

May 21, 1929.

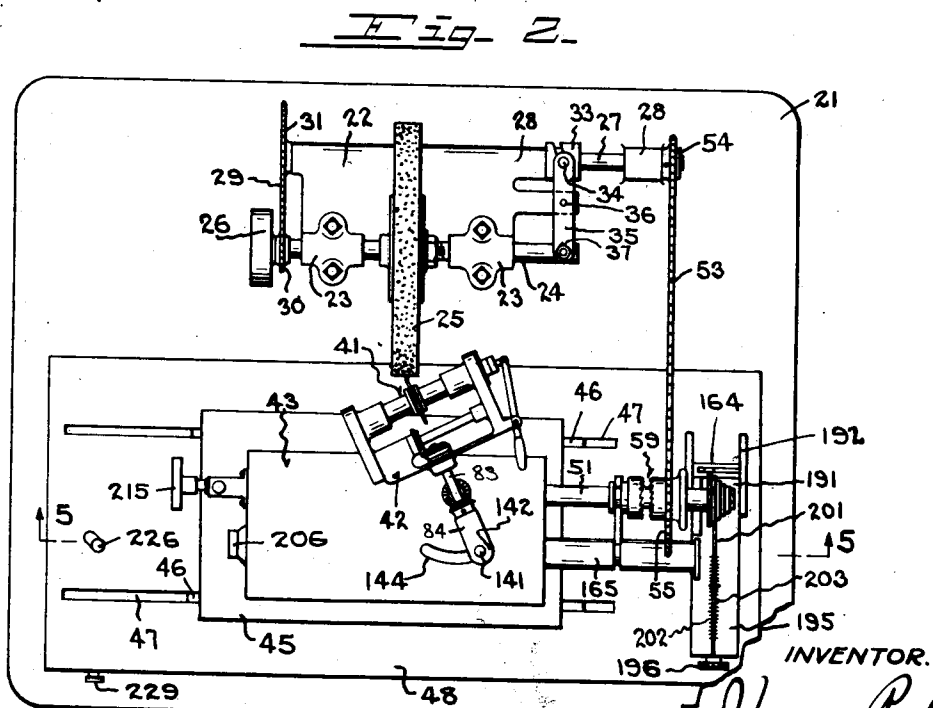
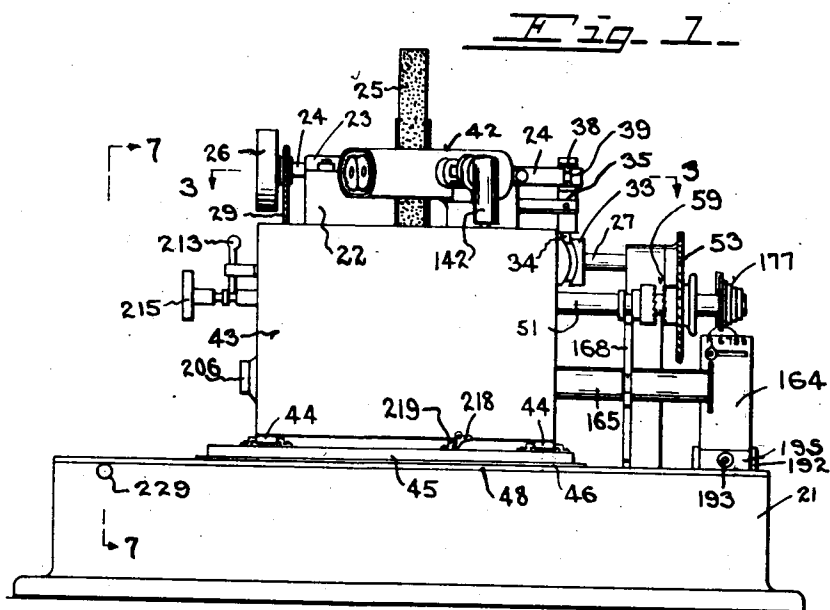
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1,713,622

