Jan. 7, 1930. M. O'FLANAGAN 1,742,412

GOGGLES

Filed July 10, 1926 3 Sheets-Sheet 1

Fig. 1.

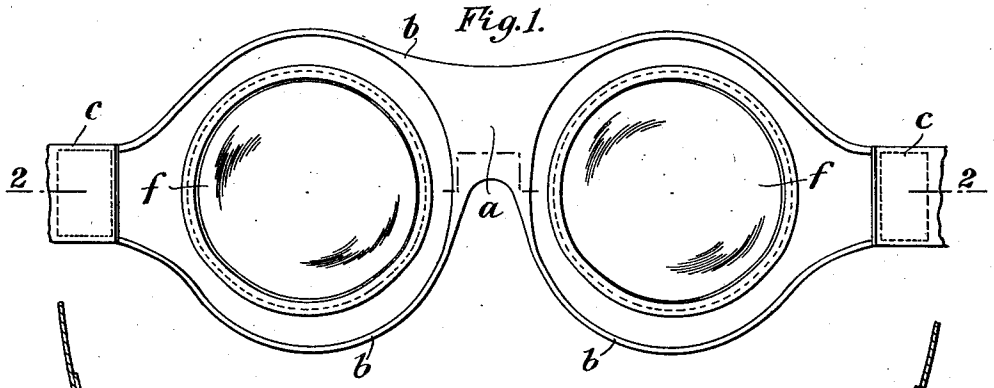



Fig. 2.

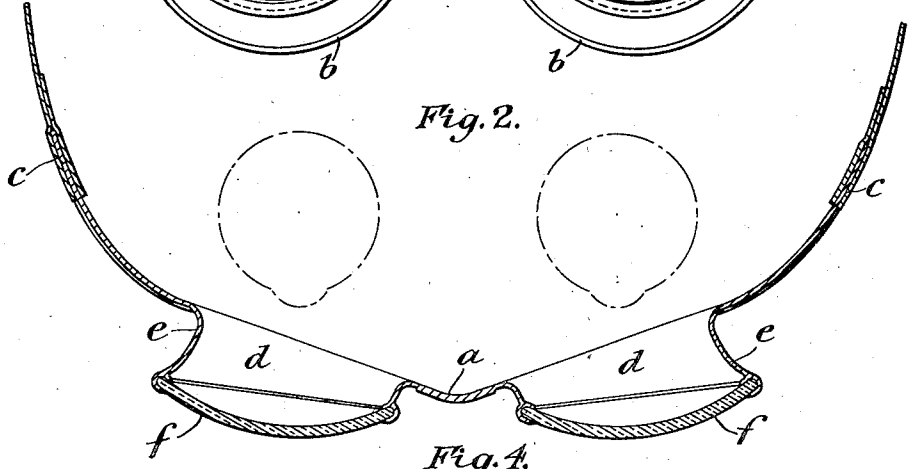



Fig. 4.

