

1,267,014.

Patented May 21, 1918.

FIG. I

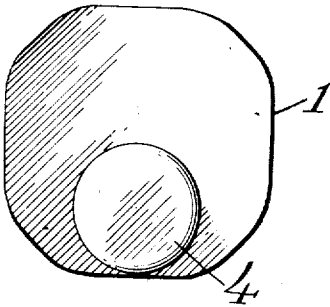


FIG. II

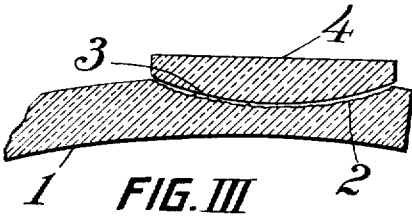
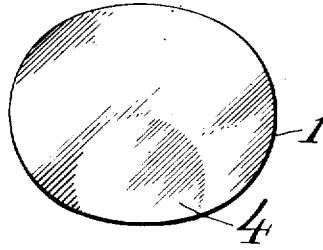


FIG. III

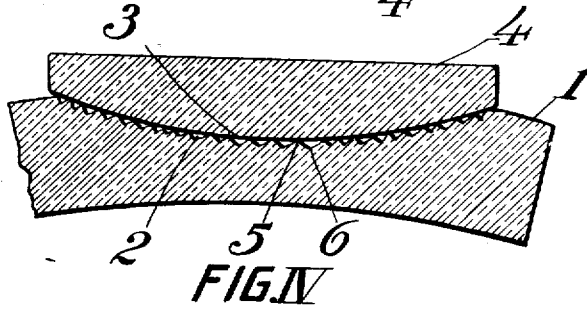


FIG. IV

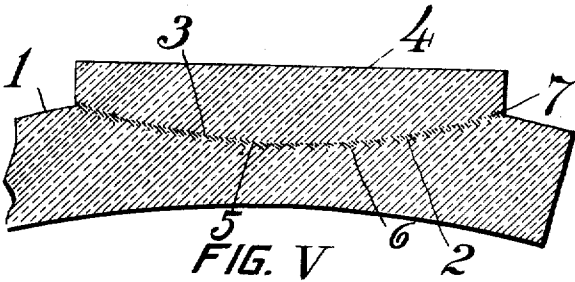


FIG. V

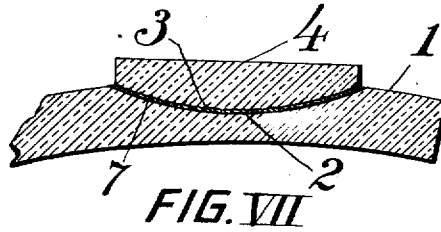


FIG. VII

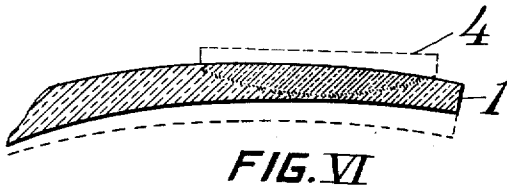


FIG. VI

FIG. VIII

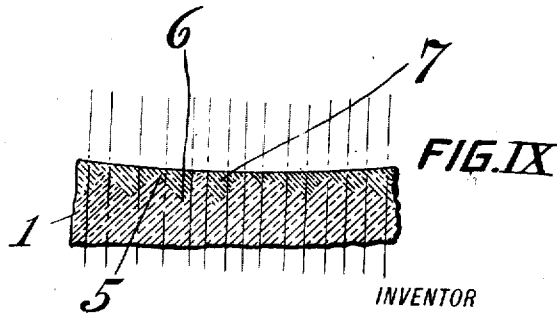
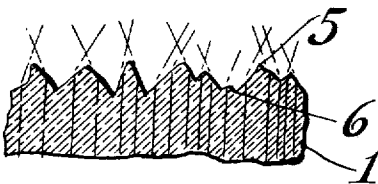


FIG. IX

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LENS.

1,267,014.

Specification of Letters Patent.

Patented May 21, 1918.

Application filed November 29, 1916. Serial No. 134,130.

To all whom it may concern:

Be it known that I, EDGAR D. TILLYER, a citizen of the United States, residing at Southbridge, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Lenses, of which the following is a specification.

This invention relates to improvements in lenses and has particular reference to lenses of the bifocal or multifocal type.

One of the leading objects of my present invention is the provision of a novel and improved construction of lens formed from two or more parts having different indices of refraction, in which the parts shall be very securely and at the same time detachably united.