LENS EDGE GRINDING MACHINE

Filed Aug. 11, 1926

4 Sheets-Sheet 1



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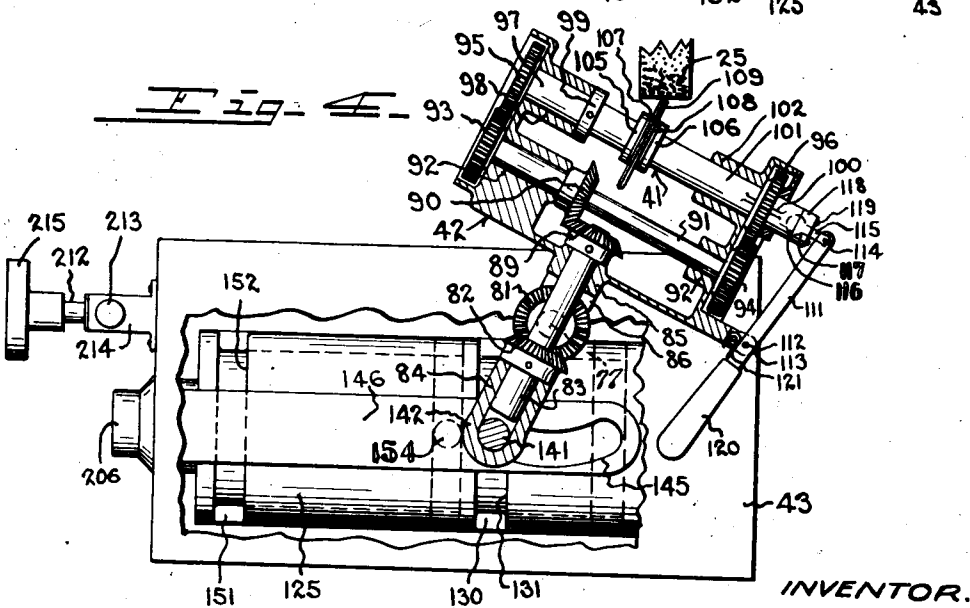
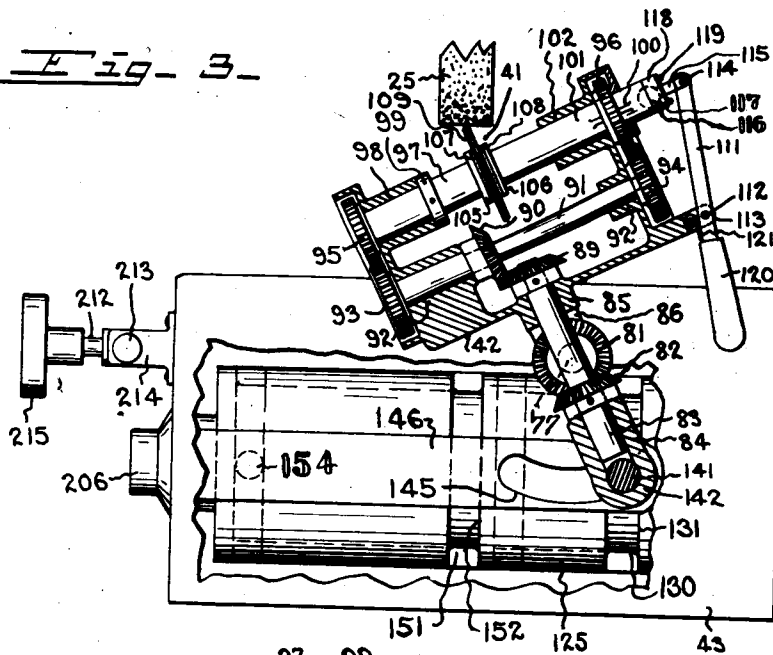
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LENS EDGE GRINDING MACHINE

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Fig. 3.



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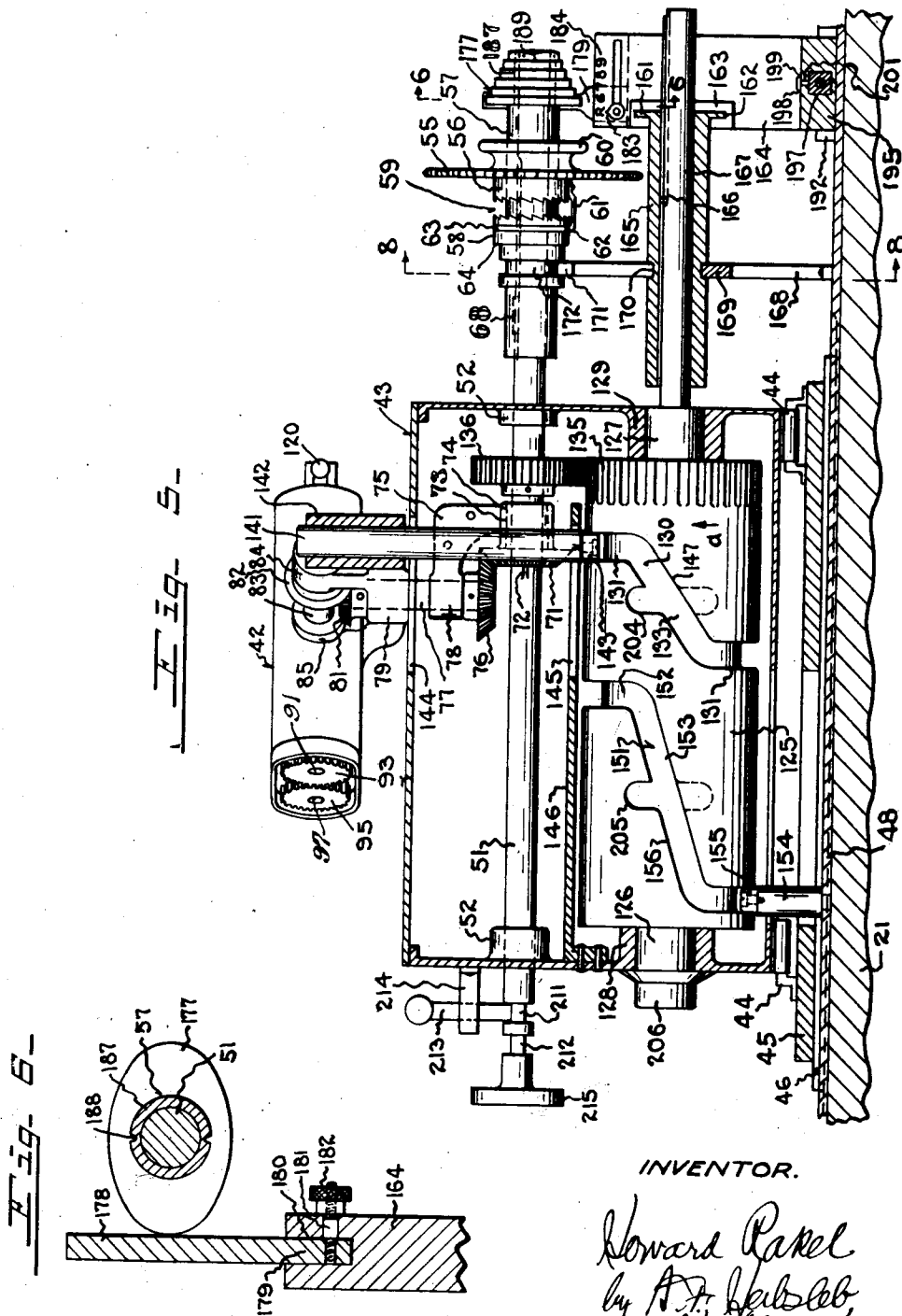
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LENS EDGE GRINDING MACHINE

