No. 817,503. PATENTED APR. 10, 1906.

T. MUNDORFF.

MACHINE FOR MAKING BIFOCAL LENSES.

APPLICATION FILED FEB. 15, 1905.

2 SHEETS—SHEET 1.

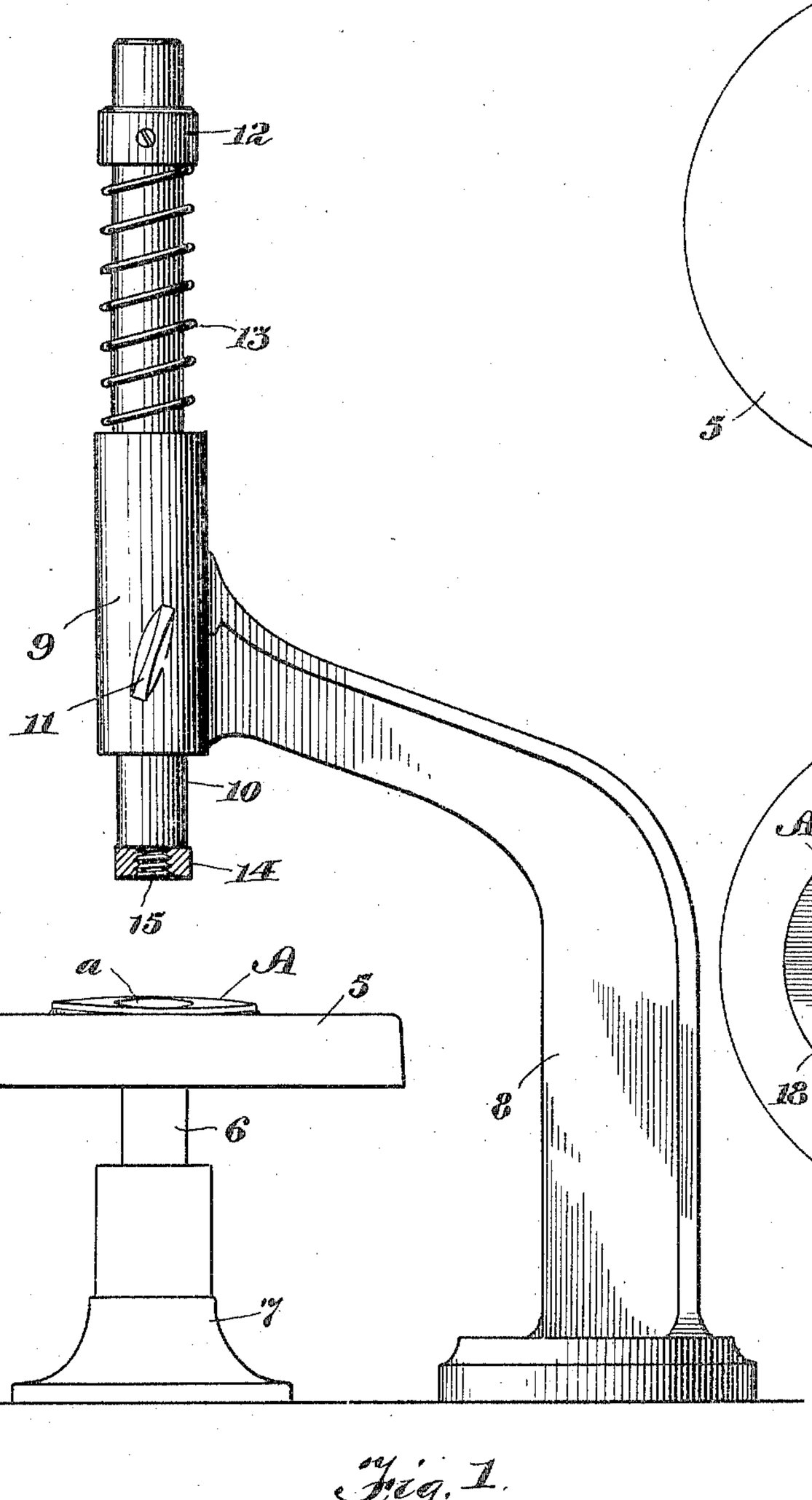

Fig. 1.

