air exhaled by the user to a point adjacent the carbon dioxide absorption chemicals, discharge of generated oxygen through said nozzle into said mixing tube causing a circulation of exhaled air through said absorption chemicals.

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