

No. 612,240.

Patented Oct. 11, 1898.

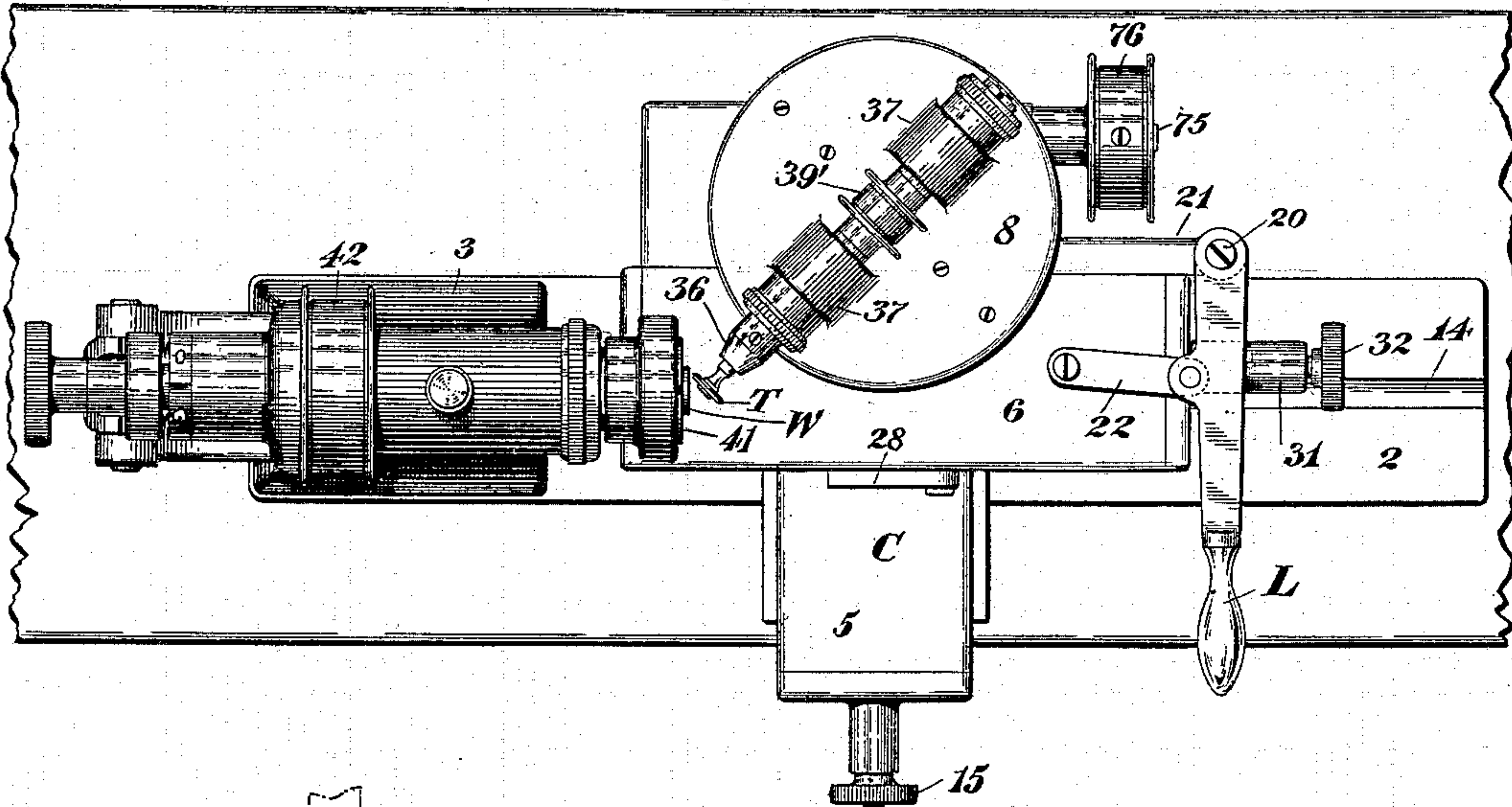
L. E. HARPER & C. L. GROHMANN.  
MACHINE FOR DRESSING AND GRINDING METALS.

(Application filed Nov. 4, 1897.)

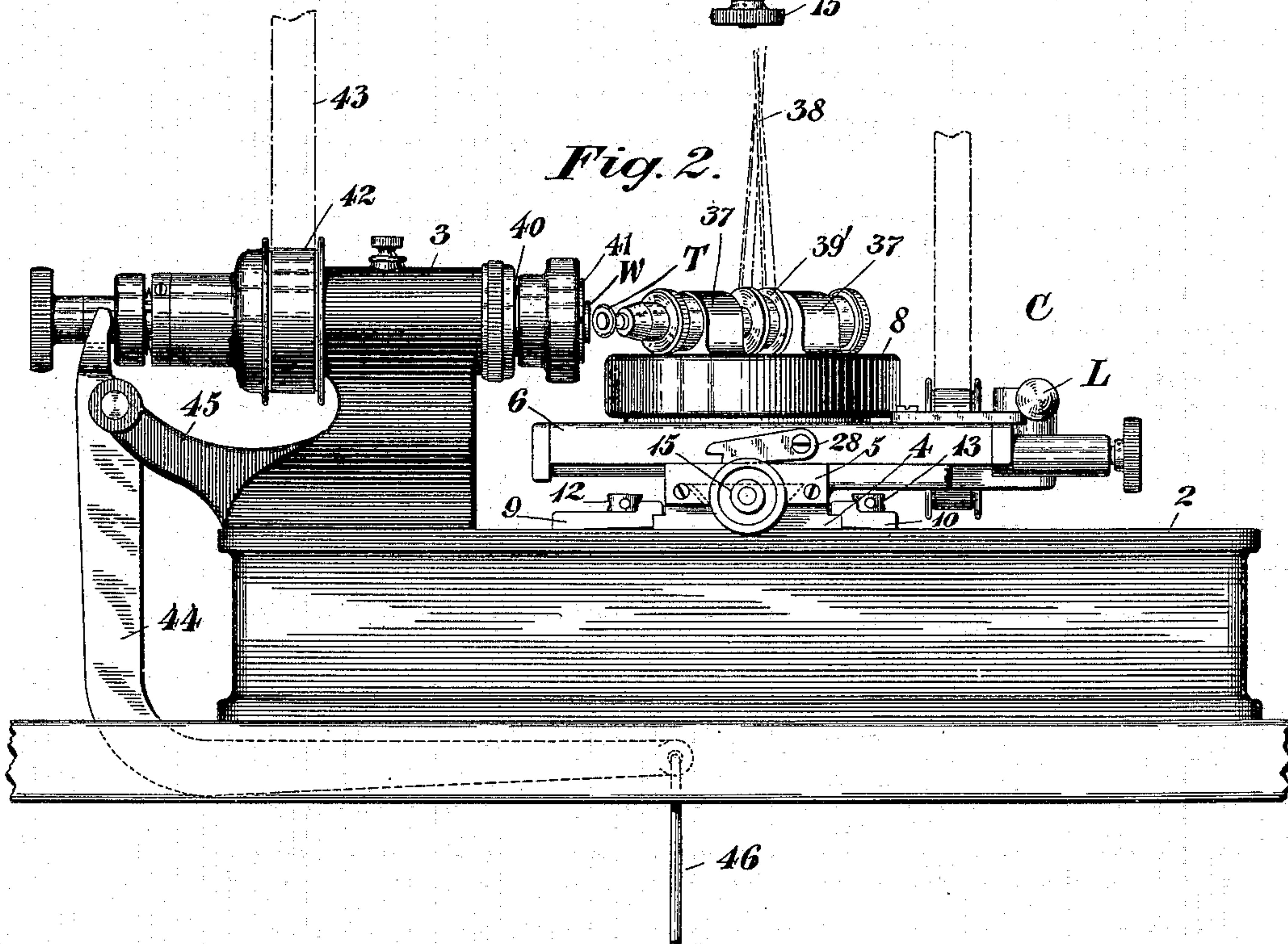
(No Model.)

6 Sheets—Sheet 1.

*Fig. 1.*



*Fig. 2.*



*Witnesses:*

*C. F. Schmelz*  
*Fred. J. Dole.*

*Inventors:*

*Lewis E. Harper*  
*and Carl L. Grohmann,*  
*By their Attorney*

*F. H. Richards.*



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Fig. 3.

