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LENS GRINDING MACHINE.

APPLICATION FILED JULY 21, 1910.

987,403.

Patented Mar. 21, 1911.

2 SHEETS—SHEET 1.

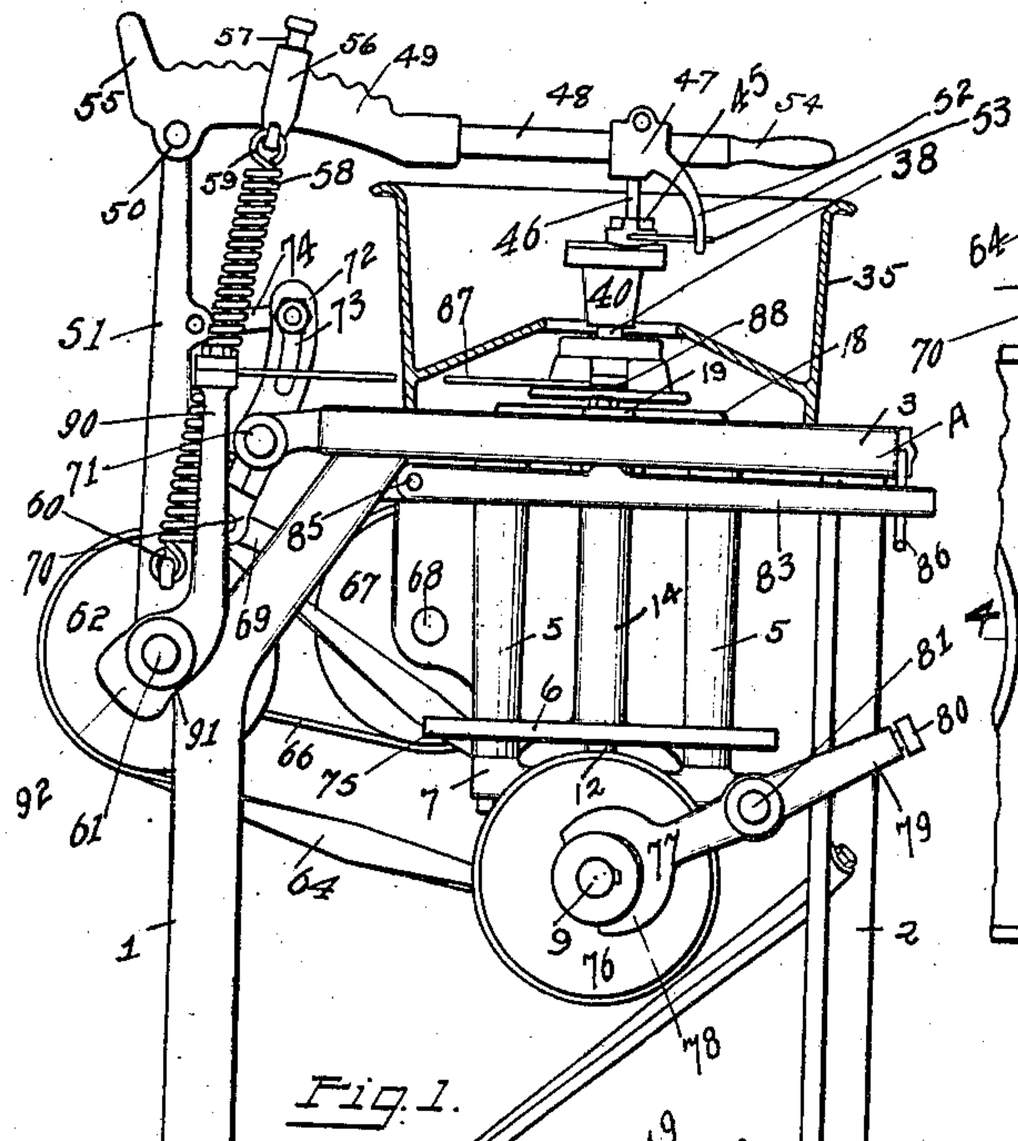

Fig. 1.

