No. 816,854. PATENTED APR. 3, 1906.

A. FERNANDEZ.

TAPER BORING MACHINE.

APPLICATION FILED OCT. 28, 1901.

4 SHEETS—SHEET 1.

Fig. 1.

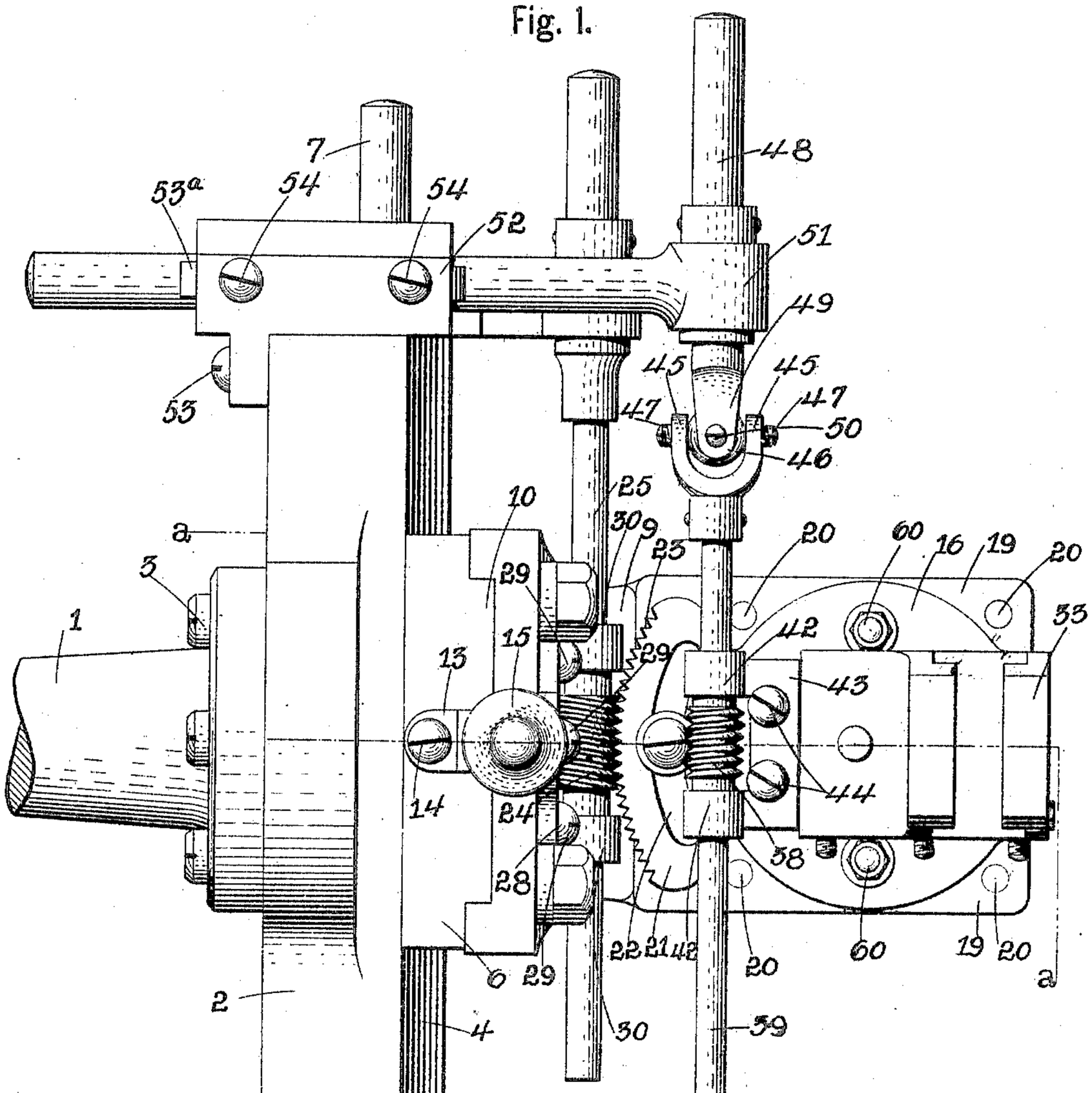
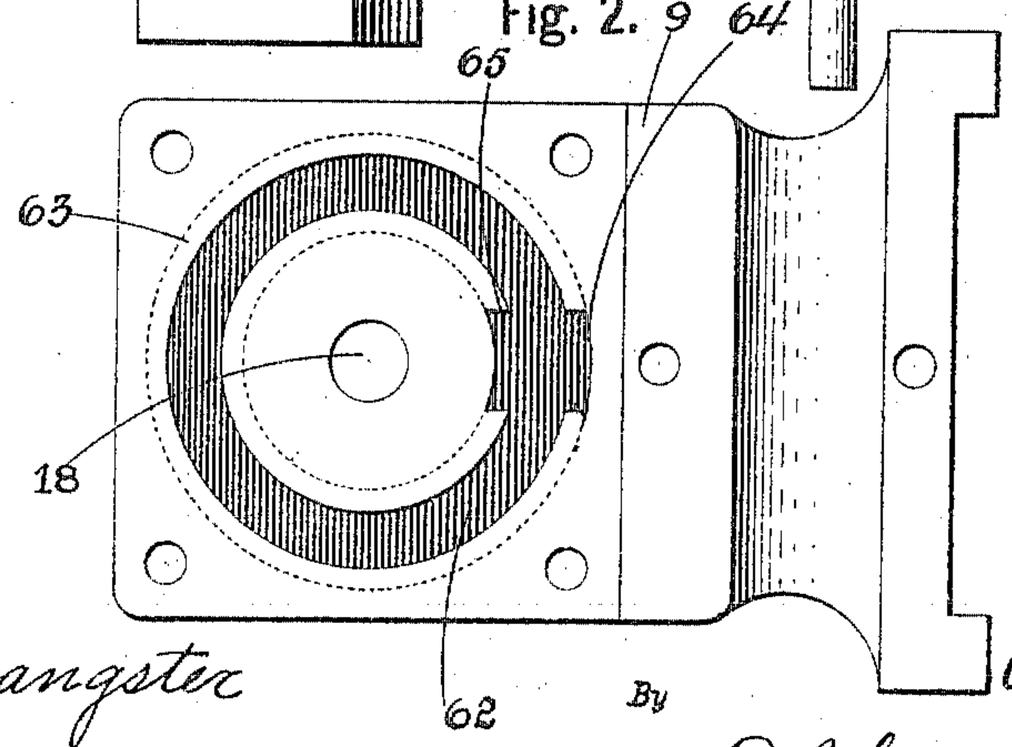


Fig. 2.