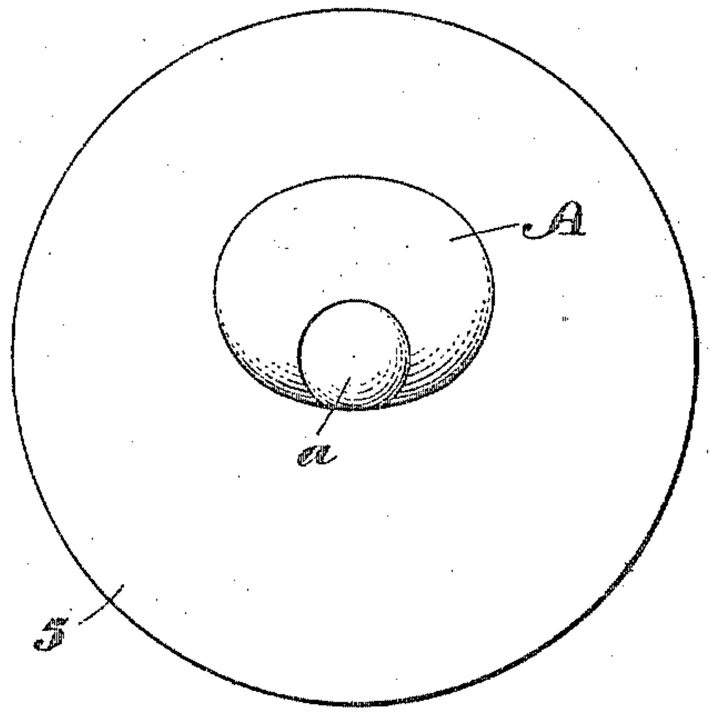

Fig. 3.

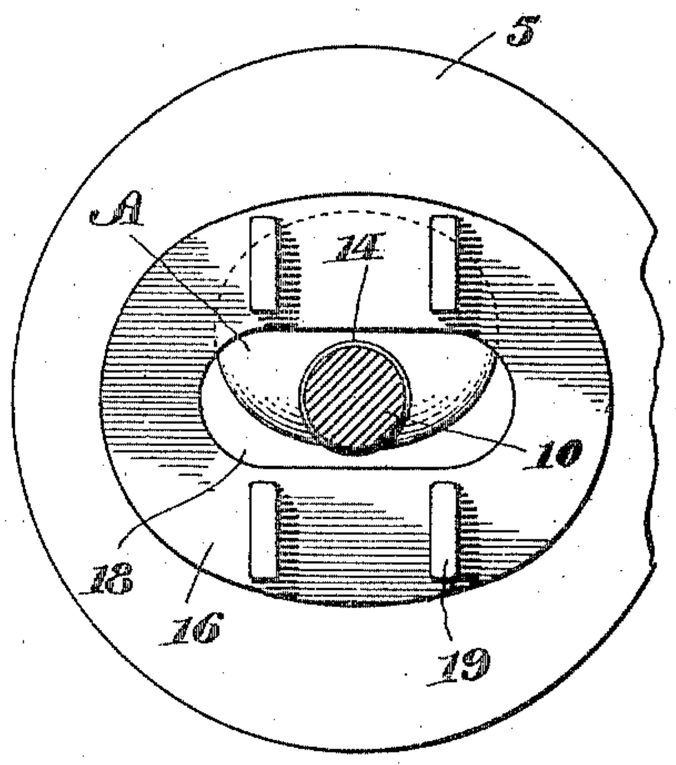

Fig. 4.