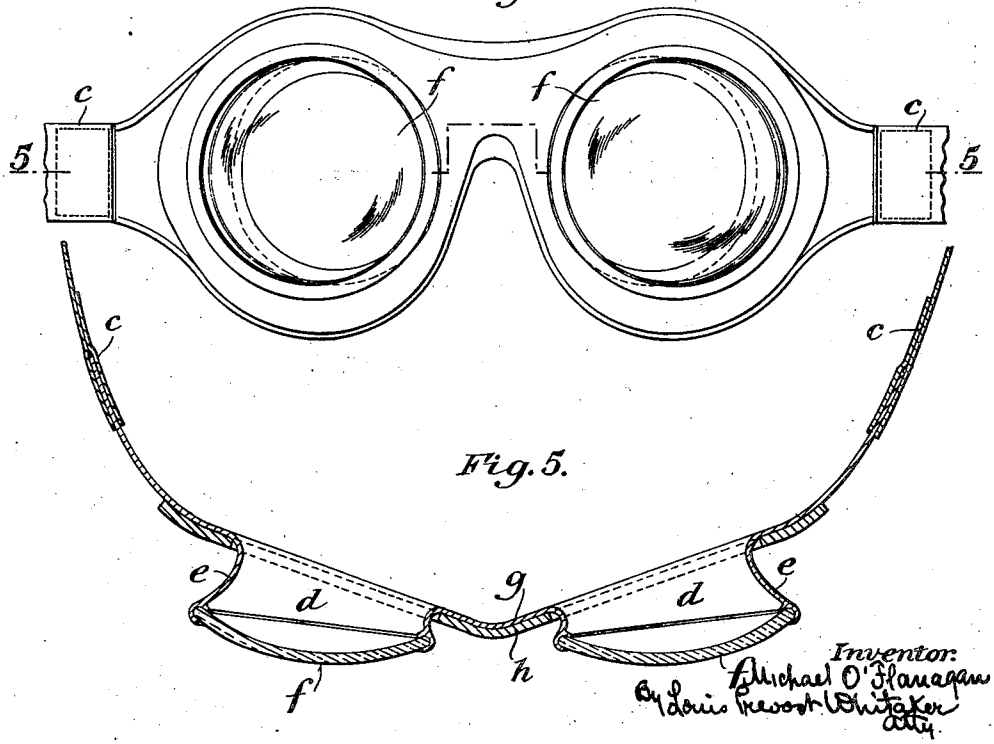



Fig. 5.

Inventor:
Michael O'Flanagan
By Louis Prescott Whitaker
Atty

Jan. 7, 1930. M. O'FLANAGAN 1,742,412

GOGGLES

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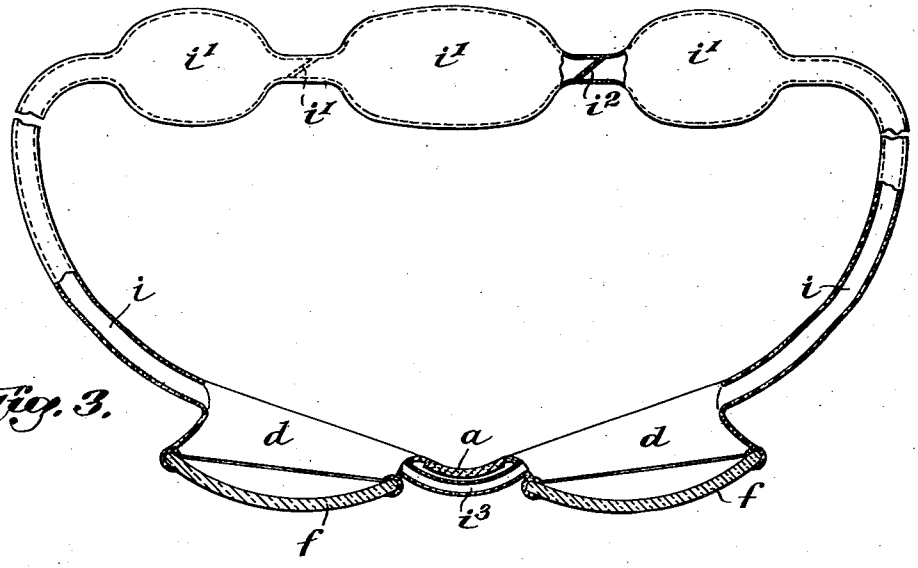



Fig. 3.

Inventor:
Michael O'Flanagan
By Louis Prevost Whitaker
Atty.

Jan. 7, 1930. M. O'FLANAGAN 1,742,412

GOGGLES

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Fig. 6.