Witnesses.

L. M. Sangster

Geo. A. Neubauer.

Inventor.

Anthony Fernandez.

By A. J. Sangster Attorney.

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4 SHEETS—SHEET 2.

Fig. 3.

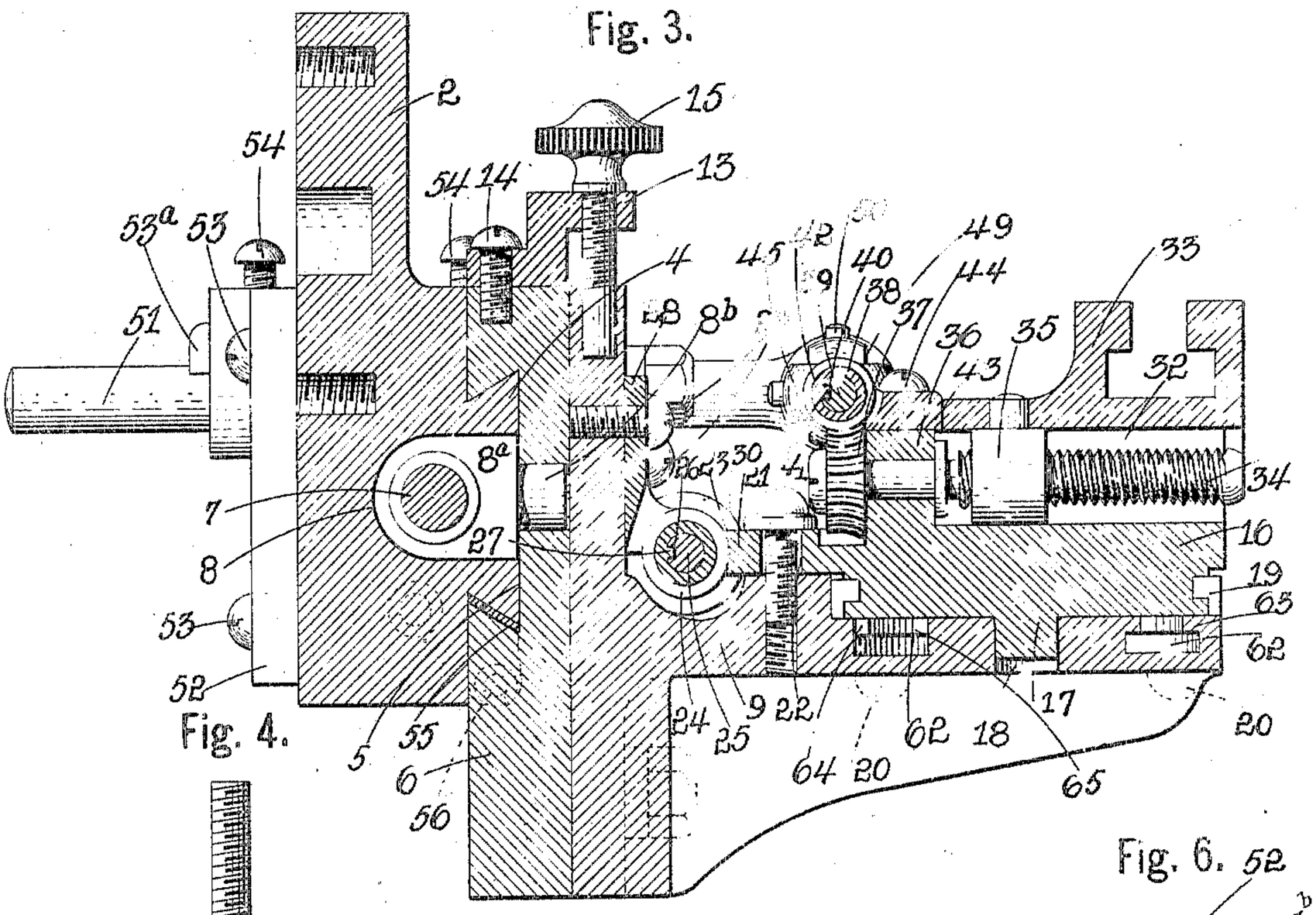

Fig. 4.

Fig. 5.

Fig. 6.

