Dec. 6, 1927. 1,651,501

N. M. BAKER

BEVEL EDGING MACHINE

Filed May 22, 1924 4 Sheets-Sheet 1

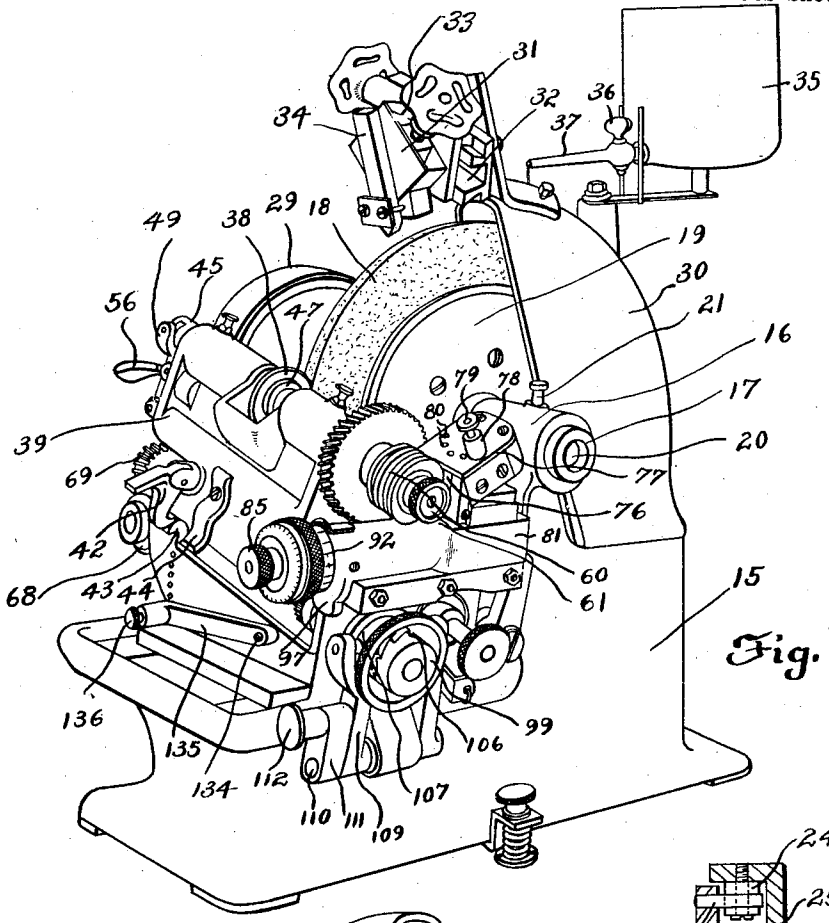


Fig. 1.

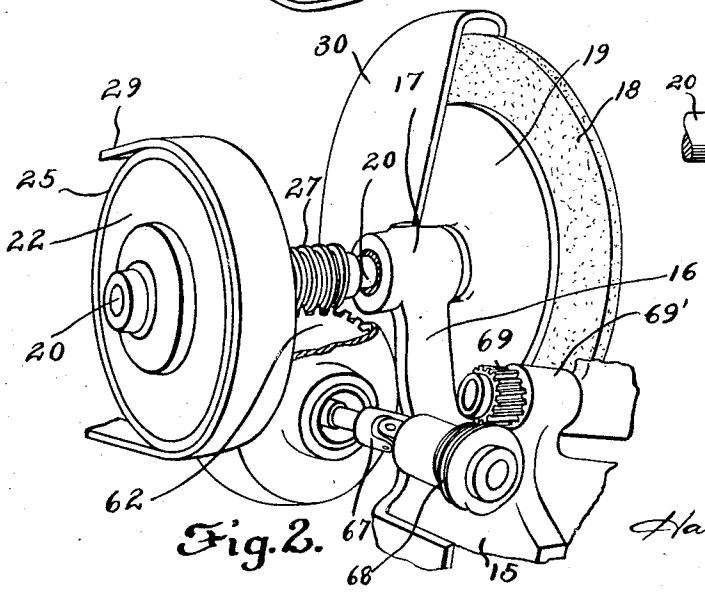


Fig. 2.

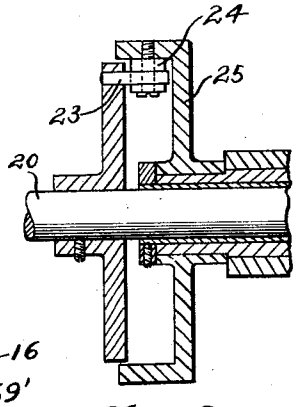


Fig. 3.

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BEVEL EDGING MACHINE

Filed May 22, 1924 4 Sheets-Sheet 2

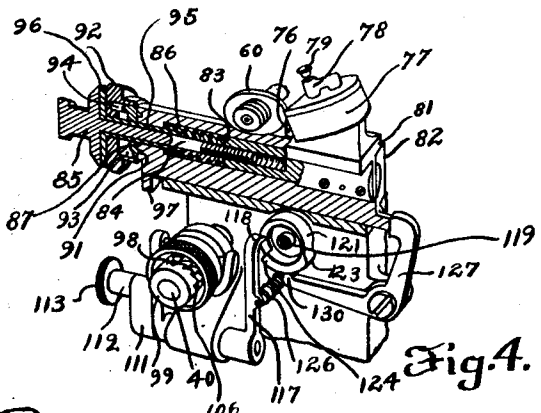


Fig. 4.

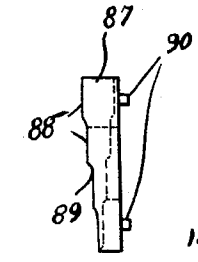


Fig. 6.

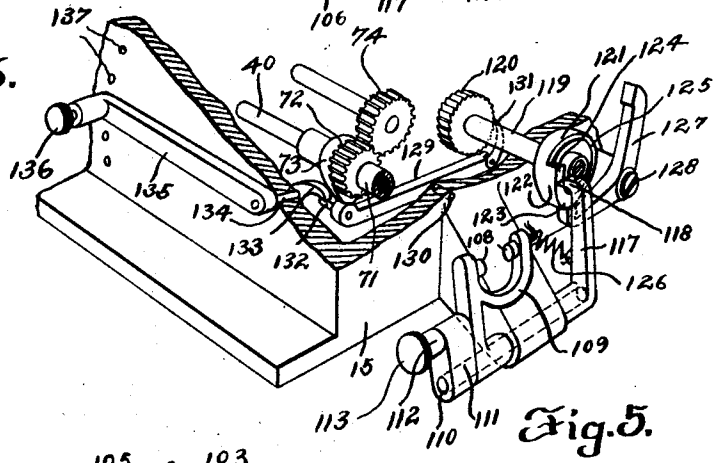


Fig. 5.



