No. 710,180. Patented Sept. 30, 1902.

J. F. BYINGTON.

MACHINE FOR GRINDING LENSES.

(Application filed Dec. 30, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

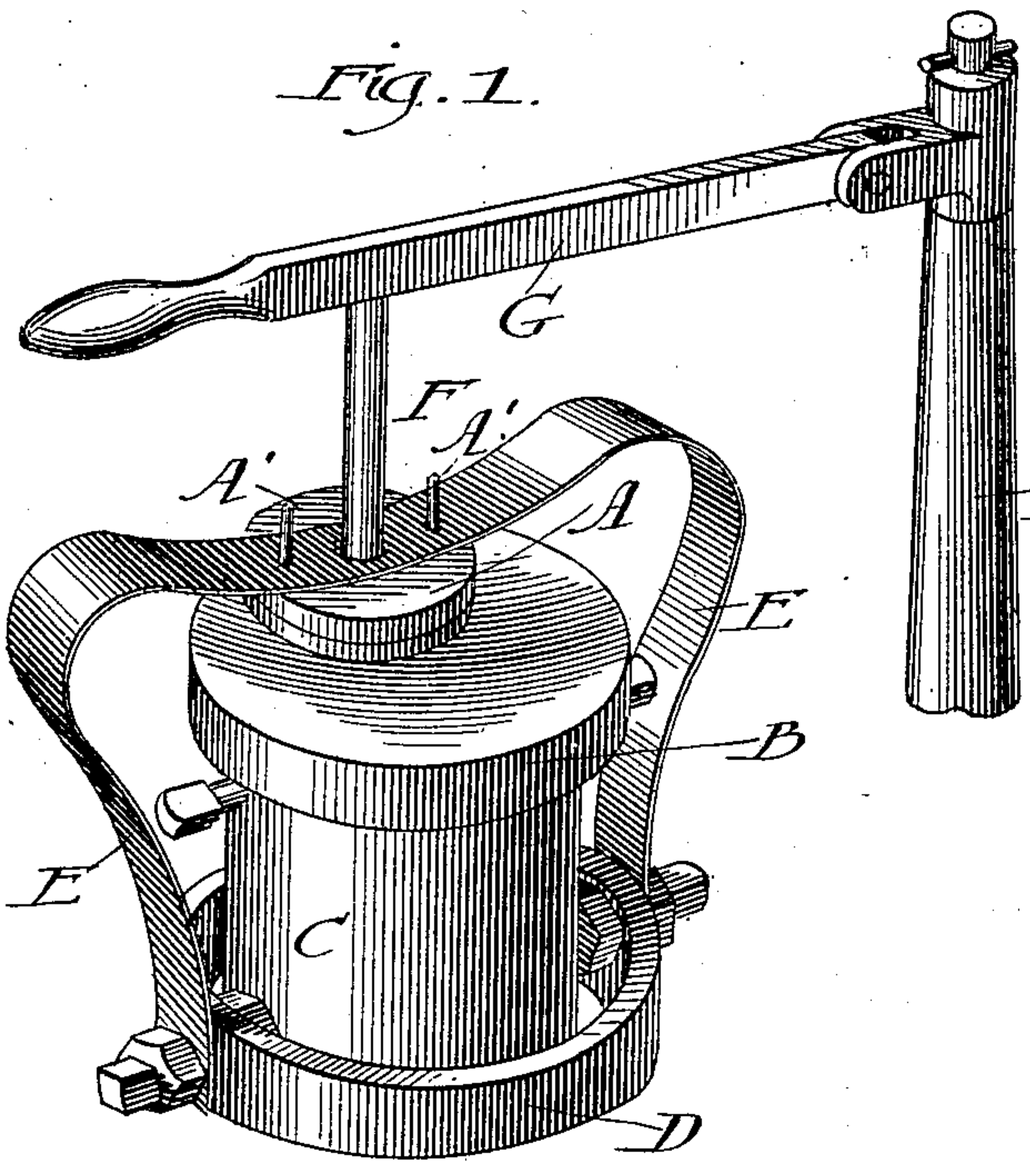


Fig. 2.