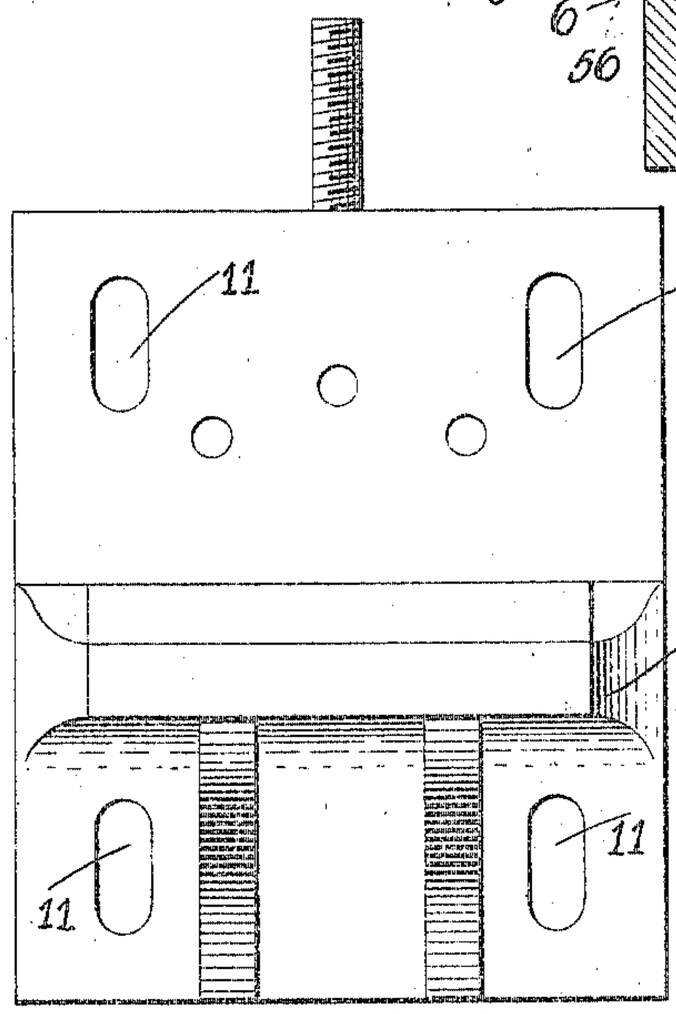

Fig. 9.

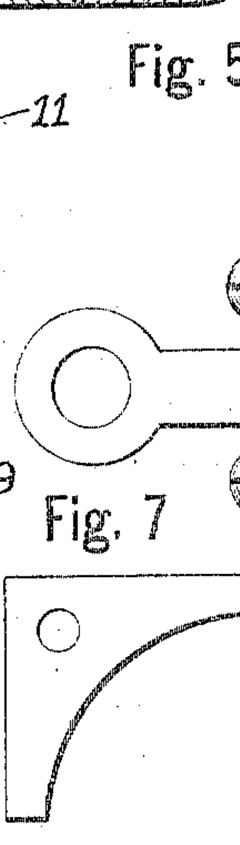

Fig. 7

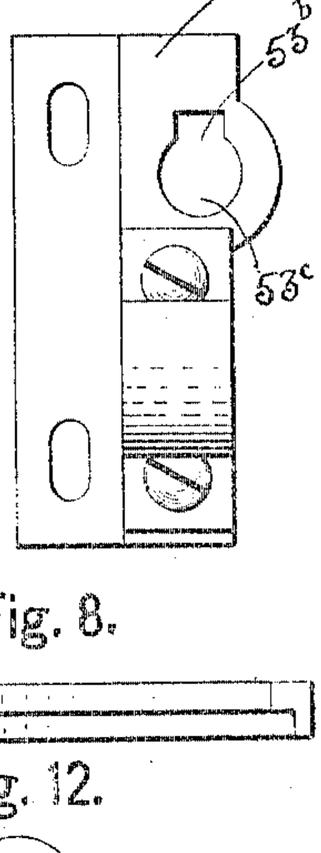

Fig. 8.

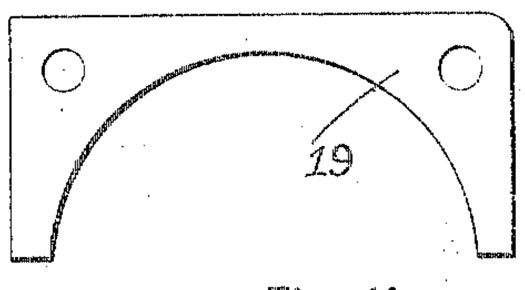

Fig. 12.

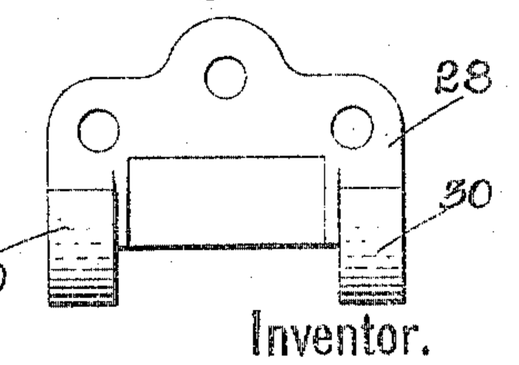

Fig. 10.

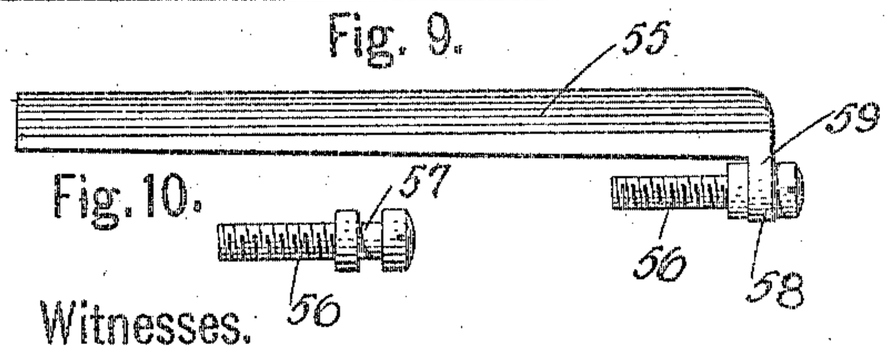

Fig. 11.

Witnesses.

L. M. Sangster.

Geo. A. Neuhauer.

Inventor.

By Anthony Fernandez.

A. J. Sangster Attorney.

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4 SHEETS—SHEET 3.

Fig. 13.

