No. 807,064. PATENTED DEC. 12, 1905.

G. H. DAY.

LENS DRILLING MACHINE.

APPLICATION FILED MAR. 25, 1905.

3 SHEETS—SHEET 1.

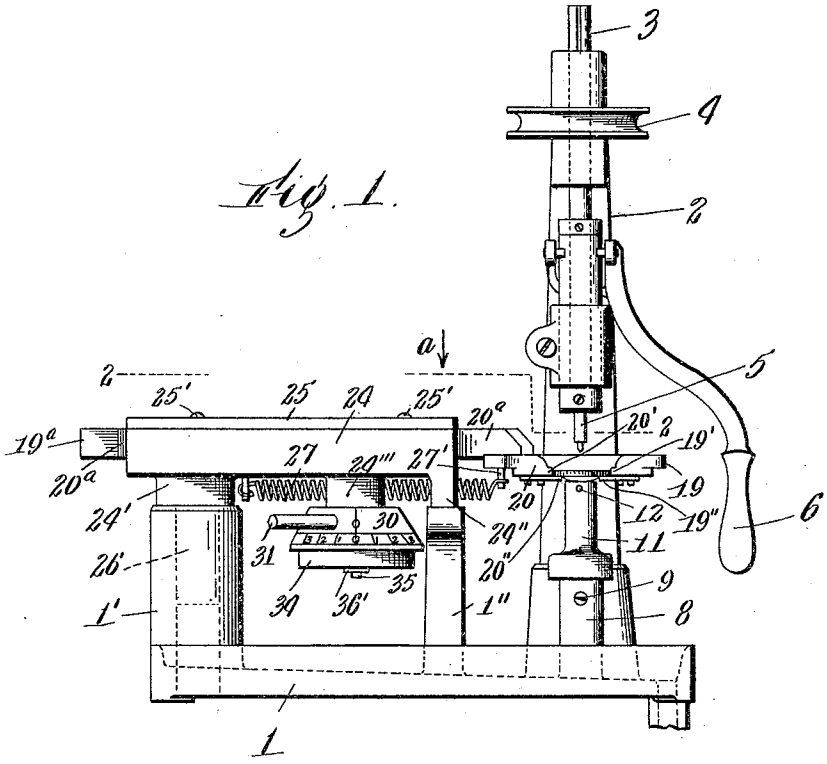


Fig. 1.

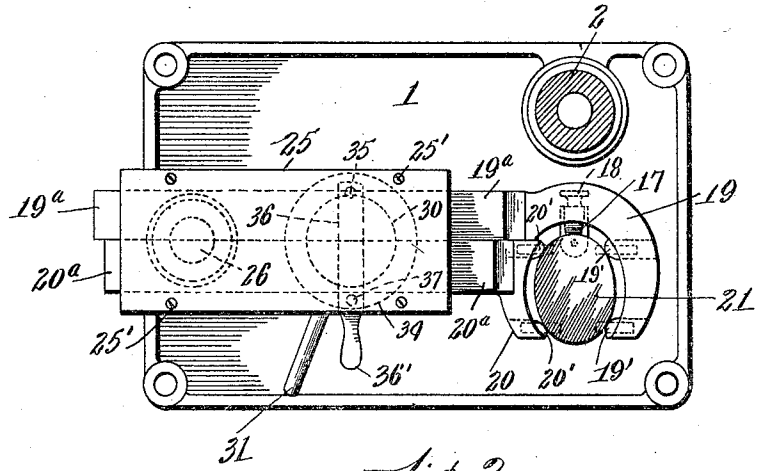


Fig. 2.

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By his Attorney
John L. Dewey

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Fig. 3.