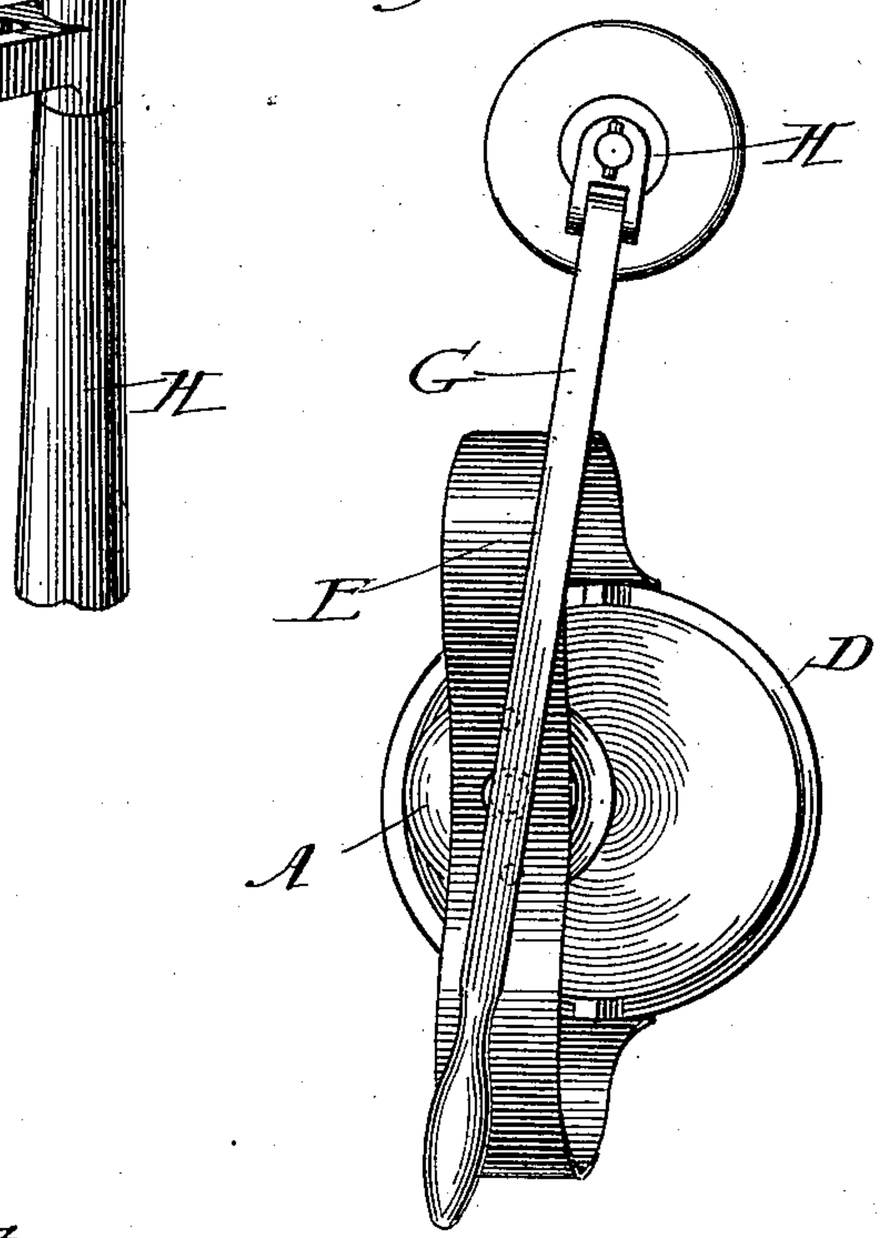