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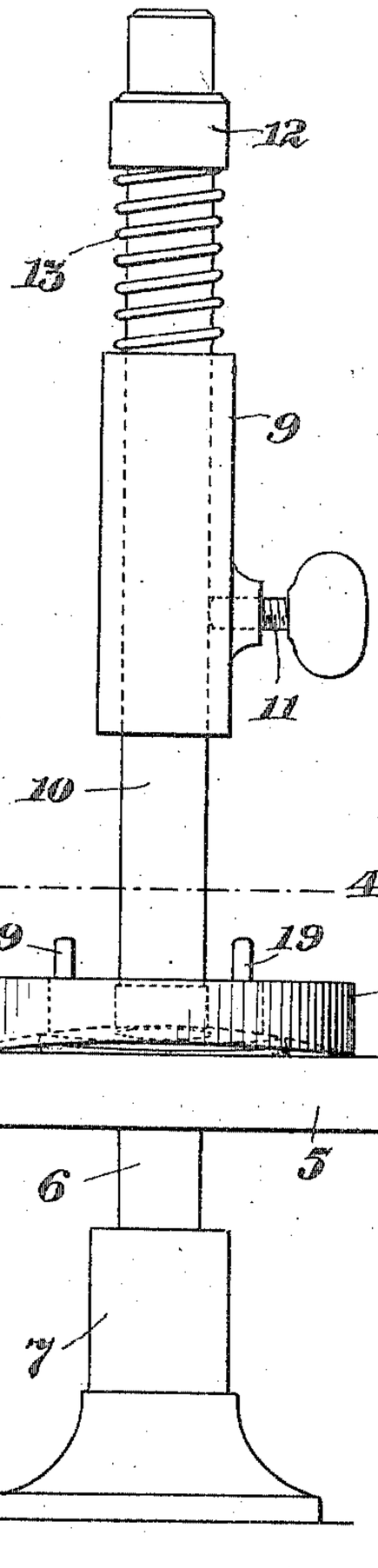

Fig. 2.

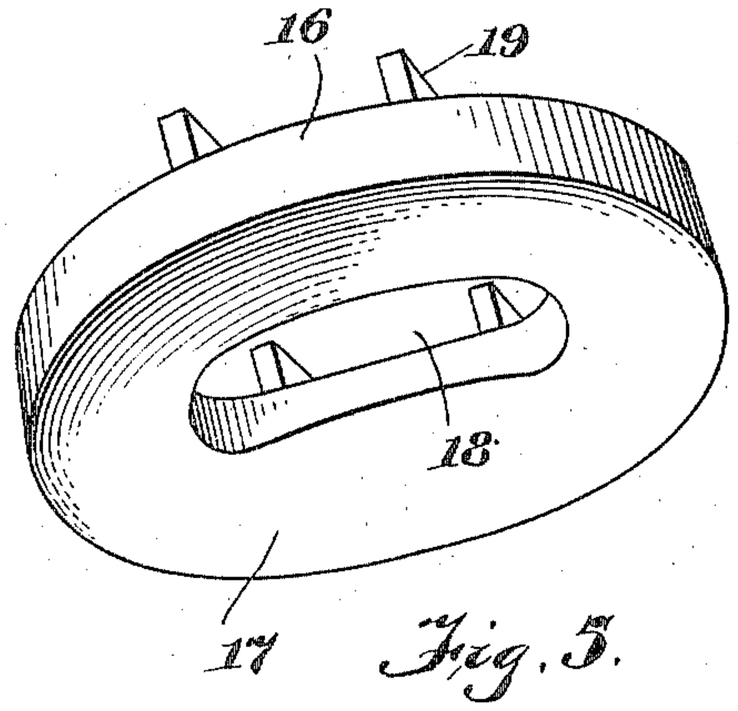

Fig. 5.

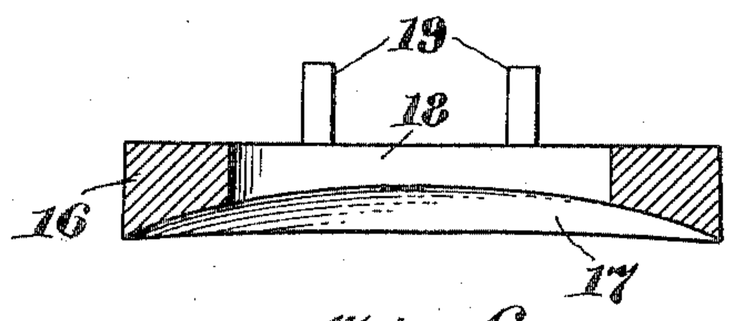

Fig. 6.

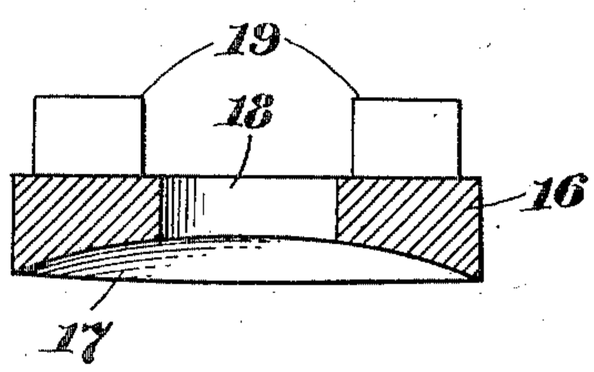

Fig. 7.