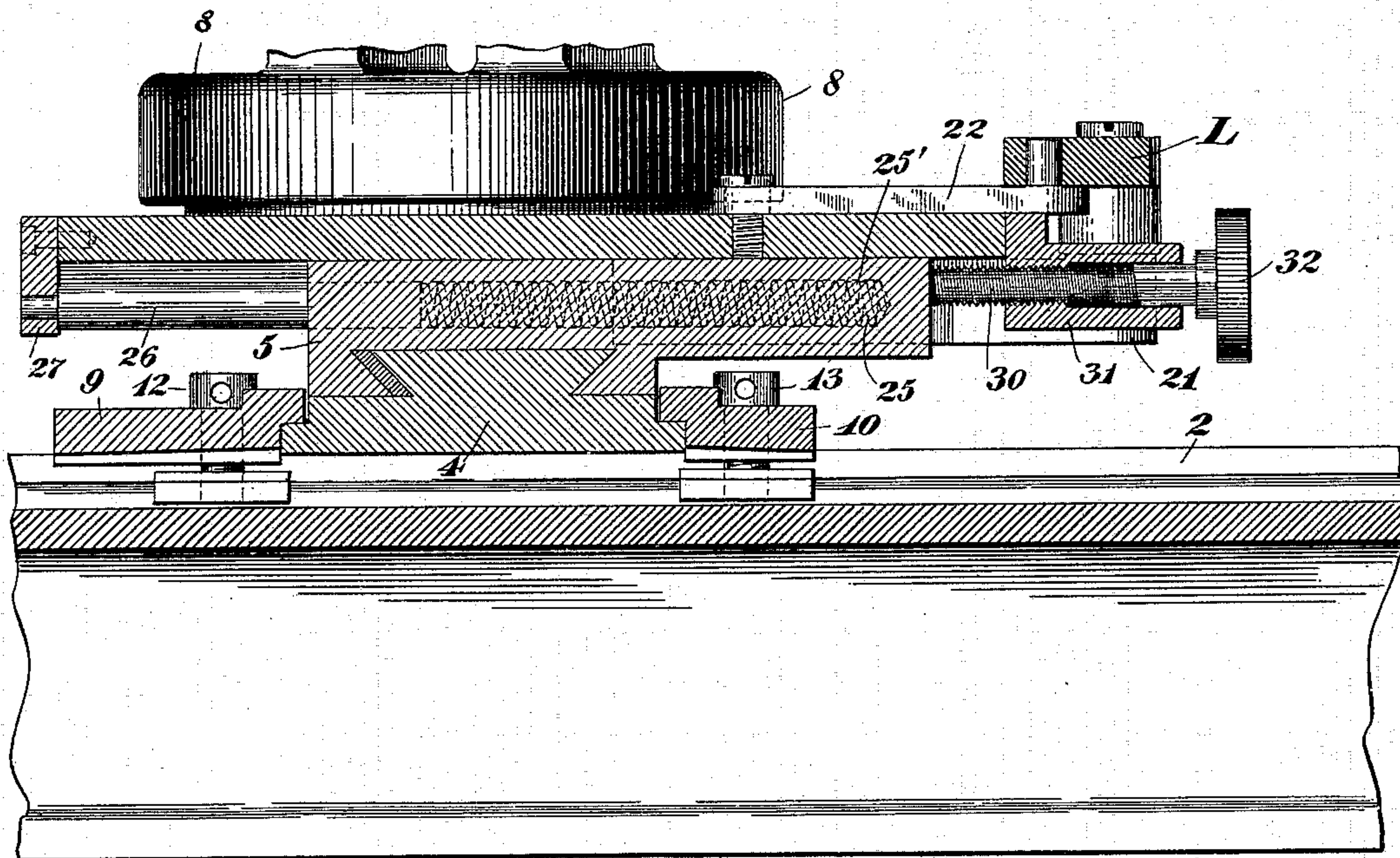
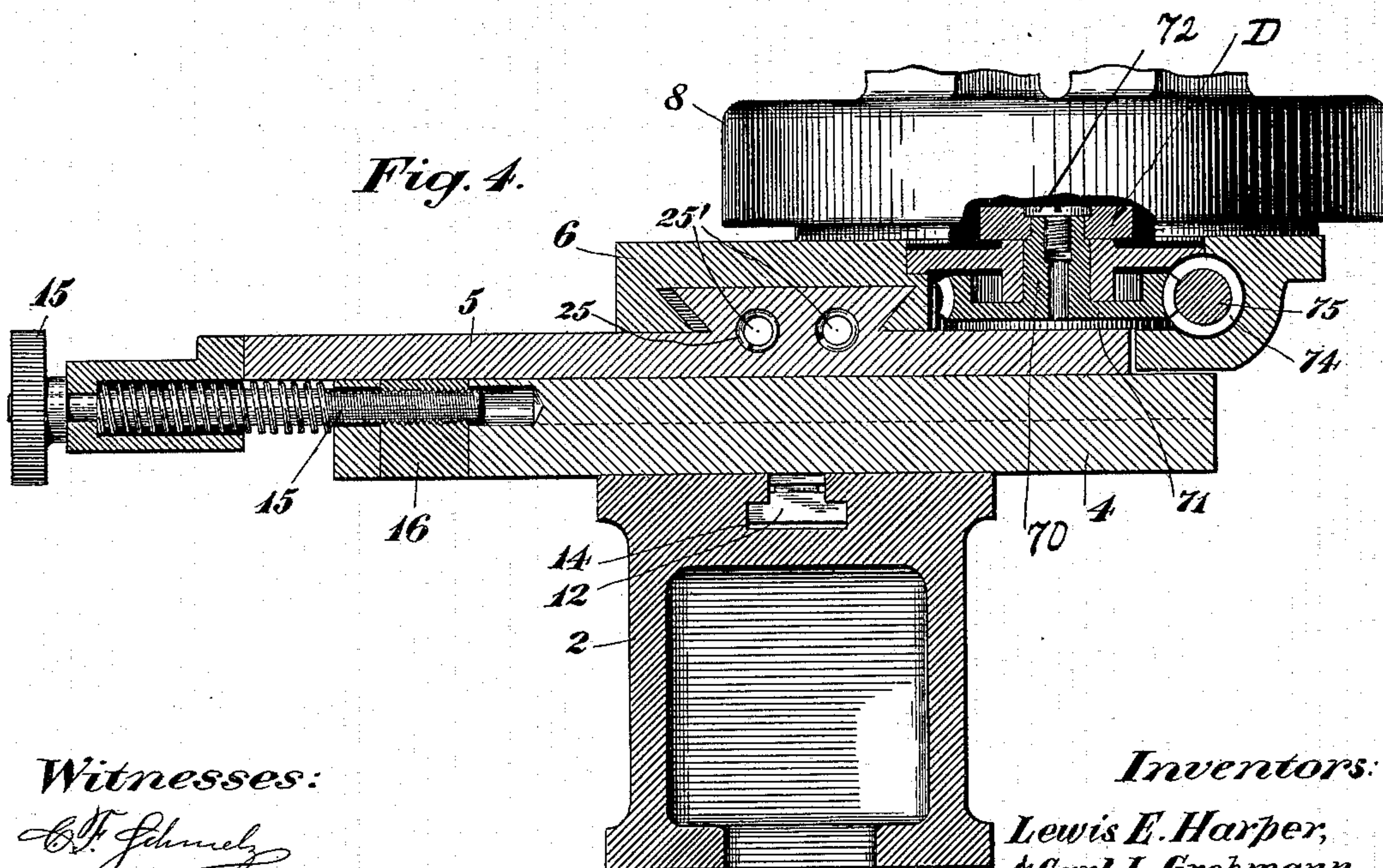


Fig. 4.



Witnesses:

*C. F. Schmely*  
*Fred. J. Dole*

Inventors:

*Lewis E. Harper,*  
*and Carl L. Grohmann,*  
By their Attorney

*F. H. Richards*



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Fig. 5.

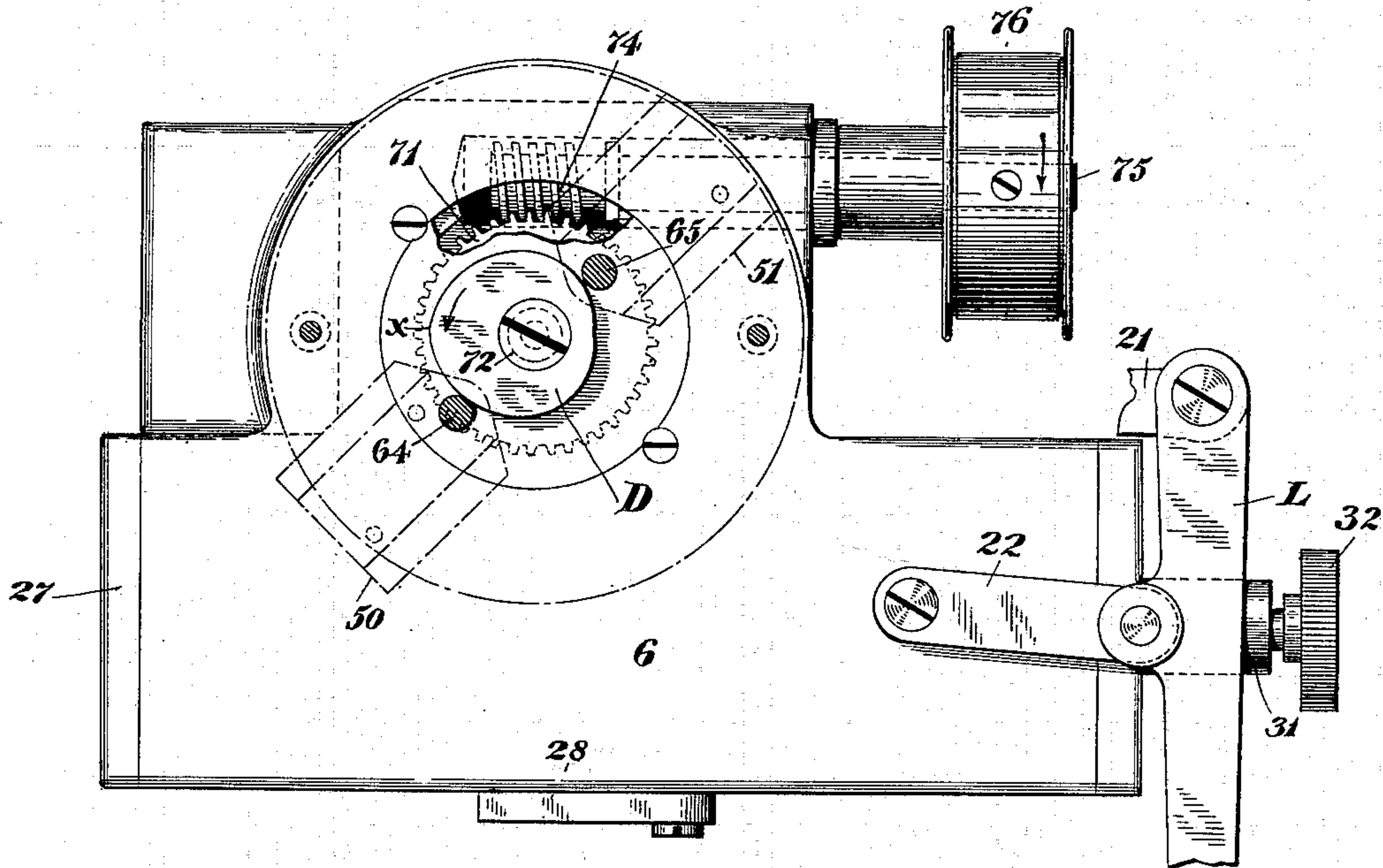


Fig. 6.

