

(No Model.)

4 Sheets—Sheet 1.

L. E. HARPER & R. F. DOW.
MACHINE FOR GRINDING OR DRESSING METAL.

No. 596,503.

Patented Jan. 4, 1898.

Fig. 1.

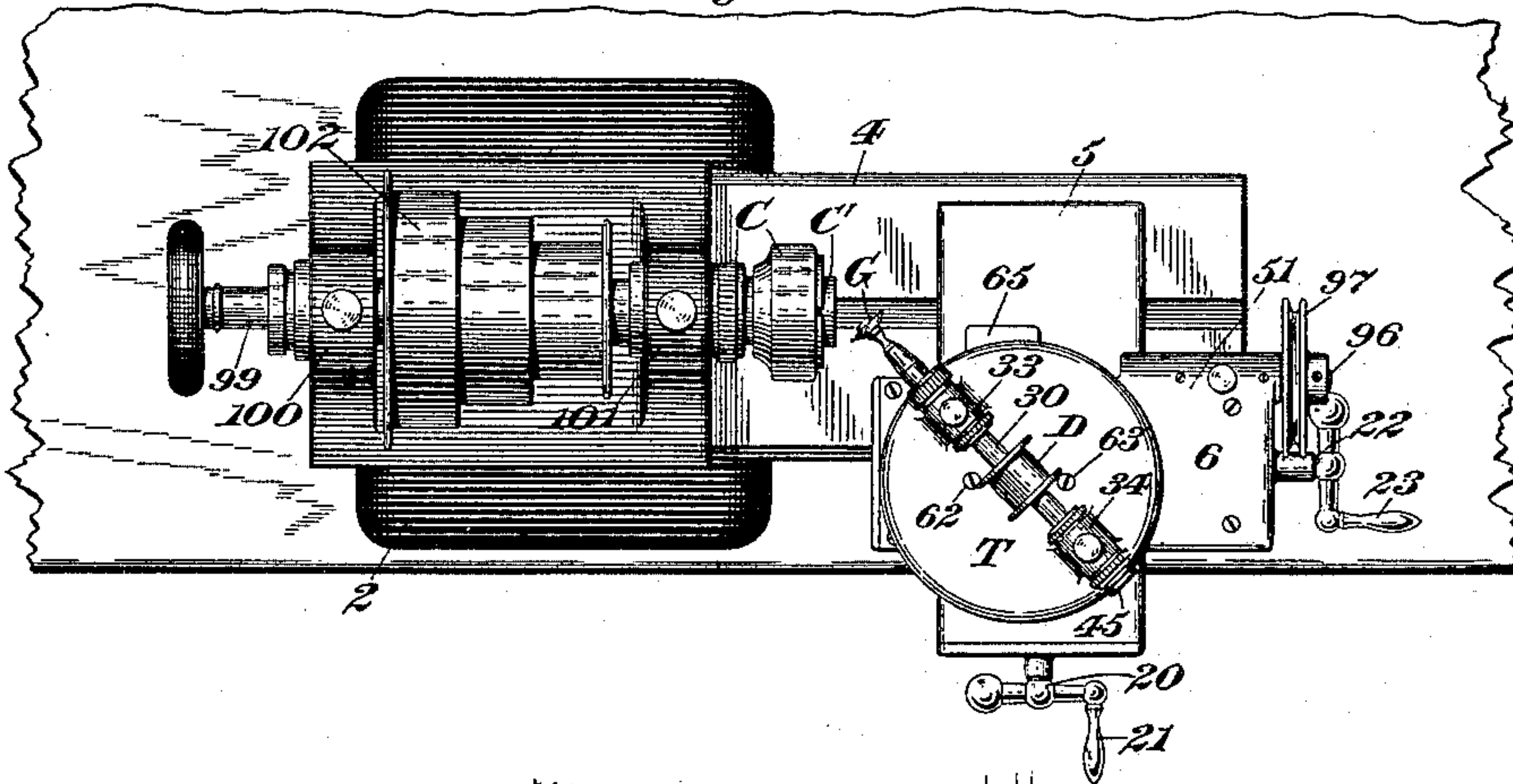
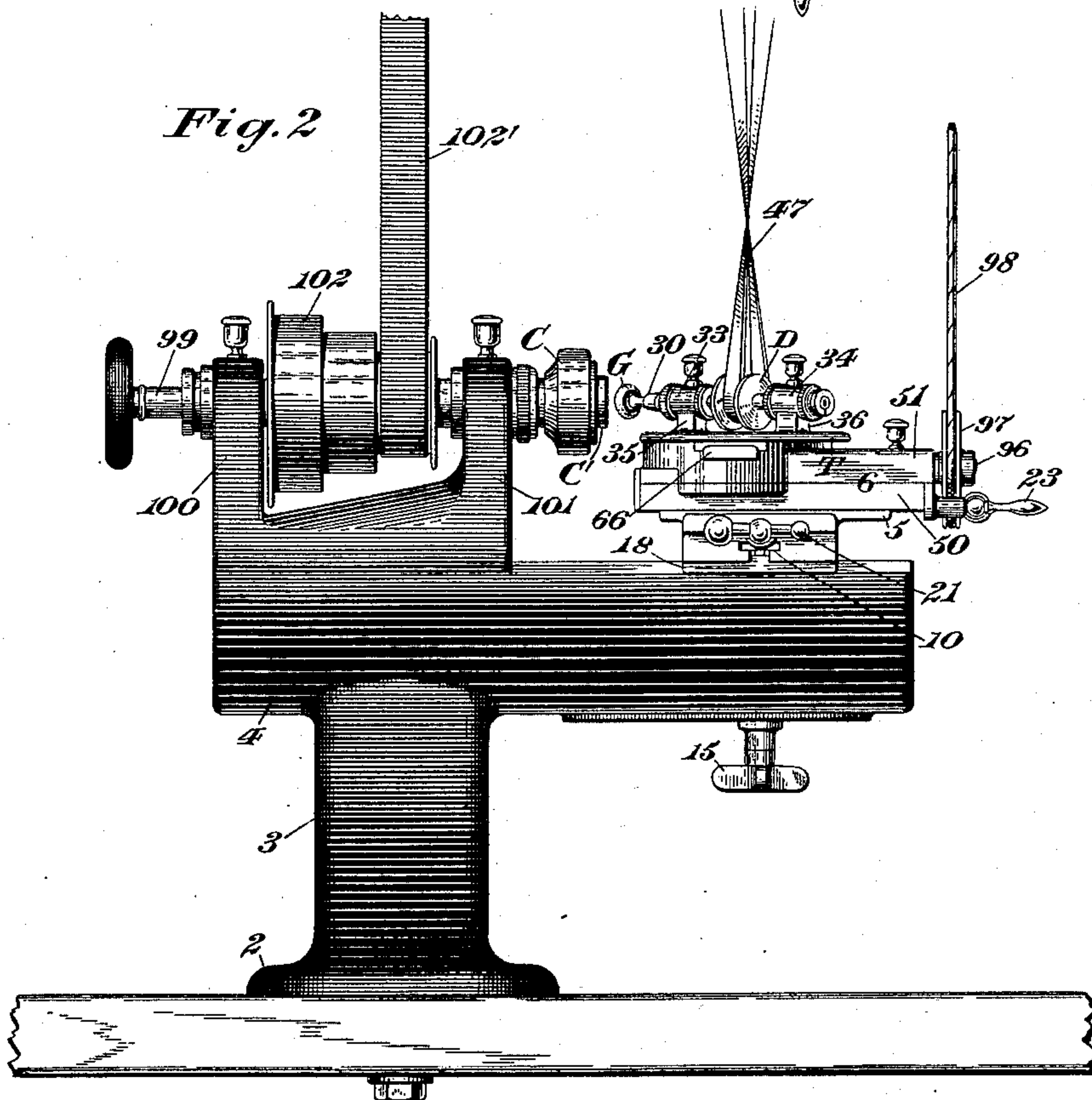


Fig. 2.