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4 Sheets-Sheet 3



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LENS EDGE GRINDING MACHINE

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4 Sheets-Sheet 4

Fig. 7

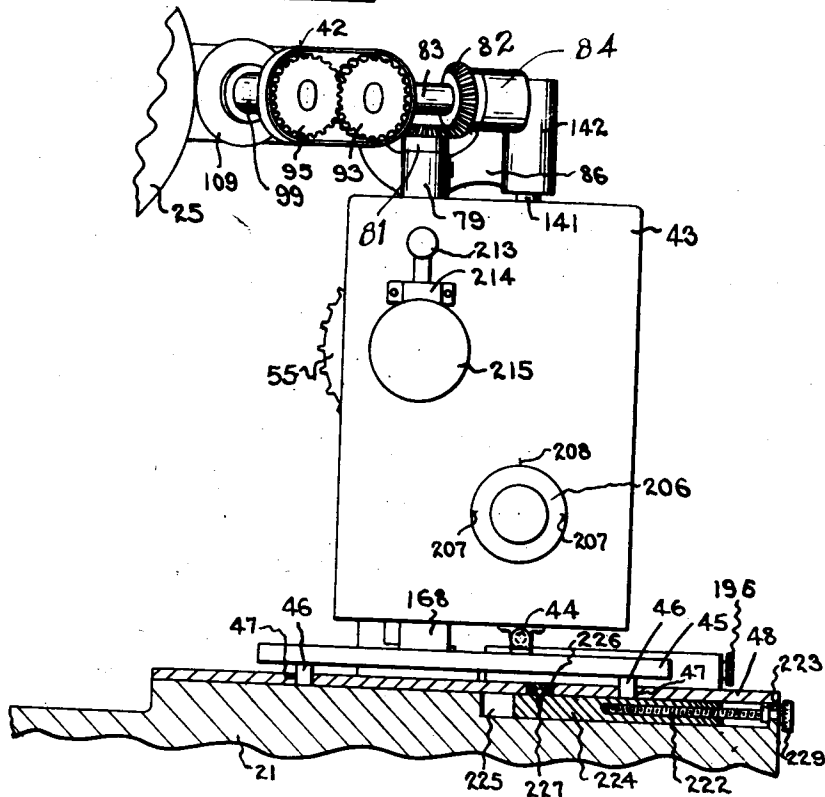


Fig. 8

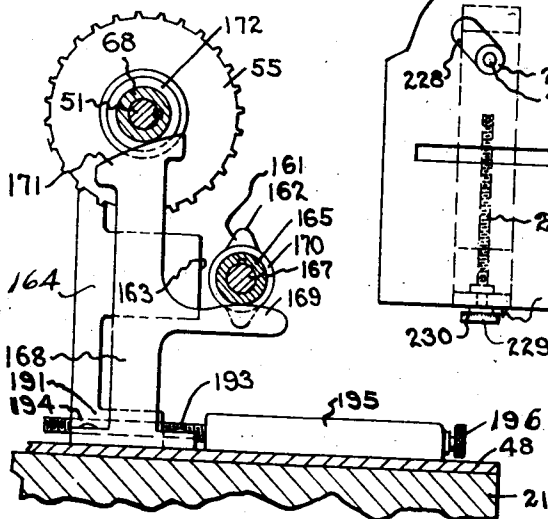
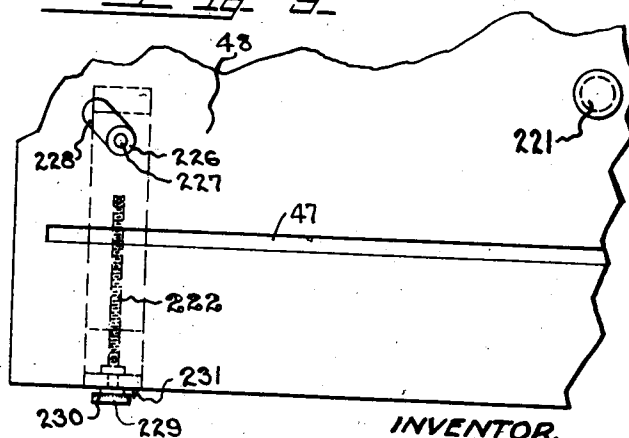


Fig. 9



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UNITED STATES PATENT OFFICE.

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LENS-EDGE-GRINDING MACHINE.

Application filed August 11, 1926. Serial No. 128,689.

My invention relates to improvements in lens edge grinding machines for grinding the edges of lenses and is primarily for use in grinding the edges of optical lenses.

5 It is the object of my invention to provide a lens edge grinding machine capable of grinding opposite edge bevels at the opposite faces of lenses, for instance, for rim glasses or spectacles, and of grinding straight edges
10 on lenses, for instance, for rimless glasses or spectacles; further, to provide novel means for presenting lenses at opposite angles to the grinding face of a grinding tool; further, to provide novel means for presenting lenses
15 substantially perpendicular to the grinding face of a grinding tool; further, to provide novel means for moving the lenses bodily lengthwise of the grinding face of a grinding tool, whereby the lenses are located in coac-
20 tive relations with the grinding face during the various grindings thereof; further, to provide means for qualifying the angular positioning means for the lens, whereby to adjust the angular position at which the lens is
25 presented to the grinding face, in order to locate the opposite bevels at the edge of the lens central with relation to the said edge; further, to provide novel means for adjusting the movements of the lens carrier for grind-
30 ing lenses of various sizes; and, further, to provide novel means for angular presentation of the lens and for shifting the lens whereby a narrow grinding wheel may be employed for the various grinding operations.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

40 Fig. 1 represents a front elevation of my improved device.

Fig. 2 represents a plan view of the same.

