No. 798,446. PATENTED AUG. 29, 1905.

J. L. PERKINS.

ELLIPSOGRAPH.

APPLICATION FILED JAN. 7, 1904.

4 SHEETS—SHEET 1.

Fig. 1.

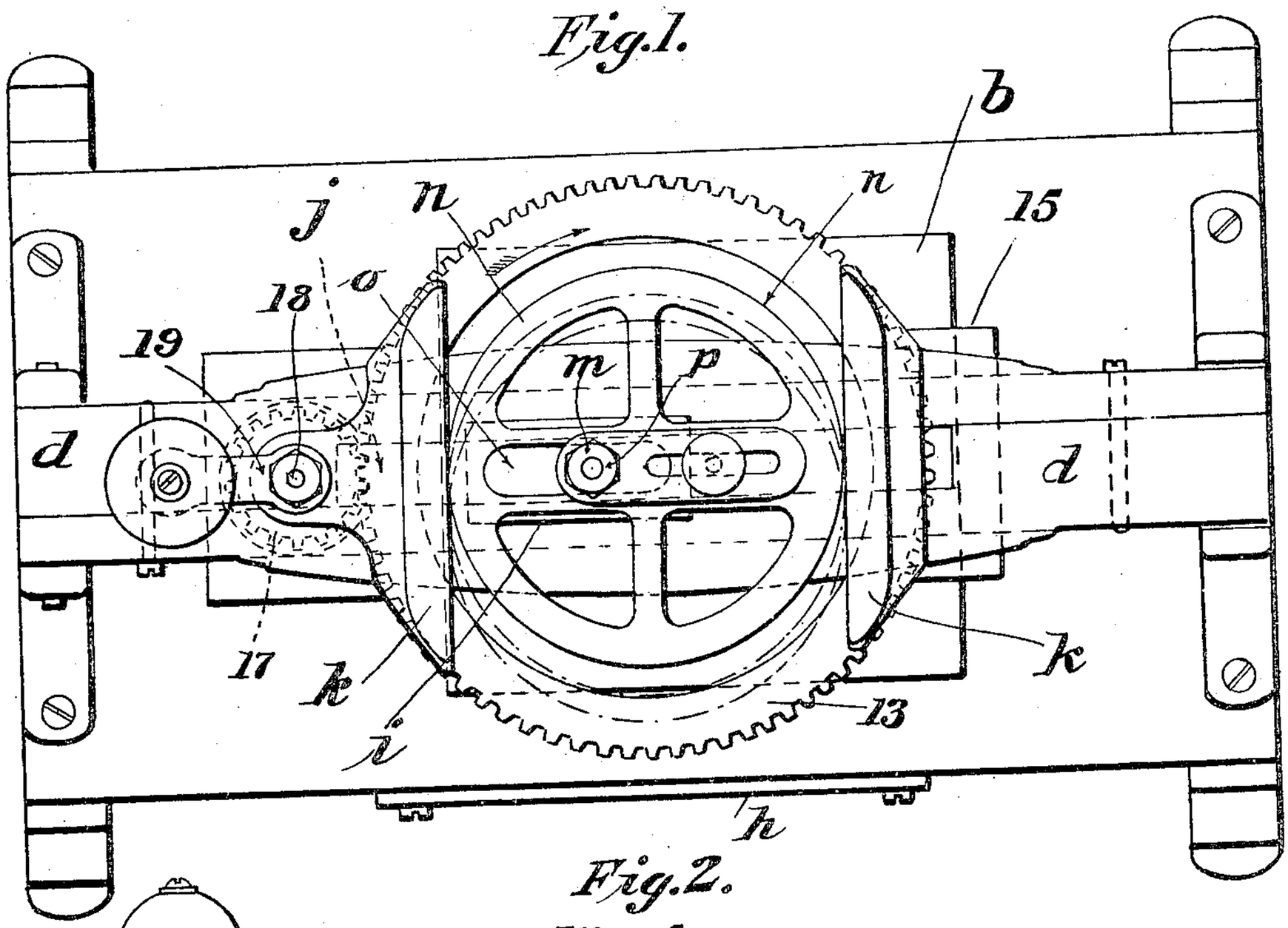

Fig. 2.

