No. 686,676. Patented Nov. 12, 1901.

E. M. LONG.

LENS GRINDING MACHINE.

(Application filed June 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

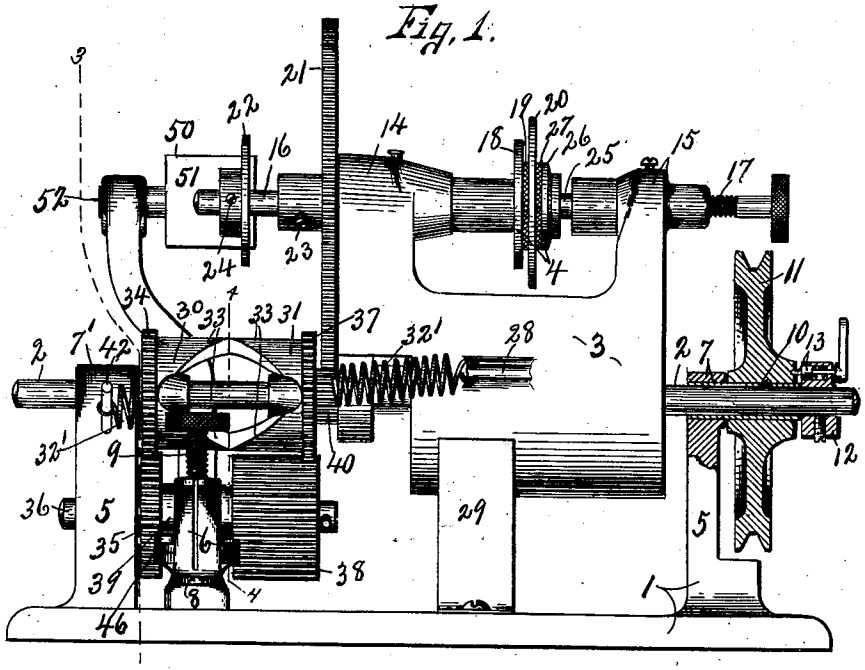
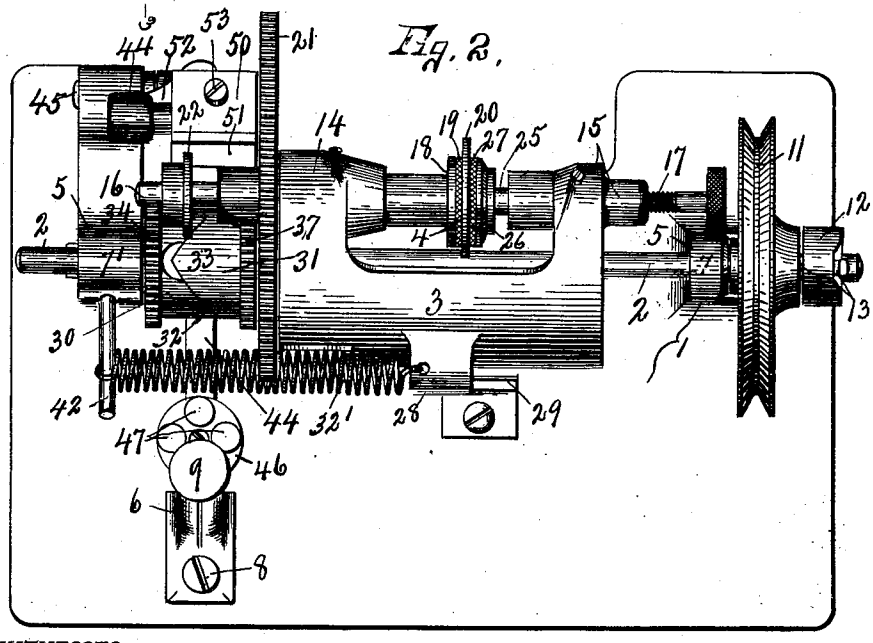


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 3,

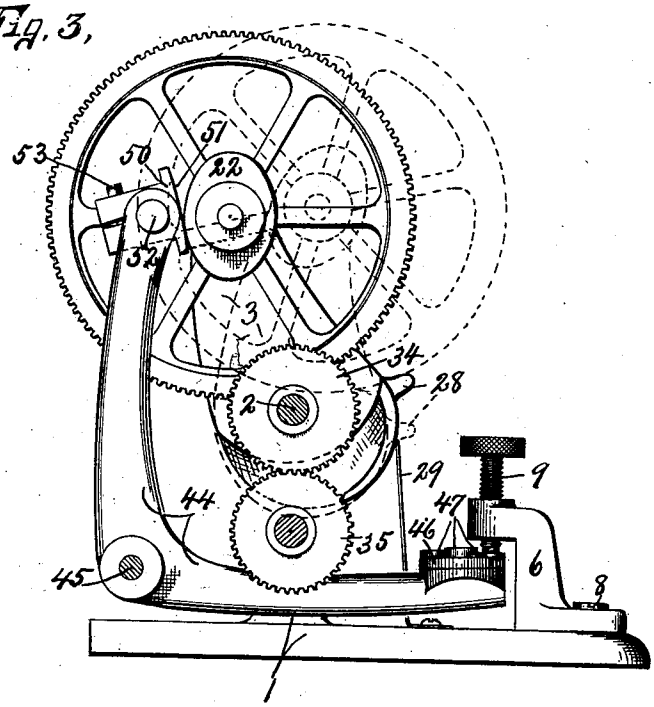


Fig. 4.