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THEODORE MUNDORFF, OF NEW YORK, N. Y.

MACHINE FOR MAKING BIFOCAL LENSES.

No. 817,503. Specification of Letters Patent. Patented April 10, 1906.

Application filed February 15, 1905. Serial No. 245,662.

To all whom it may concern:

Be it known that I, THEODORE MUNDORFF, a citizen of the United States, residing in the city of New York, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Machines for Making Bifocal Lenses, of which the following is a specification.

My invention relates to a machine for making optical lenses of that class wherein a plurality of fields of different radii are produced on the surface of a one-piece lens.

The object of this invention is the provision of means by which a field of one radius may be produced on the surface of a lens and at the same time a ledge or shoulder, intervening fields of different radii, may be eliminated entirely from the lens.

A further object is to conceal or cover on the lens a field of one radius while grinding a field of a different radius on the exposed face of the lens, thus obviating any contact of the abrasive member with a ground part of the lens during the subsequent treatment thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, wherein like characters of reference are used to indicate corresponding parts in all the figures.

Figure 1 is a side elevation of one form of machine for grinding optical lenses and constructed in accordance with my invention. Fig. 2 is an elevation taken at right angles to Fig. 1. Fig. 3 is a plan view of a rotating head or work-holder, illustrating an incomplete lens in position to have one field thereof stopped out and the remaining surface of the lens ground to a different field. Fig. 4 is a sectional plan view taken in the plane of the dotted line 4 4 of Fig. 2, showing the grinding or abrasive member in position for operation on an exposed face of the lens. Fig. 5 is a perspective view of a preferred form of grinding or abrasive member. Fig. 6 is a vertical longitudinal section through the member shown by Fig. 5, and Fig. 7 is a vertical transverse section through the member illustrated by Figs. 5 and 6.

As disclosed in a companion application filed of even date herewith, Serial No. 245,663, I have produced a new article in the shape of a bifocal lens which is devoid of a ledge or shoulder intervening high and low power fields, said application also disclosing a new method of producing lenses of this character. My present application is for a machine adapted to practice the process disclosed in the copending application and to produce the new article claimed therein.

In the drawings a work-holder or head 5 is carried by a vertical shaft 6, the latter being journaled in a suitable bearing 7 and driven by any suitable connections with a source of power, such as a motor or a line-shaft. As shown, the holder or head 5 is in the form of a disk adapted to rotate in a horizontal plane, and on the upper face of this disk is adapted to be secured the piece of glass which forms a "blank" or an embryo lens, the same being indicated at A. It is evident that this lens may be produced from any suitable grade of optical glass and that it may have any desired form and size. The blank or lens is adapted to be secured fixedly to the revoluble holder in any suitable or preferred way; but in practice said lens is secured to the holder by an adhesive, such as wax.

Before the blank or lens A is subjected to treatment in my machine a space is reserved on the blank for a high-power field of any desired radius to be produced thereon, as indicated at *a* in Fig. 3. This field *a* is preferably ground on one surface of the lens in the usual or any preferred manner, either before or after grinding the lens in my machine, said field being of circular, elliptical, or any other shape and preferably arranged within the edges of the blank or lens A. In this operation of grinding the field *a* on the lens, as ordinarily practiced, a ledge or shoulder is produced on the surface of the lens, which ledge or shoulder defines or marks the outlines of the field *a*. To entirely overcome the production of this ledge or shoulder and at the same time produce a field of low power and of a different radius on the lens, I have devised the machine shown by the drawings, the important element of which machine is the grinding tool or member. (Shown by Figs. 4 to 7, inclusive.)

