

No. 836,486.

PATENTED NOV. 20, 1906.

C. W. CONNER.
APPARATUS FOR PRODUCING BIFOCAL LENSES.

APPLICATION FILED APR. 21, 1903.

3 SHEETS—SHEET 1

Fig. 1.

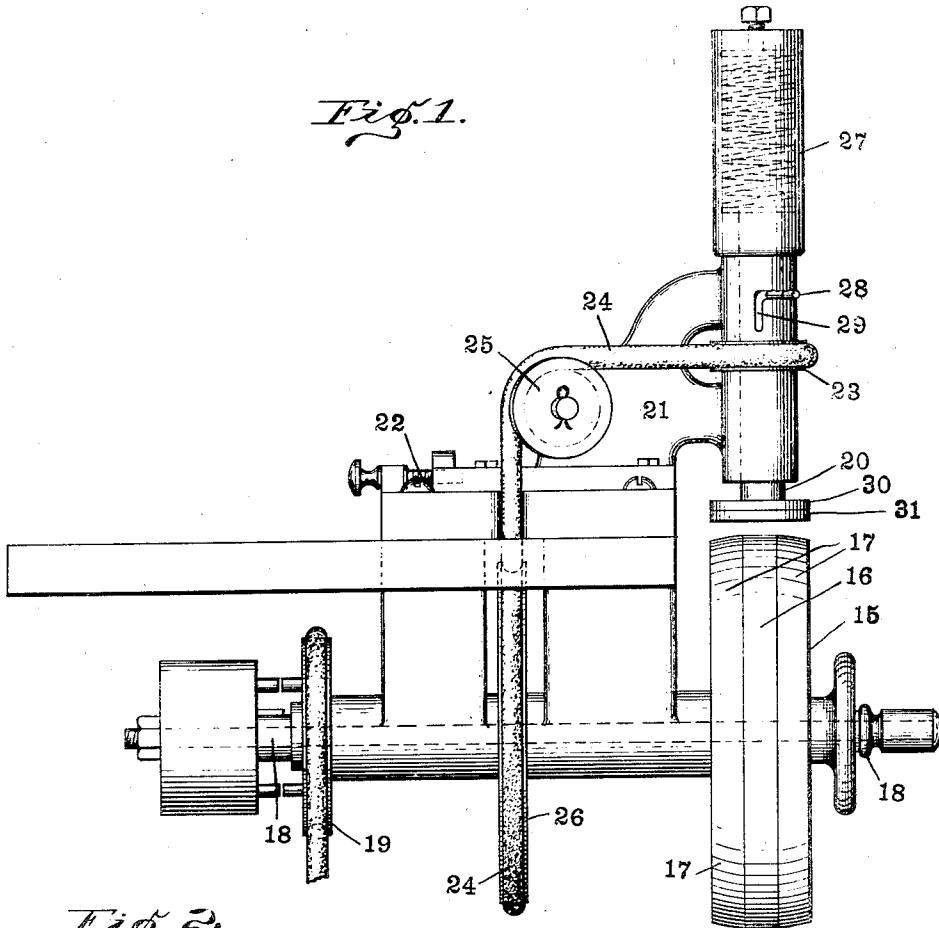
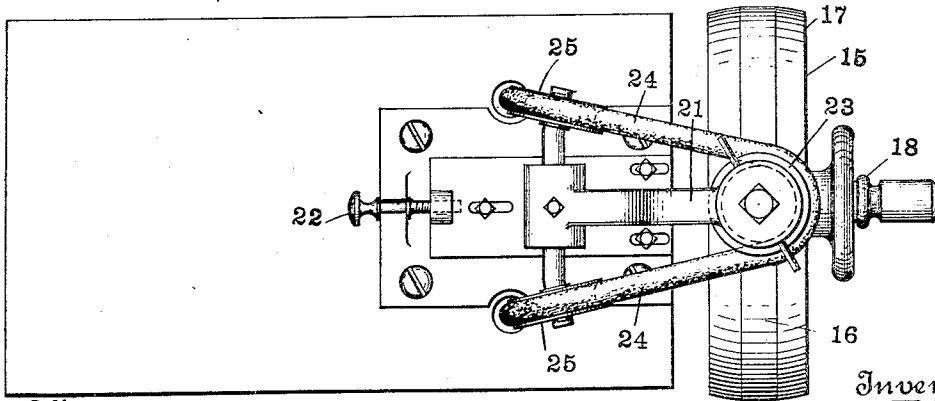


Fig. 2.



