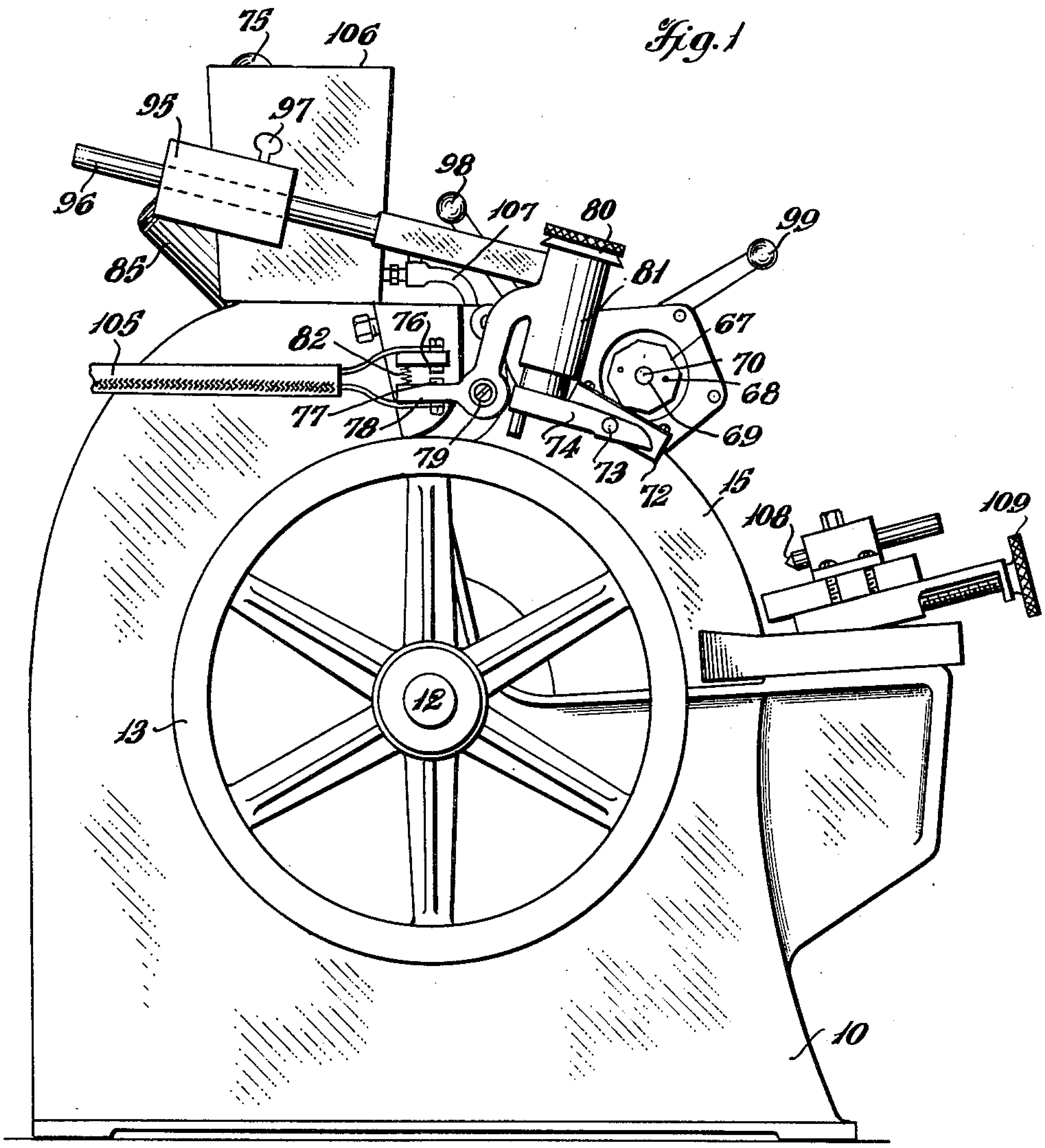
Oct. 31, 1950 E. GRASSER 2,528,137

LENS GRINDING MACHINE

Filed Oct. 22. 1947 5 Sheets-Sheet 1



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LENS GRINDING MACHINE

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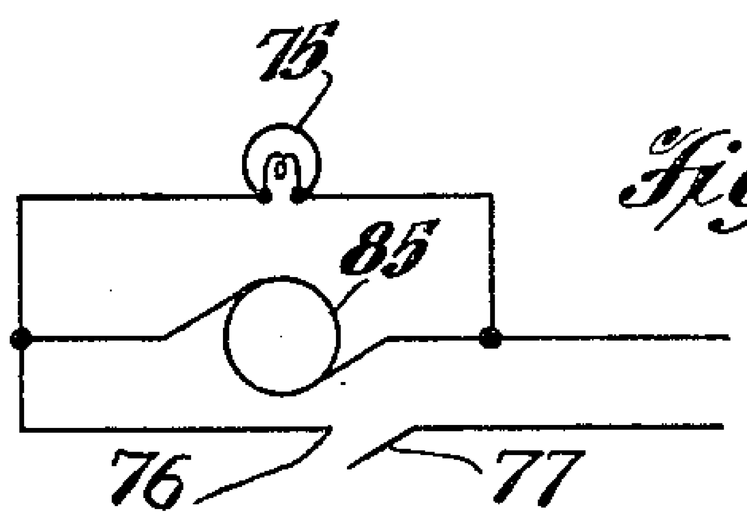