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By their Attorney,
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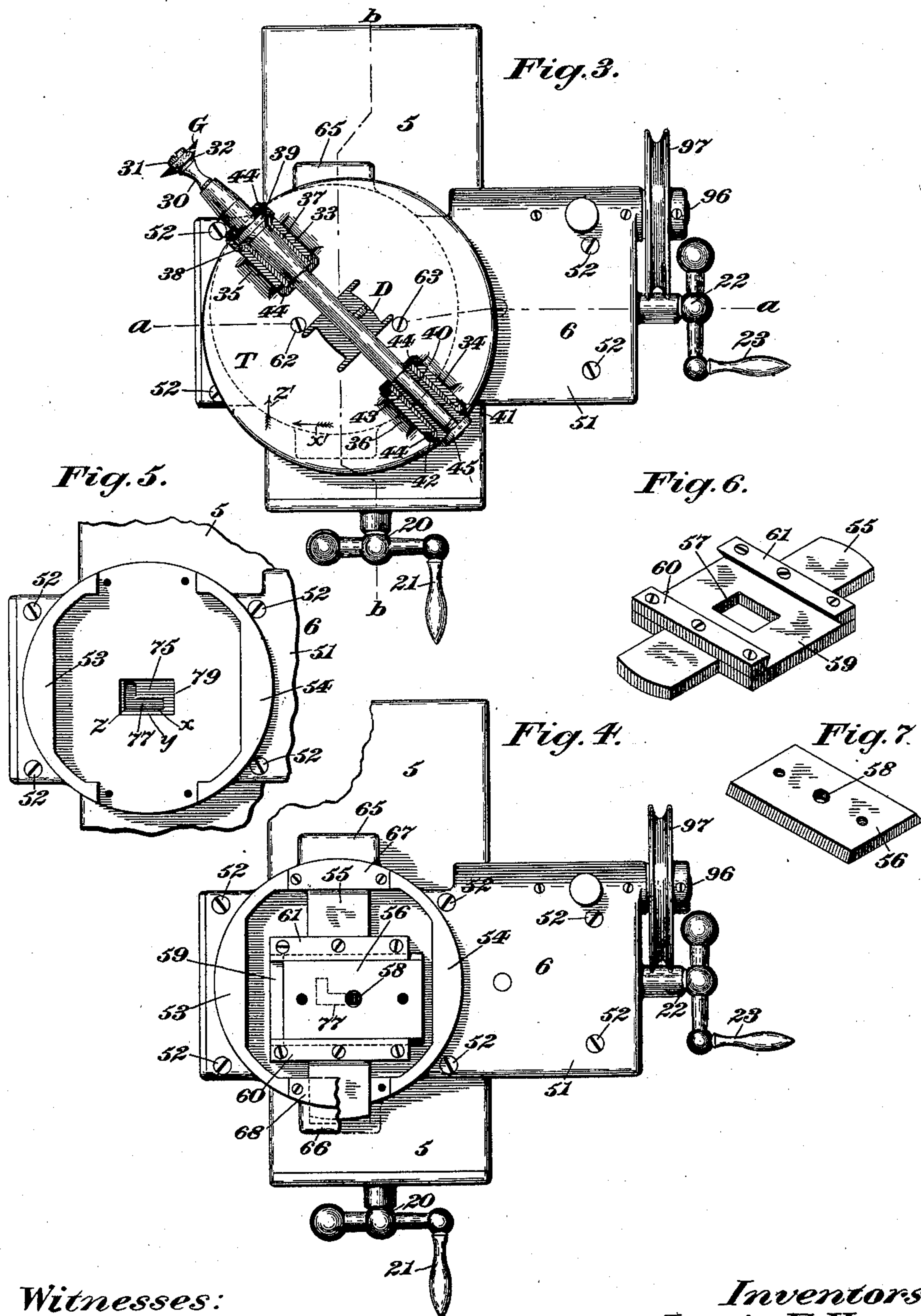
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Fig. 10.

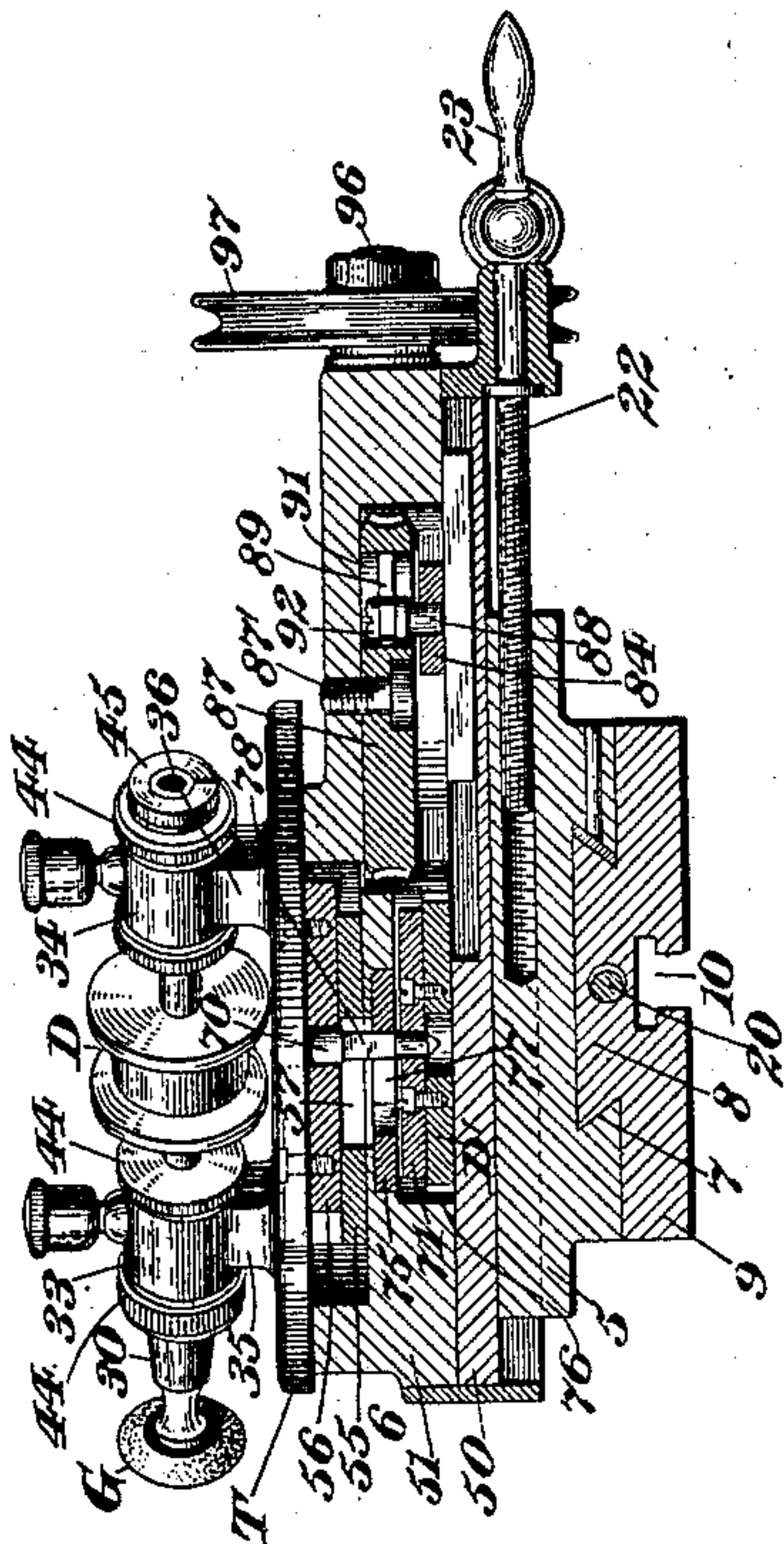


Fig. 11.

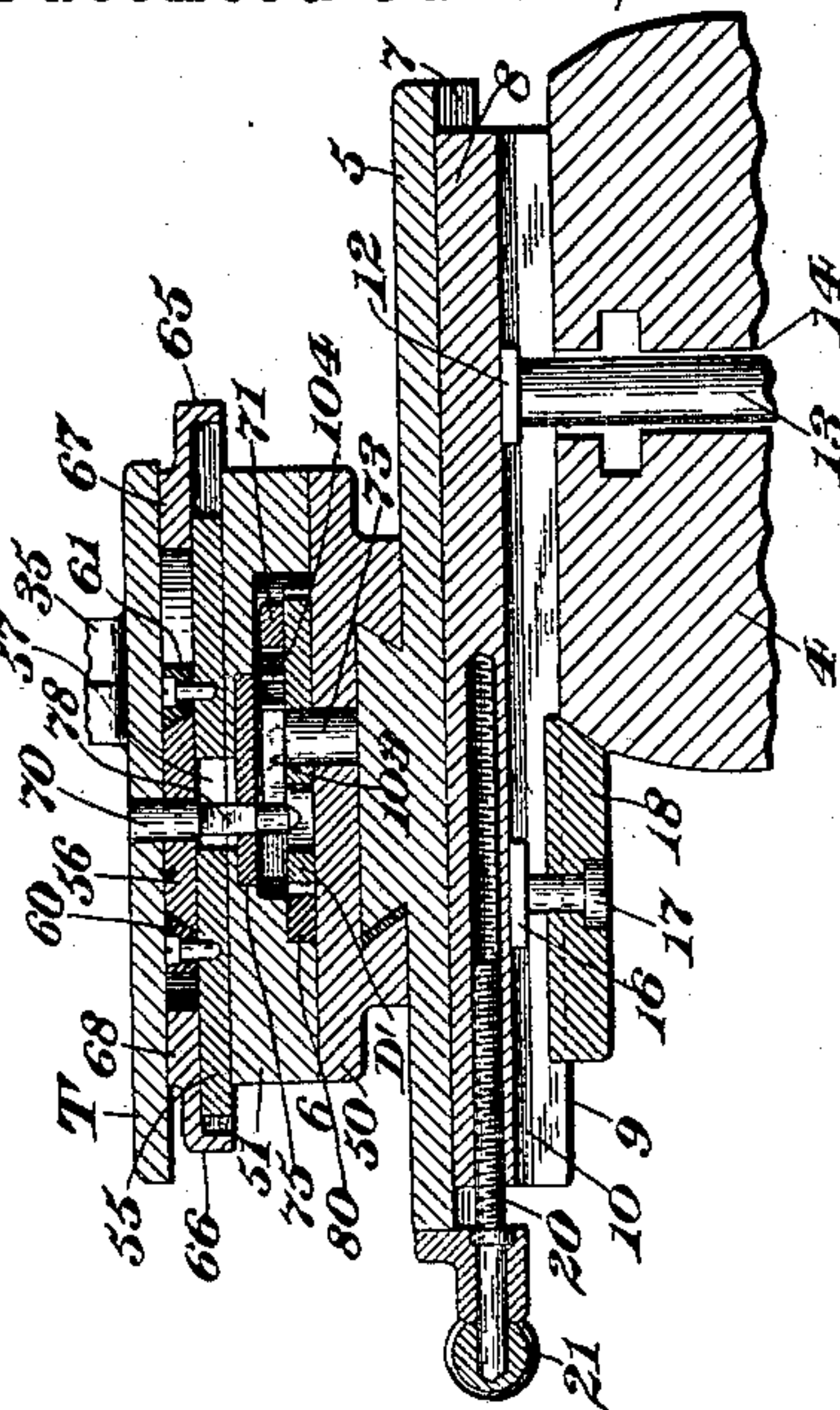


Fig. 8.