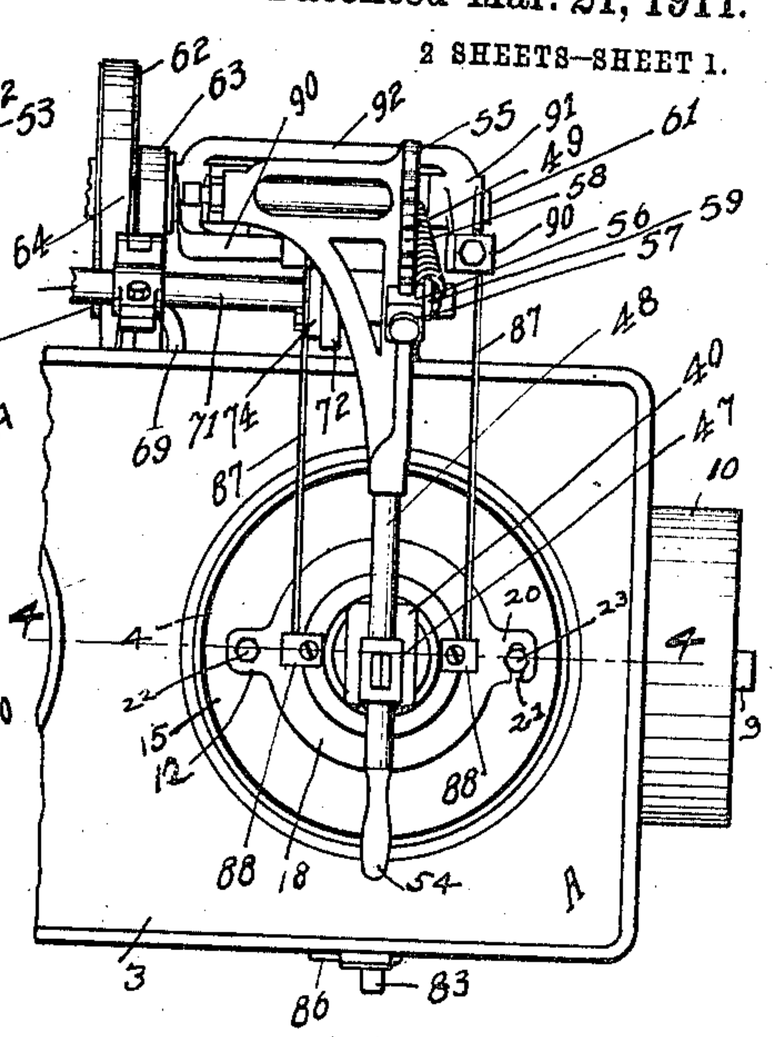

Fig. 2.