Fig. 7

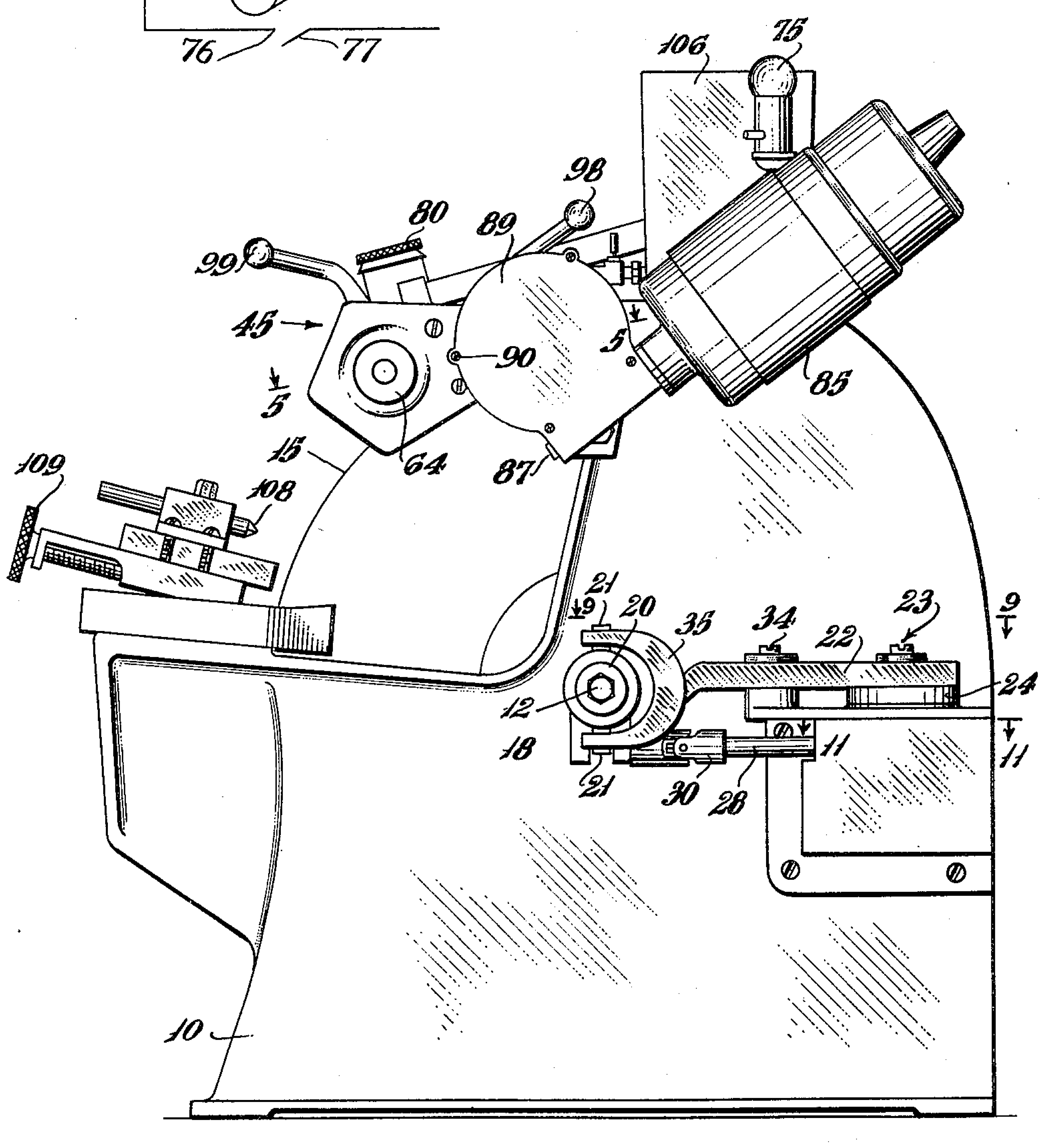

Fig. 2

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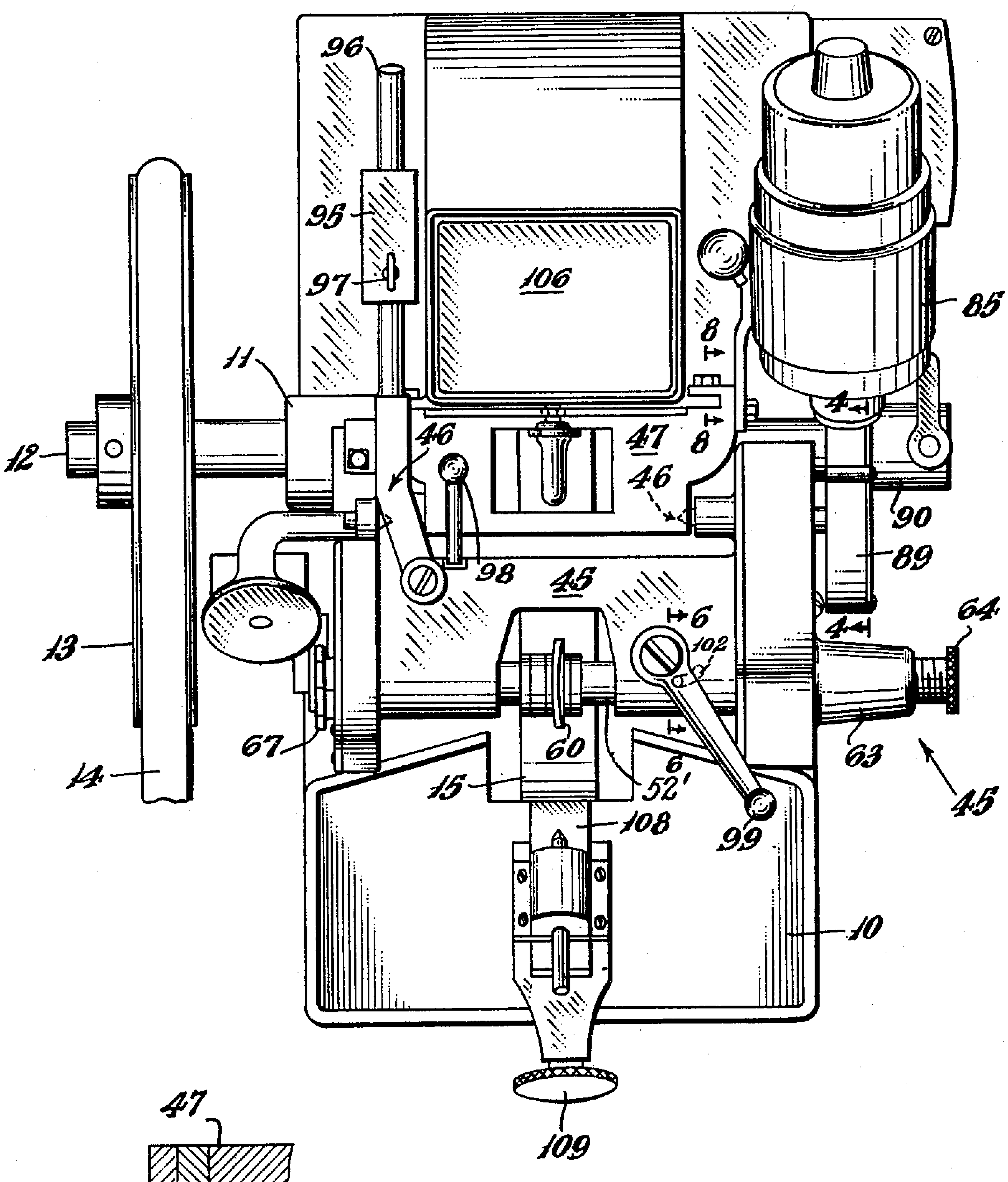
Fig. 3



