Oct. 24, 1933. L. G. JENNESS 1,931,989

AIR PURIFYING DEVICE

Filed May 25, 1931

Fig. 1.

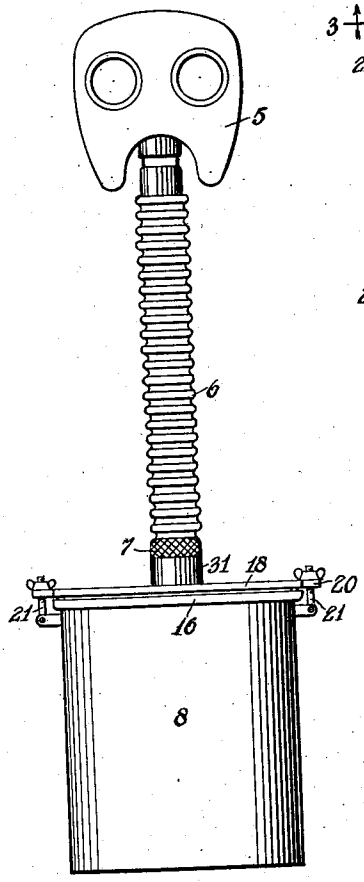


Fig. 2.

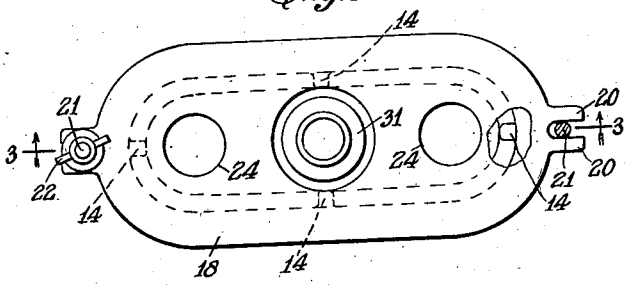


Fig. 3.

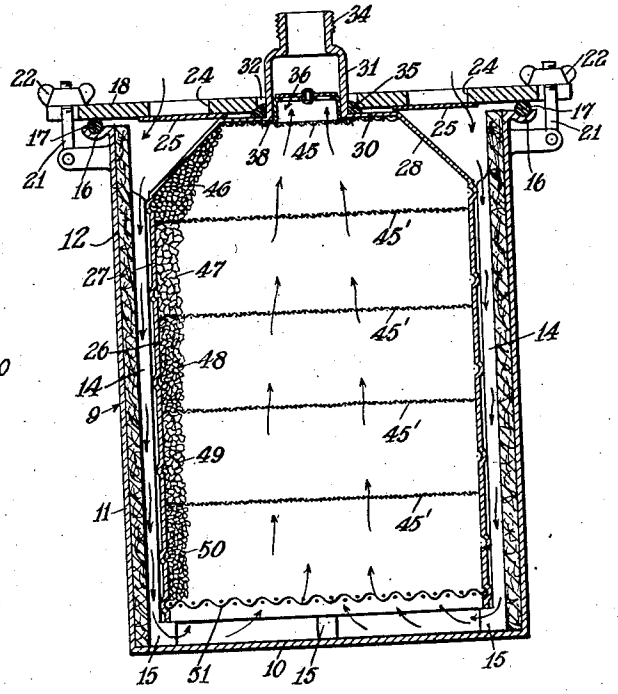
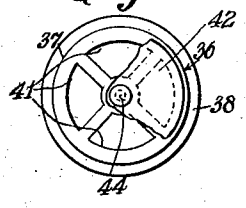


Fig. 4.



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AIR-PURIFYING DEVICE

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Application May 25, 1931. Serial No. 539,719

1 Claim. (Cl. 183—49)

This invention relates to air-purifying devices of the type adapted for use in association with a gas mask and characterized by a canister, carrying therein an air-purifying medium or material such as an oxidizing catalyst, employed in transforming carbon monoxide into carbon dioxide.

An object of the invention is to provide simple and effective means for materially prolonging the canister life of the catalyst.