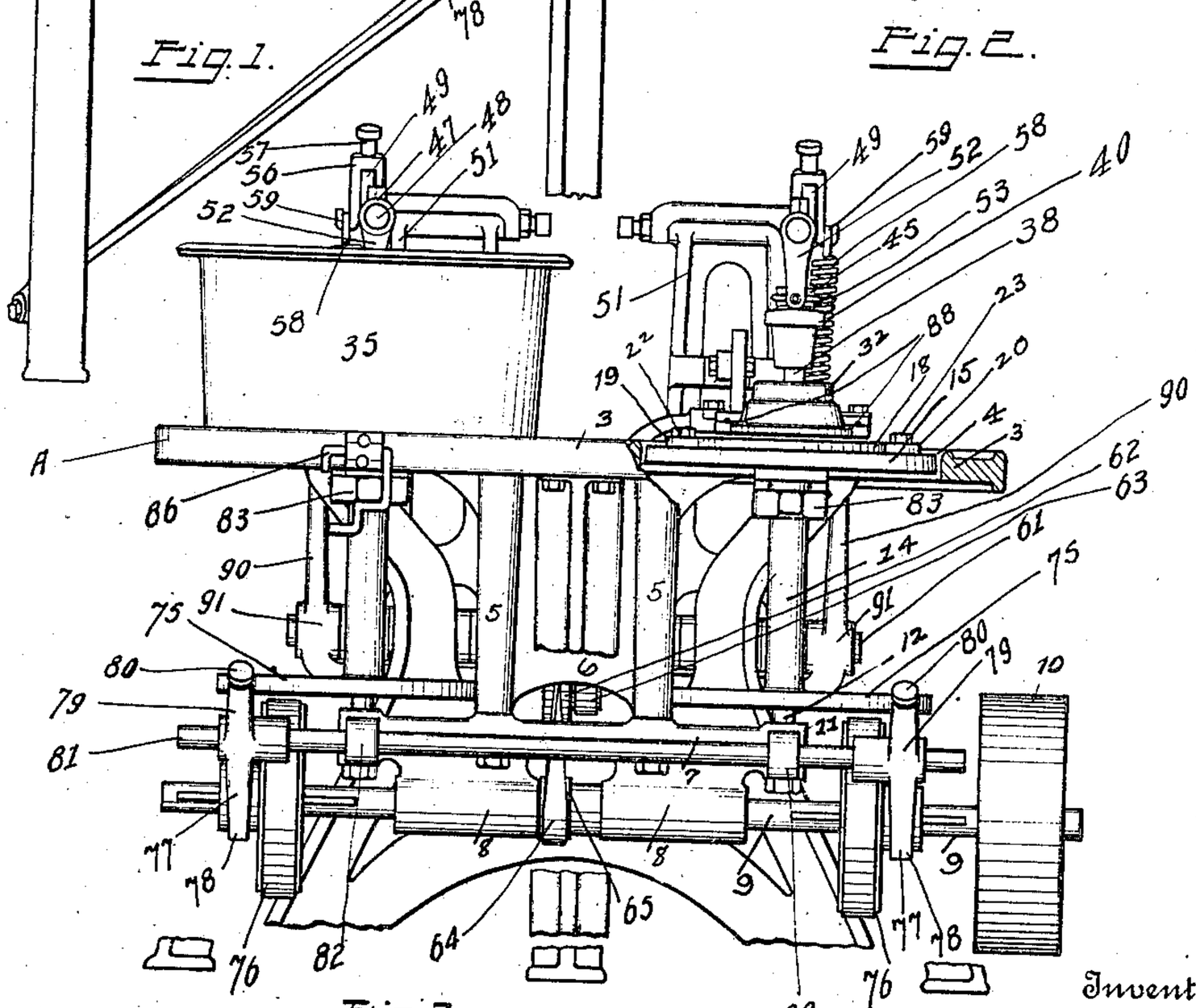

Fig. 3.

