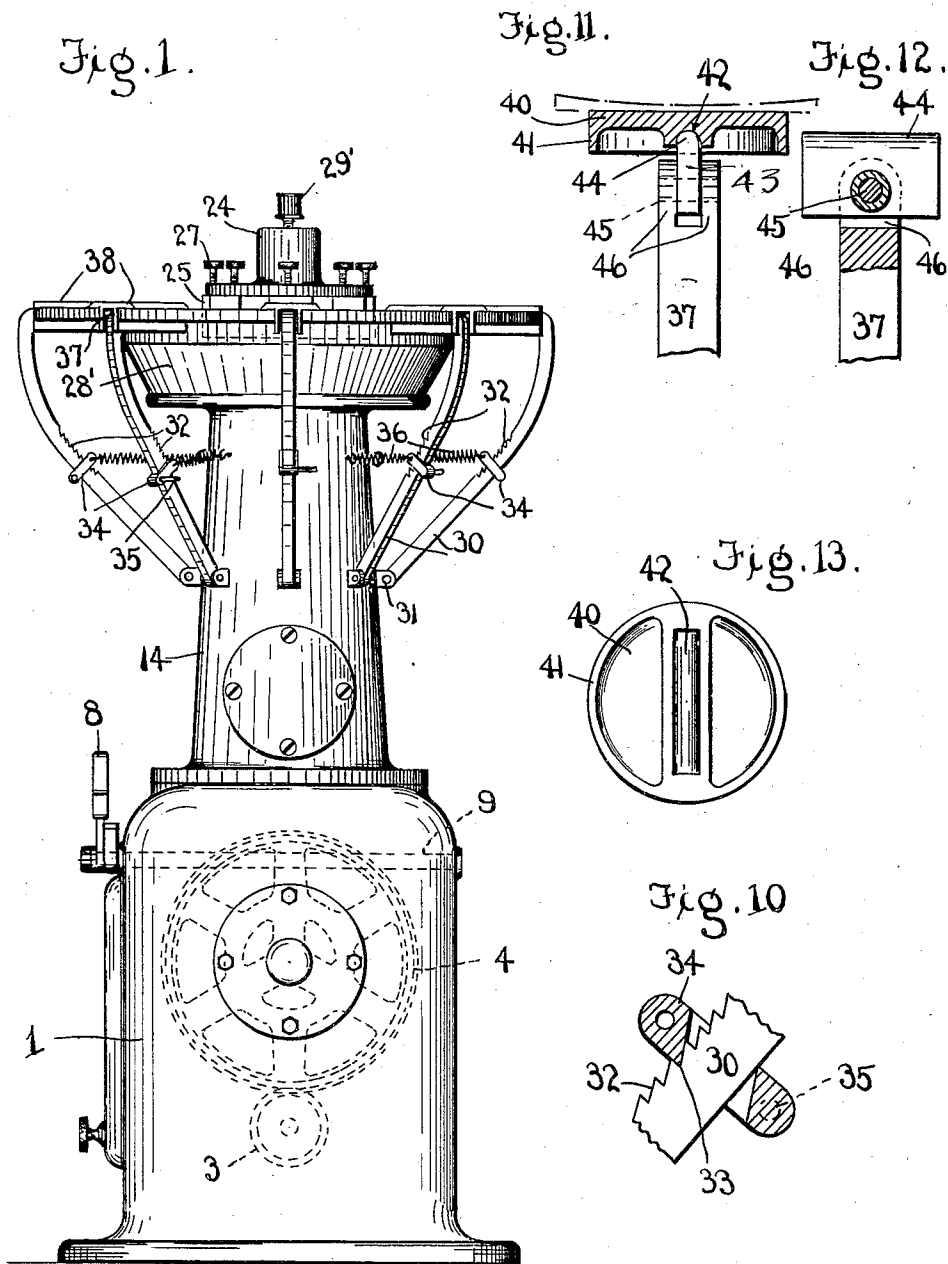


E. O. MATTERN.
TORIC LENS GRINDING MACHINE.
APPLICATION FILED OCT. 3, 1912.

1,065,154.

Patented June 17, 1913.