Fig. 12.

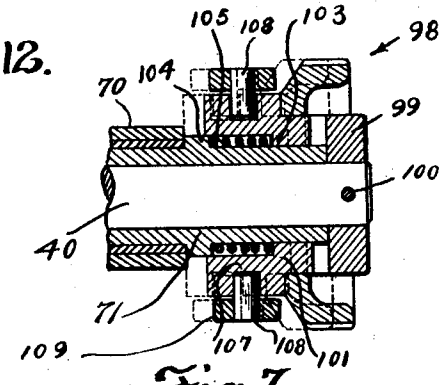


Fig. 7.

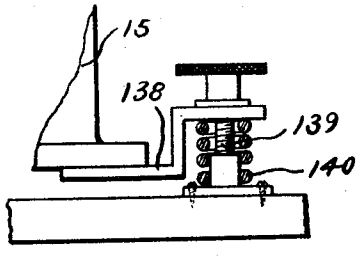


Fig. 8.

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BEVEL EDGING MACHINE

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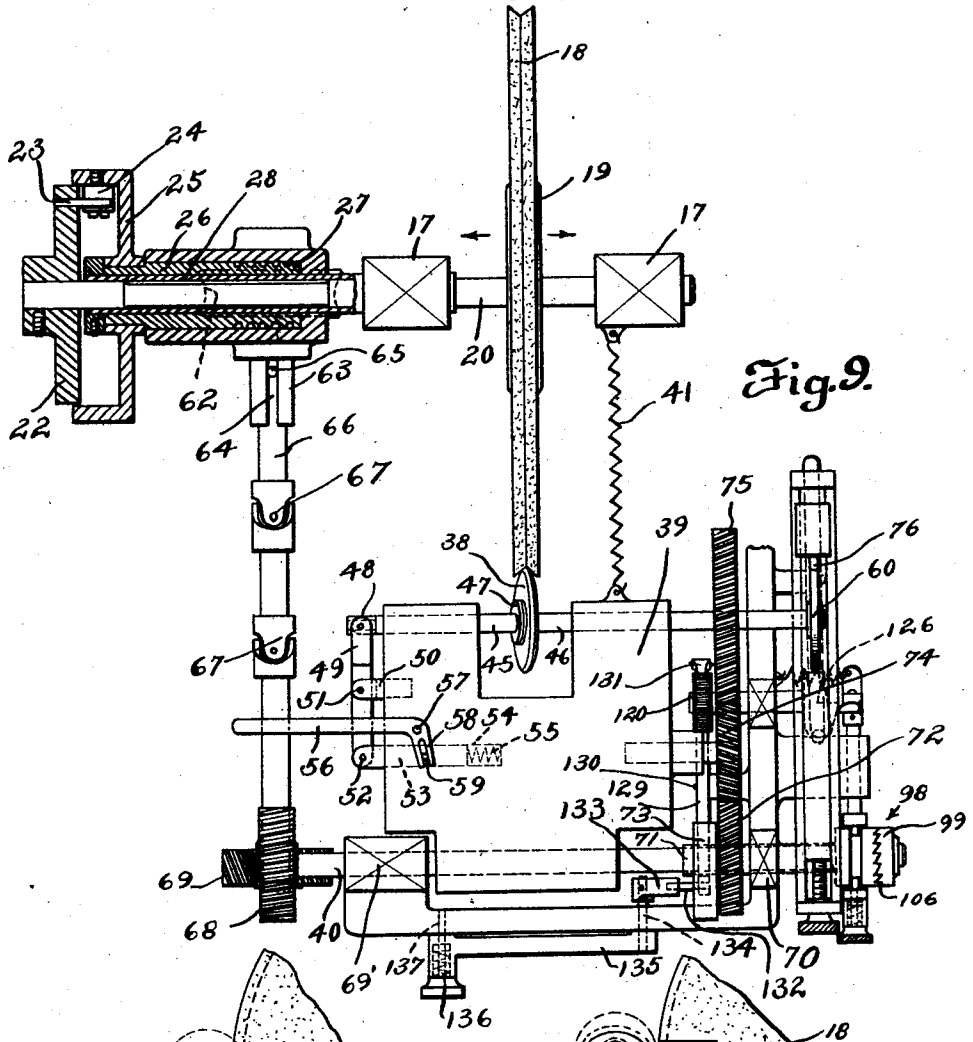


Fig. 9.

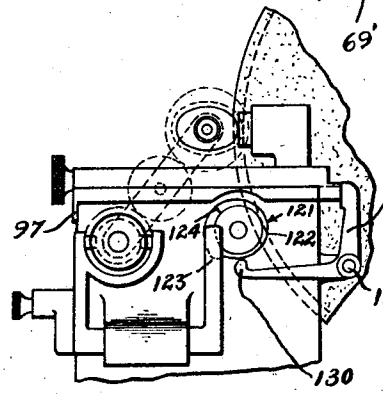


Fig. 10.

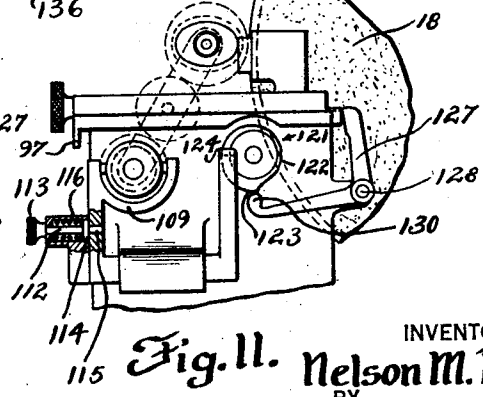


Fig. 11.