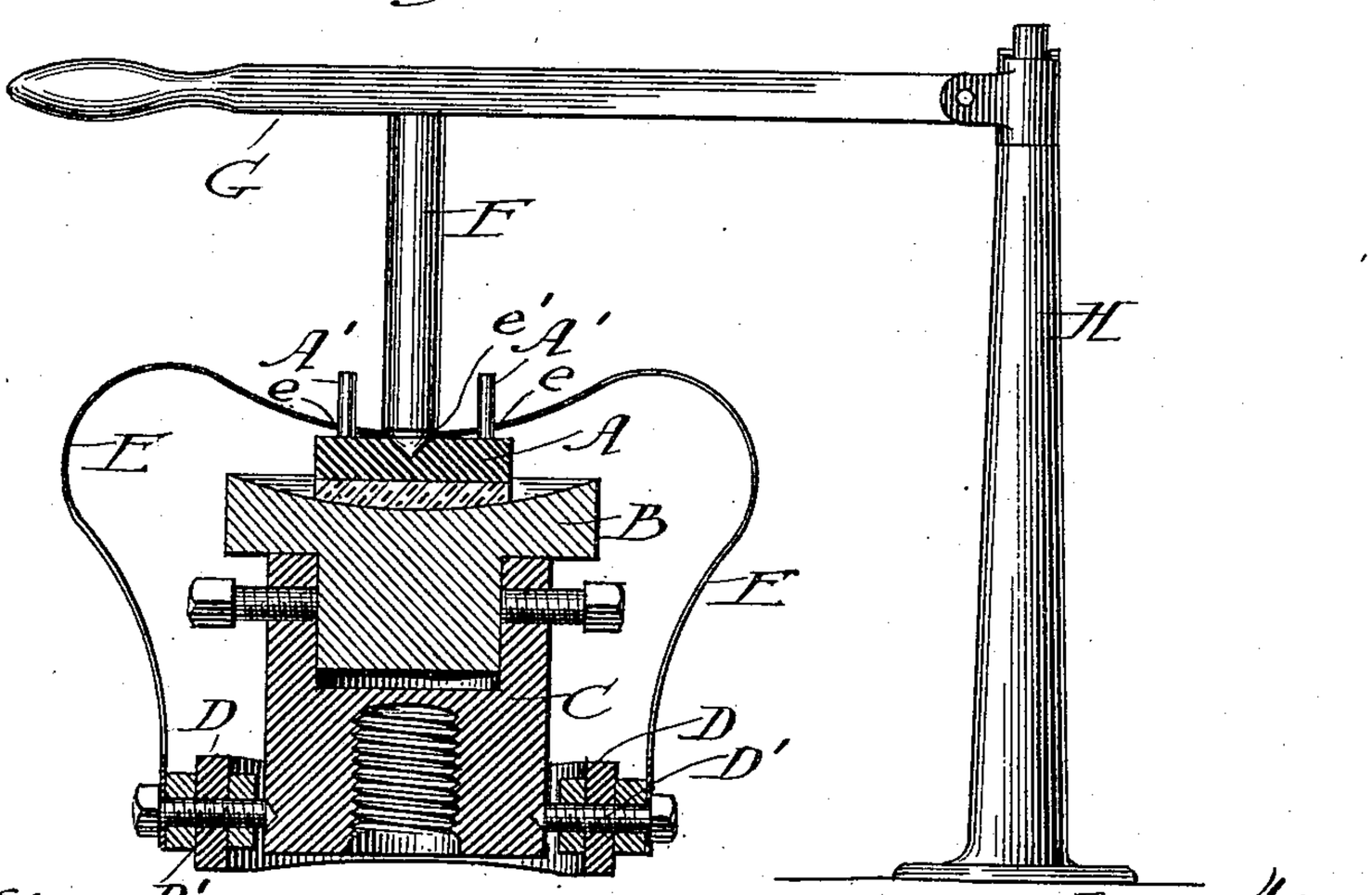