Other objects and advantages of the invention will become apparent from the following description, taken in connection with the accompanying drawing, in which—

Fig. 1 is a view in elevation of a canister embodying this invention, the canister being shown in association with a gas mask;

Fig. 2 is a plan view of the canister;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2, and

Fig. 4 is a plan view of an out-let check valve.

Referring to the drawing, the numeral 5 indicates a gas mask, which is of standard construction and includes air supply tube, such as a rubber hose 6, provided at its lower end with a suitable coupling member 7, to which may be secured an air-purifying device 8 embodying this invention.

The air-purifying device 8 comprises a metal shell or housing 9, the bottom and side walls 10 and 11, respectively, of which are provided with a liner 12 of suitable insulating material, such as asbestos. Located within the housing 9 and suitably secured to the wall 11 thereof, are a plurality preferably four, of vertically disposed and equidistantly spaced guides or vanes 14, each of which is provided at its lower end with an inwardly projecting foot-like support 15, the function of the guides and their foot-like supports being hereinafter more particularly explained. Carried by the wall 11, at the upper end thereof, is an outwardly projecting flange or gasket seat 16, provided with a suitable gasket 17, such as a rubber ring, on which is adapted to fit the outer margin of a cover plate 18. The cover plate 18 is provided with two pairs of outwardly projecting lugs 20, adapted to receive, respectively, therebetween the screw-threaded ends of a pair of clamp rods 21, which are pivotally connected to the side wall 11 and are provided with wing nuts 22, the wing nuts being adapted, when screwed down on the clamp rods 21, to urge the cover plate 18 into firm engagement with the gasket 17 and to lock the cover plate on the housing 9. In the cover plate 18 are provided a pair of inlet openings 24, through which outside air may enter the canister by way of a pair of suitable check valves 25, which are associated with the cover plate and are so constructed as to permit air to pass only inwardly through the openings, as indicated by the arrows in Fig. 3.

Located within the housing 9, is a metal canister 26, of smaller horizontal dimensions than the housing so as to leave a surrounding air passage between its side wall 27 and the wall of the housing. This canister 26 is adapted to be introduced into the housing 9 and to rest on the foot-like supports 15 of the vanes 14, which vanes serve to center the canister and hold it against transverse displacement, whereas the supports 15 serve to maintain the lower end of the canister in a spaced relation to the bottom wall 10 of the housing. The inside wall 27 of the canister is inclined inwardly and upwardly at its upper end, as shown at 28, and is there provided with a closure wall 30, to which is secured an upwardly extending outlet tube 31, adapted to project through an opening 32 formed in the cover plate 18, the upper end of the tube 31 being of a reduced diameter and provided with screw-threads 34, by which the air-purifying device 8, as a whole, may be connected to the gas mask hose 6 by the coupling member 7 carried thereby. Disposed about the tube 31 and resting on the closure wall 30, is a gasket ring 35, of suitable material such as rubber, which, when the cover plate 18 is clamped in place on the housing 9, impinges on the closure wall and the cover plate at a point on the latter adjacent the opening 32 so as to afford an effective seal for such opening.

Disposed within the lower end of the tube 31, is a suitable outlet check valve 36, which comprises a metal cup-shaped member 37, the peripheral flange 38 of which engages the lower surface of the cover plate 18, and the bottom portion 40 of which is provided with a plurality of airports or openings 41, over which is disposed a valve disc 42, loosely mounted on a vertical pin 44, suitably connected to the bottom wall of the cup-shaped member, the pin 44 being provided at its upper end with a head, as shown, to prevent undue displacement of the valve disc thereon.

Within the canister 26 and at the upper end thereof, is arranged a transversely disposed screen 45, the mesh of which is such as to prevent the adjacent particles of purifying material 46 from entering the tube 31. If desired, the canister 26 may be provided with similar screen-like elements 45′ to maintain the various kinds of air-purifying materials 46, 47, 48, 49 and 50 in a separated condition, one of which materials may be an oxidizing catalyst for transforming carbon

monoxide into carbon dioxide. The air-purifying materials 46, 47, 48, 49 and 50, together with the screen 45 and the material-separating screens 45', may be held within the canister by a suitable screen-like bottom wall 51, which is secured to the wall 27 of the canister at the lower end thereof.