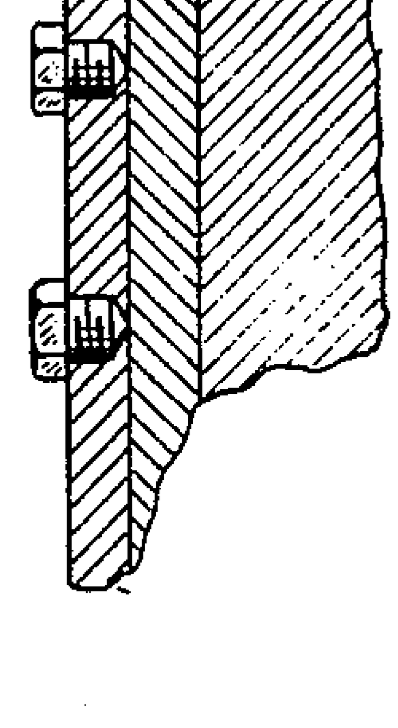


Fig. 8

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LENS GRINDING MACHINE

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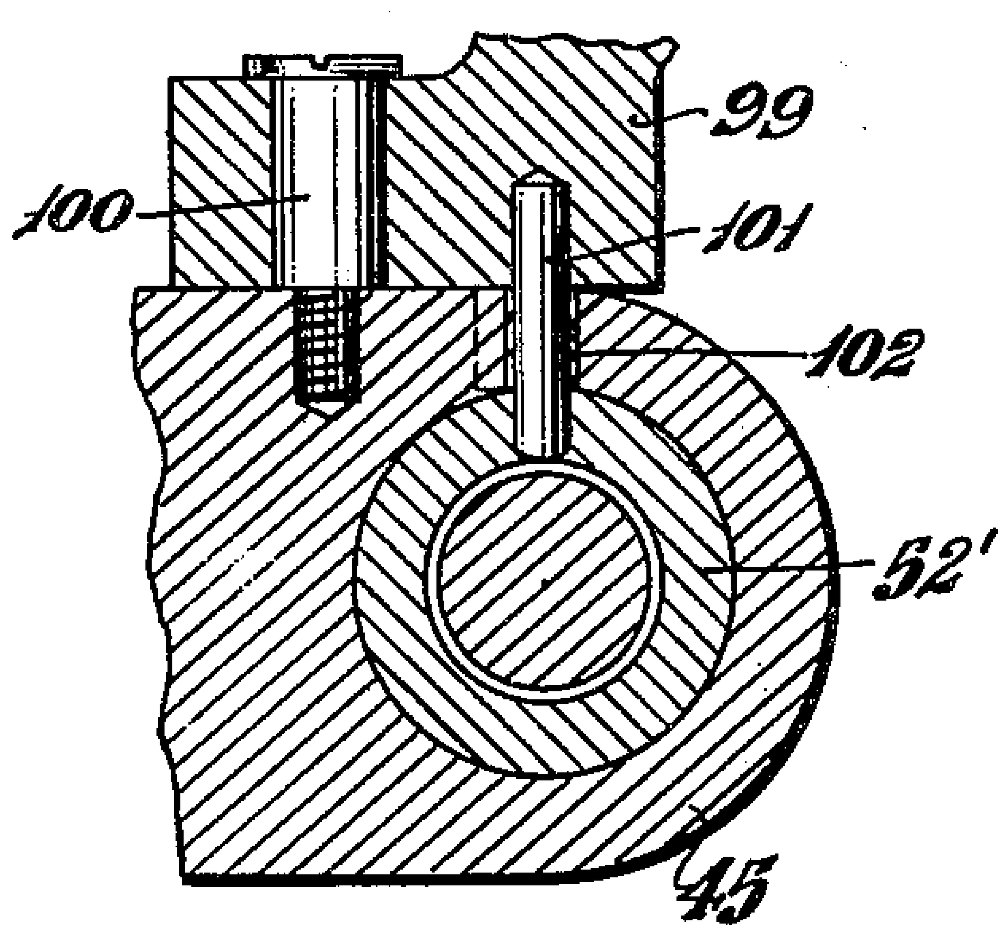


Fig. 6

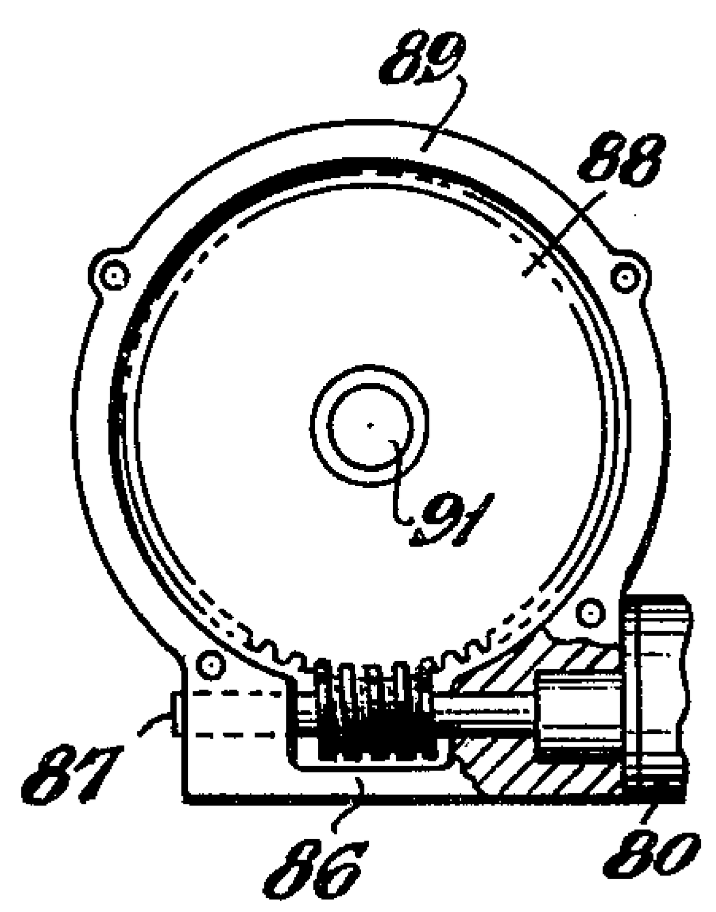
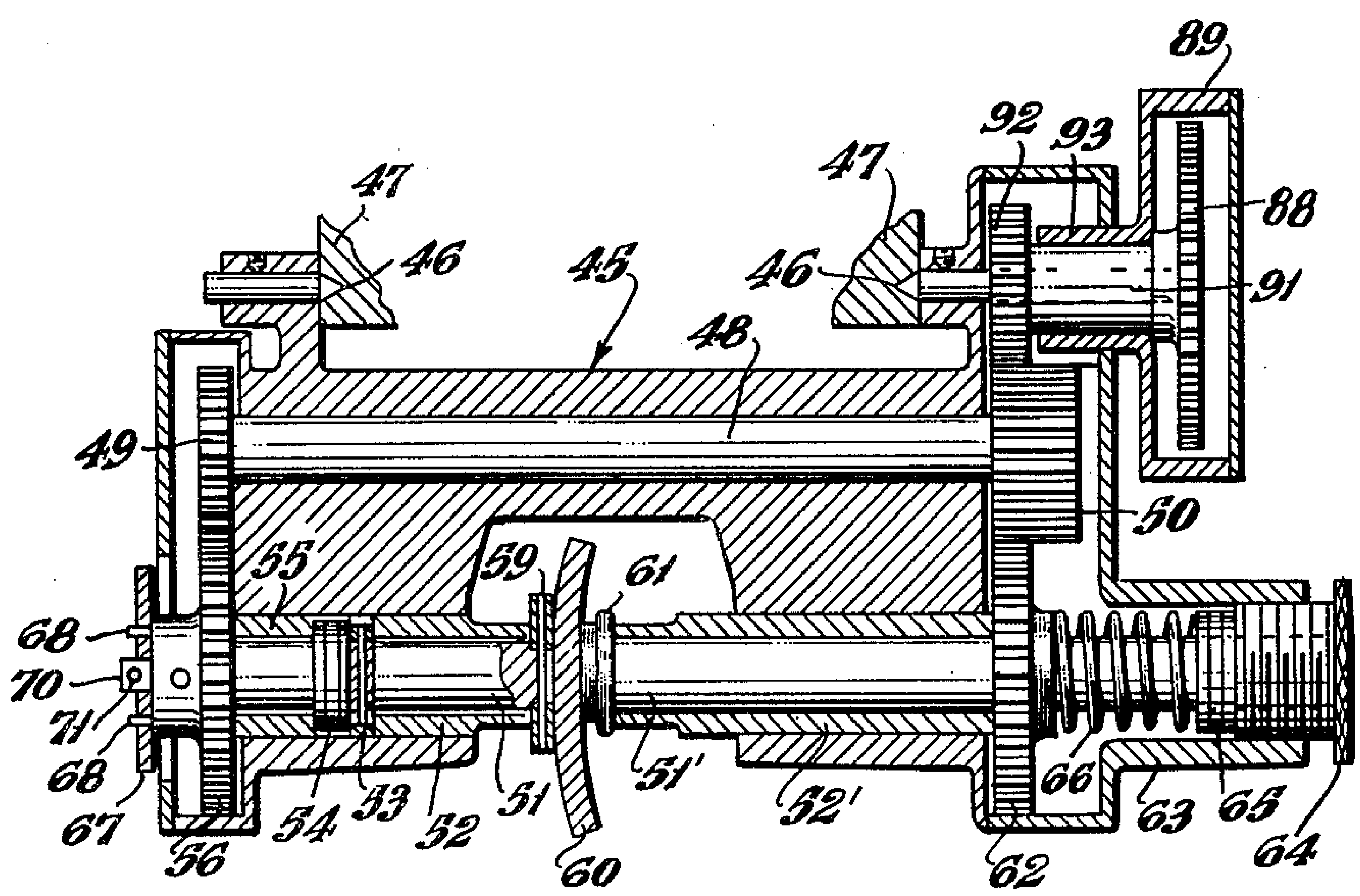