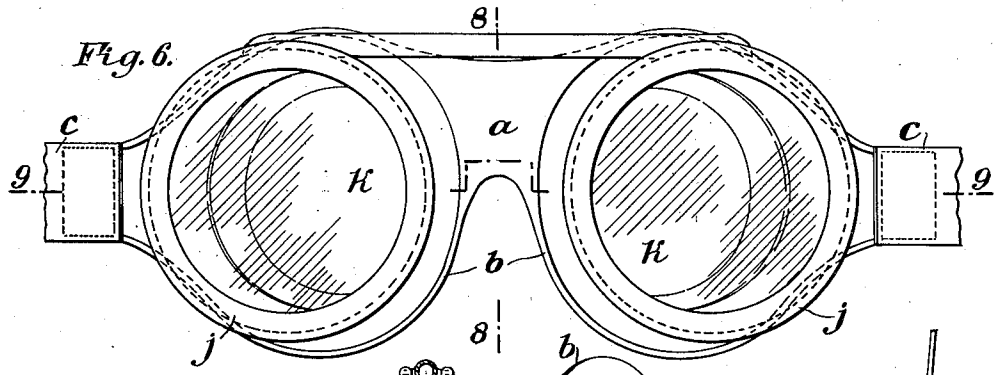



Fig. 8.

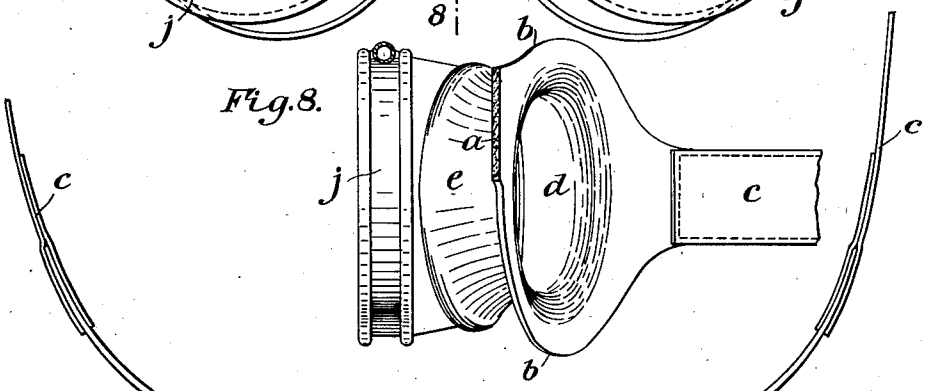



Fig. 7.

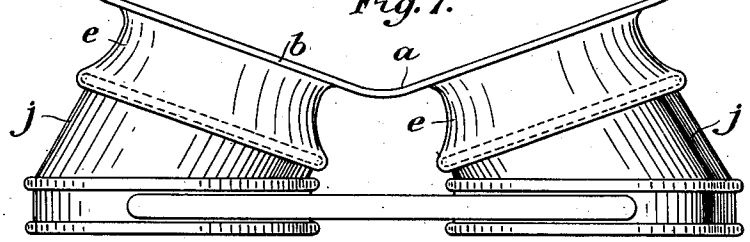
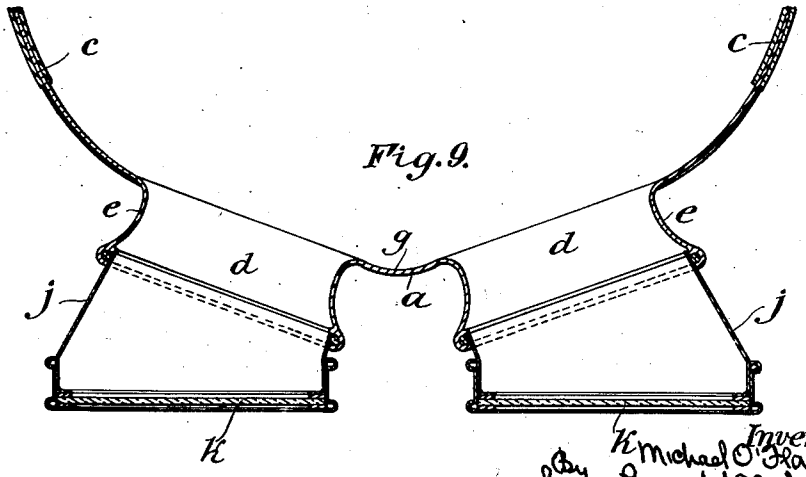



Fig. 9.