Fig. 3 is a plan view of the same partly broken away and partly in horizontal section on the line 3—3 of Fig. 1, showing the parts
45 arranged for grinding a bevel at the edge of one face of a lens.

Fig. 4 is a similar view showing the same arranged for grinding a bevel on the oppo-
50 site face of the lens.

Fig. 5 is a longitudinal section of my improved device taken on the line 5—5 of Fig. 2.

Fig. 6 is an end view of a detail of the same partly in section on the line 6—6 of
55 Fig. 5.

Fig. 7 is an end elevation of my improved

device partly broken away and partly in section on the line 7—7 of Fig. 1.

Fig. 8 is a sectional detail of the same taken in the plane of the line 8—8 of Fig. 5.

Fig. 9 is a detail of the same showing the means for angular adjustment of the slide.

A support 21 shown as a base has a pedestal 22 extending upwardly therefrom, in which there are bearings 23, for a grinder shaft 24,
60 on which a grinding tool 25, shown as a grinding wheel, is secured in suitable manner. The grinding wheel has a suitable supply of water or other lubricant thereon. The grinder shaft is arranged to be rotated from a suit-
65 able source of power and has a pulley 26 fixed thereto.

Endwise reciprocation is imparted to the grinding wheel, as by providing a shaft 27, journaled in bearings 28 of the pedestal, and
70 driven by means of a sprocket chain 29, received about sprocket wheels 30, 31, respectively fixed to the shafts 24, 27. A cam collar 33 is fixed to the shaft 27, and is provided with a cam groove in which a pin 34 is re-
75 ceived. This pin is on a lever 35, pivoted at 36 to the pedestal, and having a fork 37, provided with pins 38, received in an annular groove 39 in the grinder shaft 24 for reciprocating the grinder shaft.

A lens carrier 41 comprises a frame 42 pivoted on a housing 43. The housing is in turn pivoted, as by pivots 44, to a slide 45, having guides 46 received in guideways 47 of a plate 48, which may be part of the support, but is
80 preferably adjustable with relation thereto for purposes to be hereinafter described. The location of the pivots 44 is such as to normally cause tilting of the rotary lens holder toward the grinding tool for coaction of
85 the rotating lens with the grinding tool with a limited pressure to prevent chipping of the lens.

A shaft 51 is journaled in bearings 52 in the housing, and is exemplified as driven
90 from a sprocket chain 53, received about a sprocket wheel 54 fast to the shaft 27, and about a sprocket wheel 55 received about the shaft 51. The sprocket wheel 55 is on a collar 56 slidable endwise on and rotatable with a
95 sleeve 57. This sleeve is provided with a collar 58 fixed thereto. A clutch 59 is located between the collars 56, 58.

The clutch is arranged to be engaged for driving the sleeve 51, and is
100 arranged to be disengaged for disengaging the driving connection of said shaft. The

collar 56 is provided with a knob 60, by means of which the collar 56 is moved manually endwise for engagement and for disengagement of the clutch. The collar 56 is provided with a spring finger 61, having a button 62 received in an annular groove 63 in the collar 58 when the clutch is in disengaged relation. The button 62 is received in a rabbet 64 when the clutch is in engaged relation, for aiding in maintaining said engaged relation. The sleeve 57 has spline key and groove connection 68 with the shaft 51, for driving the shaft 51 when the clutch is in engaged relation.

A bevel gear 71 has spline key and groove connection 72 with the shaft 51. The hub 73 of the bevel gear is journaled in a bearing 74 of a bracket 75 fixed to the housing 43. A bevel gear 76 meshes with the bevel gear 71, and is fixed to an upright shaft 77, journaled in a bearing 78 extending from said bracket 75. The frame 42 is provided with a bearing 79 about the shaft 77. This bearing is supported on the housing 43. A bevel gear 81 is fixed to the shaft 77, and meshes with a bevel gear 82 fixed to a shaft 83, journaled in bearings 84, 85, of the frame 42. The bearings 79, 84 and 85 may be located in an arm 86 of said frame.

The shaft 83 has a bevel gear 89 fixed thereto, which meshes with a bevel gear 90 fixed to a cross-shaft 91 journaled in bearings 92 in the frame 42. The shaft 91 has gears 93, 94, fixed thereto, which respectively mesh with gears 95, 96. The gear 95 is fixed to a shaft 97 journaled in a bearing 98 in the frame 42, and held axially by a collar 99. The gear 96 has spline key and groove connection 100 with a shaft 101 journaled in a bearing 102 of the frame 42.

The shafts 97, 101, have the respective parts 105, 106, of a lens clamp fixed thereto. This lens clamp may comprise cushions 107, 108, received against the respective faces of the lens, exemplified at 109, which it is desired to grind. The lens is arranged to be clamped in said clamp and is readily releasable therefrom.

A lever 111 is pivoted at 112 in a fork 113, fixed to the frame 42, and has articulation 114 with a stem 115 of a ball 116, located in a socket 117 of the shaft 101. A cap 118 of the socket is secured to the end of the shaft 101 by means of screws 119. Unscrewing the screws releases the ball. The lever 111 is provided with a handle 120. A spring 121 is located between the frame 42 and the outer end of the lever 111 for normally urging the lens clamp into clamping relation. Moving the handle for shifting the shaft 101 outwardly endwise, releases the clamp.

