F. W. BARNES.

LENS GRINDING MACHINE

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1,270,770.

Patented July 2, 1918.

Fig. 1

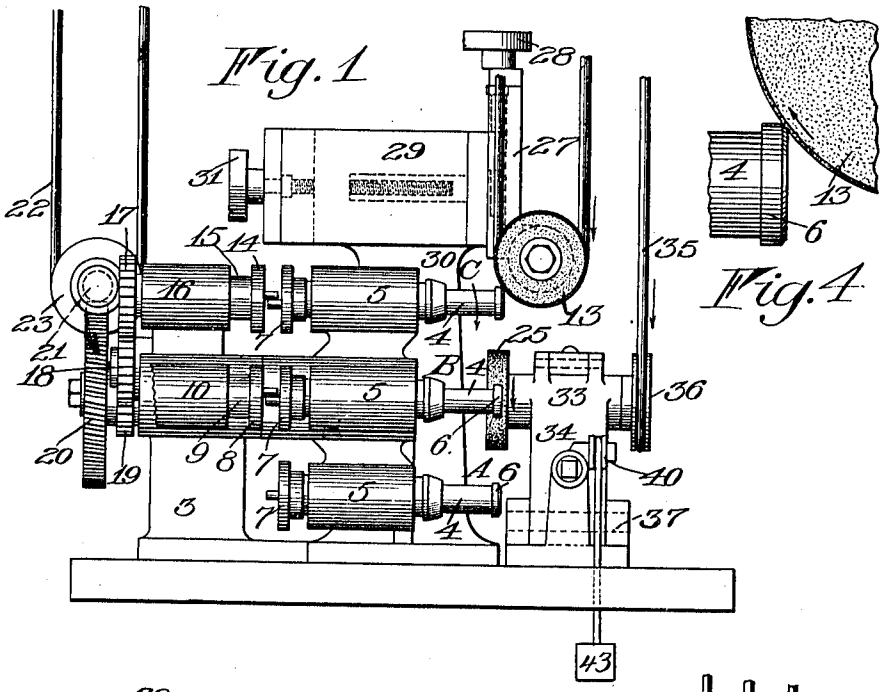


Fig. 4

Fig. 2

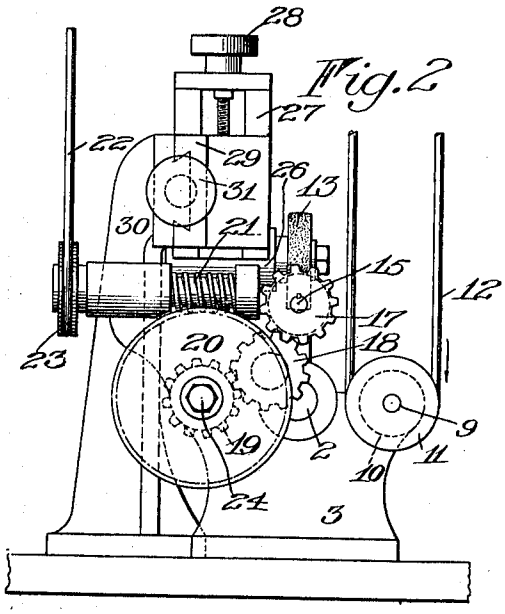
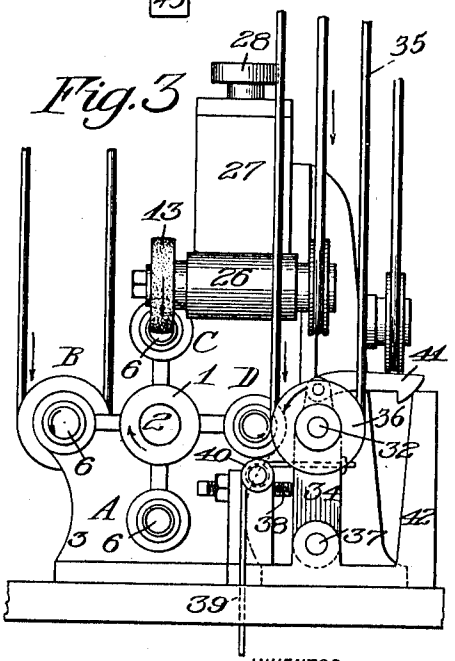


Fig. 3



WITNESSES:

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LENS-GRINDING MACHINE.

