Jan. 24, 1939. W. P. BIGGS 2,144,611

PROTECTIVE GEAR

Filed Dec. 14, 1936 3 Sheets-Sheet 1

Fig. 1.

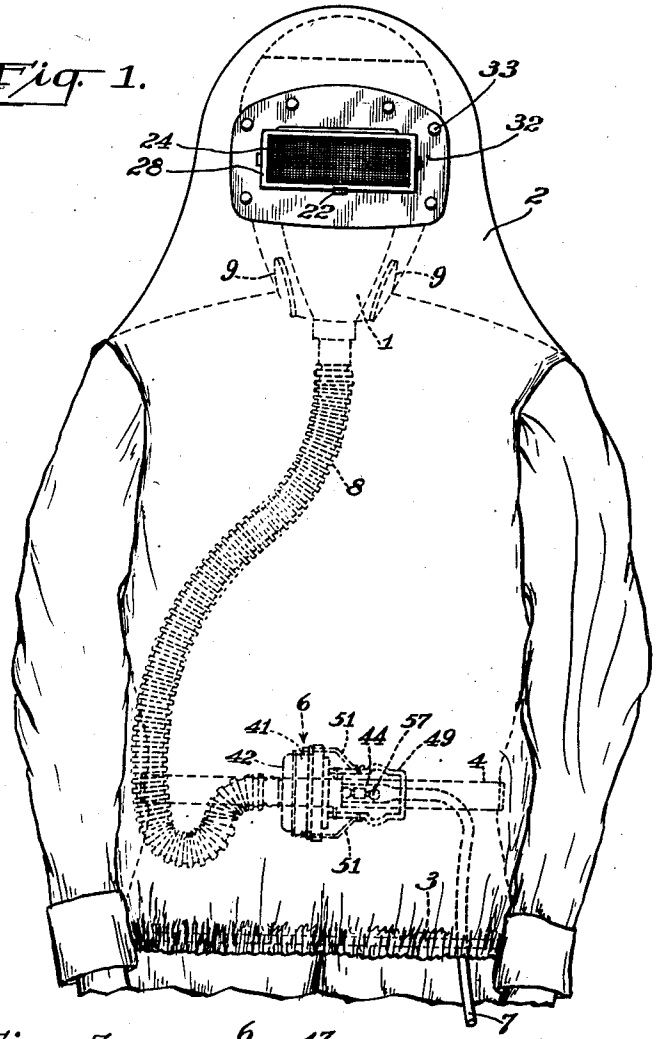
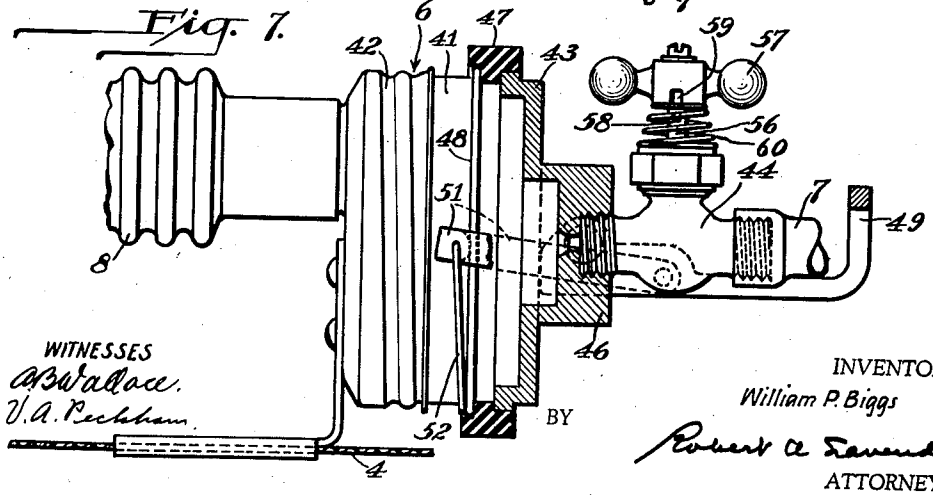


Fig. 7.



