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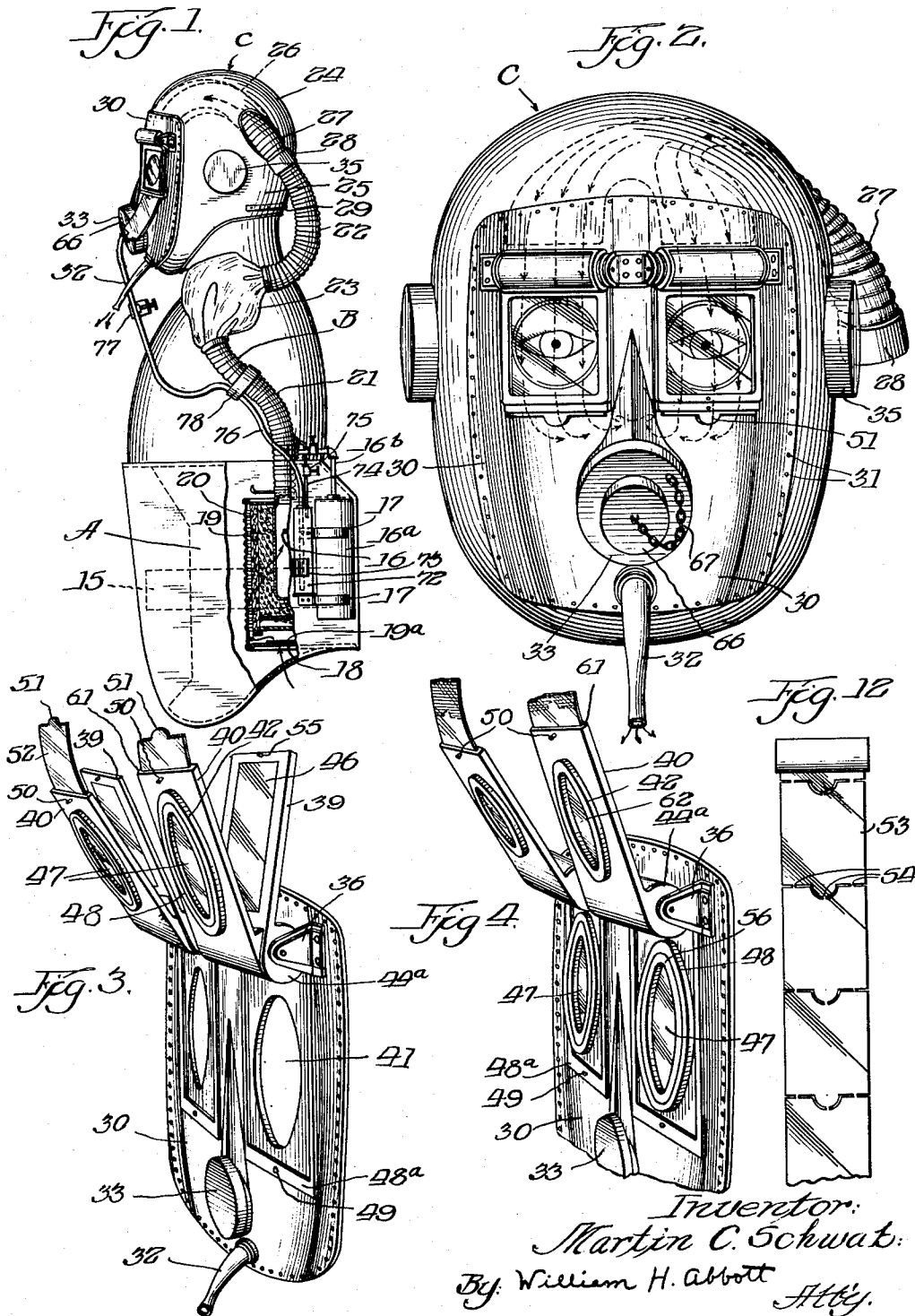
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GAS MASK