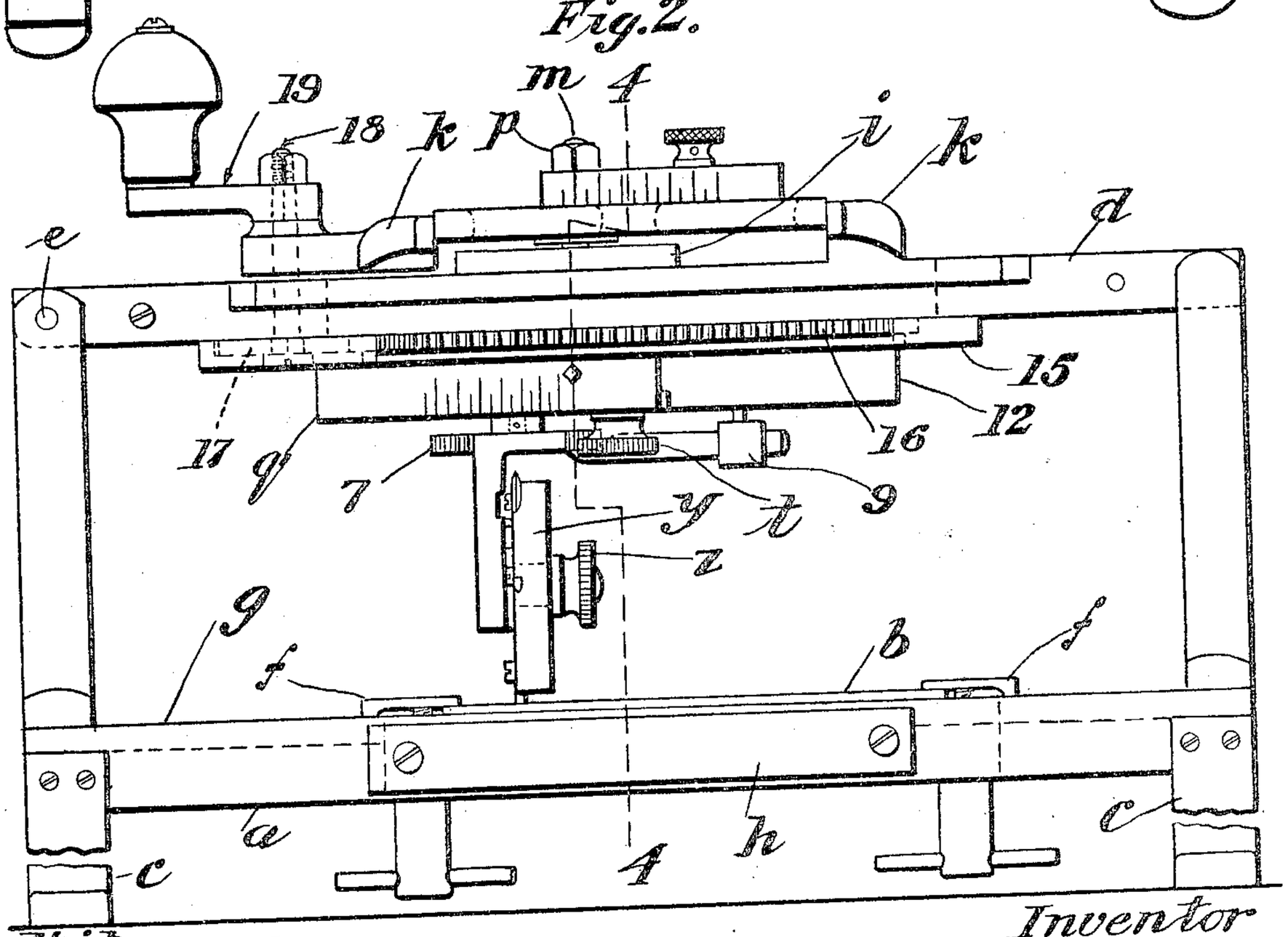

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Fig. 3.