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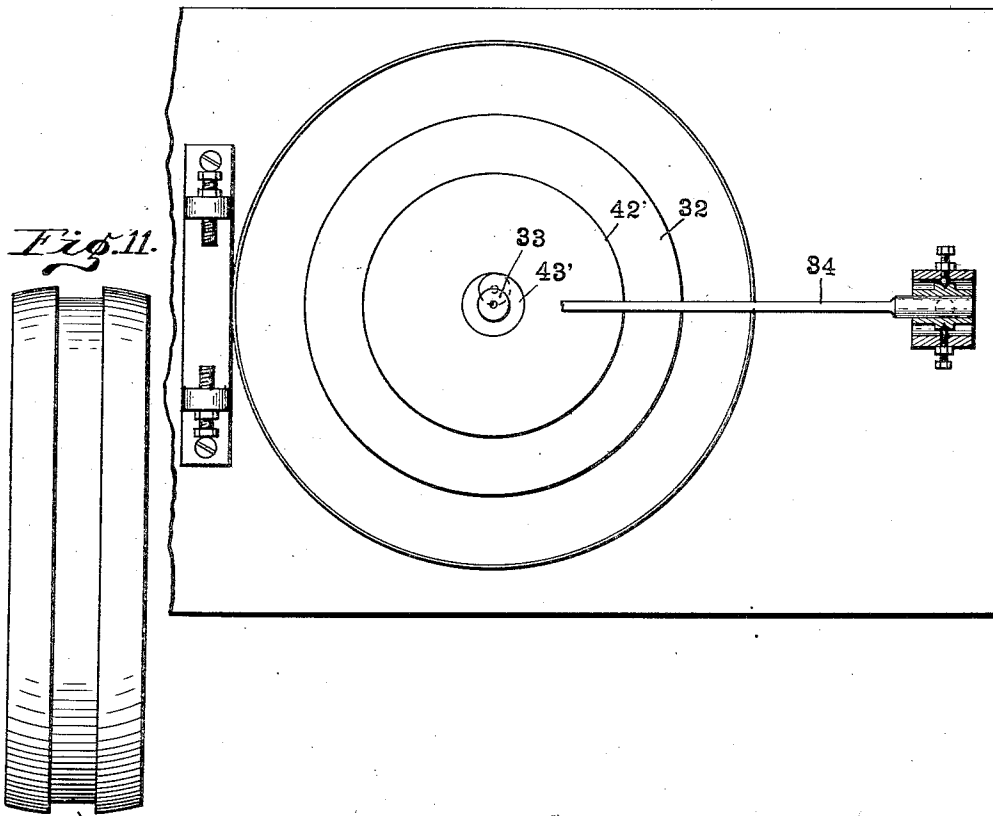
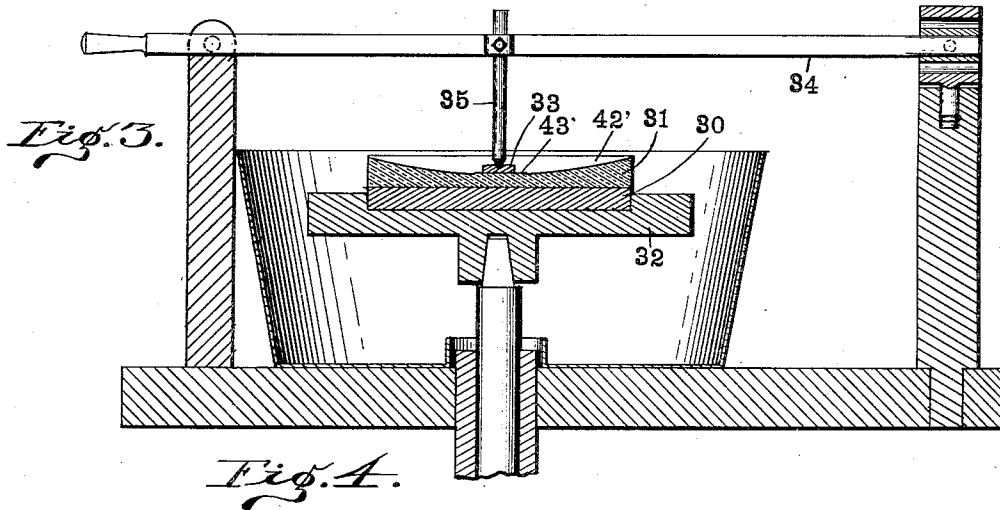
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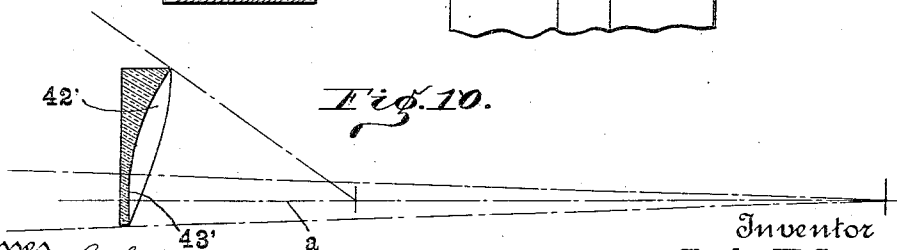
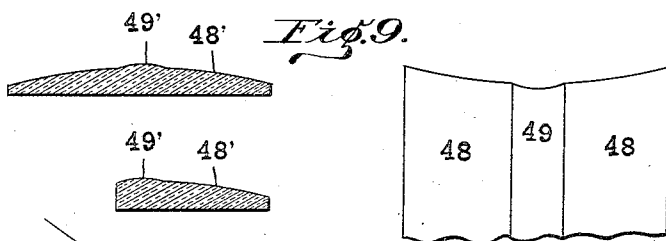
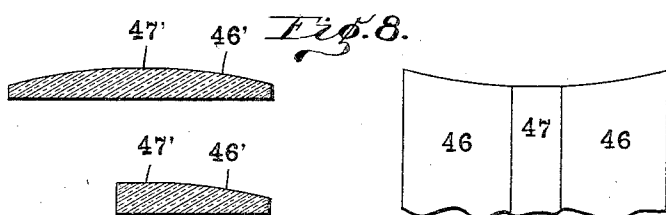
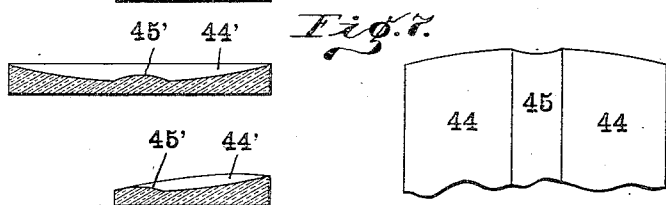
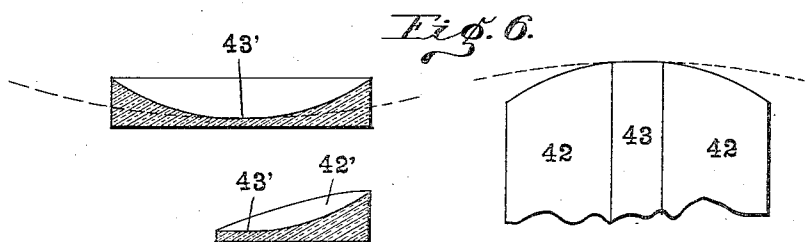
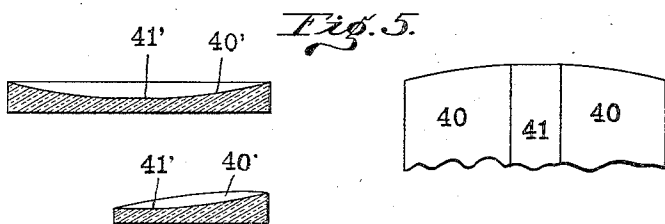
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