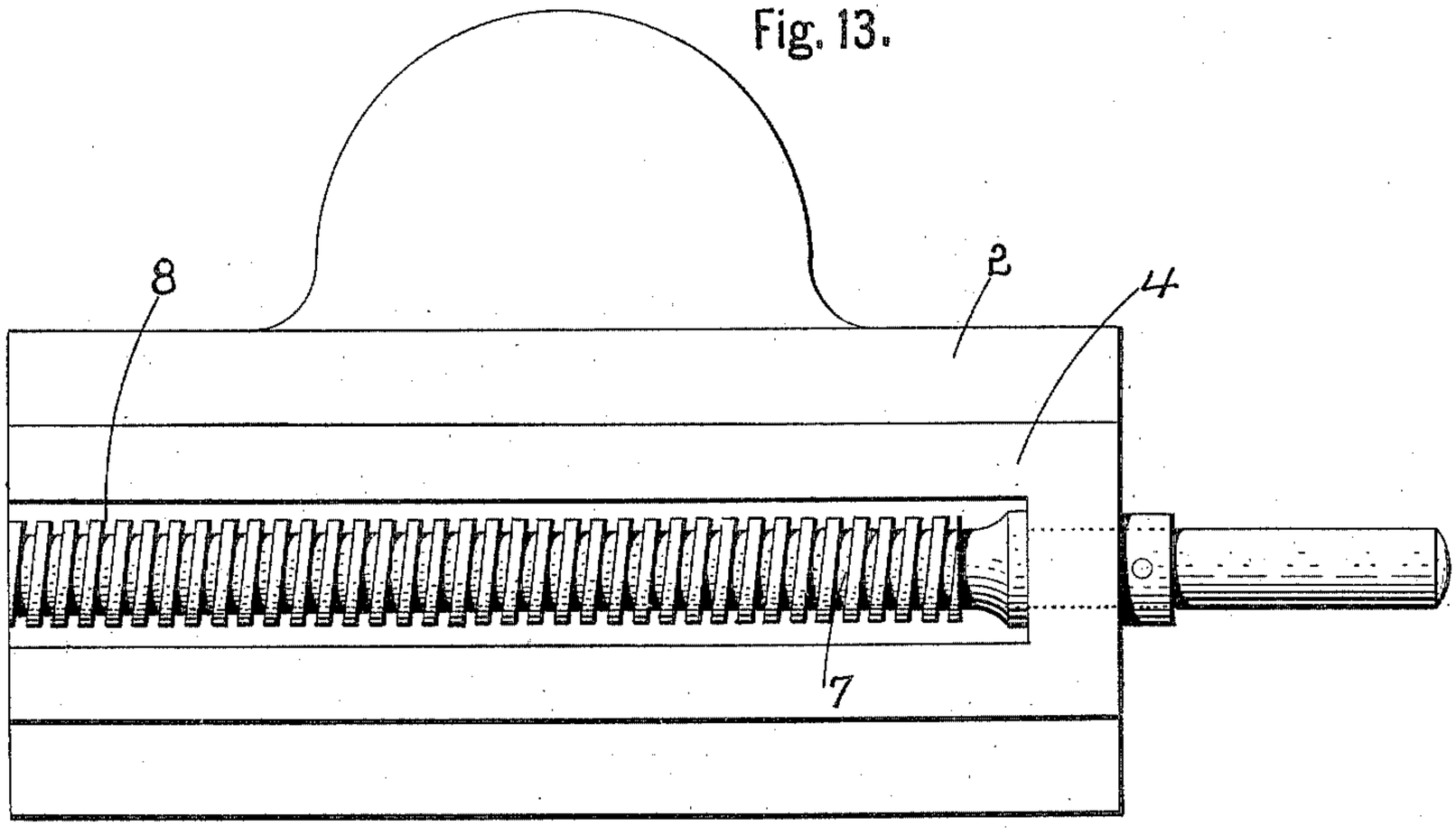


Fig. 16.

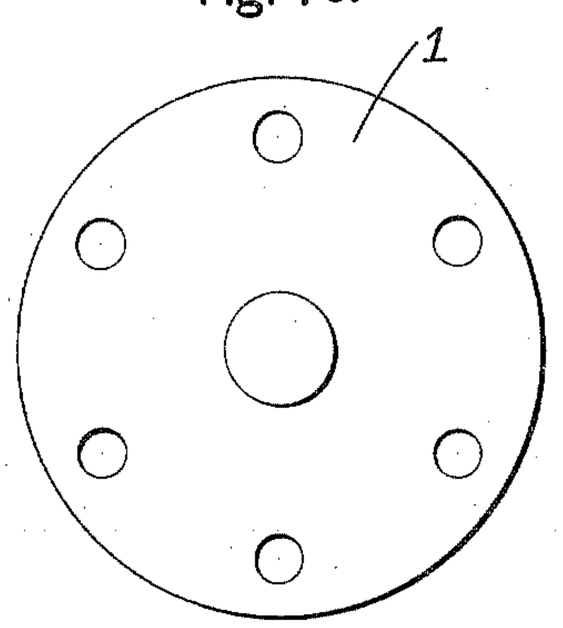


Fig. 14.

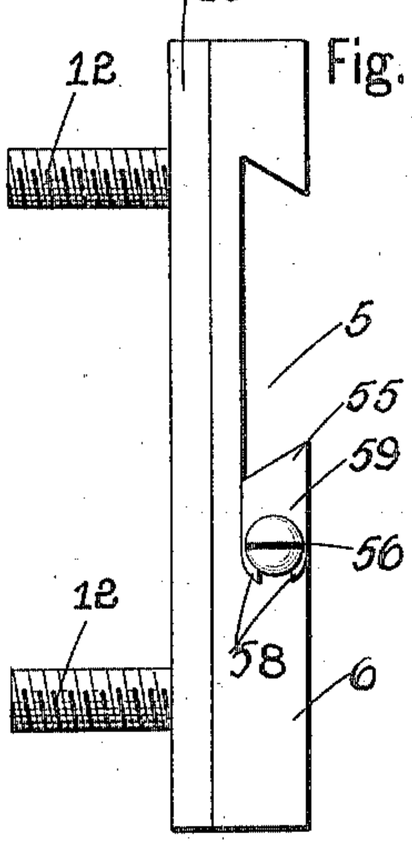


Fig. 15.

