J. H. HAMMON.

LENS GRINDING AND POLISHING MACHINE.

APPLICATION FILED JUNE 27, 1917.

1,275,019.

Patented Aug. 6, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

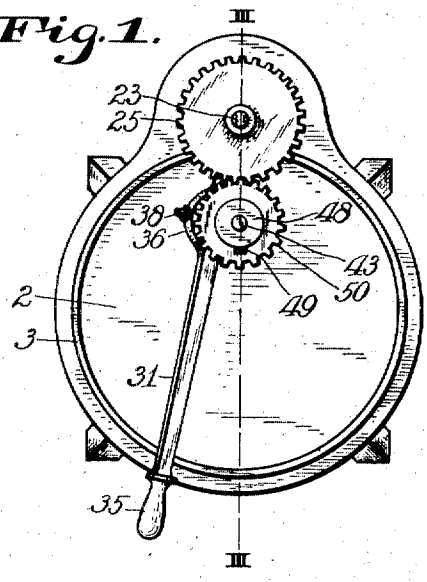


Fig. 2.

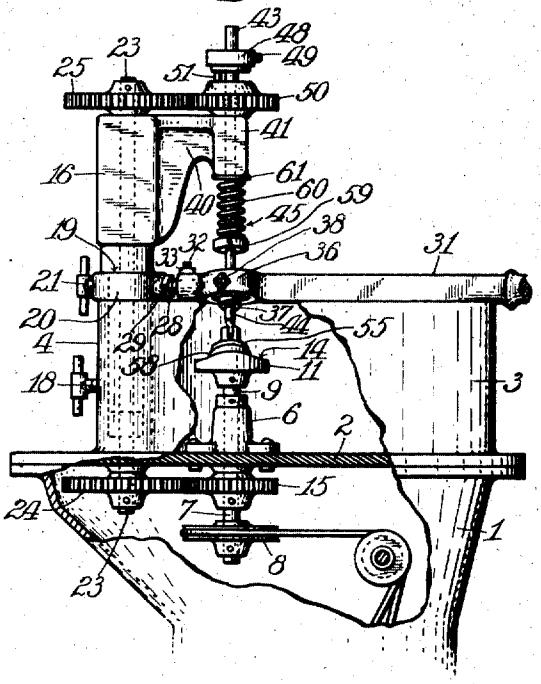


Fig. 3.

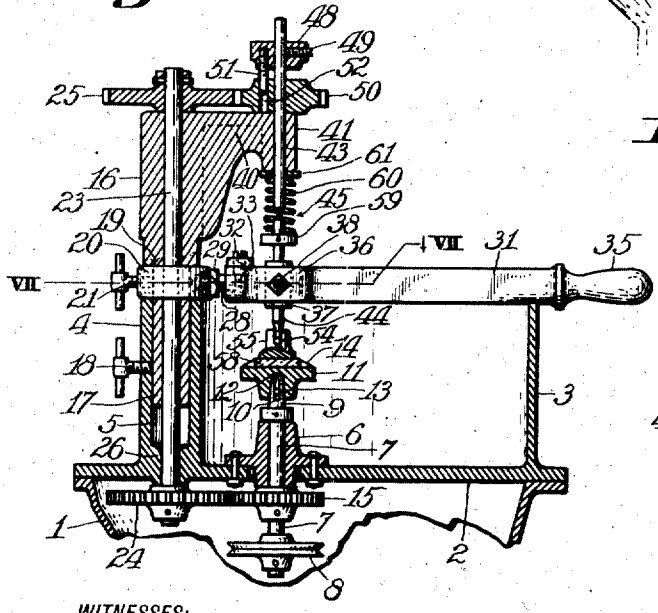
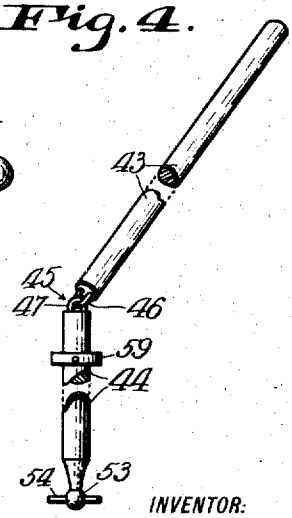