CHARLES W. CONNER, OF INDIANAPOLIS, INDIANA.

APPARATUS FOR PRODUCING BIFOCAL LENSES.

No. 836,486.

Specification of Letters Patent.

Patented Nov. 20, 1906.

Application filed April 21, 1903. Serial No. 153,696.

To all whom it may concern:

Be it known that I, CHARLES W. CONNER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Apparatus for Producing Bifocal Lenses, of which the following is a specification.

The object of my invention is to provide an apparatus for grinding from a single piece of crystal simultaneously the two surfaces of a bifocal lens, said surfaces being of different dioptries and the line of junction between the two focal surfaces being practically even, smooth, and invisible.

In carrying out said invention I provide a crystal-holding member, a rotary grinding member coöperating therewith and having a spherically-disposed grinding-surface, and an adjacent non-spherically disposed grinding-surface which has the same degree of circumferential curvature in one direction as the spherically-disposed surface, and means for revolving one of said members—that is, either the crystal-holding member may be stationary and the rotary grinding member revoluble and rotary or said grinding member may be only rotary and the crystal-holding member revoluble, as herein shown, the latter being preferable.

Another feature of said apparatus is that the axis of the crystal-holder is in line with a radius through the center of the non-spherical surface of the grinding member, so that the latter surface will create a circular minor surface, while the spherically-disposed grinding surface or surfaces will create the major surface.

The accompanying drawings illustrate my invention.

