

No. 818,294.

PATENTED APR. 17, 1906.

J. RIDDELL.

BORING BAR.

APPLICATION FILED SEPT. 19, 1903.

2 SHEETS—SHEET 1.

Fig. 6

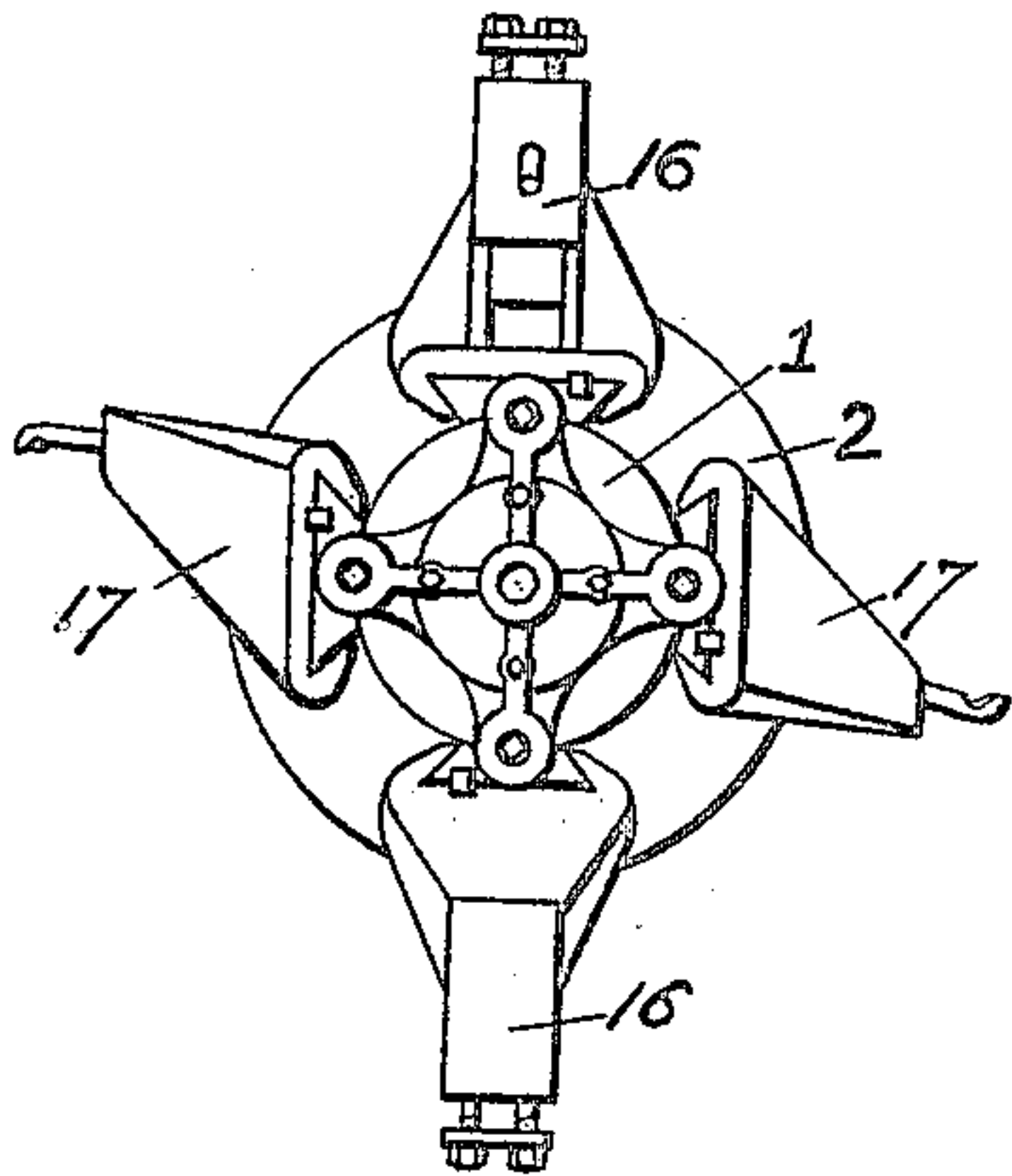