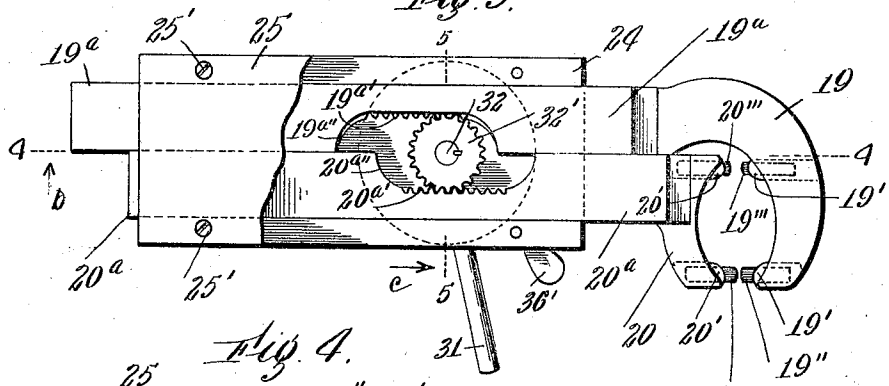


Fig. 4.

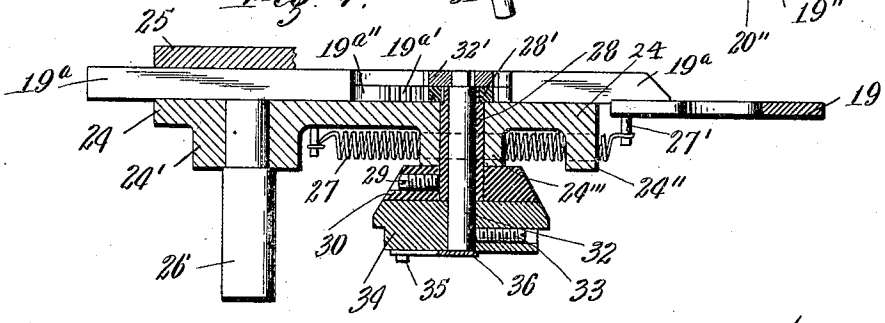


Fig. 5.

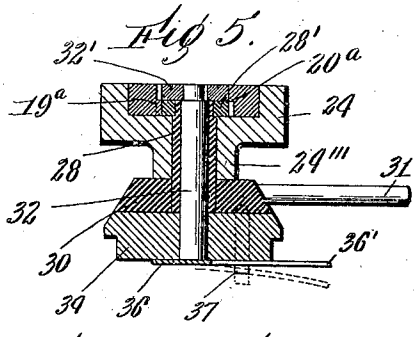


Fig. 6.

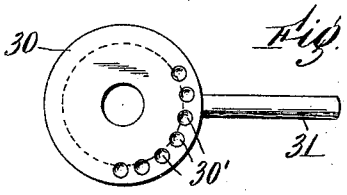


Fig. 7.

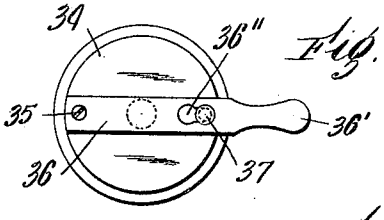


Fig. 11.

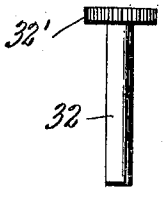


Fig. 10.

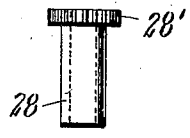


Fig. 8.

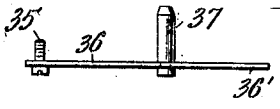
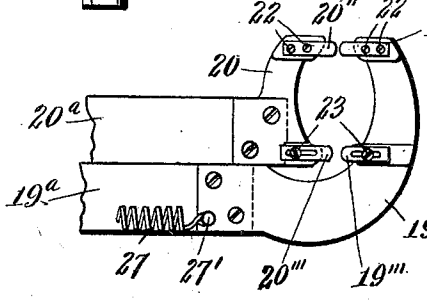


Fig. 9.



Fig. 12.