A further object of the present invention is the provision of an improved construction of two-part lens, in which one of the parts shall be so formed and adapted that it will to a maximum resist any accidental relative movement of the parts.

A further object of the invention is the provision of an improved lens and process of producing the same, which will permit of the construction of the lens with a minimum amount of labor and consequently considerably reduce the cost of production of the same.

Other objects and advantages of my improved construction should be readily apparent by reference to the following specification taken in connection with the accompanying drawings forming a part thereof, and it will be understood that I may make any modifications in the specific details of construction shown and described within the scope of the appended claims without departing from or exceeding the spirit of my invention.

Figure I represents a plan view of a blank for the construction of my improved lenses.

Fig. II represents a similar view of a completed lens.

Fig. III represents a sectional view of the parts of my lens in condition for uniting.

Fig. IV represents an enlarged fragmentary sectional view of the parts.

Fig. V represents a similar view showing the parts united.

Fig. VI represents a corresponding sectional view through the complete lens.

Fig. VII represents a sectional view of an alternative form of my construction.

Fig. VIII is a semi-diagrammatic view illustrating the refraction of light through a ground but unpolished glass surface.

Fig. IX is a similar view showing the surface treated with my filler or cement.

In the drawings, in which similar characters of reference are employed to denote corresponding parts throughout, the several views, the numeral 1 designates the major blank having formed therein the concavity 2 adapted to receive the curved face 3 of the segment 4, this being a well known type of construction known as countersunk bifocal, in which the major portion 1 and segment 4 are of glass of different indices of refraction so that in the completed lens as illustrated in Fig. VI, the lens may be formed on the segment bearing surface with a continuous curve and at the same time the two desired foci secured in the lens. It is to be understood, of course, that while I have here particularly described and illustrated a bifocal lens, that the principles of my invention are equally applicable to any form of multifocal, and I, therefore, do not wish to be specifically limited to the use of my improvement in connection with a lens having but two foci.

In the process of forming an ophthalmic lens it is customary to first grind the surface with a rough quick cutting abrasive, and to subsequently polish the surface by the use of a pitch polisher, a fine abrasive or the like. The initial rough grinding or polishing operation produces on the lens what is ordinarily known as a ground glass surface, which to the eye possesses the general effect of a translucent but not transparent member having a whitish surface, the transparency or opaqueness of this surface depending largely on the grade of abrasive employed, in that the coarser the abrasive, the more opaque the surface, while the finer the abrasive, the better the surface till the use of the finest abrasive, as mentioned, constitutes what is commonly known as polishing, that is producing the absolutely transparent optically correct surface regularly employed with lenses.

It is not understood by many, however, that this ground glass surface is not of itself opaque, but presents the appearance of

opacity or translucency, but not transparency only on account of the fact that the surface is rough, as particularly illustrated in the enlarged view, Fig. IV, comprising the points or hills 5, as they may be termed and the corresponding hollows or indentations 6, between the points. This formation produces in effect a series of irregular teeth or substantially prism members, each of which bends or refracts the light rays seeking to pass through the ground glass surface so that the result is the rays are so bent or refracted that no image is transmitted by them but only the effect on the eye produced of the matte or ground surface, although every point individually considered is entirely transparent or transmissive of image bearing light rays.

It is, therefore, the purpose of my present invention to make use of this optical principle in connections with the formation of bifocal or multifocal lenses, or the uniting of two glass surfaces.

In the utilization of this idea as illustrated in Figs. I to VI of my patent drawings inclusive, I suitably form the major blank 1 and have then roughly ground in it the concavity 2, but have omitted the polishing of the countersink, which has hitherto always been deemed necessary, thus leaving the blank as clearly illustrated in Fig. IV, with the series of points or hills 5 projecting in the concavity portion. I then suitably form the segment 4 with the properly curved and polished surface 3, adapted to fit into the concavity 2.

The parts being thus formed it will be understood by reference to Fig. IV for example, that when the segment 4 is placed in position in the concavity the point 5 will project into engagement therewith and will tend to exert a frictional or biting effect with reference thereto to prevent sliding movement of the segment within the concavity.

To unite the parts I then employ a suitable optical cement having substantially the same index of refraction as the major blank. For example, if desired the major blank may be made of glass having an index 1.523 while the segment is formed from glass having an index of 1.62. In uniting the parts I may then employ among other cements or mediums the well known Canada balsam, having the refractive index 1.53, or substantially that of the major blank. In the uniting of the parts the balsam is placed within the concavity in the usual manner and in suitably heated or softened condition so that it will flow between the hills or points 5 and fill up all of the hollows 6 to produce a smooth and continuous surface to the concavity, whose curvature is determined by the points 5 under ordinary conditions, or which may be varied within reasonable

limits by suitable molding or forming of the cement or medium 7 which is engaged with the points.