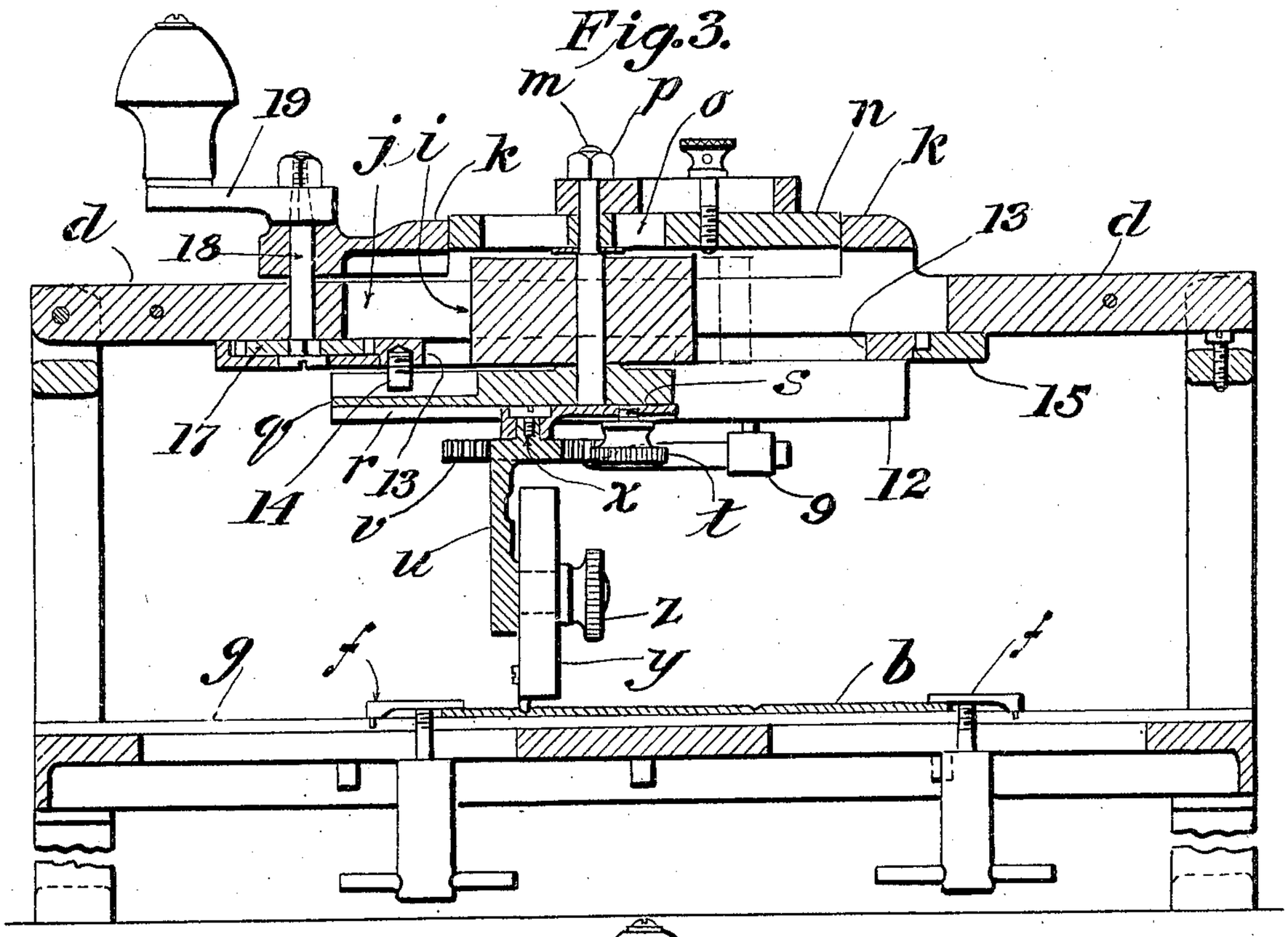


Fig. 4

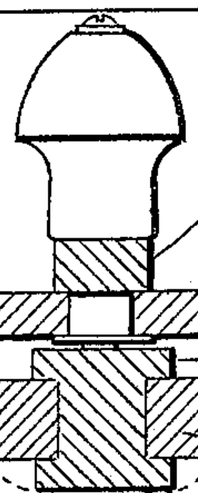


Fig. 8.

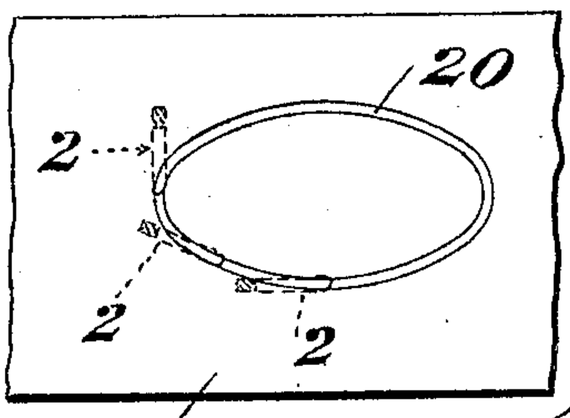
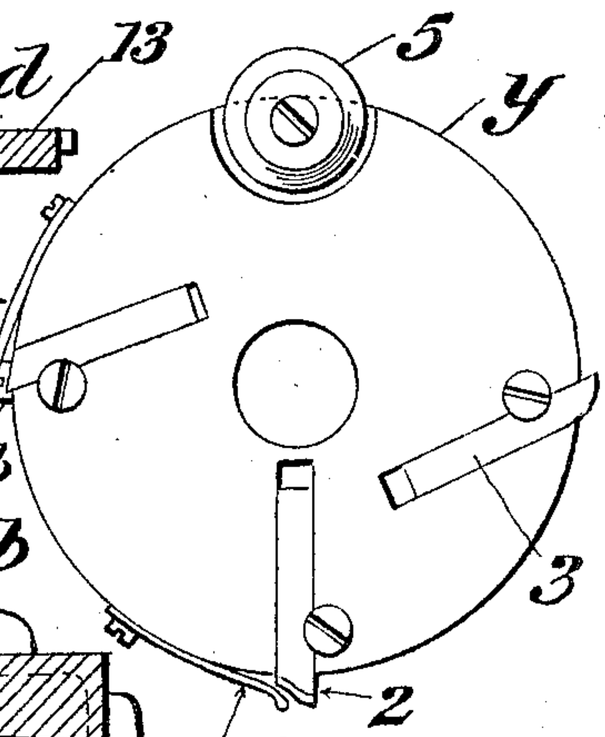


Fig. 9.



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4 SHEETS—SHEET 3.

Fig. 5.

