G. A. SQUIER.

MACHINE FOR TRUING LENS GRINDING DISKS.

APPLICATION FILED OCT. 1, 1917.

1,384,643. Patented July 12, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

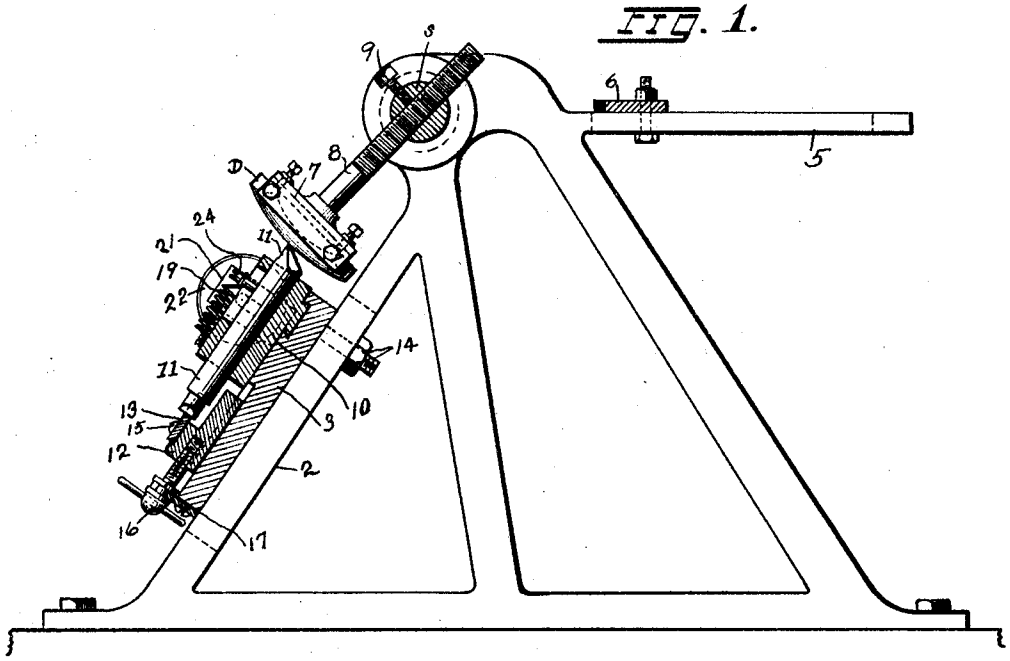

Fig. 2.

