

No. 644,638.

Patented Mar. 6, 1900.

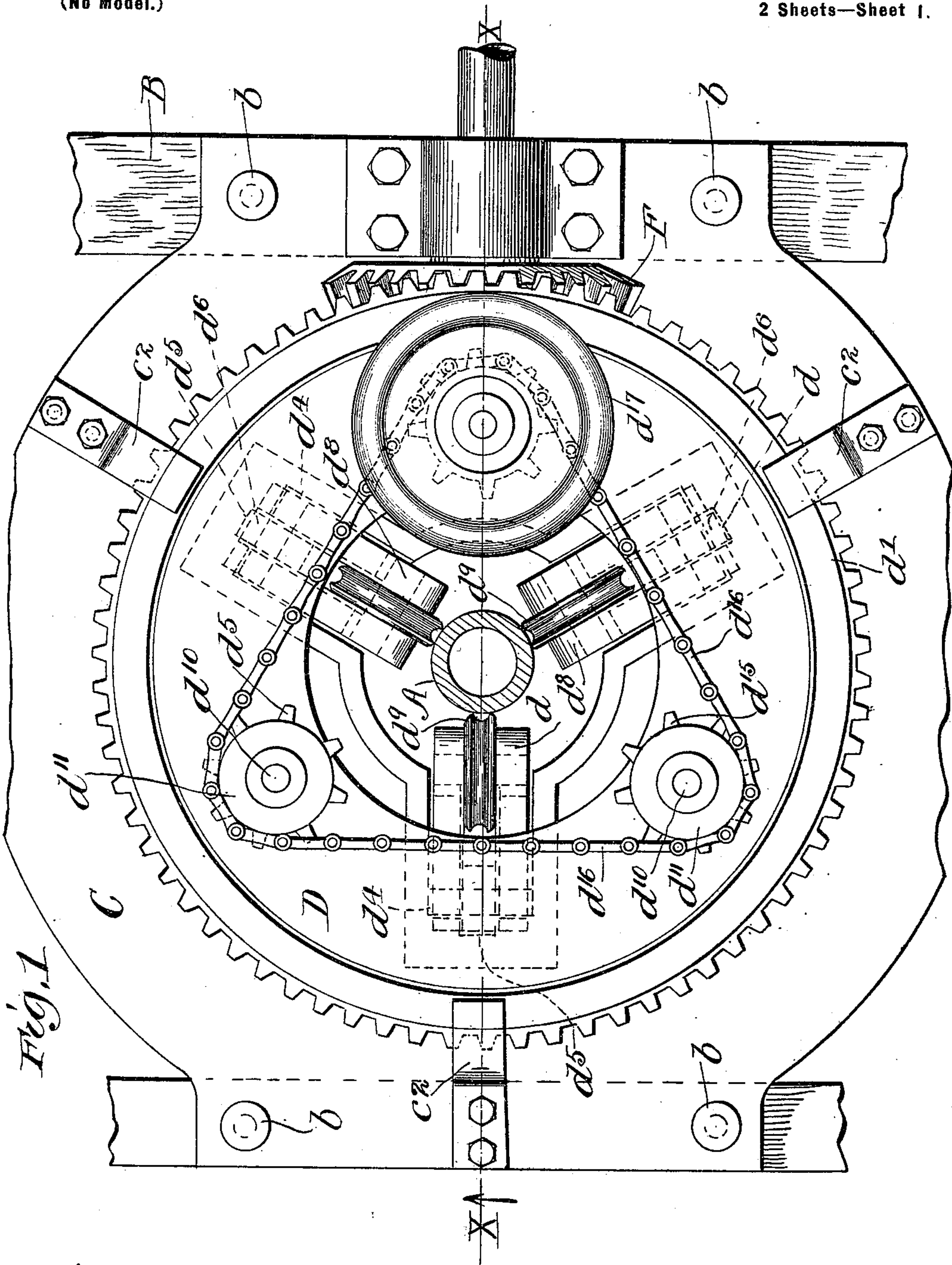
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(Application filed Jan. 18, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