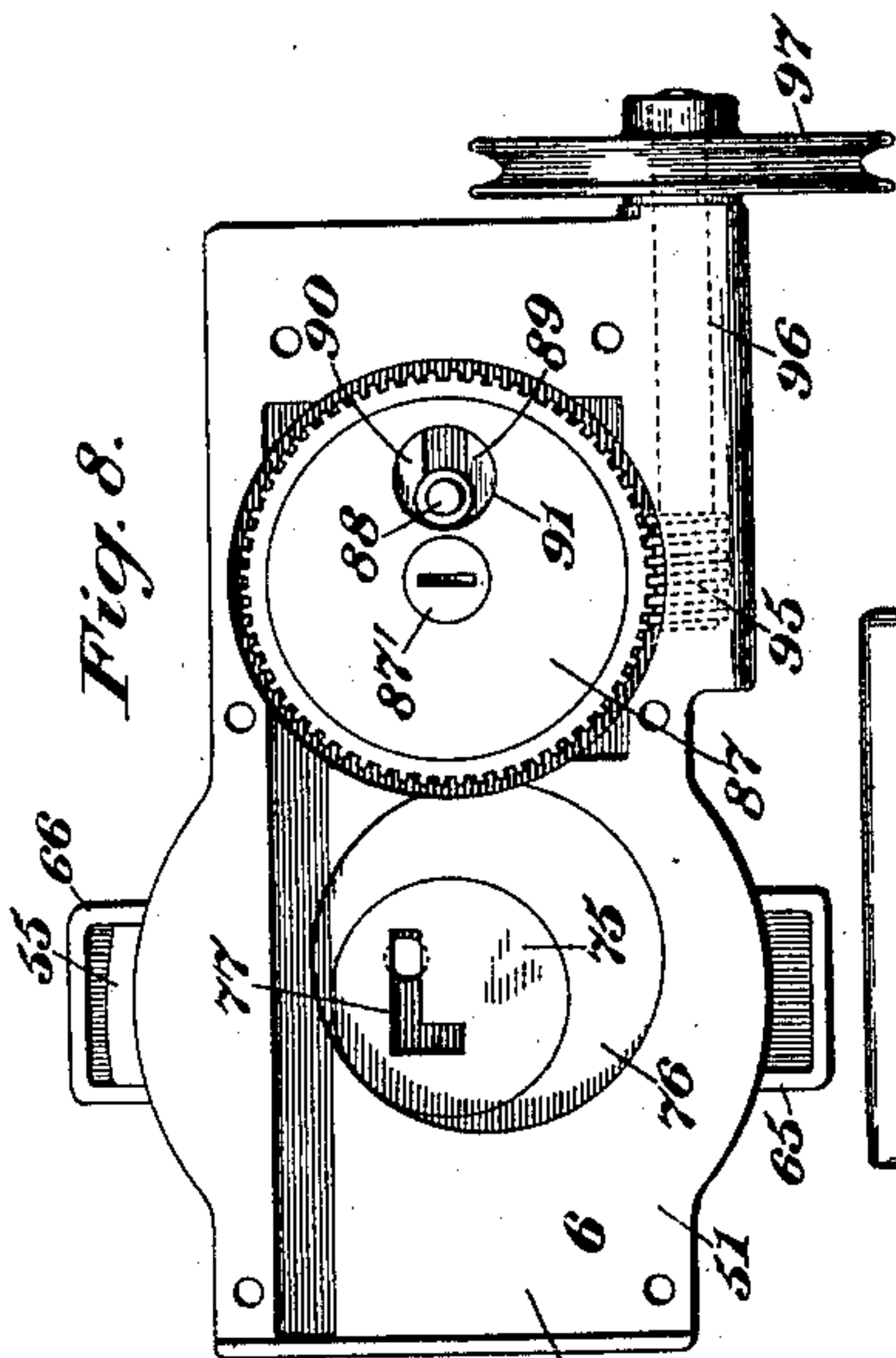


Fig. 9.

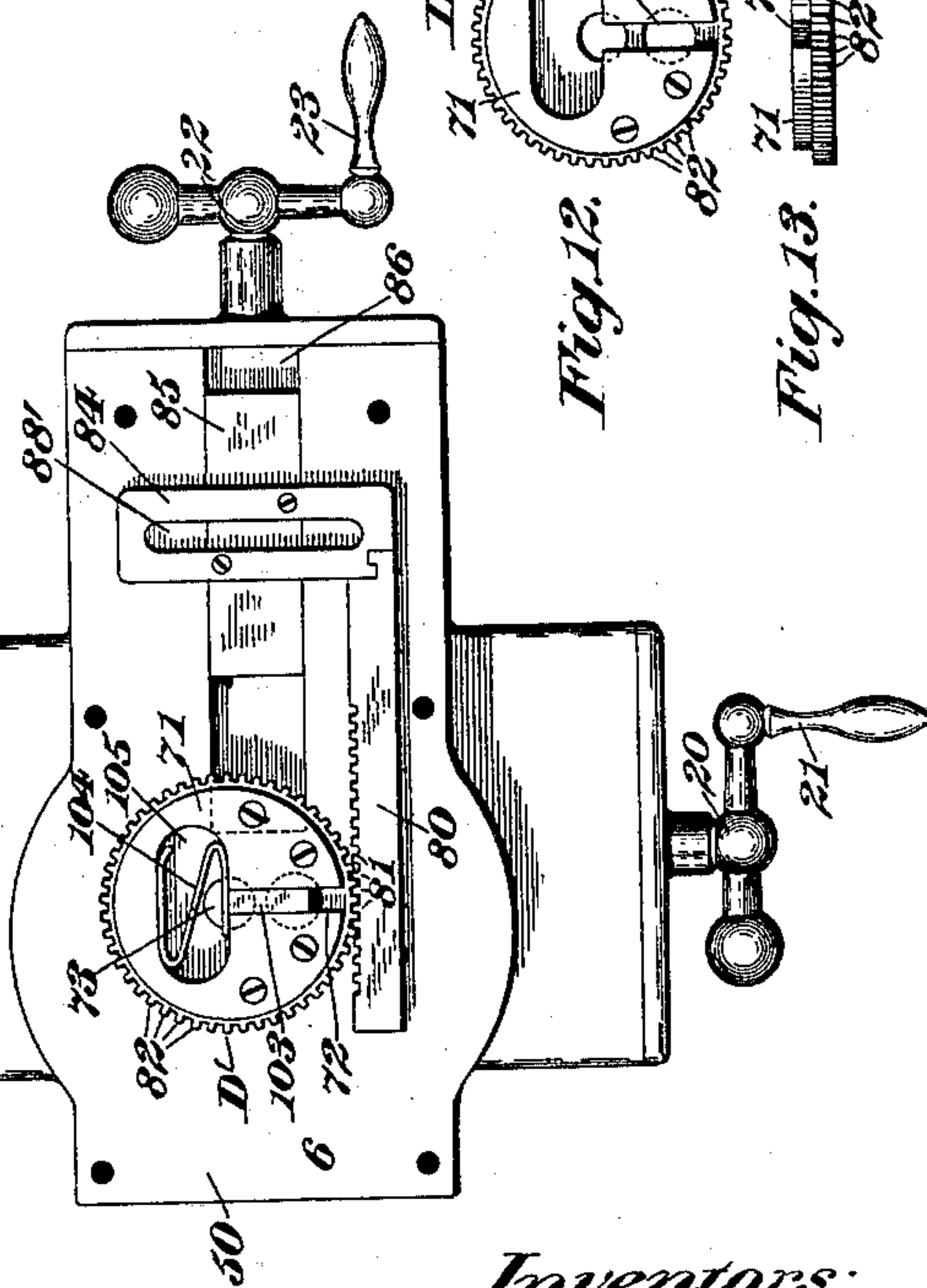


Fig. 12.

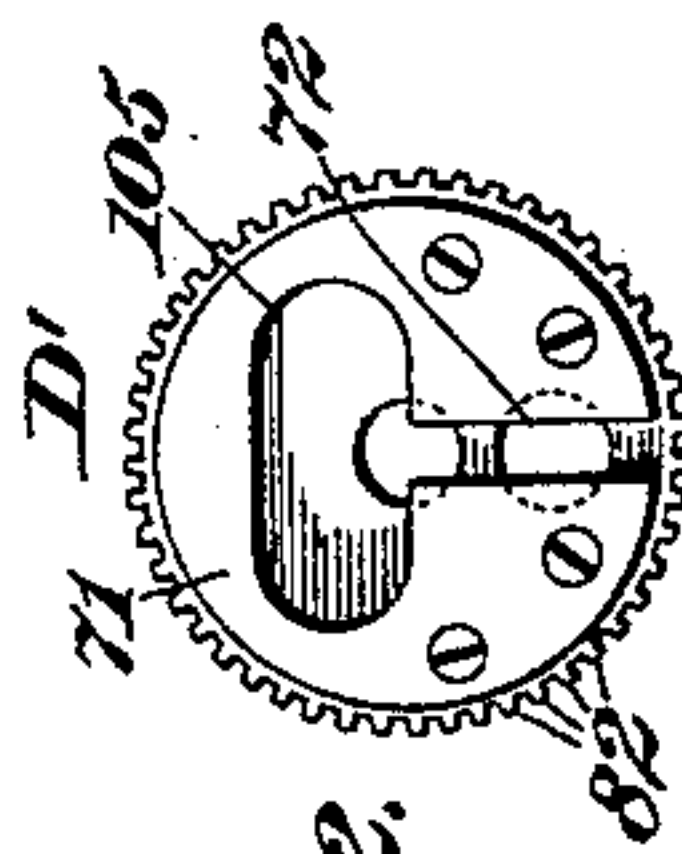
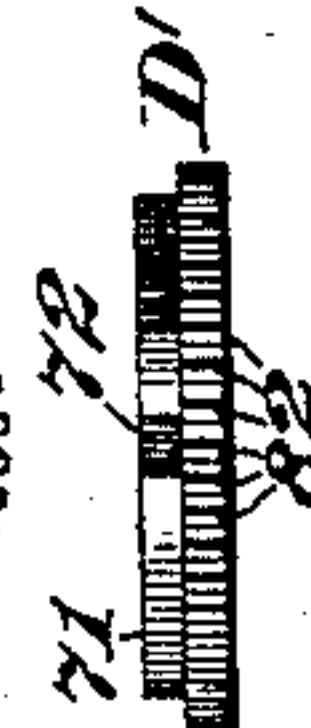


Fig. 13.