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2 Sheets-Sheet 1



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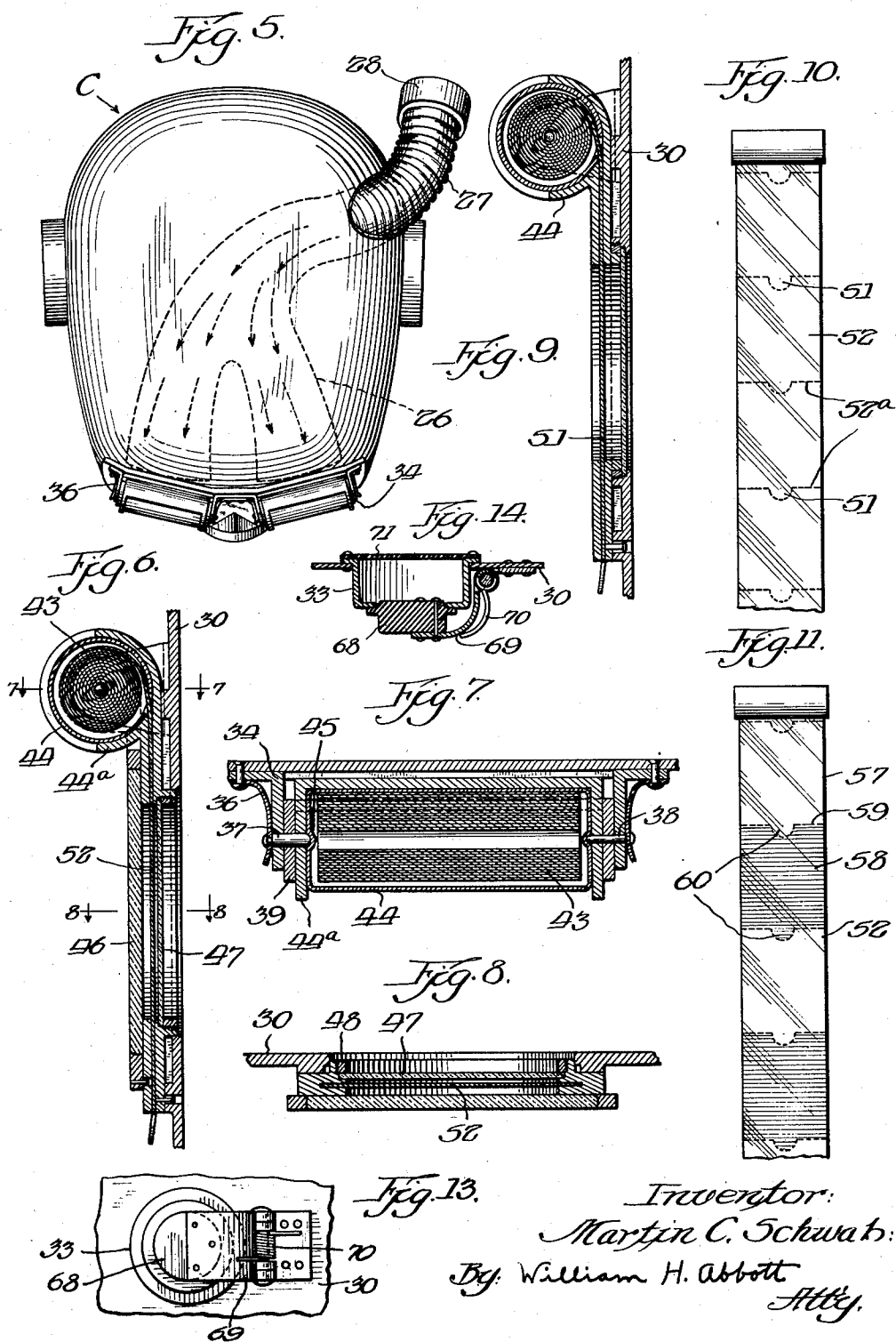
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UNITED STATES PATENT OFFICE

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GAS MASK

Martin C. Schwab, Chicago, Ill.