From the foregoing description it will be understood that as the wearer of the gas mask 5 inhales, air will pass into the air-purifying device through the openings 24, by way of the check valves 25, and will flow downwardly between the walls 11 and 27 and into the canister 26 where it is subjected to the purifying materials 46 to 50 as it passes upwardly through the same, the action of the air-purifying materials being such as to render the air suitable for breathing as it passes from the canister by way of the tube 31 and into the hose 6 from which it is supplied to the wearer of the mask. As the impurities of the air that is to be rendered suitable for breathing react with the air-purifying material, heat of reaction is generated, and this heat is transmitted to the wall 27 of the canister, where it is utilized to heat the incoming air as it passes downwardly through the space afforded between the wall 11 of the housing and the wall 27 of the canister. As a result of the heat exchange that takes place between the purifying material and the incoming air, the temperature of the material is lowered and the temperature of the incoming air is increased, with the result that the temperatures of these two mediums, namely, the air-purifying material and the incoming air, approach each other, and with the further result that the purified air leaves the canister at a temperature no higher than that at which it would leave the canister were the heat of reaction not employed to heat the incoming air prior to its entering the canister. From tests made, respectively, with a canister, to which air was directly admitted without preheating, and with the device embodying this invention, I have determined the following facts under identical operating conditions, each canister being filled with the following materials, the quantity being indicated in cubic centimeters and the granular sizes in the screens of standard mesh representing either substantially the size of grains or the range of sizes in the grains, as follows:

	Cubic centimeters	Mesh
Calcium chloride	100	8
Catalyst	450	10–14
Calcium chloride	150	8
Charcoal	300	8–14
Soda lime	520	8–14

First.—That the life of the catalyst was increased from 35 minutes, when no preheating of the entering air was effected, to 9 hours and 20 minutes, when the entering air was heated by the heat of reaction; the temperature of the outside air, that is the air prior to its entering the canister, being in both instances at 32° F.

Second.—That the life of the catalyst was extended from 5 hours, when no preheating of the entering air was effected, to 40 hours or more, when the entering air was heated by the heat of reaction; the outside air being in both instances at room temperature, and the test in the second instance being discontinued at the end of the fortieth hour without a breakdown of the catalyst.

The tests by which the first above-mentioned fact was determined, where the temperature of the outside air was 32° F., were conducted with air charged with .5% carbon monoxide at a flow of 32 litres per minute and at a relative humidity of 100%; and tests by which the second above-mentioned fact was determined, where the outside air was at room temperature, were conducted with air charged with 1% carbon monoxide at a flow of 32 litres per minute and at a relative humidity of 50%.

It is interesting to note that the temperature of the catalyst was no higher, under identical outside air temperature conditions, in the tests where preheating was employed than in the tests where preheating was not employed, and that the amount of preheating, by utilizing the heat of reaction, was sufficient to bring the temperatures of the catalyst and of the entering air, immediately prior to its contact with the catalyst, sufficiently near to each other to account for the very marked increase in the canister life of the catalyst.

Although only one form of the invention is herein shown and described, it will be understood that various changes may be made without departing from the spirit of the invention or the scope of the following claim.

What is claimed is:

An air-purifying device adapted for use with a gas mask and to be connected to the air-supply tube thereof and comprising a canister having an imperforate and heat-conducting wall and having an air inlet and an air outlet and adapted for the reception of a catalyst through which air to be purified may pass, a housing for said canister having an air inlet and forming with the heat conducting wall of the canister on air conduit affording a large contact of incoming air with the heat-conducting wall of said canister, said air inlet of the housing and said air conduit being in substantially non-heat interchanging relation to the air outlet from the canister and said air conduit delivering the air to be purified directly to the air inlet of the canister and the air outlet from the canister extending out from the housing and adapted to be there connected to the air-supply tube of the mask so that the purified air is delivered from said air outlet directly to the air-supply tube of the mask.

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