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

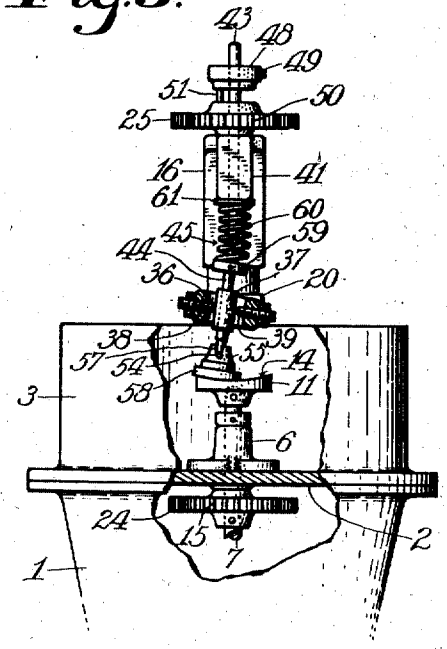


Fig. 6.

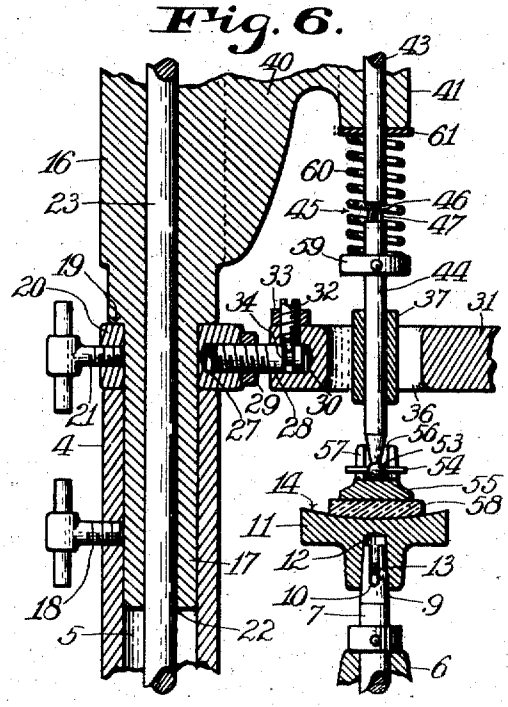


Fig. 7.

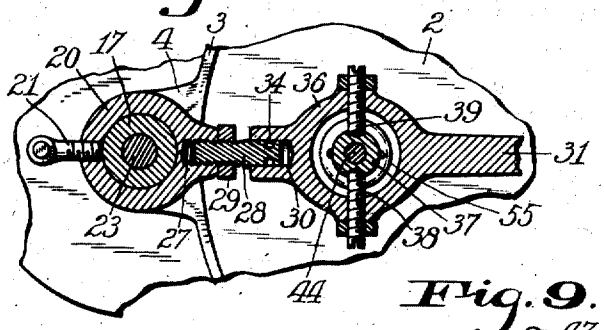


Fig. 8.

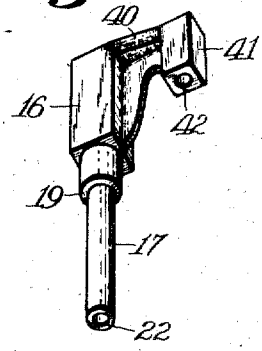
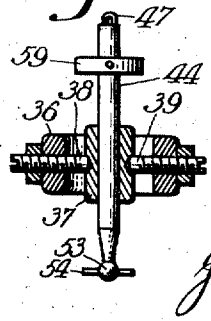


Fig. 9.



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UNITED STATES PATENT OFFICE.

JAMES HALLECK HAMMON, OF VINCENNES, INDIANA.

LENS GRINDING AND POLISHING MACHINE.

1,275,019. Specification of Letters Patent. Patented Aug. 6, 1918.

Application filed June 27, 1917. Serial No. 177,238.

To all whom it may concern:

Be it known that I, JAMES H. HAMMON, a citizen of the United States, residing at Vincennes, in the county of Knox and State of Indiana, have invented a new and useful Lens Grinding and Polishing Machine, of which the following is a specification, reference being had to the accompanying drawings and to the letters and figures of reference marked thereon.