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Fig. 17.

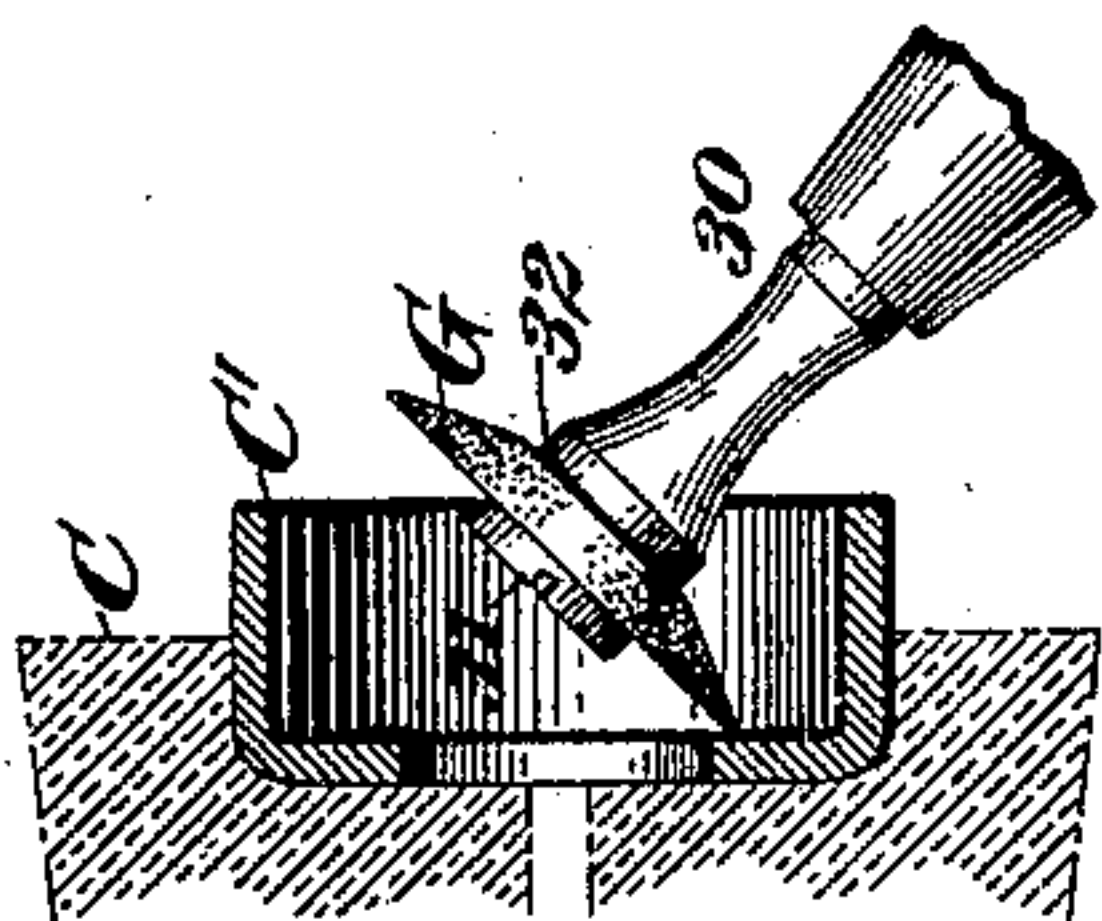


Fig. 16.

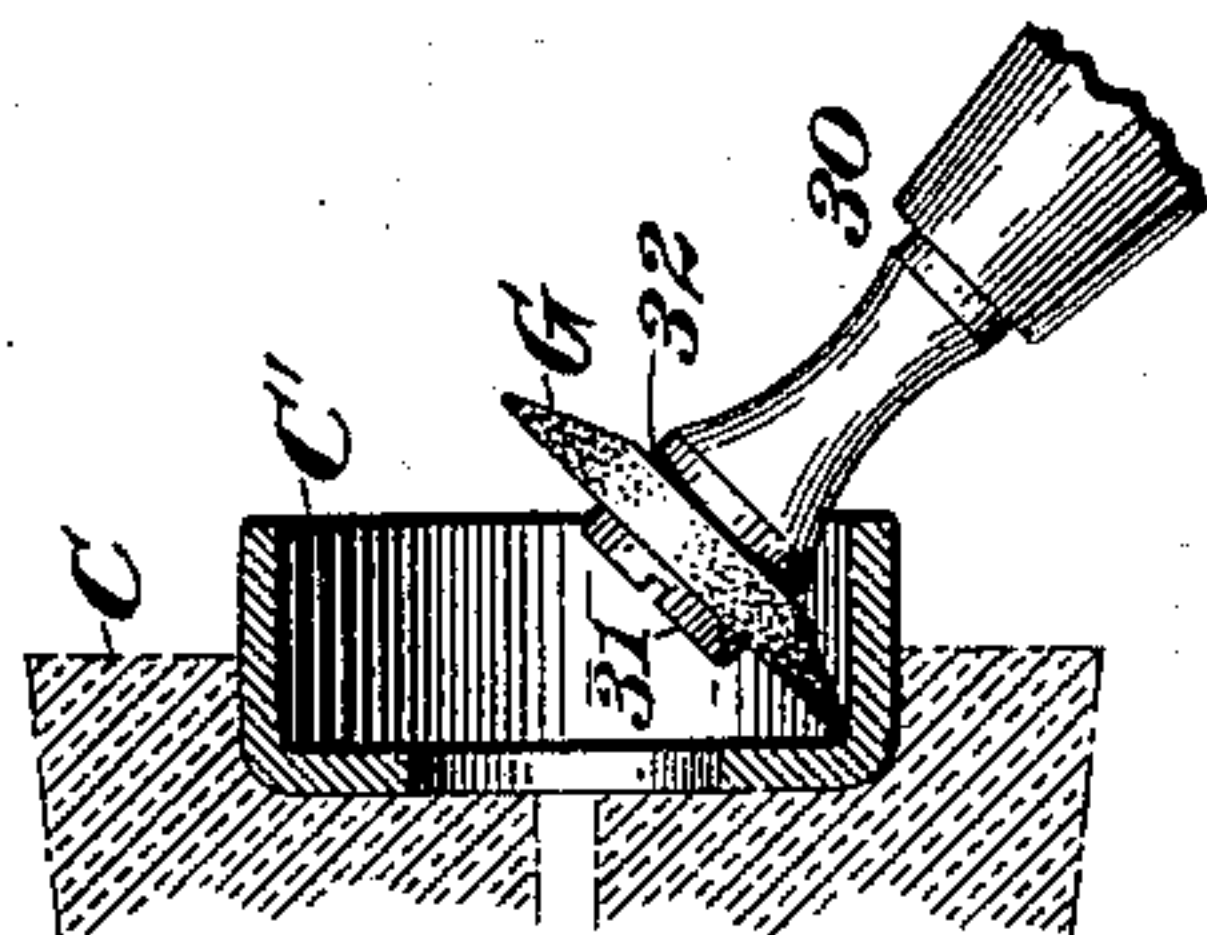


Fig. 15.