Fig. 3.



Witnesses:
Frank L. Blanchard
Bella Evans.

Inventor:
John F. Byington
By W. W. Hopkins
Attorney.

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Fig. 4.

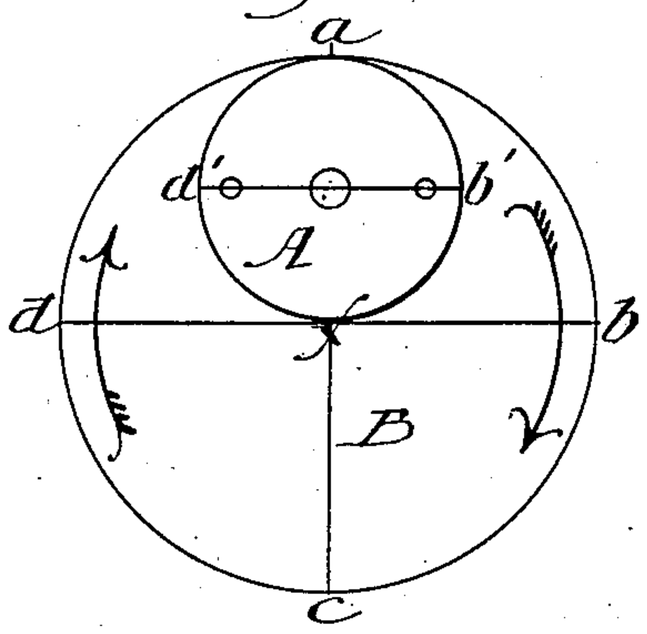


Fig. 5.

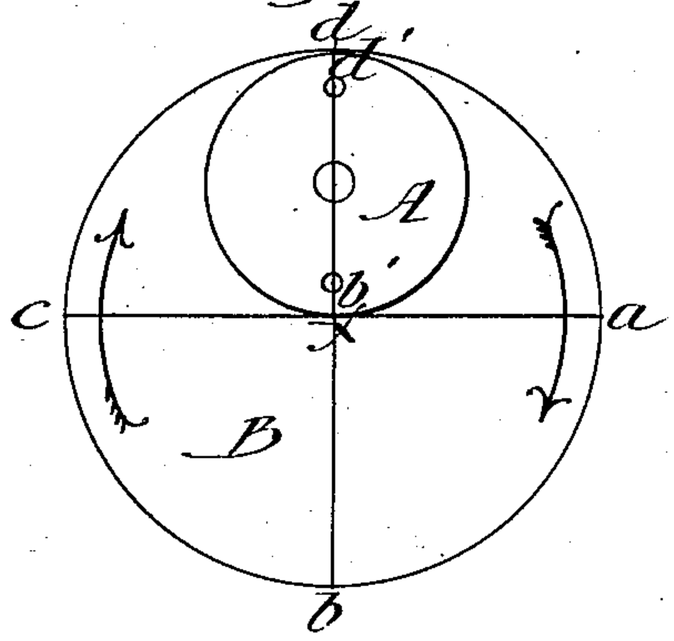


Fig. 6.