This invention relates to machines that are designed to grind various forms of lenses and particularly those which are ground on concave tools or laps, the present application for Letters Patent relating to an improvement on the apparatus shown in a prior patent issued to me September 4, 1917, No. 1,239,268.

An object of the present invention is to provide an improved and more particularly a universal grinding and polishing machine or surfacer of such construction as to permit the grinding or polishing of any character of lens with equal or approximately equal ease, and by operators having limited experience.

Another object is to provide a grinding and polishing machine in which the operations shall be performed with uniform or equal pressure on all portions of the lens and also on the tool or lap, in order to keep the tool or lap surface true to avoid expense of new tools or re-surfacing damaged tools.

A further object is to provide a lens-grinding and polishing machine which shall be especially adapted for grinding toric cylinder lenses in a simple manner and successfully, and also be capable of grinding or polishing lenses of various other characters, and without requiring expert operators; an aim being to provide a machine of the above-mentioned character which shall be simple and durable, not liable to derangement and on which the operations may be economically performed.

A still further object is to provide improvements generally in lens-grinding and polishing machines and more particularly with reference to gearing, an important object being to provide an improved controllable spindle for holding and driving the lenses correctly with respect to the tool or lap for all the various characters of lenses.

With the above-mentioned and other objects in view the invention consists in an improved lens-grinding and polishing machine comprising essentially a driving spindle for the lens having a universal coupling to constitute a flexible spindle, the lower portion of which is controllable and adapted to carry and rotate the lens to be treated, the invention consisting also in novel means for guiding and controlling the controllable portion of the spindle so that it shall be maintained constantly at right angles to that part of the surface on which the grinding is being done while following the curvature of the tool or lap. The invention consists also further in improved gearing for driving the lap and the spindle and operatively connecting the lap and the spindle together; and further, the invention consists in the novel parts and combinations and arrangements of parts as hereinafter particularly described and further defined in the appended claims.

Referring to the drawings,—Figure 1 is a top plan of the improved universal grinding and polishing machine minus the gear casing (not shown) which in practice covers the uppermost gear wheels; Fig. 2 is a side elevation of the machine partially broken away; Fig. 3 is a vertical central section of the machine with its stand broken away on the line III—III on Fig. 1; Fig. 4 is a perspective view of the improved sectional spindle as perferably constructed for controlling the lens; Fig. 5 is a front elevation of the machine partially broken away and minus the lower portion of its stand; Fig. 6 is a fragmentary section also on the line III—III assuming that the controller for the sectional spindle is moved to central position on said line; Fig. 7 is a fragmentary section on the line VII—VII on Fig. 3. Fig. 8 is a perspective view of one of the frame parts of the machine; and, Fig. 9 is a detail sectional elevation showing portions of the sectional spindle and its controlling devices.

Similar reference characters on the differ-

ent figures of the drawings indicate similar parts or features of construction herein referred to and described.

The invention as preferably constructed comprises a suitable stand 1 which supports a pan comprising a bottom 2 and a side wall 3. A suitable support for a frame member is provided and preferably comprises a boss 4 cast integrally on the outside of the wall of the pan, the boss having a suitable bore 5 vertically arranged therein. The bottom 2 of the pan is provided with a journal box 6 in which a driving shaft 7 is rotatably mounted in vertical arrangement. The driving shaft extends upward and also downward beyond the journal box and the lower portion of the shaft is provided with a driving pulley 8. The driving shaft has a tapering upper portion 9 in which is a vertical slot 10. Each tool or lap 11 provided with the machine has a socket 12 in its under side to receive the tapering portion 9 of the shaft, a cross bar 13 being secured in the socket to enter the slot so as to accurately position and drive the tool or lap. The top 14 of the tool or lap is shaped as required for the lens required to be ground or polished, different tools having different surface contours, as will be understood. A toothed driving wheel 15 is secured to the driving shaft 7 below the bottom 2 of the pan. A frame member is provided which comprises a main or head portion 16 and a cylindrical portion 17, the portion 17 being rotatively arranged in the bore 5 of the boss 4, the boss having a set screw 18 mounted therein to secure the frame member to the boss by engagement with the cylindrical portion 17. The frame member is suitably supported at the proper height preferably by means of a shoulder 19 facing downward, the shoulder having a suitable bearing, preferably upon a collar 20 which has its bearing upon the boss 4, the collar constituting a part of a spindle-controlling appliance and being rotatively arranged on the cylindrical portion 17 of the frame member; the collar being provided with a set screw 21 whereby to secure the collar to the cylindrical portion. The frame member has a vertical bore 22 extending therethrough in which a main shaft 23 is suitably mounted so as to be rotatable, the shaft extending through the frame member and the bore 5 and also through the bottom of the boss 4. A toothed gear wheel 24 is secured to the lower end portion of the shaft 23 and meshes with the driving wheel 15, another toothed gear wheel 25 having a diameter equal to that of the wheel 24 being secured also to the shaft 23 upon the top of the portion 16 of the frame member. Preferably the bottom of the boss 4 is provided with a journal bearing 26 for the shaft 23.