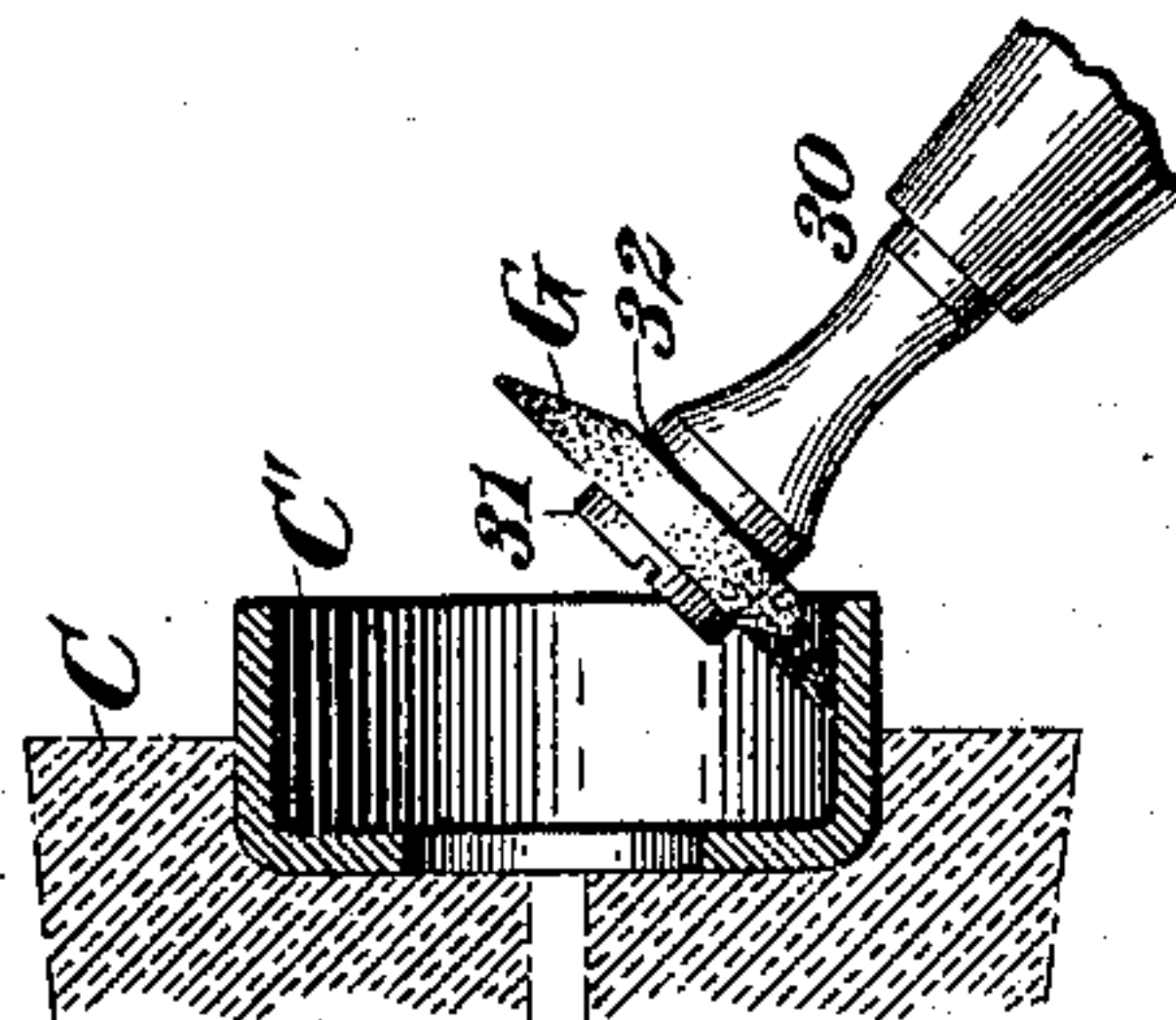


Fig. 14.

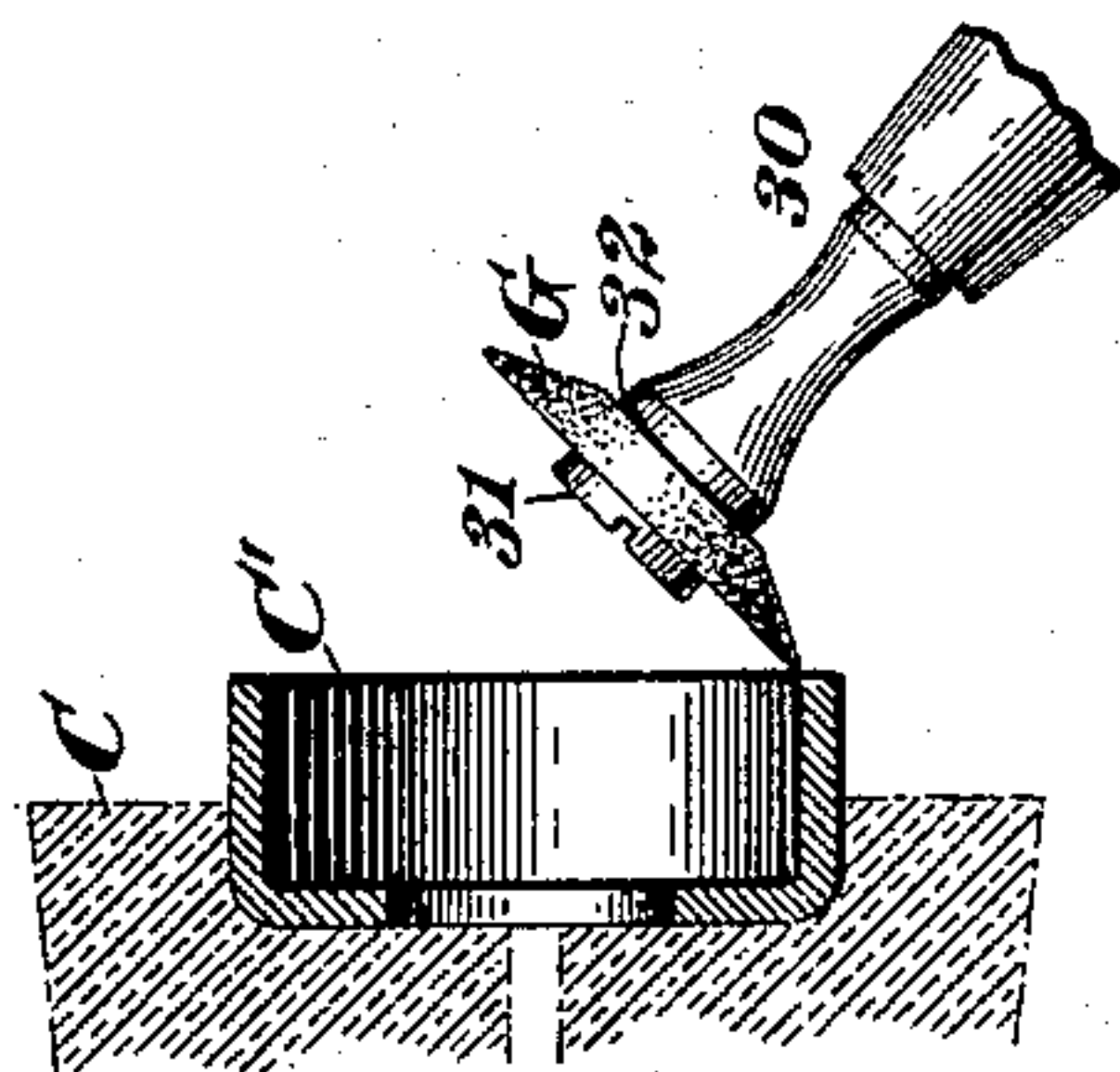


Fig. 22.

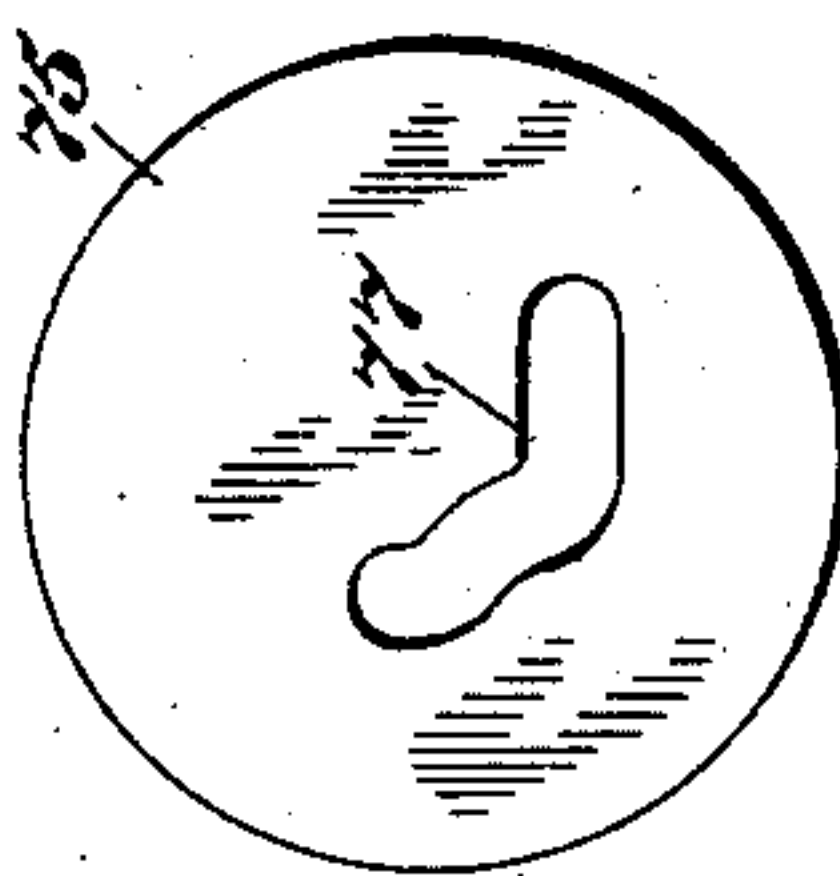


Fig. 21.