3 SHEETS-SHEET 1.



WITNESSES:

L. B. James

W. K. Lamm

INVENTOR

E. O. Mattern

by H. B. Willson & Co.
ATTORNEYS

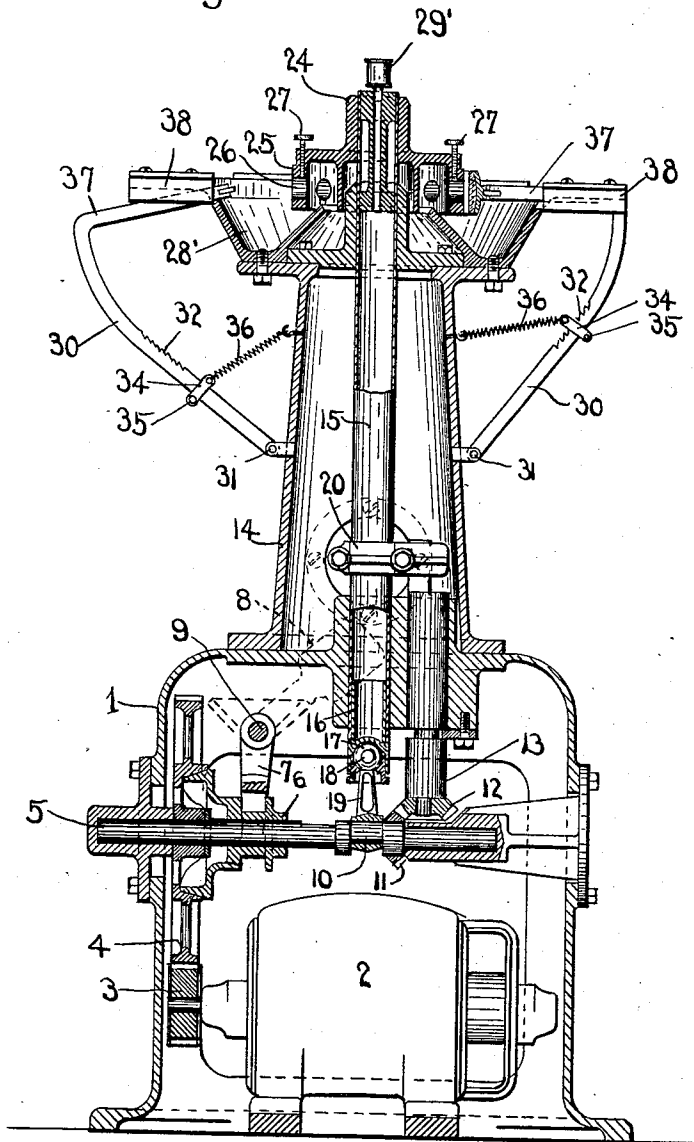
E. O. MATTERN.
TORIC LENS GRINDING MACHINE.
APPLICATION FILED OCT. 3, 1912.

1,065,154.

Patented June 17, 1913.

3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

L. B. James
N. L. Collamer

INVENTOR.