Inventor:
Michael O'Flanagan
by Louis Prewost Whitaker
Atty

Patented Jan. 7, 1930

1,742,412

# UNITED STATES PATENT OFFICE

MICHAEL O'FLANAGAN, OF DUBLIN, IRELAND

## GOGGLES

Application filed July 10, 1926, Serial No. 121,634, and in Great Britain May 21, 1926.

This invention relates to improvements in goggles adapted for use by persons swimming in water or working under water or by persons who are surrounded by an atmosphere laden with smoke or other noxious fumes or gases. It has for its main object to make the eyes secure against the intrusion of any substance such as water or smoke that might injure the eyes or interfere with satisfactory vision. When intended for use under water it has for its further special object to enable objects to be seen under water with practically no distortion at different angles of vision.

According to the invention I provide goggles comprising a frame or the like of any suitable rigid or semi-rigid material, such as wood, metal or hard rubber, which is adapted to fit against the face of the wearer, to which it may be attached in any convenient manner, such as by straps, tapes or the like passing around the head. To secure a tight fit between mask and face, the former may be made with a flexible and elastic sheet portion which adjusts itself against the convex portions of the contour of the wearer's face under the direct tension of the head band, and of the elastic portion and against the concavity on each side of the nose by the pressure of the rigid frame on said flexible portion.

The goggles may be of a shape and size to fit over eyes of the wearer, in which case the front is glazed, for example, by means of plane or curved discs of glass or other transparent material arranged in front of the two eyes.

When the goggles are to be used under water the following special arrangement and/or construction of the glasses may be adopted. When flat glass is used, one continuous piece thereof may extend across in front of both eyes; or, if two pieces of glass are employed, they may be held in the same plane by the rigidity of the frame. When curved glass is used the curve may be such that the line of vision is always perpendicular to both surfaces of the portion of the glass through which it passes and this is obtained by making each glass in the form of a segment of a hollow sphere of such diameter and held by the rigidity of the frame at such distance from the eye that the centre of this sphere will coincide approximately with the centre of rotation of the eye. When intended for use in noxious atmospheres the above described restrictions on the shape and arrangement of the glass may with obvious advantages be dispensed with.

A flexible tubular band may pass from one eye chamber to the other, for example, round the back of the head or round behind the ears and under the chin and may be held in place partly by the fastening tapes and a short tube may also make direct connection in front between the eye chambers. In this manner circulation of air from one chamber to the other in a more or less continuous stream is rendered possible. One or more elastic bulbs, for example, three, may be placed along the line of the tubular band, and valves disposed between them to allow the air to pass in one direction only so that, when the glasses are used in deep sea diving, the pressure of the water will force the air from the collapsible bulb or bulbs into the less collapsible eyepieces, thus rendering the air in the eyepieces more dense and counteracting the suction or pressure that would operate upon the eyes if they were enclosed in rigid chambers to which no collapsible antechamber was attached. The alternate application and removal of water pressure, for example, in diving for pearls, will automatically cause a current of air to circulate through the eye chambers. When used on the surface of water, or on land, the central bulb may be placed under the chin, by which it may be pressed upon from time to time while the hands are otherwise engaged. Moisture absorbing substances may be placed within the tube, and thus the air may be kept so dry that no moisture will be deposited on the inner surfaces of the glasses. When two bulbs are employed, one may be made of smaller and more tense and contractile rubber than the other and the size and direction of opening of the valves may be so arranged that a steady stream of air may tend to pass from the tense to the lax bulb and the air may be quickly passed back into the tense bulb by

pressure which may be applied to the lax bulb by the hand, chin, or any other convenient means.

