No. 670,500. Patented Mar. 26, 1901.

F. A. MORGAN & F. H. BROWN.

LENS CUTTING AND EDGING MACHINE.

(Application filed July 16, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

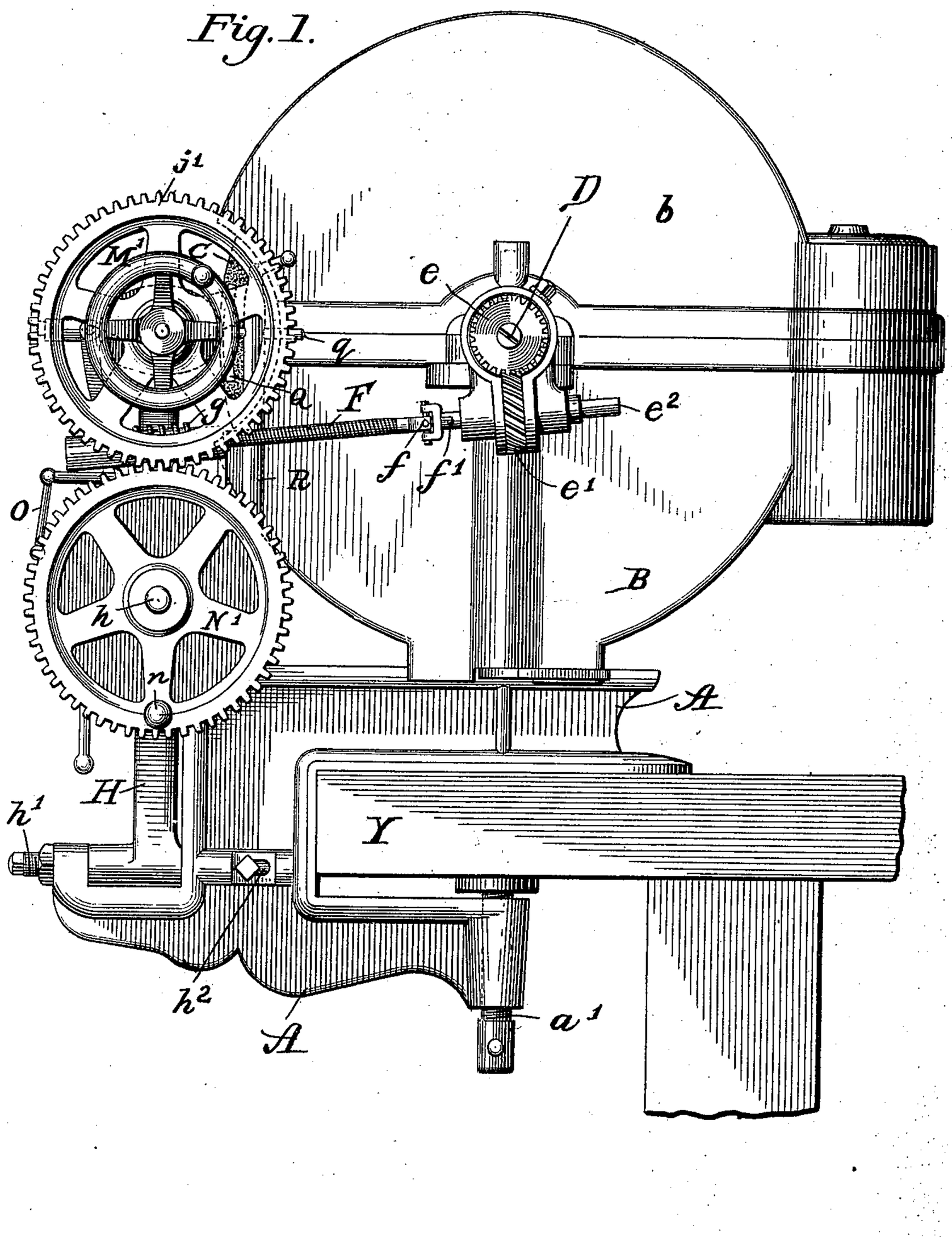

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Fig. 2.