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PROTECTIVE GEAR

Filed Dec. 14, 1936 3 Sheets-Sheet 2

Fig. 3.

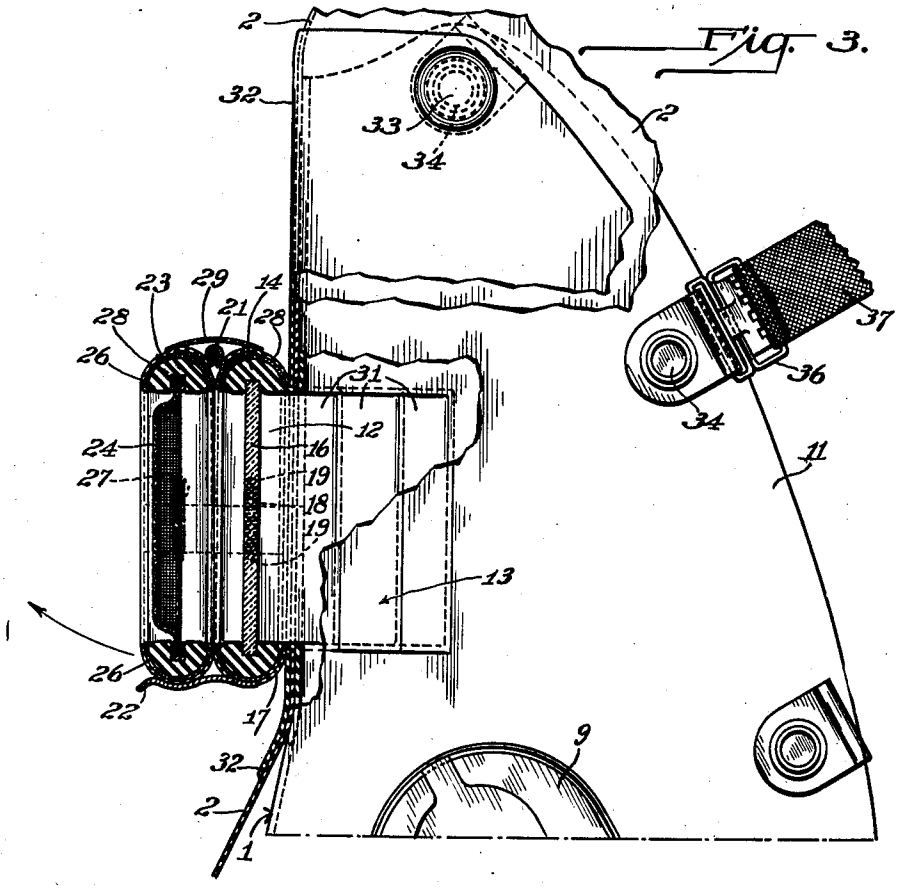
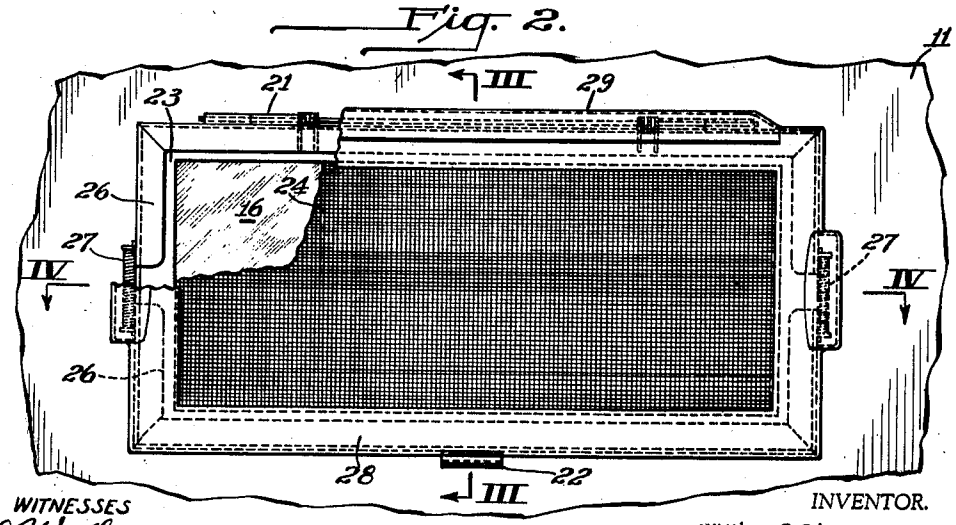