Another important feature of my machine is a means for "stopping out" the field *a* of the embryo lens, and one embodiment of such such stopping-out means is a disk plate or its equivalent. (Shown more clearly by Figs. 1. and 4.) A support 8 of any suitable character is fixed quite close to the bearing 7 for the rotating shaft 6. This support is provided with a guide 9, adapted to overhang the rotating holder 5, and in this guide is mounted a spindle 10, the latter being adapted for

vertical adjustment. The spindle is slidable freely in the guide 9, and it is adapted to be held in a fixed position by a binding-screw 11, the latter having a threaded bearing in the guide 9 and being adjustable by hand so as to impinge the spindle 10 and clamp it in place. The spindle is shown as having a collar 12, against which acts a coiled spring 13, which spring envelops the upper part of said spindle, whereby the spring has a tendency to lift the spindle to a raised position away from the work on the rotating holder. The stopping-out member 14 is secured detachably to the lower part of the spindle 10. This member is adapted to cover the field *a* on the lens during the period that the grinding or abrasive member is operating on the exposed surface of the lens. Said stopping-out member 14 may be of any desired size, shape, and material, and in practice I prefer to use different shapes and sizes of said members. For this purpose the spindle 10 and the members are constructed to permit of the ready interchange of the members 14. As shown by Fig. 1, the spindle 10 has a threaded stud 15, and each member 14 has a threaded socket or opening, whereby each member 14 may be screwed on the stud of the spindle. It is evident that the stopping-out member may be easily detached and replaced by another member, because the lower end of the spindle is always accessible. Furthermore, the member when attached to the spindle is adjustable up and down therewith.

The distinctly novel feature of my present invention is the grinding-tool or member 16. This member is provided with a working face 17 of the desired radius. As shown, the working face 17 is concave and provided on the under side of the body of said tool or member 16. As lenses are to be ground to a different radii, I find it necessary to employ a number of these grinding tools or members, the working faces of which vary according to the radii of the lenses to be produced. In practice the member or tool may be cast in a single piece of metal and the working face 17 subsequently produced thereon in any suitable or appropriate way; but in some instances this tool may have the desired working face produced thereon during the operation of casting the tool, it being immaterial how the tool is produced. The tool is furthermore provided with a slot 18, which opens through the working face 17 thereof, and for convenience in handling the tool I provide suitable lugs 19 on the back of the body.

The operation may be described as follows: The embryo lens A may be first prepared by producing the high-power field *a* of the desired radius on the lower part of said lens, or a space may be reserved on the lens on which the high-power field is to be produced after the lens shall have been ground in the present machine. The operator proceeds to secure the lens on the upper face of the rotative holder 5, the space reserved for the high-power field *a* thereof being directly below or in vertical alinement with the spindle 10. A suitable stopping-out member 14 having been secured to the spindle, the latter is pressed downwardly against the tension of the spring 13 until the stopping-out member 15 is brought quite close to the space reserved for the field *a* of said lens. The member 14 is adjusted so that it will not have actual contact with the reserved space or the field *a*, and the spindle 10 is held fixedly in place by the clamping-screw 11. Before the stopping-out member is lowered, the grinding-tool or abrasive member 16 should be placed over the lens so that the spindle 10 will pass through the slot 18. The parts having been adjusted into positions for operation, the shaft 6 is rotated at the required speed, so as to make the lens A turn in a horizontal plane. The working face 17 of the tool or member 16 is supplied with a suitable abrasive well known to those skilled in the art, and this tool is held or manipulated by the operator while the lens rotates with the holder or head. The operator moves the tool back and forth across the exposed surface of the lens, said tool having a transversing movement in a plane parallel to the plane of rotation of the lens with the holder 5. It will be seen that the tool is manipulated by the operator to perform two classes of work on the lens which is carried by the rotating holder: first, a lower-power lens of the desired radius is ground on the exposed face of the lens, and, second, the lens is so ground or treated as to wholly overcome the formation of the ledge or shoulder between the high-power field *a* and the low-power field, which is to be ground on the exposed face of said lens. By these operations I am able to produce a bifocal lens having fields of different radii and wholly devoid of a shoulder or ledge between such fields, and, furthermore, the high-power field *a* of the lens under treatment or the stopped-out reserved space for the field is not in any way injured by the operation of the grinding tool or member, because the stopping-out member 14 protects such reserved space or field *a* from the action of the tool. When the grinding operation shall have been completed, the screw 11 is released and the spring 13 lifts the spindle and the member 14 to a position clear of the lens, thus permitting the tool 16 to be removed and enable access to be had to the lens A for removing it from the holder. Of course the lens is subsequently treated, polished, and finished in the described or any usual way.