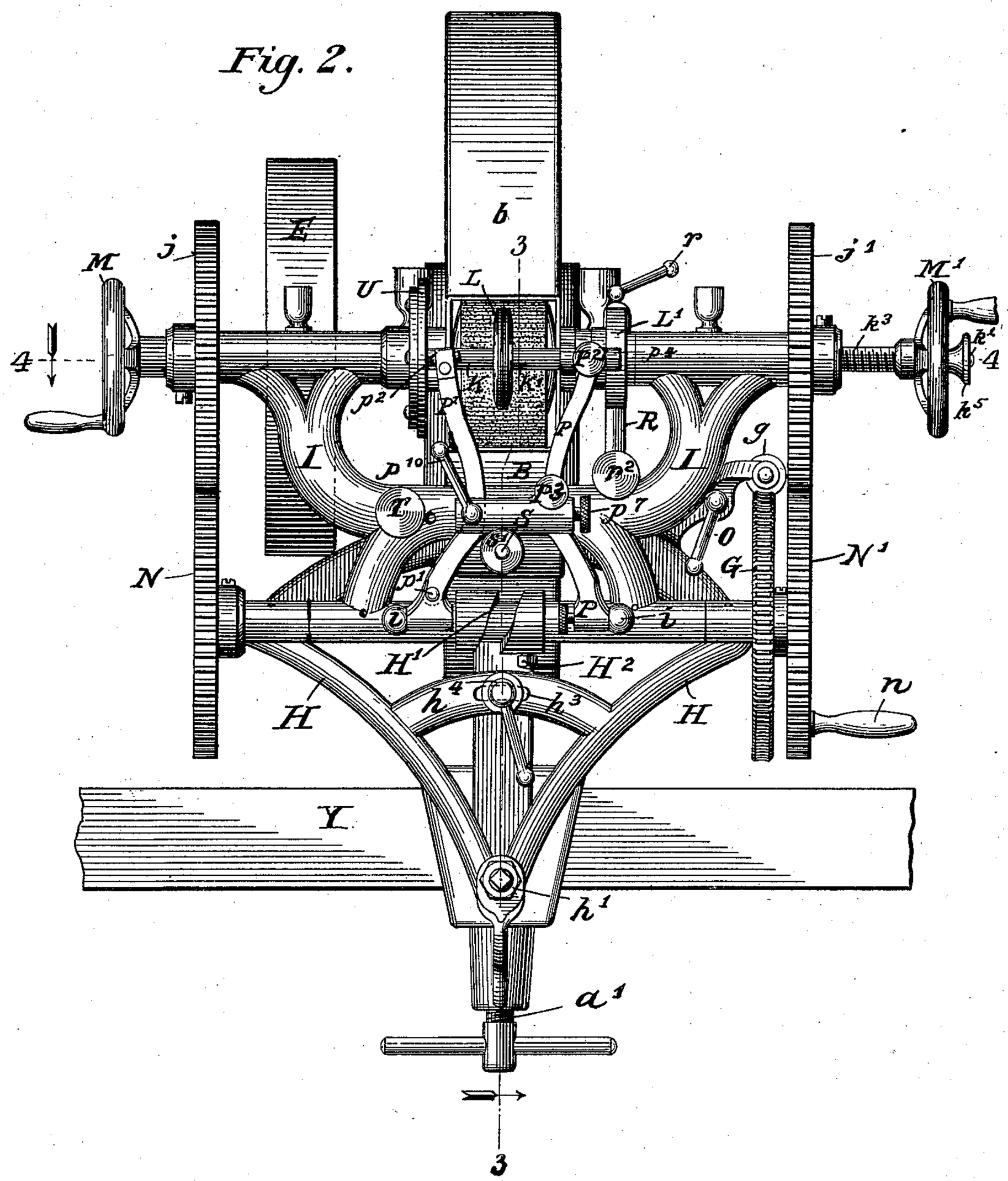

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Fig. 5.