Fig. 4

Fig. 5



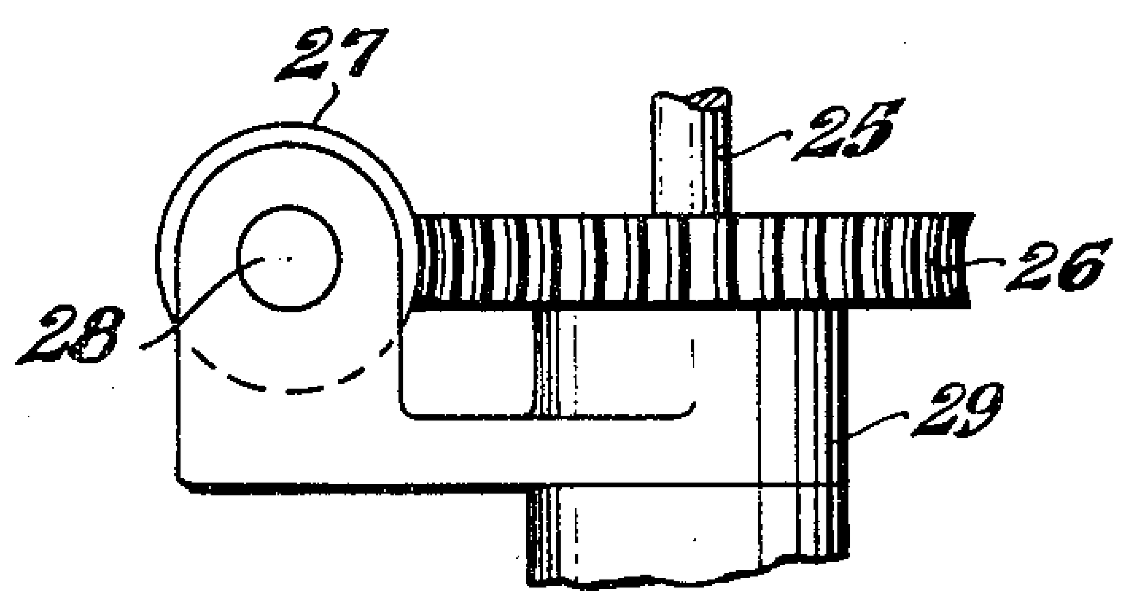


Fig. 13

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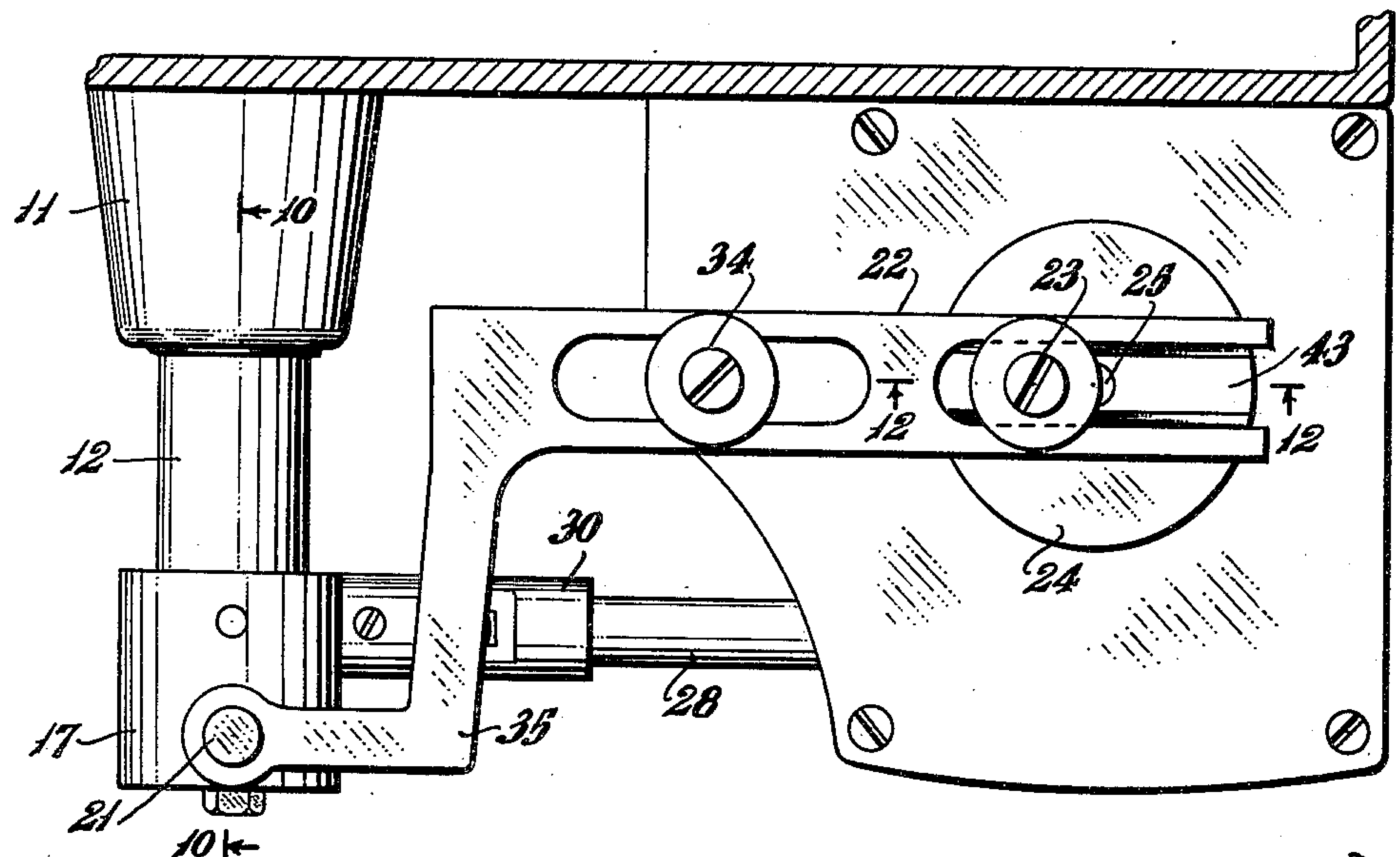
Fig 9