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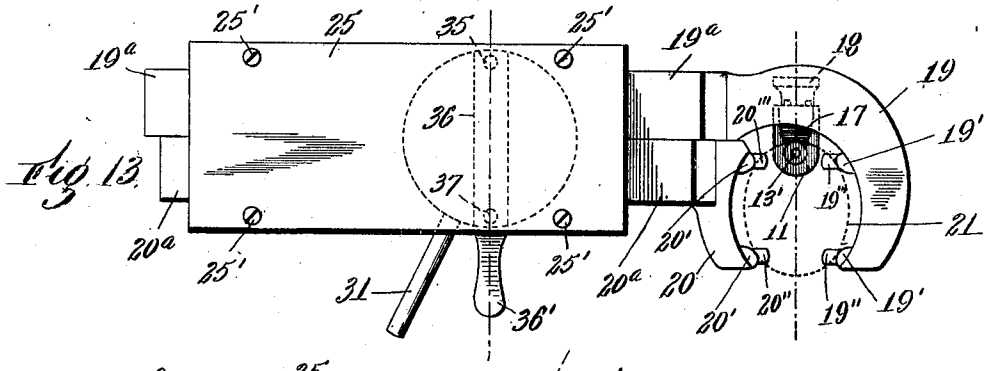


Fig. 13.

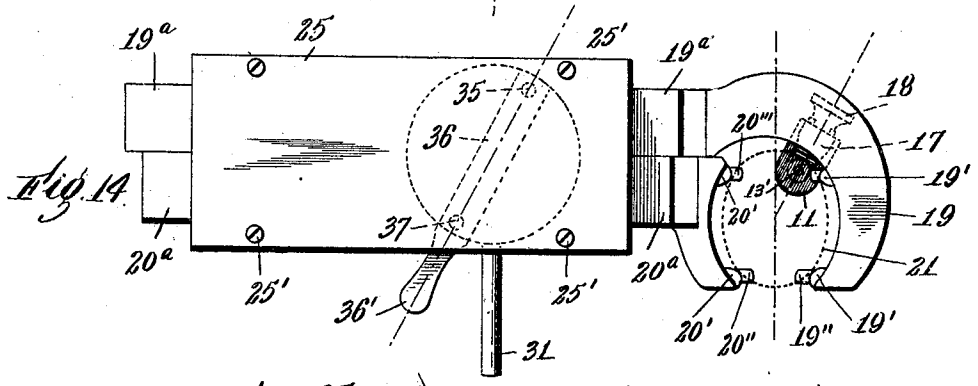


Fig. 14.

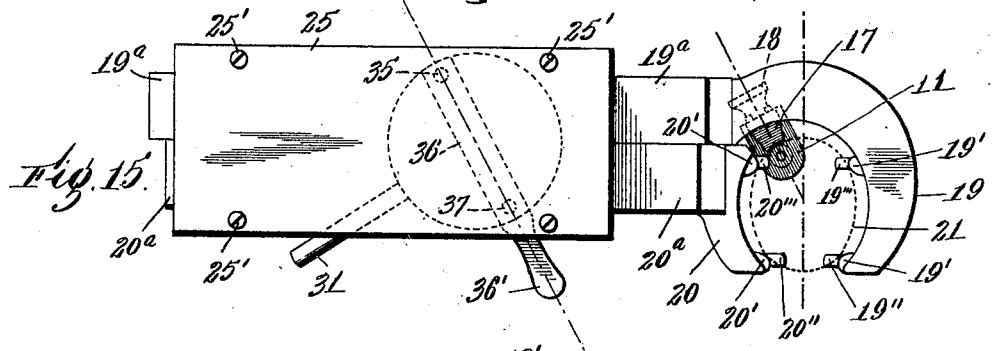


Fig. 15.

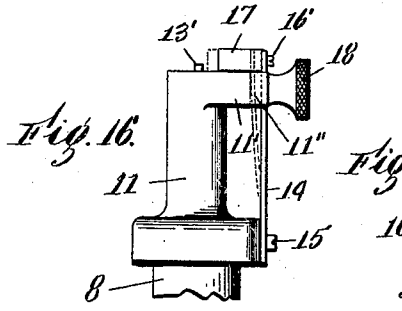


Fig. 16.

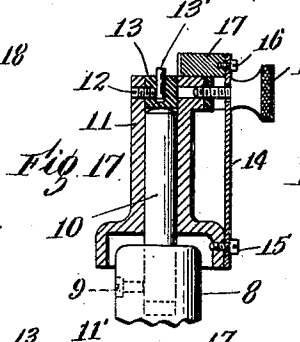


Fig. 17.