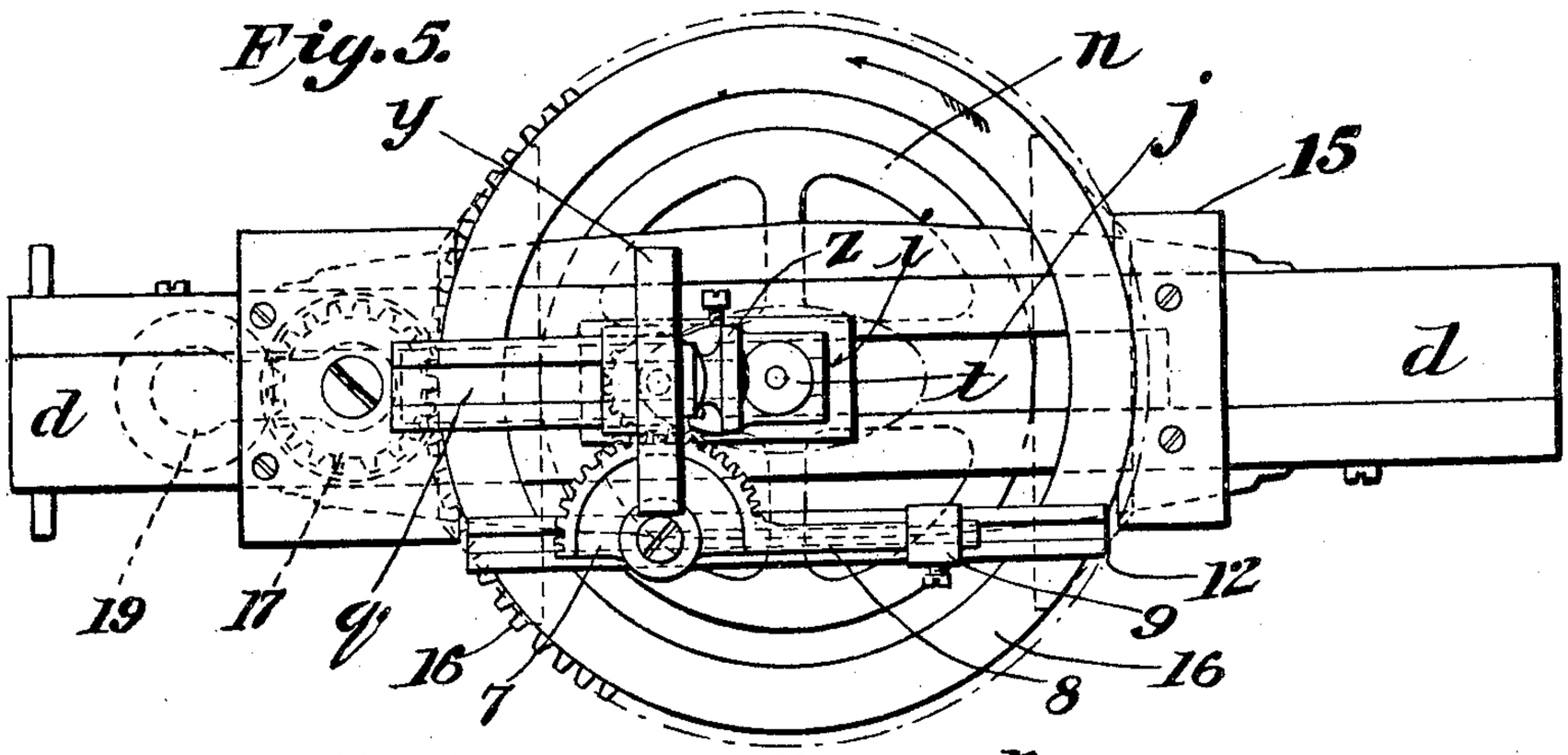


Fig. 6.