Or, the goggles may be formed of a sheet of rubber reinforced with a semi-rigid plate or connected rigid eye-pieces. When secured in position the rubber sheet forms a hermetic joint with the face.

As will be understood goggles made in accordance with the invention are automatically adaptable to faces of different shapes and dimensions. Furthermore, the pressure of the air within the chamber or chambers of the mask is automatically adjusted to counteract the varying pressures due to varying depths of immersion of the wearer in water. This is due to the fact that the flexible sheet portion renders the goggles capable of being forced by the pressure of the water nearer to the face of the wearer thereby confining within a smaller space, and rendering more dense the enclosed air.

To enable the invention to be fully understood I will describe it by reference to the accompanying drawings, in which:—

Figure 1 is a front view of a face-mask constructed in accordance with the invention and designed to cover the eyes only of the user.

Figure 2 is a section on the line 2—2, Figure 1.

Figure 3 is a view similar to Figure 2, illustrating a modification.

Figure 4 is a front view of another modification of the face-mask illustrated in Figures 1 and 2, and

Figure 5 is a section on the line 5—5, Figure 4.

Figures 6 and 7 are, respectively, a front view and a plan view of another modification of the improved face-mask, and

Figures 8 and 9 are, respectively, sections on the lines 8—8, and 9—9, Figure 6.

Referring to Figures 1 and 2, *a* is the frame of wood, metal or hard rubber adapted to fit against the face of the wearer and having a flexible sheet portion *b* to ensure a water-tight joint with the face around the eyes only, and *c*, *c* are the straps or tapes which pass around the head of the wearer of the mask and are secured together in the form of a head band to hold the goggles in place. *d*, *d* are the eye-openings in the goggles and which are in the form of tubular projections *e*, *e* from the frame *a* and closed at the outer ends by the discs *f*, *f* of glass which are portions of spheres, the centres of the curves of which are approximately the centres of rotation of the eye-balls of the wearer of the goggles, so that practically no distortion will be observed of objects under water at different angles of vision.

Figure 3 illustrates the form of my invention where the goggles are furnished with a flexible tube *i* designed to pass around the head, or behind the ears and around the chin, to keep the mask in position, the said tube being fitted with collapsible bulbs $i^1$ and valves $i^2$ and opening at its ends into the chambers formed by the tubular projections *e* so that the pressure of the water when the wearer is diving will be imparted to the air within the said chambers, and so that intermittent or continuous circulation of air through the eye chambers may be maintained. $i^3$ is the short tube connecting the chambers *e*.

Figures 4 and 5 illustrate the construction where the goggles are formed of a sheet *g* of rubber, reinforced by a plate or frame *h*, the said frame being preferably of semi-rigid or flexible metal so that it can be manipulated to suit the contour of different faces, the rubber forming a hermetic joint with the face.

Figures 6 to 9 illustrate the construction where the reinforcement of the sheet of rubber *g* is in the form of a pair of connected metal eye-pieces *j*, *j* attached to the tubular projections *e*. In this arrangement, instead of the spherical discs *f* above referred to, I employ flat pieces *k* of glass arranged in a common plane. With this arrangement, however, slight distortion of the objects viewed under water will result when the angle of vision differs from a right-angle with the plane of the glasses *k*.

It will be clearly understood from the foregoing that the flexible sheet portions may be formed as a part of the frame or as an independent part attached to the frame or the frame attached to it like in Figs. 4 and 5, but in any event the sheet portion must have sufficient inherent elasticity to readily conform to the convex portions of the wearer's face under the direct tension of the head band, and to conform to the concave portions of the wearer's face by the pressure of the frame against said sheet portion. It will be furthermore understood that the flexibility of the sheet portion and particularly its marginal edge, is such that the pressure of the water will act to hold such sheet portion closely against the face of the wearer and further permits the water pressure to force the goggles closer to the eyes of the wearer, thereby confining the air within the eye-tubes in a smaller space.