Fig. 2.



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Fig. 4.

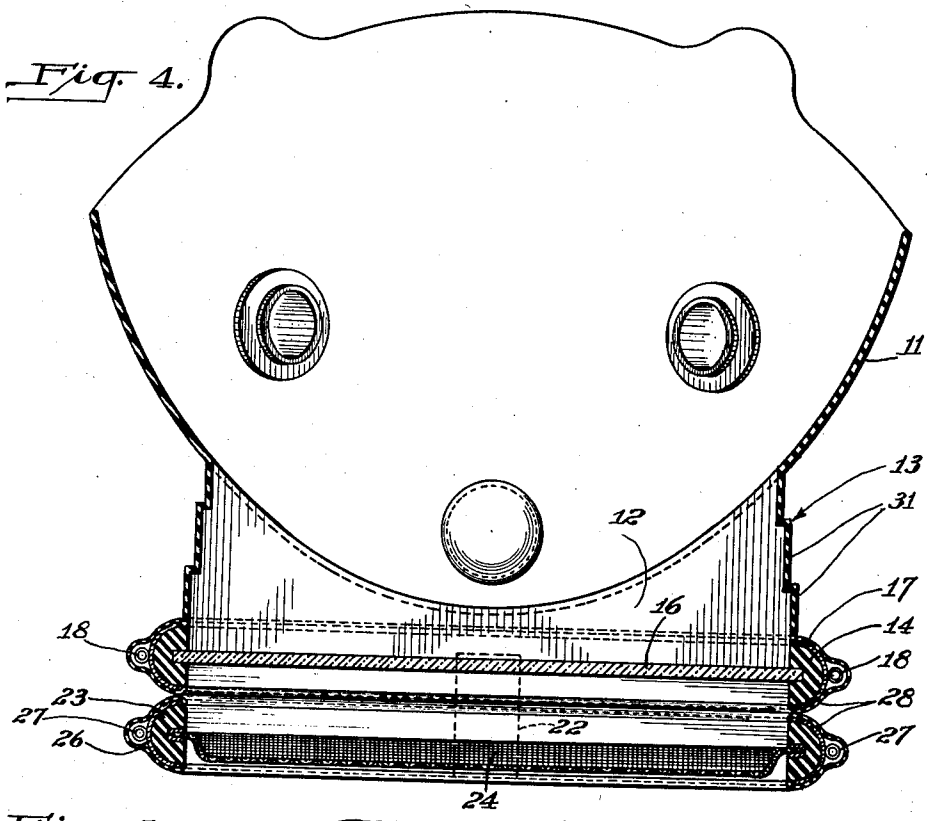


Fig. 5.

