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J. R. SCHWINZER.

METHOD OF MAKING BIFOCAL LENSES.

APPLICATION FILED OCT. 31, 1905.

Fig. 1.

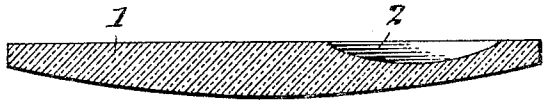


Fig. 2.

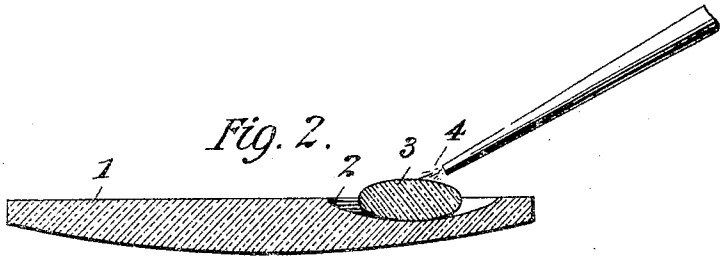


Fig. 3.

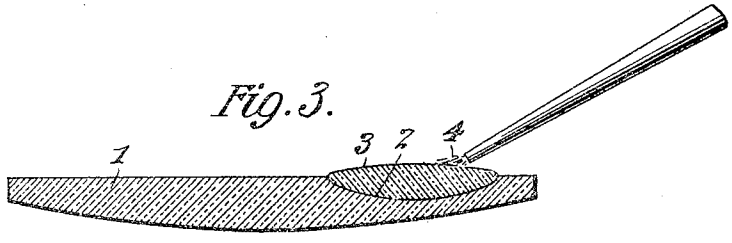
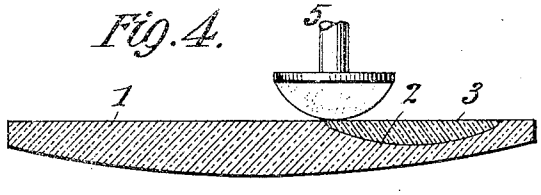


Fig. 4.



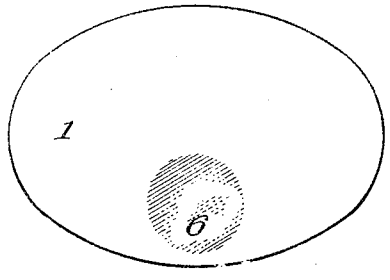


Fig. 5.

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METHOD OF MAKING BIFOCAL LENSES.

No. 869,938. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed October 31, 1905. Serial No. 285,259.

To all whom it may concern:

Be it known that I, JOHN R. SCHWINZER, a subject of the Emperor of Germany, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Methods of Making Bifocal Lenses, of which the following is a full, clear, and exact description.

My invention relates to a method of making bi-focal lenses, and particularly lenses of this character in which the line of junction between the component lenses or sections is invisible.

The object of the invention is to provide a method which shall be simple and efficient for producing lenses of this character.

A further object of the invention is to secure a lens having the above characteristics which shall have perfect optical properties for each of its component parts, and in which the line of junction is absolutely invisible.

With these and other objects in view, my invention consists in the order, character, and sequence of operations hereinafter more fully set forth, as illustrated in the drawing, and finally particularly pointed out in the appended claims.

My invention further consists in the construction, combination, location and arrangement of parts of the completed article, as also more fully hereinafter set forth, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in cross section showing a bi-focal lens embodying the principles of my invention in the first stage of its construction; Fig. 2 illustrates diagrammatically one of the initial steps of my process; Fig. 3 illustrates a later stage of the process; Fig. 4 shows one of the final steps of the process embodying the principles of my invention; and Fig. 5 is a perspective view showing the completed article.

It will be understood that for persons obliged to use glasses, no particular lens can be made which is in itself suitable to all requirements. The person is continually looking first at far and then at near objects, and with a single lens, the best that can be done is to make a compromise between the two extremes which are really required. Lenses have been manufactured in which the far and near focus component parts were placed side by side having a line of division extending horizontally across the center of the spectacle frames. This is objectionable since the line of separation is always apparent and is confusing. It is accordingly very desirable to produce a glass which shall have the two focal lengths, for far and near objects, in which the component parts shall so merge together that the line of separation is not visible. A method which has been proposed makes use of two separate glass lenses which are fused together at their adjoining faces, so that after fusion the two are welded into an integral single structure. The disadvantage of this process is that the lenses become soft at the temperature of fusion and are quite liable to warp out of their proper shape, thereby destroying the correct optical properties of the glass. The process is one requiring a great deal of skill and is very expensive.

In carrying out my present invention I grind what I shall term the main or major lens into its correct form, and I afterwards fuse the auxiliary or secondary lens thereto. Instead of employing for my auxiliary or secondary lens a material which has substantially the same fusion temperature as the major lens, I make the secondary or auxiliary lens of a material which has a considerably lower fusion point than the major lens, so that the two may become welded together without warping or destroying the optical properties of the main lens.