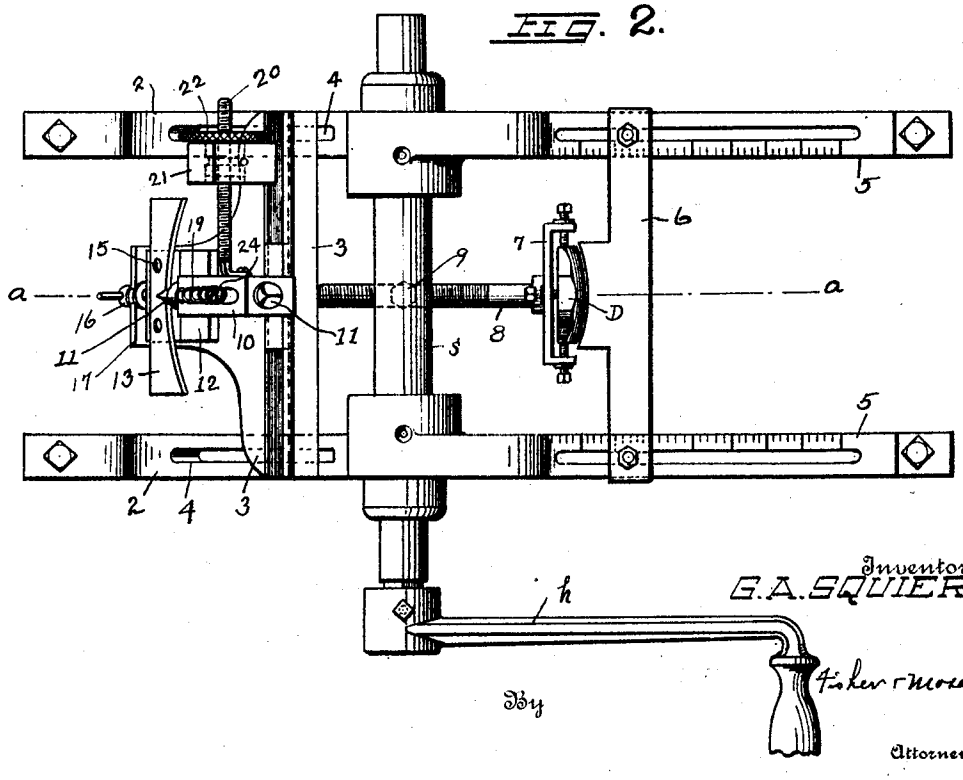

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FIG. 3

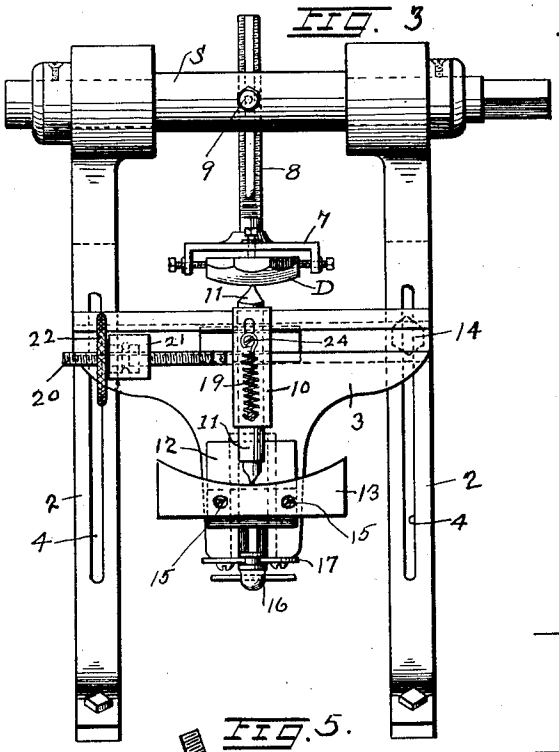


FIG. 4.

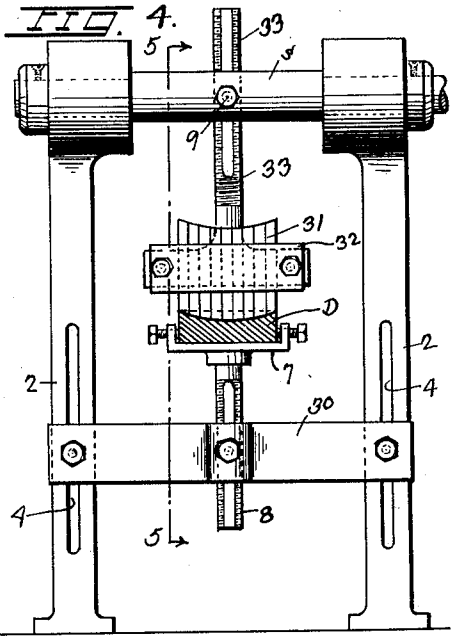


FIG. 5.