Witnesses

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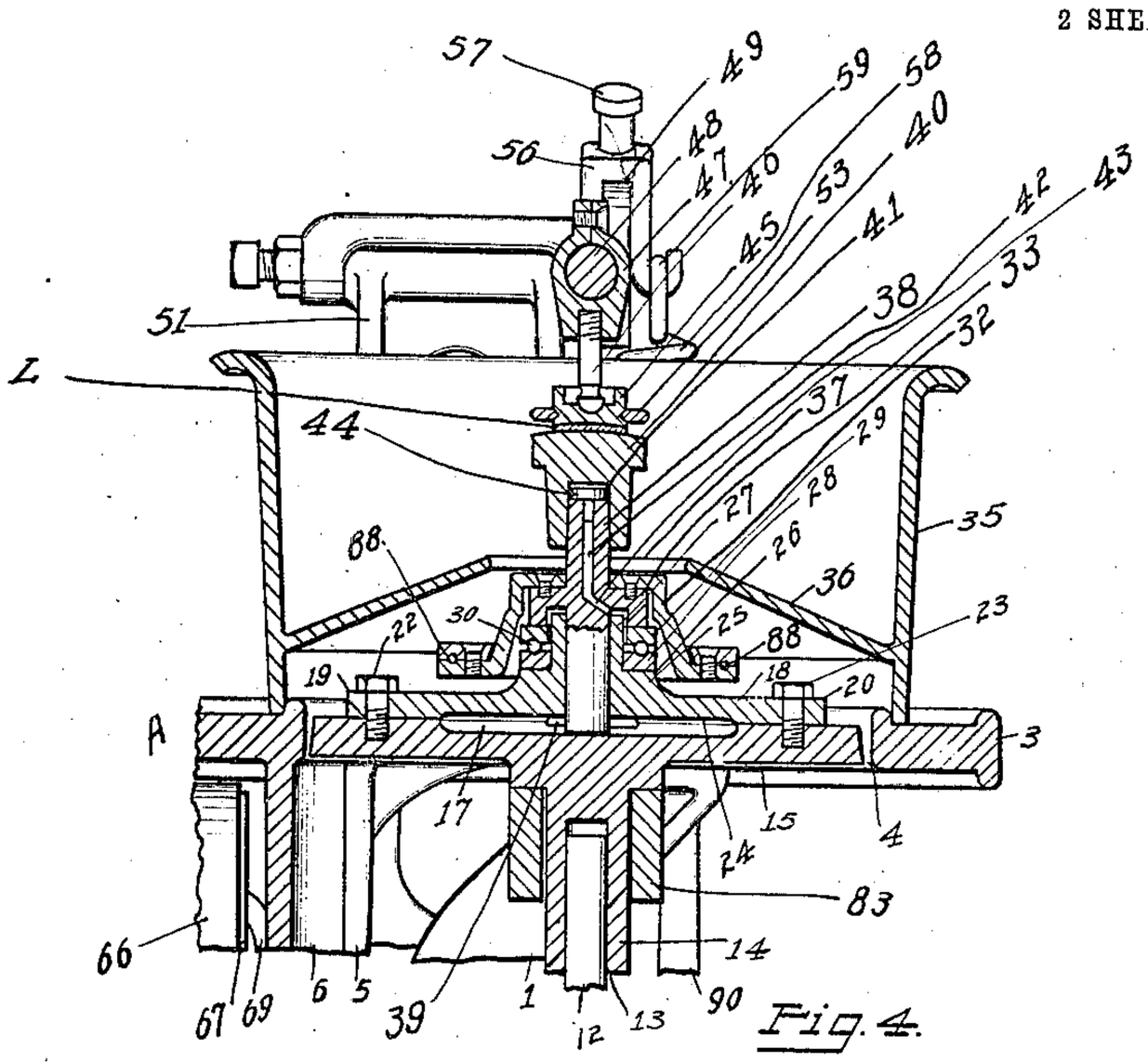

Fig. 4.

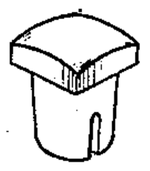

Fig. 5.

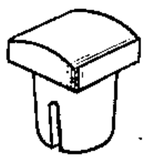

Fig. 6.

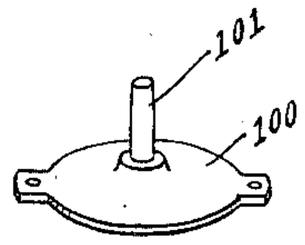

Fig. 7.

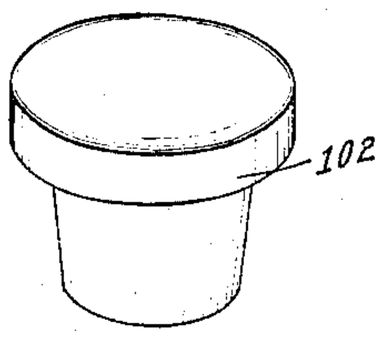

Fig. 8.

Witnesses

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LENS-GRINDING MACHINE.

987,403. Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed July 21, 1910. Serial No. 572,984.

To all whom it may concern:

Be it known that we, STILLMAN W. ROBINSON and ERDIS G. ROBINSON, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Lens-Grinding Machines, of which the following is a specification.

This invention relates to improvements in lens grinding machines, and has particular application to a machine of the character described, adapted for the grinding of either spherical, cylindrical, toric or other forms of lenses.

In the present instance, it is our purpose to provide an improved machine of simple, durable and reliable construction and one wherein means are provided for regulating the pressure between the lens block and the lap and for holding the lens block operating arm in an upright position when not in use.