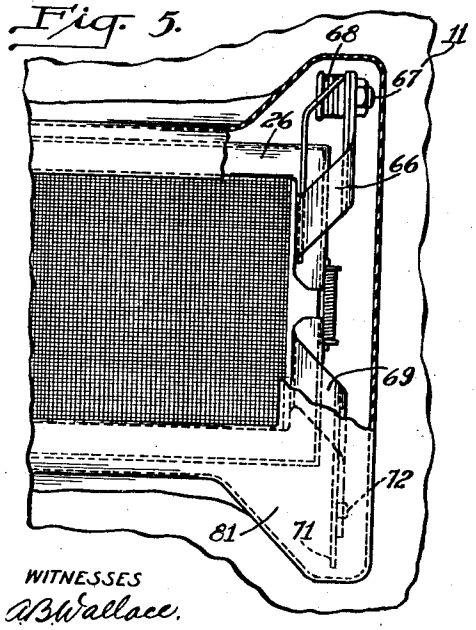
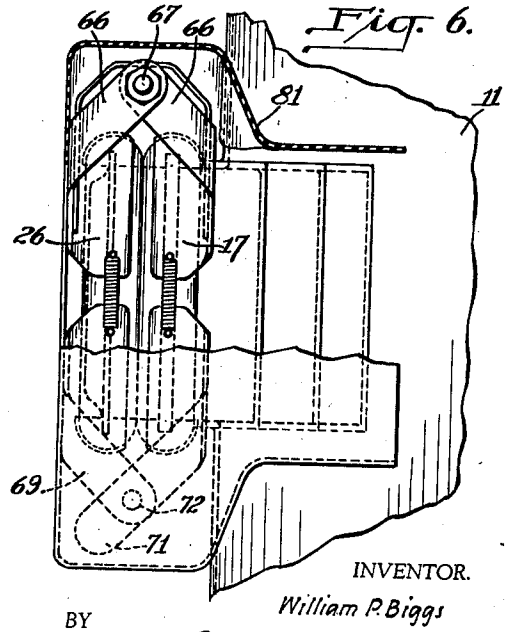


Fig. 6.



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UNITED STATES PATENT OFFICE

2,144,611

PROTECTIVE GEAR

William P. Biggs, Washington, D. C.

Application December 14, 1936, Serial No. 115,802

14 Claims. (Cl. 128—141)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to protective gear worn by abrasive cleaners, such as shot and sand blasters, stone cutters and the like, to protect their faces and lungs from the abrasives, dusts and other solid particles encountered in their work. The invention is also useful for men who coat metal by spraying molten metal onto it. Protective gear for these purposes generally includes a mask provided with a lens protected by a screen, and a hood covering the head and mask.

It is among the objects of this invention to provide protective gear of this nature which effectively safeguards the wearer, which is highly resistant to wear and abrasion by flying solid particles, which is light in weight and not uncomfortable to wear, which includes a mask adapted to have a sealing fit with heads and faces of all shapes and sizes, and in which the lens and its protecting screen are readily replaceable.

Accordingly, a mask having a flexible face-piece is provided in front with an opening surrounded by a forwardly projecting flexible flange terminating in a frame containing a lens. The end portions of the flange are so formed as to increase their flexibility to thereby prevent them from interfering with proper accommodation of the face-piece to faces of various shapes and sizes. The lens frame is held in sealing engagement with the lens by readily detachable rigid members that are connected by a hinge and latch to similar members compressing a flexible frame against a screen disposed in front of the lens for protecting it. The rigid members are protected by a resilient shield or shields from abrasion by the solid particles filling the air where the work with which this mask is used is carried on. The head and upper part of the body of the wearer of this mask are covered and protected by a flexible hood provided with an opening through which the lens and screen project. The hood around this opening is preferably reinforced by stronger material carrying snaps by which the hood is attached to the mask. Air is supplied to the wearer from a pump or compressor through a safety valve, a quickly detachable coupling, a filter, and a relatively long and large expansible tube leading into the mask. The mask is provided with outlets through which the air escapes and fills out the hood to hold it away from the head and render it more resistant to abrasion.

The invention is illustrated in the accompanying drawings in which Fig. 1 is a front view of my protective gear as worn by a sand blaster; Fig. 2 is an enlarged front view, partly broken away, of the screen shielding the lens; Fig. 3 is a fragmentary vertical section through the lens and screen members taken on the line III—III of Fig. 2; Fig. 4 is a horizontal section of the mask taken on the line IV—IV of Fig. 2; Fig. 5 is a fragmentary front view, partly broken away, of one end of a modified type of protective screen and its supports; Fig. 6 is an end view, also partly broken away, of the modification shown in the previous figure; and Fig. 7 is an enlarged bottom view, partly in section, of the filter and valve fitting shown in dotted lines in Fig. 1.