1,270,770. Specification of Letters Patent. Patented July 2, 1918.

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To all whom it may concern:

Be it known that I, FREDERICK W. BARNES, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Lens-Grinding Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

My present invention relates to grinding machines and more particularly to machines for grinding lenses and it has for its object to provide a machine of this character adapted for grinding and finishing off the edge surfaces of lenses in a safe and expeditious manner. The improvements are directed in part toward providing a simple and efficient means for beveling off the corner of the glass at the point where the lateral edge surface joins the polished or optical surface and to accomplishing this in such manner that there is no danger of impairing the optical surface. To these and other ends the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a front elevation of a lens grinding machine constructed in accordance with and illustrating one embodiment of my invention;

Fig. 2 is an elevation of the left hand end thereof;

Fig. 3 is an elevation of the right hand end of the machine, and

Fig. 4 is a detail fragmentary but enlarged view illustrative of the manner of coöperation of the beveling grinder with the lens or work-piece.

Similar reference numerals throughout the several views indicate the same parts.

Although the invention is not necessarily so restricted in its application, it can be made use of in preparing photographic lenses. These lenses, as camera objectives, are usually set in a tube known as a lens tube which they are made to fit very accurately and to the diameter of which they are carefully ground down. In seating them within the tube, it is helpful if the lenses are devoid of sharp corners or edges having a tendency to catch upon minute burs or other inequalities operating to obstruct their entrance. For these reasons, I have found it expedient to bevel or remove at least one corner edge of the lens and the machine illustrated herein was designed for that particular purpose which it accomplishes without requiring a separate operation to the extent that one handling or setting up of the lens is sufficient to carry it through both the beveling and edge grinding treatments.

Referring more particularly to the drawing, the machine of this embodiment is a turret machine, that is, one in which previously inserted lenses are being ground while the operator is utilizing the time thus consumed by setting up other lenses for subsequent grinding. It consists of a shiftable spindle head 1 turning upon a shaft 2 journaled in the base 3 and carrying four work spindles 4 mounted in bearings 5. The successive positions of the work spindles are respectively indicated by the letters A, B, C, and D in Fig. 3. The head 1 is shifted by hand in the direction indicated by the arrow and A is the idle position of the spindles. The position B is that in which the lenses or work pieces are applied and I have shown a lens indicated at 6 upon each spindle. The lens is stuck on to the spindle in a properly centered position by means of pitch or any suitable temporary cement and to cause its rotation for centering purposes, namely, to bring the geometrical center of its previously ground optical faces into coincidence with the axis of the spindle, the opposite end of the spindle projecting from the bearing 5 is provided with a clutch element 7 coöperating temporarily with a similar clutch element 8 on a shaft 9 carried in a stationary bearing 10 on the support 3, the said shaft being provided with a pulley 11 (Fig. 2) and continuously driven by a belt 12.

When the lens or work-piece is properly centered in this manner, the head 1 is shifted to carry the spindle to position C for treatment by the bevel grinder 13 hereinafter described. During this operation, the spindle carrying the lens is rotated by engaging the clutch member 7 thereon with a clutch member 14 on a shaft 15 carried by another stationary bearing 16 on the frame 3. The clutches 7, 8 and 14 are simply disks having pins adapted to contact with each other and interlock the members when they are in alinement but the pins clear each other when the spindles are rotated. This shaft 15 is continuously driven at the proper speed through gearing 17, 18, 19 and 20, the last named gear taking motion from a worm 21 driven by a belt 22 and pulley 23. A shaft 24 carrying this gear 20 is provided on its opposite end with a clutch member similar to the clutch member 14 but not shown herein and driven at the same speed which shaft and clutch member are in alinement with the D position of the spindle so that the latter may be similarly rotated in that position also. When disposed at D, the lens or work piece is acted upon by an edge grinder 25 following the beveling operation and this edge grinder finishes off the lens so that it can be removed when arriving again at position A or at position B, if more convenient.