A further object of our invention is to so construct the machine that the stroke of the lens block operating or carrying arm, may be adjusted according to the character of the work being done, and the device for tensioning the lens block, being capable of adjustment during the operation of the machine.

Still another object of our invention is to provide improved means for stopping and starting the lap by raising and lowering the lap supporting table; and for operating the lap.

A further object of our invention is to provide a machine whereby the lenses may be rapidly and accurately ground.

With these and other objects of a similar nature in view, our invention consists in the construction, combination and arrangement of parts set forth in and falling within scope of the appended claims.

In the accompanying drawings: Figure 1 is a view in side elevation of a machine embodying our invention, the casing on top of the frame or table being shown in section. Fig. 2 is a top plan view of one of the portions of the machine. Fig. 3 is a front view partly in elevation and partly in section of our improved lens grinding machine, Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 2. Fig. 5 is a perspective view of the form of lap employed for the production of toric lenses. Fig. 6 is a similar view of the form of lap employed for cylindrical lenses, Fig. 7 is a view in perspective of the plate employed in grinding spherical lenses, and, Fig. 8 is a view of the form of lap employed for spherical lenses.

Referring now to the accompanying drawings in detail, the letter A designates the frame or table of the machine as a whole, said frame comprising the legs or standards 1 and 2 and the top frame 3. In the top, on each side of the center of the length thereof, is formed a comparatively large opening 4, designed for the purpose hereinafter described. In the machine as shown, it will be noted that we practically duplicate the operating parts, that is, one at each side of the center of the length of the machine. As these operating portions, are, as stated, practically duplicates, a description of one will suffice for both.

Depending from the underside of the top of the frame, are the vertical arms 5 preferably connected by suitable webs 6, said arms carrying a horizontal plate 7 from which depend the horizontal tubular bearings 8 adapted to receive the main power shaft 9 of the machine, this shaft having a drive pulley at one end thereof. At each end of the hanger plate or bar 7, is a vertical bearing 11 in which is rigidly supported the vertical shaft 12, the latter extending up into the bore 13 of the revolving sleeve 14. Preferably formed integral with this sleeve, is a relatively large disk 15 lying within the opening 4. The upper surface of the plate 15 is provided with an annular recess 17 and mounted upon such disk is a circular plate 18 having the lugs 19 and 20, the latter having an open slot 21. The bolts or screws 22 and 23 are employed to fasten the plate rigidly to the disk, the slot 21 permitting the adjustment of such plate relative to the disk. When the bolt 23 is at the inner or closed end of the slot 21, a point which is central with reference to the length and breadth of the plate 18, is approximately opposite the center of the disk 15. But when said bolt is at the outer or open end of the slot, it is obvious that the central part of the plate is eccentric with the center of the disk 15. The underside of the plate 18 is also provided with an annular recess to correspond with the recess 17 in the plate 15, so that a space is formed as is shown at

24 in Fig. 4. The plate 18 is provided with an upwardly extending tubular bearing member 25 having the widened shoulder portion 26 and the reduced portion 27. Mounted upon the shoulder portion of the tubular bearing, is a ball bearing, comprising the lower member 28 and the top member 29, the balls 30 lying in the race therebetween.

Mounted upon the top 3 directly over the opening 4 therein, is the chamber 35 having the inclined diaphragm 36 provided with a central opening 37. A shaft 38 extends upward through the vertical tubular bearing 25 and the cap surmounting the same, and through the opening 37 in the partition 36, this shaft being held in place by the cotter pin 39 passing transversely through the lower end thereof, while the upper end of the shaft carries the lap 40, the latter having the socket 41 therein, for the reception of the end of the shaft and whereby said lap is detachable from the shaft. Integral with the shaft 38 or firmly secured thereto, is a flange or collar 33, resting at its lower side upon the upper ball bearing section 29 and on its upper side carrying the cap 32 firmly secured as by screws.

42 designates a vertical oil duct in the shaft, terminating in the transverse duct 43 through the medium of which oil may be fed to the bearings of the cap, said duct being closed by the plug 44.