Preferably the main portion of the controlling lever above referred to is adjustably connected to the collar 20 which constitutes the pivotal support for the lever, and for this purpose the side portion of the collar 20 has a screw-threaded socket 27 therein in which a screw-threaded stud 28 is arranged and provided with a lock-nut 29 to secure the stud which is adjustable to vary its effective length. The projecting portion of the stud is cylindrical and is received in a smooth-bored socket 30 which is provided in one end of a lever 31 in which a screw 32 having a lock-nut 33 is mounted, the screw having a suitable end portion that extends into a circumferential groove 34 with which the stud is provided, so as to constitute a swivel connection between the main part of the lever and its pivotal collar 20. The lever 31 extends across the top of the wall 3 of the pan to be guided by the latter and has a handle 35 thereon. A portion of the lever near its pivotal collar is suitably formed to constitute a yoke 36 in which a guide collar 37 is arranged on trunnions 38 and 39 that are adjustably secured to the yoke, so that the guide collar may be brought into alinement with the driving shaft 7 and may be tilted in the yoke.

The head portion 16 of the frame member has an arm 40 thereon which is provided with a journal box 41, the bore 42 of which is parallel with the shaft 23. An improved spindle is provided which comprises a section 43 and a section 44 connected together by means of a suitable universal coupling 45, a suitable coupling comprising two links or loops 46 and 47 connected together and fixedly secured, one to each section. The section 43 is suitably mounted rotatably in the journal box 41 and so as to be movable longitudinally, the section extending through and beyond the journal box. A collar 48 is secured to the spindle section 43 above the journal box by suitable means, as a set screw 49, whereby the spindle may be rotated or drawn upward. A toothed wheel 50 is rotatably mounted on the spindle section 43 and in mesh with the wheel 25, the wheel 50 having a diameter equal to that of the wheel 15. The collar 48 is provided with a dowel-pin 51 that operates in a socket 52 with which the wheel 50 is provided, to enable the wheel 50 to rotate the spindle as the latter rises or falls. The lower one of the spindle sections which may be moved swingingly on the upper section is provided on its lower end with a ball 53 having a cross bar 54 whereby to rotate a lens holder or block 55 which has a socket 56 to receive the ball and a slot 57 to receive the cross bar. The lens holder as will be understood is adapted to have a lens blank 58 or a number of blanks cemented thereto to be treated on the tool or lap. The swingable section 44 of the spindle

extends rotatably and slidingly through the guide collar 37 and has a collar 59 fixed thereon on which a coil spring 60 is seated, the spring extending over the universal coupling and having its upper end suitably supported to yieldingly force the lower section of the spindle downward. A suitable support for the spring may comprise an antifriction collar 61 arranged between the spring and the journal box 41.