Referring to Fig. 1 of the drawings, a man is shown wearing an abrasive cleaner's gear or outfit comprising a mask 1 covered by a protective hood 2 that extends down below his waist where an elastic band 3 in the bottom of the hood tightly grips his body. The hood is provided with armholes that fit snugly around the man's arms adjacent his shoulders, and is preferably made of silk impregnated with latex, Duprene or the like to render this silk substantially impervious to air. Strapped around the man's waist is a belt 4 which carries a coupling or fitting 6 that connects an air line 7 from a compressor to a flexible tube 8 leading to an inlet in the bottom of the mask. It will be noted that flexible tube 8 is materially larger than line 7, is preferably corrugated, and is relatively long. Such a tube forms an expansion chamber that retards the velocity of the air being forced into the mask, and the corrugations permit it to expand to compensate for sudden increases in air pressure. At both sides of the inlet there are exhalation valves 9, preferably of the flutter type, e. g., such as shown in Patent No. 1,515,645 to Yablick. Two valves are desirable because air is forced into the mask under pressure and it generally requires two outlet valves to keep the air pressure from building up to an undesirable extent within the mask. Furthermore, the air escaping from the mask fills or balloons out the hood and holds it away from the head. This protects the head from flying solid particles and increases the resistance of the hood to abrasion.

The mask is of the type having a flexible face-piece 11 (Figs. 3 and 4), such as of rubber, that covers the entire face of the wearer. As shown in Fig. 4, the face-piece is provided centrally with an elongate opening 12 for the wearer to look through. This opening is preferably rectangular in shape and is surrounded by a forwardly projecting flange 13 integral with the face-piece and terminating at its outer end in a bead forming a

resilient rectangular frame 14. The inner surface of the frame is provided with a groove which snugly receives the marginal portions of a lens 16. In accordance with this invention the resilient frame is clamped tightly against the lens to form a seal by a pair of rigid, e. g., metal, channels 17 that fit over the top and bottom portions of the frame and have vertical extensions that receive its ends, as shown in Figs. 3 and 4. The two channels are biased toward each other by coil springs 18 detachably hooked over pins 19 projecting laterally from the ends of the channels.

As shown in Figs. 2 and 3, these channels also serve as a rigid support for a hinge 21 and a latch or spring clip 22 by which a foraminous shield is supported in front of the lens to protect it from the flying particles incident to abrasive cleaning. This shield comprises a resilient rectangular frame 23, like frame 14, provided interiorly with a peripheral groove that receives the edges of a foraminous member 24 such as a fine mesh wire screen bulged outwardly to strengthen it. The resilient frame 23 is clamped securely to the screen in the same manner as the frame around the lens, that is, by rigid channels 26 drawn together at their ends by coil springs 27. The hinge, which is preferably at the top, may be a typical spring hinge that swings the screen upwardly out of the line of vision when latch 22 is released, or it may be a stiff springless hinge that holds the screen in any desired position.

It is a feature of this invention that the frame-enclosing metal channels and the hinge are protected from abrasion by flying particles due to abrasive cleaning. This is preferably accomplished by means of resilient shields 28 of rubber or the like which are channel shape in cross section and enclose the metal channels as shown in Figs. 2 and 3. The ends of these shields are provided with outwardly projecting portions for receiving the coil springs at the ends of the channels (Figs. 2 and 4). The hinge between the upper channels is protected by a strip 29 of resilient material secured to the rubber shields at both sides of the hinge. These shields yield when struck by abrasive matter, and therefore do not wear away like metal or rigid articles.