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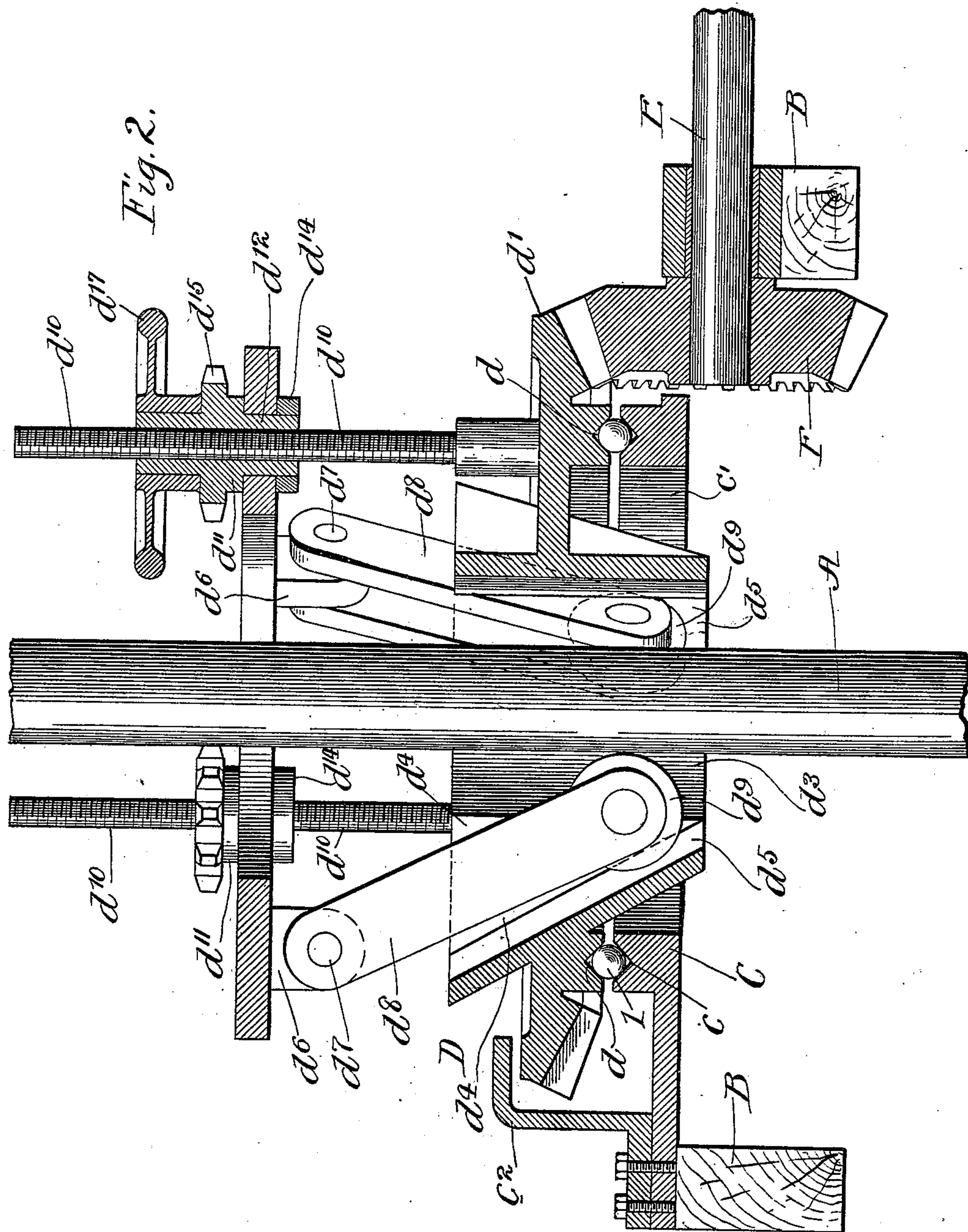
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# UNITED STATES PATENT OFFICE.