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6 Claims. (Cl. 128—141)

This invention relates to improvements in gas masks adapted to purify expired air by the removal of gas or smoke and is particularly adapted for military usage, although it is to be understood that the improved mask may be modified for civilian usage such as at fires or in coal mines. A particular disadvantage of the gas masks employed in World War I was their cumbersomeness, and the difficulty the user had in engaging in physical operation while the mask was in place. While this difficulty was overcome to some extent in gas masks developed in the post-war period, it still is present to a noticeable extent in restricting the physical activities of the users. An object of the present invention, therefore, is the provision of a mask which is comfortable, in that it may also serve as a cushion for the conventional helmet and does not interfere to any material extent with the physical activities of the user. A large part of the objection to the gas masks of the prior art lies in the fact that the hose tube conducting the purified air from the canister to the facepiece is disposed in front of the user, thus restricting the free use of his arms in front of his body. A feature of the improved gas mask is the provision of a hose tube extending along the back or side of the user and over the side of his head to the facepiece.

A further important object of the invention is the provision in gas masks of lens members from which any accumulated fog or moisture may be readily removed without removing the entire mask. One of the most difficult problems in the development of a suitable gas mask has been the problem of disposal of fog or mist, which may be deposited on the internal and external sides of the lenses, or the formation of irregular markings on the external surfaces of the eyepieces, as by the etching action of chemicals in certain gases, as well as the condensation of moisture from the breath on the inner side of the eyepieces and difference in temperature within and outside of the mask. I have overcome this difficulty by providing laminated lens members, one element of which comprises a strip of transparent flexible material which is preferably sunproof, heatproof, moistureproof and fire resistant, adapted to be drawn downwardly across the eyepieces from a roll and severed when they become misted, at the same time drawing downwardly a fresh unmisted strip. The double lens piece tends to insulate the interior of the mask from external temperature changes and to prevent condensation of moisture on the inner side of the lens. A further feature of the invention is the provision

of flexible strip material having portions adapted to protect the eyes against the glare of the sun. Other objects of the invention are to provide a gas mask which is simple in design and easy to operate and place in position. Other features of my improved gas mask are that it is reasonably easy to manufacture in quantity, has a low breathing resistance, in that there is a relatively straight flow of air from the canister to the mask, is rugged enough to withstand field conditions and has a relatively long service life in the field or in storage. A further hygienic feature of my improved mask lies in the fact that the flow path of the exhaled air is entirely divorced from the flow of the incoming air.

The invention will be readily understood from the following detailed description in conjunction with the accompanying drawings, in which:

Fig. 1 is a side elevation, partly in section, of the improved gas mask in use and showing the canister in cross section;

Fig. 2, a front elevation of the mask;

Fig. 3, an enlarged perspective view of a portion of the facepiece;

Fig. 4, an enlarged perspective view of a portion of a modified form of facepiece and eye lens;

Fig. 5, a plan view;

Fig. 6, a vertical cross-sectional view of the facepiece and lens members shown in Fig. 3;

Fig. 7, a sectional view taken along the lines 7—7 of Fig. 6;

Fig. 8, a sectional view taken along the lines 8—8 of Fig. 6;

Fig. 9, a vertical sectional view of a portion of the modified form of facepiece and lens members shown in Fig. 4;

Fig. 10, a front elevation of a strip of flexible transparent material forming one element of the eyepieces;

Fig. 11, a front elevation of another form of flexible strip material for use as an element of the eyepieces, having portions adapted to protect the user against sun glare;

Fig. 12, a front elevation of a further type of transparent flexible material for use as an element of the eyepieces;

Fig. 13, a partial front view of a form of closure member for the mouthpiece of the mask; and

Fig. 14, a sectional view of the horizontal center line of Fig. 13.

Referring to the drawings, the improved gas mask generally comprises three elements, namely, a carrier A, a hose tube B, and a headpiece C. The carrier A is an irregular shaped satchel formed of canvas and is provided with an ad-