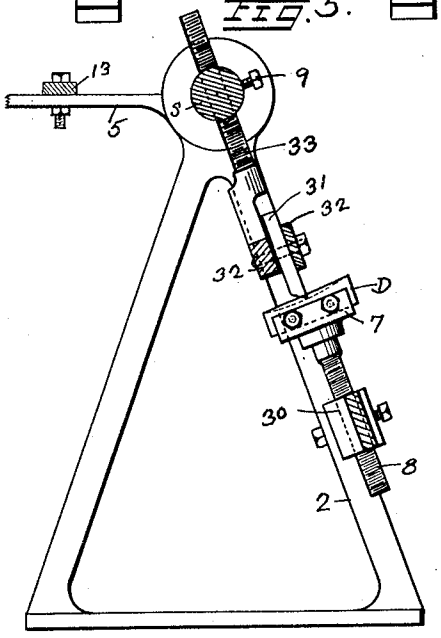
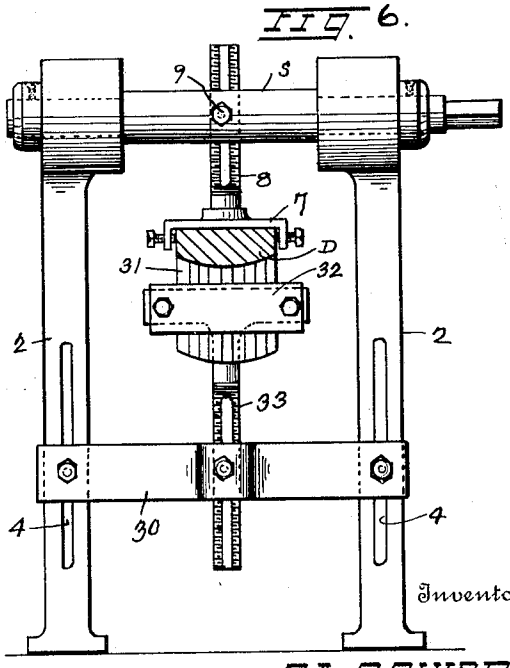


FIG. 6.



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UNITED STATES PATENT OFFICE.

GEORGE A. SQUIER, OF CLEVELAND, OHIO.

MACHINE FOR TRUING LENS-GRINDING DISKS.

1,384,643. Specification of Letters Patent. Patented July 12, 1921.

Application filed October 1, 1917. Serial No. 194,141.

To all whom it may concern:

Be it known that I, GEORGE A. SQUIER, citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Machines for Truing Lens-Grinding Disks, of which the following is a specification.

This invention pertains to a machine for truing lens grinding disks, and the object of the invention is to provide an improvement by which opticians shall be enabled to true their own disks and grind lenses with more ease, rapidity and exactness than has hitherto been possible and with a very material reduction in the time and patience required heretofore to do the work.

As to the former practice and upon which the present invention is an improvement, it may be noted that the method generally employed, for lack of something better, requires the use of metal disks, and which, when received from the manufacturer, carry a given curvature on their surface based upon the index of the refraction of the glass to be ground upon it. These disks, when received by the optician, are as perfect as mechanical means can make them, but after being used in grinding the glasses they lose their exactness of curvature due to the abrasive substance employed therewith to form the curve upon the glass.

It is also a well known fact to most if not all of the wholesale and retail optical establishments which make a practice of grinding lenses, that they have no accurate way of retruing the metal disks when they have lost their original or manufacturer's curvature.

In the use of these disks the common practice is or has been to measure the curves upon the disk by templet gages, which are obtained from the disk manufacturers. These gages will show any deviation from the exact curvature required on the disk, and any high or low places being noted, the workman then proceeds with a file or piece of carborundum to reshape as nearly as possible to the original curvature. Obviously this in an unsatisfactory and very tedious and inaccurate method of doing or trying to do what was originally done on a lathe. It is said, and known to be a fact, that there are many thousands of lenses being turned out from grinding plants that are not absolutely exact as to curvature and therefore cannot be true to the focus intended, and yet are made to pass as perfect. This goes back to the fact that there is no way known to keep these disks true to curvature, and the only known remedy is to return them to the manufacturer to reshape them as originally. This, of course, involves expense and delay, and the necessity of carrying extra sets of disks for use while the others are being retrued.

The present invention is designed to avoid the objections inherent in the methods and means hitherto practised and for the most part as above set forth, and to provide a simple, inexpensive and efficient machine whereby lens grinders shall be enabled to retrue toric cylinders, flat cylinders and spherical disks to the accuracy of their original curvature, thereby insuring a perfect lens by having a perfect disk to grind it upon.