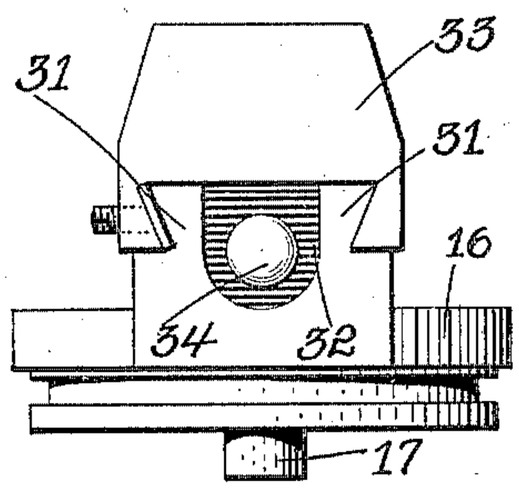
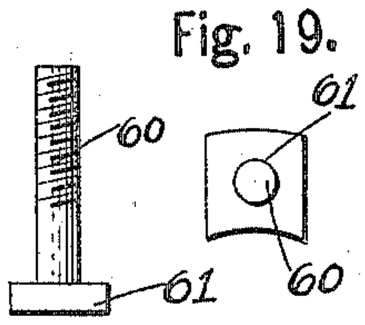


Fig. 17.

Fig. 18.

Fig. 19.



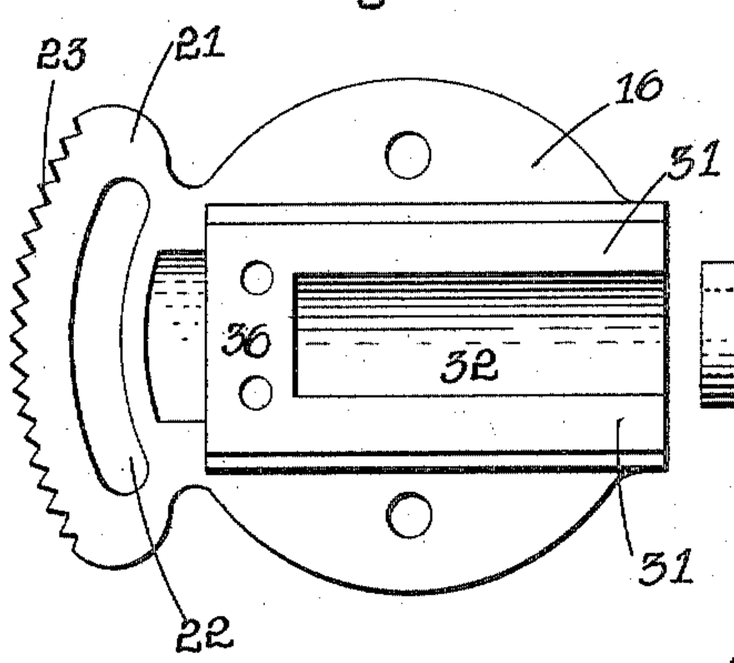
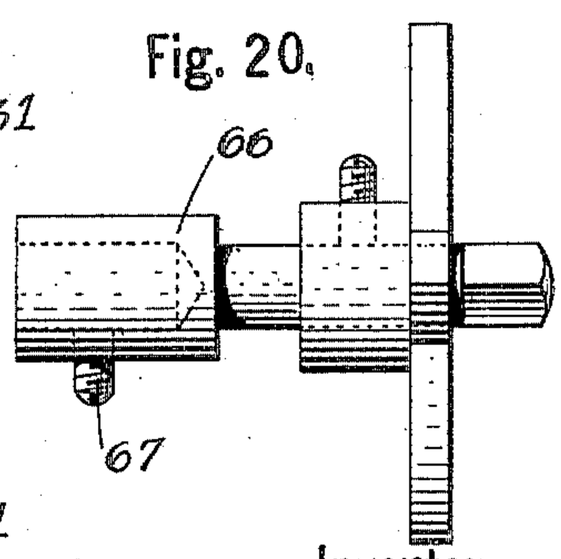


Fig. 20.



Witnesses.

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Geo. A. Neubauer.

Inventor.

Anthony Fernandez.

By C. J. Sangster Attorney.