Figure 1 is an elevation of one form of my improved grinding-wheel together with an apparatus for using the same; Fig. 2, a plan thereof; Fig. 3, a vertical section of the apparatus for finishing one of the surfaces; Fig. 4, a plan thereof. Figs. 5, 6, 7, 8, and 9 are views of several forms which my improved grinding-wheel may assume, each of said figures giving also a transverse section of the whole lens formed by such wheel, together with a similar section of the lens when used for eyeglasses or spectacles. Fig. 10 is a diagram of the lens shown in Fig. 6. Fig. 11 is an elevation of a grinding-wheel in which the intermediate portion is sufficiently depressed so that it will not serve as a grinding-surface.

In Figs. 1 and 2, 15 indicates a grinding-wheel the intermediate peripheral portion 16 of which is parallel with the axis of rotation, while the edge portions 17 17 are convex. Wheel 15 is mounted upon the arbor 18 and rotated by means of a pulley 19. Mounted above wheel 15, preferably but not necessarily at right angles to arbor 18, is a lens-rotating arbor 20, journaled in a suitable bracket 21, which is adjustable along a line substantially parallel with the axis of arbor 18 by any suitable means, such as an adjusting-screw 22. Arbor 20 is rotated preferably at a considerably higher speed than arbor 18 by means of a pulley 23 and belt 24 which belt passes around idlers 25 and a driving-wheel 26, carried by arbor 18.

Arbor 20 is capable of vertical movement within its bearing-bracket 21 toward and from the periphery of the grinding-wheel 15 and is normally forced downward by a spring 27. The arbor 20 may be held in its upper position by means of a sleeve mounted within the bearing of bracket 21 and provided with a pin 28, projecting through a bayonet-slot 29.

In operation the lower end of arbor 20 is adapted to engage and rotate the lens-holding head 30, to which a crystal 31 is attached in the usual manner. The crystal 31 may preferably be roughed out, so as to partially conform with the curvature of the grinding-surfaces 17, by the ordinary grinding means, which need not be here described. After the head 30, together with its attached crystal 31, has been connected to arbor 20 it is held in engagement with the periphery of the grinding-wheel 15 by spring 27 and the parts then rotated, the grinding-wheel about its arbor 18 and the crystal 31 about the axis of arbor 20. The grinding-surface 16 operates to produce a central lens-surface concentric with the arbor 20 and the grinding-surfaces 17 17 simultaneously operate to produce a lens-surface concentric with arbor 20 and surrounding the lens-surface produced by the grinding-surface 16.

If desired, the two lens-surfaces may be ground and finished by the same or similar wheels; but in practice I find that this may result in an imperfect central lens-surface, for the reason that slight irregularities in the surface 16, especially in a line directly beneath or very closely beneath the axis of arbor 20, may possibly produce concentric ridges and hollows in the lens-surface. For the reason after the crystal 31 has been roughed out

by the wheel such as shown in Fig. 1, where the surfaces 16 and 17 17 have substantially the proper dioptrics for the two desired surfaces, I remove said wheel and substitute therefor a wheel such as that shown in Fig. 11, where the intermediate grinding-surface is removed, as at *b*, and grinding is continued until a slight surplus of material is left in the center of the crystal, as shown in Fig. 3. The external surface is finished with a wheel similar to the wheel shown in Fig. 11 or by any other desired means, and the crystal is then transferred to the rotating head 32 (shown in Fig. 3) and there rotated in conjunction with a grinding-plate 33, the under face of which has been given the proper dioptric curve desired for the central surface, and the surplus material of the center of the crystal is then reduced by this grinder until the line of junction between the central surface and the surrounding surface is made practically invisible. The grinding-plate 33 is of less diameter than the lens-surface which it is to grind and finish, so that as it is moved transversely of the crystal across its center by the arm 34 it will be rotated upon the pin 35 as an axis by reason of the rotation of the crystal 31 by head 32.

In Fig. 5 I have shown a portion of the periphery of a grinding-wheel having a pair of separated grinding-surfaces 40 40, which are of the same dioptric, and an intermediate grinding-surface 41, which is parallel with the axis of rotation. Such a wheel will produce a lens such as shown in Fig. 5, with a flat central circular surface 41'. The finished eyeglass-lens is also shown in the same figure, a portion of the crystal having been removed, so as to bring the surface 41' to one edge of the finished lens.

In Fig. 6 the surfaces 42 42 are of a plus dioptric which is greater than the plus dioptric of the intermediate surface 43. This wheel will produce the lens shown with a minus central surface 43' and a surrounding minus surface 42' of smaller dioptric.