In the accompanying drawings, Figure 1 is a sectional elevation of the machine in one of its preferred forms and taken on line *a*—*a*, Fig. 2. Fig. 2 is a plan view of the machine shown in Fig. 1, but with the disk holder swung around to the rear. Fig. 3 is a front elevation of the machine. Fig. 4 is an elevation partially in section of a modification of the machine, and Fig. 5 is a section on line 5—5, Fig. 4. Fig. 6 is an elevation of the machine as shown in Figs. 4 and 5, but with the tool and its coworking part in reverse position as compared with Fig. 4.

As thus shown in Figs. 1, 2 and 3, the invention consists of a frame having two upright side portions 2 and adapted to be firmly fixed on a suitable base machine, and certain cross parts here and there connect these members, as the turned steel shaft *s* having its bearings in the top thereof and provided with a driving pulley for power or a hand crank *h*, as desired. In addition, a table 3 is shown in Figs. 1, 2 and 3, as slidably mounted in the slots 4 in the frame by suitable means and adapted to be adjusted up and down as the operations of the machine may require.

The said upright sides or members 2 of the frame each carry an arm 5 that extends outward horizontally at the rear thereof and serve together as a support for gage bar 6. The said bar has a straight edge and is adjustable at its ends in longitudinal slots in said arms and adapted to give a quick

and accurate measurement of the circle in which the disk D is to travel in its rotation or swing about the axis of shaft *s* in Fig. 2. The said disk is removably supported or clamped in a head 7, which has a screw stem 8 adjustably engaged in a bore through shaft *s* and locked when adjusted by a set screw 9 entering a longitudinal groove in said stem.

The so-called table or member 3 carries the cutting tool holder 10, the tool 11 therein and the templet gage holder 12 carrying the templet 13. Each one of these parts is separately adjustable. Thus, the table 3 is secured to the two inclined upright sides 2 of the fixed frame by a threaded pin or bolt 14 at each end which extends down through the slots 4 in the said sides, and the templet gage holder 12 is provided with two threaded holes which admit the two cap screws 15 which pass through the templet and securely fasten the same to the holder. The said holder 12 is secured to the table 3 by a male dovetail and adapted to slide up and down therein under control of a thumb screw 16 which passes through the holder and turns in a plane 17 suitably fastened to the lower edge portion of the table.

The table 3 also is provided with a transverse dovetail groove in its upper portion, and the cutting tool holder 10 has a correspondingly shaped tongue engaged in said groove and adapted to travel therein back and forth across the table under adjustment while the tool 11 is at work. Movement of the said holder is controlled by a feed screw 20 secured thereto at one end and which runs back through a threaded block 21 swiveled to the table, and on the outside of this block a hand or star wheel 22 is engaged on said screw and serves to turn the same and adjust or move the cutting tool holder as required. The said holder is also provided with a round bore centrally in which the cutting tool is located and with its ends exposed as shown. The top of the tool holder has a longitudinal slot, and a pin 24 fixed to the cutting tool passes up through this slot and a strong spiral spring 19 is affixed to said pin while the opposite end is attached to the holder, thus tending to pull the cutting tool backward and keep its lower end in constant contact with the templet gage 13, which backs the tool in its work. It will be readily seen that by these means different curves can be readily cut upon the horizontal sections of the disks D by simply changing the templet gages; also that any given curve can be had in the vertical or right angle by the rotation of the disk in shaft *s*.

The foregoing construction and arrangement of parts is employed when the machine is used for cutting or truing disks which have convex curvature and a single cutting tool is used. Modifications of this are shown in Figs. 4, 5 and 6. Thus, as a means for cutting or truing concave disks, I have provided for disposition of the parts as seen in Figs. 4 and 5, and for truing a convex disk an arrangement as seen in Fig. 6. In Figs. 4 and 5, as also in Fig. 6, I employ a battery or series of cutting tools 31, which are first set side by side in the head 32 to the desired curvature by means of a templet gage applied by hand or as may be done in Figs. 4 and 5 by substituting such gage for the cross bar 6 or arms 5. The said tools are then firmly clamped together in the head 32 and ready for work. In Figs. 4 and 5 the said holder is supported from shaft *s* by a stem 33, but in Fig. 6 the parts are in reversed positions, and the disk D is hung from shaft *s* while the cutters or tools with the head 32 and stem 33 are supported from a cross bar 30 fixed on the main frame, and as also seen in Fig. 4. By setting the disk D at a given distance from the center of shaft *s* and the battery of cutting tools to a given curve and then rotating the shaft the said tools will be brought into contact with the disk and cut two distinct curves upon its surface, one being at right angle to the other and at any other angle blending the two curves and forming what is known as the toric curve.