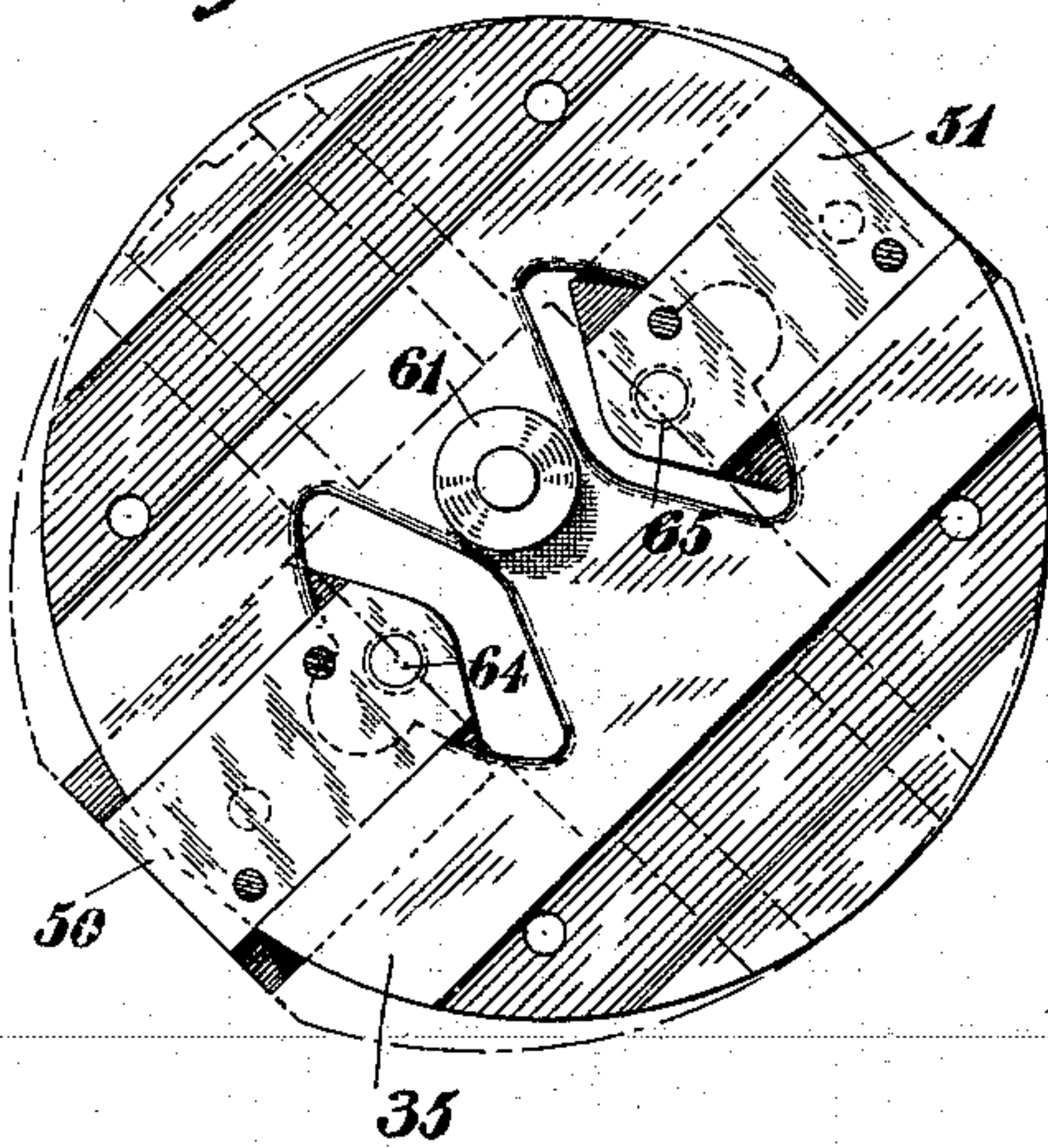
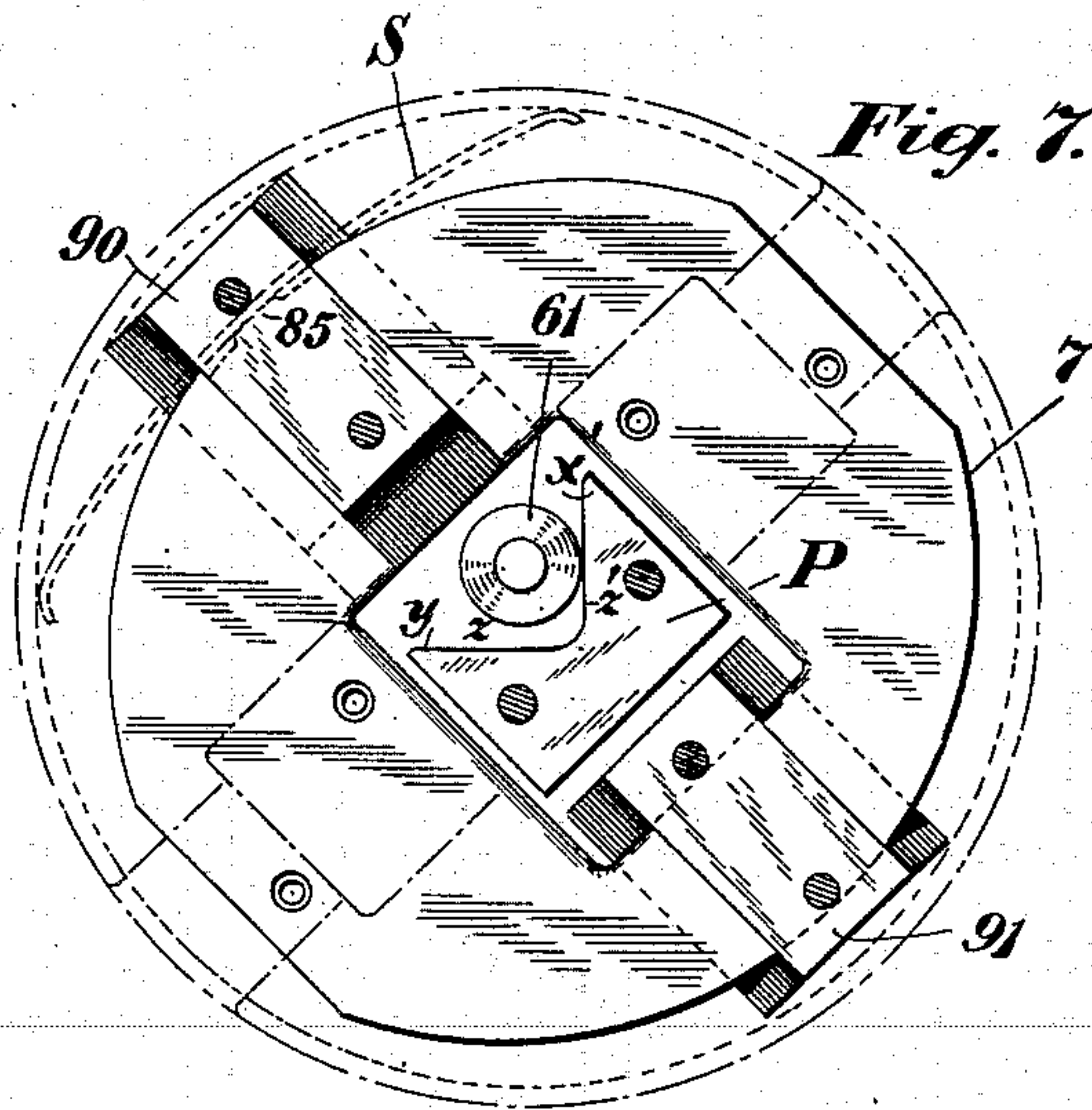


Fig. 7.



Witnesses:  
C. F. Schmelz  
Fred. J. Dole.

Inventors:  
Lewis E. Harper,  
and Carl L. Grohmann,  
By their Attorney  
F. A. Richards.