justable waist strap 15 and an adjustable shoulder strap not shown. It is preferably carried at the left side of the user, under his arm, with the shoulder strap fitting over the right shoulder. The carrier is adapted to house the hose tube B and the headpiece C when they are not in use, and the headpiece C may be placed over the head of the user without change of the position of the carrier from the side of the user. The carrier also houses a canister 16 which is oblong shaped, is preferably formed of sheet metal, and is provided at its lower end with an air inlet 18 extending through the carrier A. The air inlet 18 is equipped with an inlet valve, not shown, to permit the passage of air into the canister but otherwise remains closed. The interior of the canister is preferably provided with a combination gas and smoke filter 19. A suitable filter may be formed of a mixture of 80% activated charcoal and 20% soda lime, although it may be comprised of other well-known chemicals adapted for adsorbing toxic gases. The outer surface of the filter may be provided with a cotton pad 20 adapted to filter out smoke, dust and mist. The chemical filter formed of activated charcoal and soda lime is adequate for protection against chemical warfare gas. It is not suitable for civilian use, since it does not filter out toxic gases, such as carbon monoxide, or ammonia. For such uses, a more comprehensive and bulky filter must be employed. For example, the filter may comprise several layers, first, a layer of activated charcoal, then a cotton pad for filtering out smoke and dust, then a layer of silicate gel for the purpose of absorbing ammonia, then a layer of caustic kaolin, to absorb any moisture, then a layer of hopcalite comprising a mixture of manganese dioxide and copper oxide in granular form, another layer of caustic kaolin, and, lastly, another cotton pad filter. A wire screen may be placed above the filter and the layers held in position by a spring. The hopcalite acts as a catalyst to cause a union of carbon monoxide with the oxygen in the air to form relatively harmless carbon dioxide. The hopcalite loses its catalytic power when saturated with water vapor and thus layers of caustic kaolin are provided above and below it to adsorb water vapor. The canister containing as a filter material a mixture of activate charcoal and soda lime has been found to be satisfactory for most military purposes, and the more expensive and cumbersome canister containing several filter layers need only be employed for special uses.

Secured to the canister 16 by straps 17 is a second canister 16a within the carrier A. This canister contains oxygen and has a valved outlet 16b to the hose tube B so that if the wearer of the gas mask has inhaled traces of toxic gas he can be strengthened or revived by inhaling oxygen.

The hose tube B leads from the upper part of the canister 16 to the headpiece C and, as shown, comprises two sections 21 and 22 with an intermediate resilient sack 23 adapted to house a supplementary filter of activated charcoal and soda lime in cake form, if desired. The hose tube sections 21 and 22 are formed of a corrugated tube of rubber covered with a thin layer of cotton fabric vulcanized to the rubber.

The headpiece C is adapted to conform fairly closely to the shape of the user's head and, accordingly, various shapes and sizes of headpieces are necessary in order to fit various users, and is so formed that the conventional military helmet fits comfortably thereon. The upper portion 24 of the headpiece may be formed from molded rubber blanks of approximately the correct size covered on the outside by a thin layer of cotton fabric vulcanized to the rubber. The headpieces may be cut out from blanks to the exact size and shape by means of a die. The pieces are sewn together and taped with adhesive tape to form a gas-tight seam. The lower portion 25 of the headpiece is formed of a distensible rubber which may be stretched to slip the headpiece over the head of the user and when in place will contract to form a rather snug fit beneath the chin and upper neck of the user. The upper portions 24 of the headpiece are provided with channels 26 into which an extension 27 of the hose tube is fitted. The channels 26 lead from the upper rear side of the mask to the upper front portion of the mask. The upper portion 22 of the tube hose B is connected to the tube portion 27 fixedly secured in the headpiece C by means of a slip joint 28. The lower rear portion of the headpiece C may be provided with a strap 29 in order to draw it in snugly around the upper portion of the wearer's neck. Adhesive tape may also be applied along the lower edge of the headpiece C to provide a gas-tight seal.

The facepiece 30 is preferably formed of a lightweight metal such as aluminum or magnesium or alloys thereof and may be secured to the headpiece by rivets 31 or by a rubber cement, or both. The facepiece is shaped to conform to normal facial contours and is spaced somewhat from the face of the wearer in order to permit the purifying air to pass from the channels 26, between the facepiece 30 and the face of the wearer, to his nostrils. As shown in Fig. 2, the purifying air to be inhaled passes between the eyes of the wearer and the eyepieces of the mask and will thus tend to remove any mist that may be formed on the inner surface of the eyepieces by reason of condensation of moisture from the breath of the wearer or temperature differences between the interior and exterior of the mask. Thus, in my improved mask I am able to eliminate the deflectors normally employed to deflect the incoming air across the eyepieces, since without such a device in the gas masks known to the art the eyepieces would soon become so fogged or dimmed that it would be impossible for a man wearing the mask to see through it. The purified air passes relatively slowly through the channels 26 and across the face and in cold weather the air to be inspired will be warmed during this passage almost to body temperature.