A single lens is shown clamped in the clamp, but a plurality of lenses may be clamped therein when grinding straight edges on the lenses.

Means are provided for grinding opposite

edge bevels at the respective faces of the lens when grinding a lens for being received in a rim, and means are also provided for presenting the lens to the grinding surface so as to grind a straight edge on said lens, for making a so-called rimless lens, and means are further provided for moving the lens holder in endwise relation to the grinding surface, for positioning the lens in similar positions lengthwise of the grinding surface during the various characters of grinding, whereby a narrow grinding wheel may be employed.

A cam drum 125 is journaled on axles 126, 127, in bearings 128, 129, of the housing 43. It is provided with a cam groove 130, provided with straight portions 131, and inclined portions 133, which connect with the respective ends of the straight portions at opposite sides of the cam drum. There is an inclined portion 133 at each side of the cam drum, the respective inclined portions being inclined in opposite directions. The cam drum is provided with a gear 135, with which a gear 136 fixed to the shaft 51 meshes, for rotating the cam drum.

A stem 141 is fixed in a bearing 142 on the frame 42, and is provided with a roller 143, which coacts with the cam. The stem is received in a slot 144 in the top of the housing and in a slot 145 in a bracket 146 fixed in said housing. These slots are arcuate slots, the curvatures of which are described from the pivotal axis of the frame 42. The walls of these slots guide and steady the stem.

The drum 125 rotates in the direction of the arrow *a*. The wall 147 of the inclined portion 133 of the cam groove 130 coacts with the roller for swinging the frame 42 in one direction, and the similar wall of the opposite inclined portion at the other side of the cam drum, coacts with said roller for swinging the frame 42 in the opposite direction. The swinging of the frame is for the purpose of presenting the respective sides of the lens being ground in opposite angular relations to the grinding surface of the grinding wheel, so as to grind said lens with opposite edge bevels at its respective sides. The respective positions of the frame 42 and of the lens are shown in full lines in Figs. 3 and 4. The median position of the grinding wheel is shown in these figures.

When the frame 42 is swung from the position shown in Fig. 3 to the position shown in Fig. 4, or vice versa, the frame is moved equal distances and is presented at equal but opposite angles to the plane perpendicular to the axis of rotation of the grinding wheel, in which the pivotal axis of the frame 42 is located. The positions of the lens are distanced from each other in these two angular positions of the pivoted frame.

In order to compensate for this movement of the lens, the lens holder is moved in oppo-

site direction, lengthwise of the grinding surface of the grinding wheel, for relocating the lens in proper grinding relation with the grinding wheel. For accomplishing this, the cam drum 125 is provided with a cam, shown as a cam groove 151, which has straight portions 152, and inclined portions 153. There is an inclined portion 153 at each side of the cam drum, the respective inclined portions being inclined in opposite directions. A stem 154 is fixed to the plate 48, and is provided with a roller 155 received in the cam groove. When the wall 156 of the inclined portion 153 coacts with the roller, the slide is moved from the position shown in Fig. 3 to the position shown in Fig. 4. When the similar wall of the opposite inclined portion of the last-named cam groove coacts with said roller, the slide is moved in the opposite direction.

The rotary lens holder rotates at greater speeds than the speed of rotation of the cam drum, there being a number of rotations of the rotary lens holder for each endwise shifted position of the slide, and the construction is such that there are a number of rotations of the edge adjacent to one face of the lens for grinding upon one bevel of the lens, whereupon there is a shifting of the lens and another number of rotations of the lens, during opposite positioning of the lens for grinding a portion of the opposite bevel at the opposite face of the lens. The grinding wheel rotates at relatively much greater speeds. These coactive relations for grinding take place during travel of the roller 143 in the straight portions 131 of the groove 130, the slide being held endwise during such coactive rotations by travel of the roller 155 in the straight portion 152 of the groove 151. In the interims between such grindings, the roller 143 coacts with the respective inclined portions 133 of the groove 130 and the roller 155 coacts with the respective inclined portions 153 of the groove 151 for accomplishing the shifting motions of the rotary cam drum 125, the housing 43 and frame 42.

The swinging movement of the lens during such shifting movements would normally be into the plane of the grinding surface. Means, however, are provided for moving the lens away from the grinding surface during such shifting movements, accomplished in the present exemplification by a cam 161, having high points 162, which coact with a stop face 163 on a stand 164. The cam 161 is on a sleeve 165, which has spline key and groove connection 166 with a shaft 167 extending from the cam drum. A post 168 is fixed to the plate 48, and is provided with a guide 169 which is received in an annular groove 170 in the sleeve 165 for positioning said sleeve endwise. The post is also provided with a guide 171 received in an annular groove 172 in the sleeve 57. These guides

169 and 171 have arcuate edges, respectively preferably described from the pivotal axis of the housing 43, so as to maintain coactive relations between said guides and said sleeves respectively, during the rocking movements of the housing, whereby such sleeves are maintained in endwise positions during endwise movements of the slide. The shafts 51 and 167 move endwise in said sleeves during endwise movements of said slide, the driving connections between said respective sleeves and said respective shafts being, however, maintained.

Patterns 177 rotate in unison with the rotation of the lens, for determining the shapes to which the respective lenses shall be ground. There may be a suitable number of these patterns, and the patterns be of different shapes, as will be well understood in the art. A co-acting arm 178, which forms a stop, is on a slide 179, slidable in a guideway 180 on the stand 164, the slide being adjustable crosswise of said patterns, for placing the co-acting arm in coactive relation with any one of the patterns desired, for determining the shape to which the lens is to be ground. The slide is provided with a threaded stem 181, over which a nut 182 is threaded, for clamping the slide in adjusted positions. The slide is provided with a pointer 183, arranged to register with any one of the indications 184 corresponding to the shapes of the patterns.