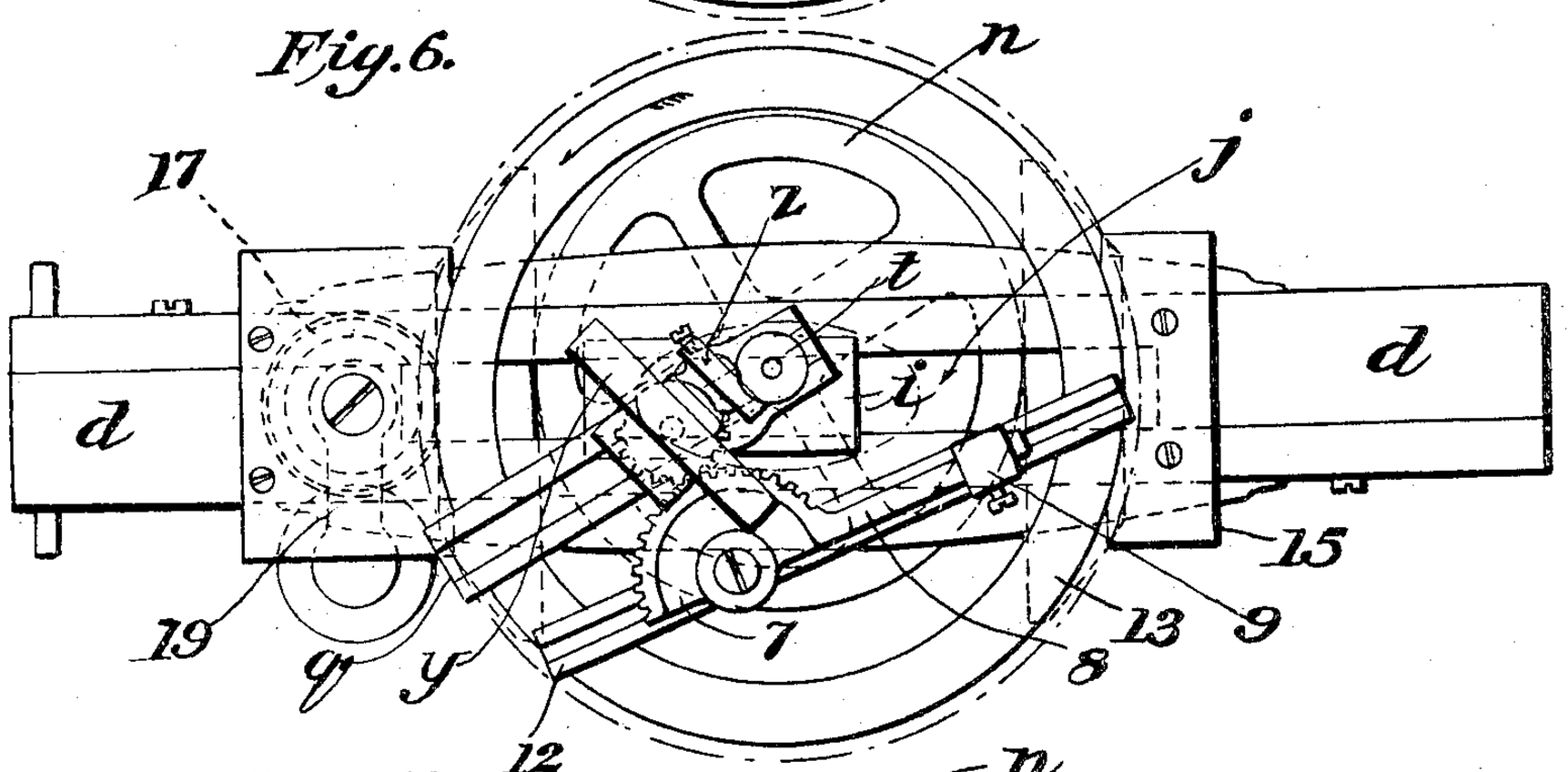
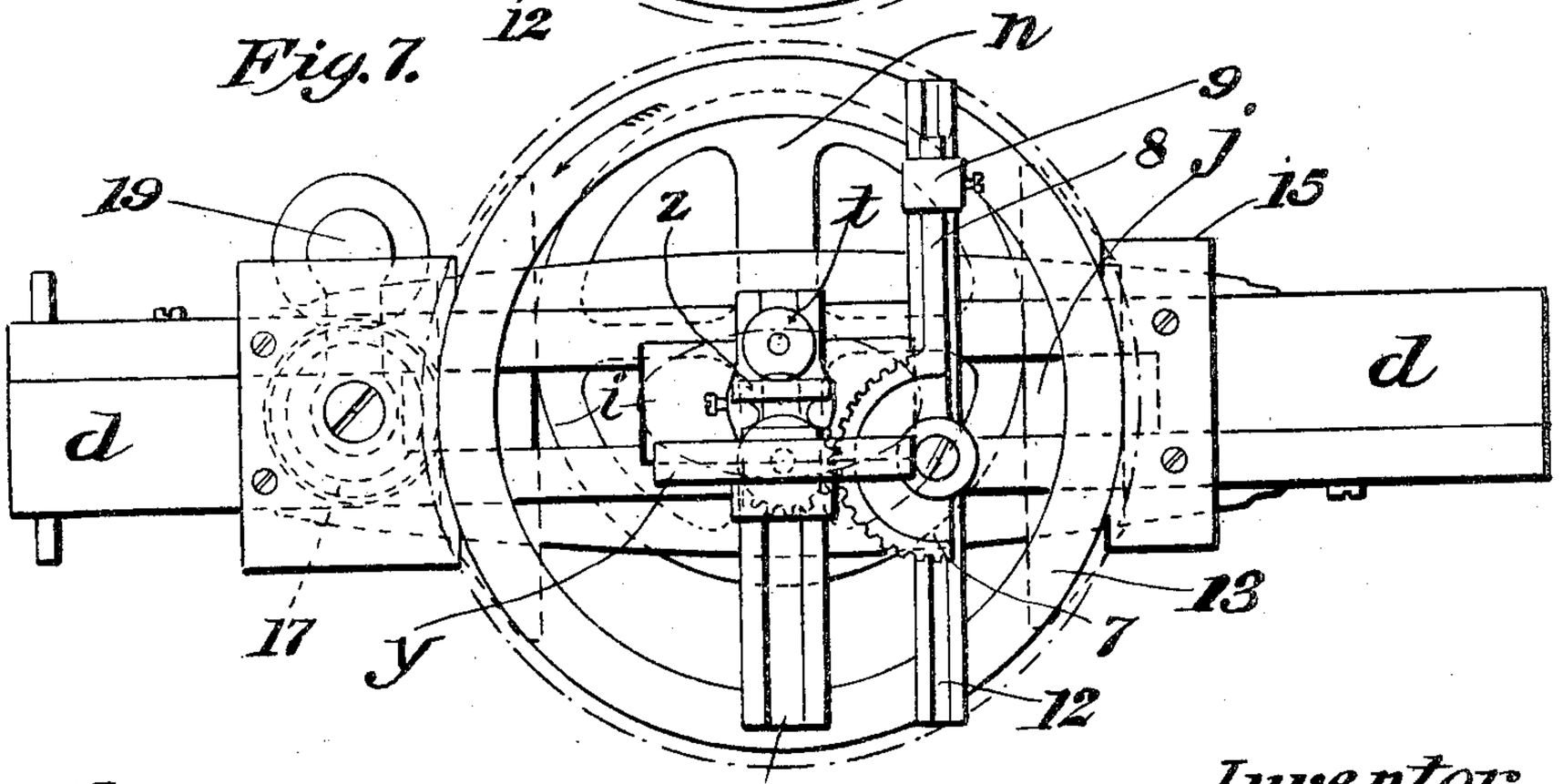