It will be understood that if desired, as for temporary trial wear or the like, an optical surface may be formed with the ground portion of the blank 1 as a base, and the actual curvature produced or finish of the curve, formed by this shaping of the medium 7 in place of the final polishing of the surface, and that an optically usable lens is thus provided which is capable of entirely satisfactory use up to a point when the surface, on account of its softness, would be impaired by scratching or the like, this being the only limit to the optical usability of a lens surface so constructed, and being the only reason that I have specified this surface as adapted especially only for temporary or trial purposes.

In the construction of a bifocal, however, this is eminently satisfactory due to the fact that the countersink being filled with the cement or filler medium 7, the segment 3 is then placed in position while the cement is still in a soft or heated condition, and the segment pressed firmly into place, the medium 7 taking care of the difference, if any, between the curve of the polished surface 3 of the segment 4 and the curve of the countersink 2, interlocking with the points or teeth 5, filling up all the hollows and at the same time firmly engaging the polished surface 3 of the segment to firmly retain the segment in position. It will be understood that while the medium 7 serves to secure the countersink that at the same time the countersink is in contact with the points 5 which have a frictional or biting effect on the polish of the segment and serve to prevent any slipping of the same.

It is to be understood that for the successful and satisfactory construction of my lens, it is absolutely essential that the refractive index of the substance 7 be substantially that of the ground but unpolished surface to which it is applied, in that the optical effect produced is substantially that of completion of the ground surface, in that the medium 7 fills up the hollows, making an even surface with the points 5 or as molded so that the various light rays in place of being deflected in varying directions, as indicated in the diagrammatic view in Fig. VIII, which illustrates the effect produced by light waves emerging through the ground glass surface on account of the prism present, pass straight through the ground glass surface and filler 7 due to their corresponding index of refraction, as is clearly illustrated in Fig. IX.

From the foregoing description taken in connection with the accompanying drawings, the construction and advantages of my improved lens or bifocal lens should be read-

ily apparent, and it will be seen that I have provided an improved construction in which it is unnecessary to polish the surface of the lens, in that the effect of the surface polished, namely the elimination of noticable hills and hollows, is produced by the filling up of these hollows to secure a smooth or polished effect surface through the medium of a filler or cement of the same refractive index as the glass to which it is applied, and it will be further noted that my improvement is particularly adaptable for use in connection with the construction of bifocal lenses, both on account of the fact that the segment of the bifocal lens serves as a cover plate to protect the filler 7 and prevent injury to the artificial surface thus produced to which on account of its relative softness, it might be subject in the absence of a cover plate, and also on account of the fact that the roughened ground but unpolished surface will provide points or hills coming just to the surface of the filler 7, but being disposed sufficiently at the surface of the filler or cementing medium to have a frictional or biting engagement with the segment, tending to resist any relative slipping movement of the segment and major blank either during the final grinding operation in the production of the finished lens 6, or subsequently when the finished lens 6 is in use.

It will further be understood that while I have primarily described in the specification the polished surface 3 as being on the segment and the unpolished surface being on the countersink, that the parts may be reversed and the countersink polished and the surface of the segment left unpolished, as indicated in Fig. VII, it being understood that in this event it is necessary to employ

a cement or filler medium of the same refractive index as the segment in place of the refractive index of the major blank, it being essential to my improvement that the refractive index of the filler correspond to the refractive index of the member having the unpolished surface, so that the effect of the light rays will be as indicated in Fig. IX and that no deflection will take place as would be the case were the filler an unpolished surface formed from material having different indices of refraction.

I claim:

1. A bifocal lens, including a major blank and a segment, one of said parts having projecting points engaging the other to resist relative slipping of the parts.

2. A bifocal lens, including a major blank and a segment, one of said parts having projecting points engaging the other to resist relative slipping of the parts, and a filler of the same refractive index as the major blank adapted to fill up the hollows caused by grinding to produce a smooth surface.

3. A two part optical lens, in which one of the parts has a roughened surface for engagement with the other part, and an interposed filler cement of the same refractive index as the roughened part for securing the parts in engagement.

4. An optical lens including a major blank and a segment, one of said parts having a roughened surface engaging the other to resist relative slipping of the parts.

In testimony whereof I affix my signature in the presence of two witnesses.

EDGAR D. TILLYER.

Witnesses:

H. K. PARSONS,
H. H. STYLL.