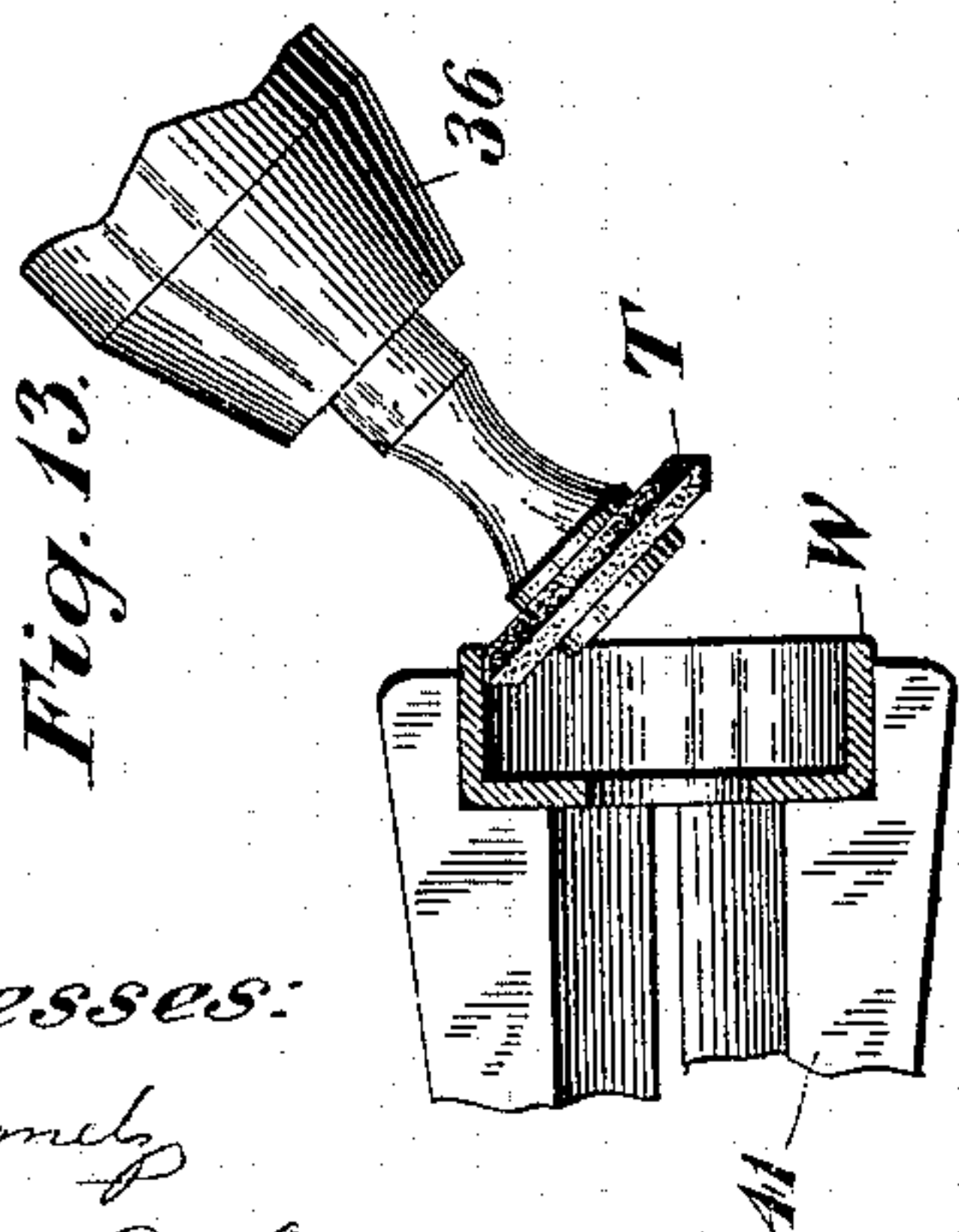
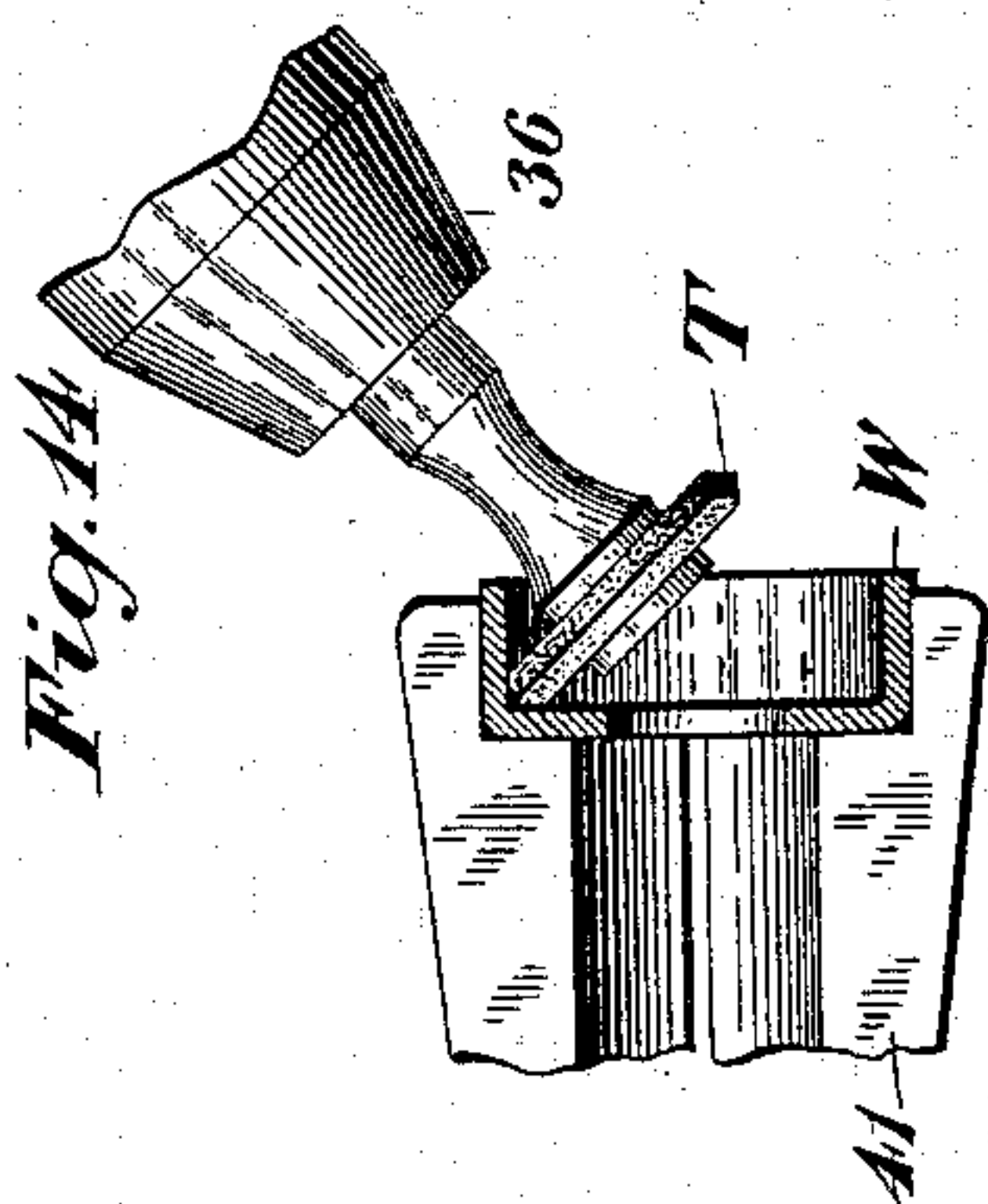
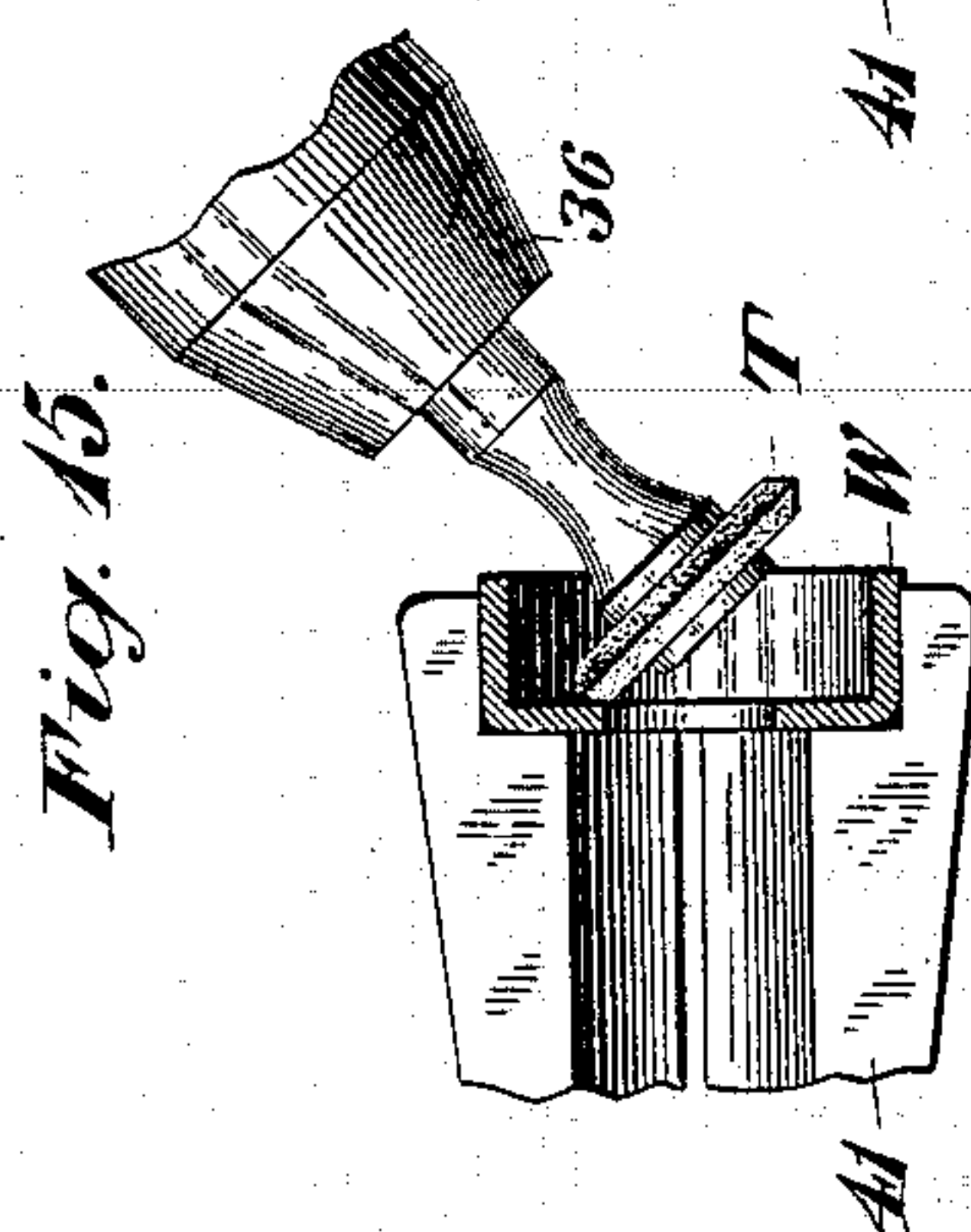
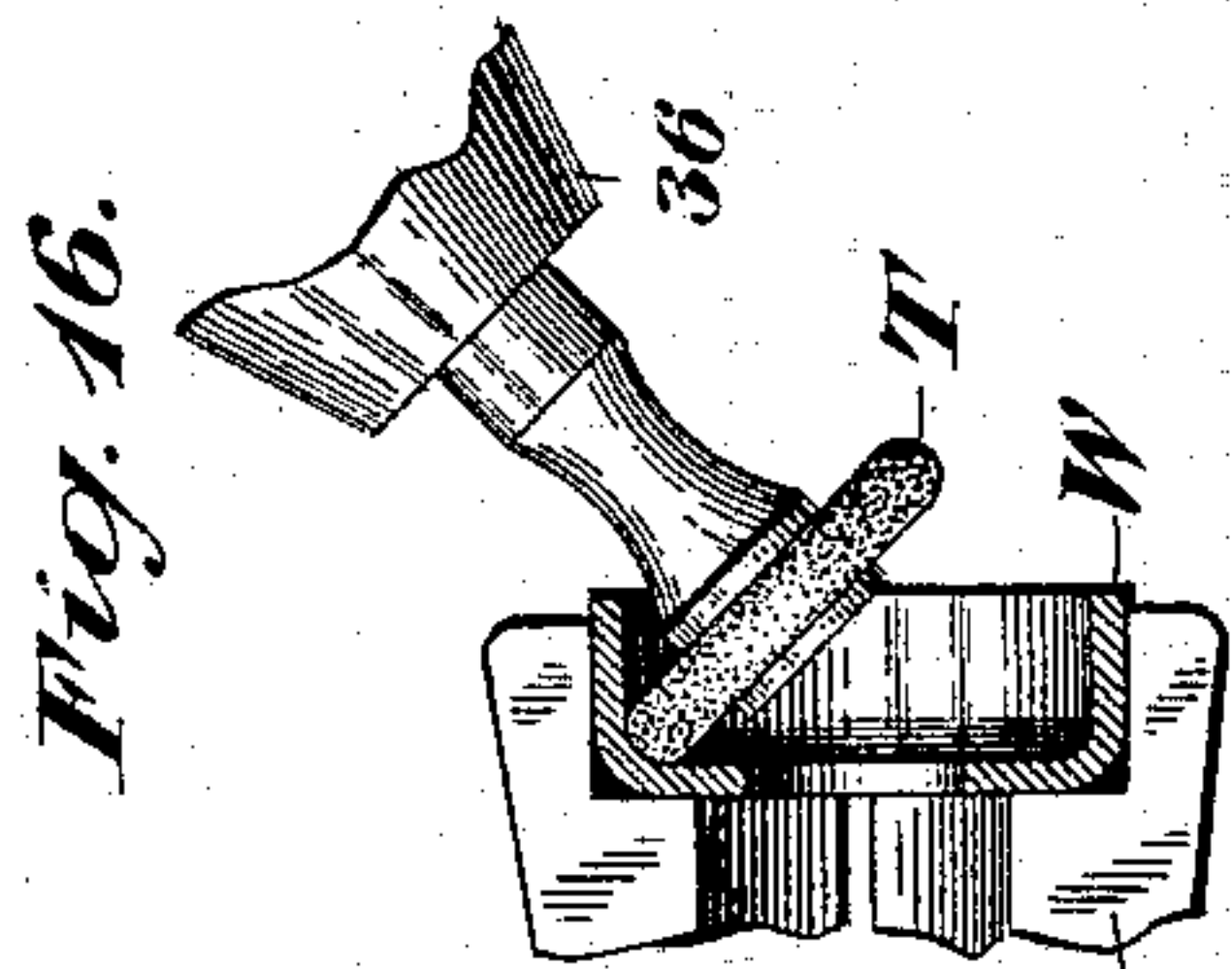