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BEVEL EDGING MACHINE

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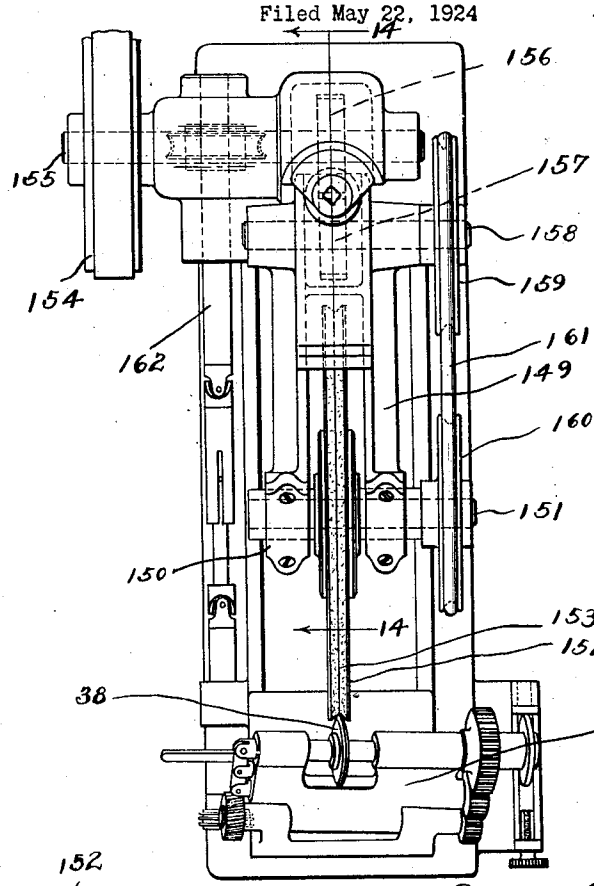


Fig. 13.

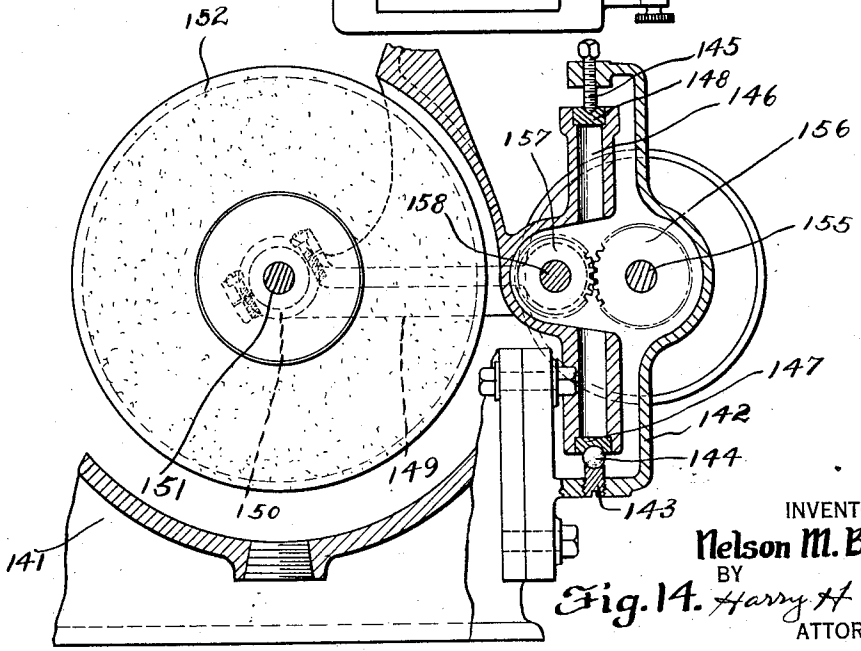


Fig. 14.

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BEVEL-EDGING MACHINE.

Application filed May 22, 1924. Serial No. 715,030.

The present invention relates to an improved lens edging machine and has particular reference to a lens bevel edging machine.

An important object of the invention is to provide a bevel edging machine including a stone and a lens carriage, means to feed one toward the other, and means to stop the feed at a predetermined point, and to hold this relationship of the stone and lens carriage at this point for a number of revolutions for the final finishing and sizing of the lens being ground.

Another very important object of the invention is to provide a bevel edging machine including a stone and a lens carriage, means to feed one toward the other at a definite speed, means to stop the feed at a predetermined point and to hold this relationship of the stone and lens carriage at this point for a number of revolutions for the final finishing and sizing of the lens being ground, and means for automatically moving the lens carriage away from the stone and stopping rotation of the lens after the lens has been finished.

A still further object of the invention is to provide a bevel edging machine employing a grooved stone which is free to move longitudinally of the machine, and having a lens carriage so arranged that the lens to be ground will be received within the groove in the stone, and including means to determine the shape and means to determine the size of the lens to be ground, after which the lens and lens carriage will be automatically swung away from the stone, and an automatic clutch to stop the rotation of the lens.

A still further object of the invention is to provide a bevel edging machine for grinding both sides of a lens simultaneously, including means whereby the speed with which the lens may be ground can be regulated, but so arranged that the resultant finished lens will always be ground to a predetermined size.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings, wherein like numerals are employed to designate like parts throughout the same:

Figure 1 is a perspective view of the complete bevel edging machine;

Figure 2 is a detail perspective partly in section illustrating a portion of the drive of the machine;

Figure 3 is a section taken through the stone drive;

Figure 4 is a perspective view partly in section showing the lens size controlling mechanism;

Figure 5 is a detail perspective of the step by step feed mechanism employed;

Figure 6 is an elevation of the size regulating cam;

Figure 7 is a longitudinal section taken through the automatic clutch;

Figure 8 is a view of the machine levelling device;

Figure 9 is a diagrammatic view of the machine;

Figure 10 is a similar diagrammatic view illustrating the lens in contact with the stone during the grinding operation;

Figure 11 is another view of the same showing the lens swung out of engagement with the grinding stone at the end of the grinding operation;

Figure 12 is a view of the finished lens;

Figure 13 is a top plan view of a machine employing a slightly different form of stone mounting;

Figure 14 is a section taken on line 14—14 of Figure 13, and looking in the direction of the arrows.