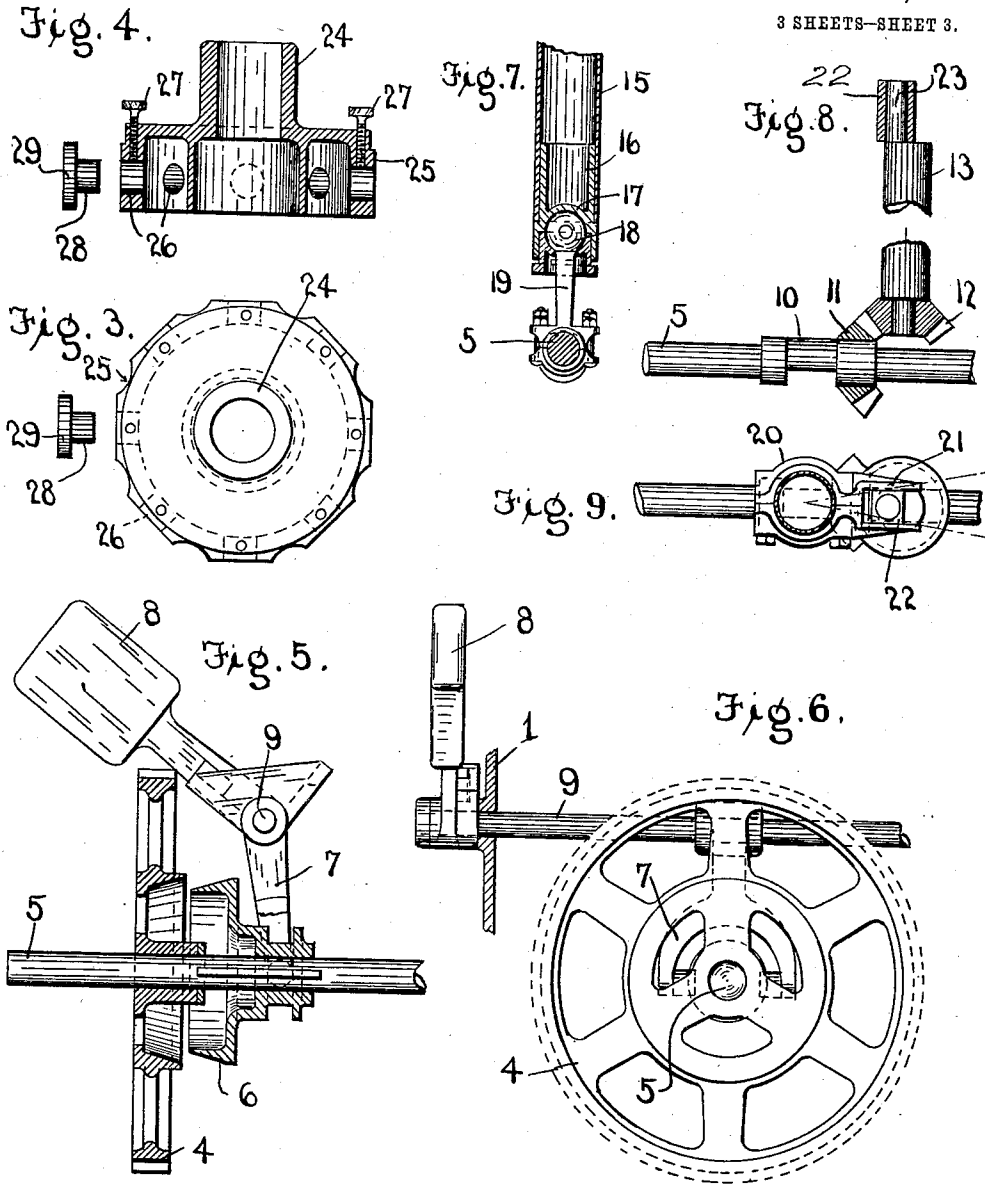
E. O. Mattern
by *A. B. Willson & Co*
ATTORNEYS

E. O. MATTERN.
TORIC LENS GRINDING MACHINE.
APPLICATION FILED OCT. 3, 1912.

1,065,154.

Patented June 17, 1913.

3 SHEETS—SHEET 3.



WITNESSES:

L. B. Jamel
M. L. Collamer

INVENTOR.

E. O. Mattern
by *A. B. Willson & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE.

ERNEST OTTO MATTERN, OF PORTLAND, OREGON, ASSIGNOR OF ONE-HALF TO OTTO
HENRICHSEN MATTERN, OF PORTLAND, OREGON.

TORIC-LENS-GRINDING MACHINE.

1,065,154.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed October 3, 1912. Serial No. 723,808.

To all whom it may concern:

Be it known that I, ERNEST O. MATTERN, a citizen of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Toric-Lens-Grinding Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the class of grinding and polishing, and more especially to those machines which operate on glass; and the object of the same is to produce a grinding machine particularly adapted to act on a number of toric lenses simultaneously.