If screen 24 wears away so that a new one is needed, or if the lens requires replacement, these replacements can be quickly and easily made by merely stripping resilient shields 28 from the metal channels, spreading each pair of channels apart to release them from frames 14 and 23, and then inserting a new screen or lens in the proper frame.

It is also a feature of this invention that the mask is so constructed that it will have a sealing fit with heads and faces of all shapes and sizes. Heretofore difficulty has been encountered in this respect due at least in part to the flange around the sight opening resisting sufficient distortion of the face-piece to permit it to accommodate itself to all faces. This difficulty has been overcome by increasing the flexibility of flange 13 at the ends of opening 12 without unduly weakening it. Preferably, the vertical end flanges are provided with laterally offset portions 31 which may be in the form of vertically disposed flat or concave corrugations or steps as shown in Fig. 4. When the sides of the face-piece are moved in or out as required, these offset portions yield individually a material amount and in effect pivot on the vertical lines of juncture between steps and therefore do not interfere with proper fitting of the face-piece to the face.

Another feature of this invention is that the protective hood 2 is provided with an opening minus a lens so that the hood fits around flange 13 behind the lens of the mask as shown in Fig. 3. The portion of the hood immediately adjoining this opening is preferably reinforced by a heavy sheet of rubber 32 that grips flange 13 and forms a firm support for snaps 33 by which the hood is detachably connected to the face-piece. The snaps 34 on the face-piece are mounted adjacent the edge thereof so that the hood will not tend to hang from flange 13 and exert a leverage on the mask, and they are preferably made a part of the buckles 36 by which the head harness straps 37 are connected to the face-piece.

Referring to Figs. 1 and 7, fitting 6 attached to belt 4 comprises a filter cartridge 41 detachably mounted in a receptacle 42 connected directly to air tube 8, a cap 43 detachably connected to the cartridge, and a valve 44 connecting air line 7 to a boss 46 integral with the center of the cap. The cap is also privided with a rubber gasket 47 molded into it and engaging the rim 48 of the cartridge. Pivoted to opposite sides of boss 46 are the ends of a U-shape lever 49, and pivoted to each leg of the lever is a link 51 that has an inturned end for holding the cartridge rim against gasket 47 when the lever is in the position shown in the drawings with its flat ends against the face of the cap. The ends of the links are held diametrically opposite each other by a wire 52 which is looped half-way around the cartridge. If the air supply to the mask happens to fail, or if the wearer wants to leave his work, cap 43 can be quickly disconnected from the filter cartridge by merely swinging lever 49 toward the cap so as to release links 51 from the cartridge rim. The wearer can then inhale through tube 8 for as long as is necessary, and any fumes or dust in the air will be removed by the filter.

Valve 44 is provided with a valve stem 56 on which a handle 57 is slidably and rotatably mounted. Spaced inwardly from the handle when it is in its outermost position is a pin 58 projecting radially from the valve stem. The handle is provided with a notch 59 for receiving this pin when the handle is moved inwardly along the stem, but it is normally held out of engagement with the pin by a coil spring 60 encircling the stem and compressed between the handle and the body of the valve. Consequently, if the handle is accidentally turned while the mask is in use it will not turn the stem and shut off the air supply.

In Figs. 5 and 6 a modified frame hinge and latch, and a different type of frame shield are shown. The two upper channels 17 and 26 are hinged together at their ends by laterally and upwardly extending metal strips 66 pivoted together at their upper ends by screws 67 on which coil springs 68 are mounted, the ends of the springs being held behind the lower portions of the strips. Extending laterally and downwardly from the ends of the lower channels are similar strips 69 and 71, each strip 71 being provided with a pin 72 that extends through a hole in adjoining strip 69 to hold the screen in its lower position. By bending strips 71 inwardly, the pins are withdrawn from the holes and springs 68 then swing the screen up out of the line of vision.