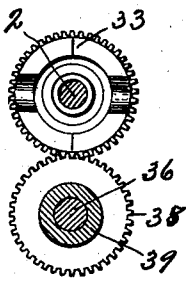


Fig. 5

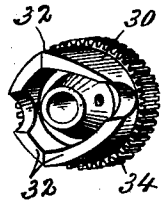


Fig. 6.

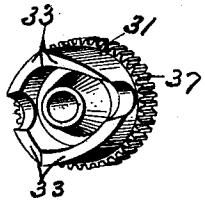
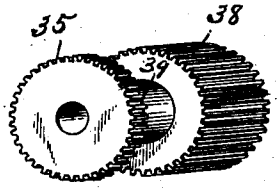


Fig. 7.



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UNITED STATES PATENT OFFICE.

ELI M. LONG, OF GENEVA, NEW YORK, ASSIGNOR TO THE STANDARD OPTICAL COMPANY, OF GENEVA, NEW YORK, A CORPORATION OF NEW YORK.

LENS-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 686,676, dated November 12, 1901.

Application filed June 14, 1901. Serial No. 64,567. (No model.)

To all whom it may concern:

Be it known that I, ELI M. LONG, of Geneva, in the county of Ontario, in the State of New York, have invented new and useful Improvements in Lens-Grinding Machines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to machines for grinding lenses, having more particular reference to the means for effecting the reciprocal or endwise movement of the lens across the face of the grindstone.

The object of my invention is to provide a lens-grinding machine with means actuated by the driving-shaft for automatically moving the lens-support endwise in reverse directions across the face of the grindstone at a uniform rate of speed and without liability of any jar or vibration in its movement from one extreme to the other or at the point of return from the limits of its movement.

A further object is to so arrange and combine the parts of a lens-grinding machine as to economize in the space occupied by said machine without detriment to its operation.

To this end the invention consists in the construction, combination, and arrangement of the parts of a lens-grinding machine, as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figures 1 and 2 are respectively front elevation and top plan of a lens-grinding machine embodying my invention, Fig. 1 being partly in section. Figs. 3 and 4 are sectional views taken, respectively, on lines 3 3 and 4 4, Fig. 1. Figs. 5 and 6 are isometric perspective views of the cams for effecting the endwise movement of the lens-supporting frame. Fig. 7 is an isometric perspective view of the means for transmitting motion from one cam to the other.

Similar reference characters indicate corresponding parts in all the views.

In the drawings I have shown a lens-grinding machine, consisting of a supporting-frame 1, a revoluble shaft 2, a lens-carriage 3, a revoluble lens-clamping head 4, means for reciprocating the carriage 3 lengthwise of the shaft 2, and additional means for regulating the size of the lens during the process of grinding. The frame 1 may be of any desired form, size, or construction and preferably consists of a base-plate having separated upright standards 5 and a bracket 6. The standards 5 are provided with suitable bearings 7 7′ for receiving the revoluble shaft 2, and the bracket 6 is preferably formed separate from the base 1 and is secured thereto by a suitable screw or other fastening means 8, this bracket being provided with a threaded aperture for receiving an adjusting-screw 9, which forms a portion of the means for regulating the size of the lens during the process of grinding. One of the bearings, as the bearing 7, is provided with a sleeve 10, upon which is loosely mounted a suitable driving-pulley 11. The shaft 2 is supported in the bearings 7 7′, one end being extended through the sleeve 10 and provided with a collar 12, having a clutch member 13, adapted to engage sockets in the adjacent face of the pulley 11. This collar 12 being secured to the shaft, it is evident that when the clutch member 13 is interlocked with the adjacent portion of the pulley 11 the shaft 2 will be rotated.

Any desired means may be employed for rotating the pulley 11; but I usually connect the same by a belt to the axle of the grindstone or other grinding device. (Not illustrated.)