To this end the invention consists in the construction hereinafter more fully described and claimed, and as shown in the drawings wherein—

Figure 1 is a side elevation and Fig. 2 a central vertical section of this machine complete. Fig. 3 is a plan view and Fig. 4 a central vertical sectional view of the head, with one of the laps slightly removed therefrom. Fig. 5 is an enlarged sectional detail of the clutch mechanism, and Fig. 6 is a side elevation thereof. Fig. 7 is a vertical section through the lower end of the main shaft, showing the peculiar connection between it and the power shaft by means of which the rotation of the latter causes the vertical reciprocation of the former. Fig. 8 is a side elevation of the mechanism for causing the oscillation of the main shaft, the gears being shown in section; and Fig. 9 is a horizontal section through the main shaft with a plan view of the oscillating mechanism. Fig. 10 is an enlarged detail of one of the dogs referred to hereinafter. Figs. 11, 12 and 13 are enlarged details of the disk and its connection with the inner end of the upper arm of the workholder.

In the drawings the numeral 1 designates a hollow base within which in the present instance is mounted a motor 2 whose shaft is connected by gears 3 and 4 with the power shaft 5, through the instrumentality of a clutch 6 which is moved to its extreme open or closed position by a lever 7 standing on the outside of the base and within reach of the operator, and held at either extreme position by a weight 8 pivoted at 9 to said

lever as best seen in Figs. 5 and 6. Within the base said power shaft 5 is cranked at 10, and carries a gear 11, the latter meshing with another gear 12 at the lower end of an upright shaft 13 which is part of the mechanism that produces the horizontal oscillation of the head as described below.

Supported by the base is a hollow standard 14 having bearings in which is mounted the main shaft 15. As seen in Fig. 7 said main shaft is preferably tubular, and within its lower end is secured a plug 16 having a socket 17 wherein works a ball 18 at the upper end of a pitman rod 19, the lower end of the latter being connected with the crank 10 on the power shaft so that rotation thereof causes the vertical reciprocation of the main shaft 15. On the latter is secured a clamp 20 (see Fig. 9) carrying a horizontally projecting fork 21 between whose arms moves a block 22 mounted upon a crank pin 23 which rises from the upper extremity of the upright shaft 13; and when the intermeshing gears 11 and 12 cause the rotation of this shaft, its crank pin 23 moves the block 22 around in a circle, which movement is communicated through the fork 21 to the outer end of the clamp 20 and by the latter to the main shaft 15 which is therefore oscillated on a horizontal plane at the same time that it is vertically reciprocated by the mechanism best seen in Fig. 7. It is the joint use of these two movements, communicated to the head and to the laps or grinding devices yet to be described, which effects the grinding of the pieces of glass carried by the disks, also yet to be described, in a rapid, economical, and perfect manner, and within full sight and ready reach of the operator, as will be seen.

The head 24 best seen in Figs. 3 and 4 is secured upon the upper end of the main shaft 15 by any suitable means not necessary to illustrate, and has a depending annular flange 25 pierced with openings 26 which are radial to the head and transversely intersected by set screws 27 so that the shanks 28 of the laps 29 may be mounted therein and be adjustable in various ways, or that differently-shaped laps may be substituted when desired. The flange 25 of the head is extended to some distance radially outward from the axis of the main shaft, and beneath the wearing faces of the various laps carried by such flange is a V-shaped annu-

lar gutter or trough 28', mounted upon the standard 14, for catching the grindings and the emery water and trapping the same so that no part of it can get into the moving parts of the machine and to its various bearings. The main shaft 15 is by preference extended upward completely through the head 24, and its upper extremity may have an oil-cup 29' or other device for feeding lubricant to and throughout the length of the interior of the main shaft and thence to the moving parts which are mostly located within the base 1.