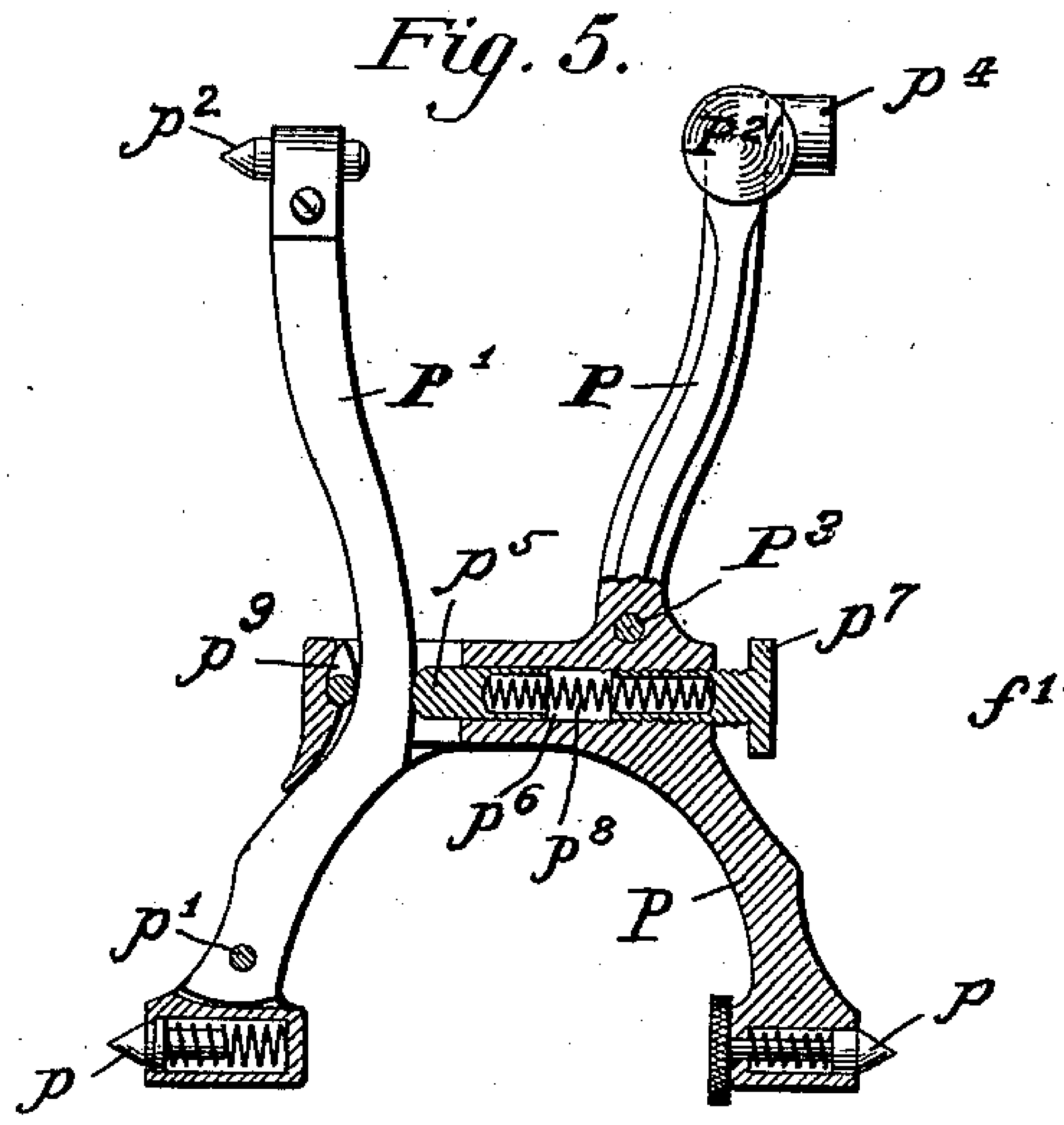


Fig. 3.

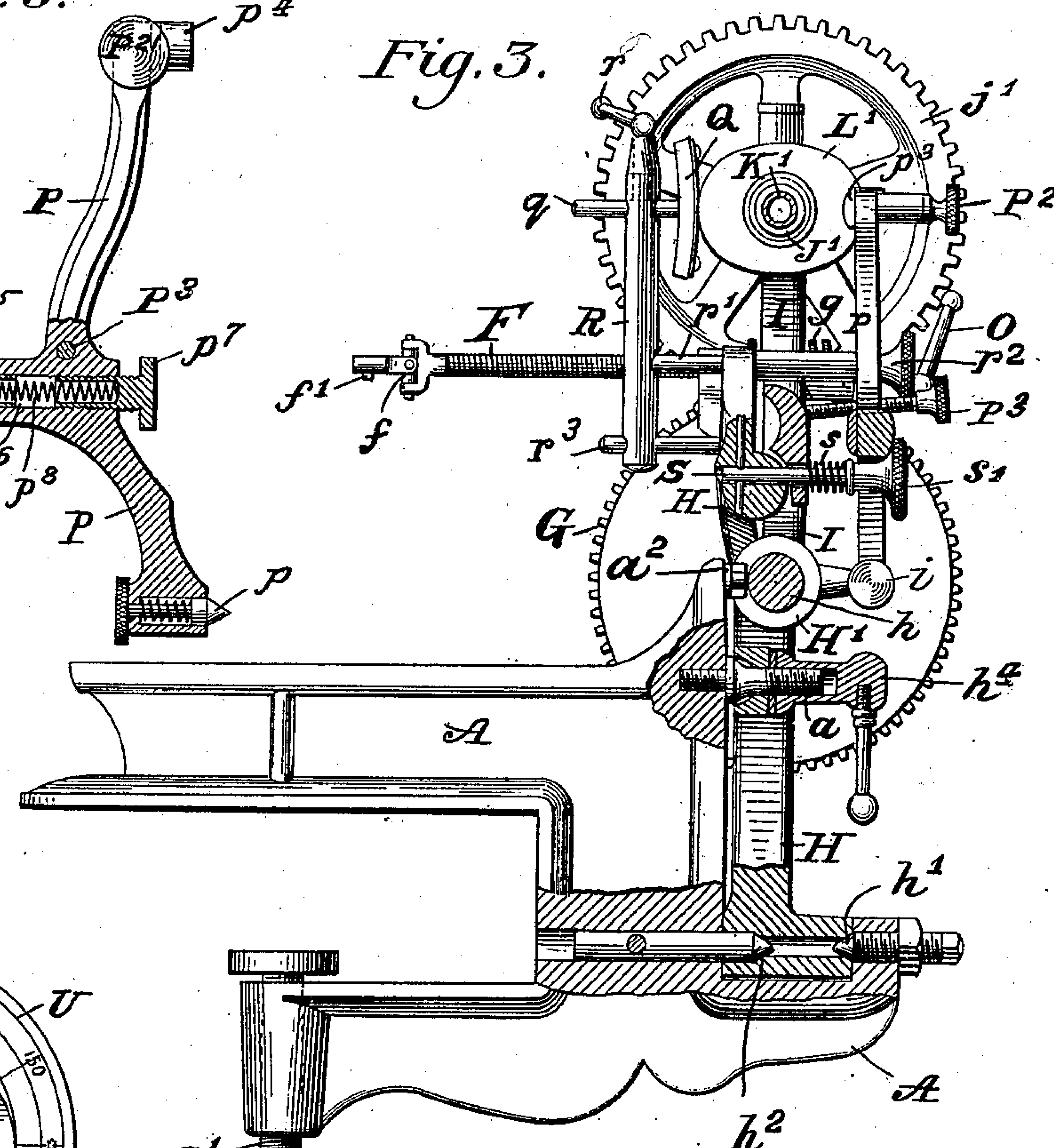


Fig. 6.