In the drawings, wherein for the purposes of illustration is shown the preferred embodiment of the invention, the numeral 15 designates the frame of the machine. The frame 15 carries the journals 16, in which are mounted bearings 17. The type of stone used is preferably a two part stone and is designated by the numeral 18, the two sections when clamped together by the plates 19 forming a stone having a substantially V-shaped groove. Obviously a single stone can be employed by cutting the V-shaped groove therein and mounting it between the plates 19 as shown in Figures 1 and 9. A shaft 20 is passed centrally through the stone 18 and plates 19 and is of sufficient length to be received within the plain bearings 17 in the journals 16. The shaft 20 is so mounted that it may be slid through the

bearings in either direction, and to facilitate this movement means 21 are provided to lubricate the bearings 17. One end of the shaft 20 extends a substantial distance beyond the journal 16, as is clearly shown in the diagrammatic view, Figure 9, and is adapted to support a plate 22, the said plate carrying a pair of inwardly extending pins 23. The pins 23 have engagement with a roller 24 carried by a pulley 25. The pulley 25 is mounted on the sleeve 26, in which are cut the worm threads 27. The worm threads 27 may, if desired, be formed in a separate piece and keyed or otherwise placed upon and movable with the sleeve 26. The sleeve 26 is in turn mounted upon the bearing 28, which is arranged around the shaft 20. The pulley 25 is driven as by the belt 29, and it will be seen that the shaft 20 and plate 22 may be moved longitudinally of the pulley 25 and still be driven thereby in view of the roller 24 mounted between the pins 23. In other words, the pulley 25, sleeve 26 and worm threads 27 are adapted to be rotated, but are not designed to move longitudinally, while the shaft 20, stone and parts associated therewith are adapted to be rotated as well as moved longitudinally or laterally of the machine at the same time.

A suitable guard member 30 is mounted upon the frame 15, and as is clearly shown in Figure 1, a suitable honing device 31 may be mounted thereon so that the stone 18 may be honed at intervals to keep the groove accurate and smooth. The hone 31 may be of any desired construction, although I have illustrated a double slide hone comprising the slides 32 and 33 so that the honing member 34 may be raised and lowered into and out of engagement with the stone as desired. A receptacle 35 is also provided and includes the control valve 36, and spout 37 so as to supply water or the like to the stone 18 during the grinding operations.

The lens carriage is mounted in front of the movable stone and is so arranged that it is at an angle to the stone so that the lens 38 will be at an angle to the stone 18 rather than in exact alignment therewith. The lens carriage 39 is pivotally mounted on the shaft 40 and is adapted to be swung toward the stone by means of a spring 41 which is connected to the carriage and to a stationary part of the machine so that the lens carriage will at all times be resiliently urged toward the stone. However, means are provided to hold the lens carriage away from the stone when it is desired to remove or replace a lens. To accomplish this a pivoted latch 42 is carried by the carriage and is adapted to engage the member 43. As can readily be seen in Figure 1, the latch 42 may be pivoted into and out of engagement with the member 43 so as to hold the carriage away from the stone or allow the spring to move the carriage toward the stone. A supporting arm 44 is also carried by the carriage and adapted to abut a portion of the frame 15 to support the lens carriage when it has been moved away from the stone, as above pointed out.

The lens carriage comprises a pair of opposed aligned shafts 45 and 46, respectively, between which the lens 38 is adapted to be held. Suitable pads or the like 47 are carried by the adjacent ends of the two shafts so as to prevent scratching or otherwise marring the lens when same is between the said shafts. The opposite end of the shaft 45 is pivotally connected as at 48 to a rocker arm 49 which is pivoted to the support 50 as at 51, while the opposite end of the rocker arm 49 is pivotally connected as at 52 to the slidable plunger 53. The slidable plunger 53 is received within a recess 54 in the end of which is mounted a coil spring or the like 55, so that the coil spring will normally urge the plunger 53 outwardly, thus rocking the rocker arm 49 in such a manner that the shaft 45 will be moved inwardly of the carriage. A lever 56 is pivotally mounted on the carriage 39 by means of a pin or the like 57. The inner end of the lever 56 is forked as at 58 to adapt its engagement with a pin or the like 59 carried by the movable plunger 53, so that upon movement of the lever 56 and by reason of the forked engagement thereof with the pin on the slidable plunger, the plunger may be slid in the recess 54 so as to permit of engagement with or disengagement of the shaft 45 with the lens 38 which is to be ground.

The shaft 46 is adapted to be rotated, but is guarded against lateral movement of the machine so that its position or location is never changed with respect to the stone. In other words, when it is desired to grind a lens the shaft 45 is moved outwardly so that the lens may be placed between the pad members 47 on the adjacent ends of the shafts 45 and 46, after which the shaft 45 is adapted to be released so that it will firmly clamp the lens 38 in position for grinding. The opposite end of the shaft 46 is provided with a plurality of patterns or formers 60 which are so mounted thereon that they may be easily removed and interchanged when desired. A locking member 61 is provided to hold the patterns or formers in position when in use upon the shaft 46.

As can readily be seen in Figure 2 and in the diagrammatic view in Figure 9, the worm gear 27 has engagement with the spiral gear 62. The gear 62 is carried on the sleeve 63 which is provided with the elongated slot 64, in which is received a pin or the like 65, carried by the shaft 66. The pin 65 and slotted sleeve 63 form a telescopic connection so that the shaft 66 may be

moved toward and away from the gear 62. The shaft 66 is provided with a pair of universal joints 67 to permit the shaft 66 to be slightly out of alignment with the gear 62 if necessary.

The opposite end of the shaft 66 carries the worm gear 68 which meshes with the gear 69 on the shaft 40 so that through rotation of the shaft 66 the shaft 40 is also rotated. The shaft 40 passes through the journal 69', the lower end of the lens carriage 39, and the bearing 70 at the opposite end of the frame. As is clearly shown in Figure 5, a sleeve 71 is mounted on the shaft 40, while a pinion 72 and a cam 73 are keyed to the sleeve 71. The pinion 72 meshes with an intermediate gear 74, which in turn meshes with a gear 75 keyed to the shaft 46, whereby the shaft 46 is rotated, thereby rotating the lens 38 in the groove of the stone 18.