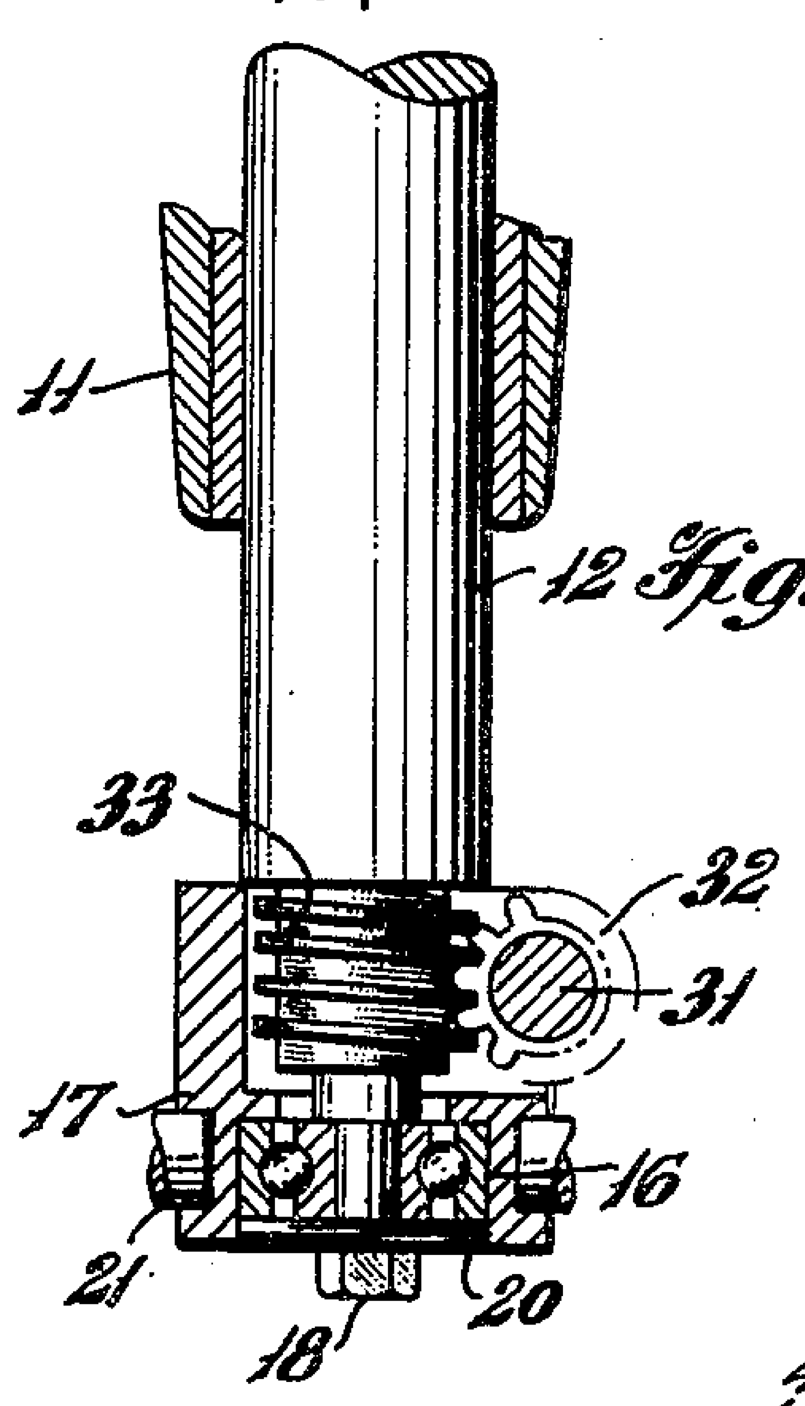


Fig.10

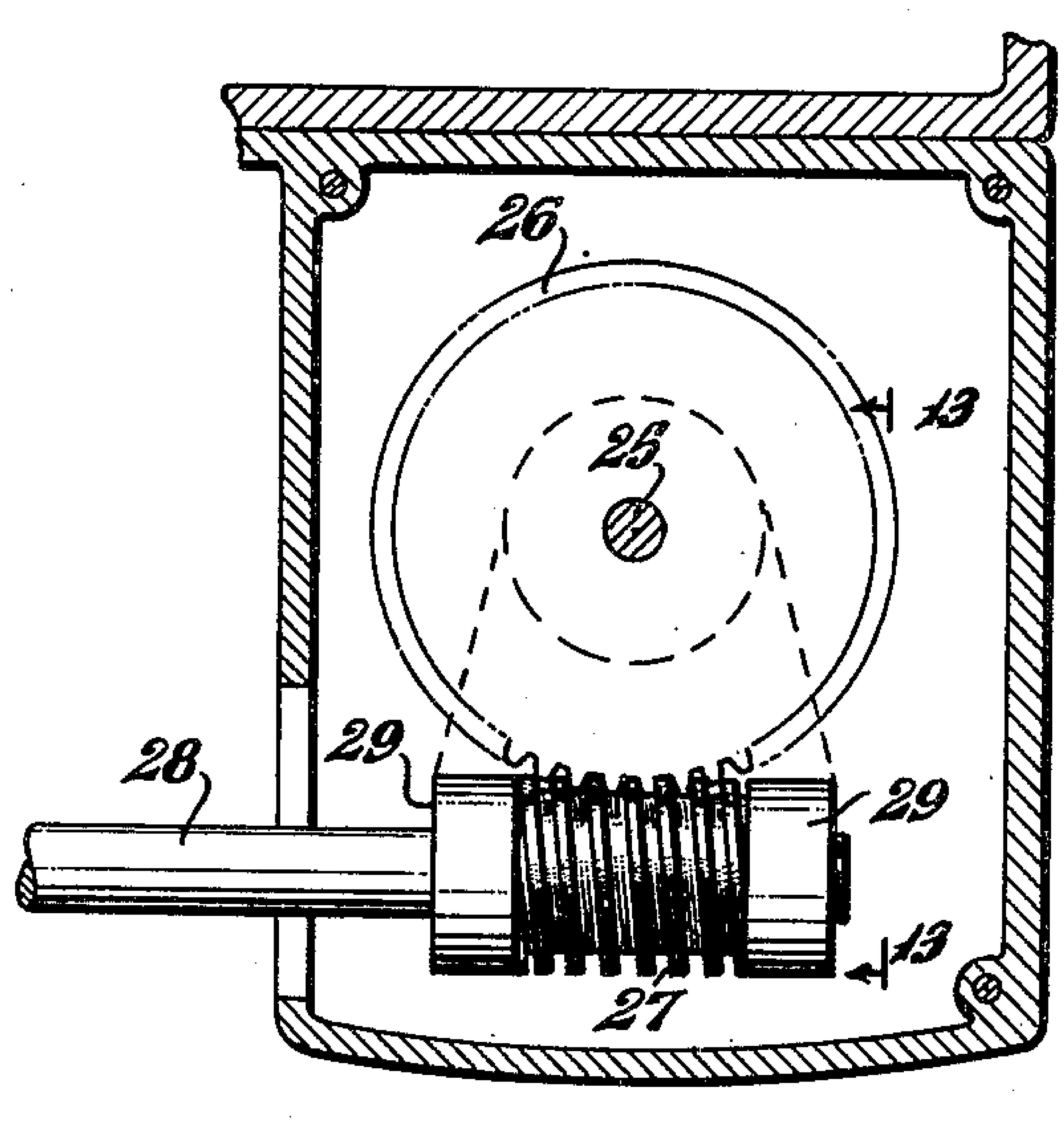


Fig.11

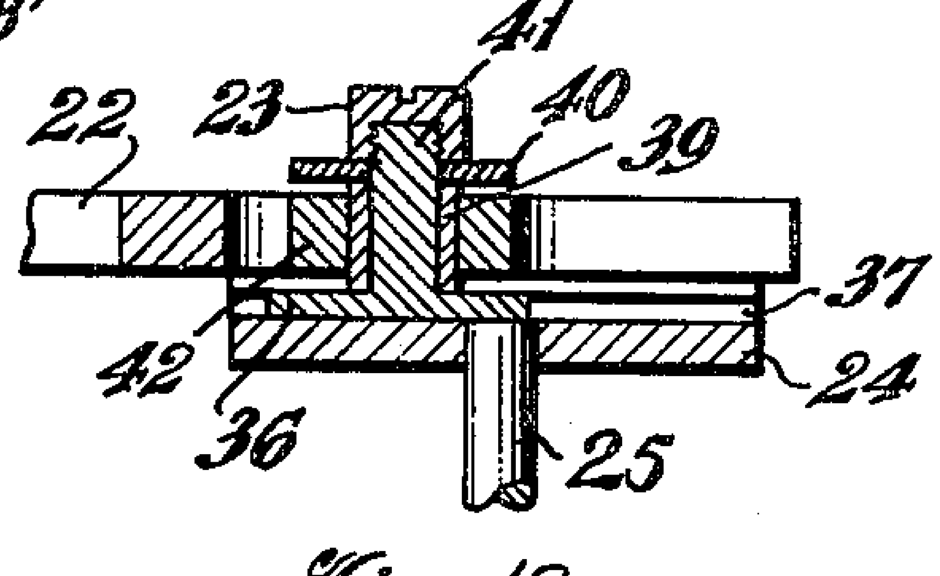


Fig.12

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UNITED STATES PATENT OFFICE

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LENS GRINDING MACHINE

Emil Grasser, Brooklyn, N. Y.

Application October 22, 1947, Serial No. 781,288

1 Claim. (Cl. 51—101)

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This invention relates to lens grinding machines and an object of this invention is to provide a fully automatic rimless lens edger which will grind all shapes and sizes of lenses, without requiring an attendant during operation.

Another object of this invention is to provide a lens edge-grinding machine having two lens clamp members for resiliently clamping and rotating a lens to be edge-ground, and having means for automatically reciprocating a grinding wheel during its rotation to prevent flaking or chipping of the edges of the lenses being ground.

Another object of this invention is to provide two coaxially mounted lens holding spindles driven from a single source of power, the spindles being resiliently pressed toward each other and to provide a thrust bearing on each spindle to cushion vibrational shocks on each side of said lens as an aid in preventing flaking of the lens.