In Fig. 7 the grinding-surfaces 44 44 are plus, while the intermediate surface 45 is a minus dioptric, and consequently the lens produced has a central plus surface 45' and a surrounding minus surface 44'.

In Fig. 8 the minus grinding-surfaces 46 46 have a plain surface 47 interposed, and this will produce a lens having a central flat circular portion 47' and a surrounding plus surface 46'.

Attention is called to the fact that the grinding-surfaces 17 in Fig. 1 are spherically disposed—that is, all parts of said grinding-surfaces have one common center. The effect of this is to give to the crystal in the latter part of the operation the desired spherical surface and in a perfect form, all parts of the major surface of the crystal engaging the grinding-tool. The intermediate grinding-surface

16 has the same degree of curvature circumferentially as the grinding-surfaces 17; but transversely of the wheel 15 the surface 16 is not spherical, but is formed so as to produce the desired minor surface, either plano, concave, or convex.

In Fig. 9 the grinding-surfaces 48 48 are minus and the intermediate grinding-surface 49 minus of a greater dioptric, thus producing a lens having an intermediate plus surface 49' and a surrounding plus surface 48'.

In Fig. 10 I have shown the eyeglass-lens illustrated in Fig. 6 and have further shown that the radius *a* is common to both of the lens-surfaces 42' and 43'.

It will be readily understood that, if desired, one of the grinding-surfaces 17 17 may be omitted, or, if desired, a single grinding-surface offset with relation to the arbor 20 may be used for producing the external or surrounding lens-surface; but both of these changes would probably prove to be objectionable for the reason that in that case the head 30 would have to be rigidly connected with the arbor 20 and there would not be that flexibility of grinding which appears to be essential for the production of an accurate lens.

It is to be understood that the side of the crystal opposite that upon which the two surfaces of different dioptrics have been formed may be and usually will be given any desired dioptric conformation in any desired manner.

After the crystal has been provided on one face with the two surfaces and the opposite face reduced to the desired conformation an eyeglass or spectacle lens is produced by removing a portion of the outer or surrounding surface, so that the central surface will then lie at the lower edge of the finished lens. It is thus possible to produce from a single crystal a bifocal lens with the "near-vision" portion properly positioned at the lower edge.

I claim as my invention—

1. Apparatus for producing bifocal lenses including a rotary holder for the lens-crystal, and means for grinding two bifocal surfaces of different dioptrics simultaneously on one face thereof, substantially as set forth.

2. Apparatus for producing bifocal lenses including a rotary crystal-holder, and a rotary grinding member cooperating therewith and having a spherically-disposed annular grinding-surface and an adjacent non-spherically-disposed annular grinding-surface which has the same degree of circumferential curvature as the spherically-disposed surface.

3. Apparatus for producing bifocal lenses including a rotary crystal-holder, and a rotary grinding member cooperating therewith and having a spherically-disposed annular grinding-surface and an adjacent non-spherically-disposed annular grinding-surface which has the same degree of circumferential cur-

vature as the spherically-disposed surface, the axis of said crystal-holder being in line with a radius through the center of the non-spherical surface of the grinding member.

5 4. Apparatus for producing bifocal lenses including a crystal-holding member, a grinding member having two parallel spherically-disposed annular grinding-surfaces and an intermediate non-spherically-disposed annular grinding-surface which has the same degree of circumferential curvature as the spherically-disposed surface, and means for causing a grinding movement between said members.

15 5. In an apparatus for producing bifocal lenses, the combination of a grinding element having a plurality of grinding-surfaces thereon of different dioptries, whereby focal surfaces of different dioptries are simultaneously produced upon the lens-crystal, means for rotating said grinding element, a holder for the lens-crystal, and means for moving said crystal-holder with relation to the surface of said grinding element.

25 6. In an apparatus for producing bifocal lenses, the combination of a grinding ele-

ment having a plurality of grinding-surfaces thereon of different dioptries, whereby focal surfaces of different dioptries are simultaneously produced upon the lens-crystal, means for rotating said grinding element, a holder for the lens-crystal rotatable about an axis at an angle to the axis of the grinding element and offset from the grinding element, and means for rotating the crystal-holder. 35

7. In an apparatus of the class described, the combination of a pair of separated grinding-surfaces of the same dioptric, a crystal-holder, means for rotating said crystal-holder upon an axis at an angle to the grinding-surfaces, and means for causing a relative movement between the grinding-surfaces and the crystal-holder along the line of separation of the two grinding-surfaces. 40

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 18th day of April, A. D. 1903. 45

CHARLES W. CONNER. [L. s.]

Witnesses:

ARTHUR M. HOOD,
JAMES A. WALSH.