In order to regulate the shape of the lens 38 which is to be ground, it is necessary to provide the pattern or former 60, which is of the desired shape of the required finished lens. As has been pointed out, to save time I provide a plurality or a gang of formers on the end of the shaft 46. A movable contact shoe 76 is slidably mounted in the box 77 and is moved to and from the stone by means of the operating lever 78, so that the shoe may be brought into engagement with any of the desired formers on the shaft 46. A movable pin 79 engages any one of the openings 80 so as to hold the contact shoe against accidental displacement during the operation of the machine. The shoe carrying box 77 is mounted upon the slide 81, which is movable in the slide way 82 as is clearly shown in Figure 4 of the drawings. The slide 81 is provided at the oppoiste end with the screw threaded bore 83 in which is received the end of the screw threaded shaft 84 carried by an adjacent dial 85. A coil spring 86 is arranged between the end of the slide formed in the slide way 82 and abuts against the end of the slide 81 so as to normally urge the slide rearwardly and the slide way forwardly. Upon rotation of the dial 85 the slide 81 may be adjusted within the slide way as desired.

In Figure 6 is shown a stepped annular cam 87, which has a plurality of faces 88 separated by the curved shoulders 89. The rear face of the stepped cam 87 is provided with the pins 90 which are received within small recesses 91 formed in the forward end of the slide way 82. A second dial or operating member 92 is provided with a recess 93, in which is received the stepped cam 87, as is clearly shown in Figure 4, and is provided with the pin 94 adapted to ride upon the faces 88 of the stepped cam. A sleeve 95 is arranged around the screw threaded shaft 84 and terminates in the flange 96, which forms a bearing between the two dials 85 and 92.

As can be seen, upon rotation of the operating member 92 the pin 94 may be moved upon any one of the several faces 88 formed in different planes upon the stepped cam 87, as the cam 87 is held against rotation within the recess 93 by means of the pins 90. In this manner different diameters of lenses may be ground with the same former, said former controlling the shape of the finished lens, and not the size. It will readily be seen that the spring 41 will, during the operation of the machine, hold the former or pattern 60 into engagement with the contact shoe 76 at all times so that the shape of the former will move the lens carriage to and from the stone, thus reproducing the same shape of lens as the former, while the adjustment of the stepped cam 87 will regulate the size.

It will thus be seen that the stepped cam 87 is provided with the faces 88, which faces are in different planes or levels so that the pin 94 may be moved onto any one of the planes or faces by means of the dial 92 which is provided with the necessary graduations or scale to indicate upon which face the pin 94 rests. The faces 88 are arranged to give the standard sizes to which ophthalmic lenses are ordinarily edged. The dial 85 is also provided with graduations to indicate what change has been made in the setting by the rotation of the same. The function of the dial 85 is to move the slide within the slideway so as to set the contact in position for sizes that cannot be obtained from the stepped cam, and to also compensate for wear of the various parts of the shape and size controlling mechanism. In other words we will assume that we desire to grind a lens the size of which cannot be obtained from the stepped cam and pin. In this event I move the dial 92 and the pin 94 onto the face 88, which will designate on the scale either the nearest size above or the nearest size below the actual size required. I then adjust the dial 85 until the necessary addition or subtraction has been made to give the desired size. In this way I can obtain any size desired by working the two adjustments either singly or together. The slide 82 is also provided with the depending lip 97 which will be more fully described hereinafter.

In order to simplify the operation of my improved bevel edging machine I provide automatic means for moving the lens out of engagement with the stone when it has been ground to the predetermined desired shape and size, and in addition also provide an automatic clutch which will stop rotation of the lens after it has been thrown out of engagement with the stone. This structure comprises a clutch member designated in its

entirety by the numeral 98, which is associated with the outer end of the shaft 40. One section 99 of the clutch is keyed to the end of the shaft 40 by means of the pin or the like 100, (see Figure 7). The movable section 101 of the clutch is slidably mounted upon the sleeve 71 and is provided with a shoulder 103 while the sleeve 71 is provided with a similar shoulder 104. A coil spring 105 is disposed between the shoulders 103 and 104, respectively, so as to normally urge the slidable section of the clutch into engagement with the stationary portion 99. Of course, the stationary part is rotatable with the shaft 40 but is guarded against relative longitudinal movement thereof. Both sections of the clutch are provided with the teeth 106, Fig. 9, as will readily be understood. The movable clutch member is provided with a groove 107, in which pins 108 are adapted to ride. The pins 108 are carried by the yoke 109 which is pivotally mounted on the pin 110. It will thus be seen that the pins 108 in the groove 107 will allow the clutch member to rotate with the section 99, while at the same time the yoke 109 may be so rocked that the movable section of the clutch may be moved out of engagement with the other section when desired. A portion of the frame 15 is so formed that the shaft 110 may be journaled therethrough. It is to be understood that the yoke 109 is loosely mounted upon the shaft 110, Figure 5.

Mounted adjacent the yoke 109 is a block 111 keyed to the said shaft so that upon movement of the shaft 110 said block 111 will be moved therewith. The block 111 is provided with a spring pressed pin 112 which, as can be seen in Figure 11, comprises the knob 113, disc 114, and stub pin 115, extending a substantial distance beyond the disc 114. A coil spring 116 normally urges the stub pin 115 toward the yoke 109. The yoke 109 is provided with an aperture in which the stub pin 115 may be received. It will be seen that when the pin 115 is received within the aperture in the yoke 109, the yoke 109 will be moved with the shaft 110. On the other hand, when the pin 115 is removed from the aperture the yoke 109 will again be loosely held on the said shaft.

Keyed to the opposite end of the shaft 110 is an arm 117 which has the extension 118, as is clearly shown in Figure 5 of the drawings.

Journaled through the frame 15 is a shaft 119, on one end of which is mounted a ratchet wheel 120, while at the opposite end thereof is a double cam 121. The ratchet wheel 120 is preferably arranged inside of the frame 15, while the double cam 121 is arranged on the outside. The double cam 121 has a cammed surface on its periphery, as at 122, which is clearly shown in Figures 10 and 11 of the drawings. The bunch or hump 123 is clearly shown in Figure 11, and will be more fully described later on.

The flange of the double cam is also varying, and as is clearly shown in Figure 5, an abrupt shoulder 124 is provided thereon. The extension 118 on the arm 117 is adapted to contact with the flange 125 on the double cam 121, and to insure constant contact with this cam a spring 126 is connected to the arm and to a portion of the frame 15.