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Witnesses:  
C. F. Schmelz  
Fred. J. Dole.

Fig. 9.

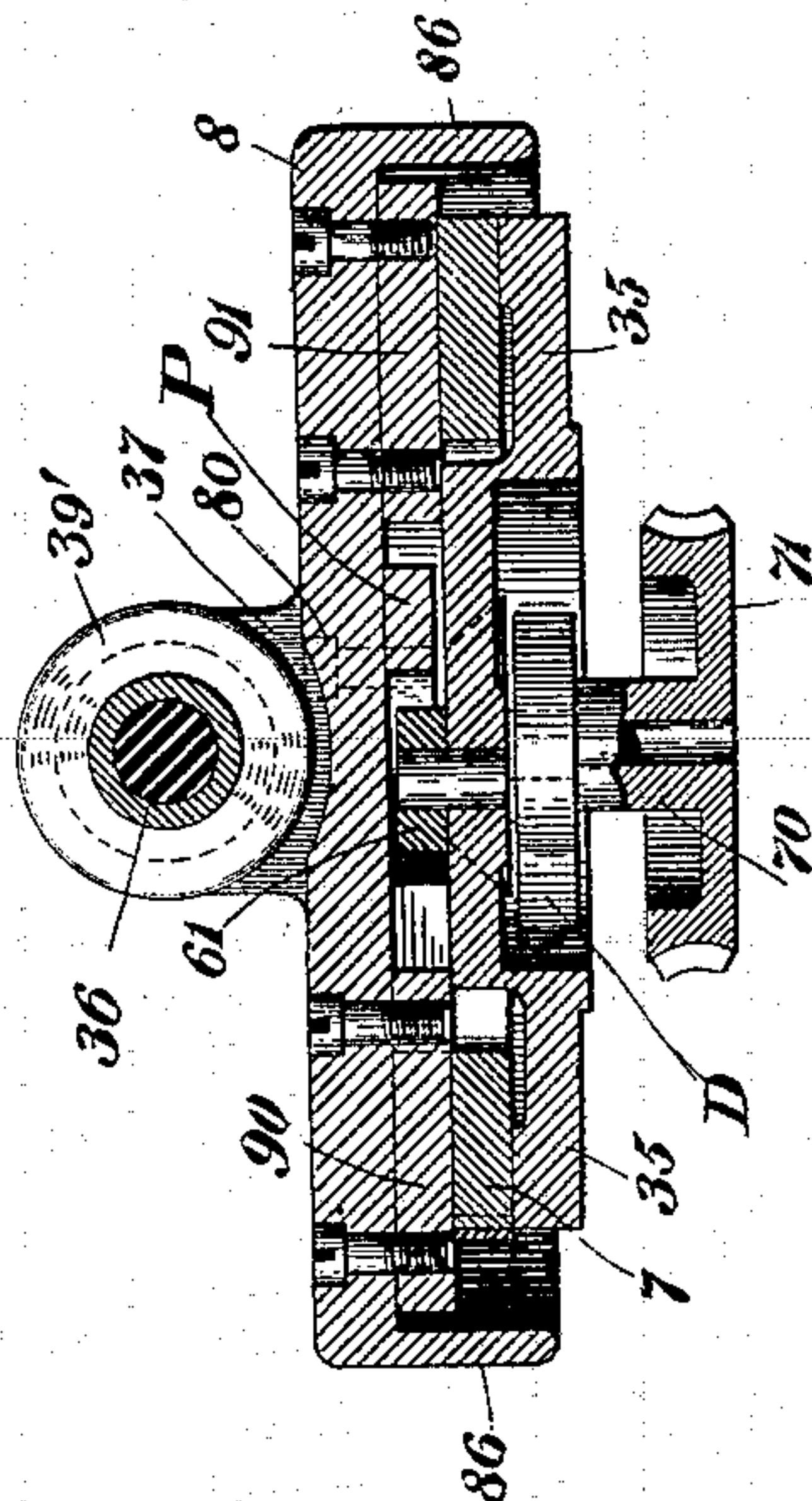
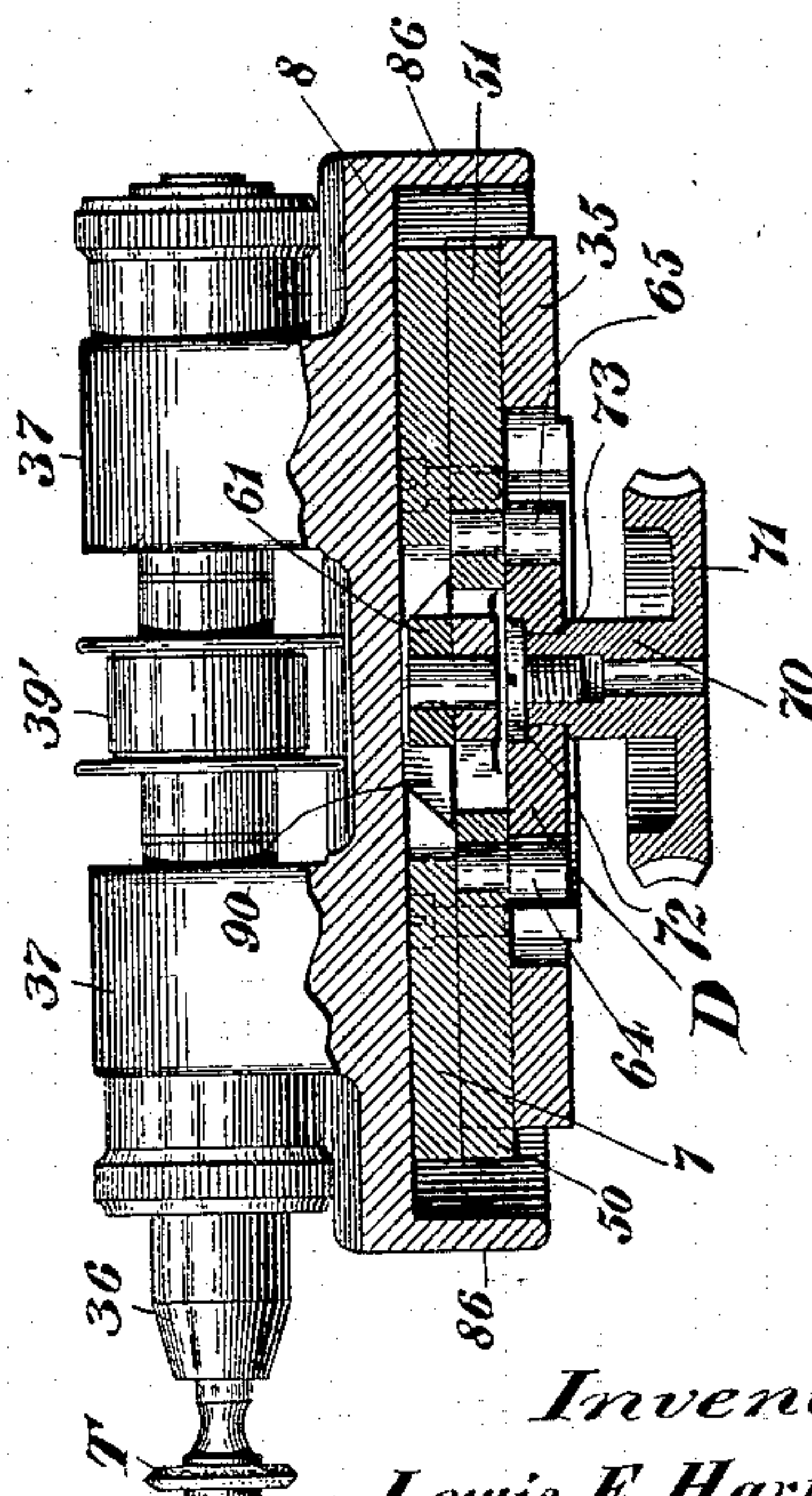


Fig. 8.