The patterns are received over a reduced end 187 of the sleeve 57, and have positioning means between said sleeve and said patterns for fixing the angular relations between said sleeve and said patterns, exemplified as lips 188 on the patterns, received in grooves in the sleeve parallel with the axis of the sleeve. The patterns are clamped on said sleeve by a nut 189 received over the threaded end of the outer reduced portion of said sleeve.

The lens is clamped in the rotary lens holder so that its shape corresponds in angular position to the angular position of the pattern corresponding with the shape desired of the lens. The axis of rotation of the patterns moves toward and from the arm 178 to control the movement of the axis of rotation of the lens toward and from the grinding surface. The radial position of the point of contact of the pattern with its arm coincides with the radial position of the point of contact of the lens with the grinding wheel.

Means are provided for regulating the approach of the axis of rotation of the rotary lens holder toward the grinding surface, for grinding lenses of various sizes for the respective patterns. This is accomplished by adjusting the position of the arm 178, which forms a stop. This stop is adjusted toward and from the axis of rotation of the grinder shaft for adjusting the approach of the rotary lens holder toward the grinding surface. The axis of rotation of the rotary lens holder is

permitted to approach the grinding surface closer for smaller lenses than for larger lenses.

The means thus provided also permit adjustment of the approach of the axis of rotation of the lens holder toward the grinding surface during grinding of the lenses, so as to avoid chipping.

Thus the stand 164 is located on a slide 191, slidable in a guideway 192 on the plate 48. An adjusting screw 193 is threaded in a threaded bearing 194 in the slide, and is held in endwise position in a guide piece 195. The screw rod is provided with a knurled handle 196 for turning the same. A nut 197 is threaded on the screw, and is provided with pointers 198, 199, on a stem, rigidly connected with the nut, and extending through a slot 201 in said guide piece. The pointers register respectively with the graduations of scales 202, 203. The scale 202 is for the purpose of adjustment for lenses being ground with bevel edges, and the scale 203 is for lenses being ground with straight edges.

The stop 178 is so adjusted that the rough edge of the lens makes contact with the grinding surface, and, as the edge is ground down, the slide 191 and the stop are adjusted toward the plane of the grinding surface, permitting further approach of the lens holder toward the grinding surface. The limit of approach of the rotary lens holder toward the grinding surface is determined by the correspondence of the gage finger with the desired graduation of its scale. These coactive relations between the lens and the grinding surface are maintained during the time that the roller 143 coacts with the straight portions 131, of the cam 130, during which times the cam disk 161 is out of coactive relation with its coacting face 163. As the roller 143 enters either one of the slanting portions 133, of the cam 130, one of the high points 162 of the cam disk 161 coacts with the coacting face 163, for causing recession of the housing 43 and of the rotary lens holder away from the grinding surface, so that the lens is out of contact with the grinding surface during the swinging movements of the lens holder. When the roller 143 enters the opposite straight portion of the cam 130, the high point 162, of the cam coacting with the face 163, will have passed such face, for again placing the pattern in coactive relation with the stop 178, for grinding a portion of the opposite bevel on the edge of the lens.

When lenses are ground with straight edges, as for rimless spectacles, the rotary lens holder is positioned with its axis of rotation parallel with the grinding surface, and is held stationarily in this position. The slide 45 is also held in stationary position. These positions are intermediate of the limits of swinging movements of the lens holder and the limits of sliding movements of the slide.

For accomplishing this each of the inclined portions of the cams is provided with an offset. These offsets in the inclined portions 133 of the cam 130 are shown as recesses 204, and in the inclined portions 153 of the cam 151 are shown as recesses 205. The roller 143 is received in one of the recesses 204 for positioning the lens frame 42. The roller 155 is received in one of the recesses 205 for positioning the slide 45 at an intermediate position. The axle of the cam drum is provided with a knob 206, having opposite marks 207 thereon, either of which is arranged to register with a mark 208 on the housing, during rotation of the housing in its driven direction, for indicating coincidence in annular direction between the roller 143 and either of the recesses 204, and between the roller 155 and either the recesses 205. Rotation of the knob and cam drum in the opposite direction, that is, clockwise direction looking at the knob and indicator marks, causes the walls of the recesses to be received about the rollers, for fixing the slide at an intermediate position in endwise relation, and fixing the pivoted frame 42 in an intermediate endwise position, with the axis of rotation of the rotary lens holder parallel with the grinding surface.

This manipulation of the cam drum preferably takes place while the driving means for the cam drum are dissociated therefrom. This dissociation may be effected by making the shaft 51 longitudinally slidable in its bearings and in the sleeve 57, for moving the gear 136 endwise out of mesh with the gear 135. The spline key and groove connection 72 maintains driving relation between said shaft and bevel gear 71.

The shaft is positioned endwise in its respective positions by being provided with annular grooves 211, 212, and providing a pin 213 axially movable in a lug 214 on the housing and insertable in either of the grooves. The outer end of the shaft is provided with a knob 215 for moving the shaft endwise. When the pin is in the annular groove 211 the gear 136 is in mesh with the gear 135, and when the pin is in the annular groove 212, the said gears are out of mesh.

Placing the gear 136 out of mesh with the gear 135, causes the cam drum to remain non-rotative, thereby placing the cam disk 161 into non-rotative relation and in non-interfering position with relation to the stop face 163. The function of this cam is unnecessary when grinding straight edges on lenses, as swinging movement of the frame 42 does not then take place. The approach adjustment between the rotary lens holder and the grinding surface by means of the coaction between one of the patterns and the stop 178 is determined by adjustment of the pointer 198 with relation to the gage 202, when grinding straight edges or rimless lenses.