Another object of this invention is to mount a template or pattern having the desired edge contour of the lens at one end of a lens holding spindle and to provide mechanism whereby rotation of the template will cause the lens to be accurately edge-ground, the mechanism also causing an electric lamp to be lighted when the grinding of the edge of a lens is completed.

With the above and other objects in view, the invention will be hereinafter more particularly described, and the combination and arrangement of parts will be shown in the accompanying drawings and pointed out in the claims which form part of this specification.

Reference will now be had to the drawings, wherein like numerals of reference designate corresponding parts throughout the several views, in which:

Figure 1 is a side elevation of the automatic rimless lens edge grinding machine as seen from the left hand side thereof.

Figure 2 is a side elevation of the grinding machine shown in Figure 1, as seen from the right hand side thereof.

Figure 3 is a top plan view of the machine shown in Figures 1 and 2.

Figure 4 is a cross-sectional view, the section being taken as on line 4—4 in Figure 3.

Figure 5 is a cross-sectional view, the section being taken as on line 5—5 in Figure 2.

Figure 6 is a cross-sectional view, the section being taken as on line 6—6 in Figure 3.

Figure 7 is a wiring diagram of the electric circuit.

Figure 8 is a fragmentary cross-sectional view, the section being taken as on line 8—8 in Figure 3.