Inventors:  
Lewis E. Harper,  
and Carl L. Grohmann,  
By their Attorney,  
F. H. Richards.

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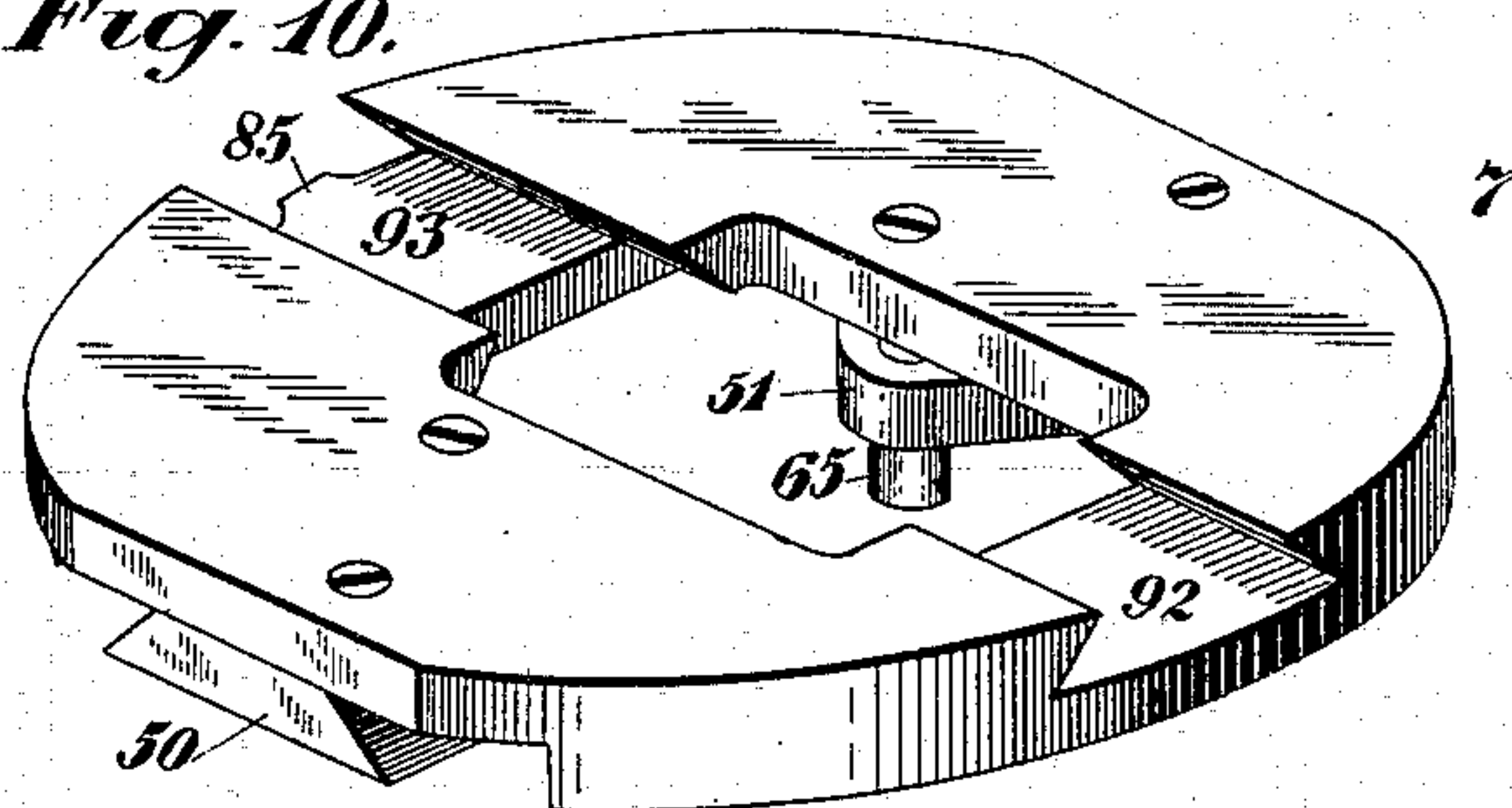
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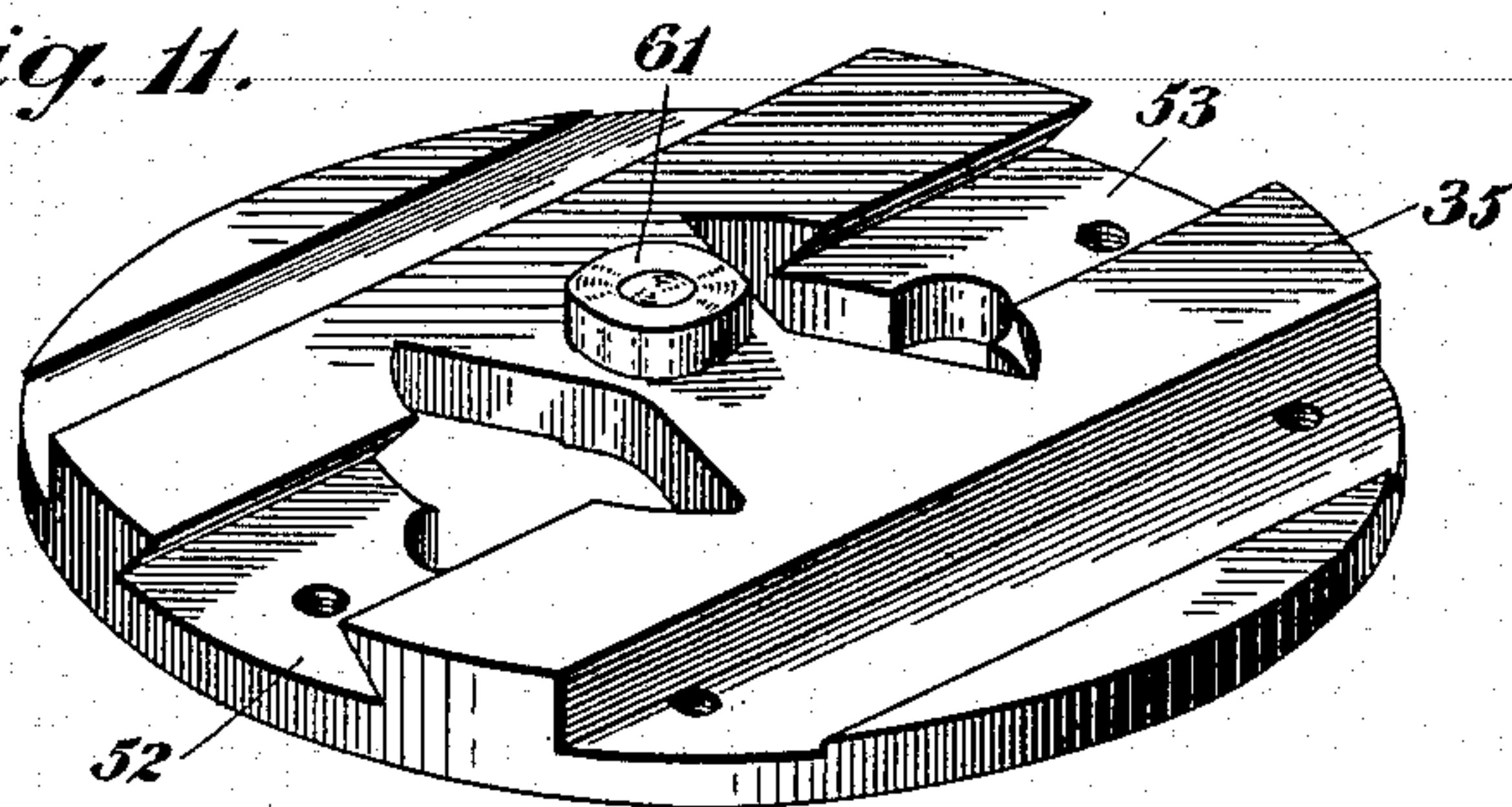
(No Model.)

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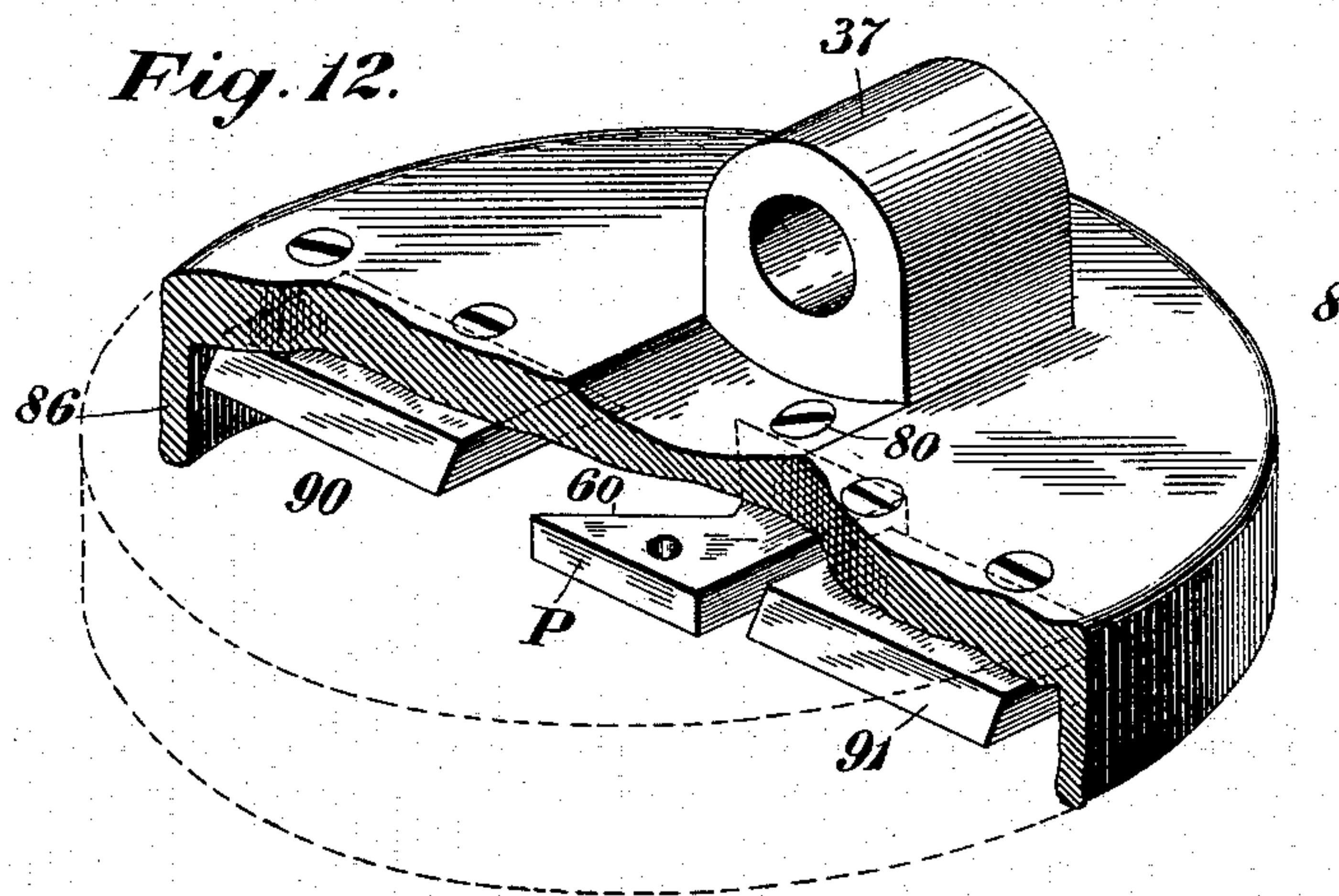
*Fig. 10.*