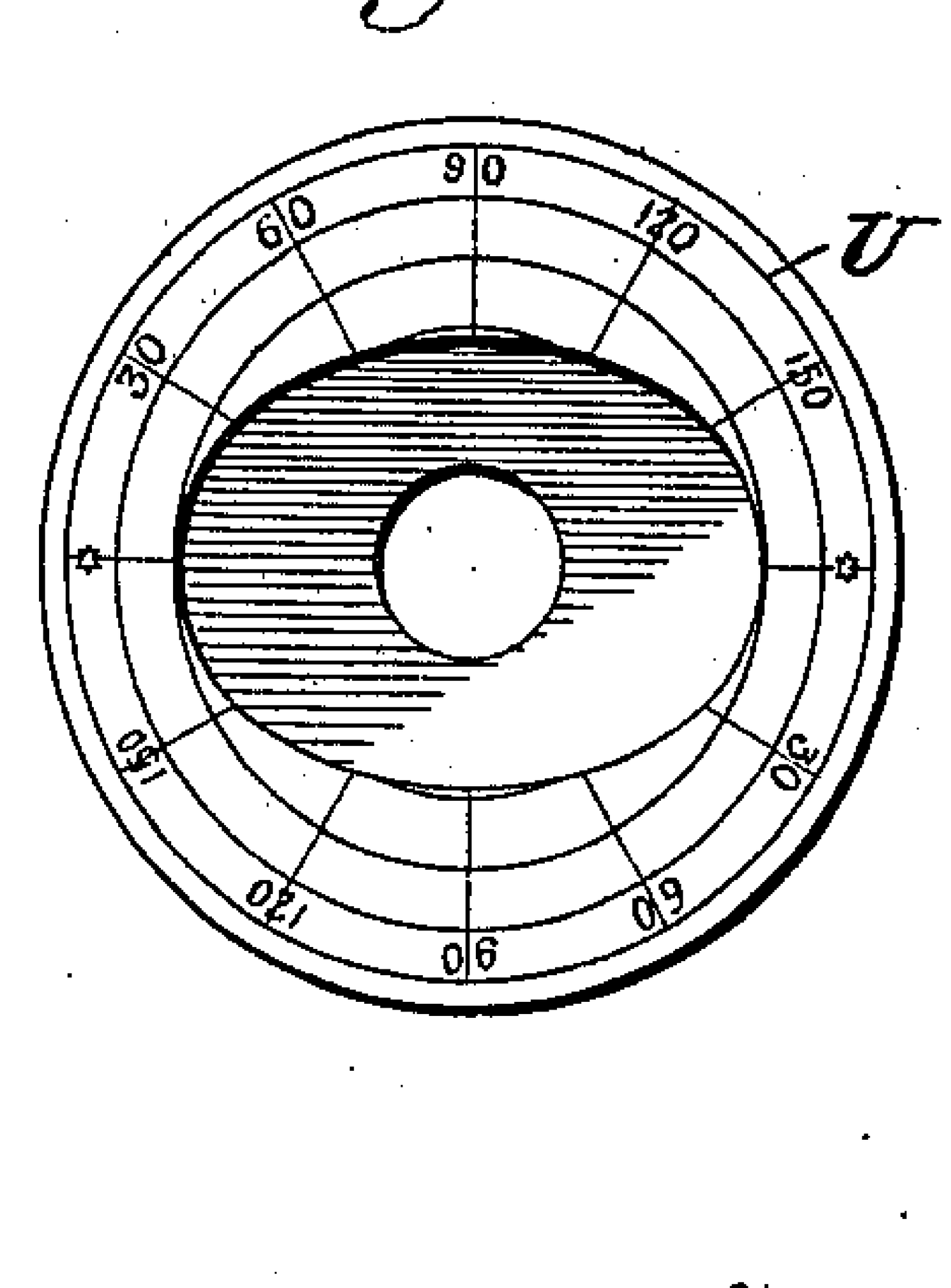
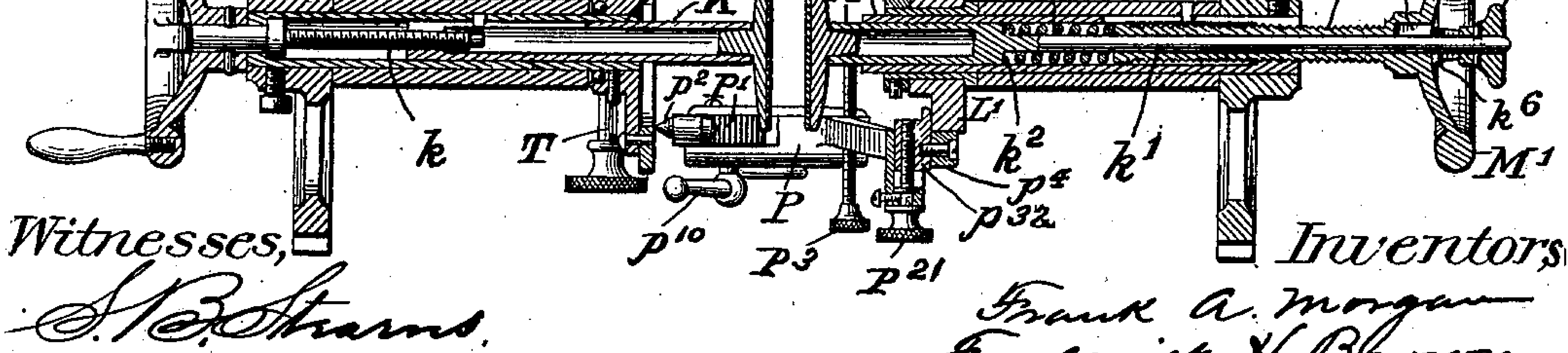