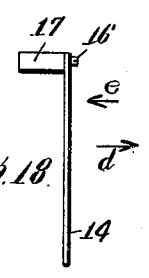


Fig. 18.

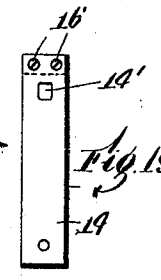


Fig. 19.

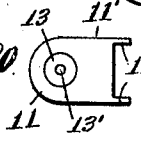


Fig. 20.

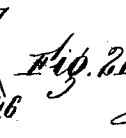


Fig. 21.

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UNITED STATES PATENT OFFICE.

GEORGE H. DAY, OF SOUTHBRIDGE, MASSACHUSETTS, ASSIGNOR TO AMERICAN OPTICAL COMPANY, A CORPORATION OF MASSACHUSETTS.

LENS-DRILLING MACHINE.

No. 807,064. Specification of Letters Patent. Patented Dec. 12, 1905.

Application filed March 25, 1905. Serial No. 251,962.

To all whom it may concern:

Be it known that I, GEORGE H. DAY, a citizen of the United States, residing at Southbridge, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Lens-Drilling Machines, of which the following is a specification.

My invention relates to a lens-drilling machine and to that class of machines which are used for centering and drilling lenses for eyeglasses and spectacles and in which means are provided to clamp and adjust the position of the lens relative to the drill, so that the holes to be drilled through the lens may be at a predetermined distance from the edge of the lens and in line with the major axis or at either side thereof at a predetermined distance, as desired.

The object of my invention is to improve upon the construction of a lens-drilling machine of the class referred to as ordinarily made and to make a machine simple in construction and effective in operation for holding and drilling lenses.

In my improvements I preferably employ the ordinary vertically-moving and rotary drill, which is raised by a spring and lowered by the operator through an operating-handle and rotated by a driven belt through belt connections passing around grooved pulleys, all in the usual and well-known way.

In connection with the drilling mechanism of the machine I use my improvements for supporting and holding the lens and for adjusting the position thereof relative to the drill, as will be hereinafter fully described.

I have only shown in the drawings sufficient parts of a lens-drilling mechanism of well-known construction and operation with my improvements combined therewith to enable those skilled in the art to understand the construction and operation thereof.

Referring to the drawings, Figure 1 is a front view of a lens-drilling machine embodying my improvements. Fig. 2 is a sectional plan view on line 2 2, Fig. 1, looking in the direction of arrow *a*, same figure. Fig. 3 is a detached plan view of the holder, partially broken away, for the longitudinally-moving slides and lens-clamping jaws and showing the rack-and-pinion mechanism. Fig. 4 is a longitudinal section on line 4 4, Fig. 3, looking in the direction of arrow *b*, same figure. Fig. 5 is a transverse section on line 5 5, Fig. 3, looking in the direction of arrow *c*, same figure. Fig. 6 shows the under side of one of the rotary disks detached. Fig. 7 shows the under side of the other rotary disk detached. Fig. 8 is a side view of the spring-blade and pin shown in Fig. 7 detached. Fig. 9 shows the pin shown in Fig. 8 detached. Fig. 10 shows the hollow shaft and pinion thereon detached. Fig. 11 shows the inner shaft and pinion thereon detached. Fig. 12 shows the under side of the lens-holding jaws detached and in a closed position. Fig. 13 is a detached plan view of the lens-holding jaws and their supports and the holder therefor and the lens-supporting block and a lens with the major axis thereof in line with the supporting-block. Fig. 14 corresponds to Fig. 13, but shows a different position of the parts, with the supporting-block for the lens at one side of the major axis thereof. Fig. 15 corresponds to Fig. 14, but shows the parts in a different position with, the supporting-block for the lens at the opposite side of the major axis thereof. Fig. 16 shows the lens-supporting block and the adjustable stop or gage thereon detached. Fig. 17 is a central vertical section through the parts shown in Fig. 16. Fig. 18 is an edge view of the stop or gage and its supporting-arm detached looking in the direction of arrow *d*, Fig. 19. Fig. 19 is a front view of the stop or gage and its supporting-arm detached looking in the direction of arrow *e*, Fig. 18. Fig. 20 shows the top of the lens-supporting block shown in Fig. 16 detached, and Fig. 21 shows the top of the stop or gage detached.