In practical use the lower section 44 of the spindle that rotates the lens may be straight down as in grinding flat surfaces, or by means of the lever 31 may be swung so as to be directed toward the inner curve of concave spherical tools; or the section may be directed at right angles to the central grinding portion of the curve of convex tools; the angular adjustment of the lower spindle section being necessary to successfully grind toric cylinder lenses on concave tools because of the fact that on concave cylinder tools there is more or less variation in the two principal meridians of the same, such construction of spindle being necessary in order that there shall not be an irregular pressure as the grinding lens passes over the meridian of great curvature to one of greater or less curvature, thereby enabling the lens to be ground upon a tool whose lesser curved meridian is great and whose greater meridian is still more curved, with as much ease as the same can be ground upon a tool which is plane in one meridian and concave in another, with the driving shaft at right angles to the plane of travel of the tool.

The spindle is rotated at the same speed and in the same direction as the driving shaft 7. Having applied the desired form of tool or lap to the machine the proper lens blank is applied and the blank properly positioned relatively to the tool. The set screws 18 and 21 may be loosened when making the required adjustment and afterward tightened; but when it is desired to move the lever 31 the set screw 21 is slackened, as will be understood. When the lever is moved laterally it is caused by the spindle section 44 to turn on its swivel connection.

The necessity of a universal coupling in the spindle of a surfacing machine of the character described is due to the fact that in grinding convex surfaces, which are ground on concave tools it is absolutely necessary that the spindle holding the lens in contact with the grinding surface shall be rotated or its position maintained as nearly as possible to that of an altitude of the particular plane upon which the glass is being ground; one of the prime necessities of this being because of the fact that where the driving spindle is not so situated as the lens travels to the outer edge or periphery of the concave tool the angle formed of necessity brings an oblique pressure on the glass, thereby causing the glass to fail to maintain an even pressure over its grinding face and causes the glass or lens to fly off, due to the fact that the friction is greater on one side of the glass than on the other, this being especially true in polishing, inasmuch as the lens is always polished upon a cloth or some other soft surface which does not present a firm resisting surface to the glass.

Having thus described the invention, what is claimed as new is—

1. A surfacing machine including a driving shaft and a spindle rotatable on parallel axes, the spindle being journaled and movable longitudinally and having a controllable swingable section, mean for controlling the swingable section of the spindle, and a spring directly acting axially on the swingable section of the spindle and to follow the swinging movement of the section.

2. A surfacing machine having an upright driving shaft and a spindle rotatable in unison, the spindle comprising a journaled section having a controllable swinging section, the spindle being movable longitudinally, the machine having a member affording a horizontal guide, a controlling lever pivotally connected with the machine and slidingly guided upon the horizontal guide, and a guide collar adjustably carried by the lever and guiding the swinging section of the spindle.

3. A surfacing machine including an upright driving shaft and a spindle rotatable in unison, the spindle comprising a journaled section having a controllable swinging section, the spindle being movable longitudinally, the machine having an upright pivot member and also a horizontal guide member, a controlling lever collar connected with the pivot member, a controlling lever having a swivel connection with the collar, and a guide collar adjustably carried by the lever and guiding the swinging section of the spindle.

4. A surfacing machine including an upright driving shaft and a spindle rotatable in unison, the spindle comprising a journaled section having a controllable swinging section, the spindle being movable longitudinally, the machine having an upright pivot member and a horizontal guide member, a controlling lever collar connected with the pivot member, a controlling lever having swiveled and longitudinally-adjustable connection with the collar and slidingly guided upon the horizontal guide member, the lever being guided to permit it to rotatively turn upon the guide member, and a guide collar adjustably carried by the controlling lever and guiding the swinging section of the spindle.

5. A surfacing machine having a driving

shaft and a spindle rotatable on parallel axes, the spindle comprising a journaled section having a controllable swingable section, the spindle being movable longitudinally, a collar secured to the swingable section of the spindle, a spring seated on the collar to force the spindle toward the driving shaft, means for guiding the swingable section of the spindle to adjust and hold it to position, and means for rotating both the driving shaft and the journaled section of the spindle at equal speed and in one and the same direction.

