A. A. ARNOLD.

GRINDING MACHINE.

APPLICATION FILED APR. 3, 1914.

1,199,519.

Patented Sept. 26, 1916.

2 SHEETS—SHEET 1.

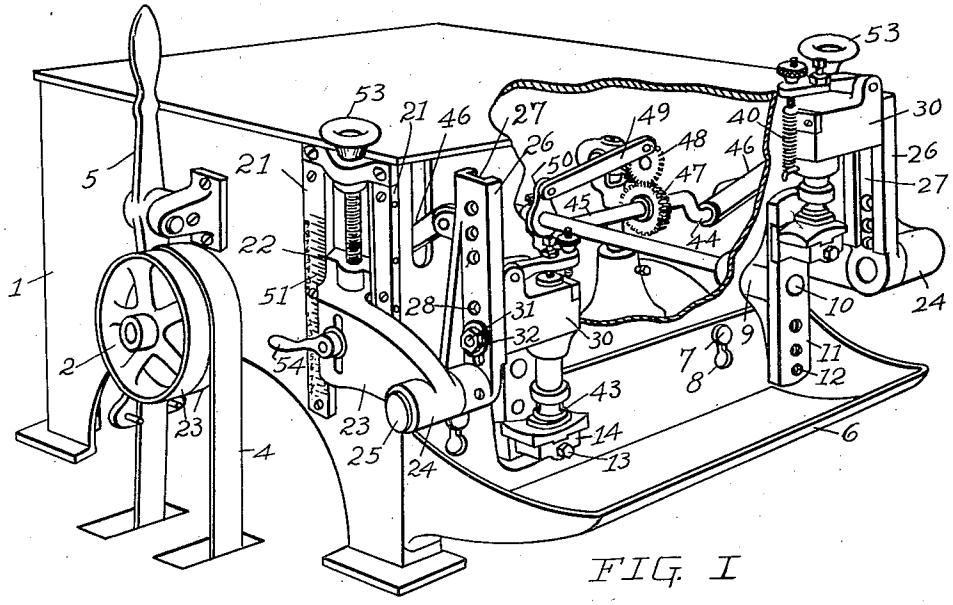


FIG. I

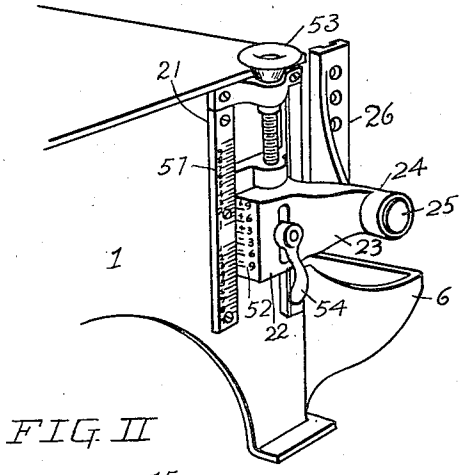


FIG. II

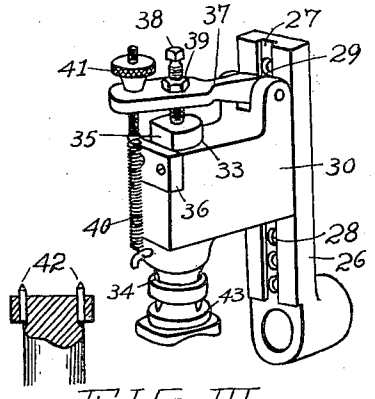


FIG. III

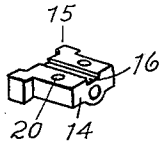


FIG. IV

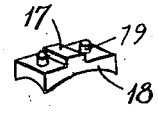


FIG. V



FIG. VI

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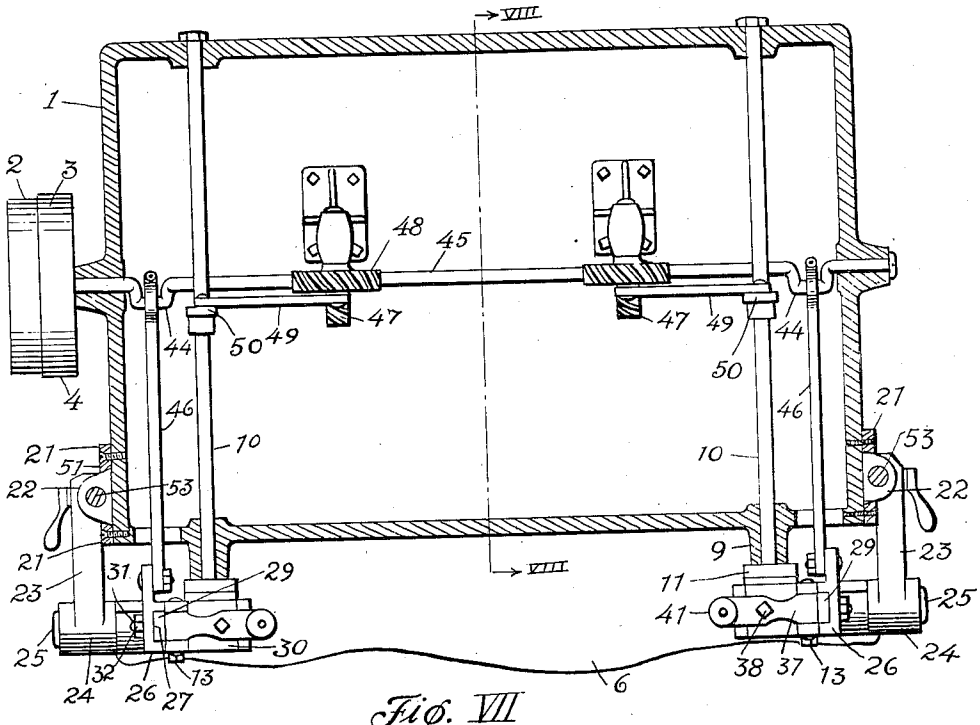


Fig. VII

Fig. VIII

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UNITED STATES PATENT OFFICE.

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GRINDING-MACHINE.

1,199,519. Specification of Letters Patent. Patented Sept. 26, 1916.

Application filed April 3, 1914. Serial No. 829,247.

To all whom it may concern:

Be it known that I, ARTHUR A. ARNOLD, a citizen of the United States, residing at Southbridge, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

My invention relates to improvements in grinding machines, and has particular reference to a novel and improved machine particularly adapted for use in grinding ophthalmic lenses.

The leading object of my invention is the provision of an improved machine of this character which shall be constructed and adapted for use in grinding various types of ophthalmic lenses, both spherical, cylindrical and toric, and with either positive or negative curves.

A further object of my invention is the provision of an improved machine in which the parts may be so adjusted as to satisfactorily grind a lens with the desired curve thereon.

A further object of my invention is the provision of novel and improved means for attaining the various adjustments in a simple, inexpensive and efficient manner.

Other objects and advantages of my improved grinding machine should be readily apparent by reference to the following description taken in connection with the accompanying drawings, and it will be understood that I may make any modifications in the specific details of construction shown and described within the scope of the appended claims without departing from or exceeding the spirit of my invention.