The lens block of the machine is shown at 45 and is connected through the rod 46 with the block 47 slidable upon the arm 48, which is extended from the segmental rack arm 49 pivoted as at 50 to the lever 51. The block 47 is provided with a curved arm 52 connected through a wire or the like 53, with the lens block 45, for the purpose of steadying the same. It will be noted that the lens which is indicated at L, is held on this block 45. One end of the arm 48 is provided with a handle 54, while the segmental rack 49, has the upwardly extending lug 55.

56 designates an adjustable block carried by the segmental arm 49 and which is provided with a stud 57, said block being tensioned by the spring 58, one end of which is fast thereto at 59, while the opposite end is secured as at 60 to the lower portion of the arm 51, the tendency of the spring being to normally draw the rack and the arm 48 into the position shown in Fig. 1, while it will be observed that the arm may be thrown upward and backward through the medium of the handle 54 until after such arm has passed a certain point, when through the action and direction of the spring, such arm will be maintained in an approximately vertical or open position away from the table.

The numeral 61 designates a shaft passing through the lower ends of the levers 51, and upon which shaft said levers are rotatably mounted. This shaft 61 also has thereon a two-part pulley comprising the relatively large member 62 and the smaller member 63. The pulley section or member 62 is connected through the drive belt 64 with the pulley 65 on the power shaft 9 at the front of the machine, while the smaller pulley section 63 is in driving engagement through the endless belt 66 with the pulley 67 mounted upon the shaft 68 beneath the top frame of the machine. This pulley 67 is provided with a pitman 69 connected to the arm 70, the latter in turn being connected to the rock shaft 71, while at each side of said arm, and carried by the rock shaft are the segmental arms 72 slotted at 73 and connected through links 74 with the arms 51. From the arrangement just described, it will be noted that motion is imparted from the shaft 9, pulley 65, pulley section 63, drive belt 66, pitman 69, arm 70, rock shaft 71, segmental arm 73 and link 74 to the lever 51, to impart a reciprocating motion to the lens carrying arm 48.

In addition to the reciprocating motion imparted to the arm carrying the lens block, it is also desired to impart to the lap block a none-rotative curvilinear or wabbling movement and to accomplish this we employ the following mechanism. Carried by the sleeve 14, at the lower end thereof, are the horizontally disposed friction disks 75 adapted to be rotated by the friction wheels 76 splined on the power shaft 9, said friction wheels being capable of being moved radially toward and from the center of the drive disks by means of the sliding yoke 77 connected through the member 78, to increase or decrease the speed of the machine, the handle 79 of the yoke having the locking pin 80 through the medium of which the yoke may be fastened in the desired position upon the shaft 81 mounted in supports 82 at the front of the machine.

Referring to Figs. 1 and 3, it will be noted that the driving disk 75 is out of driving engagement with the drive pulley 76. In order to put the same into operative driving engagement, we provide a lever 83, a portion of said lever being bifurcated, the bifurcated end of the lever being pivoted at 85 near the rear of the frame. 86 designates a hook or other device at the front of the machine, through which the lever may be supported when drawn upward, thereby holding the disk out of driving engagement with the driving pulley 76. When it is desired to place the parts in driving engagement, the lever 83 is disengaged from the hook 86 and the weight of the part lowers the sleeve 14, so that the disk 75 contacts with the drive pulley 76 and through the power shaft, motion is imparted to rotate the vertical sleeve 14. The rotation of the sleeve in turn, car-

ries the disk 15 around in the opening 4, this movement also rotating the plate 18 fast on the disk 15. This rotation of the plate will have a tendency to also revolve the cap 32 mounted thereon. But in order to prevent this rotation of the cap, and to cause its non-rotation, such that any point on its surface shall describe a circle of the same diameter: and that the successive positions of any straight line drawn on the surface of the cap or the lap mounted thereon, shall remain parallel, we provide two parallel wires or rods, such as shown at 87, one end of each wire being fastened to the cap as at 88, while the opposite ends of the parallel wires are secured as at 89, to the vertically extending arms 90, these arms being mounted upon the shaft 61 as at 91, and being connected through the cross yoke 92, in one piece, so that said arms are rocked slightly upon the shaft 61 by reason of the resilient rods 87 connecting them to the non-rotatably moving cap 32.