*Fig. 11.*



*Fig. 12.*



*Witnesses:*

*C. F. Schmelz*  
*Fred. J. Dole.*

*Inventors:*

*Lewis E. Harper*  
*and Carl L. Grohmann,*  
*By their Attorney*  
*F. H. Richards.*







# UNITED STATES PATENT OFFICE.

LEWIS E. HARPER AND CARL L. GROHMANN, OF HARTFORD, CONNECTICUT.

## MACHINE FOR DRESSING AND GRINDING METAL.

SPECIFICATION forming part of Letters Patent No. 612,240, dated October 11, 1898.

Application filed November 4, 1897. Serial No. 657,359. (No model.)

*To all whom it may concern:*

Be it known that we, LEWIS E. HARPER and CARL L. GROHMANN, citizens of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Dressing and Grinding Metal, of which the following is a specification.

This invention relates to machines for dressing or grinding metal, the object of the invention being to provide an improved machine of this character for dressing or grinding articles of various shapes with uniform accuracy, said machine being particularly adapted for finishing inside work of irregular form, such as cups or boxes, for containing bicycle bearing-balls.

Our improved machine comprehends, as to one of its features, a plurality of superimposed transversely-reciprocatory slides, a support upon which the under slide is mounted for reciprocation, and a coöperative pattern and guide, one of said last-mentioned parts being mounted on the support and the other being mounted on one of the slides.

In the present case the pattern is carried on the upper slide and the coöperating guide is fixed to the support, and means, such as a spring, is employed for forcing the working face of the pattern firmly in contact with the guide, by reason of which, when the under slide is reciprocated, a tool on the upper slide is caused to traverse a path coinciding with the shape of the pattern.

The means which holds the pattern against its guide may consist of a spring, as stated, and in such case said spring preferably acts against the upper slide, and by holding the pattern against the fixed guide the tool is caused to follow a line corresponding with the outline of the pattern when the under slide is operated.

Another feature of the machine resides, in connection with a slide and its support, in a spring for operating the slide in one direction and manually-controlled means for effecting the movement of the slide in the opposite direction, by reason of which the tool can be quickly moved toward and from its work, a detent being preferably employed to

hold the slide in one of its extreme positions against the action of its spring, and this organization is primarily intended for rough adjustment, the accurate positioning of the slide being obtained by independent means.

In the drawings accompanying and forming part of this specification, Figure 1 is a plan view of a grinding-machine embodying my present improvements. Fig. 2 is a front elevation of the same. Fig. 3 is a central sectional side elevation, on an enlarged scale, of the tool-carriage and the bed. Fig. 4 is a transverse central section of the same, the upper part of the carriage being in elevation. Fig. 5 is a plan view of the carriage with the two mechanically-operated slides removed. Fig. 6 is a plan view of the support or track upon which the lower mechanically-operated slide is mounted. Fig. 7 is a plan view of the lower mechanically-driven slide. Fig. 8 is a sectional side elevation of the two mechanically-operated slides and their support. Fig. 9 is a transverse sectional elevation of the same. Fig. 10 is a perspective view of the lower mechanically-driven slide. Fig. 11 is a similar view of the support or track for sustaining said last-mentioned slides. Fig. 12 is a perspective view of the upper slide. Figs. 13 to 15, inclusive, are sectional elevations of the work, chuck, and tool, showing the mode of operation of the latter; and Fig. 16 is a similar view to the preceding three views, showing a grinding-tool of slightly-different construction. Fig. 17 is a plan view of slide 5, forming a part of the tool-carriage, the link 22 being broken away; and Fig. 18 is a cross-sectional view of the grinding-machine, taken in line *a a*, Fig. 1, and looking toward the left.

Similar characters designate like parts in all the figures of the drawings.

The framework for sustaining the various parts of the machine may be of any suitable character, it consisting in the present case of a longitudinal bed 2, having near one end the standard or upright 3, which supports the chuck or work-holding mechanism, the tool carriage or slide C being supported for movement along the upper face of the bed 2.

The tool-carriage C consists of a plurality



of superimposed slides, as 4, 5, 6, 7, and 8, and as means are illustrated for actuating the two uppermost slides 7 and 8, respectively, by power they have been termed herein "mechanically-operated" slides, better to distinguish them from the three lower hand-adjustable slides 4, 5, and 6.

The slide 4 is held, preferably, in a fixed position on the bed when the parts are assembled, the necessary adjustment of the tool, which is carried by the topmost slide 8, being obtained by the manipulation of the transversely-reciprocative slides 5 and 6. The lowermost slide 4 rests upon the bed of the machine, and it is clamped in a fixed position thereon by the dogs 9 and 10, secured in place by the T-headed bolts 12 and 13, respectively, passing through the elongated groove 14 in the upper face of the bed.

The adjustment of the slide 5 crosswise of the bed is effected by the ordinary feed-screw 15, operative with said slide 5 and secured to the nut 16, fixed to the stationary slide 4.

The operation of the slide 6 crosswise of the slide 5 is effected in one direction by manually-controlled means, such as a lever connected therewith, and is actuated or fed in the opposite direction by a spring or springs.

In the present case the slide 6 is retracted by a hand-lever and is fed forward toward the work by a series of springs, a dog or detent of suitable construction being employed to hold said slide away from the work.

The hand-lever for operating the slide 6 is designated by L, and it is fulcrumed, as at 20, to the lateral extension 21 on the slide 5. A link 22 is pivoted to the hand-lever L at a convenient point between the fulcrum of the latter and its handle, the other end of the link being similarly connected with the slide 6.

In Fig. 1 the slide 6 is shown in its advanced position. It will be evident that by grasping the lever L said slide can be drawn back rapidly to carry the tool away from the work. The advancing movement of the slide 6 in the present case is obtained by the protractile coiled springs 25, seated in bores 25' in the slide 5, said springs bearing against the free ends of the guide-pins 26, fixed at their outer ends to the plate 27, secured to and depending from the inside of the slide 6, said pins also being seated in the bores or sockets for the two springs.

When the lever L is manipulated in the manner hereinbefore described to pull back the slide 6, the springs 25 will be placed under compression by the pins 26, which move with said slide and which bear against said springs, whereby when the slide is released it can be fed quickly forward by said springs.

Any convenient device may be employed for holding the slide 6 in its retracted position, a gravity dog or detent 28, pivoted to the slide 6, being shown for this purpose, the dog being adapted to drop behind the slide 5 when the slide 6 has reached a predetermined point in its retractive movement.

When the gravity-detent 28 is lifted, the slide 6 can be fed forward by the two springs to carry the tool toward the work, the handle L being usually grasped to prevent the too-rapid movement of said slide.

While the means just described for operating the slide 6 frequently brings the tool to the requisite place to start an operation, it is advisable to employ independent adjusting means for insuring the accurate positioning of the tool, and for this purpose we have shown a feed operative independent of the springs and hand-lever. Said independent feed includes in its organization a screw 30, seated in the nut 31 at the outer end of the slide 6, the inner end of the screw fitting against the slide 5. The head of the screw is designated by 32, and by rotating the same it will be farther turned in its seat, and the inner end of said screw being in contact with or fitting against the slide 5 the upper slide 6 will be thereby caused to recede, the spring 25 being put under compression. By turning the screw in the reverse direction the slide 6 will be moved forward.

Our invention embodies as a part thereof a series of superimposed transversely-reciprocative slides, a support or track upon which the under slide is mounted for movement, and a reciprocative pattern and guide, one of said last-mentioned parts being mounted on the support and the other being mounted on one of the slides, and the series of slides consists in the present case of the topmost or mechanically-driven slides 7 and 8, the under slide 7 being mounted for reciprocative movement upon the support or track 35, which can be screwed or otherwise fixed to the hand-adjustable slide 6. The slide 7 supports the slide 8, upon which the tool is mounted, the tool consisting in the present case of a grinding device adapted to finish off inside work.

The mechanically-driven or tool slide 8, to which the pattern is preferably secured, is reciprocative in a direction transversely to the lower mechanically-driven slide 7, a guide co-operative with the pattern being secured to the fixed support or track 35, and a feed device is employed to force or hold the working face of the pattern in contact with the fixed guide, by reason of which when the lower mechanically-driven slide is reciprocated the tool will be caused to reciprocate through a path corresponding with the shape of the effective portion of the pattern.