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK A. MORGAN AND FREDRICK H. BROWN, OF LEBANON, NEW HAMPSHIRE.

LENS CUTTING AND EDGING MACHINE.

SPECIFICATION forming part of Letters Patent No. 670,500, dated March 26, 1901.

Application filed July 16, 1900. Serial No. 23,775. (No model.)

To all whom it may concern:

Be it known that we, FRANK A. MORGAN and FREDRICK H. BROWN, citizens of the United States, residing at Lebanon, in the county of Grafton and State of New Hampshire, have invented certain new and useful Improvements in Lens Cutting and Edging Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates especially to improvements in machines for cutting and grinding the edges of a lens, but equally adapted for grinding and polishing a variety of articles having curved or irregular surfaces, one of the principal features of the invention being that the pattern-disk, which guides the cutting-point or diamond when describing its oval course around a lens and which also regulates the curve and the contact of the edge of a lens relative to the stone against which it bears when being ground, is permitted to bear against a contact-plate having a convexed surface corresponding to the circle of the stone or wheel by which the grinding or polishing is accomplished; but the invention also contemplates the grinding of circular or cylindrical surfaces.

To this end and others to which the invention pertains the same consists in the novel construction and adaptation of its parts, having for its object the saving of time and labor, as well as avoiding the danger and liability of mistakes in filling prescriptions for eyeglasses and other lenses, as will be fully set forth in the following specification and claims and clearly illustrated in the drawings accompanying and forming a part of the same, of which—

Figure 1 represents a side elevation of our improved machine, Fig. 2 being a front elevation. Fig. 3 is a sectional elevation taken through the cutting-line 3 of Fig. 2 and looking in the direction of the arrow. Fig. 4 is a sectional plan view of an oscillating frame, taken on cutting-line 4 in Fig. 2, with clamps shown in an open position. Fig. 5 is a detached sectional elevation of our improved device for marking or cutting a lens. Fig. 6 is a detached elevation of our improved scale or graduated disk by which the axis of a lens may be formed at any desired degree or angle relative to its oval form.

Similar letters of reference designate corresponding parts throughout the various views.

A represents the base or frame of the machine, to which is conveniently attached a case B, having a cap or cover *b* for inclosing a suitable grindstone C, which is mounted upon a shaft D, carried in bearings formed for the purpose in the water-receptacle or case B.

The shaft D may be driven by a belt-pulley E, as shown in Fig. 2, and made to transmit motion and power to the shaft carrying the lens-clamps by suitable gears *e e'* and a flexible shaft F, as will be hereinafter explained.

The flexible shaft F is formed of helically-coiled wire, one end of said shaft being provided with a universal joint *f* and adapted for detachable connection by means of a common bayonet-fastening *f'* to a longitudinally-movable shaft e^2, which is splined within the gear *e'*. The opposite end of the flexible shaft is connected to a worm-gear *g*, meshing with a gear G, as shown in Figs. 1, 2, and 3, said gear being mounted upon a shaft *h*, carried in a frame H. (Shown best in Figs. 1 and 3.) Centrally and at a point considerably below the plane of said shaft *h* the frame H is pivotally connected with the base A by means of adjustable cone-points *h'* h^2, as seen in Fig. 3, in order that it may be rocked longitudinally; but this longitudinal motion is not always desirable, and in order to hold said frame in a horizontal position or at rest a threaded stud *a* may be secured to the base A, and passing outward through an elongated opening h^3 in the frame H this stud may be provided with a suitable threaded nut h^4, as seen in Figs. 2 and 3.

The base A is recessed for the reception of the edge of a work bench or table Y, to which said base may be attached by a clamping-screw *a'*, as seen in the drawings.

The longitudinal rocking motion of the frame H is effected by means of a cam H',

which is engaged by a suitable projection a^2, (seen in Fig. 3,) which is formed upon the base A for the purpose.