In the accompanying drawings, 1 is the bed or frame of the machine, preferably made of metal and having extending up therefrom at one corner a column or post 2 for supporting the drilling mechanism of the machine, which may be of any usual and well-known construction and operation, comprising a vertically-moving rotary shaft 3, suitably journaled and rotated by a belt (not shown) passing around a pulley 4. At the lower end of the shaft is secured a drill 5. A spring (not shown) acts to raise the shaft 3 and drill 5 and normally hold it in its raised position. A handle or arm 6 is connected with the rotary shaft 3 and is moved down by the op-

erator to lower the shaft 3 and the drill 5 during the drilling operation in the usual and well-known way.

In connection with the drill mechanism of the machine above described are combined my improvements.

I will first describe my improved movable lens support or block on which the end of the lens which is being drilled may be supported and which carries an adjustable gage or stop which bears against the edge of the lens and positions it relative to the drill.

A post 8 extends up from the bed or frame 1 of the machine in front of the column or post 2 of the drill mechanism. The lower end of a rod or spindle 10 extends down into a hole in the upper part of the post 8 and is secured therein by a screw 9. (See Fig. 17.) On the rod or spindle 10 is loosely mounted to rotate or swivel freely thereon and be removed therefrom the lens support or block 11. (See Figs. 16 and 17.) The lens-support 11 has in this instance a central vertical opening therethrough for the spindle 10, and in the upper part of said opening is secured by a screw 12 a block 13, having a pin 13′, preferably made separate therefrom and adjustably secured in a vertical opening therein by the screw 12 to be raised or lowered, as desired. (See Fig. 17.) The upper end of the pin 13′ is always in exact vertical alinement with the drill and supports that part of the lens through which the hole is to be drilled.

The upper end of the lens-support 11 has an extension 11′ on one side thereof with projections 11″ thereon, which form guides (see Fig. 20) for the upper end of a flat spring-arm 14. The lower end of the spring-arm 14 is secured to the base of the lens-support 11 by a screw 15. The upper end of the spring-arm 14 has secured thereto, in this instance by two screws 16, a block 17, which extends over and moves upon the upper end of the lens-support 11 on the side extension 11′ thereon at one side of the block 13. The inner end of the block 17, which forms a gage or stop for the edge of the lens, is curved, as shown in Fig. 21, and the shape of the curve is such as to allow the largest lens to engage at the center of the curved end of the stop or gage 17.

The position of the inner end of the gage or stop 17 relative to the pin 13′ on the lens-block 13 to cause the lens against the edge of which the stop 17 bears to be moved inwardly to bring the pin 13′ nearer the edge of the lens is regulated, in this instance by a thumb-screw 18, having preferably an enlarged knurled head and a threaded end, which turns loosely through an opening 14′ in the spring-arm 14 and is screwed into a threaded hole in the side extension 11′ on the lens-support 11. (See Fig. 17.)

By turning the set-screw 18 the gage or stop 17, which engages the edge of the lens, is moved toward the pin 13′ on the lens-block 13, (see broken lines in Fig. 16,) and by turning out said set-screw 18 the spring-arm 14 acts in this instance to move out the gage or stop 17 to the position shown in Figs. 16 and 17.

Instead of the spring-arm 14 to support the gage or stop 17 any other suitable device may be used.

In connection with the lens-support 11, carrying the block 13, having the pin 13′ which forms the support for the end of the lens directly under the drill as it is being drilled, and the adjustable gage or stop 17 I employ the two lens-holding jaws or supports 19 and 20, which extend above the lens-support 11 and are shaped on their inner edges to correspond with the shape of a lens 21. Each lens-support 19 and 20 has upon its inner edge two inwardly-extending projections 19′ and 20′, respectively, (see Fig. 13,) which are preferably made integral with the supports and form surfaces between which the lens is clamped, as shown in the drawings. The projections 19′ and 20′ act to bring the lens into proper alinement preparatory to being drilled.