Fig. 4

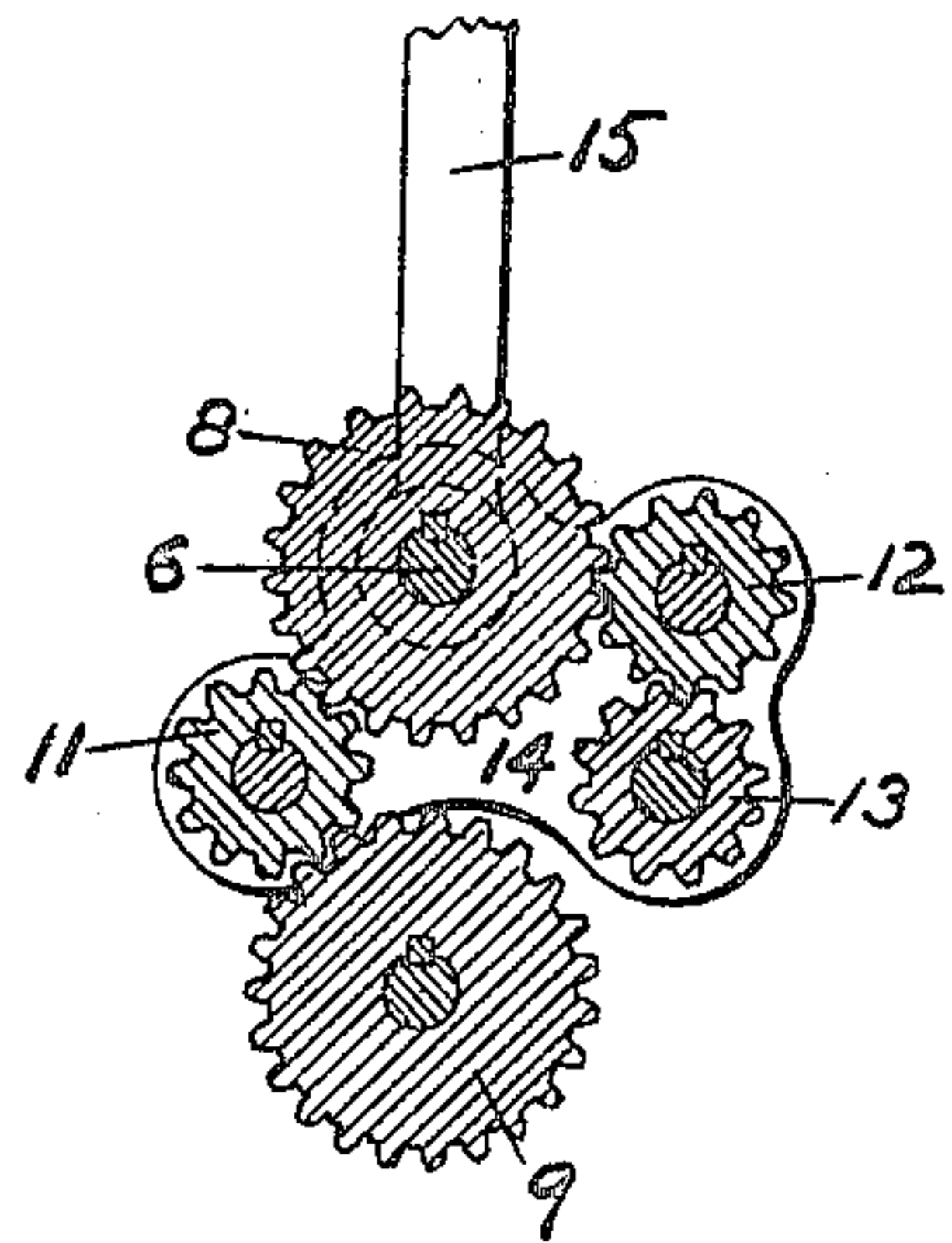
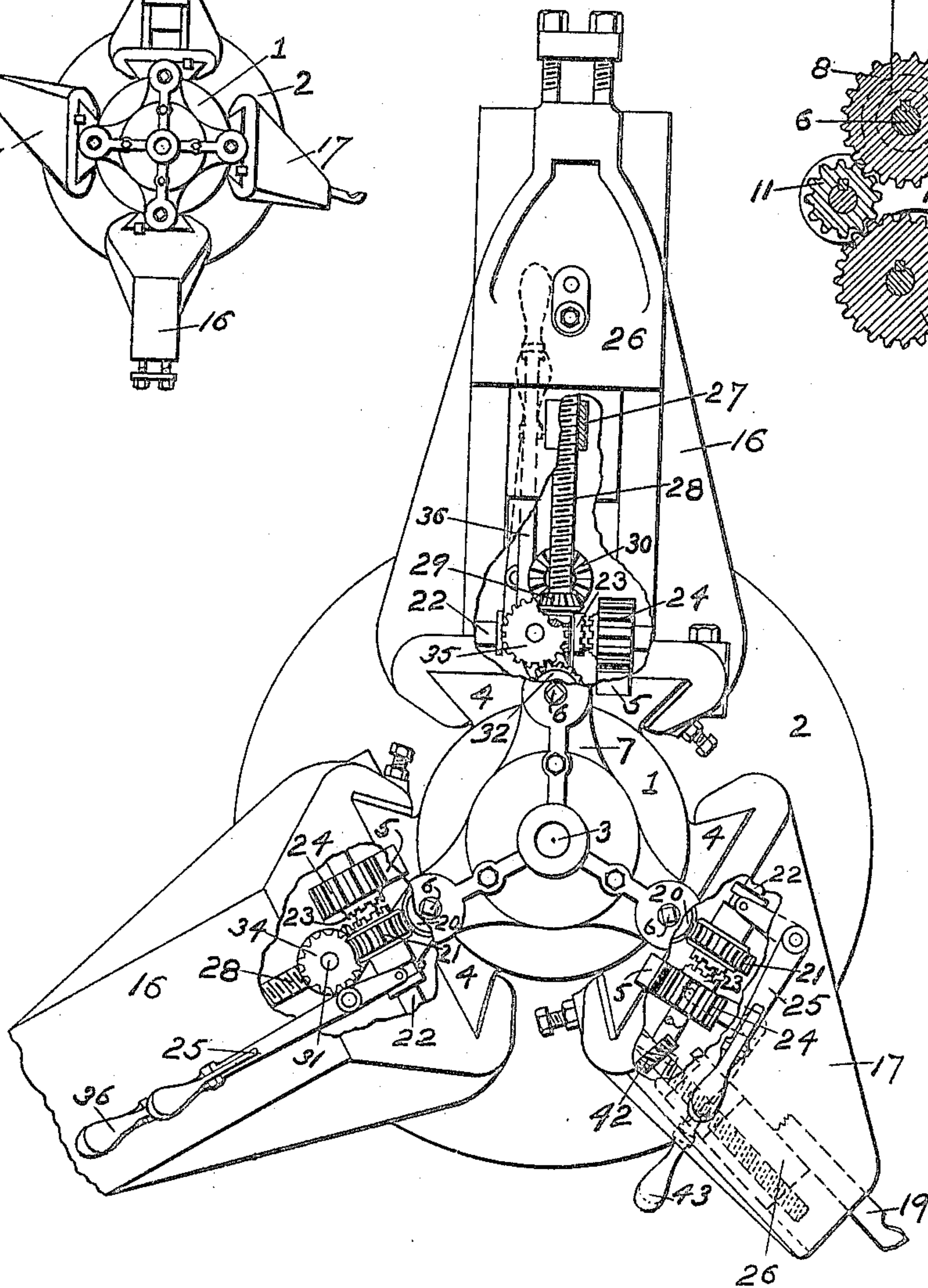