The above is a description of the mechanical construction of our machine and the operation of the same is as follows: The lens blank to be ground is cemented or otherwise secured upon the lens block 45, the latter being flexibly and non-rotatably connected to the block 47, by members 46 and 53. The arm 48 carrying the lens block is now lowered into operative contact with the lap, by throwing the segmental rack arm 49 forward on its axis 50; the proper or desired pressure being obtained by adjusting the spring controlled sliding block 56 along the rack, said block engaging with the notches of the rack. The lever 83 is then released from its hook 86 to bring the disk 75 into contact with the friction wheel 76. Power being applied to the shaft 9 through the belt pulley 10, the disk 75 in its rotation turns the sleeve 14 carrying the disk 15, which rotates in the opening 4. In grinding a cylindrical or toric lens, the plate 18 is offset so as to be eccentric to the disk 15, and said plate being connected to the disk, will move in an eccentric path. The plate in its movement carries the shaft 38 in the eccentric path, said shaft being connected to the cap 32 as by screws, or otherwise, this shaft carrying the lap. The parallel wires connected to the cap and to the arms 90, hold such cap against rotation, and the rocking of the arms 90, and the resiliency of the spring wires 87 accommodate the movement imparted to the cap and shaft 38. This gives the lap a non-rotating circular motion, as previously described. The arm carrying the lens block is as heretofore described, given a reciprocating motion back and forth through the lever 51 by the train of mechanism mentioned. It will thus be noted that in the grinding of a cylindrical lens, the lap receives a non-rotative circular motion, while the lens block held against rotation, is reciprocated back and forth across the same. This enables the grinding of such a lens to be accomplished rapidly and accurately.

When it is desired to grind a spherical lens, we may dispense with the construction of cap and connections shown in Fig. 4 and employ the device shown in Fig. 7, comprising the plate 100 and the stud 101, in which case the plate is mounted concentric with the rotating disk 15, while a lap such as shown at 102 in Fig. 5, is employed.

While we have herein shown and described one embodiment of our invention by way of illustration, we wish it to be understood that we do not limit ourselves to all the precise details herein set forth, as modification and variation may be made without departing from the spirit of the invention or exceeding the scope of the claims.

What we claim, is—

1. In a lens grinding machine, the combination with a frame, of lens grinding mechanism mounted thereon including a lens holder, and means for imparting a non-rotating reciprocating movement thereto, a rotating member, a lap holder pivoted to said member eccentrically to the axis thereof, and yielding connections between the holder and a fixed part whereby all points on the surface of the lap describe equal circles, and all successive positions of any straight line drawn on the surface of the lap remain parallel during the operation of the machine.

2. The combination with a frame, of a non-rotating reciprocating lens holder, a swinging member upon which said lens holder is mounted, a rotating member, a lap holder mounted on said member eccentric to the axis thereof, and yielding connections between the holder and a fixed part whereby all points on the surface of the lap describe equal circles and all successive positions of any straight line drawn on the surface of the lap remain parallel during the operation of the machine.

3. In a lens grinding machine, the combination with a frame having an opening therein, of a revolving member located in said opening, a non-rotating member supported on the revolving member, a lap carried by the non-rotating member, a lens holder, power mechanism for actuating the revolving member, and means for raising and lowering the revolving member to place the same in driving engagement with the power mechanism.

4. In a lens grinding machine, the combination with a frame, of a rotating member located in the opening in said frame, a lap holder mounted on said member eccentric to the axis thereof, yielding connections between the holder and a fixed part, a lens holder, a power mechanism for actuating

the rotary member and for imparting a reciprocating non-rotating movement to the lens holder.

5. In a lens grinding machine, the combination with a frame, of a reciprocating lens holder, a rotating member, a lap holder mounted on said member eccentric to the axis thereof, connections between the holder and a fixed part whereby all points on the surface of the lap describe equal circles and all successive positions of any straight line drawn on the surface of the lap remain parallel during the operation of the machine, power mechanism for the rotary member and for imparting the reciprocating movement to the lens holder, and means connected to the support of the rotating member for lowering and raising said support to place said member in and out of driving engagement with the power mechanism.