Fig. 7.



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4 SHEETS—SHEET 4.

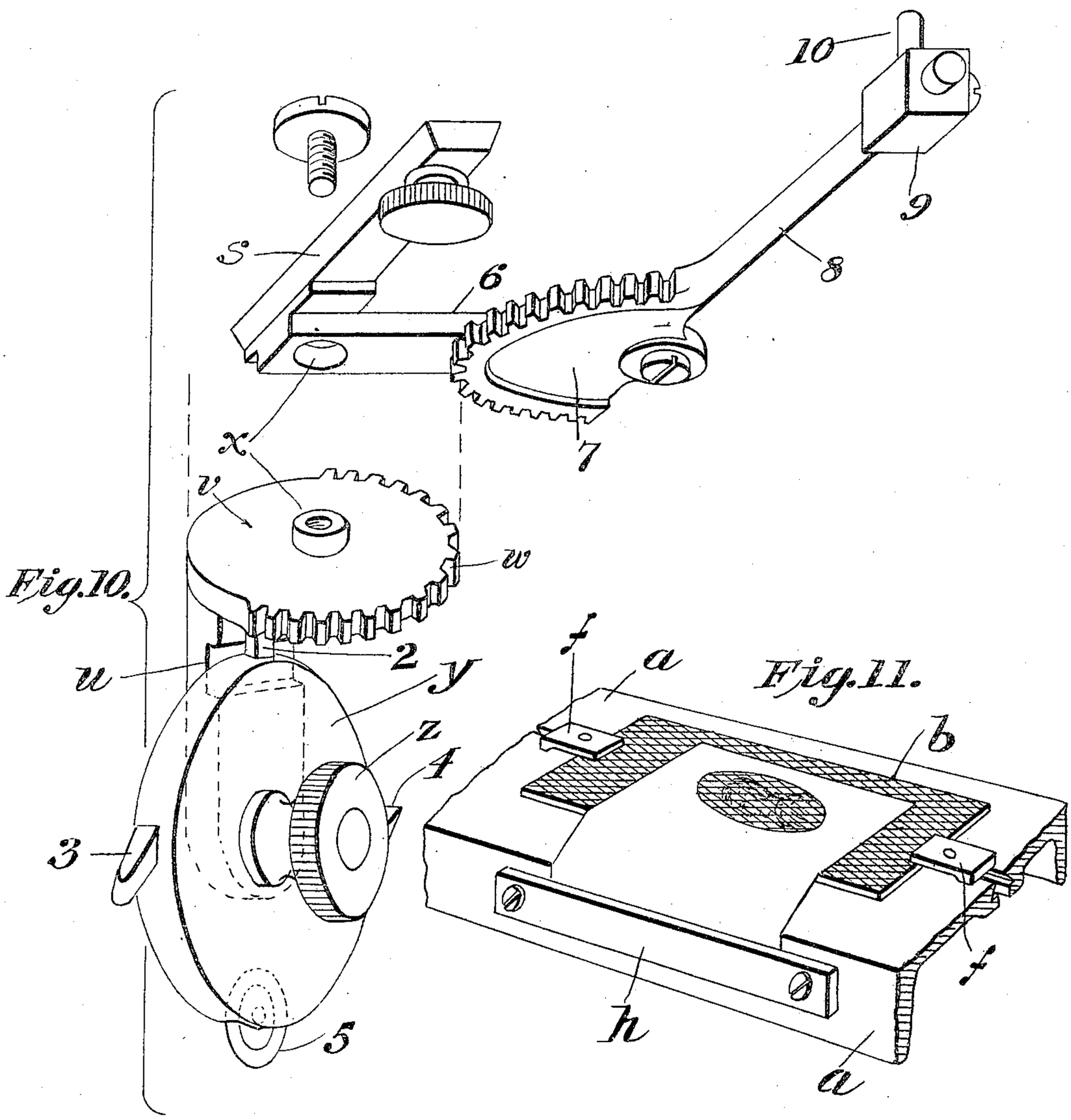

Fig. 10.

Fig. 11.

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UNITED STATES PATENT OFFICE.

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ELLIPSOGRAPH.

No. 798,446. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed January 7, 1904. Serial No. 188,024.

To all whom it may concern:

Be it known that I, JULIAN L. PERKINS, a citizen of the United States of America, residing at West Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Ellipsographs, of which the following is a specification.

This invention relates to ellipsographs; and the object thereof is to provide a machine of this description adapted to describe an ellipse on a metal printing-plate and cut a channel therein whereby one or more burs may be thrown up which may be by a subsequent operation of the machine cut down to the level of the printing-surface of the plate, and thus in the printing operation print an elliptical border in one or more lines about the figure or other matter on the plate.

A further object of the invention is to provide means for maintaining the cutting-tool always in a position tangential to the particular portion of the curve described by the cutting edge of the tool to the end that a channel of uniform width may be formed throughout.

A still further object of the invention is to provide certain improvements in the construction of the machine incidental to the adaptation to machines of this class of the novel features referred to, all of which will be fully described in the following specification and claims and are fully illustrated in the drawings accompanying the same, in which—

Figure 1 is a plan view of the machine. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is a central longitudinal section of Fig. 1. Fig. 4 is a cross-section on line 4 4, Fig. 2. Figs. 5, 6, and 7 are plan views of the under side of the principal operative parts of the machine, showing three successive positions the parts occupy during the operation of the machine. Fig. 8 shows the relative position of a tool to the ellipse it describes. Fig. 9 is an enlarged side elevation of a rotatable tool plate or turret. Fig. 10 is a perspective view of certain parts of the tool-turret-operating mechanism in separated relation. Fig. 11 is a perspective view of the bed of the machine, showing means for centering the part of a printing-plate to be located within the curved outline to be drawn around it.

Referring to the drawings, the frame of the machine consists of a bed-plate *a*, on which the printing-plate *b* may be clamped to be operated upon, this bed being supported on suitable legs *c* in a horizontal position, and above the bed is a bar *d*, parallel with the bed and arranged to carry the operative parts of the mechanism. Preferably this bar *d* is hinged, as at *e*, in one of its supports, whereby it may be swung upward to give access to the mechanism which is in large part supported beneath it, but more particularly to give access to the bed for clamping the plates thereon. The plates may be clamped to the bed in any suitable manner—as, for example, by means of the clamping-plate *f*, sliding in a dovetailed groove *g* in the bed and engaged by screws extending through slots opening into the under side of the groove *g*. (All shown in Fig. 3.) On one side of the bed is a clamping-plate, *h* as in Figs. 1 and 2, under which one edge of a strip of paper may be clamped, as in Fig. 11, in which an ellipse may be cut to test the adjustment of the machine, and this elliptical opening in the paper serves as means for properly locating on the bed that portion of the plate which is to be surrounded by the curved border-line when adjusting the plate preparatory to cutting said line therein.

The fundamental principles of the construction of the parts of the machine shown and described herein, whereby the outline of the elliptical figure may be traced by means of a stylus or pencil in place of a cutter, is recognized as old and well known. This mechanism as adapted to the ends in view in constructing the machine forming the subject of this application is constructed as follows:

In the bar *d* is a sliding head *i*, movable lengthwise of the bar in a slot *j*. Located transversely of this bar and above the surface thereof are two ribs *k*, whose inner edges are perpendicular. A post *m* is located centrally of the sliding head *i* and is rotatable therein, and on the upper end of this post is mounted a guide-wheel *n*, the post extending through a slot *o*, located diametrically of the guide-wheel, a nut *p* on the upper end of said post serving to secure the guide-wheel to the post in any position of eccentricity thereof relative to the post permitted by the length of the slot *o*. The lower end of the post *m* projects below the head *i*, and there is fixed thereon an arm *q*, in the under side of which is a longitudinally-disposed slot *r*, having undercut edges, in which there is mounted a slide *s*, which is adjustable therein in any desired position relative to the axis of the arm *q*, said slide being secured by means of a thumb-screw *t* or other suitable means. Depending

from this slide *s* is a tool-carrying arm *u*, the slide and the arm being shown in perspective in separated relations in Fig. 10. At the upper end of the arm *u* is a disk *v*, to which the arm is connected near the edge thereof, or the disk may be integral with the arm, the position of the disk being at right angles thereto. On the border of this disk gear-teeth *w* are cut, and the disk and its arm are rotatably mounted at *x*, near one end of the slide *s*.