An outlet 32 comprising a rubber tube protected by a metal guard is disposed at the lower end of the facepiece below the mouth of the wearer. It is provided with a one-way valve to allow the exhaled air to pass out of the facepiece but otherwise remains closed to prevent any air from being drawn into the mask through the outlet and is so disposed that the path of the exhaled air is segregated from the path of the incoming air. A closed metal cylinder 33 is formed above the outlet 32 and this may be replaced by a microphone in certain masks to be used by officers. The upper portion of the facepiece, as shown in Fig. 5, is provided with an angle bar 34 to strengthen the face piece and prevent interruption of the passage of the air currents from the passages 26 below it. Ear muffs 35 of a rubberized fabric secured to the sides of the headpieces are adapted

to protect the ears of the wearer of the mask from the effects of vesicant gases while not impairing his auditory powers to any appreciable extent.

As previously set forth, an important improvement in my gas mask lies in the novel eyepiece members which are adapted not only to eliminate condensation on the inner surfaces of the eyepieces but also provide a device whereby any moisture or impairment of the outer lens surface by reason of the etching effect of acids in certain toxic gases may be eliminated. Leaf spring members 36 are mounted on the upper ends of the facepiece 30 in the channels of angle bars 34 and are equipped with pin members 37 and 38 adapted to serve as pivot members for a pair of sun glass frames 39 and a pair of eyepiece guideways 40 adapted to swing thereon. The guideways 40 comprise an oblong shell member open at both ends and are each provided with a central annular opening surrounded by a boss 42 having screw threads on its inner side. As shown in Figs. 3, 6 and 8, glass eyepieces 47 are mounted in spaced relation in the bosses 42 in front of the eyes of the wearer and are held therein by detachable screw-on type retaining rims 48 so that they may easily be replaced.

Disposed within the inner end of each guideway 40 is a roll 43 of flexible transparent sheet material which may comprise plain or moistureproof, fireproof cellulose acetate, Pliofilm or the like. As shown in Fig. 7, the pins 37 and 38 are of different sizes, the pin 37 being larger in order that, when it is necessary to replace an exhausted roll of the transparent sheet material, this can be effected by the wearer without removing the mask and without reversing the parts upon re-assembly of the roller device. The roll 43 is housed in a cylindrical slotted shell 44 and is supported at the cylinder inner end 44a of the guideway by the pins 37 and 38 entering the detents 45 in the housing through aligned bores in the spring members 36, angle bars 34, frames 39 and cylindrical ends 44a of the guideways 40. Within the frame 39 is a colored glass 46 adapted to protect the eyes of the wearer from sun glare.

The annular bosses 42 of the guideways 40 are adapted to fit snugly within the angular openings 41 for the eyepieces in the facepiece 30 to be retained therein when the guideways are swung downwardly in vertical usable position. The guideways 40 and frames 39 are pivotally mounted on pins 37 and 38 and usually only the guideways 40 will be carried in alignment with the eyepieces 41. Additionally, the retaining frames 48a, in which the guideways 40 fit when the lenses 47 are aligned with the eye openings 41, are provided with a snap opening 49 adapted to receive the snap 50 on the lower inner surface of the guideways. Thus it will be seen that when the guideways 40 are in the vertical position, two layers of protective material are provided for the eyes, the inner one being the glass layer 47 and the outer one being the portion of the transparent sheet drawn across the annular opening 41 in the facepiece. Thus, if any moisture condenses or any lines are etched in the portion of the transparent strip extending across the annular opening 41, the strip may be drawn downwardly by grasping the tab 51 on the end thereof and tearing off the damaged portion, thus drawing a fresh portion into the line of vision. As shown in Fig. 10, the strip of transparent material 52 depending from the roll 43 is provided at frequent intervals with perforations 52a form-