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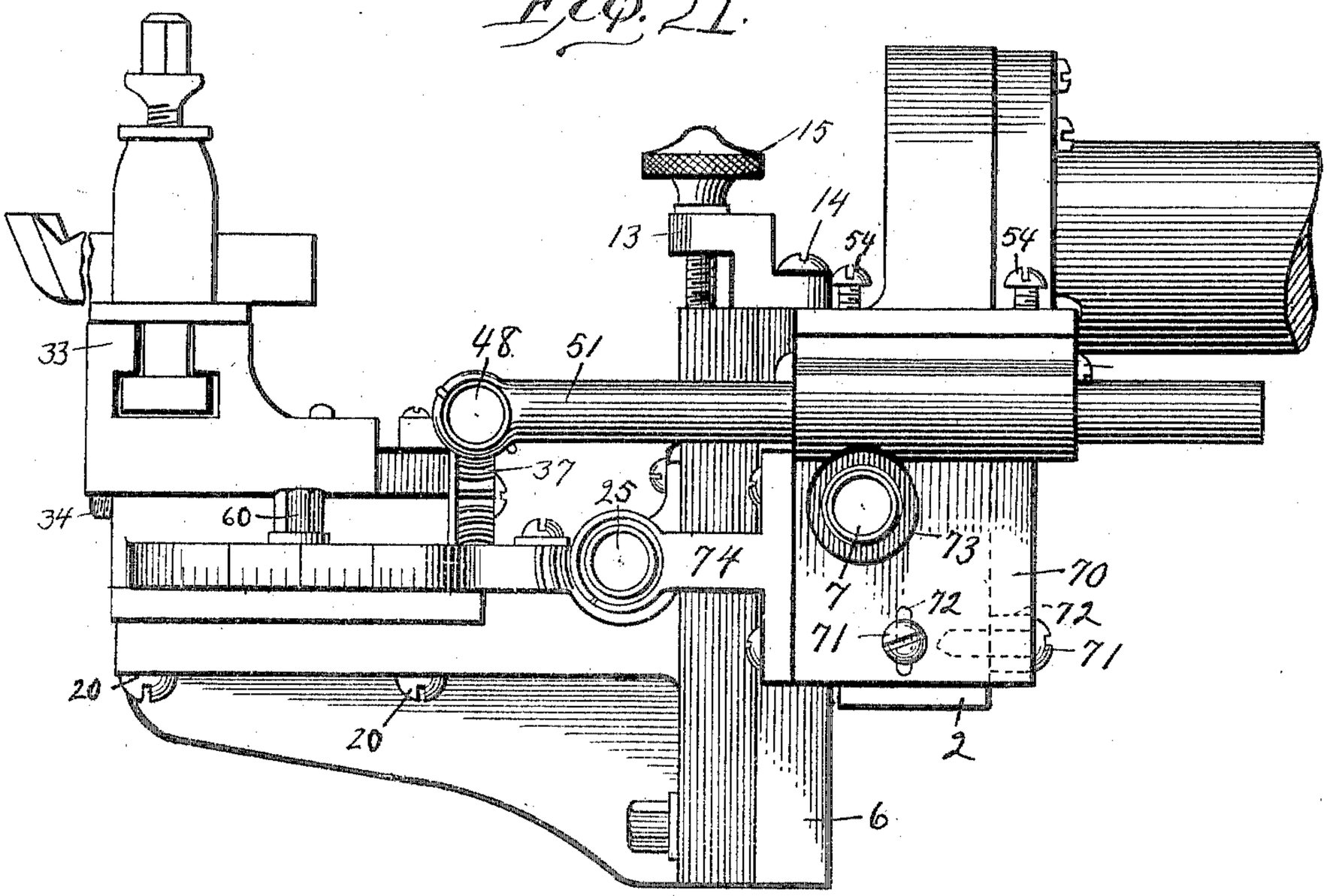
APPLICATION FILED OCT. 28, 1901.

4 SHEETS—SHEET 4.

Fig. 21.



WITNESSES:

J. A. Fowler Jr.

Chas. W. Cunningham.

INVENTOR

Anthony Fernandez,

BY

R. S. & C. Caldwell.

Attorney

UNITED STATES PATENT OFFICE.

ANTHONY FERNANDEZ, OF DUNKIRK, NEW YORK.

TAPER-BORING MACHINE.

No. 816,854. Specification of Letters Patent. Patented April 3, 1906.

Application filed October 28, 1901. Serial No. 80,197.

To all whom it may concern:

Be it known that I, ANTHONY FERNANDEZ, a citizen of the United States, residing at Dunkirk, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Taper-Boring Machines, of which the following is a specification.

This invention relates to an improved taper-boring device; and the primary object of the invention is to provide a device of this character which can be secured to the revolving spindle of a drill-press or to any similar machine having a revolving part, so that the entire device may be revolved, and to provide the device with independent pivotal, lateral, and longitudinal adjustments, so that the work may be held rigid for the device to operate upon.

This improved device is adapted to be provided with any suitable means for fastening it to the face-plate of a lathe, to the revolving spindle of a drill-press, or to any revolving part of a suitable operating-machine, and can be adjusted to bore any taper desired either by inches to the foot or by degrees, also to turn and face any piece of work within the limit of travel of the tool.

With these and other objects in view the invention consists in the construction, arrangement, and combination of parts to be hereinafter described, and particularly pointed out in the appended claims.

In the drawings the device is shown in a horizontal position, it being so disposed when applied to the face-plate of a lathe, and reference to the device made hereinafter shall be in accordance therewith. It is to be understood, however, that the device can be effectively operated in any other position, and the disposition of the same depends entirely on the disposition of the part to which it is secured.

Figure 1 is a top plan view of my improved machine. Fig. 2 is a detached top plan view of the angular turret-support. Fig. 3 is a central horizontal section taken on line *a a*, Fig. 1. Fig. 4 is a detached front elevation of the angular turret-support shown in Fig. 2. Fig. 5 is a detached side elevation of the bracket for supporting the sliding rod which serves as a support for the universally-jointed tool feed-shaft. Fig. 6 is a detached end elevation of the bracket shown in Fig. 5. Fig. 7 is a detached plan view of one of the locking-plates for locking the turret to the turret-support. Fig. 8 is a detached edge view of the locking-plates shown in Fig. 7. Fig. 9 is a detached front view of the wedge for adjusting the slideway for the cross-beam. Fig. 10 is a detached side view of the wedge-adjusting screw. Fig. 11 is a detached end elevation of the wedge. Fig. 12 is a detached front elevation of the bracket for supporting the worm-shaft by means of which the turret is revolved. Fig. 13 is a detached front view of the cross-beam. Fig. 14 is a detached side view of the supporting-head in which the cross-beam slides and on which the turret-support slides. Fig. 15 is a detached end elevation of the turret and sliding tool-support. Fig. 16 is a detached end elevation of the shank supporting the machine. Fig. 17 is a detached plan view of the turret. Fig. 18 is a detached side view of one of the sliding screws for locking the turret against movement on the turret-support. Fig. 19 is a detached end view of the screws shown in Fig. 18. Fig. 20 is a detached side elevation of the preferred form of handle for rotating the different shafts.

In referring to the drawings in detail like numerals designate like parts.

1 represents a tapered shank or support which is bolted or otherwise attached to the cross-beam 2 of the device and is adapted to be inserted in spindle of a lathe or other machine to fasten the taper-boring device thereto, or the device may be attached to the face-plate of the lathe, if desired. Various other means can be employed in lieu of the shank to attach the taper-boring device to different machines, as desired, as it is simply necessary to revolve the device, the means of obtaining such movement being immaterial.