The lens rests at its outer end upon supports 19″ and 20″, comprising in this instance thin plates or blades (see Fig. 12) permanently secured to the under side of the supports 19 and 20 at their outer ends by screws 22, with their inner ends extending out beyond the projections 19′ and 20′. The lens rests at its inner end upon supports 19‴ and 20‴ and may also rest upon the pin 13′. The supports 19‴ and 20‴ are preferably thin plates or blades, each adjustably secured to the under side of the supports 19 and 20 at their inner ends in a plane below the projections 19′ and 20′ by a screw 23, extending through a slot in the plates 19‴ and 20‴. (See Fig. 12.) The supports 19‴ and 20‴ may be moved out of operative position, so that the inner end of the lens will be supported only on the pin 13′, if desired.

The clamps or supports 19 and 20 are each secured in this instance upon the under side of the ends of two longitudinally-reciprocating slides or bars 19^a and 20^a. The bars 19^a and 20^a are supported and have a longitudinal movement in the upper part of a holder or frame 24, which is recessed upon its upper side to receive and hold the bars 19^a and 20^a. A plate 25 extends over the bars 19^a and 20^a and is secured to the holder 24 by screws 25′. Extending down from the holder 24, at the outer end thereof, is a spindle 26, the upper end of which is secured within a boss 24′ on the lower side of the outer end of the holder 24. The spindle 26 extends loosely into a central vertical opening through the post 1′, extending up from one end of the frame 1. (See Fig. 1.) The boss 24′ rests upon the upper

side of the post 1′, and through the spindle 26 the frame or holder 24 has a pivotal motion and may also be readily removed by raising the spindle 26 out of the post 1′. The front end of the holder 24 has a downward extension 24″ thereon, which is adapted to extend over and rest upon a stand 1″, extending up from the frame or bed 1 to support the front end of the frame or holder 24. (See Fig. 1.)

A spring 27, attached at one end to the under side of the bar-holder 24 and at its other end to a pin 27′, in this instance on the under side of the clamp or support 19, acts to move the bars 19^a and 20^a and the two clamps or supports 19 and 20 thereon toward each other to hold the lens 21 supported on the projections on the inner edges of said supports 19 and 20.

Within an opening through the holder 24 and a boss 24‴ on the lower side of said holder is loosely journaled a hollow shaft 28, (see Fig. 4,) which has fast on its upper end a pinion 28′, which meshes with teeth $19^{a\prime}$ on the lower inner edge of the recessed portion $19^{a\prime\prime}$ of the bar or slide 19^a. (See Figs. 3 and 5.) Upon the lower end of the hollow shaft 28 is secured, in this instance by a screw 29, (see Fig. 4,) a disk 30, having a beveled edge with one index-line marked zero (0) thereon. (See Fig. 1.) Secured to the disk 30 is a handle 31, extending out therefrom, by means of which said disk and with it the hollow shaft 28 and the pinion 28′ are rotated. Within the hollow shaft 28 is loosely journaled a shaft 32, having fast on its upper end a pinion 32′ of the same size and extending directly over the pinion 28′. The pinion 32′ meshes with teeth $20^{a\prime}$ on the upper inner edge of the recessed portion $20^{a\prime\prime}$ of the bar or slide 20^a. (See Fig. 3.) On the lower end of the shaft 32 and directly below the disk 30 is secured, in this instance by a screw 33, a disk 34, which has in this instance a beveled edge with index-lines or a scale thereon leading from a zero (0) line in opposite directions. (See Fig. 1.) Upon the under side of the disk 34 is secured by a screw 35 one end of a flat spring 36, (shown detached in Fig. 8,) which has the projecting engaging end 36′. The spring 36 has in this instance an opening 36″ therethrough enlarged at one end to receive a pin 37, which has an annular groove 37′ therein (see Fig. 9) to receive the edges of the narrow part of the opening 36″ and cause said pin 37 to be moved in and out with the spring 36. The pin 37 extends loosely through an opening in the disk 34, and its inner end is adapted to enter and engage any one of a series of holes 30′ in the under side of the disk 30. (See Fig. 6.) The position of the holes 30′ correspond to the index-lines on the edge of the disk 34.