The tool is designated by T, and it is fixed in some convenient manner to the end of the spindle 36, whose axis is oblique or diagonal to the axis of the work-spindle, said spindle 36 being carried by the posts or bearings 37 on the slide 8 and being driven by a belt 38, passing around the pulley 39' thereon.

The means just described for operating the tool-spindle 36 is a convenient one; but it is apparent that it could be otherwise operated, or, in fact, the tool might be stationary.

The working spindle is designated by 40,



it having the chuck 41, in which the work W can be clamped, and also carrying a pulley 42, which may be driven by the belt 43.

The clutch mechanism is operated by the usual lever 44, supported upon the bracket 45, the lower end of the lever being connected by the rod 46 to the usual treadle, (not shown,) by which the clutch can be operated to lock or unlock the work.

The slide 7 has on its under side the wedge-shaped blocks or tongues 50 and 51, respectively adapted to enter the correspondingly-formed grooves or ways 52 and 53 in the support or track 35, the path of reciprocation of the slide 7 coinciding with the axis of the tool-spindle 36, and the plane of reciprocation of the slide 8, which carries the tool, is transverse to that of the slide 7, by reason of which when the pattern or templet on the upper slide is held against a fixed guide or resistant on the support or track 35 the tool T will be moved back and forth in a direction agreeing with the outline of the pattern.

The pattern or templet is designated by P, and it is apertured on one side to form the rectangular working face 60, adapted to be held in contact with the fixed guide or resistant 61, secured to the track or support 35, the guide consisting in the present case of an antifriction-roll.

The means for reciprocating the slide 7 may be of any suitable kind—such, for example, as the cam D—supported between the depending studs 64 and 65, respectively, of the slide-blocks 50 and 51, which, it will be remembered, are secured to the slide 7.

The working face or periphery of the cam-driver D is of such shape as to impart equal strokes in opposite directions to the slide 7 and it in turn may be operated in any suitable manner. For this purpose we have illustrated the following mechanism: The cam-driver D is bored at a proper point to receive the projection or stud 70 on the upper side of the worm-gear 71, the cam being held on the stud by the screw 72 in threaded engagement with said stud, the head of the screw serving to force the cam against the shoulder or abutment 73 on the projection or stud.

The worm-gear meshes with the worm 74 on the shaft 75, the latter carrying at its outer end the pulley 76, by rotating which in the direction of the arrow in Fig. 5 the cam-driver D, through the described mechanism, will be rotated in the direction of the arrow, (also shown in said figure,) and said cam-driver being in contact with the depending studs 64 and 65 of the slide-blocks 50 and 51, respectively, on the slide 7 the latter will be reciprocated as soon as the pulley 76 is in motion.

When the slide 7 is operated in the manner just described and when the pattern or templet P on the upper or tool slide 8 is fed with its working face against the fixed guide 61, the tool T, as hereinbefore specified, will be reciprocated in a direction corresponding with the shape of the pattern.

The tool-slide 8 is secured in some suitable manner to the slide-blocks 90 and 91, which are seated in corresponding ways 92 and 93, respectively, on the slide 7.

The pattern or templet P is preferably removably fixed to the slide 8, the screws 80, adapted to enter said slide, being shown for holding said pattern in place.

The means shown for feeding the rectangular working face of the pattern P against the fixed guide 61 on the support or track 35 consists of the elongated spring S, bearing near its middle against the seat or protuberance 85 on one side of the slide 7, the opposite ends of the spring acting against the depending annular flange or rim 86 of the slide 8.

At the commencement of a working stroke of the grinding-tool T both of the mechanically-driven slides 7 and 8 will be in their extreme outer positions, at which stage the point  $x$  of the cam-driver will be in contact with the pin 65 on the slide 7 and the periphery of the roll 61 will be in contact with the working face 60 of the pattern P at a point marked  $y$  on said pattern, the working face of the latter being held firmly against the roll 61 by the longitudinal flat spring S acting against the tool-slide 8, in the manner hereinbefore set forth.

When the cam starts to rotate, the under slide will be advanced in a direction coinciding with the axis of the tool-spindle 36 and diagonal to the work-spindle 40, and as said slide 7 operates the tool-slide 8 is fed in a transverse direction by the spring S, so that the branch  $z$  of the face 60 will be caused to ride along the roll 61 until said roll is in contact also with the portion  $z'$  of said working face, when, the roll being a fixture, the direction of motion of the slide 8 is changed to correspond with the branch  $z'$  of the working face 60, and about the time the roll 60 is opposite the point  $x'$  on said face 60 the point  $x$  of the cam-driver will have reached the pin 64, it being understood that the point  $x$  is intersected by the major axis of the cam. On the return stroke of the cam the two slides will follow reversely the same path taken on their advancing movement.

In operation the work W, which consists in the present case of a box or cup for containing bicycle bearing-balls, will be clamped in the chuck 41, after which the shaft 75 will be turned by hand to carry the tool T to its extreme retracted position, at which time the point  $x$  of the cam will be in contact with the pin 65 and the point  $y$  of the face 60 of the pattern P is in contact with the periphery of the roll 61. The several hand-slides are then adjusted to carry the tool T nearly in contact with the work, as indicated in Figs. 1 and 2, with the periphery of said tool in line with the inside face of the cup or work W, at which stage motion is imparted to the tool and work shaft 36 and 40, respectively, whereby the tool is caused to dress off the inside of the



cup W by moving through a path corresponding with the shape of the pattern P, the tool first working against the wall of the cup and then its floor or bottom and subsequently back, and these operations will alternate so long as the several shafts are in motion.

Having described our invention, we claim—

1. The combination, with a support, of a pair of superimposed slides one of which is mounted on the support; a pattern fixed to the upper slide; a cooperating guide for the pattern, said guide being secured to the support; and mechanism for positively holding the working face of the pattern in contact with the guide.

2. The combination, with a support, of a pair of superimposed slides one of which is mounted on the support; a pattern fixed to the upper slide; a cooperating guide for the pattern, said guide being secured to said support; mechanism for positively holding the working face of the pattern in contact with the guide; and mechanism for reciprocating the lower slide.

3. The combination, with a support, of a pair of superimposed slides one of which is mounted on the support; a pattern fixed to the upper slide; a cooperating guide for said pattern, said guide being secured to the support; a spring for holding the working face of the pattern constantly in contact with the guide; and mechanism for reciprocating the lower slide.

4. The combination, with a support, of a series of superimposed transversely-reciprocatory slides; a support upon which the under slide is mounted; a pattern secured to the upper slide; a cooperating guide for the pattern; means for holding the working face of the pattern in contact with the guide; and a cam-driver adapted to engage depending pins on the under slide.

5. The combination, with a support, of a pair of superimposed slides one of which is mounted on said support; a pattern having an apertured angular working face; a cooperating guide for the pattern, secured to said support; means for positively holding the working face of the pattern constantly in contact with the guide; and mechanism for reciprocating the lower slide.

6. The combination, with a series of superimposed transversely-reciprocative slides the upper of which has a flange, of a fixed support upon which the under slide is mounted for reciprocation; a cooperative pattern and guide, one of which last-mentioned parts is mounted on said support and the other of which is mounted on one of the slides; and a spring in position to act against said flange to hold the working face of the slide against the guide.

7. The combination, with a support, of a series of superimposed transversely-reciprocatory slides; a cooperating guide; a pattern for the slides; and an elongated spring bear-

ing between its ends against one of the slides and at its opposite ends against the other slide.

8. The combination, with a series of superimposed transversely-reciprocative slides, of a support upon which the under slide is mounted for reciprocation; a cooperative pattern and guide, one of said last-mentioned parts being mounted on said support and the other being mounted on one of the slides; means for holding the working face of the pattern in contact with the guide; and a cam-driver for engaging means on the under slide, to reciprocate the latter.

9. The combination, with a series of superimposed transversely-reciprocative slides, of a support upon which the under slide is mounted for reciprocation; a pattern secured to the upper slide; a cooperative guide fixed to said support; a spring for holding the working face of the pattern in contact with the guide; a cam adapted to engage pins on the under slide; a worm-gear to which said cam is secured; and a shaft-carrying means for operating the same and also having a worm meshing with the worm-gear.

10. The combination, with a series of superimposed transversely-reciprocative slides, the upper one of which has a flange; a spring bearing against the under slide and also against said flange; a pattern fixed to the other slide; a cooperative guide; a fixed support upon which the under slide is mounted for reciprocation and which also carries said guide; a worm-gear provided with a cam, adapted to engage depending pins on the under slide; a worm-shaft the worm of which meshes with the worm-gear; and a hand-adjustable slide on which said support is fixed.

11. The combination, with a slide and its support, of a tool carried by said slide, and two independent mechanisms for adjusting said slide, one of said mechanisms involving a spring for operating said slide in one direction, manually-controlled means for moving the slide in the opposite direction, and a detent acting in opposition to the spring.

12. The combination, with a slide and its support, of tool mechanism sustained upon the slide; a spring for operating the latter in one direction; manually-controlled means for moving the slide in the opposite direction; and a detent for holding the said slide against the action of said spring.

13. The combination, with a slide and its support, of tool mechanism mounted on the slide; a spring for operating said slide in one direction; a hand-lever for moving the slide in the opposite direction; and a detent for holding said slide against the action of said spring.

14. The combination, with a slide and its support, of a spring for operating said slide in one direction; a hand-lever supported independently of said slide; a link connected, respectively, with the hand-lever and slide;



a detent for holding the latter in its retracted position; and tool mechanism mounted on said slide.

15 5 The combination, with two slides one of which is supported upon the other, the lower slide having a bore, of a spring seated in said bore; a pin secured to the upper slide, one end of which is fitted in the bore and is acted upon by the spring; a hand-lever connected with the upper slide; and a detent for  
10 holding the slide against the action of its spring.

16. The combination, with two slides one of which is mounted upon the other, of a spring for operating the upper slide in one di- 15 rection; manually-controlled means for moving said slide in the opposite direction; and an adjusting-screw carried by the upper slide and bearing against the lower slide.

LEWIS E. HARPER.  
CARL L. GROHMANN.

Witnesses:

RICHD. F. DOW,  
HENRY BISSELL.