From the foregoing description it is to be understood that the two fields may be produced on the lens in either of two ways: first, by stopping out the space reserved for the

high-power field, grinding the lens to the low-power field, and, to overcome the formation of a shoulder, thereafter grinding the reserved space to the required radius to produce the high-power field, using the means disclosed by my prior patent, or, second; the high-power field may be ground first on the lens, then the space stopped out, and the exposed face ground as set forth. In either case the desired fields are produced without the objectionable ledge or shoulder.

Changes in the form, size, proportion, and minor details in construction may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof, and I therefore reserve the right to make such alterations and modifications as fairly fall within the scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a work-holder, means for stopping out a portion of a lens adapted to be fixed to said holder, and a grinding member movable across the surface of a lens on said holder.

2. The combination of a rotary work-holder, means for attaching a lens in fixed position on said holder, and a grinding member movable across a surface of a lens on said holder, said grinding member being reciprocable in a plane substantially parallel to the plane of rotation of the work-holder.

3. The combination of a revoluble work-holder, adapted to give rotary motion in a fixed plane to work carried thereon and an abrasive member adapted to rest on said holder and reciprocable at will across the surface of a lens on said holder.

4. The combination of a work-holder and a grinding member, one of said parts being revoluble in a fixed plane for giving rotary motion to a lens fixed thereto and the other being movable relatively to the first part in a plane substantially parallel to the plane of rotation.

5. The combination of a revoluble work-holder, means for affixing the lens to said holder and a grinding member movable relatively to the work-holder and in a plane parallel to the plane of rotation of said work-holder.

6. The combination of a revoluble work-holder, means for stopping out a portion of a lens on said holder, and an abrasive member movable relatively to the work-holder and the stopping-out means.

7. The combination of a revoluble work-holder, means for stopping out a portion of a lens on said holder, and an abrasive member movable relatively to the work-holder and the stopping-out means, said abrasive member being shiftable at will across the surface of a lens on said holder.

8. The combination of a work-holder and a grinding member, one rotating in a fixed plane and the other having movement relative to the first member, and means for stopping out a portion of the work on said holder.

9. The combination of a movable work-holder, a stopping-out device, means for presenting said device to work in said holder, and means for treating the work on said holder.

10. The combination of a revoluble work-holder, a stopping-out device, means for holding said stopping-out device opposite to work on said holder, and means for treating the exposed surface of work on said holder.

11. The combination of a revoluble work-holder, a stopping-out device, and a support for maintaining the stopping-out device in a stationary position opposite to the work-holder.

12. The combination of a revoluble work-holder, a stopping-out device, and adjustable means for presenting the stopping-out device to work on said holder.

13. The combination of a work-holder, means for presenting a stopping-out device to said holder, and a stopping-out device connected detachably to said presenting means.

14. The combination of a work-holder, a support movable in a predetermined path relative to said work-holder, a stopping-out device on the support, and an abrasive member movable relative to the holder and spindle.

15. The combination of a work-holder, a support movable toward the holder, a stopping-out device on the support, and an abrasive member.

16. The combination of a work-holder, a support movable toward the holder, a stopping-out device carried detachably by the support and adapted for use interchangeably with different stopping-out devices, and an abrasive member.

17. In a machine for grinding lenses, an abrasive member adapted to be moved relative to a lens and having a working surface of a predetermined radius extending longitudinally and transversely thereof.

18. In a machine for grinding lenses, an abrasive member having a working surface of a given radius and controllable at will relative to the lens upon the surface of which the member is adapted to operate.

19. In a machine for grinding lenses, the combination with a work-holder, of an abrasive member having a working surface of a given radius and movable relative to said work-holder.

20. In a machine for grinding lenses, the combination with a work-holder, of an abrasive member having a working surface of a given radius and movable relative to said work-holder, said member being disconnected from and movable independently of the work-holder.

21. In a machine for grinding lenses, the combination with a work-holder, of a stopping-out device for a lens, and a grinding member, the working surface of which has an opening to accommodate the stopping-out device.

22. In a machine for grinding lenses, a grinding member provided with a vertical slot and on its bottom side with a working surface of a desired radius.

23. The combination of a work-holder, a slotted grinding member, and a stopping-out support fitted to the slot in said member.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THEODORE MUNDORFF.

Witnesses:
H. I. BERNHARD,
JAS. H. GRIFFIN.