The lens-supporting frame 3 is pivotally mounted on the shaft 2, being arranged to swing toward and away from the face of the grindstone, and is provided at its upper end with bearings 14 and 15 for receiving suitable spindles 16 and 17, the spindle 16 being extended through and beyond the opposite faces of the bearing 14, the inner end of said spindle being provided with a clamping-plate 18, having a yielding contact-face 19, adapted to engage one face of a lens 20. The opposite end of the spindle 16 is provided with a gear 21 and a lens-form or sizing-plate 22, said gear and lens-form being secured in position by suitable set-screws or equivalent devices 23 and 24. The spindle 17 is mounted in the bearing 15, and the inner end of said bearing is adapted to receive a centering-pin 25, which engages a second clamping-plate 26 at the opposite side of the lens 20. This clamping-plate 26 is also provided with a yielding bear-

ing-face 27, and the screw-threaded spindle 17 is arranged to engage the outer end face of the centering-pin 25 for impinging the lens 20 between the yielding faces 19 and 27. It is sometimes desired to swing the lens-supporting frame backwardly away from the grinding-surface, and I therefore provide the frame 3 with a stop-shoulder 28, which is arranged to engage a spring stop-arm 29, projecting upwardly from the base of the frame 1, the yielding stop-arm 29 serving to prevent any injurious jar to the machine when the frame 3 is forcibly drawn backwardly against the same.

The means for moving the lens-supporting frame 3 endwise in reverse directions preferably consists of cams 30 and 31 and a spring 32′. The cams 30 and 31 are mounted upon the driving-shaft 2, and each preferably consists of hollow hubs having V-shaped recesses in their adjacent faces for forming similar projections 32 and 33, the projections of one hub being adapted to fit into the recesses of the other hub and the walls of the recesses being arranged to engage each other. The hub 30 is preferably fixed to the shaft 2 and is provided with a gear 34, meshing with a gear 35, which latter gear is mounted on a spindle 36, secured to the adjacent upright standard 5. The cam-hub 31 is loosely mounted upon the shaft 2 and is provided with a gear 37, meshing with another gear 38, which is also mounted on the spindle 36 and is rigidly connected to the gear 35 by a hub 39.

Mounted on the shaft 2 between the gear 37 and the adjacent end of the frame 3 is a pinion 40, which meshes with the gear 21 for transmitting power to the spindle 16 and clamping-head 4. The pinion 40 is secured to the shaft 2 and serves as a suitable collar, abutting against the adjacent faces of the gear 37 and lens-supporting frame 3.

In order to effect the reciprocal or endwise movement of the lens-supporting frame, one of the cam-hubs, as 31, is connected to move at a slightly less speed than the other drum 30, and for this purpose I have provided a gear 37 with a greater number of teeth than the gear 38, whereby the gear 38 is rotated with less speed than the gear 37, these gears 34, 35, 37, and 38 being so relatively proportioned that the hub 31 is rotated only at a slightly less speed than the gear 34 in order to insure a more perfect contact between the cam-faces and for preventing any jar or vibration incidental to the rotation of the shaft 2.

It is evident from the foregoing description that by rotating the cam-hubs at different rates of speed and by loosely mounting one of the cam-hubs, as 31, upon the shaft for permitting its endwise movement the driving cam-faces will force the loose cam-hub endwise against the action of the spring 32′ and that when the cam-points of the hub 31 have reached the limit of their endwise movement the spring 32′ automatically returns the hub 31 and frame 3 to their normal positions, the spring 32′ being connected, respectively, to a pin 42 on the standard 5 and to the stud 28 upon the frame 3. The cam-faces of each of the hubs are of substantially the same inclination, so that the advance cam-faces of the driving member are always in contact with the adjacent faces of the other cam-section during the outward movement of the lens-supporting frame or against the action of the spring and that as the driving-shaft continues to rotate in the same direction the opposite cam-faces engage each other and permit the lens-supporting frame 3 to gradually return by the action of the spring 32′ to its starting position, as seen in Fig. 2.

In order to permit the device to be adjusted for various sizes of lenses, I provide a bell-crank lever 44, which is pivoted at 45 to the upright standard 5 and having one arm provided with a revolving plate 46, having a series of surfaces 47 projecting at unequal distances from the upper face of the plate and adapted to be engaged by the lower face of the adjusting-screw 9. The opposite arm of this bell-crank lever is provided with a sizer-plate 50, having a curved bearing-face 51, which is adapted to be engaged by the periphery of the lens-form 22. This sizer-plate 50 is adjustably mounted upon a pin 52, provided on the upper end of the upwardly-projecting arm of the lever 44 and usually consists of a split hub which is clamped upon the pin 52 by a suitable clamping-screw or equivalent device 53. The object in adjustably mounting the sizer-plate upon the lever 44 and providing the same with a curved bearing-face is that as the grindstone wears away the contact-surface may be adjusted to the angle of contact of the lens with the grindstone.