Fig. 1



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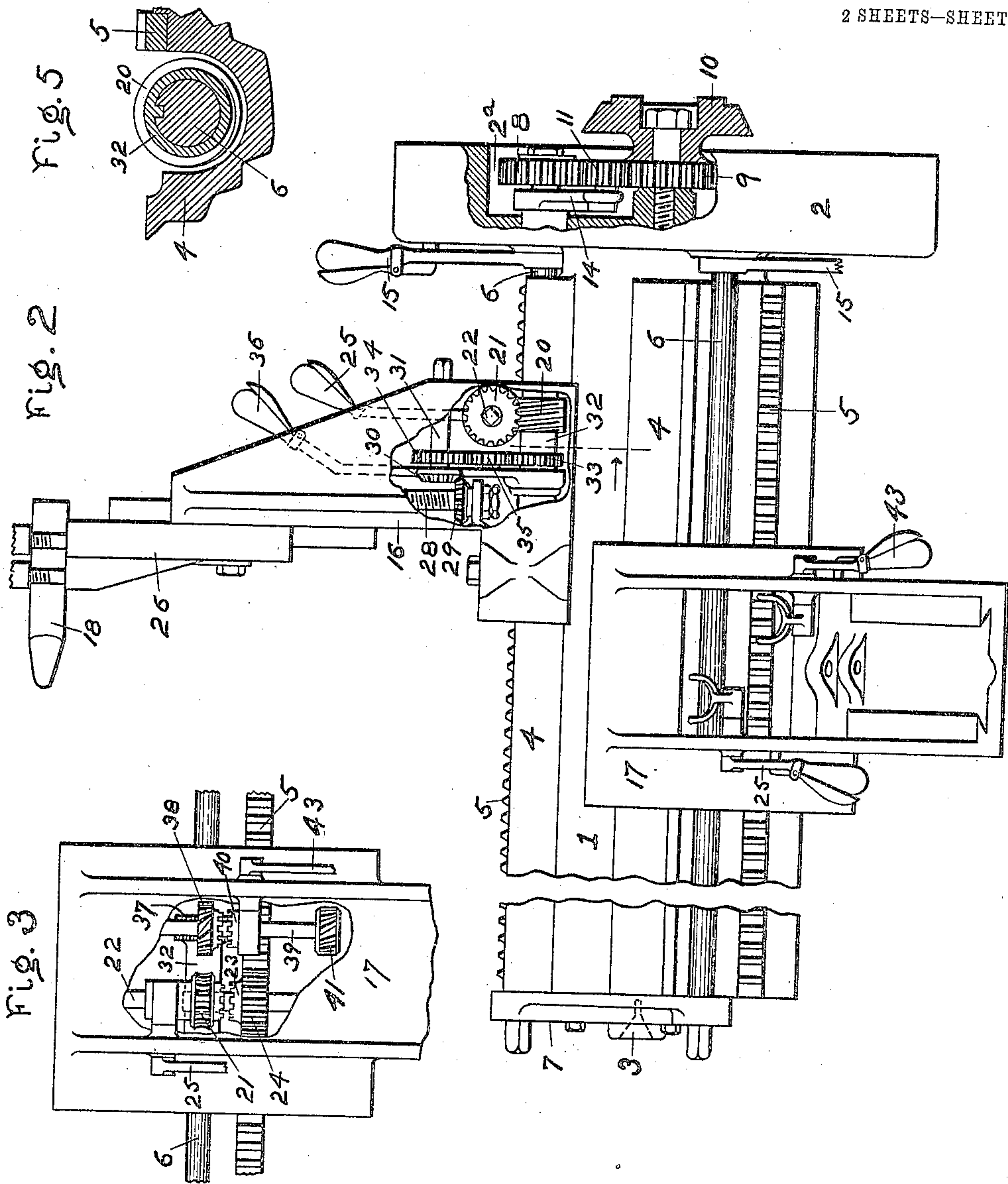
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2 SHEETS—SHEET 2.



Witnesses:

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# UNITED STATES PATENT OFFICE.

JOHN RIDDELL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## BORING-BAR.

No. 818,294.

Specification of Letters Patent.

Patented April 17, 1906.

Application filed September 19, 1903. Serial No. 173,757.

*To all whom it may concern:*

Be it known that I, JOHN RIDDELL, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Boring-Bars, of which the following is a specification.

This invention relates to metal-working machines; and its object is to provide an improved device for boring out and facing up work having a cylindrical interior—such, for instance, as the field-frame of a dynamo-electric machine.

This invention consists in certain constructions and arrangements of parts relating to the support and feed of the tools and tool-carriages, as hereinafter set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is an end elevation of my improved boring-bar, partly broken away. Fig. 2 is a side elevation partly in section and partly broken away. Fig. 3 is a top plan view of one of the tool-carriages partly broken away. Fig. 4 shows the reversing-gearing for one of the feed-shafts. Fig. 5 is a cross-section of a feed-shaft and worm, and Fig. 6 is a modification.