ing additional tabs 51. To avoid any possibility that the strips may not readily be severed along the perforations, in the embodiment of Fig. 12 the strips of transparent film 53 are shown provided with tear lines extending almost completely across the strips except for the short unsevered points 54. While it is believed that the rolls 51 contain sufficient sections so that they will not be exhausted during one engagement, extra rolls are carried to the carrier A and may, if necessary, be inserted in the guideway 40 without removing the mask during a battle by pulling out the pins 37 and 38 from the spring members 36, removing the exhausted cartridge 44, inserted the new one, replacing the pins 37 and 38 and threading the strip into its channel in the guideway 40. As previously pointed out, the pins are preferably of different sizes in order that the cartridge will be inserted without reversing it. If desired, the device may be constructed so that the glass lenses 47 are mounted in the annular openings 41 in the facepiece instead of in the guideways 40. Furthermore, the device may be provided with additional rollers mounted on the facepiece below the openings 41 to serve as rewind rollers for the strip material 52 after it is drawn past the openings 41, instead of severing portions of it.

It will also be understood that the wearer of the gas mask when compelled to look into the glare of the sun can swing downwardly the frame 39, bringing the colored glass 46 into the line of vision of the wearer. The frame 39 is provided with a snap member 55 adapted to retain the frame in the line of vision of the wearer.

A somewhat modified eyepiece construction is shown in Figs. 4 and 9, and for most usages this construction is preferred in that it is simpler since the frame member 39 containing the colored glass 46 for eliminating sun glare is not employed. In this construction the retaining rim 48 for the glass lens members 47 and the lens members 47 are mounted in circular openings in the facepiece 30 which is provided with groove member 56 adapted to frictionally receive the boss 42 surrounding the annular opening 62 in the guideway 40. A roll of transparent flexible sheet material, as shown in Figs. 10 and 12, may be housed in the roll housing 44 of the guideway or, more preferably, a strip of sheet material such as shown in Fig. 11 may be employed. In this material, sections of transparent material 57 are alternated at desired intervals, such as every other section, as shown, or every third or fourth section, with sections of colored flexible material 58 and are supported by perforations 59 equipped with tabs 60. Thus, when the wearer of the mask must face into the glare of the sun or reflection from other object or artificial light, he can pull a section 58 of the colored sheet material into the opening 62 of the guideway, otherwise the transparent sections 57 may be brought in register with the eye opening 62 of the guideway. When the portions of the strip material in the annular openings 41 become misted or etched, it is a simple matter for the wearer of the gas mask, without removing the mask, to grasp one of the tabs 60, pull the strip downwardly through the opening of the guideway 61, and tear off the damaged section along the edge of the guideway, which may serve as a severing edge.

As shown in Fig. 2, the cylindrical mouthpiece 33 may be provided with an opening in which a rubber stopper 66 fits snugly. The stopper 66 is

provided with a chain 67 secured to the mouthpiece 33 to prevent losses or misplacement of the stopper. In Figs. 13 and 14, a modified closure device for the cylindrical mouthpiece 33, in case an opening in the mouthpiece for emergency use is desired, is shown. In this construction, the rubber stopper 68 provided with an annular flange adapted to seat firmly on the edge of the mouthpiece 33 is secured by a hinge 69 to the facepiece 30. The leaf spring 70 yieldingly retains the stopper 68 in its seated position. The inner end of the cylindrical mouthpiece 33 is provided with a rubber diaphragm 71 which may have a small central aperture. Thus, in case of emergency either in field operations or in a base hospital, the wearer of the mask who may be injured may be fed or given oxygen through the mouthpiece 33 by removing the stopper 66, shown in Fig. 2, or swinging open the stopper 68, shown in Figs. 13 and 14, and pushing a feeding tube through the diaphragm 71. Thus, in cases of emergency it will be seen that the wearer of the mask may be given food, water or oxygen through a tube without removal of the mask and without letting any, or very minute amounts, of atmosphere which may contain traces of poisonous gas, within the mask.