During such times as approach between the rotary lens holder and the grinding surface is unnecessary or undesirable, as when inserting the lens or when the machine is inactive, it is desirable to swing the housing away from the grinding surface and lock the same in such position. This is accomplished by means of a latch 218, pivoted to the housing, and arranged to be received in a keeper 219 fixed to the slide.

The relation between the slide 45, the pivoted frame 42, the lens clamp, and the axis of rotation of the rotary lens holder, is preferably such, that the bevels ground at the respective faces of the lens are normally equal, which is a proper relation when grinding lenses, the respective faces of which are parallel, or are of substantially equal curvatures in opposite directions, for instance, double convex lenses and double concave lenses. The bevels are formed equal at both faces of such lenses by opposite positions of the frame 42 at equal angles to a central plane perpendicular to the grinding surface, the apex between such bevels being in the middle of the edge of the lens.

I have found that by qualifying such swinging movements of the rotary lens holder and frame 42, I am enabled to locate the apex between the bevels at the respective sides of lenses having curvatures in similar directions, in a middle position between said faces, for instance when grinding meniscus lenses. I accomplish this qualification in the present instance by shifting the direction of movement of the slide 45, whereby the median plane between the limits of swinging movements of the frame 42 is placed at an angle to a plane perpendicular to the grinding surface, for positioning one face of the lens at a greater angle to the grinding surface than the other face thereof. The extent of this shifting movement is determined by the extent of curvature of the edge portion of the lens.

This is accomplished in the present instance by pivoting the plate 48, as by a pivot pin 221, on the base. An adjusting screw 222 is journaled and held endwise in a bearing 223 in the base, and is threaded in a slide 224, slidable in a guideway 225 in the base. The slide is provided with a roller 226, pivoted on a pin 227 on the slide, the roller coacting with the walls of a slot 228 formed in the lower face of the plate 48. This slot is preferably inclined, so that its relation to the pivot 221 and the direction of movement of the plate 48 are such as to permit minute adjustments. The adjusting screw is provided with a knob 229, having indications of a scale 230 thereon, which register with a mark 231 on the base.

My improved device provides means whereby opposite edge bevels are provided on the lens, with the apex of the bevels in the middle of the respective opposite faces of the lens

adjacent to said edge, whether such opposite faces be parallel, or of opposite concave curvatures, or opposite convex curvatures, or whether such opposite faces be curvatures in similar directions, so that all characters of rim lenses may be ground, and my improved machine is also capable of grinding straight edge lenses, and of grinding all such lenses of desirable shapes and sizes.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a lens edge grinding machine, the combination with the grinding tool, of a rotary lens holder, means for presenting the axis of rotation of said lens holder successively at reverse angles to the grinding face of said grinding tool, said means comprising a cam including an interruption and a coacting part coacting with said cam, and means for locating said coacting part in said interruption whereby to maintain said axis of said lens holder substantially parallel with said grinding face of the grinding tool.

2. In a lens edge grinding machine, the combination with the grinding tool, of a rotary lens holder, a rotary cam and a coacting part relatively movable for shifting said lens holder to opposite angles with relation to the grinding surface of the grinding tool for presenting its axis of rotation at opposite angles to said grinding surface, and a rotary cam and coacting part relatively movable for moving said lens holder lengthwise of the grinding face of the grinding tool for repositioning said lens holder in substantially the same relations lengthwise of said grinding face at both said angular positions.

3. In a lens edge grinding machine, the combination with the grinding tool, of a rotary lens holder, a rotary cam and a coacting part relatively movable for shifting said lens holder to opposite angles with relation to the grinding surface of the grinding tool for presenting its axis of rotation at opposite angles to said grinding surface, and a rotary cam and coacting part relatively movable for moving said lens holder lengthwise of the grinding face of the grinding tool for repositioning said lens holder in substantially the same relations lengthwise of said grinding face at both said angular positions, and means locking said respective coacting parts to said respective cams.

4. In a lens edge grinding machine, the combination with a rotary grinding tool, of a rotary lens holder, a rotary cam and coacting part relatively movable for shifting said lens holder to opposite angles with relation to the grinding surface of the grinding tool for presenting its axis of rotation at opposite angles to said grinding surface, a rotary cam and coacting part relatively movable for moving said lens holder lengthwise of the grinding face of the grinding tool for repositioning

said lens holder in substantially the same relations lengthwise of said grinding face at both said angular positions and means for adjusting the angles of the axes of rotation of said cams with relation to the axis of rotation of said rotary grinding tool for qualifying said angles of presentation.

5. In a lens edge grinding machine, the combination of a support, a slide thereon, a rotary lens holder having a pivot on said slide, a stem extending therefrom, a rotatable cam on said slide coacting with said stem for automatically shifting said lens holder on said pivot to opposite angles with relation to the grinding face of a grinding tool, means automatically shifting said slide on said support lengthwise of said grinding face for locating said lens holder lengthwise at substantially similar positions with relation to said grinding face during the respective angular positions of said lens holder for grinding opposite edge-bevels at the respective faces of the lens, said cam provided with an interruption, and means for positioning said stem in said interruption whereby to interchangeably maintain said lens holder at an intermediate position on its pivot for presenting the axis of rotation of said lens holder substantially parallel with said grinding face.