A bell crank member 127 is pivotally carried by the machine, as on the shaft 128, and has a portion 130 adapted for engagement with the double cam 121, while the opposite arm thereof has engagement with the slide way 82, above referred to, Figure 4. The double cam 121 has the face 122, which is so formed that at the beginning of the operation the bell crank lever 127 will ride thereagainst until a low spot on the cam face 122 rotates in position so as to disengage the lever 127, and allow the lip 97 to abut a portion of the frame. This is done so that the slide way will no longer be free to move towards the stone near the end of the grinding of the lens, which enables the lens to take a smooth and true bevel. From then on the cam face 122 does not contact with the end 130 of the bell crank 127 in view of the fact that this surface has been reduced to a point where a slight space is left between the two parts. However, the double cam 121 is kept rotating until the high spot 123 again contacts with the end 130 of the bell crank lever to throw the lens carriage away from the stone.

From the foregoing it will be seen that the double cam 121 has a thick portion which gradually decreases to its thinnest end, where it no longer contacts with the bell crank 127, this non-contacting portion of the double cam 121 being arranged at that portion of the cam where the last or finishing and sizing touches are being given to the lens. After the lever 127 has passed over this thin portion of the cam it again rises up on the high spot for the throwing out operation, in order to be in position for the next grinding operation.

In the grinding of ophthalmic lenses oftentimes some lenses can be edged more rapidly than others, depending upon the thickness, etc., of the lens blank. As has been pointed out, a ratchet wheel 120 is keyed to the same shaft as the double cam 121 so that the speed with which the cam 121 is rotated will depend upon the rapidity with which the ratchet wheel 120 is rotated.

In Figure 5 is clearly shown the method or manner in which the ratchet wheel 120 is rotated. The structure used comprises a pivoted bar 129, which is pivoted on the pin 130 in such a manner that the pawl 131 will be under spring tension so as to hold it in

engagement with the ratchet wheel at all times. The opposite end of the bar 129 is provided with the angularly extending pin 132, against which abuts the finger 133 carried on the shaft 134, which is rocked by the lever 135. The lever 135 is arranged on the exterior of the frame 15 and is provided with the spring pressed pin 136 which has engagement with any one of the apertures 137 formed in the said frame. By swinging the lever 135 up and down the bar 129 will likewise be rocked so that one, two, three, or any number of teeth on the ratchet wheel 120 may be moved at a time. In Figure 5 it will be seen that by rocking the lever 135 the finger 133 will either depress the pin 132 and rocker arm 129, or allow the same to raise. By raising or lowering the forward end of the rocker arm 129 it will be seen that the cam contacting end thereof will be brought nearer to or pushed farther away from the axis of the drive shaft 40. When the cam contacting end of the rocker arm 129 is closer to the axis of the shaft 40 it will be seen that the cam 73 will have farther to push the said rocker arm down so that the opposite end, that is, the pawl end, will be moved through a greater arc, thus rotating the ratchet wheel 120 more than in the case where the cam 73 does not have to push the contacting end of the rocker arm 129 so far. Thus the holes 137 are so arranged that the spring pressed finger 136 of the lever 135 can gauge any one of the same so that the rocker arm will be positioned relatively close or far away from the axis of the drive shaft 40, thus increasing or decreasing the number of teeth tripped on the ratchet wheel 120 during each rotation of the cam 73. In other words, the ratchet wheel 120 may be rotated slowly or quickly, depending upon the nature of the lense being edged, thus slowly or quickly rotating the cam 121 in such a manner that the lens will be fed quickly or slowly to the stone, as the case may be.

In order to level up the machine to prevent the stone from having a tendency to slide one way or the other, a levelling device is shown in Figure 8, and comprises the bent plate 138 which is raised or lowered by means of the threaded shaft 139 and the spring 140.

The operation of my improved lens bevel edging machine is as follows: the lens 38 is firts placed in a centering device to get the geometrical center of the lens, and in the cases of torics, cylinders and similar lenses to get the axis or axes in correct line, so that when the finished edge lens is mounted in a spectacle or eyeglass frame the axes of the said lenses will be in accordance with the prescription. After the lens has been centered it is transferred to the machine by separating the opposed shafts 45 and 46, and placing the lens 38 between the pads 47. It is to be remembered that the shaft 45 is slidable in its bearing by means of the pivoted lever 56, which rocks the rocker arm 49, and upon release of the lever 56 the spring 55 will rock the arm 49 in such a manner that the shaft 45 will firmly clamp the lens between the adjacent ends of the two shafts. The machine is then set into operation by applying power by means of the belt 29 to the pulley 25, which rotates upon the bearing sleeve 28. The sleeve 26 is keyed to the pulley 25, the said sleeve 26 having the worm threads 27 cut therein. The worm 27 has engagement with the gear 62 which drives the shaft 66 and through the gears 68 and 69 drives the shaft 40. At the same time the plate 22 which is keyed to the shaft 20, is rotated as through the inwardly extending pins 23, having engagement with the roller 24 carried on the inner portion of the flange or the pulley 25. By reason of the pins 23 and roller 24, the shaft 20 and plate 22 may be moved in and out of the pulley 25, while at the same time it will be constantly rotated therewith. It will thus be seen that the shaft 20 may be slid through its bearings 17 so that the grooved stone will in reality be what may be termed a floating or sliding grind stone.