In the drawings: Figure I is a perspective view of my machine, parts being broken away to show the interior mechanism thereof. Fig. II is an enlarged detail perspective view of a portion of my machine. Fig. III is a similar view of another part thereof. Fig. IV is a detailed view of one of the carrier blocks. Fig. V is a similar view of a concave lap inverted. Fig. VI is a similar view of a convex lap. Fig. VII is a horizontal sectional view through the complete machine. Fig. VIII is a transverse sectional view.

In the drawings, in which similar characters of reference are employed to denote corresponding parts throughout the several views, the numeral 1 designates the frame of my improved machine having extending therethrough the shaft 45 bearing the fixed pulley 2 and loose pulley 3 for the driving belt 4, the belt being shifted from one to another of said pulleys by means of the lever 5. Projecting from the front of the machine is a trough 6 for receiving the emery to be applied to the lenses during grinding thereof, this trough being secured to the frame by means of studs 7 engaged in the key-hole slots 8 in the side of the trough, these slots permitting of removal and ready cleansing of the trough when desired.

In that form of my invention here illustrated I have shown the same as adapted for use in grinding two lenses, but it will be understood that I may make my machine with but a single unit or with several units, as desired, the operation being substantially the same in any instance.

Projecting from the frame 1 above the trough 6 and at right angles to a spindle 25 is a bearing 9 for the rock shaft or spindle 10 having secured on its outer end the substantially vertically disposed arm 11 formed with a plurality of threaded apertures 12. These apertures are preferably arranged in series, one set or series being arranged above the pivot point or center of oscillation of the arm, and the other set below the center of oscillation of the arm, for a purpose which will subsequently appear. A bolt 13 is passed through an opening in the carrier block 14 and has the end thereof threaded into any one of the apertures 12 in the arm 11 to secure the block in position upon the arm, side flanges 15 being formed on the block for engagement with the arm 11 to prevent twisting movement of the block relative to the arm. A groove 16 is formed on the upper face of the block and this groove is adapted to receive a rib 17 on the lap 18 which lap may be either concave or convex as desired, and which is provided with the pins 19 for engagement with recesses 20 in the carrier block to assist in retaining the lap in position upon the block.