Claims:

1. A pair of goggles comprising a flexible sheet portion capable of being adjusted to the contour of the user's face and having eye openings, a frame adapted to bear against the forehead, consisting of two substantially rigid eye portions rigidly connected by a bridge, each eye portion having a part which extends under the eye opening, and means having independently of the frame a positive connection with the said sheet portion and adapted to draw the same into conforming contact with the convex portions of the wear-

er's face, and to act upon the frame to cause the latter to force the flexible sheet portion into conforming contact with the concave portions of the wearer's face.

2. A pair of goggles comprising a flexible sheet portion capable of being adjusted to the contour of the user's face and having eye openings, a frame adapted to bear against the forehead, consisting of two substantially rigid eye portions rigidly connected by a bridge, each eye portion having a part which extends under the corresponding eye opening and of such shape that it is adapted to bear against the part of the cheek under the eye and adjacent to the side of the nose, and a headband having independently of the frame a positive connection with the said flexible sheet portion and adapted to draw the same into conforming contact with the convex portions of the wearer's face, and to act upon the frame to cause the latter to force the flexible sheet portion into conforming contact with the concave portions of the wearer's face.

3. A pair of goggles comprising a flexible sheet portion capable of being adjusted to the contour of the user's face and having eye openings with flexible tubular portions projecting forward, a frame the upper part of which is adapted to bear against the forehead, and the lower portions against the cheeks on each side of and adjacent to the nose, said frame consisting of two substantially rigid eye portions rigidly connected by a bridge, and means having independently of the frame a positive connection with the said sheet portion, and adapted to draw the same into conforming contact with the convex portions of the wearer's face, and to act upon the frame to cause the latter to force the flexible sheet portion into conforming contact with the concave portions of the face.

4. A pair of goggles comprising a frame, eye-tubes associated with the frame and provided with transparent viewing discs, a head band, means providing for air communication between the eye-tubes and means for causing circulation of air in said eye-tubes.

5. A pair of goggles comprising a frame, eye-tubes associated with the frame and provided with transparent viewing discs, a head band, means providing for air communication between the eye-tubes and means carried by the head band for producing air circulation in the eye-tubes.

6. A pair of goggles comprising a frame, eye-tubes associated with the frame and provided with transparent viewing discs, a head band, means providing for air communication between the eye-tubes and means carried by the head band for causing circulation of air in the eye-tubes and means for fixing the direction of circulation.

7. A pair of goggles comprising a frame, eye-tubes associated with said frame and provided with transparent viewing discs, an air tube connecting said eye-tubes and means for causing circulation between said eye-tubes through the air tube.

8. A pair of goggles comprising a frame, eye-tubes associated with said frame and provided with transparent viewing discs, an air tube connecting said eye-tubes and a tubular head band connecting said eye-tubes and means connected in the head band for compressing air in the eye-tubes.

9. A pair of goggles comprising a frame, eye-tubes associated with said frame and provided with transparent viewing discs, an air tube connecting said eye-tubes and a tubular head band connecting said eye-tubes and valves arranged to determine the direction of flow of the air in said head band and eye-tubes.

10. A pair of goggles comprising a frame, eye-tubes associated therewith and provided with transparent viewing discs, a flexible sheet portion connected to said frame and the said sheet portion being capable of adjusting itself to the contour of the user's face, a tubular head band adapted to draw said sheet portion into conforming contact with the convex portions of the wearer's face and to act upon the frame to cause the latter to force the flexible sheet portion into conforming contact with the concave portions of the face, an air connection between said eye-tubes, compressible bulbs within the length of the head band to produce circulation in said head band and eye-tubes and valves within the length of said head band for determining the direction of flow of the air therein.

MICHAEL O'FLANAGAN.