JAY B. RHODES, OF HARVEY, ILLINOIS, ASSIGNOR TO FREDERICK C. AUSTIN, OF CHICAGO, ILLINOIS.

## ROTATING DEVICE FOR ROTARY DRILLS.

SPECIFICATION forming part of Letters Patent No. 644,638, dated March 6, 1900.

Application filed January 18, 1900. Serial No. 1,900. (No model.)

*To all whom it may concern:*

Be it known that I, JAY B. RHODES, a citizen of the United States, residing at Harvey, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Rotating Devices for Rotary Drills, of which the following is a specification.

The objects of my invention are to provide a simple, reliable, powerful, and an improved device for gripping and rotating the usual drill rod or spindle of an ordinary core-drill; to provide improved and highly-efficient means for permitting the drill rod or spindle to be rotated and at the same time allowed to descend for its full length without the necessity of readjusting the rotating device; to reduce the number of stoppages usually incident to drilling a well and to facilitate the operation generally; to provide a rotator or rotating device which may be easily, advantageously, and quickly adjusted; to provide improved means which will permit the use of drill rods or spindles of various sizes without the necessity of changing or substituting any of the various parts of the rotating device; to provide a construction of rotating device involving three relatively-equidistant gripping-rolls—that is to say, three rolls or rollers which are arranged about the drill-rod at equal distances from each other, whereby the drill-rod may be firmly gripped and rotated whether such rod or spindle be round, polygonal, oval, or irregular in cross-section; to provide a novel and highly-effective device by which various objects—such as pipes, rods, shafts, &c.—may be gripped and rotated and at the same time allowed to shift or move longitudinally, and also to provide certain details tending to increase the general efficiency and to render a device of this description or character effective and thoroughly reliable.

To the foregoing and other useful ends my invention contemplates the provision of gripping-rolls, preferably three in number and arranged about the drill-rod at equal distances from each other, and also of suitable means for simultaneously adjusting such rolls or rollers for the purpose of causing them to either grip or release the drill-rod. The said rolls or rollers are preferably arranged about

the drill-rod with their axes at right angles to the axis of the latter, and their peripheries are preferably grooved or otherwise adapted to bite or engage the drill-rod. Suitable means are, as stated, provided for simultaneously adjusting the three rollers toward or away from the drill-rod, so as to grip or release the latter, and the entire device is adapted and arranged for rotation for the purpose of rotating the drill. With this arrangement the rolls or rollers effectively grip and rotate the drill-rod, but at the same time permit the latter to feed gradually downward as the rolls or rollers are free to turn on their axes as the drill works its way into the rock or soil, and in this way the rolls permit the drill-rod to descend for its full length without the necessity of a readjustment of the rotating device. These rolls or rollers may be forced into engagement with the drill-rod in any suitable manner; but as a matter of further improvement I mount the rolls and connect them for simultaneous adjustment along radial guideways. These guideways are preferably upwardly divergent and in such way adapted to afford inclined planes along which the rolls or rollers can be adjusted radially either toward or away from the drill-rod. As a result of such construction and arrangement a powerful and effective gripping of the drill-rod is secured regardless of the latter's shape or size, and at the same time the rod is free to descend or feed downwardly by reason of its own weight. The three gripping-rolls are preferably mounted and arranged in such manner as to be capable of a wide range of shift or adjustment, so as to permit the use of drill-rods of various sizes without the necessity of substituting or changing any of the parts, and as a matter of further and special improvement provision is made whereby the gripping rolls or rollers may be quickly and easily adjusted without the use of tools.

Other features and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings, Figure 1 is a plan of a rotating device constructed in accordance with my invention, the gripping-rollers being shown in contact or engagement with the drill rod or spindle. Fig. 2 is a ver-



tical section of the same, taken on line  $xx$  in Fig. 1.