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Figure 9 is a cross-sectional view, the section being taken as on line 9—9 in Figure 2.

Figure 10 is a cross-sectional view, the section being taken as on line 10—10 in Figure 9.

Figure 11 is a cross-sectional view, the section being taken as on line 11—11 in Figure 2.

Figure 12 is a cross-sectional view, the section being taken as on line 12—12 in Figure 9.

Figure 13 is a side view of a fragmentary portion of a mounting for a worm and worm gear which reciprocate the grinding wheel while it rotates.

In the illustrated embodiment of the invention, the numeral 10 indicates a stationary housing having bearings 11 in which a drive shaft 12 is rotatably mounted. A belt pulley 13 is suitably fixed to the shaft 12 whereby the shaft may be driven by a belt 14.

A grinding wheel 15 is suitably fixed to the shaft 12. As best shown in Figures 2, 9 and 10 the shaft 12 may during its rotation have limited reciprocatory movements imparted thereto. For imparting reciprocatory movements to the shaft 12 and to the grinding wheel 15, the end of the shaft opposite the pulley 13 is made of smaller diameter to provide a journal for a ball bearing 16. A collar 17 is mounted on the ball bearing 16 and is held against movement lengthwise of the shaft 12 by a bolt 18 and a washer 20. The collar 17 has two pins 21 extending diametrically therefrom.

A vibratory arm 22 is actuated by an adjustable eccentric 23. The free end of the arm 22 terminates in a yoke 35 through the opposed arms of which the pins 21 freely pass. The adjustable eccentric 23 comprises a rotatable collar 24 driven by a shaft 25 (Figure 12). A worm gear 26 is secured to the lower end of the shaft 25. The worm gear 26 is in engagement with a worm 27 fixed to a horizontal shaft 28 mounted in bearings 29.

A universal joint 30 connects the shaft 28 and a worm gear shaft 31 having a worm gear 32 fixed thereto. The worm gear 32 is in interengagement with a worm 33 on the drive shaft 12.

It will thus be seen that rotation of the drive shaft 12 will cause rotation of the shaft 28 and the shaft 25 and the adjustable eccentric 23. The eccentric 23 imparts vibratory movements to the arm 22 about a pivot 34, and, through the yoke 35, vibratory movements are imparted to the drive shaft 12 and to the grinding wheel 15 secured thereon.

As shown in Figure 12, it will be seen that the eccentric **23** is integral with a horizontal slide **36**. The slide **36** may be adjusted in a guideway **37** in the collar **24** at the upper end of the shaft **25**.

A bushing **39** on the eccentric **23** extends above the arm **22** and may be held in position by a washer **40** and a threaded nut **41**. It is thus possible to change the position of the eccentric **23** with relation to the shaft **25** and vary the amplitude of the vibratory movements of the grinding wheel **15**.

A slide **42** on the bushing **39** is slidable in close fitting relation in a guideway **43** in the arm **22** and prevents any lost motion during the vibratory movements of the grinding wheel **15**.

Figures 3 and 5 show the mechanism for supporting a lens edgewise against the peripheral surface of the grinding wheel and comprises a rock-frame **45** which is mounted to oscillate on centers **46** in a carrier **47** supported above the grinding wheel **15**.

The rock-frame **45** comprises a shaft **48** having gears **49**, **50**, fixed thereto at opposite ends. The gear **50** is considerably wider than the gear **49**. The rock-frame **45** also comprises coaxial rotary spindles **51**, **51'** which are journaled in bearings **52**, **52'** provided in the outer portion of the rock-frame.

The spindle **51** carries a fixed collar **53** which contacts a thrust bearing **54**. The thrust bearing **54** contacts a bearing **55**. The spindle **51** has a gear **56** secured thereto. The gear **56** is in interengagement with the gear **49**. At its free end, the spindle **51** caries a suitable lens holder **59** for a lens **60**.

The spindle **51'** carries a suitable lens holder **61** at its free end and has a gear **62** fixed thereto and in engagement with the gear **50**. The lens holder **61** may be in the form of a pad made of rubber, leather, etc., for frictionally engaging the face of the lens to reduce the liability of breakage or marring the lens. The lens holders grip the lens from opposite faces of the lens and support the lens in a substantially vertical position.

The rock-frame **45** has a threaded tubular extension **63** which is coaxial with the spindle **51'** and has a bushing **64** threaded therein. The spindle **51'** terminates short of the outer end of the extension **63** and contacts a thrust bearing **65**.

The threaded bushing **64** may be rotated to press against the thrust bearing **65** to compress a coil spring **66** on the spindle **51'** and releasably clamp the lens **60** between the lens holders **59** and **61**. It is to be noted that the gear **50** is much wider than the gear **62** and this permits considerable movement of the spindle **51'** from the spindle **51** for inserting or removing the lens **60** from the rock-frame **45**. The gear **62** remains in interengagement with the gear **50** during all such adjustments. The spindle **51'** is thus longitudinally or axially adjustable while the spindle **51** is not adjustable longitudinally or axially.

A template or pattern **67** of the contour desired of the outer edge of the finished lens **60** is mounted on pins **68** extending from the gear **56**. The template or pattern **67** has a central aperture **69** to fit on a reduced end portion **70** of the spindle **51**. The end portion **70** has a radially movable spring-pressed ball **71** which is adapted to lock the template **67** in service position on the spindle **51**. Upon rotation of the template **67**, its outer edges successively contact a table **72** which is fixed by a bolt **73** to an arm **74** and which is normally urged against the template by a coiled spring **82**, as will become clearer below. The arm **74** is suitably mounted for vertical adjustment by a micrometer dial **80**.

As shown in Figures 1 and 2, an electric lamp **75** suitably mounted on the frame **10** provides a single indicating to the operator when the edge-grinding machine has completed the operation of edge-grinding a lens. The electric lamp **75** is lighted by current passing through a fixed electric contact **76** and by a coacting movable electric contact **77** secured to an arm **78**. The arm **78** is pivotally mounted on a screw **79** in an extension of a micrometer housing **81**.

When the edge of a lens **60** is ground to a finish according to the contour of a portion of the template **67**, the weight of the rock-frame causes the table **72** and the micrometer housing **81** to pivot about the screw **79** and to raise the arm **78** against the force of the compression spring **82** and bring the contact **77** against the stationary contact **76**, thereby closing the circuit through the lamp **75** and the motor **85** (Figure 7) from a source of electric energy not shown.