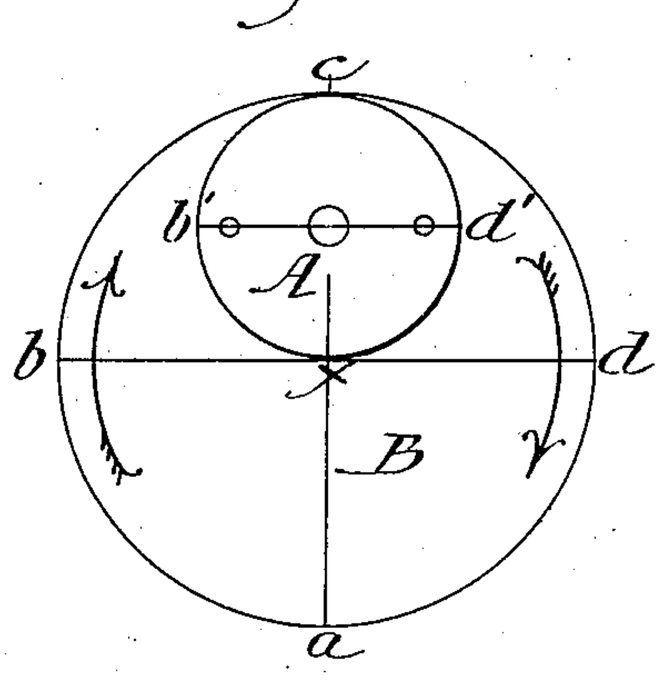


Fig. 7.

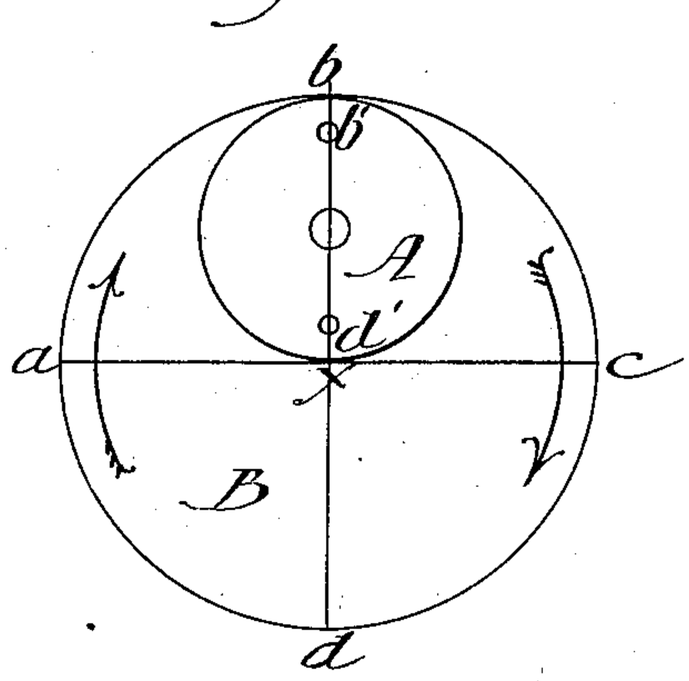
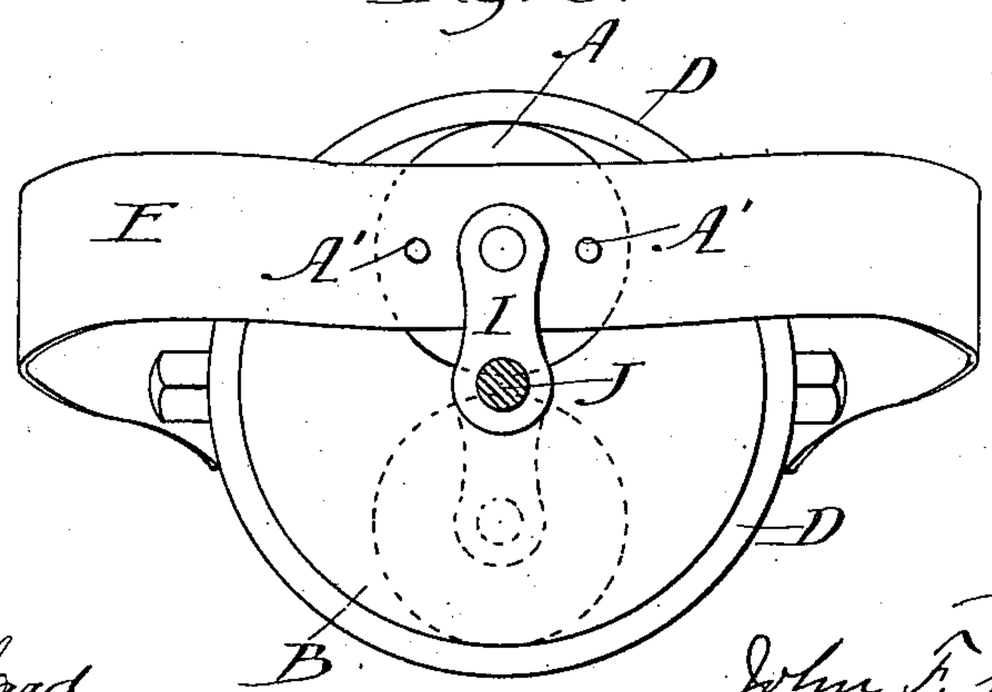