Near the lower end of the tool-carrying arm *u* a tool-carrying turret *y* is rotatably mounted, means being provided (as the nut *z*, for example) whereby this turret may be secured immovably to the arm in any adjusted position to bring any one of the tools 2, 3, 4, or 5 into operative position relative to the surface of the plate *b*. This turret is shown in Figs. 9 and 10, more or less enlarged.

On the slide *s* there is rigidly fixed an arm 6, (or it may be integral therewith,) which extends rectangularly therefrom in such position as will permit the segmental gear 7 to be mounted thereon in meshing position with the gear-teeth *w*, and on this segmental gear or forming a part thereof is an arm 8, which is located substantially at right angles to a line drawn through the axis of said segment and the axis of the turret-carrying arm *u*. The end of the arm 8 extends loosely through a block 9, in which there is a pin 10, which enters a slot in a bar 12, which is secured to the ring 13 at such distance from the arm *q* as to provide for the proper engagement of the segmental gear 7 and the teeth of the gear *v*. The end of the arm *q* overlies the border of the ring 13, and a pin 14 in the latter enters a longitudinal slot in the contiguous side of the arm, the ring being mounted on the under side of the bar *d* in circular flanged pieces 15, with which the border of the ring engages to the end that said ring may rotate always on the same vertical axis. The edge of the ring 13, as shown in the various figures of the drawings, is provided with gear-teeth 16, and a pinion 17, mounted on the under side of the bar *d*, meshes with the teeth in said ring, the pinion being rotated by means of the vertical shaft 18, the upper end of which is secured to the crank-arm 19, located above the bar *d*.

Referring now to Figs. 5, 6, and 7 of the drawings, the manner of operation of the machine will be readily apparent. When the parts are in the position shown in Fig. 5, that one of the tools in the turret-head which is in operative position relative to the plate will then be in contact with the latter at one end of the long axis of the ellipse. Fig. 6 shows the position of the parts at one-eighth of one revolution of the ring 13, and Fig. 7 shows the position at one-quarter of the revolution, and obviously these same positions will be duplicated for each quarter-revolution. The rotation of the ring 13 transmits like movement to the arm *q* about its axis, which is the vertical shaft or post *m*, said movement being communicated to the arm by means of the pin 14 in the ring 13 operating in the slot in the side of the arm, as shown in Fig. 3 and heretofore described. This shaft or post *m* is carried in the sliding head *i*, and the guide-wheel being mounted on the upper end of the shaft and controlled in its movements by engagement with the ribs or abutments *k* it is clear that according to the well-known principles in machines of this class the cutting-tool will be guided in an elliptical path whose axes are determined by the distance of the cutter from the center of rotation of the ring 13 and by the extent of the simultaneous movement of the sliding head *i* while the cutter is describing half of a revolution.

An entirely novel feature in machines of this class consists in adapting it to use a cutting-tool whereby an elliptical groove may be cut in the surface of metal as compared with machines adapted only to trace an ellipse by means of a pointed instrument. In cutting a groove in the metal plate the tool must be inclined relative to the direction of its movement to do good work, and this position of the tool in turn necessitates means for changing the position of the tool whereby a line drawn longitudinally therethrough will always be tangent to the elliptical path of the tool-point. Otherwise the groove cut in the plate would not be of the same width at all points. Therefore provision is made herein to effect this constant change of position of the tool, which is illustrated diagrammatically in Fig. 8, in which it may be assumed that the tool shown in dotted lines therein is, for example, the tool 2, and the first position thereof at the left is in the position the tool would occupy relative to its path 20 when the parts are in the position shown in Fig. 5, the other two positions thereof being, respectively, those the tool would occupy when the parts are in the positions shown, respectively, in Figs. 6 and 7. This, covering as it does a quarter-revolution, illustrates clearly the progressive and accurate adjustment of the tool to a position tangential at all points to its elliptical path, and this change is effected by mounting the tool-carrying arm *u* on a vertical axis, as *x*, which axis is in the plane of the point of contact of the tool with the plate, and in providing means, as the gear-teeth cut on the disk *v*, to rotate this arm *u* on its axis by the provision of the stationary circular rack or segmental gear 7, whose position relative to the disk *v* never changes. As the cutting-tool approaches either end of the long axis of the ellipse the sliding head *i* is of course nearing the end of its movement in one direction, and when it reaches the end of that movement the position of the parts will be as in Fig. 5 and the axis of the guide-rings (whereby movement is imparted to said block) and the axis of the ring 13 will reach a position of coincidence,

at which position the arm q and the bar 12 will be substantially parallel. Then as the movement of the ring 13 is continued the arm q will gain slightly on the bar 12 in its movement, owing to the accelerated speed of the head i after its direction of movement is reversed, the two assuming the position shown in Fig. 6, from which position these arms will again assume a position of parallelism at the quarters, as shown in Fig. 7. This gain of the arm q on the bar 12 produces such change of relation of the disk v and the stationary segmental gear 7 as to impart to said disk (the gear being fixed) a slight rotatory movement on the axis x, which movement is so proportioned as to rotate the turret-carrying arm u enough to maintain the tangential position of the tool relative to its path of movement. If now the movement be continued from that shown in Fig. 7 to that point of the revolution of the ring 13 diametrically opposite to that shown in Fig. 5, it will be seen that the arm q will lose instead of gain relative to the bar 12 on account of the change of the speed of movement of the sliding head i, which from zero at the position in Fig. 5 attains its maximum at the position shown in Fig. 7 and from this position to the position of opposition to Fig. 5 again recedes to zero. Thus means are provided whereby whatever may be the radius of the curve on which the tool is moving it will in all cases and at all times, irrespective of any change in proportion of the relative long and short axes of the ellipse, maintain a true tangential position relative to the path of its movement.