The bar has a body 1, preferably cylindrical and having at one end a head 2, which can be bolted to any suitable rotating gear or face-plate. The other end of the bar has an axial socket 3 to receive a suitable center in a tail-stock or other support. Running lengthwise of the body are one or more ribs or V's 4, having flat tangential outer faces and undercut edges, so as to serve as ways for the tool-carriages. Each V has a longitudinal rack 5, parallel with which is a groove in which is received a feed-shaft 6, suitably journaled at its outer end in a removable yoke 7, secured to the end of the body 1. Each shaft extends at its other end into a recess 2<sup>a</sup> in the head 2, where it carries a gear-wheel 8, which can be coupled with a central driving-gear 9, housed in the recess in the head 2 and integral with a clutch member 10, which is suitably driven. The two gears 8 and 9 can be coupled either by an idle gear 11 or by the idle and intermediate gears 12 13, all carried on a frame 14, capable of oscillation on the shaft 6 by means of a suitable lever 15. The idle gears are always in mesh with the gear 8,

and by rocking the frame one way or the other either one of said idlers can be engaged at will with the gear 9 in order to drive the shaft 6 in one direction or the other, as desired. The shafts may have extended squared ends for receiving a wrench to operate them quickly by hand, both idlers in that event being disengaged from the gear 9.

Mounted on the ways 4 are the carriages 16 17, the former carrying-facing tools 18 and the latter carrying boring-tools 19. In each carriage is rotatably mounted a worm 20, splined on the shaft 6 and meshing with a worm-gear 21, loosely mounted on a transverse shaft 22, journaled in the carriage. Splined in said gear is one half of a clutch 23, the other half being carried by a pinion 24, fixed on the shaft and meshing with the rack 5. A lever 25 operates said clutch, which when closed causes the constantly-rotating shaft 6 to actuate the pinion 24 and traverse the carriage along the V's. When the clutch is open, the pinion can be rotated by a handle placed on the projecting squared end of the shaft 22 in order to quickly traverse the carriage along the V's. The tools are mounted in slides 26 on the carriages, each slide having a nut 27, engaging with a feed-screw 28. The facing-tool feed-screws are operated as follows: A bevel-pinion 29 on the screw meshes with a bevel-gear 30 on a short shaft 31 in the carriage. The worm 20 is formed on a sleeve 32, which carries a gear 33, which can be connected at will with a gear 34 on the shaft 31 by an intermediate gear 35, carried on a lever 36. When thus connected, the rotation of the shaft 6 effects a rotation of the feed-screw. By opening the clutch 23 this feeding can be done without moving the carriage. The feed for the boring-tool is quite similar, being effected by a spiral gear 37 on the sleeve of the worm 20, an intermeshing spiral gear 38, sleeved on a shaft 39, a clutch 40, splined on said shaft, a spiral gear 41 on said shaft, and an intermeshing spiral gear 42 on the feed-screw. A lever 43 controls the clutch 40.

The operation of my invention is like that of any other boring-bar. By means of the clutches the tools can be fed along the bar or radially thereto, as desired. It will be noticed that the carriages are angularly disposed and can pass each other without interference, so that each carriage can operate at



any point along the entire length of the bar and for any distance lengthwise of the same. The operations of facing and boring can be carried on simultaneously, Fig. 1 showing two facing tools and one boring-tool and Fig. 6 showing provision for two of each kind. By using worms of reverse pitch two carriages can be fed by one shaft toward opposite sides of the work.

The invention has been especially designed for facing up the two ends and boring out the interior of the frames of induction-motors where extreme accuracy is required in order to enable the maintenance of a minimum air-gap between the stator and rotor; but the bar is adapted for many other kinds of work, as will be readily understood.

In accordance with the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A boring-bar provided with a plurality of separate independently-movable tool-carriages which are angularly disposed about the axis of said bar.

2. A boring-bar provided with a plurality of independently-movable carriages, each having means for causing it to traverse the entire length of the bar in a path independent of that of the other carriages and without interfering with the others.

3. A boring-bar provided with a plurality of independently-movable tool-carriages angularly disposed and capable of passing one another, and means for operating each carriage independently.

4. A boring-bar comprising a rotatable body provided with longitudinal V's for supporting and retaining the carriages, and an independent tool-carriage on each V, the carriages being arranged to traverse the entire length of the bar without interfering with each other.

5. A boring-bar comprising a rotatable body provided with longitudinal V's for supporting and retaining the carriages, an independent tool-carriage angularly disposed on each V, and means for moving each carriage independently.