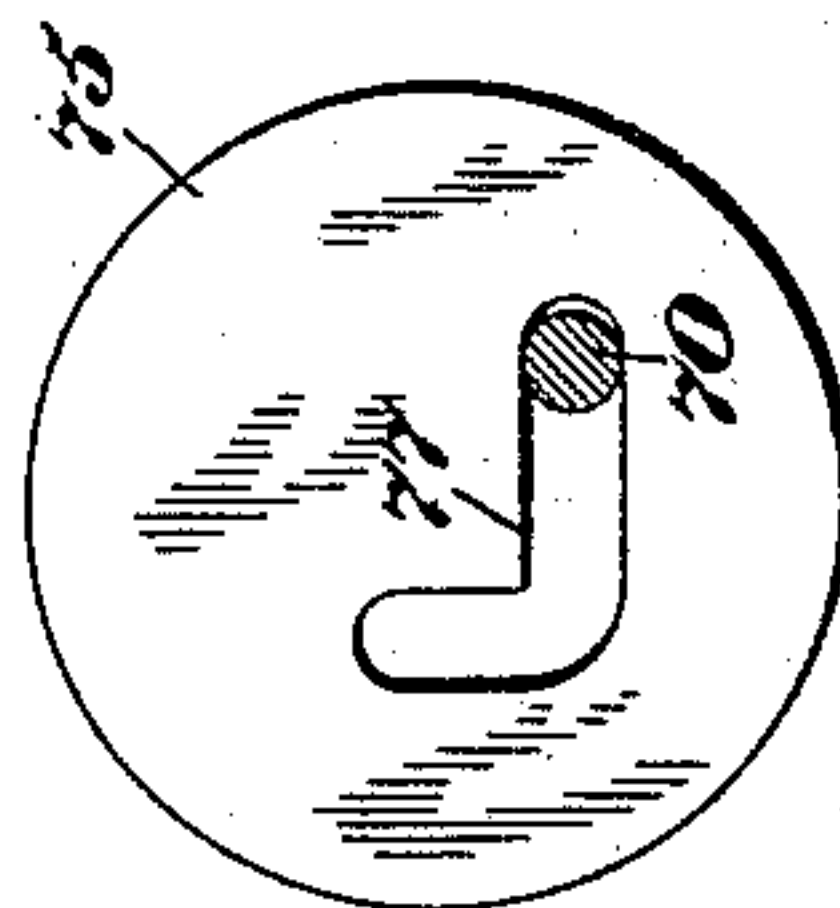


Fig. 18.

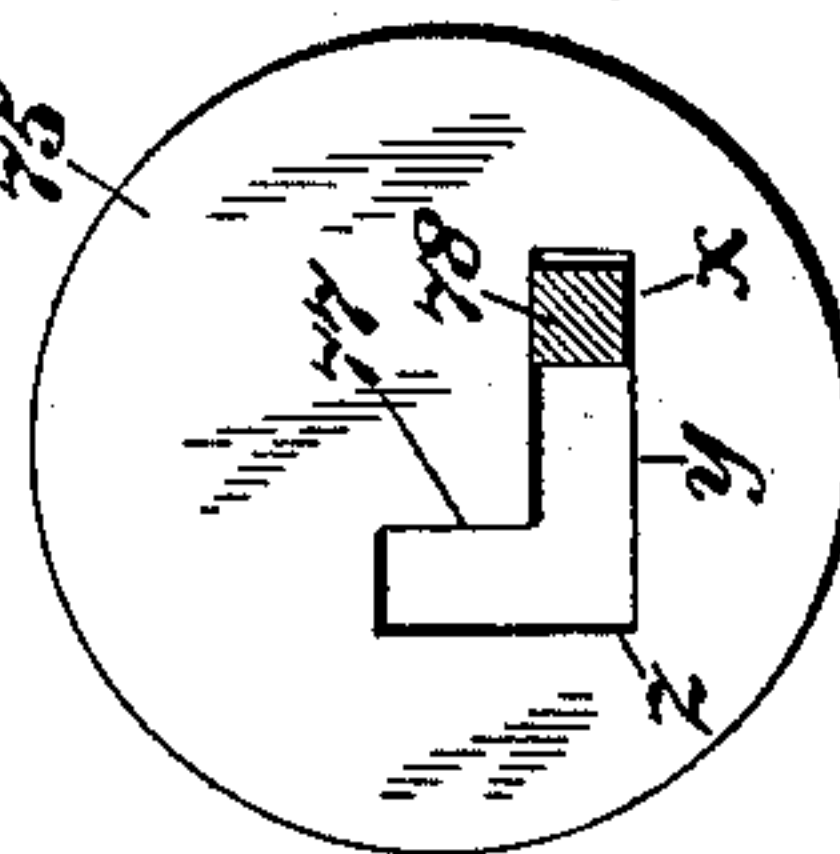


Fig. 19.

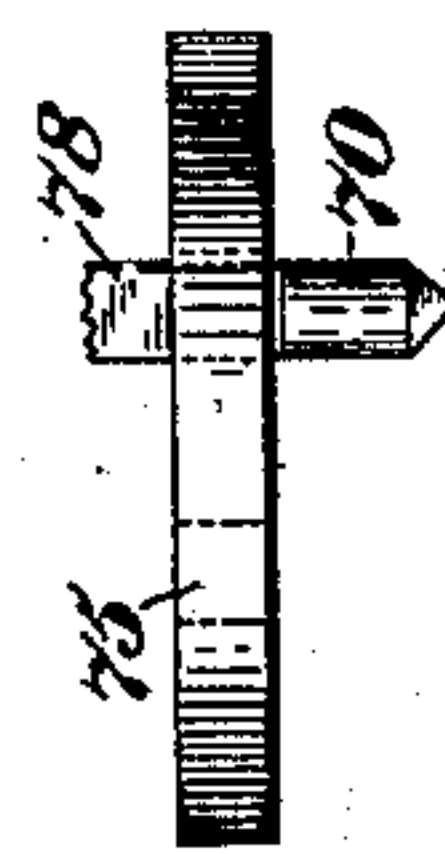
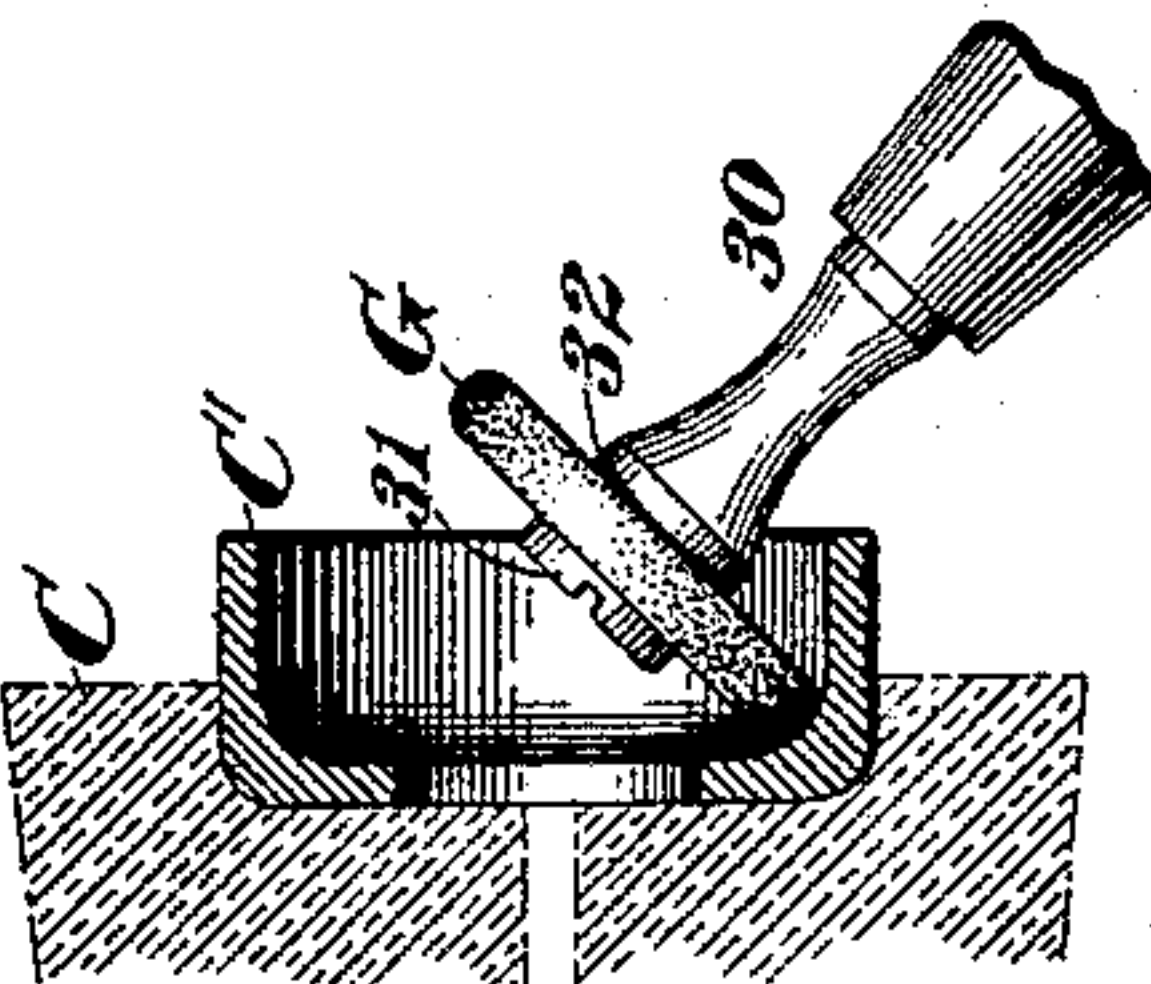


Fig. 20.



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UNITED STATES PATENT OFFICE.

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ASSIGNORS TO THE PRATT & WHITNEY COMPANY, OF SAME PLACE.

MACHINE FOR GRINDING OR DRESSING METAL.

SPECIFICATION forming part of Letters Patent No. 596,503, dated January 4, 1898.

Application filed May 10, 1897. Serial No. 635,782. (No model.)

To all whom it may concern:

Be it known that we, LEWIS E. HARPER and RICHARD F. DOW, 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 Grinding or Dressing Metal, of which the following is a specification.