The shaft 40 is provided near its opposite end with a sleeve 71, on which are mounted the pinion 72 and the cam 73. The shaft 40 also extends beyond the journal 70 and carries the clutch member 98. The pinion 72 meshes with the pinion 74, which in turn meshes with the gear 75 on the shaft 46, so as to rotate the said shaft and the lens 38. In addition the former or formers 60 which are carried by the outer ends of the shaft 46 are also rotated so as to regulate the shape of the lens to be ground. The formers 60 are adapted to contact with the shoe 76, the said shoe being adjustable to any one of the gang formers 60, as is clearly shown in Figure 1. The pin 79 is received in one of the apertures 80 to lock the contact shoe against accidental displacement during the grinding operation. Now that the shape of the lens to be cut has been decided upon, it is necessary to make the necessary adjustment for the required size. This is done by moving the graduated dial 92 which carries the pin 94, which rides upon the stepped cam 87, Figure 6. The stepped cam 87 may have any number of faces 88 which are separated by the curved shoulders 89 so that the pin 94 may be moved up to or lowered down upon any one of the various faces. These faces are so formed with respect to each other that they will give the various standard size lenses. After one of the faces has been regulated to give the standard size designated for that particular face, the remainder of the faces will automatically give

their respective standard size. By rotating the graduated dial 92 the slide 81 will be moved in the slide way 82, while the spring 86 will have a tendency to separate the two parts as far as possible. After making adjustments to compensate for wear or for lenses that are not standard size, the supplemental graduated dial 85 carried by the screw threaded shaft 84 may be turned. Ordinarily, however, it will not be necessary to adjust the dial 85, as the simple adjustment of the dial 92 will be sufficent for the various size lenses which are ordinarily ground for spectacles and eyeglasses.

It is to be understood that the coil spring 41 which is connected to the lens carriage 39 and a stationary part of the bevel edging machine frame will at all times hold the lens in contact with the stone during the grinding operation, except when it is manually pulled away from the stone and locked in that position by means of the pivoted latch 42, or at the end of the grinding operation when the automatic throw out means have separated the lens and the stone. This spring also holds the former 60 and the contact shoe in engagement, as will be readily understood by inspection of the drawings.

At the beginning of the grinding operation the bell crank lever 127 is so arranged that one end is on the high point or bunch 123 of the double cam 121, and as the cam is gradually rotated the bell crank lever rides down on the cam. At the same time the opposite end of the bell crank lever is in engagement with the slide way 82, which moves on the frame 15 as is clearly shown in Figure 4 of the drawings. When the bell crank lever portion 130 reaches a certain point on the double cam 121, the lip 97 will abut the frame so that it will no longer slide therealong, thus holding the lens at one spot with respect to the stone so that the finishing revolutions or finish or fine grinding will take place. By having the inward motion of the lens stopped at this point and allowing the lens to rotate several times, the lens is ground to an accurately finished size. In order to rotate the cam 121 it is necessary to rotate the ratchet wheel 120 and to this end the cam 73 which is mounted on the sleeve 71 is rotated around, and each time strikes the pivoted bar 129 which rocks the opposite end, thereby moving the ratchet one, two, three, or as many notches as the lever 135 has been set for. To regulate the number of teeth tripped each time the lever 135 is moved up or down, depending upon the character of lens to be ground so that one or as many of the teeth may be moved as desired at one time. In some lenses it is necessary to grind more slowly than in other lenses, so that in the case of a lens which it is necessary to grind slowly a relatively slow movement is given to the cam by tripping one or two teeth at a time on the ratchet wheel, while in the case where lenses may be ground more rapidly more teeth of the ratchet may be tripped or moved each revolution of the shaft.

At the same time that the bell crank lever 127 is operated by the cam, the pivoted lever 117 rides against the outer face of the said cam in such a manner that when the angular extension 118 rides over the shoulder 124 the movable section of the clutch will be disengaged from the separate section 99. This is accomplished by keying the arm 117 to the shaft 110 and loosely mounting the yoke 109 thereon, while the block 111 is likewise keyed adjacent the yoke 109. The spring pressed pin 112 is adapted to lock the stationary block 111 to the loosely mounted yoke 109 when it is desired. In starting the grinding operation the pin 115 is disengaged from the movable yoke 109 so that the coil spring 105 will move the said movable section of the clutch into engagement with the portion 99 of the clutch which is keyed to the shaft 40. As the cam is rotated the arm 117 is gradually pulled toward the frame 15 of the machine until a point is reached where the pin 115 will snap into position in the aperture formed in the yoke 109. When the cam reaches a point 124 the arm 117, through the action of the spring 126, will be snapped inwardly, thus disengaging the clutch members to automatically stop rotation of the lens.

Just prior to the automatic disengagement of the lenses the bell crank lever will, at its end 130, ride on to the high point or bunch 123 of the said cam so that the said bell crank lever will be rocked in such a manner that the slide way 82 will be moved onto the frame so that the contact shoe will bear against the pattern or former 60, thus throwing the lens away from the grinding stone. When the machine has reached this point the lens 38 will have been sufficiently ground and sized to the predetermined desired shape and size, and the lens will be ready for mounting in a spectacle or eyeglass frame.

In Figure 10 of the drawings is diagrammatically shown the location of the lens and other parts of the machine during the grinding operation, while in Figure 11 is shown the bell crank lever when the high point 123 is in engagement with the portion 130 of the said bell crank lever, illustrating the lens removed from the stone 18.

In Figures 13 and 14, I have shown a slightly modified form of machine in which the stone is pivotally mounted instead of slidably mounted. The same form of lens carriage and lens feed controlling mechanism as well as automatic clutch is employed, in this form, the change being merely made in the method of floating or moving

the stone. It is to be remembered that in both forms of stone mountings the stone is so arranged that it is responsive to the different curvatures of lenses ground so that it will accommodate itself by moving to the right or left so that the lens at all times will be ground on both faces simultaneously. In other words, the stone is adapted to be moved to the right or left to follow the lateral displacements caused by the surface curvatures of the lens. For instance, in the case of a lens having a cylindrical power it will be seen that the major axis will have a power while the minor axis will not, so that the surface of the lens will not lie on the same plane, thus causing the stone to move or have a displacement equal to the differences in the location of the two major meridians. Of course, this displacement will vary with the types of lenses used and the powers.