6. A boring-bar comprising a rotatable body provided with longitudinal V's for supporting and retaining the carriages, an independent tool-carriage on each V, a rotatable shaft adjacent to each V, and operating connections between each shaft and the corresponding tool-carriage.

7. A boring-bar comprising a rotatable body provided with longitudinal V's for supporting and retaining the carriages, an inde-

pendent tool-carriage on each V, a rotatable shaft adjacent to each V, means for imparting movement from said shaft to said carriage, and means for rotating the shaft in either direction.

8. The combination with a rotatable boring-bar, of a tool-carriage movable longitudinally thereof, a shaft for moving said carriage, a gear on said shaft, a rocking frame carrying idle gears meshing with said gear, and a driving-gear with which said idle gears can be engaged.

9. The combination with a boring-bar having a head at one end, of a plurality of tool-carriages movable on said bar, a plurality of shafts for operating said carriages, a central driving-gear in said head, and a separate reversing-gearing for connecting said gear with each shaft.

10. A boring-bar provided with a plurality of separate independently-movable tool-carriages which are angularly disposed about the axis of the bar and are mounted to move past each other, a longitudinally-extending V for each carriage, shafts running parallel with the V's, and supports for the shafts.

11. A boring-bar body having a plurality of undercut ribs having tangential faces, carriages mounted on the ribs and arranged to move past each other when in operation, and tool-holders mounted on the carriages.

12. A boring-bar body having a plurality of longitudinal undercut ribs having tangential faces each containing a longitudinal groove, tool-carriages mounted on the ribs, shafts mounted in the grooves for moving the carriages past each other, and tool-holders mounted on the carriages.

13. A boring-bar body having a plurality of longitudinal undercut ribs radially disposed and having tangential faces, each containing a longitudinal groove, carriages mounted on the ribs to move past each other, feed-screws located in the grooves, racks adjacent to the feed-screws, and gears meshing with the racks for moving the carriages past each other.

14. A rotatable boring-bar having longitudinally-movable tool-carriages mounted to move past each other, a means for rotating the bar, longitudinal shafts for moving the carriages past each other, racks adjacent to the shafts and movable with the bar, pinions mounted on the carriages and meshing with the racks for quickly moving the carriages, and means for connecting the pinions with the shafts.

15. A rotatable boring-bar carrying longitudinally-movable tool-carriages angularly disposed and arranged to move past each other on their supports, a means for rotating the bar, a longitudinal shaft, a rack adjacent to said shaft and movable with the bar, a pinion mounted on the carriage and meshing with said rack, a worm mounted on said car-



riage and splined on said shaft, and a worm-gear meshing with the worm and driving said pinion.

5 16. A rotatable boring-bar carrying a longitudinally-movable tool-carriage, automatic means for moving the tool-carriage radially, a means for rotating the bar, a longitudinal shaft, a rack adjacent to said shaft, a pinion mounted on the carriage and meshing with  
10 said rack, a worm mounted in said carriage and splined on said shaft, a worm-gear meshing with the worm and driving said pinion, and a clutch for connecting and disconnecting said worm-gear and pinion.

15 17. The combination with a rotatable boring-bar, of a plurality of longitudinally-movable tool-carriages angularly disposed about the axis of the bar and capable of moving past each other while in operation, radially-movable slides on said carriages, longitudinal shafts, means for operatively connecting the carriages with the shafts, and independent means rotating with the bar for operatively connecting the slides with said  
20 shafts.

25 18. The combination with a rotatable boring-bar, of a plurality of tool-carriages angularly disposed about the axis of the bar and

capable of moving past each other while in operation, radially-movable slides on and rotating with said carriages, screws mounted on the carriages for moving said slides, longitudinal shafts mounted in bearings on the rotatable bar, sleeves mounted in the carriages and splined on the shafts, gears on said sleeves, and connections between said gears and said screws. 30 35

19. The combination with a rotatable boring-bar, of a means for rotating the bar, tool-carriages angularly disposed about the axis of the bar and capable of moving past each other while in operation, radially-movable slides on said carriages, screws engaging with said slides and provided with pinions, longitudinal shafts, sleeves splined on said shafts and provided with gears, intermediate gearing between said gears and pinions, and means rotating with the bar for connecting and disconnecting said gearing. 40 45

In witness whereof I have hereunto set my hand this 17th day of September, 1903. 50

JOHN RIDDELL.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.