The beveling grinder 13 is preferably a diamond wheel with a rounded cutting face, as shown, and its shaft is carried in a bearing 26 on a sliding bracket 27 vertically adjustable by means of a micrometer screw 28. The bracket 27 is in turn carried by a horizontally sliding bracket 29 on a supporting arm 30 extended from the general support 3 and such bracket 29 may be adjusted by means of a micrometer screw 31. These adjusting mechanisms do not require more minute description as their function is merely to give the wheel 13 mobility in both the direction of its axis and laterally thereof. It is essential, however, that the grinder 13 revolve in a plane disposed angularly to the plane of rotation of the work piece 6 and of its carrying spindle 4 and it preferably rotates in the plane of the axis of the said spindle 4 when the latter is in the position C. The work-piece is carried into contact with the wheel by the rotation of the shifting head 1 and the wheel being rounded, as previously described, it readily cuts its way through to a proper position relatively to the work-piece as the latter thus approaches it from the side. The work-piece revolves at a relatively slow speed as soon as the clutch elements 7 and 14 are in engagement with each other while the grinder 13 travels at a relatively high rate of speed. Furthermore, it will be noted that as the work-piece and wheel 13 are traveling in transverse planes, there is a tendency of the dislodged particles resulting from the grinding action that causes the cutting or grinding face or surface of the wheel to clear itself and the cutting contact is distributed more generally over the surface of the wheel than would be the case with other possible relative dispositions of the wheel and work-piece. It is also preferable to rotate this grinder 13 in the direction indicated by the arrows, namely, so that the cut is taken in a direction outwardly from the axis of the work spindle 4 and of the work-piece or from the optical surface toward the edge surface of the lens. When so effected, the cut cannot possibly chip or mar the adjacent optical surface and any chipping that does occur on the edge surface (which is then in a rough or unfinished state) will be removed by the subsequent action of the edge grinder 25.

This edge grinder 25 is also preferably a diamond wheel but may have a cylindrical cutting periphery, as shown, and its shaft 32 is carried by a bearing 33 on a swinging arm 34 and is continuously driven by a belt 35 and a pulley 36 on the outer end of such shaft 32. The swinging arm 34 is pivoted to the base 3 at 37 and held against an adjustable stop 38 by a cord 39 passing over a small pulley 40 and attached to a weight 43. As the workpiece leaves the position C after being beveled as described, and is carried to the position D for coöperation with the edge grinder 25, as described, the latter is preferably thrust backward momentarily to an inoperative position by swinging the arm 34 and then is allowed to come gently into contact with the edge of the lens or work-piece 6 where it is yieldingly held by the weight on the cord 39, the work-piece taking the thrust until it is ground down to the proper diameter, at which point the wheel is halted by contact of the arm 34 with the adjustable stop 38. The wheel or edge grinder 25 and the work-piece 6 rotate against each other, that is, in the same direction but in opposite directions locally at the point of contact, as indicated by the arrows in Fig. 3.

If it is desired to lock out the edge grinder 25, as for instance, when the beveling operation is to be performed, alone, a latch 41 on the swinging arm 34 is hooked over an arm 42 on the base 3 and the tendency of the weight overcome.

I claim as my invention:

In a lens grinding machine, the combination with a revoluble support, a plurality of rotary work supports on said revoluble support, a plurality of grinders one of

which is arranged in substantially the same plane with the faces of said work supports and another of which is arranged in a plane substantially perpendicular thereto and adapted to coöperate with different pieces of work simultaneously, means for rotating the work supports during the grinding operations, and other means for successively rotating said supports for centering the work thereon.

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Witnesses:

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