In the operation of my invention the lens is clamped in position between the yielding faces 19 and 27, with its long and short axes in substantially the same position as the axes of the lens-former 22. The contact-plate 50 is then adjusted so that its surface 51 is substantially concentric with the surface of the grindstone, as seen by dotted lines in Fig. 3, and the carriage is then rocked forward until the lens comes in contact with the grindstone. The clutch 13 is then or previously operated to lock the shaft to the pulley 11, whereupon the lens and lens-former and the cam-hubs 30 and 31 are rotated from the main driving-shaft. Assuming that the cams are in their closed position, as seen in Fig. 2, the advancing face of the cam 30 impinges against and rides upon the adjacent face of the slower-moving cam 31, thereby forcing said cam or hub endwise away from its seat in the hub or cam 30 and imparts similar endwise movement to the carriage 3. As the adjacent ends or points of the cams meet the opposite walls of the recess or cam-faces of the cams engage each other, or rather the cam 31 follows instead of being in ad-

vance of the contact-faces of the cam 30, and were it not for the spring 32′ the cam 30 would leave or break contact with the cam 31 on account of the faster movement of the cam 30; but the spring 32′ holds said cam-faces in close contact and effects the same uniform backward or return movement of the carriage as is produced in its outward movement. When desired to vary the size of the lens during the process of grinding without changing its form, it is simply necessary to rotate the sizer-plate 46 until one of the elevated surfaces 47, corresponding with the size desired, is registered with the contact end of the adjusting-screw.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that the essential feature of my invention is to provide cams operated by differential speed-gears for converting rotary into reciprocal or endwise motion and that some change may be made in the details of the construction shown and described without departing from the spirit thereof.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A lens-grinding machine comprising a rotary lens-holder, rotary members one having an abutting cam-face engaged with the other, and means for rotating said members at different rates of speed whereby one of the members is moved endwise independently of the other for imparting similar endwise movement to the lens-holder.

2. A lens-grinding machine comprising a rotary lens-holder, rotary members having abutting cam-faces, and means for rotating said members at different rates of speed whereby one of the members is moved endwise for imparting similar endwise movement to the lens-holder, and additional means for returning the lens-holder endwise.

3. In a lens-grinding machine the combination with a rotary lens-holder and driving-shaft, and rotary members mounted on the driving-shaft and actuated thereby at different speeds, one having means to force the other endwise for moving the lens-holder endwise.

4. In a lens-grinding machine the combination with a rotary lens-holder and driving-shaft and rotary members mounted on the driving-shaft, means for rotating the members at different speeds, one of the members having means to force the other endwise for moving the lens-holder endwise in one direction, and additional means for moving the lens-holder endwise in the reverse direction.

5. In a lens-grinding machine the combination with a rotary lens-holder and driving-shaft, revoluble members having coincident axes and abutting cam-faces, means actuated by the driving-shaft for rotating the members at different speeds whereby one of the members is moved endwise and imparts endwise movement to the lens-holder, and a spring for returning the lens-holder against the action of the cams.

6. In a lens-grinding machine the combination with a rotary holder and a lens-driving shaft, rotary members mounted on the driving-shaft one being tight and the other loose and both having intermeshing cam-faces, and means actuated by the driving-shaft for rotating the loose member slower than the driving-shaft for the purpose described.

7. In a lens-grinding machine, the combination with a lens-carriage having a rotary lens-holder thereon, means for rotating the lens-holder, a rotary member actuated by said means, a second rotary member actuated by the said former member at a different rate of speed and provided with a cam-face engaged with said former member whereby the second member is moved endwise for actuating the carriage in one direction, and means for returning the carriage.

8. In a lens-grinding machine, the combination with a lens-carriage having a rotary lens-holder thereon, means for rotating the lens-holder, a rotary member actuated by said means and provided with a cam-face, a second rotary member bearing against said cam-face and actuated by the former member at a different rate of speed whereby the second member is moved endwise for moving the carriage in one direction, and means for returning the carriage.

9. In a lens-grinding machine, the herein-described means for converting rotary into reciprocal motion consisting of two revoluble members having a common axis and adjacent end cam-faces lapping one upon the other, means for revolving one of the members, and additional means for revolving the other member at a different rate of speed than the former member.

10. In a lens-grinding machine the combination with a revolving driving-shaft, a carriage hinged to the shaft and movable endwise thereof, a revoluble lens clamp and former mounted on the carriage and actuated by the driving-shaft, a gear secured to the shaft and provided with an end cam-face, a second gear loosely mounted on the shaft between the carriage and former gear and provided with a cam-face engaged with the cam of the former gear, the latter gear being geared to the former gear to rotate at a reduced rate of speed whereby the said latter gear is moved endwise for moving the carriage in one direction, and a spring for returning the carriage and contacting the cam-faces of the gears with each other.

In witness whereof I have hereunto set my hand this 28th day of May, 1901.

ELI M. LONG.

Witnesses:
MILDRED M. NOTT,
H. E. CHASE.