The work-holders are alike and therefore a description of one will suffice for all; in the present instance I have shown a machine capable of acting on eight lenses simultaneously, and therefore there are eight work-holders. Each consists of a supporting bar whose lower arm 30 is pivoted at 31 to the outside of the standard 14 at about the mid-length of the latter and leads obliquely outward and upward away from said standard, its inner face being notched as shown at 32 to receive the sharp inner edge 33 of a dog 34 (see Fig. 10) whose body loosely surrounds said lower arm and carries a handle 35 and whose inner end is connected by a contractile spring 36 with the standard at a point above the pivot 31. It follows from the use of this dog that by grasping its handle and tilting it slightly, its sharp inner edge 33 may be disengaged from the teeth or notches 32 and the dog adjusted higher or lower so as to increase or diminish the tension of said spring 36. In Fig. 2 I have shown one of the supporting bars as drawn inward by this spring, whereas that to the left of the figure is permitted to swing outward because the dog has been slipped downward on the lower arm 30 so that the only function remaining to the spring in this instance is to hold the bar about as shown. The upper arm 37 of each supporting bar extends from the upper end of the lower arm straight inward through a slotted guide 38 supported by the head 24 and preferably carried by the outer edge of the trough 28' as shown; and the inner extremity of this upper arm 37 carries the lens-holding disk best seen in Figs. 11, 12 and 13. The disk has a round body 40 with a surrounding flange 41 and a transverse groove 42 across its rear face; and 43 is a rocking knuckle whose outer end is rounded as at 44 to rest within the groove 42 and whose body is pivoted as at 45 in a fork 46 at the extremity of the upper arm 37 of said supporting bar. The pivot pin 45 stands vertical when the supporting bar is raised into active position as seen at the right of Fig. 2, and therefore the knuckle may move slightly in a horizontal plane; whereas the length of the groove 42 and the rounded end 44 engaging it stand in a plane at right an-

gles to the axis of the pivot 45, and therefore the disk 40 may move in a vertical plane. This form of universal joint and the support therefor, I consider of especial advantage in a machine of this character, because at any time the operator may move any supporting bar backward against the tension of its spring 36, lift the disk 40 off the rounded outer end 44 of the rocking knuckle 43, and examine the lens being ground. As well known to those who are expert in this line of business, the piece of glass which is to be converted into a lens is cemented or secured to the face of the disk 40 in any suitable way, and after the exposed face of such piece of glass has been ground to the proper curvature, according to the shape of the grinding face of the lap 29 which is employed, it is removed from the face of the disk and its other side ground in any shape and to any radius desired.

The action of this machine is as follows: When the motor is started, power is communicated to the driving shaft 5, and through the mechanism above described is conveyed to the main shaft 15 which is caused to rise and fall rapidly during its vertical reciprocation and to turn to the right and then to the left rapidly during its horizontal oscillation. Thereby is imparted to the head and by the head to the various laps, a compound movement which I have found to be extremely useful in grinding lenses. I would employ intermesh-gears 11 and 12 having such number of teeth that the oscillations of the main shaft are not timed to correspond with its reciprocations, and therefore no point in the grinding surface of any lap will move over a strictly straight path across the face of any lens being ground. Assuming, for instance that the motor is sped up until the vertical reciprocations of the main shaft approximate six-hundred per minute, I would not have the horizontal oscillations thereof either six hundred per minute or any exact multiple of the same, and therefore the head will be turned in a horizontal plane either more or less rapidly than it is reciprocated in a vertical line. I consider the use of the dogs connecting the outer ends of the springs 36 with the lower arms 30 of the work-holders as a feature of this invention, inasmuch as they permit the instantaneous adjustment of said dogs along the arms to increase or diminish the tension of the springs so that the work is drawn more or less forcibly against the grinding surface of the laps, or—as shown at the left of Fig. 2—the dogs can be let downward on the lower arms of the work-holders so that their upper arms drop outward in the slotted guides 38, when the disk thereon can be removed and the lens being ground inspected, after which it can be instantly replaced and the tension of the spring restored to what it was before.

I would make the trough 28' rather deep and quite wide so that all particles ground off of the lens or chipped off of the lap, and more particularly the emery water used in grinding lenses, will drop into this trough and cannot flow to any working part of the machinery to its detriment. Otherwise the parts of this machine are of any desired sizes, shapes, proportions and materials, and changes in details may be made without departing from the principle of this invention.

What is claimed as new is:

1. In a lens grinding machine, the combination with an upright main shaft, and means for reciprocating it vertically and oscillating it horizontally; of a hollow standard inclosing said shaft and having bearings therefor, a lap-carrying head mounted on the shaft and having a flange depending from its periphery, an annular trough carried by the standard beneath said flange, and work-holders movably mounted on said trough.