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

In the drawings accompanying and forming part of this specification, Figure 1 is a plan view of our improved machine. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view of the tool mechanism, a portion being in transverse central section. Fig. 4 is a similar view with the head or table removed to show the two auxiliary slides. Fig. 5 is a fragmentary view in plan of a portion of the mechanism with the two auxiliary slides removed. Figs. 6 and 7 are perspective views of the auxiliary slides. Fig. 8 is a bottom plan view of the upper section of one of the main slides, showing the mechanism contained therein. Fig. 9 is a plan view of the lower portion of the mechanism, showing other parts of the means for actuating the tool. Fig. 10 is a cross-section taken in the line *a a*, Fig. 3. Fig. 11 is a similar view, the section being taken in the line *b b*, Fig. 3. Figs. 12 and 13 are details in plan and elevation, respectively, of one of the elements of the tool-actuating mechanism. Figs. 14, 15, 16, and 17 are sectional elevations showing the work in a chuck and the action of the tool in traversing a rectangular path. Fig. 18 is a plan view of a pattern or form for causing the tool to accomplish the work shown in Figs. 14 to 17, inclusive, said views also illustrating in transverse section a guide-pin. Fig. 19 is a side elevation of said pattern or form with the guide-pin extending therethrough. Fig. 20 is a sectional elevation of the work and the tool, the latter being in the act of finishing a curved

surface. Fig. 21 is a plan view of the pattern or form for causing the tool to accomplish the work shown in Fig. 20, and Fig. 22 is a similar view of a pattern or form to be used for a different kind of work.

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 the base 2, the standard 3, rising therefrom, and the longitudinal bed 4, secured to said standard and supporting the tool and chuck mechanism.

The tool mechanism comprehends, preferably, as a part thereof two adjustable main slides reciprocatory in transverse planes, the tool being mounted on one of said slides, so that an attendant may move the same toward and from the work. The two main slides are designated, respectively, by 5 and 6, the slide 6 being carried by the slide 5 and the slide 5 being adjustably mounted on the bed 4. The lower main slide 5 is longitudinally grooved on its under side, as at 7, to receive the guide or tongue 8, formed on a third slide 9, directly carried by the bed 4. The slide 9 has a preferably-dovetailed groove or slideway 10 to receive the head 12 of the holding and adjusting bolt 13, said bolt passing through an elongated slot 14 in the bed 4 and being furnished at its lower end with a thumb-nut 15, whereby when said thumb-nut is loosened the entire device can be simultaneously moved longitudinally of and maintained in a predetermined position on the bed 4 by tightening said thumb-nut 15. The upper portion of the dovetailed groove 10 is adapted to receive the block 16, with which the screw 17 is in threaded engagement, said screw passing through the plate 18, which is partly disposed in the guideway 10. By loosening the screw 15 the slide 9 can be moved crosswise of the bed 4 and can be held in the desired position by tightening said screw, it being understood that the stop-plate 18 bears against the bed 4, as shown in Fig. 11, the adjacent bearing-faces of these two parts being obliquely formed to fit against each other.

The lower main slide 5 has the usual adjusting-screw 20 suitably secured thereto, the

thread of which is adapted to engage an internal thread formed in the slide 9, said adjusting-screw being furnished with the customary handle 21 at its outer end, by which it can be rotated to adjust said slide 5 relatively to the slide 9.

The main slide 6, which is suitably guided upon the slide 5 for lateral movement, is furnished with the adjusting-screw 22, suitably secured thereto, the threaded portion of which is adapted to work in a correspondingly-threaded bore in the lower main slide 5, said screw being equipped at its outer end with the operating-handle 23, of ordinary construction, by which the screw can be turned in and out of its bore to admit of the movement of the upper slide 6.

As hereinbefore stated, the tool mechanism proper will be mounted on one of the main slides, and in the present case the upper main slide 6 constitutes a support for this purpose, said slide being made preferably in two sections or parts to incase or house the mechanism for reciprocating the tool.

It is to be understood that dressing-tools of various kinds may be employed to accomplish various classes of work, either interior or exterior, the tool in the present case consisting of a grinder adapted to finish off inside work.

The tool is illustrated in the form of a beveled grinding-disk G, suitably secured to a spindle or shaft 30, mounted on the head or table of the machine and preferably detachably held in position, whereby it can be readily removed, if desired, to substitute another in its place, although a milling or other kind of dressing or polishing tool may be substituted therefor to suit the character of work being operated upon.

Any suitable means may be employed for securing the tool to its spindle or shaft, a screw 31 being shown for this purpose, said screw passing through a central aperture in the tool, and its thread (not shown) being adapted to engage a cooperating internal thread formed at the working end of the spindle, the head of the screw being designed to bind firmly against the outer face of the tool, and the rear face of the latter fitting against a shoulder 32 on the spindle, whereby it will be held firmly in place. To substitute a different tool for that illustrated, it is simply necessary to remove the binding-screw 31, when this operation can be quickly accomplished.

The spindle 30 is preferably mounted upon the table or head T, said table being furnished at suitable points thereon with hubs or bearings 33 and 34, respectively, in which the spindle or shaft is designed to turn, said bearings being formed at the upper ends of the vertical posts 35 and 36, suitably secured to the table or carriage T, the latter being preferably supported for movement in an irregular path, either transverse or curvilinear, whereby the tool G, which is mounted thereon, is caused to travel in a coinciding direction.

The spindle or shaft 30 is encircled by the collar 37, which can be driven into the bore of the bearing or hub 33, the outer end of the bearing-collar 37 being shouldered, as at 38, said shoulder fitting against the outside face of said bearing 33, the spindle being provided with an annular bulge 39, fitting against said shoulder 38. The opposite or reduced end of the spindle is journaled in the bearing-collar 40, shouldered at 41 at its outer end, said shoulder being designed to fit against a shoulder 42 on the bushing 43, which can be driven into the bore of the bearing 34, the opposite ends of the bushing 43 and the bearing-collar 37 being embraced by removable rings, as 44. The spindle or shaft 30 is preferably held against longitudinal or endwise movement in its bearings by the check collar or nut 45, which is adapted to engage the externally-threaded end of the spindle and to bind against the shoulder 41 of the collar 40.

It will be understood that in the present instance, and as hereinbefore set forth, the tool G is rotary, and any suitable mechanism may be provided for obtaining this motion.

The driver for rotating the tool consists in the present case of a pulley D, which is secured to the spindle or shaft 30. In practice the driver or pulley will be rotated by a cross-belt, such as 47, passed around said pulley and also around a power-transmitting pulley or drum. (Not shown.)

The upper main slide 6, in which the tool-reciprocating mechanism is situated, preferably consists of two parts or sections 50 and 51, held together by suitable fastening means, as the screws 52, the upper section or plate 51 constituting a suitable cover for the other plate or section, and the slide-plate 51 preferably supporting for reciprocation the table or carriage T.

The plate 51 on its upper side, near one end thereof, is provided with the segmental flanges or tracks 53 and 54, constituting a convenient means for shiftably supporting the table T and is secured to the plate 50 in some suitable manner, the upper faces of the two flanges being flat or level and serving as a bearing-surface on which the flat under face of the table T is adapted to rest.

In connection with the tool G and its table or carriage T a plurality of transversely-reciprocatory auxiliary slides are provided, one of said slides being carried by the other and both being mounted in the space between the segmental tracks 53 and 54, respectively, means being provided for successively operating the two slides, and a similar motion being simultaneously imparted to the table T, and consequently to the tool mounted thereon. The two auxiliary slides are designated, respectively, by 55 and 56, each being apertured to receive a suitable guide-pin preferably carried by the tool-carriage, the aperture for the slide 55 being of rectangular shape and designated by 57, and the aperture for the slide 56 being designated by 58.

The slide 55 has at a point intermediate its ends the cross-piece 59, to the opposite sides of which are removably secured the gibs 60 and 61, said gibs being beveled on their inner faces to form, in connection with the cross-piece 59, a slideway for receiving the auxiliary slide 56.

The slide 56 is suitably secured to the under side of the table or carriage T, the screws 62 and 63 being shown for this purpose.

A pair of recessed lugs or extensions are shown at 65 and 66, having squared ends 67 and 68, which are situated in the spaces between the adjacent edges of the two segmental tracks 53 and 54, respectively, suitable means being provided to hold said squared extensions in place, and the recesses of the lugs forming slideways for receiving the opposite ends of the auxiliary slide 55.

The tool table or carriage is preferably equipped with a guide, such as the depending pin or lug 70, suitably fixed centrally thereto, and driving mechanism is employed to reciprocate the carriage, and consequently the tool, a pattern of desired shape being used to cooperate with the guide to effect a movement of the table and the tool thereon through a path corresponding with the shape of the pattern.

The means in the present case for operating the table consists of a driver for the guide-pin 70, said driver being designated by D' and comprising an oscillatory gear and an actuator 71 in the form of a cap suitably secured to the upper face thereof, said actuator 71 having a radial slot 72 to receive the lower end of the guide-pin 70.

The oscillatory driver or gear D' is pivoted at 73 to the lower section 50 of the main slide 6 and can be operated in any suitable manner.

It will be evident that the lower end of the pin 70 being in the slot and the gear D' being suitably oscillated the actuator 71 will move the table T on its support, and when a suitable pattern is placed between the driver D' and the table T the table will be caused to move in a path corresponding with the shape of the pattern.

In Figs. 4, 5, and 8 a pattern is illustrated for causing the traverse of the carriage T in a rectangular path, the pattern consisting in the present case of a disk removably secured in place in the upper section 51 of the main slide 6. The pattern or form is designated by 75, and consists in the present instance of a disk which is seated in a recess 76, formed in the under side of the plate 51, said pattern or disk having a guide-slot 77 to receive the squared portion 78 of the guide-pin 70, the guide-slot 77 being shown in Figs. 4, 5, 8, and 18 of rectangular shape, although it is apparent from an inspection of Figs. 21 and 22 that it may be of other shape.