An upper laterally-rocking frame I is pivotally attached to the shaft h and is provided with a pair of projections i i, which are recessed on their adjacent sides for the reception of the spring-actuated conical bearings of our improved lens-cutting device, which is thus detachably connected to said frame I in a manner rendering it easily removable when not required for use and which device will be hereinafter described.

In order that the lens-clamps may be revolved in unison and yet be capable of adjustment toward and away from each other, hollow shafts J J′ are mounted in the frame I, and within them slide the hollow shafts K K′, to the adjacent ends of which are attached the lens-clamps L L, the shaft K being adjusted longitudinally within its shaft J by means of the screw-rod k, which is threaded therein and carries on its outer end a hand-wheel M, and the shaft K′ has a reduced portion k', forming a shoulder k^2, said reduced portion k' passing outward loosely through a rod k^3, which rod is threaded to the interior of the shaft J′ and is provided at its outer end with a hand-wheel M′, and between the shoulder k^2 and the inner end of said rod k^3 rests a helical spring k^4, and upon the outer end of the reduced portion k' of the shaft K′ is rigidly secured a pull-button k^5, provided with a projection k^6, which normally engages the groove m in the hand-wheel M′; but this projection may be drawn out and disengaged from said groove and so retained by a slight rotative motion when it is desired to quickly separate the lens-clamps, which construction is shown in Fig. 4.

The shafts J J′ of the frame I are provided, respectively, with spur-gears j j', which mesh with and are driven by spur-gears N, mounted on the shaft h, and one of said gears is provided with a handle n, so that the shaft h may be slowly revolved by hand when the cutting point or diamond is describing the oval on a lens, and at such time the worm-gear g must be thrown out of gear with the gear G, which may be accomplished by any convenient means—such, for instance, as a cam operated by a handle O. This lens-cutting device comprises a frame P, carrying at its lower ends a pair of spring-actuated cone-points p p, adapted to fit into and be supported by the projections i i of the frame I, one of the arms P′ of said frame being pivotally attached at p' near one of the spring-actuated cone-points p, as shown in Figs. 2 and 5. The upper end of the pivoted arm P carries the cutting-point or diamond p^2, and the upper end of the stationary arm of the frame P carries an adjustable block or indexed slide-rest p^3 for indicating the size of lens to be cut, which slide-rest may be provided with a roll p^4, adapted to bear upon the pattern-disk L′. The roll p^4 is not an essential feature of the construction; but by its use the friction and wear upon the pattern-disk will be decreased. The arm P′ is acted upon by a spring-actuated stud p^5, fitting a horizontal perforation p^6, formed in the frame P, the outer portion of said perforation being threaded for the reception of an adjusting-screw p^7, the helical spring p^8 being disposed within the perforation and operating expansively between said stud and adjusting-screw, the adjacent ends of each of which are preferably recessed, as shown in Fig. 5, for the reception of a portion of the spring. This construction of the cutting device gives to the arm P′ a yielding pressure outward or toward a lens, which pressure can readily be varied, so as to increase or decrease the tension, by means of the adjusting-screw p^7, and by means of a suitable cam p^9, bearing against the outer side of the spring-actuated arm P′ and operated by a knob or handle p^{10}, said arm P′ may be quickly thrown out of engagement with a lens without wasting time to adjust the screw p^7. For cutting circular work a set-screw P^3 may be adjusted so as to bear against the frame I, thus preventing lateral motion of the cutting device by removing it from contact with the pattern-disk L′.

The curved contact-plate Q is a very important feature of our invention, as the curve of its convex face is the same as that of the grindstone upon which the edge of a lens is ground, and hence insures the desired result—viz., to shape the oval of a lens in perfect accord with the pattern. This contact-plate should be capable of horizontal adjustment toward and away from the pattern-disk, but the means employed for the purpose may vary. In the drawings we show a vertical post R, through which passes, near its upper end, the horizontal stem q of said contact-plate Q, and in the top of said post is threaded a stud which may be turned down, by means of a handle r, tightly upon said stem q. A horizontal rod r', rigidly attached to said post R, passes through a portion of the frame H and may be adjusted by a suitable thumb-screw r^2, while the rod r^3 is secured in said frame H and passes loosely through a perforation in said post, serving as a guide for maintaining the same in a vertical position and in alinement with said pattern-disk L′. The frame I is normally pressed toward the grindstone to hold the pattern against contact-plate Q by mechanism which includes a threaded stud S, rigidly secured in the upper portion of the frame H and passing horizontally outward and loosely through a perforation in the frame I, the outer end of this stud S being provided with a helical spring s and with a threaded nut s', said spring acting expansively between the said nut and frame and being sufficiently stiff to keep the contact-plate Q in contact with the pattern-disk L′, and by turning the nut s' the tension of the spring may be varied as desired according to the thickness of a lens being ground.

A set-screw T is threaded to the frame I and adapted to bear against the frame H for the purpose of stopping the lateral motion of said frame I.

U is a dial which is graduated to degrees, and by being secured to the shaft J at a point convenient to the lens-clamps a lens may be placed and clamped for cutting the same to any desired axis.

As is well known, all cylinder-lenses have an axis—*i. e.*, in one meridian there is no refractive power—and in prescribing glasses this axis may be necessary at any degree on a circle.