In the preferred adaptation of the invention shown in the drawings the shank is secured to the cross-beam by bolts 3. The cross-beam is provided on its side surface with a longitudinal dovetailed guide 4, which fits in a correspondingly-shaped recess 5, formed in the transverse slide-block 6. An adjusting-screw 7 is journaled near one end in the cross-beam and extends through a longitudinal depression 8 in the cross-beam, passing through an internally-screw-threaded opening in a collar 8^a, which is provided with a pin 8^b, pivoted in the slide-block 6. An angular turret-support 9 is mounted on the slide-block 6, so as to have a limited range of

adjustment thereon at a right angle to the line of adjustment of the slide-block 6 on the cross-beam. The slide-block 6 is provided medially with an elevated portion 10, which extends from end to end thereof and forms a guide which fits in a depression in the turret-support 9. The turret-support is provided with elongated openings 11, through which bolts 12 pass to secure the same to the slide-block 6. A lug 13 extends from the front edge of the slide-block and is secured to the latter by a screw 14. Said lug is provided with a threaded aperture, in which an adjusting-screw 15 is threaded, which has its end held in the turret-support, so as to revolve therein, but not to be withdrawn therefrom, thereby permitting the adjustment of the turret-support to the desired position.

The turret 16 has a center pintle 17, which fits in a recess 18, formed in the outstanding portion of the turret-support, and is screwed to said support by a locking-plate 19, so that it may revolve thereon. Said plate is formed in two halves or sections, which are fastened to the turret-support by bolts or screws 20. The turret has a segmental projecting portion 21, provided with a segmental slot 22 and a toothed edge 23. A worm-gear 24 is mounted on a worm-shaft 25, the latter having a longitudinal groove 26, in which a feather 27, attached to the worm-gear, projects to prevent independent rotation of the worm-gear on the shaft. (See Fig. 3.) A bracket 28 is fastened to the turret-support by screws 29 and has two journal-bearings 30, through which the shaft 25 passes and between which the worm-gear 24 is located. The turret is provided with a forwardly-extending dovetailed guide 31 and with a depression 32 on said guide. A tool-supporting block 33 is mounted on the guide and is adjusted thereon by a feed-screw 34, located in the depression 32. Said feed-screw is journaled in the turret and passes through an internally-screw-threaded collar 35, having a stud which enters an opening in the tool-block. A worm-wheel 37 is mounted on the feed-screw 34 and meshes with a worm 38, which is mounted on a shaft 39, having a longitudinal groove 40, into which a feather 41, projecting from the worm 38, extends. The shaft 39 is journaled in bearings 42 in a bracket 43, fastened by screws 44 to the turret, and the worm 38 is located between these bearings 42. A bifurcation or fork 45 is formed at one end of the shaft 39, in which a ball 46 is pivoted by a pivot-pin 47. A second shaft 48 has a similar bifurcated or forked extremity 49, the forks thereof being at substantially a right angle to the forks 45 and pivoted to the ball 46 by a pin 50, thereby forming a universal joint between the ends of the shafts 39 and 48, which, in effect, form a single-jointed shaft. The shaft 48 is journaled in the outer extremity of a slide-bar 51, which is slidably mounted in an opening formed in a box 52, fastened to one end of the cross-beam by screws 53. The slide-bar 51 can be fastened firmly in the box 52 against any movement by a tapering wedge-strip 53^a, which engages in the slot 53^b, formed over the opening 53^c, through which the bar passes. (See Fig. 6.) Screws 54 are employed to move the wedge 53^a against the slide-bar, and thus more firmly secure the latter against movement. The wedge 53^a is of the usual and well-known form employed in various mechanical devices to prevent the play of parts, being substantially similar to that shown in Fig. 9.

Lost motion or wear between the guide 4 and the walls of the recess 5 is taken up by a tapering wedge 55, which fits between the opposed surfaces substantially as shown in Fig. 3 and is adjusted by an adjusting-screw 56, having an annular groove 57, in which the bifurcations 58 of the bent end 59 of the wedge 55 engages, substantially as shown in Figs. 9 and 14 and in dotted lines in Fig. 3.

The turret is locked to the turret-support by bolts 60, which are provided with peculiar-shaped heads 61, substantially as shown in Figs. 18 and 19, having opposite concave and convex sides which fit and slide in an annular groove 62 in the turret-support. (See Figs. 2 and 3.) The walls of the said groove are provided with upper inwardly-extending flanges 63 to hold the bolt-heads in place, said flanges being cut away at one point to permit the removal of the bolts, as shown at 64 and 65 in Fig. 2.

The turret can be provided with any of the usual scales or other means for securing the taper.

The operation is as follows: The device is attached to a suitable operating-machine by means of the shank 1 or by other suitable means. The tool is fastened in the usual manner to the tool-block 33. The slide-block 6 is adjusted transversely on the cross-beam to the desired position by the screw-bar 7. The turret-support is adjusted on the slide-block at a right angle to the adjustment of the latter by loosening the screws or bolts 12 and turning the thumb-adjusting screw 15, thereby providing both vertical and horizontal adjustment to properly position the tool. The turret is partially revolved to the desired position by loosening the bolts 60 and turning the shaft 25, and the tool-block 33 is adjusted on the turret by turning the universally-jointed bars 39 and 48. By this means the boring tool is adjusted to the desired taper-boring position. The object in joining the shafts 39 and 48 by a universal joint is to provide for the turning of the shaft 39 to any position to which the turret may be adjusted, thereby rendering said shaft operative at different angles.

The principal advantages are the means

for adjustment in every required direction and the manner in which all parts can be made rigid and fastened unyieldingly in place.

The different adjusting-shafts are preferably operated by a detachable handle or hand-wheel 66, which is secured to the shaft by a lock-screw 67.