Referring now to the drawings and to the various views and reference signs appearing thereon in which like parts are designated by the same reference sign, 1 indicates a main or major lens which may be ground to convex or concave or plano-convex or concave form, and to any desired length of focus, and upon one of the faces or surfaces thereof, I initially grind or otherwise form a second or auxiliary lens surface 2. In Fig. 1 of the drawing I have illustrated the main or major lens portion 1 as a plano-convex lens having the auxiliary lens surface 2 ground upon a portion of its plane surface. The grinding and polishing of the different surfaces is accomplished in the usual and well known way which need not be particularly described in this specification.

Having obtained a main or major lens portion with the secondary surface 2 ground therein, I place a pellet 3 of material more easily fusible than the glass of the major lens, into the cavity formed by the surface 2. Many different sorts of material may be used for the pellet 3, and I do not desire to be limited or restricted to any particular material or composition, but I have found that very superior practical results are obtained by employing the composition known as strass which may be conveniently obtained upon the market for the manufacture of the well-known paste diamonds. This material may be composed so that it has an index of refraction widely different from the usual flint and crown glass used in optical work, and, by proper selection of the basic materials may be brought to a fusion point considerably below that of the glasses mentioned. An approximate composition of strass composition is as follows: pure flint or rock crystal heated white and cooled in water, pulverized and dried, three parts cream of tartar and 1½ parts of white lead. This when melted with calcined borax and saltpeter produces the strass

composition known to commerce. When, therefore, a blow pipe flame 4 (Fig. 2) or any other suitable method of heating, as for example, a gas or electric oven, is applied to the pellet or material 3, the latter eventually becomes melted and in its molten state flows over and completely fills the cavity formed by the surface 2 within the major lens 1. Under these circumstances the strass composition becomes fused, or, in a sense, soldered to the glass, as indicated diagrammatically in Fig. 3. By reason of the lower fusion point of the strass composition the glass of the major lens 1 while heated sufficiently for a perfect welding union, is not heated sufficiently to become warped or change its optical characteristics or properties in any way. At the same time since the pellet composition is completely melted, it is free to acquire a homogeneous character throughout its mass, and insures against any air bubbles remaining between the adjoining surfaces.

The final step of my process comprises grinding the surface of the pellet 3, and for this purpose I make use of a grinding wheel 5, or any other suitable grinding or abrading means so as to impart a uniform surface to the pellet which may be made uniform with that of the major lens 1. Under these circumstances the exterior form of the complete bi-focal lens is exactly the same as a lens having the characteristics of its main or major portion, but owing to the different index of refraction of the material fused on to the surface 2, the lens has a different focal length, and in other respects different optical properties, at the portion occupied by the fused pellet.

The respective focal lengths of the major and auxiliary lenses are governed by the curvatures of the exterior surfaces and the surface 2. The focal length of the auxiliary lens is also dependent on the particular fusible compound used. I take advantage of this latter fact as a means of accurately adjusting the focal lengths. By varying the substances or compositions used, as, for example, by varying the quantity of white lead added to the strass composition, the index of refraction and focal length of the auxiliary lens may be minutely determined to satisfy any particular requirements without altering the curvatures of the major lens surfaces.

In Fig. 5 I have illustrated a complete bi-focal lens having the main or major portion 1 of the usual elliptical form adapted for eye-glasses, and a small circular section 6 formed by material fused to the main lens and having a different index of refraction therefrom, in the manner above described. To ordinary appearances the complete glass is a simple lens of ordinary form, and it is only by close inspection, or by analyzing its optical properties, that its bi-focal character is made to appear.

While I have particularly described a method of carrying out my invention, and a particular form of the article produced thereby, I do not desire to be strictly limited to the details shown and described. For example, it is not essential to make use of a pellet of the aforesaid substance melted by a blow pipe as above described, it being equally within the province of my invention to melt the fusible compound in a crucible or in any other way, and pour it upon the surface of the major lens in a molten state.

What I claim, is:—

1. The method of making a bi-focal lens which consists in grinding and polishing a piece of glass to form a lens with a secondary or auxiliary lens surface upon a portion thereof, fusing and welding a material more fusible than glass to such secondary or auxiliary surface, said material being in any natural state or condition of form, without being ground or fitted to the surface of the lens, and finally polishing the surface of the material so added.

2. The method of making a bi-focal lens which consists in grinding and polishing glass to form a main or major lens having an auxiliary or secondary lens surface thereon, fusing strass of a composition more easily melted than glass to such auxiliary surface, said strass being in any natural state or condition of form without being ground or fitted to the surface of the lens and finally grinding and polishing the same.

3. The method of making a bi-focal lens having a major portion and a minor or auxiliary lens portion of any desired focal length, which consists in melting a vitreous material more readily fusible than glass, adding a compound to change the index of refraction thereof, and finally flowing such material into said minor lens portion fusing the material to an auxiliary lens surface upon the face of the major lens.

4. The method of making a bi-focal lens of any predetermined focal lengths which consists in melting strass composition, adding a varying percentage of white lead, and finally fusing the material to an auxiliary lens surface upon the face of any desired main or major lens.

5. The method of making a bi-focal lens which consists in forming a ground and polished lens with an auxiliary surface thereon, of a comparatively refractory material, and fusing and welding a more fusible material to such auxiliary surface.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

JOHN R. SCHWINZER.

Witnesses:
CARL JUSSEN,
KATHARINE MCCARRAN.