6. In a lens grinding machine, the combination with a frame, of a rotatable plate lying in an opening in the frame, a non-rotating member mounted on the rotating member, means for raising or lowering the rotatable member vertically, means for varying the speed of rotation of the rotating member, a lap carried by the non-rotating member, and a lens holder reciprocating across the lap without rotation.

7. In a lens grinding machine, the combination with a frame having an opening therein, of a plate rotatably mounted in said opening, a casing surrounding the opening, a spindle extending into said plate and carrying non-rotating members, a lap carried by said spindle, a lens holder, and mechanism for reciprocating the lens holder across the lap without rotation.

8. In a lens grinding machine, the combination with a frame having an opening therein, a revolving plate member moving in said opening, a shaft upon which said plate member is mounted, a second plate at the lower end of said shaft, means engaging with the second plate for varying the speed of rotation, a lap mounted above the revolving plate, means for holding the lap against rotation, a lens holder, and means for moving said lens holder relative to the lap without rotation.

9. In a lens grinding machine, the combination with a frame, the lap block and the lens holder, of a plate mounted in an opening in the frame and carrying the lap block, mechanism for imparting a rotary movement to the plate and means arranged below the revolving plate for raising and lowering the latter in driving engagement with said mechanism.

10. In a lens grinding machine, the combination with a frame, a lap supported above the frame, means for imparting a non-rotating curvilinear movement to the lap including a plurality of parallel rods, a rocking lever, an arm pivotally connected to said lever, and a lens block adjustably mounted on said arm.

11. In a lens grinding machine, the combination with a frame, of a lap movably mounted thereon, wires or rods for preventing rotation of the lap, a rocking lever, an arm carried thereby, a lens holder mounted upon said arm, and means for varying the stroke of the lever.

12. In a lens grinding machine, the combination with a frame, of a vertically adjustable rotating plate arranged in an opening in said frame, means for raising and lowering the plate, a casing surrounding said plate, a cap mounted on the plate within the casing, a lap arranged above said cap, a pair of rods connected to the cap to prevent rotation of the lap, a lens holder coöperating with the lap, and mechanism for actuating the lens holder and the lap.

13. In a lens grinding machine, the combination with a frame, a power shaft carried thereby, a plate mounted within the frame, means for raising and lowering the plate, means on the power shaft adapted to rotate the plate, a rocking lever, an arm carried by said lever, a lens holder mounted upon the arm, a lap beneath the holder, wires or rods preventing rotation of the lap, and means for actuating the lap and the lens holder.

14. In a lens grinding machine, the combination with a frame, a rotatable plate, a cap mounted on the plate, a lap arranged above the cap, a plurality of rocking arms, and two connecting rods between the cap and the arms whereby a non-rotative motion is imparted to the lap upon the rotation of the plate.

15. In a lens grinding machine, the combination with a frame, a power shaft carried thereby, a vertically movable plate arranged above the power shaft, means for rotating said plate, means for varying the speed of rotation of the plate, a lap arranged above the plate, a lens holder, means for imparting a reciprocating non-rotating motion to the lens holder, and means including two connecting rods for imparting a non-rotative motion to the lap.

16. In a lens grinding machine, the combination with a frame, having an opening in the top thereof, a plate mounted to rotate within said opening, a lap carried by the plate, wires or rods preventing rotation of the lap, a rocking lever mounted on the frame, an arm pivoted to said lever, means for tensioning said arm, and a lens holder mounted on the arm coöperating with the lap.

17. In a lens grinding machine, the combination with a frame, a rotating plate mounted therein, a casing extending above

the plate provided with a diaphragm, a lap mounted within the casing, a reciprocating lens holder coöperating with the lap, means for imparting a circular non-rotative movement to the lap, means for varying the speed of rotation of the plate, and means for varying the pressure of the lens holder.

In testimony whereof we affix our signatures in presence of two witnesses.

STILLMAN W. ROBINSON.
ERDIS G. ROBINSON.

Witnesses:
A. L. PHELPS,
INGLE A. MORRIS.