Mounted on the side of the frame 1 are the guides 21 for the slide block 22 having preferably integral therewith and projecting forwardly therefrom the arm 23 terminating in the bearing portion 24. Journaled in said bearing 24 is a spindle 25 carrying on its inner end the arm 26 provided with a groove

27 and having a plurality of apertures 28 formed therein, the number of these apertures preferably corresponding to the number of apertures 12 of the arm 11, and the apertures being arranged in series in a manner similar to the apertures 12. Fitting into the groove 27 is the rib 29 of the member 30, a bolt 31 on the member 30 projecting through one of the apertures 28 and being secured in position by the nut 32 to lock the member 30 in desired vertical adjusted position relative to the arm, the groove and rib connection between the member 30 and arm 26 serving to prevent any twisting movement of the member upon the arm.

The member 30 has formed in the outer portion thereof the bore or passage 33 for the slide 34, said slide preferably being provided near its upper end with a flat face 35 engaged by the plate 36 which serves to prevent relative rotary or twisting movement of the slide 34 in the member 30. Pivoted to the member 30 is a pressure arm 37 having adjustably mounted therein the bolt 38 provided with a lock nut 39, the bolt depending from the arm 37 and bearing against the upper end of the spindle, a spring 40 having one end secured to the member 30 and the other end connected to the arm 37 by a suitable spring tension device 41, which serves to regulate the pressure of the lower end of the bolt against the slide and at all times tends to force the same downward relative to the member 30. Formed at the lower end of the spindle are suitable contact members preferably a pair of prong points 42 which fit into recesses in the lens block 43 and hold the lens in correct engagement with the lap 18 while permitting it to automatically adjust itself thereto, the spring 40 through the medium of the parts 34, 37 and 38 serving to hold the lens in operative engagement with the lap 18.

It is to be understood that when the slide block 22 is arranged within the guide 21 in a position so that the center of the spindle 25 lies in a direct horizontal plane with the center of the rock shaft 10, each corresponding aperture of each of the corresponding series of apertures in each of the arms 11 and 26 will be disposed the same distance away from the center of oscillation of the other arm so that should the lap 18 be mounted at the lowermost aperture in the lower series in the arm 11 and the member 30 be mounted in the corresponding lowermost aperture in the lower series in the arm 26 a spherical curve will be ground upon the lens because of the fact that the distance between the lens and the centers of oscillation of the arms 11 and 26 are the same. Accordingly a similar curve would be ground upon the lens should both the lap and member 30 be arranged in any corresponding position upon the respective arms, the only difference being that the curves generated upon the lens would vary according to the arc upon which the tool oscillated.

It has previously been mentioned that both the arm 11 and the arm 26 are mounted for oscillatory movement, which movement may be imparted to the arms in any desired manner, the particular means for so doing forming no part of this invention, but for purposes of illustration I have shown one form of attaining this result. A crank 44 is formed in the shaft 45 and this crank is connected by the links 46 with the arm 26 to oscillate the same during rotation of the shaft 45. A gear 47 is mounted on the shaft 45 and meshes with the pinion 48 which is suitably supported in any preferred manner within the frame, said pinion having eccentrically secured thereto a link 49 which serves through the medium of the arm 50 on the spindle 10 to rock the spindle and thus rock or oscillate the arm 11, the gearing being such that the relative speeds of oscillation of the arms 11 and 26 will be entirely different, so there will be no danger of producing wave effect upon the lenses.

In the operation of my device the lap carrier 14 is first placed in desired adjusted position on the arm 11 according to the base curve of the lens, the series of apertures shown in the upper portion of the arm 11 being adapted for base curves of plus 3, plus 6 and plus 9, and the series of apertures shown in the lower portion of the arm being adapted for base curves of minus 3, minus 6 and minus 9. The carrier 14 having been secured in desired position upon the arm 11, I then preferably shift the member 30 to one of the apertures in the arm 26 corresponding to the aperture in which the bolt 13 is engaged, and then secure the member 30 in its desired adjusted position. The position of the carrier 14 determines the curve which will be generated by movement of the arm 11, while to determine the curve which will be generated by oscillation of the arm 26 I refer to the scale 51 which operates in conjunction with the designations 52 of the slide 22.

It should be apparent that when the lap is arranged on the arm at any one of the apertures above the center of oscillation of the arm and the member 30 is correspondingly arranged upon the arm 26 a plus or convex curve will be ground upon the lens instead of the minus or concave curve as is done when the lap and member are arranged below the center of oscillation of the arm, the arrangement of the parts of the machine whereby a convex lens is ground being shown to the right in Fig. 1 of the drawings, while to the left in this figure has been shown the arrangement of parts whereby a concave lens is ground.