In Figs. 4 and 5 the cutters 31 are supported from shaft *s* and set in convex cutting formation to cut a concave surface, while in Fig. 6 the cutters are supported from cross-bar 30 and in concave cutting formation to cut a convex surface. Thus, in Figs. 4 and 5 the cutters 31 are adapted to be rotated from shaft *s* and the stock to be cut is fixed, while in all the other views the stock is rotated and the cutters or tools are fixed.

No lateral feed is required when a battery or multiple series of tools is employed, and setting of the tools for both convex and concave formation is determined by a suitable templet as above described.

What I claim is:

1. In a machine as described, a cutting tool and a holder for stock to be cut, and a constantly rotating shaft having a transverse opening and one of said parts being provided with a stem extending through said opening and adjustably fixed therein, and the other of said parts being also mounted for adjustment toward or away from said shaft and movable in an arc having the axis of the shaft as a chord thereof.

2. A machine as described, having a rotatable shaft and a disk holder having a stem extending through said shaft and adapted to be rotated with the plane of the disk describing an arc movement about the shaft, and means to cut the surface of said disk adjustably affixed to the main frame of the

machine at one side of the shaft and movable in an arc transversely to the path of the disk holder.

3. A machine as described, having a rotatable shaft and a device adjustably affixed to said shaft and adapted to hold the stock to be cut at varying distances from the axis of the shaft, and adjustable means on the frame of the machine adapted to gage the distance at which the stock is to be set away from the axis of said shaft.

4. A machine as described, having a rotatable shaft and a stock support having a stem extending through said slot and rotatable therewith, and adapted to hold the stock at varying distances from the axis of the shaft, a slotted frame, cutting means and a holder therefor adjustably fixed to the slotted frame of the machine and movable in an arc across the path described by the stock in said support.

5. In a machine as described, a shaft and a disk holder adjustably fixed thereon adapted to set a disk at varying distances from the axis of said shaft, a tool holder adjustable on the frame of the machine opposite said disk holder, and a templet adapted to fix the working position of the tool at varying distances from the axis of the shaft.

6. In a machine as described, spaced uprights, a shaft and a stock holder thereon mounted between said uprights, a stem engaged with said shaft to adjustably set the stock at varying distances from the shaft to describe arcs of different radii, a table adjustable on the frame of the machine in a direction toward the axis of the shaft and a tool holder adjustable in said table and means adapted to impart an arc travel of the tool obliquely to the arc movement of the stock holder.

7. In a machine as described, a frame and a rotatable shaft therein and a table adjustable thereon in respect to said shaft, a tool holder laterally adjustable on said table on parallel lines with said shaft, and a templet to fix the working position of the tool relatively to the axis of the shaft, and means adapted to adjustably place said templet at varying distances from the axis of the shaft.

8. In a machine as described, a frame having inclined sides, a table adjustable thereon and a tool holder laterally adjustable on said table and provided with a bore to support a tool therein, and an adjustable abutment for the tool comprising a templet adapted to engage the end of the tool.

9. In a machine as described, a frame having inclined sides, a table adjustable up and down on said sides and a tool holder laterally adjustable on said table, in combination with a rotatable shaft, a disk support having a screw stem adjustably mounted in said shaft, and means to fix the working relations of said support and said tool holder respectively.

Signed at Cleveland, in the county of Cuyahoga, and State of Ohio.

GEORGE A. SQUIER.