The dial U, herein shown, which forms an index, is used in accurately placing a lens in the holding-clamps.

To cut a lens, draw back lens-clamp L nearly flush with face of index U, place lens thereon, axis of lens corresponding with degree on index U to which the lens is to be cut, hold in position, and move up right-hand clamp L to grip the lens. The lens-cutting attachment being in position, release lever holding diamond, which is done by throwing lever P^{10} to left, then press roller p^4 against pattern L, then rotate operating-shaft by means of crank N until oval has been described by diamond on lens, then remove lens-crimp off edge of lens, then run lens-clamp to center of stone, and place lens in clamp corresponding to the axis at which it was cut. The clamps are always in alinement corresponding to oval pattern on the operating-shaft, the index U always rotating in unison with the oval pattern. The upper end of arm P carries a guideway in which a block p^{32} is guided. This block carries roller p^4 and is adjusted through screw P^{21} to regulate the size of oval described by the diamond irrespective of the size of the pattern. Screw P^3 may be operated to throw roll p^4 away from oval pattern, thus holding diamond in position so that a round lens will be cut or ground. The lens is kept in contact with wheel (grinding-stone) by tension-spring *s*.

To grind edge of lens, throw machine into gear by operating cam-lever O, which throws worm *g* into gear G, which is the driving-gear of machine. The oval pattern rotating against curved contact-plate Q causes frame I to swing toward and from the stone, reproducing an oval lens corresponding to the oval pattern. The cam H′ in lower shaft *h* gives the frame an oscillating lateral motion across the face of stone to prevent grooves being worn in the face of the stone.

Having described our invention, what we claim is—

1. In a lens cutting and edging machine, a pair of pivotally and gear connected frames carrying the lens-clamps and driving-shaft, and means for imparting a longitudinally-rocking motion to the frames, substantially for the purpose set forth.

2. In a lens cutting and edging machine, a pair of pivotally-connected frames disposed one above the other, a pair of shafts mounted in the upper frame, lens-clamps and a pattern-disk mounted thereon, a driving-shaft mounted in the lower frame, gears connecting said driving-shaft with the shafts in the upper frame, and means for imparting a longitudinal rocking motion to said pivoted frames.

3. In a lens cutting and edging machine provided with a power-driven grinding-wheel, a pair of pivotally-connected frames disposed one above the other, a pair of shafts mounted in the upper frame, lens-clamps and a pattern-disk mounted upon said shafts, a driving-shaft mounted in the lower frame, gears connecting said driving-shaft with the shafts of the upper frame and with the shaft of said grinding-wheel, and means for imparting a longitudinal rocking motion to said pivoted frames.

4. In a lens cutting and edging machine provided with a power-driven grinding-wheel, a pair of pivotally-connected frames disposed one above the other, a pair of shafts mounted in the upper frame, lens-clamps and a pattern-disk mounted upon said shafts, means for adjusting said lens-clamps, a driving-shaft mounted in the lower frame, gears connecting said driving-shaft with the shafts of the upper frame and with the shaft of said grinding-wheel, and means for imparting a longitudinal rocking motion to said pivotally-connected frames.

5. In a lens cutting and edging machine, a pair of pivotally and gear connected frames disposed one above the other, a pair of hollow shafts mounted in the upper frame, a driving-shaft mounted in the lower frame, gears connecting said driving-shaft with said hollow shafts, a longitudinally-adjustable shaft mounted in each hollow shaft, detachable lens-clamps upon the adjacent ends of the longitudinally-movable shafts, and means for imparting a longitudinal rocking motion to said pivotally-connected frames.

6. In a lens cutting and edging machine, a pair of pivotally-connected frames disposed one above the other, a pair of hollow shafts mounted in the upper frame, a driving-shaft mounted in the lower frame, gears connecting said driving-shaft with said hollow shafts, a longitudinally-movable shaft mounted in each hollow shaft, lens-clamps detachably mounted upon the adjacent ends of the longitudinally-movable shafts, and a cam on said driving-shaft for imparting a longitudinal rocking motion to said pivotally-connected frames.

7. In a lens cutting and edging machine, a pair of pivotally-connected frames disposed one above the other, a pair of hollow shafts mounted in the upper frame, a driving-shaft mounted in the lower frame upon which shaft the upper frame is mounted, gears connecting said driving-shaft with said hollow shafts, a longitudinally-movable shaft mounted in each hollow shaft, lens-clamps detachably connected to the adjacent ends of the longitudinally-movable shafts, and a cam on said

driving-shaft capable of imparting a longitudinal rocking motion to said pivotally-connected frames.

8. In a lens cutting and edging machine, a pair of frames disposed one above the other, the lower frame carrying a driving-shaft, the said driving-shaft to which the upper frame is pivoted and adapted to rock laterally and provided with gears, a pair of hollow shafts mounted in the upper frame, a pattern-disk and gears mounted upon said hollow shafts, a longitudinally-movable shaft mounted in each hollow shaft, lens-clamps detachably connected to the adjacent ends of said longitudinally-movable shafts, and a cam upon said driving-shaft capable of imparting a longitudinal rocking motion to said frames.