As shown in Fig. 1, a small canteen 72 containing water may be disposed in the satchel A and secured to the sides thereof or to the canister 16 by a strap 73. A rubber tube 76 of small diameter extends from the top of the canteen 72 to the stopper 66 disposed in the mouthpiece. A strap 78 holds the tube 76 adjacent to the lower portion of the hose tube 21 so that it will not impede the arm movements of the wearer. The tube is also provided with a clamp 77 which must be opened before water can be sucked up by the wearer of the mask from the canteen 72. A line 74 provided with a clamp 75 leads from the upper portion of the canteen 72 into the lower portion 21 of the hose tube. Thus, when water is sucked up from the canteen through the tubing 76, air from the hose tube 21 will enter the canteen to replace the withdrawn water and thus prevent collapsing of the tube 76. The clamp 75 must be closed when no more water is to be withdrawn from the canteen in order not to restrict normal operation of the canister 16 in filtering air. This improvement, it is believed, will remove the cause of some numerous casualties in World War I by soldiers becoming thirsty and removing their gas masks to obtain a drink and thus becoming asphyxiated by gas inhaled while their masks were off, since in the modified construction of my improved mask it is possible to obtain water, stimulants or liquid foods without removal of the mask.

Thus it will be seen that a feature of the invention is that it may be employed in both night and day warfare in that means are provided for eliminating the glare of the sun by day or the glare of artificial light by night, such as from searchlights or from Thermite or magnesia flares.

What I claim is:

1. A gas mask comprising a facepiece removably secured before the face of the wearer, lens members in said facepiece, guideways pivotally mounted adjacent said lens members and provided with apertures adapted to be brought into register with said lens members, rolls of flexible transparent material carried in said guideways and adapted to be drawn therethrough and removed at intervals when the transparency of the

portions within said apertures becomes impaired, and means for replacing said rolls without removing said mask.

2. A gas mask comprising a facepiece removably secured before the face of the wearer, eye apertures in said facepiece, guideways pivotally mounted above said eye apertures and provided with lens members adapted to be brought into register with said eye apertures, and rolls of flexible transparent strip material carried in channels in said guideways and adapted to be drawn therethrough and removed at intervals when the translucency of the portions before said apertures become impaired.

3. A gas mask comprising a facepiece removably secured before the face of the wearer, eye apertures in said facepiece, guideways pivotally mounted above said eye apertures and provided with lens members adapted to be brought into register with said eye apertures, and rolls of flexible transparent material carried in said guideways and adapted to be drawn therethrough and removed at intervals when the transparency of the portions within said apertures becomes impaired, and frame members pivotally mounted adjacent said guideways and housing colored glareproof lens members adapted to be brought into register with said first mentioned lens members.

4. A gas mask comprising a facepiece removably secured before the face of the wearer, lens members in said facepiece, guideways pivotally mounted adjacent said lens members and provided with apertures adapted to be brought into register with said lens members, and rolls of flexible transparent material carried in said guideways, said rolls being divided by perforations forming tabs in sections of approximately the height of said lens members, said rolls being adapted to be drawn through said guideways and torn off in sections when the transparency of the sections within said apertures becomes impaired.

5. A gas mask comprising a facepiece removably secured before the face of the wearer, lens members in said facepiece, guideways pivotally mounted adjacent said lens members and provided with apertures adapted to be brought into register with said lens members, and rolls of flexible material carried in said guideways, said rolls being divided by perforations forming tabs in sections of approximately the height of said lens members, some of said sections being transparent and some colored to remove the glare of the sun, said rolls being adapted to be drawn through said guideways and removed in sections when the transparency of the sections within said apertures becomes impaired.

6. A gas mask comprising a facepiece, a canister carried on the side of the wearer containing agents for removing toxic impurities in the air, a canteen containing water, stimulants or liquid foods disposed at the side of the wearer of the mask, a hose tube leading from said canister to said facepiece, lens members in said facepiece, a valved member in said facepiece for disposing of exhaled air, a mouthpiece in said facepiece, a tube leading from said canteen to said mouthpiece and a valved line extending from said hose tube to the tube leading from said canteen and adapted to maintain normal pressure within said canteen and tube during removal of the liquid content thereof.

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