This modified form of construction comprises the base 141 and the bracket 142. The bracket 142 has disposed at one end, preferably a screw threaded plug 143, which carries a ball or the like 144. The opposite end of the bracket contains an adjustable pin 145 so that the stone swing or carriage 146 may be pivotally mounted between the ball member 144 and the adjustable member 145. The swing or carriage 146 has the hardened plug 147 which contains a suitable pocket for the reception of the balled member 144, while the opposite end is provided with a hardened plug 148 having a recess therein adapted to receive the pointed end of the adjustable pin 145. The swing or carriage 146 is provided with the arms 149, which terminate in the journal section 150, so as to support the transverse shaft 151 which carries the stone 152. The type of the stone 152 is identical with the type of stone employed in the slidable stone, in that it has a substantially V-shaped groove 153. The stone is rotated by means of the belt and pulley connection 154, the said pulley being keyed to the shaft 155, the said shaft carrying a gear member 156. The gear 156 meshes with a second gear 157, which is carried on the stub shaft 158, which carries at one end the pulley 159. The stone shaft 151 also carries a pulley 160 which ordinarily is in alignment with the pulley 159, and to rotate the pulley 160 a suitable belt connection 161 is trained over the two pulley wheels. The gears 156 and 157 are loosely connected so that the gear 157, which is carried by the shaft 158, may be rocked or swung around the gear 156. It will be noted that a straight line drawn through the pivot points of the carriage will pass through the pitch line of the two gears 156 and 157. By having the pivot points and pitch line of the gears in a straight line the carriage and gear 157 will be free to rock around the gear 156 without binding. Furthermore, by having the location of the gears so disposed the necessary free movement of the stone and carriage will not in any way be affected by the movement of one lens with respect to the other in this manner.

The shaft 162 corresponds to the shaft 66 in Figure 9, and operates the gears, etc., constituting the lens carriage 163 in Figure 13. The lens carriage 163 is the same as the lens carriage 39 in Figure 9.

It will be seen that when the lens 38 is placed within the lens clamp carried by the lens carriage, it may be received within the substantially V-shaped groove 153 of the stone 152, and upon rotation of the stone and lens through their respective mechanisms the lens will cause the stone to be swung back and forth so that the stone will readily accommodate itself to the various curved lenses which are used in ophthalmic eyeglass and spectacle mountings.

From the foregoing it is obvious that the operation of the feed of my improved machine is as follows: The lens and lens carriage are fed to the stone step by step to a predetermined point. After the lens and carriage have reached this predetermined point the lens is allowed to revolve a selected number of times to produce a finish and to grind to an accurate predetermined size, after which the lens carriage and lens are automatically thrown away from the stone and an automatic clutch stops the rotation of the lens. This is an important feature of my machine, as by having the lens stopped at a certain point and then allowed to rotate a number of times it is possible to edge the lens to an accurate and smooth reproduction of the shape of the former or pattern used and to give the exact predetermined size for that shape, which size is determined by the relation of the dials 85 and 92.

It will be seen from the foregoing that I have provided a lens bevel edging machine that will readily grind any desired shape and size of lens on both faces of the lens simultaneously. The stones are so mounted that they will readily accommodate themselves to the various change in curvatures and shapes of lenses. It is understood that the lens carriage is in no way transversely movable while the stone in the first instance is adapted to be slid in either direction by reason of the contact of the lens within the groove, while in the second instance the stone is adapted to be swung in either direction, accomplishing the same result in both instances.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same, and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. In a grinding machine, a grinding element, a lens holding element, means to rotate the elements, means to urge one element toward the other, a pattern on one of the elements, a contact shoe engaging the pattern, means to feed one element intermittently toward the other, comprising a pivoted rock lever, a rocker cam having a contact adapted to contact with one end of the rock lever at each revolution of the cam and to rock said lever intermittently, means to change the relationship between the rock cam and the end of the rock lever to regulate the amount of throw given the rock lever by each contact with the cam, a pawl engaging the other end of the rock lever, a ratchet wheel operated by the pawl, a second cam rotated by the ratchet and a bell crank lever having one end engaging the second cam and the other end engaging the contact shoe support, the face of said second cam being so arranged that it will allow the bell crank lever to allow the contact shoe to retract a certain amount for the intermittent travel of the said second cam given it by the ratchet.

2. In a grinding machine, a grinding element, a lens holding element, means to rotate the elements, means to urge one element towards the other, a pattern on one of the elements, a contact shoe engaging the pattern, means to feed one element intermittently towards the other comprising a pivoted lever, a cam having a contact adapted to contact with one end of the lever at each revolution of the cam and to rock the said lever intermittently, a second rotatable cam, interengaging means between the other end of the lever and the second cam adapted to intermittently rotate the second cam as the lever is rocked about the first cam, and a bell crank lever having one end engaging the second cam and the other engaging the contact shoe support, the face of said second cam being so arranged that it will allow the bell crank lever to allow the contact shoe to retract a certain amount for the intermittent travel of the said second cam given it by the rock lever.

3. In a grinding machine, a grinding element, a lens holding element, means to rotate the elements, a clutch in the lens rotating means, means to urge one element towards the other, a pattern on one of the elements, a contact shoe engaging the pattern, means to feed one element intermittently towards the other comprising a pivoted lever, a cam having a contact adapted to contact with one end of the lever at each revolution of the cam and to rock said lever intermittently, a second rotatable cam, interengaging means between the other end of the lever and the second cam adapted to intermitently rotate the second cam as the lever is rocked by the first cam, a bell crank lever having one end engaging the second cam and the other engaging the contact shoe support, the face of said second cam being so arranged that it will allow the bell crank lever to allow the contact shoe to retract a certain amount for the intermittent travel of the said second cam given it by the rock lever, clutch lever means having one end engaging the clutch and the other the second cam, and contact means on the second cam to engage the clutch lever means to release the clutch and stop the rotation of the lens holding means after the surfacing operation has been completed.

4. In a grinding machine, a grinding element, a lens holding element, means to rotate the elements, a clutch on the lens rotating means, means to urge one element towards the other, a pattern on one of the elements, a contact shoe engaging the pattern, means to feed one element intermittently towards the other comprising a pivoted rock lever, a rocker cam having a contact adapted to contact with one end of the rock lever at each revolution of the cam to rock said lever intermittently, means to change the relationship between the rock cam and the end of the rock lever to regulate the amount of throw given the rock lever by each contact with the cam, a pawl engaging the other end of the rock member, a ratchet wheel operated by the pawl, a second cam rotated by the ratchet, a bell crank lever having one end engaging the second cam and the other end engaging the contact shoe support, the face of said second cam being so arranged that it will allow the bell crank lever to allow the contact shoe to retract a certain amount for the intermittent travel of the said second cam given it by the ratchet, clutch lever means having one edge engaging the clutch and the other the second cam, and contact means on the second cam to engage the clutch lever means to release the clutch and stop the rotation of the lens holding means after the surfacing operation has been completed.

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