On reference to Figs. 10 and 11 it will be observed that the guide-pin 70 is of a length to pass through the apertures 57 and 58 of

the auxiliary slides 55 and 56, the opening 79 in the plate 51, and the guide-slot 77, and partially through the radial slot 72 of the actuator 71. At the commencement of the operation the guide-pin 70 is in the guide-slot 77 of the portion 75 at the point x , (see Fig. 5,) and also in the slot 77 of the driver D', so that on the movement of said driver the guide-pin 70 will be caused to travel along the portion y of the guide-slot and to turn, when it reaches the angle of the slot, into the portion z thereof until the driver D' has reached the end of its movement, at which time the operation just described will be reversed and the alternate advance and retraction of the guide-pin 70 and table T will follow so long as the driver D' is in motion.

It will be evident that on the action of the pin in the manner just alluded to the table T will be first moved in a direction corresponding with the arrow x' and subsequently in a direction corresponding with the arrow z' and back again through the same path, the plates 56 and 55 by reason of their connection with the table being caused to move successively in transverse planes corresponding with the movement of the table and the guide-pin secured thereto.

For the purpose of reciprocating the driver D', and consequently the other parts of the machine depending on the driver for their action, any suitable means may be employed, the rack 80, suitably driven, being provided for the purpose, the teeth 81 of the rack meshing with the teeth 82 of the driving-gear. The rack 80 is removably secured to the block 84 by a mortise-and-tenon joint, and said block is suitably fastened to the reciprocating slide, as by ordinary screws, the block being mounted in the way or groove 86, formed in the under plate 50 of the main slide 6, the slide 85 being oppositely beveled along its opposite edges to prevent its displacement.

For the purpose of reciprocating the slide 85 the power-transmitting member or worm-gear 87 is shown, said gear being pivotally mounted, as at 87', and provided with a suitable crank adapted to enter the longitudinal slot 88' of the block 84, whereby on the rotation of the gear 87 the block 84, slide 85, rack 80, and driver D' will be operated.

The crank for the gear 87 is designated by 88, it being removably held in position and is secured to the webs 89 and 90, formed at opposite sides of the eccentrically-located aperture or opening 91 in the worm-gear 87. The head of the crank 88 is provided with flat sides and is adapted to fit between the opposite webs 89 and 90, and said crank is maintained in a fixed position by a screw 92 in threaded engagement therewith.

By loosening the screw 92 the crank-pin 88 may be moved toward or from the center of rotation of the gear 87 to vary the stroke of the several parts deriving their motion therefrom to adapt the machine to different styles

of work, the screw 92 being adapted to bind against the upper sides of the two webs 89 and 90 to hold the crank in a fixed position.

The worm for rotating the gear 87 is designated by 95, it being formed on the inner end of the shaft 96, suitably journaled in the upper plate 51 of the main slide 6, and said worm-shaft 96 may be continuously rotated in any suitable manner, as by the band-pulley 97, secured to the shaft, said pulley being connected with a suitable motor (not shown) by a belt 98.

Any suitable means may be employed for holding the work to be operated upon, an ordinary chuck, as C, being shown for this purpose.

As hereinbefore stated, our present machine is capable of efficiently performing a variety of work either inside or outside; but for the purpose of illustrating the operation thereof we have shown a cup or section of a box generally employed for containing bicycle bearing-balls as held within the chuck C to be interiorly finished, said cup or box being designated by C'.

The chuck C is secured to its spindle 99, supported in suitable bearings or posts, as 100 and 101, respectively rising from the bed 4, the chuck-spindle 99 being furnished with the usual cone-pulley 102, said cone-pulley being connected by a belt or band 102' with a similar pulley. (Not shown.)

In connection with the tool G means are provided for holding the same firmly against the work, such means in the present case consisting of the spring-pressed block 103, situated in the radial slot 72 of the actuator 71, said block being adapted to act against the guide-pin 70, whereby the same is held against the outside wall of the pattern-slot.

The spring which acts against one end of the block 103 is designated by 104, it being an extensile spring of substantially Z shape and seated within the recess 105 in the driver-cam 71, so that when the pin leaves one branch of the slot it is made to promptly enter the other branch of said slot and thereby cause the tool to act upon the other portion of the work.

In operation the attendant will manipulate the several hand-slides to carry the tool G to and in contact with the outside edge of the inner surface of the cup C', it being understood that at this time the several shafts are at rest. The several belts then being shipped to tight pulleys on a line-shaft, (not shown,) the spindle and other shafts of the machine will be rotated so that, the pattern or form 75 being in proper position, the tool G, in the manner hereinbefore described, will be caused to traverse a reciprocatory path corresponding with the pattern to dress out the cup C'.

For the purpose of permitting the tool G to operate evenly and throughout the entire surface of the inside of said cup the axis of rotation of the tool-spindle is disposed obliquely to the axis of rotation of the chuck-

spindle 99, and consequently to the work held in the chuck, the tool and chuck spindles being oppositely rotative to secure a more efficient action, this last-stated operation being obtained by the crossed belt 47.

In Fig. 21 the pattern 75 is shown as having a guide-slot 77 of curved form, whereby curvilinear work, as represented in Fig. 20, can be performed, the periphery of the tool in Fig. 20 being rounded to adapt it to the different kinds of work. In Fig. 22 another style of pattern is illustrated, wherein the guide-slot is of compound curvature.

Having described our invention, we claim—

1. The combination, with a dressing-tool and its table, of a guide; a pattern having an irregular slot to receive the guide; and means for engaging the guide to carry it successively into the different portions of the slot and then to return it.

2. The combination, with a dressing-tool and its table, of a guide; a pattern having an irregular slot to receive the guide; a device for engaging the guide to carry it successively into different portions of the slot and then to return it; and means for varying the movement of said guide.

3. The combination, with a dressing-tool and its table, of a guide on the table; a pattern having an irregular slot to receive the guide; and oscillatory means for engaging the guide to carry it successively into different portions of the slot and then to return it.

4. The combination, with a dressing-tool and its table, of a guide; a pattern; and continuously-operative means for engaging the guide to carry it in a path coinciding with the pattern and then to return it.

5. The combination, with a dressing-tool and its table mounted for movement in an irregular path, of a guide secured to the table; a pattern; and a driver, the pattern and the driver being slotted to receive the guide.

6. The combination, with a dressing-tool and its table supported for movement in an irregular path, of a guide secured to the table; a pattern; a gear; an actuator secured to the gear, the actuator and pattern being slotted to receive the guide; and means for operating said gear.

7. The combination, with a support, of a plurality of slides mounted for reciprocatory movement in transverse planes, one of them carried by the other, the carrying-slide being mounted for movement on said support; a track on said support; a table on the track, having a guide passing through apertures of said slides, said table being secured to one of the guides; a pattern; and means for operating the table.

8. The combination, with a dressing-tool and its table, of a cooperating guide and pattern, one of which parts is connected with the table; a pair of slides mounted for movement in transverse planes, one of which is carried by the other and is secured to the table; and means for operating the table.

9. The combination, with a dressing-tool and its table, of a cooperating guide and pattern, one of which parts is connected with the table; a support for the slide, furnished with a track for the table; means for securing the table to one of the slides; and mechanism for operating the table.

10. The combination, with a support, of a table on the support; a guide; a pattern having a slot to receive the guide; a pair of slides mounted for movement in transverse planes and one of them carried by the other and secured to the table; and table-operating means.

11. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a slotted actuator the slot of which is adapted to receive a spring-pressed block and also to receive said guide, against which the spring-pressed block is adapted to act; and means for operating said actuator.

12. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver consisting of a gear and a slotted actuator connected to said gear, the guide being located in said slot; a block also located in the slot of said actuator and adapted to act against said guide; a spring seated in a recess in the actuator and adapted to bear against said block; and means for operating the driver.

13. The combination, with a dressing-tool and its table, of a main slide having a track; a table mounted on the track; a plurality of auxiliary slides one of which is carried by the other and secured to the table for movement therewith, the supporting auxiliary slide being mounted on the main slide; a guide on the table, passing through apertures in the auxiliary slides; a pattern carried by the main slide; and a driver, the pattern and driver being slotted to receive said guide.

14. The combination, with a dressing-tool and its table, of a pair of apertured slides one of which is connected to the table and is carried by the other slide; a guide connected to said table and passing through the apertures in the two slides; a pattern the slot of which is adapted to receive said guide; and means for operating the table.

15. The combination, with a dressing-tool and its table, of a guide on the table, having a squared portion; a slotted pattern the slot of which receives the squared portion of the guide; means for operating the table; and a spring-actuated device acting against the guide.

16. The combination, with a dressing-tool

and its table, of a cooperating guide and pattern one of which is connected with the table; a driver for the table; and means for varying the movement of said driver.

17. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for said table; a power-transmitting device; and connections between the power-transmitting device and the driver; and means on the power-transmitting device, for varying the movement of the driver.

18. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for the table; a gear; connections between said gear and the driver; and a device carried by the gear, for varying the movement of the driver.

19. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for said table; a gear having an adjustable crank; a block adapted to receive the crank; and a connection between said block and the driver.

20. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for said table, embodying a gear; a rack meshing with said gear; a block connected to the rack; and a gear having a crank adapted to be seated in a slot in said block.

21. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for the table, embodying a gear; a rack meshing with said gear; a block connected with the rack; a slide to which said block is secured; a gear having a crank adapted to be seated in a slot in said block; and means for operating said last-mentioned gear.

22. The combination, with a dressing-tool and its table, of a cooperating guide and pattern one of which parts is connected with the table; a driver for said table, embodying a gear; a rack meshing with said gear; a slotted block connected with said rack; a slide to which the block is secured; a worm-gear provided with a crank seated in the slot of said block; a shaft having a worm meshing with the worm-gear; and a pulley secured to said shaft.

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