The counterbalanced weight of the rock-frame **45** is supported on the grind stone **15** by the lens **60**, which at the beginning of the grinding operation has every radial dimension greater than every corresponding radial dimension of the template **67**. Thus the forward end of the rock-frame is raised a distance equal to the difference between the radial distance of the lens **66** to the surface of the wheel **15** and the corresponding radial distance of the template **67** to the point of contact of the template with the table **72**. Consequently the arm **78** is lowered so that the contact **77** is separated from the contact **78** and no current flows through either the motor **85** or the lamp **75**. As the wheel **15** then continuously rotates it grinds down the edge of the lens, and as this operation proceeds the front end of the rock-frame gradually falls. When the lens has been ground to the point where the above difference between the radial distances mentioned is zero, then the weight of the rock-frame will begin to be transferred partly to the table **72** through the template **67**, and owing to the small distance between the contacts **76**, **77**, a very small additional amount of grinding of the lens will cause the template to press down the table **72** a distance sufficient to raise the arm **78** sufficiently to bring the contact **78** against the contact **77**. This closes the circuit (Fig. 7) through the lamp **75** and the motor **85**, whence the lamp glows and the motor begins to rotate. Rotation of the motor **85**, as is obvious, will rotate the shaft **51**, **51'** and hence the lens **66** and the template **67**.

Rotation of the lens **67** through a small arc will then bring an unground adjacent portion of the lens into contact with wheel **15** and thus the forward end of the rock-frame will again be raised, thereby permitting the force of the spring **82** to depress the arm **82** and separate the contact **78** from the contact **77**, thus opening the circuit through the lamp and motor. Rotation of the shaft **51**, **51'** is thus stopped, whence the continuing rotation of the wheel **15** will begin grinding down the newly presented edge of the lens until again the radial distance at the newly presented point on the edge of the lens is reduced to the corresponding radial distance of the template to the table **72**, as above set forth. This performance is then repeated until the entire periphery of the lens **66** has been ground down to the shape and dimensions of the template **67**, at which time, as is obvious, the switch 77, 78 will remain closed so that the shaft 51, 51′ rotates continuously and the lamp 75 remains uninterruptedly energized, giving a signal to the operator that the grinding of the lens has been completed.

The electric motor 85 has a worm 86 secured to the motor shaft 87. The worm 86 is in interengagement with a worm gear 88 which is rotatably mounted in a gear casing 89. The casing 89 is secured by screws 90 to the rock-frame 45.

The gear 88 is fixed to a shaft 91 (Figure 5). The shaft 91 has a gear 92 fixed thereon. The gear 92 is in interengagement with the gear 50 on the shaft 48.

The casing 89 has a centrally positioned bearing 93 in which the shaft 91 is rotatably mounted. The gears 49 and 50 are of equal diameter and function as idler gears to transmit motion from the motor driven gear 92 to the spindle gears 56 and 62 which are also of equal diameter.

This gearing arrangement causes the lens holders 59 and 61 to be rotated by a single source of power in the same direction and with equal speed.

A counterbalancing weight 95 is secured to an arm 96 extending from the rock-frame 45. The weight 95 is adjusted by a screw 97. The weight is adjusted on the arm 96 so that the lens 60 will engage the periphery of the grinding wheel 15 with the degree of pressure necessary for the most efficient grinding effect. The adjustable weight 95 functions as means for controlling the pressure of the work on the grinding wheel during the edge-grinding operation.

A template or pattern 67 of the desired edge contour of the lens is mounted on the reduced end 70 of the spindle extension 70 and held by the pins 68. The spring-pressed ball 71 is employed to quickly and easily lock the template.

The operator then swings an operating or lens releasing handle 99 to the right about a pivot 100 (Figure 6). This movement causes swinging movement of a pin 101 fixed in the handle 99 and slidable in a slot 102 in the upper portion of the rock-frame 45.

It is to be noted that the lower end of the pin 101 is in engagement with the bearing or journal 52′ and when the operating handle 99 is swung to the right against the action of the spring 66, the spindle 51′ and the lens holder 61 are moved away from the lens holder 59 to permit inserting a lens therebetween.

The lens to be cut is properly aligned with the lens holders 59 and 61. By adjusting the threaded bushing 64, the lens holder 61 is brought into resilient clamping engagement with the lens and with the lens holder 59.

The counterbalanced rock-frame 45 is released from being held in an upward position by a suitable lock 98 into operative position, whereby the rock-frame 45 moves down to bring the lens into grinding position with the grinding wheel 15.

A receptacle 106 containing water is mounted on the upper portion of the housing 10 and has a suitable delivery tube 107 from which water is supplied to the grinding wheel 15.

For truing up the grinding wheel 15 there is provided a cutting tool 108 of diamond hardness. The tool 108 may be adjusted to and from the wheel 15 by a threaded member 109, well known in the art.

In accordance with the patent statutes I have described and illustrated the preferred embodiments of my invention, but it will be understood that various changes and modifications can be made therein without departing from the spirit of the invention as defined by the appended claim.

I claim:

A lens edge-grinding machine comprising a frame having a grinding wheel supported therein on a horizontal axis, means for continuously rotating said wheel, a rock-frame pivotally supported on said frame above said wheel on an axis parallel with said wheel axis, a two-piece spindle comprising a pair of co-axial sections having means normally urging said sections together, said spindle being mounted in said rock-frame forward of said rock-frame axis, lens-gripping means on the juxtaposed ends of said sections for clamping a lens between said sections, said lens-gripping means being positioned in the plane of said wheel, a member pivoted on a horizontal axis to said frame and extending forward, said spindle having lens template mounting means thereon adapted to hold a lens template thereon co-axial with said spindle, the forward end of said member lying in the same vertical plane as said lens template holding means and hence the same vertical plane as said lens template when said lens template is held on said spindle, said forward end of said member being positioned under said lens template, a fixed electric contact on said frame and a movable electric contact associated therewith on the rear end of said member, resilient means normally urging said rear end of said member downward and hence urging said forward end of said member upward against said lens template and simultaneously urging said movable contact away from said fixed contact, said rock-frame having the forward portion thereof forward of said axis thereof heavier than the rearward portion thereof so that said forward portion is normally urged by gravity toward said wheel, said lens having every dimension thereof passing through the axis thereof greater than the diameter of said spindle whereby said lens normally rests on said wheel and supports said rock-frame, an electric motor, gear means connecting said motor with said spindle for rotating said spindle upon energization of said motor, said motor being adapted to be connected in an electrical circuit including said electric contacts whereby mutual engagement of said contacts closes said circuit through said motor.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
681,396	Jungnickel	Aug. 27, 1901
739,264	Long et al.	Sept. 15, 1903
927,949	Clark	July 13, 1909
1,051,869	Eckstein	Feb. 4, 1915
2,175,719	Long	Oct. 10, 1939
1,610,638	White	Dec. 14, 1926
1,659,560	Bausch	Feb. 21, 1928
2,164,155	Lemay	June 27, 1939
2,175,719	Long	Oct. 10, 1939
2,233,312	Harrold	Feb. 25, 1941
2,321,383	Harper	June 8, 1943
2,357,154	Wilhelm	Aug. 29, 1944
2,406,606	Jackson	Aug. 27, 1946