This improved taper-boring device is attached to a horizontal boring-machine or drill-press in the following manner: A key is passed through the shank of a machine to secure it to the bar, or it can be attached in any other desired way, such as bolts passing through the face-plate. It can be secured to the tail-stock of a lathe or on the lathe-carriage by securing it thereto with any of the well-known attaching devices usually employed for this purpose. The desired adjustment of the turret is secured as follows: Set-screws 54 (shown in Figs. 1 and 3) are slackened and the slide-bar 51 is moved to the desired point. Bolts 60 and screws 20 on the radial head 16 are loosened, a removable hand-wheel or turning-tool is placed on the shaft 25 to rotate the same, thereby turning the worm-gear 24, which meshes with the toothed edge 23 of the segmental portion 21 of the turret and partially rotates the latter to the desired position. A tool, such as a boring-tool, is attached to the tool-supporting block 33 in any well-known way. As the turret is rotatably adjusted the shaft 48 slides longitudinally in the slide-bar 51, and the latter adjusts itself in the opening in which it is supported, thus preventing binding of the parts. The shaft 39 turns with the turret and on the ball-joint connection and slides longitudinally through the worm 38, which is held against longitudinal movement between the bearing parts 42, substantially as shown in Fig. 1. The object of the feather 41 and longitudinal groove 40 is to prevent independent rotation of the worm without interfering with the longitudinal adjustment of the shaft 39. The block 33 is adjusted on the guide 31 of the turret by the feed-screw 34 through the intervention of the worm-gear 37, mounted on one end of said shaft, the universally-jointed shafts 39 and 48 being rotated by a turning tool or handle and in turn rotating the feed-screw 34 through the worm 33, which meshes with the worm-wheel 37. (See Figs. 1, 3, 15, and 17.)

This device will turn, face, and make a ball-joint of any radius desired by placing the turning-tool on the end of the shaft 25, the nuts 30 and screws 22 having been previously loosened, as before described. Ordinary lathe-tools are used with this device, as no special tools are required.

To face across, the turret is secured by tightening the bolts 60 and screws 20 and placing the turning tool or handle on the feed-screw 7, which feeds the turret and the cutting-tool it carries across by rotating said screw. This will be understood by referring to Figs. 1 and 13.

It is of course understood that the device or devices used to turn the several shafts for adjusting the various parts must be of a design to permit of manual operation as well as automatic operation, and I have therefore provided a toothed wheel which when the device is operating comes in contact with a trip on some part of the machine supporting the device; but as such contrivances are common I do not consider it necessary to enter into details of construction.

Having thus described my invention, what I claim is—

1. A taper-boring machine, comprising a rotating stem or spindle, a cross-beam secured to said spindle, a slide-block movably mounted thereon, a turret adjustable to any angle, adjusting connecting mechanism interposed between the cross-beam and the turret, comprising shafts for adjusting the turret, one of which is provided with a universal joint permitting of such adjustment from a point outside and independently of the turret.

2. In a taper-boring machine, a support, a turret revoluble on said support, means for revolving said turret, a tool-holder supported on said turret, a feed-screw operatively connected with the tool-holder, a worm-wheel secured to said feed-screw, a shaft connected by a universal connection, a slidable bearing for and holding one section of said shaft substantially perpendicular to the support, a bearing fixed to and rotatably movable with the turret in which the other section of the shaft is mounted and a worm mounted on the shaft to revolve therewith but to allow independent endwise movement of the shaft, said worm being held in mesh with said worm-wheel.

3. In a taper-boring machine, the combination of a cross-beam, a slide-block adjustable longitudinally on the cross-beam, a turret-support adjustable at right angles to the cross-beam on the slide-block, a turret carried revolubly on said support, a tool-holder supported on said turret, a feed-screw operatively connected with the tool-holder, a worm-wheel secured to said feed-screw, a slide-bar held transversely adjustable on the cross-beam, a universally-jointed shaft journaled in said slide-bar at right angles to the slide-bar and the turret, and a worm mounted on the shaft to revolve therewith but to allow independent endwise movement of the shaft, said worm being held in mesh with said worm-wheel.

4. In a taper-boring machine, a cross-beam, a slide-block on the cross-beam, a turret-support on the slide-block, a turret having a toothed segment and being revolubly supported upon the turret-support, a shaft

having a worm engaging a toothed segment, a tool-holder slidably mounted on the turret, and a sectional universally-jointed bar having one section journaled upon the turret for adjusting the said tool-holder, and a slidable bearing carried by the cross-beam for journaling the other section.

5. In a taper-boring machine, a support, a turret carried by the support, means for partially rotating said turret, a tool-holder on said turret and a sectional universally-jointed shaft adapted to adjust said tool-holder on said head, one only of the sections of said rod being journaled on the turret and the other in a bearing slidably mounted in the support.

6. In a taper-boring machine, a support, a turret revolubly attached to said support and having a toothed segment, a shaft carrying a worm meshing with the segment, a tool-holder slidably mounted on the turret and a sectional universally-jointed shaft having means for adjusting the tool-holder, one section of said shaft having slidable adjustment at right angles to the cross-beam and the other section being journaled in bearings to the turret.

7. In a taper-boring machine, a cross-beam, a slide-block capable of longitudinal movement on said cross-beam, a turret-support slidably mounted on the slide-block, capable of movement transversely with respect to the cross-beam, a turret revolubly attached to said support, a tool-holder slidably mounted on the turret, a slide-bar having adjustable support and projecting laterally from the cross-beam, a shaft journaled in said slide-bar and being longitudinally adjustable therein, and a shaft having universally-jointed connection to said first-mentioned shaft and journaled in bearings attached to the turret, said last-mentioned shaft having means coupled to the shaft and tool-holder for slidably adjusting the tool-holder.

ANTHONY FERNANDEZ.

Witnesses:
L. M. SANGSTER,
CHARLES PANKOW.