Fig. 8.



Witnesses:
Frank L. Blanchard
Bellw Evans.

Inventor:
John F. Byington
By L. W. Hopkins
Attorney.

UNITED STATES PATENT OFFICE.

JOHN FLETCHER BYINGTON, OF BATTLECREEK, MICHIGAN, ASSIGNOR TO F. A. HARDY & CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

MACHINE FOR GRINDING LENSES.

SPECIFICATION forming part of Letters Patent No. 710,180, dated September 30, 1902.

Application filed December 30, 1901. Serial No. 87,687. (No model.)

To all whom it may concern:

Be it known that I, JOHN FLETCHER BYINGTON, a citizen of the United States, residing at Battlecreek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Machines for Grinding Lenses, of which the following is a specification.

A machine embodying the invention may be used for grinding lenses of all characters; but it is particularly adapted for grinding Toric and other lenses having a compound curvature. It is well understood in the art that in grinding a lens of this character it is necessary to maintain the lens being ground and the grinding-tool in such relations to each other that the corresponding axes of the lens and the tool will at all times be parallel with each other. I am aware that I am not the first to provide a lens-grinding machine capable of producing this result and would therefore have it understood that the object of my present invention is to provide a machine for this purpose of simpler construction and fewer parts than any machine for a similar purpose known to me.

To this end the invention consists in the features of novelty that are hereinafter described with reference to the accompanying drawings, which are made a part of this specification, and in which—

Figure 1 is a perspective view of a machine embodying the invention. Fig. 2 is a plan view of the principal working parts thereof. Fig. 3 is a section thereof. Figs. 4 to 7, inclusive, are diagrams showing the relations of the two coöperating grinding-tools at four equidistant points during one complete revolution of said tools. Fig. 8 is a view of a modification.

A and B are respectively the upper and lower coöperating grinding-tools, which are technically known in the art as the "block" and the "lap," respectively; but I desire to have it understood that so far as the present invention is concerned these parts may be considered simply as two coöperating grinding devices, regardless of their specific characteristics. The lap is suitably attached to a revoluble chuck C, which latter is supported by a spindle driven by any suitable means, so that the tool B is revolved about its longitudinal axis *x*.

The chuck C supports and carries with it a gimbal-ring D, which is capable of oscillating upon pivots D′, that engage the chuck C at diametrically opposite points. The gimbal-ring carries a yoke E, which extends completely over the block and lap and is provided near its center with perforations *e* for receiving stems A′, that project upward from the block, so that when said stems occupy the perforations *e* the block will be held in fixed relation to the lap, so far as the parallelism of their corresponding transverse axes is concerned. In other words, the yoke E so connects the block and lap that parallel lines cutting them diametrically will under all conditions remain parallel. This will be more fully understood by reference to Figs. 4 to 7, inclusive, in which the block and lap are shown in the positions which they occupy at four differents points during one complete revolution of the chuck.