When the inner end of the pin 37 extends into one of the holes 30′ in the under side of the disk 30, as shown in Fig. 5, the disks 30 and 34 and the shafts 28 and 32 and pinions 28′ and 32′ thereon rotate together, and through the handle 31 the several parts are rotated, and the pinions 28′ and 32′ meshing with the teeth $19^{a\prime}$ and $20^{a\prime}$ on the bars or slides 19^a and 20^a and moving in the same direction as a single pinion will move said slides longitudinally in opposite directions to move apart or open the jaws or supports 19 and 20 preparatory to receiving the lens 21. When the handle 31 is released, the spring 27, attached to the slide 19^a and to the frame 1, acts to move the slide 19^a and the jaw 19 inwardly, and the movement of said slide through the pinions 28′ and 32′ moving in the same direction as a single pinion and meshing with the teeth $19^{a\prime}$ and $20^{a\prime}$ will move the other slide 20^a and jaw 20 outwardly to bring the projections 19‴ and 20‴ on the jaws together, as shown in Fig. 3, which is their normal position. The parts are so assembled that when the hole through the lens is to be drilled exactly on the major axis the index-line zero on the upper disk 30 will be in line with the index line zero on the lower disk 34, as shown in Fig. 1. The distance from the edge of the lens for the holes to be drilled is regulated by turning in or out the set-screw 18 to adjust the position of the gage or stop 17, as above described. With the supports or jaws 19 and 20 in the position shown in Fig. 3 the handle 31 is moved to the left to open the jaws preparatory to receiving the lens 21. The lens is placed within the jaws 19 and 20 and between the projections 19′ and 20′ thereon, the handle 31 is released, and the spring 27 acts to move the jaws together, as above described, to position the lens supported on the blades 19″ 19‴ and 20″ 20‴ and clamp it between the jaws, as shown in Fig. 2, and when the end of the holder 24 is moved inwardly on its pivotal support the gage or stop 17 engages the edge of the lens and holds it over the block 13, with the portion to be drilled resting on the pin 13′ directly below the drill, which is moved down into contact with the lens to drill the hole therein in the usual way. In case it is desired to drill a hole in the lens at one side of the major axis then the free engaging end 36′ of the spring 36 is depressed to move the inner end of the pin 37 out of a hole 30′ in the disk 30 and leave said disk, the hollow shaft 28, and pinion 28′ free to turn independently of the disk 34, shaft 32, and pinion 32′. The movement of the handle 31 and the spring-blade 36 in opposite directions from the position shown in Fig. 13 to the position shown in Fig. 14 through the rotation of the pinions 28′ and 32′ in opposite directions will cause both slides 19^a and 20^a and the jaws 19 and 20 thereon to move together to the left and carry the lens to the left, so that the lens-supporting block 13 therefor will be at the right of the major-axis

line, as shown in Fig. 14. The movement of the handle 31 and spring-blade 36 in an opposite direction from the position shown in Fig. 14 to the position shown in Fig. 15 will cause both slides 19^a and 20^a and the jaws 19 and 20 thereon to move together to the right and carry the lens to the right, so that the lens-supporting block 13 therefor will be at the left of the major-axis line, as shown in Fig. 15. The amount of the movement of the handle 31 and the spring-blade 36 to move the slides 19^a and 20^a and the jaws 19 and 20 thereon, as above described, is regulated by the index-line on the disk 30 and the index-lines on the disk 34, as will be well understood. The stop or gage 17 by reason of the rotary or swivel motion of the lens-support 11, which carries it, will adjust itself automatically against the edge of the lens in the different positions of the lens, as shown in Figs. 14 and 15, and insure the drilled hole being always accurately distanced from the edge of the lens.