In this modification the resilient shield for the metal parts associated with the frames is in the form of a single flexible skirt 81 the outer edges

of which are secured in the groove in frame 23 that receives the screen. The remainder of the skirt is turned back over the channels, hinges and latches, and extends back to the face-piece. It will thus be seen that this shield completely covers all metal parts associated with the screen and lens and thereby effectively protects them from abrasion. To raise the screen from in front of the lens, the shield is turned forward and inside out.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A protective substantially flexible mask comprising a facepiece arranged to extend across the face of the wearer and provided with an opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a frame, and a lens mounted in said frame, said flange at the ends of said opening being provided wtih laterally offset portions for increasing the flexibility of the flange.

2. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a frame, and a lens mounted in said frame, said flange at the ends of said opening being in the form of vertical steps for increasing the flexibility of the flange.

3. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, said flange at the ends of said opening being provided with laterally offset portions, a pair of rigid channel members receiving said frame at opposite edges of the lens, and resilient means connecting the ends of said channel members and biasing them toward each other.

4. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, rigid channel members mounted over opposite sides of said frame, resilient means connecting the ends of said channel members, and a foraminous member hinged to one of said channels for protecting said lens.

5. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, rigid channel members surrounding said frame, a rigid foraminous member disposed in front of said lens, a flexible frame for said foraminous member, rigid channel members surrounding said last-mentioned flexible frame, and means hinging said first-mentioned to said last-mentioned channels.

6. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, rigid channel members surrounding said frame, and a resilient shield protecting said rigid channels from abrasion by abrasive particles in the air.

7. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, rigid channel members surrounding and enclosing said frame, and a resilient shield in the form of a continuous member channel-shape in cross section for covering said channels.

8. A protective mask comprising a flexible facepiece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, rigid channel members surrounding and enclosing said frame, a rigid foraminous member disposed in front of said lens, a flexible frame receiving said foraminous member, rigid channel members surrounding said last-mentioned flexible frame, means hinging said two sets of channels together, and a flexible shield in the form of a skirt the front end of which is secured within said last-mentioned flexible frame and the remainder of which extends rearwardly around all of said channels.

9. The combination of a protective mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, and a lens mounted in said frame, a flexible hood adapted to cover said facepiece and the wearer and provided with an opening for said lens, and means for introducing air under pressure into said hood for maintaining it expanded.

10. In combination, a mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, and a lens mounted in said frame, a flexible hood adapted to cover said face-piece and the wearer and provided with an opening for said lens, a flexible member secured to the portion of the hood adjoining the opening therein for reinforcing said portion, and snaps mounted on said flexible reinforcing member and on the face-piece for detachably connecting them.

11. In combination, a mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a flexible frame, a lens mounted in said frame, an air line connected to the face-piece, and a valve in the air line, said valve comprising a rotatable stem, a lateral projection on the stem, a handle slidably and rotatably mounted on the stem and provided with a notch for receiving said projection, and a spring for biasing said handle away from said projection whereby said notch is normally free of the projection.

12. In combination, a mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a frame, a lens mounted in said frame, an air tube connected to the face-piece, a filter cartridge mounted on the outer end of the tube, a cap connected to an air supply tube and receiving the cartridge, and toggle means connecting said cap to the said cartridge.

13. In combination, a mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a frame, a lens mounted in said frame, an air tube connected to the face-piece, a filter cartridge mounted on the outer end of the tube, and provided with an annular flange, a cap connected to an air supply tube and receiving the cartridge, a lever pivoted to the cap, and links pivoted to said lever and having ends adapted to engage said cartridge flange for drawing the cartridge and cap tightly together.

14. A protective mask comprising a flexible face-piece provided with an elongate opening extending across the front of the face-piece, a forwardly projecting flexible flange surrounding said opening and terminating in a frame, a screen disposed in front of the lens, a flexible frame for the screen, metal channels surrounding each frame, means for hinging the channels together, metal strips attached to each end of the channels and crossing each other, one strip being provided with an aperture, and a pin mounted on the other strip and projecting into said aperture for latching the channels together.

WILLIAM P. BIGGS.