6. A surfacing machine including a rotatable driving shaft, a toothed driving wheel secured to the driving shaft, a tool mounted on the driving shaft, a stationary support, a frame member pivotally mounted in the support and having an arm thereon provided with a journal box, a device for fixedly securing the frame member to the stationary support, a main shaft rotatably mounted in the frame member and extending therethrough and through the support, a spindle rotatably mounted in the journal box and movable longitudinally therein, a lens holder to be rotated by the spindle, a toothed driven wheel rotatable on the spindle, means for securing the driven wheel to the spindle, a spring coöperating with the spindle to move the spindle toward the tool, a toothed wheel secured to the main shaft and meshing with the driving wheel, and a second toothed wheel secured to the main shaft and meshing with the driven wheel.

7. In a surfacing machine, the combination with a driving shaft, and a lap mounted on said shaft to be rotated thereby, of a supported frame member, a lens holder to be rotated upon the lap, a spindle comprising an upper section and a lower section and a universal coupling connecting the two sections together, the upper section being rotatably mounted in the frame member, the lower section being adapted to rotate and shift the lens holder on the lap, a supported spring acting directly on the lower section of the spindle, gearing connected with the driving shaft and the spindle, and a pivoted and swiveled lever for controlling the lower section of the spindle to shift or to hold the lens holder to position.

8. In a surfacing machine, the combination of a hollow support, a driving shaft rotatably supported, a toothed driving wheel secured to said shaft, a tool mounted on said shaft, a frame member having a cylindrical portion extending through and rotatively supported in the hollow support, the frame member having an arm thereon that is provided with a journal box, a spindle rotatably mounted in said box to move longitudinally, a toothed driven wheel rotatable on the spindle and having a socket therein, a collar secured to the spindle and having a pin thereon extending into said socket, a main shaft rotatably mounted in the frame member, a toothed wheel secured to the main shaft in mesh with the driving wheel, and a second toothed wheel secured to the main shaft in mesh with the driven wheel.

9. In a surfacing machine, the combination with a driving shaft and a lap thereon, and a supported frame member, of a lens holder to be rotated upon the lap, a spindle comprising an upper section and a lower section and a universal coupling connected to the two sections of the spindle, the upper section being rotatably mounted in the frame member to move longitudinally, the lower section being adapted to rotate the lens holder and having a collar thereon, a spring seated upon the collar and extending about the sections and the coupling of the spindle, the spring coöperating substantially with the frame to force the lower section of the spindle toward the lap, gearing connected with the driving shaft and the spindle, and means for controlling the angularity of the lower section relatively to the axis of the upper section of the spindle.

10. In a surfacing machine, the combination of a pan comprising a bottom and a side wall, the wall having a hollow boss on one portion thereof, a driving shaft rotatable in the bottom of the pan, a pulley and a toothed driving wheel secured to the shaft below said bottom, a frame member having a cylindrical portion rotatively mounted in the hollow boss, the frame member having a lateral arm on the upper portion thereof that is provided with a journal box, a main shaft rotatably mounted in the frame member and extending through the hollow boss, a spindle rotatably mounted in said journal box, a toothed driven wheel on the top of said box to drive the spindle, a toothed wheel secured to the main shaft and meshing with the driving wheel, a second toothed wheel secured to the main shaft and meshing with the driven wheel, and a set-screw mounted in said boss to engage and hold the cylindrical portion of said frame member.

11. In a surfacing machine, the combination of a hollow boss, a vertical driving shaft, a toothed driving wheel secured to said shaft, a controlling lever collar supported upon said boss and having a screw-threaded socket in its side, a stud screwed into said socket, a lever swiveled on said stud and having a yoke provided with trunnions, a guide collar in said yoke and supported on said trunnions, a frame member having a cylindrical portion extending through and rotatively supported upon said lever collar, said portion being rotatively arranged in and extending through said boss, a set-screw mounted in said boss to

engage said cylindrical portion, a set-screw mounted in said lever collar to engage said cylindrical portion, a spindle rotatably mounted in said frame member and having a swingable lower portion that extends rotatably through said guide collar, a toothed driven wheel on said spindle to rotate the latter, a main shaft rotatably mounted in said frame member, a toothed wheel secured to the main shaft in mesh with the driving wheel, and a second toothed wheel secured to the main shaft in mesh with the driven wheel.

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

JAMES HALLECK HAMMON.

Witnesses:
J. W. HAWKINS,
A. K. HURSH.