The advantages of my improvements will be readily appreciated by those skilled in the art. I provide a mechanism of simple construction comprising the two supports or jaws 19 and 20, attached to the rack-bars or slides 19^a and 20^a for holding the lens to be drilled. The supports or jaws are positively moved apart to receive the lens and yieldingly moved together by a spring to hold the lens. I combine with the mechanism for moving the lens-support or jaws and the rack, bars or slides in opposite directions mechanism which is operative when desired for moving said lens-supports or jaws and the rack-bars or slides in the same direction to carry the lens to the right or to the left of the drill a predetermined distance as desired for the drilling of the hole at the right or the left of the major axis of the lens. I provide a rotary or swivel support for the lens at the point where it has to be drilled. Said support carries a stop or gage, the position of which is adjustable to vary the distance of the edge of the lens from the support on which it is supported according to the distance from the edge of the lens of the hole to be drilled. By means of the rotary support carrying the stop or gage said stop or gage will adjust itself to the edge of the lens in the different positions of the lens relative to the drill.

It will be understood that the details of construction of my improvements may be varied, if desired.

I have described herein my machine for drilling lenses; but it may be used for drilling other articles or for other purposes.

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

1. In a machine for drilling lenses, &c., the combination with two longitudinally-reciprocating slides or bars extending in the same horizontal plane, and each bar carrying a support for a lens and having teeth thereon to be engaged by a pinion, of means for positively moving said bars in opposite directions to move apart said supports, preparatory to receiving a lens, and means for moving said bars yieldingly toward each other.

2. In a machine for drilling lenses, &c., the combination with two longitudinally-reciprocating slides or bars, extending in the same horizontal plane, and each bar carrying a lens-support and having teeth thereon to be engaged by a pinion, of means for positively moving said bars in opposite directions to move apart said support, preparatory to receiving a lens, and means for moving said bars yieldingly toward each other, and means for positively moving the two bars and supports simultaneously in a direction toward or away from the drill, to change the position of the lens relatively to the position of the drill.

3. In a machine for drilling lenses, &c., the combination with two lens-supports for holding a lens, movable toward and away from each other, and bars carrying said supports and having teeth thereon, and adapted to be moved in opposite directions, and also moved in the same direction, of means for moving said bars, said means comprising a pinion meshing with the teeth on one bar and fast on a rotary shaft, and said shaft secured to a rotary disk, and said disk, and means for rotating the same, and a second pinion meshing with the teeth on the other bar, and fast on a hollow rotary shaft, and said shaft secured to a rotary disk, and said disk, and means for rotating the same, and movable connections between said disks, to cause them to rotate together in the same direction, and cause the two pinions to rotate as a single pinion, to move the two bars in opposite directions, or to allow said disks to be rotated separately in opposite directions, and cause the two pinions to rotate separately in opposite directions, to move the two bars in the same direction.

4. In a machine for drilling lenses, &c., the combination with supports for holding a lens, and means for moving said supports apart to receive the lens, and means for yieldingly moving them together to hold the lens, of a rotary or swivel support for the lens at the point where it is to be drilled, and an adjustable stop or gage on said support, adapted to engage the edge of the lens and to adjust itself to the edge of the lens in its different positions relatively to the drill.

5. In a machine for drilling lenses, &c., a rotary or swivel support for a lens at the point where it is to be drilled, and an adjustable stop or gage on said support, to engage the edge of the lens.

6. In a machine for drilling lenses, &c., the

combination with two supports for holding a lens, and rack-bars carrying said supports and pinions meshing with said rack-bars, of mechanism for moving said rack-bars in opposite directions to open the supports to receive the lens, and mechanism for moving said rack-bars in the same direction, to move the lens a predetermined distance for the drilling of the hole, at the right or left of the major axis of the lens.

7. In a machine for drilling lenses, &c., the combination with two supports for holding a lens, and two rack-bars carrying said supports, of means for moving said rack-bars in opposite directions, and in the same direction, said means comprising two pinions adapted to be rotated as a single pinion in the same direction, and also rotated as two separate pinions in opposite directions, and means for rotating said pinions.

GEO. H. DAY.

Witnesses:
C. F. HILL,
J. C. WELLS.