9. In a machine of the character described, a laterally-movable frame provided with a pair of hollow power-driven shafts, the hollow shafts, a pattern-disk mounted upon one and a longitudinally-movable shaft mounted in each of the latter, suitable lens-clamps detachably connected to the adjacent ends of said longitudinally-movable shafts, a contact-plate for the pattern-plate having a convexed surface, and means for preventing the lateral motion of said frame and holding the pattern-disk and said convexed plate from contact, substantially for the purpose set forth.

10. In a lens cutting and edging machine, a frame pivotally attached thereto carrying a driving-shaft and adapted to rock longitudinally, the said driving-shaft, a frame pivotally mounted upon said driving-shaft and adapted to rock laterally toward and away from the grinding-stone of said machine, means for preventing the lateral motion of said last-named frame in which are mounted power-driven shafts carrying lens-clamps and a pattern-disk, the said shafts, lens-clamps and pattern-disk, and means for rocking said frame longitudinally across the face of said grinding-stone.

11. In a lens cutting and edging machine, a suitable base supporting a shaft carrying a power-driven grinding-wheel, a frame disposed crosswise of and near the face of said wheel and pivotally attached to said base by a single pivot connection adapted to rock longitudinally, suitable means for rocking the same, a shaft mounted in said longitudinally-rocking frame, a frame carrying power-driven adjustable lens-clamps and a pattern-disk, said frame being mounted upon said shaft and adapted to rock laterally toward and away from the grinding-wheel, suitable gearing and a flexible shaft connecting the shaft of the lower pivoted frame with the shaft of the grinding-wheel, a curved contact-plate against which the pattern-disk bears, and means for maintaining contact of said disk with said curved plate.

12. In a lens-cutting machine, in combination a frame, a lens-clamp, a pattern-disk and a frame comprising two arms having an intermediate adjustable connection between them, one of said arms carrying a cutter or diamond in the end thereof and the end of the other arm being adapted for contact with the pattern-disk, substantially as described.

13. In a lens cutting and edging machine, a frame carrying adjustable lens-clamps and a pattern-disk, a lens-cutting device comprising a pivotally-connected frame provided with a pair of arms one being spring-actuated and carrying a cutting-point or diamond and the other being stationary and provided with an adjustable block adapted for contact with said pattern-disk, and the said cutting-point and adjustable contact-block.

14. In a lens cutting and edging machine, a frame carrying adjustable lens-clamps and a pattern-disk, a lens-cutting device comprising a pivotally-connected frame provided with a pair of arms one being spring-actuated and carrying a cutting-point or diamond and the other being stationary and provided with an adjustable block adapted for contact with said pattern-disk, the said cutting-point and adjustable contact-block, and means for adjusting said lens-cutting device whereby circular as well as oval lenses may be cut.

15. In a lens cutting and edging machine, a pair of shafts disposed in alinement, a pair of lens-clamps and a pattern-disk mounted thereon, a lens-cutting device comprising a pivoted frame provided with a pair of arms, a cutting-point mounted in one of said arms and the other being adapted for contact with said pattern-disk, and a disk mounted upon one of the shafts which carries a lens-clamp, said disk being graduated to degrees whereby the lens may be readily placed and clamped for cutting the same to the desired axis.

16. In a lens cutting and edging machine, a pair of shafts disposed in alinement, a pair of lens-clamps and a pattern-disk mounted thereon, a lens-cutting device comprising a pivoted frame provided with a pivoted arm carrying a cutting-point or diamond and a stationary arm carrying a friction-roll adapted for contact with said pattern-disk, and a disk mounted upon one of the shafts which carries a lens-clamp, said disk being graduated to degrees whereby a lens may be readily placed and clamped for cutting the same to the desired axis.

17. In a lens cutting and edging machine, a pair of shafts disposed in alinement, a pair of lens-clamps and a pattern-disk mounted thereon, a lens-cutting device comprising a pivoted frame provided with a pivoted arm carrying a cutting-point or diamond and a stationary arm carrying an indexed slide-rest for indicating the size of lens to be cut, a friction-roll upon said slide-rest for contact with said pattern-disk, and a disk mounted upon one of the shafts which carries a lens-clamp, said disk being graduated to degrees whereby a lens may be readily placed and clamped for cutting the same to the desired axis.

18. In a lens cutting and edging machine, a frame carrying revolving lens-clamps and

a pattern-disk and adapted for both a lateral and longitudinal rocking motion, a convexed contact-plate upon which the pattern-disk bears, and a suitable spring for holding said pattern-disk and convexed plate normally in contact.

19. In a lens cutting and edging machine, a frame carrying revolving lens-clamps and a pattern-disk and adapted for both a lateral and longitudinal rocking motion, a convexed contact-plate upon which the pattern-disk bears, said contact-plate being adjustable toward and away from the latter, and a suitable spring for holding said pattern-disk and convexed plate normally in contact.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK A. MORGAN.
FREDRICK H. BROWN.

Witnesses:
J. B. THURSTON,
EMILE H. TARDIVEL.