2. In a lens grinding machine, the combination with an upright main shaft, and means for reciprocating it vertically and oscillating it horizontally; of a hollow standard inclosing said shaft and having bearings therefor, a lap-carrying head mounted on the shaft and having a flange depending from its periphery, an annular trough carried by the standard beneath said flange, slotted guides carried by the outer wall of said trough, supporting bars pivoted at their lower ends to said standard and having their upper ends moving through the slots in said guides, disks pivotally connected with their inner ends, and means for drawing said bars inward with yielding force.

3. In a lens grinding machine, the combination with an upright main shaft, and means for reciprocating it vertically and oscillating it horizontally; of a hollow standard surrounding said shaft, a lap-carrying head mounted on the upper end of the shaft, and a work-holder consisting of a supporting bar comprising a lower arm pivoted to said standard and an upper arm projecting from the upper end of the lower arm inward toward said head, a disk carried by the inner extremity of said upper arm, and means for drawing the lower arm inward with spring force to move the disk toward said lap.

4. In a lens grinding machine, the combination with an upright main shaft, and means for reciprocating it vertically and oscillating it horizontally; of a hollow standard surrounding said shaft, a lap-carrying head mounted on the upper end of the shaft, and a work-holder consisting of a supporting bar comprising a lower arm pivoted to said standard and an upper arm projecting from the upper end of the lower arm inward toward said head, a disk carried by

the inner extremity of said upper arm, the lower arm having ratchet teeth, a dog adjustably mounted on said arm and engaging said teeth, and a contractile spring connecting said dog with the standard.

5. In a lens grinding machine, the combination with a hollow base containing the driving mechanism including a horizontal shaft having a crank and a driving gear, a hollow standard rising from said base, and the work-holders carried by said standard; of an upright main shaft mounted in journals within said standard, a lap-carrying head secured to the upper end of said shaft, a pitman mounted on the crank of the power shaft, a ball-and-socket connection between the upper end of the pitman and the lower end of the main shaft, and means connected with said power gear for giving the main shaft an oscillation in a horizontal plane while said pitman gives it a reciprocation in a vertical line.

6. In a lens-grinding machine, the combination with a hollow base containing the driving mechanism including a horizontal shaft having a crank and a driving gear, a hollow standard rising from said base, and the work-holders carried by said standard; of an upright main shaft, a lap-carrying head secured to said shaft, a pitman mounted on the crank of the power shaft, a ball-and-socket connection between said pitman and main shaft, an upright shaft having a gear at its lower end meshing with said driving gear and a crank pin projecting from its upper end, a clamp secured to the main shaft and having a forked outer end, and a block slidably mounted within the fork and having an aperture through which the crank pin projects, for the purpose set forth.

7. In a lens-grinding machine, the combination with a hollow base containing the driving mechanism, an upright tubular standard mounted on said base, and the work-holders carried by said standard; of an upright main shaft mounted in said standard, a lap-carrying head secured to the upper end of said shaft, means connecting said shaft with the power shaft for reciprocating the main shaft vertically, a clamp secured to the main shaft and having a forked outer end, a block slidably mounted in said fork and pierced with an aperture, and an upright shaft journaled in said standard and having a gear at its lower end meshing with said power gear and a crank pin projecting from its upper end and engaging said aperture, for the purpose set forth.

8. A work-holder for lens-grinding machines comprising an arm forked at its extremity, a rocking knuckle pivotally mounted on an upright pin through the fork-arms and rounded at its outer end, the latter standing in a horizontal plane, and a disk

having a transverse groove in its rear face adapted to engage the rounded outer edge of said member; combined with the grinding mechanism, and means for pressing said
5 work-holder toward the same with yielding force.

9. In a lens-grinding machine, the combination with a hollow base containing the driving mechanism, a standard rising from
10 said base, and the work-holders carried by said standard; of an upright main shaft, a lap-carrying head secured to said shaft, means for reciprocating the main shaft, an upright shaft connected with said driving

mechanism and having a crank pin projecting from its upper end, a clamp secured to the main shaft and projecting radially therefrom, and a block slidably mounted on the clamp and having an aperture through which said crank pin projects, for the pur- 20
pose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ERNEST OTTO MATTERN.

Witnesses:

THOS. N. STRONG,
L. C. HENRICHSEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."