The adaptation of a turret construction such as is shown and described herein or having the functions of such a turret greatly facilitates the work of inclosing cuts or printed matter in a suitable elliptical border made up of one or more lines, the tools being mounted in the turret in the order in which they are required to do the work—as, for example, the tool first employed will rout out the groove, a second tool may dress the outer edges of the bur raised by the tool on either edge thereof, and a third tool may cut the upper edge of the bur down to the level of the printed surface of the plate.

On the turret y are two springs 4^a, secured by one end to the periphery of the turret, their free ends being near the cutting-tools 2 and 4, which ends may be adjusted toward and from the plate by a screw 4^b and serve as a bearing-point for the mechanism on the bar d.

The tools may be so fashioned as to cut more than one groove, this operation being rendered all the more easy because of the tangential relation of the tool to its path, or a tool may be employed following the first tool to cut down one of the two lines of metal raised on the edges of the furrow, the third tool operating to reduce the remaining line to the level of the printed surface. These uses are cited merely as illustrative of the utility of the device.

To adjust the machine, this may be done roughly by any kind of a gage which will show the degree of eccentricity of the vertical shaft or post m relative to the guide-wheel n and the degree of eccentricity of the axis x of the turret-carrying arm relative to said shaft. A piece of thick paper may then be secured by one edge under the clamping-plate h on one side of the bed and laid over a plate on the bed and the turret rotated to bring the cutting-wheel 5 in operative position relative to the bed, and an ellipse may be cut out of the paper and the printing-plate then be laid under the elliptical opening so cut, whereby it may be determined at a glance whether said opening should be changed in its proportions to accommodate the subject-matter which it is desired to inclose. Furthermore, by means of the opening the plate to be cut may be adjusted to its proper position on the bed-plate before securing it thereto, whereby the exact position of the inclosed subject-matter relative to the border may be determined.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a machine of the class described, a tool-carrying arm rotatably mounted on the machine, a plurality of tools mounted on the arm and arranged to be brought one at a time into operative position, the axis of said arm being vertical to the surface operated on by the tool and passing through the point of contact of the latter with the work.

2. In an ellipsograph, a work-holding bed, a tool-carrying arm, and means to move said arm in a curved path over the bed, said arm being rotatable on an axis extending at right angles to the bed, a tool on said arm, and means to maintain said tool in a position tangential to said path during the movement of the tool thereover, and a ring rotatable in a fixed plane with which said tool-carrying arm has a sliding engagement.

3. In a machine of the class described, a tool-carrying arm, and means to move the latter in a curved path, a tool on the arm inclined relative to the direction of its movement, a ring rotatable in a fixed plane with which said tool-carrying arm has a sliding engagement, and means to shift the position of the tool during its movement to maintain it in tangential relation to the curved path through which it moves.

4. In an ellipsograph, a ring rotatable on a fixed axis, a head slidable diametrically thereof, an arm pivotally mounted on the head, the free end of the arm having a sliding engagement with the ring, and means to move said head reciprocally during the rotation of the ring; a cutting-tool loosely and eccentrically

supported on said arm to rotate on an axis vertical to the plane of rotation of the arm, a rack supported in fixed relation to the axis of said arm, a gear on the cutting-tool meshing with the rack, and means to rotate the ring.

5. In an ellipsograph, a ring, a support therefor on which the ring is rotatably supported at its periphery; a head slidable diametrically of the ring in a slot in said support; a shaft vertically disposed relative to the plane of the ring and passing through said head, a disk secured to one end of the shaft and adjustable radially thereon, abutments on said support extending transversely of the path of movement of said head, and between which said disk is confined in its movements; a tool supported on the opposite end of said shaft, and means to adjust said tool radially of the axis of the shaft.

6. In an ellipsograph, a ring, a support therefor on which the ring is rotatably supported at its periphery; a head slidable diametrically of the ring in a slot in said support; a shaft vertically disposed relative to the plane of the ring, and passing through said head; a disk secured to one end of the shaft and adjustable radially thereon, abutments on said support extending transversely of the path of movement of said head, and between which said disk is confined in its movements; a tool supported on the opposite end of said shaft eccentrically thereto, said tool being rotatable on an axis parallel with the shaft, means to adjust the tool radially of the shaft, together with devices to rotate the tool on its axis, more or less, by the rotation of said shaft.

7. In an ellipsograph, a bed on which a plate may be clamped, a cutting-tool, and suitable devices associated therewith to move said tool in a curved path over said bed, and means to secure a sheet of flexible material to the bed, whereby an opening cut therein by said tool may serve as a means for locating a plate, and means to clamp a plate on said bed beneath said flexible sheet.

8. In an ellipsograph, a work-holding bed, a tool-carrying arm, and means to move said arm in a curved path over the bed, same arm being rotatable on an axis extending at right angles to the bed, a tool on said arm, and means to maintain said tool in a position tangential to said path during the movement of the tool thereover, together with a movable bar on which said tool-carrying arm is mounted, said bar being movably supported above and parallel with the work-holding bed.

9. In a machine of the class described, a tool-carrying arm rotatably mounted on the machine, a tool mounted on said arm, the axis of the latter being vertical to the surface operated on by the tool and passing through the point of contact of the latter with the work, and means to positively rotate the tool-carrying arm by the movement of the machine.

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