When desired to grind a toric lens it is merely necessary to vertically adjust the block 22 by means of the screw 53 to increase or decrease the distance from the lens to the pivot axis 25, which will thus serve to vary the transverse curve formed on the lens and make this curve stronger or weaker than the curve longitudinal of the machine according to the adjustment of the block, a scale 51 serving in conjunction with the designations 52 to denote the exact transverse curve being generated at any particular adjustment of the block 22.

It is to be understood that the expansion or contraction of the spring 40 will compensate to a certain degree for the vertical movement of the spindle 33, according to the position at which the slide block is set, but in the case of extreme differences between the two curves to be ground I prefer to compensate for this sliding not only by stretching of the spring but by suitable adjustment of the bolt 38 so that the bolt will, as nearly as possible, be in axial alinement with the spindle when the machine is in operation.

From the foregoing description taken in connection with the accompanying drawings, the construction and operation of my improved grinding machine should be readily apparent, and it will be noted that I have provided a simple, durable and efficient machine of this nature which may be readily set to grind any desired curvature, a lock handle 54 being provided to secure the member 22 in any desired adjusted position, and it will be further noted that on account of the said possibility of adjustment I may grind any form of lens in my machine, and that on account of the difference in speed of oscillation of the arms 11 and 26 the lens and laps move in a sinuous path relative to each other to prevent formation of wavy surfaces on the lens.

I claim:—

1. In a machine for grinding ophthalmic lenses, the combination with a frame, of a rock shaft, a cross arm carried by the shaft and provided with a plurality of attachment points, a slide block carried by the frame, means for securing the block in adjusted position, a pivot spindle journaled in the block and adjustable therewith, an arm carried by the spindle and having a number of attachment points corresponding in location and number to the points on the rock shaft arm, coöperating means secured at certain of the attachment points on the rock shaft arm and spindle arm for retaining and operating upon a lens held between said members, and means for rocking the spindle arm and the rock shaft to cause a relative movement of the said members to grind the lens held therebetween.

2. A lens grinding machine, including a frame, a drive shaft journaled in the frame, a rock shaft and a reciprocating link operatively connected with the drive shaft, an arm on the rock shaft extending above and below the shaft and having a plurality of attachment points formed thereon, a grinding lap, means for securing the grinding lap to the rock shaft arm at any one of said points, a second rock arm mounted on the frame and operatively connected with the reciprocated link, said rock arm being likewise provided with a plurality of suitably indicated places for an attachment, said places being positioned in predetermined relation to the corresponding places on the rock shaft arm, a lens spindle holder, means for securing the spindle holder at any one of the points of attachment on the rock arm, lens block engaging means on said spindle, and means for yieldingly pressing the spindle toward the grinding member on the rock shaft arm.

3. A grinding machine designed to grind lenses of predetermined base curves, and comprising a pair of arms rocking in directions at right angles one to the other and at different rates of speed, each of said arms having a plurality of correspondingly disposed points adapted for attachment of a lens holding or grinding member, whereby attachment of said members at corresponding parts will on actuation of the arms grind a lens of known spherical curvature, and means for vertically adjusting one of the rock arms relative to the other to vary the curve generated in one meridian a known amount.

4. A grinding machine designed to grind lenses of predetermined base curves, and comprising a pair of arms rocking in directions at right angles one to the other and at different rates of speed, each of said arms having a plurality of correspondingly disposed points adapted for attachment of a lens holding or grinding member, whereby attachment of said members at corresponding parts will on actuation of the arms grind a lens of known spherical curvature, and means for vertically adjusting one of the rock arms relative to the other to vary the curve generated in one meridian a known amount, a scale, and designations coöperating with the scale to indicate the curve being generated for any particular adjustment of the lens holding and grinding members on their respective rock arms.

5. A lens grinding machine, including a laterally swinging lap, a block having a swinging movement at right angles to the movement of the lap, a rock arm carrying the block, a supporting slide for the rock arm, means for adjusting the position of the slide, and resilient means for forcing the block downward relative to the rock arm and slide into operative position.

6. In a grinding machine of the character described, the combination with a frame, of a slide mounted on the frame, a spindle journaled in the slide and bearing a rock arm, a carrier block, means for securing the carrier block in adjusted position on the rock arm, a lens block engaging spindle slidably but non-rotatably mounted in the carrier block, and means for yieldingly forcing the spindle downward relative to the carrier block to retain the spindle in operative position irrespective of the adjustment of the slide and carrier block.

7. In a machine of the character described, the combination with a rock arm, of a carrier block adjustably mounted thereon, means for securing the carrier block in desired adjusted position, a lens block engaging spindle slidably but non-rotatably mounted in the carrier block, a pressure arm pivoted to the carrier block, means for pressing the pressure arm toward the spindle, and an adjustable contact device carried by the arm and engaging the spindle to vary the position of the spindle for the same position of the pressure arm.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR A. ARNOLD.

Witnesses:
C. FRED HILL,
H. K. PARSONS.