6. In a lens edge grinding machine, the combination with a rotary grinding tool, of a base, a support thereon, a slide on said support, said support and said slide provided with complementary guiding faces extending lengthwise of the grinding face of said grinding tool, a housing having a pivot on said slide, a lens holder, a frame therefor having a pivot on said housing, means for rotating said lens holder, a rotary cam on said housing having an axis of rotation extending lengthwise of said slide, gearing for rotating said lens holder and said cam, said gearing rotating said lens holder at greater speeds than the speeds of rotation of said cam, said frame having a coacting part coacting with said cam for shifting said frame on its pivot whereby to swing said frame for presenting the axis of rotation of said lens holder at opposite angles to the grinding face of the grinding tool for grinding opposite edge-bevels at the respective faces of the lens, and means whereby to angularly adjust said support on said base to adjust the angular relation of said guiding faces with relation to the axis of rotation of said rotary grinding tool.

7. In a lens edge grinding machine, the combination with a rotary grinding tool, of a base, a support thereon, a slide on said support, said support and said slide provided with complementary guiding faces extending lengthwise of the grinding face of said grinding tool, a housing having a pivot on said slide, a lens holder, a frame therefor

having a pivot on said housing, means for rotating said lens holder, a rotary cam on said housing having an axis of rotation extending lengthwise of said slide, gearing for rotating said lens holder and said cam, said gearing rotating said lens holder at greater speeds than the speeds of rotation of said cam, said frame having a part coacting with said cam for shifting said frame on its pivot whereby to swing said frame for presenting the axis of rotation of said lens holder at opposite angles to the grinding face of the grinding tool for grinding opposite edge-bevels at the respective faces of the lens, pivoting means for pivoting said support to said base, and adjusting means between said support and said base for adjusting said support on said base, said adjusting means comprising a pin and a complementary slot, said slot extending transverse to an arc in which said pin is located and which has the pivotal axis of said pivoting means as its center.

8. In a lens edge grinding machine, the combination of a support, a slide thereon, a housing pivoted to said slide, a cam drum journaled on said housing, a rotary lens holder, a frame therefor having a pivot on said housing, gearing on said housing and said frame for rotating said lens holder, said frame having a part coacting with said cam drum for shifting said frame for presentation of said lens holder at opposite angles to the grinding face of a grinding tool, means between said support and said cam drum for shifting said slide lengthwise of the axis of rotation of said cam drum for repositioning said lens holder endwise with relation to said grinding face, means controlling the pivotal movements of said housing, and means for adjusting said last-named means.

9. In a lens edge grinding machine, the combination of a support, a slide thereon, a housing pivoted to said slide, a cam drum journaled on said housing, a rotary lens holder, a frame therefor having a pivot on said housing, gearing on said housing and said frame for rotating said lens holder, said frame having a part coacting with said cam drum for shifting said frame for presentation of said lens holder at opposite angles to the grinding face of a grinding tool, means between said support and said cam drum for shifting said slide lengthwise of the axis of rotation of said cam drum for repositioning said lens holder endwise with relation to said grinding face, means controlling the pivotal movement of said housing, means for adjusting said last-named means, and means between said support and said slide for adjusting the path of movement of said slide.

10. In a lens edge grinding machine, the combination with the grinding tool, of a support, a slide thereon, a housing pivoted on said slide, a rotary cam on said housing, a frame pivoted on said housing, a rotary lens holder

on said frame, a shaft on said housing parallel with said cam, driving means between said shaft and said cam, means interrupting said driving means, patterns rotatively fixed to said shaft, gearing between said shaft and said rotary lens holder causing coincidence of rotation between said patterns and said lens holder, means coacting with said respective patterns for controlling the pivotal movements of said housing, and means between said frame and said cam and between said support and said cam for swinging said frame on said housing and shifting said slide lengthwise of said support.

11. In a lens edge grinding machine, the combination with the grinding tool, of a support, a slide thereon, a housing pivoted on said slide, a rotary cam on said housing, a frame pivoted on said housing, a rotary lens holder on said frame, a shaft on said housing parallel with said cam, driving means between said shaft and said cam, patterns rotatively fixed to said shaft, gearing between said shaft and said rotary lens holder causing coincidence of rotation between said patterns and said lens holder, means coacting with said respective patterns for controlling the pivotal movements of said housing, means between said frame and said cam and between said support and said cam for swinging said frame on said housing and shifting said slide lengthwise of said support, and means interchangeably operable to maintain said slide at an intermediate position.

12. In a lens edge grinding machine, the combination with the grinding tool, of a support, a slide thereon, a housing pivoted on said slide, a rotary cam on said housing, a

frame pivoted on said housing, a rotary lens holder on said frame, a shaft on said housing parallel with said cam, driving means between said shaft and said cam, patterns rotatively fixed to said shaft, gearing between said shaft and said rotary lens holder causing coincidence of rotation between said patterns and said lens holder, means coacting with said respective patterns for controlling the pivotal movement of said housing, means between said frame and said cam and between said support and said cam for swinging said frame on said housing and shifting said slide lengthwise of said support, and means automatically moving said housing away from said grinding face during swinging movements of said frame.

13. In a lens edge grinding machine, the combination of a support, a housing pivoted thereto, a cam drum journaled in said housing, a shaft journaled in said housing, gearing between said shaft and said cam drum, means causing interruption in the drive relation of said gearing, a rotary lens holder, gearing between said shaft and said rotary lens holder for driving the latter, a sleeve about said shaft, patterns secured to said sleeve, driving means for said sleeve, interrupting means for said driving means, means between said cam drum and said rotary lens holder for automatically swinging said rotary lens holder in opposite directions, and means between said rotary lens holder and said cam drum interchangeably operable to hold said frame at an intermediate position.

In testimony whereof, I have hereunto signed my name.

HOWARD RAKEL.