Referring first to Fig. 4, it will be observed that the diameter *d′ b′* of the block (which is here shown as passing through the studs A′) is parallel with the diameter *d b* of the lap, and this diameter *d b* may be taken as indicating also the pivotal axis of the gimbal-ring D. When the chuck shall have made a quarter-revolution, the parts will be in the positions indicated in Fig. 5. Here the diameters *d b* and *d′ b′* are still parallel, indicating that each has made a quarter-revolution about its axis of rotation. When the chuck shall have made another quarter-revolution, the block and lap will be in the positions indicated in Fig. 6. The third quarter-revolution will bring them to the positions indicated in Fig. 7, and the fourth quarter-revolution will bring them back to the positions indicated in Fig. 4. From this it will be observed that throughout the entire revolution corresponding diameters or transverse axes of the block and lap maintain their parallelism with each other, and the lens being fixed to the block it follows that its relation to the lap will be similarly maintained. So far as these operations are concerned it is immaterial whether the axes of rotation of the block and lap be coincident or not. If

they are coincident, there will be no grinding action. In order to produce the grinding action, the block is held with its axis of rotation at one side of the axis of rotation of the lap. Preferably the entire block lies upon one side of the axis of rotation of the lap and is there maintained by a stud F, which passes through an opening *e'* in the yoke E and enters a depression in the top of the block, said stud being in turn carried by a hand-lever G, universally jointed to a support H, so that it may be moved laterally in any direction.

If the movements diagrammatically indicated in Figs. 4 to 7 are followed, it will be seen that the block, while, in fact, held against any movement toward or from the center of the lap, nevertheless has a movement relatively to the sides of the yoke E, or, to state it more accurately, the sides of the yoke E are constantly moving toward and from the block, and in order to permit this and at the same time allow the block to be held by the stud F the yoke is made of a plate-spring.

It is manifest that the same ultimate results would follow if the lap were allowed to remain at rest and the block were carried through a circular course around the center of the lap, as by a crank I, carried by a shaft J, driven by some suitable means; but in this event neither tool would revolve about its own axis.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a lens-grinding machine, the combination with two coöperating grinding-tools and means for rotating one of them, of means for preventing the tools from revolving about their respective axes, independently of each other, said means including a yoke engaging one of said tools and a pivotal support for the yoke, permitting it to oscillate relatively to the other tool, substantially as described.

2. In a lens-grinding machine, the combination with two coöperating grinding-tools and means for rotating one of them, of means for preventing the tools from revolving about their respective axes, independently of each other, said means including a spring-yoke engaging one of the tools and a pivotal support for the yoke, permitting it to oscillate relatively to the other tool, substantially as described.

3. In a lens-grinding machine, the combination with the block and lap and means for rotating one of them, of means for preventing them from revolving about their respective axes, independently of each other, said means including a yoke engaging the block, a gimbal-ring carrying the yoke, and a pivotal support for the gimbal-ring, whereby the yoke is permitted to oscillate relatively to the lap, substantially as described.

4. In a lens-grinding machine, the combination with the block and lap and a revoluble chuck carrying the lap, of means for preventing the block and the lap from revolving about their respective axes, independently of each other, said means including a yoke engaging the block, said yoke being pivotally supported by the chuck whereby it may oscillate relatively to the lap, substantially as described.

5. In a lens-grinding machine, the combination with the block and lap and a revoluble chuck carrying the lap, of means for preventing the block and the lap from revolving about their respective axes, independently of each other, said means including a spring-yoke engaging the block and extending downward upon opposite sides of the lap, said yoke being pivotally supported by the chuck whereby it is permitted to oscillate relatively to the lap, substantially as described.

6. In a lens-grinding machine, the combination with the block and the lap and a revoluble chuck carrying the lap, of means for preventing the block and the lap from revolving about their respective axes, independently of each other, said means including a spring-yoke engaging the block and extending downward upon opposite sides of the lap, and a gimbal-ring supporting the yoke, said gimbal-ring being, in turn, pivotally supported by the chuck whereby the yoke is permitted to oscillate relatively to the lap, substantially as described.

JOHN FLETCHER BYINGTON.

Witnesses:

GEORGE E. JUDD,

LYCURGUS MCCOY.