The drill rod or spindle A, which it is understood is connected at its lower end with the usual core-barrel, drill, or bit, may be either solid or hollow, and the supporting-beams B may be either part of an independent framework or a portion of the frame affording a support for the engine and boiler of the ordinary well-machine.

The rotating device comprises, preferably, a stationary bed-plate C and a rotary head D, which grips and rotates the drill rod or spindle A. For the purpose of reducing friction the upper surface of the said bed-plate is provided with an annular groove or ball-race  $c$ , and the lower surface of the rotary head is provided with a similar groove or ball-race  $d$ . Working between the upper and lower ball-races thus provided are a number of antifriction-balls  $l$ , and by such provision the friction between the bed-plate and rotary head is reduced to a minimum. The bed-plate C is also provided with a central opening  $c'$  and may be secured to the beams B in any suitable manner—as, for example, by the bolts  $b$ . The rotary head D consists of the lower base portion  $d'$ , which is preferably a bevel-gear, and the vertically-adjustable ring or upper portion  $d^2$ . The said base or lower portion  $d'$  is provided with a central opening  $d^3$  and also with radial recesses  $d^4$ , leading therefrom. The said recesses are designed to afford guideways along which the gripping-rollers may be adjusted in directions which are lateral and preferably radial or substantially radial to the drill-rod, and to such end the outer walls or surfaces of the recesses are formed with grooves  $d^5$ . Depending from the lower surface of the vertically-adjustable ring or portion  $d^2$  are a number of lugs  $d^6$ . Pivoted to each lug by a pin  $d^7$  are a pair of swinging arms  $d^8$ , and mounted between the lower ends of the latter are the gripping-rollers  $d^9$ . The depending lugs  $d^6$  are arranged so that each pair of swinging arms  $d^8$  will lie within a recess  $d^4$ . In such position the said arms will rest or bear upon the outer walls of the recesses, while the grooves  $d^5$  will receive the peripheries of the rollers and thereby permit the latter to turn freely as the drill-rod descends. The rollers are preferably provided with short journals, which extend through and rotate within the ends of the arms  $d^8$ , and the arms may therefore be said to practically form the bearings for the gripping-rollers. Peripheral grooves are also preferably formed upon the peripheries of the rollers, (see Fig. 1,) whereby the latter will be enabled to firmly grip or bite the drill-rod, and it will also be observed by reference to Fig. 1 that the recesses  $d^4$  are of such width that the arms  $d^8$  fit snugly therein—that is to say, each pair of swinging arms is embraced by the side walls of the recess wherein they lie, and for such reason the bevel-gear or base portion  $d'$  may be said to sustain the torsional strain incident to a rapid

rotation of the drill. The outer walls of the recesses  $d^4$  are preferably set at an angle of about forty-five degrees. The exact angle is immaterial, however, and may be varied as desired, for in the drawings I have, as a matter of fact, shown the said walls at an angle of thirty degrees to the drill-rod or sixty degrees to a horizontal. The result of thus forming the outer walls of the recesses is to provide a number of radial and upwardly-divergent guideways whereon the arms  $d^8$  may be adjusted back and forth and whereby the gripping-rollers may be made to approach or recede from the drill-rod, it being observed at this juncture that the provision of three relatively-equidistant gripping-rolls permits the drill-rod to adjust itself so as to permit each gripping-roll to bear firmly upon the said rod whether the latter be round, polygonal, oval, or irregular in cross-section, or, in other words, the arrangement permits the rod to center itself regardless, practically, of its form or shape. By lowering the ring or plate  $d^2$  the arms  $d^8$  will be simultaneously adjusted downwardly along the said upwardly-diverging guideways and the gripping-rollers  $d^9$  thereby simultaneously forced into contact or engagement with the drill-rod.

Vertical adjustment of the flat ring or centrally-apertured plate  $d^2$  may be accomplished in any known or suitable manner; but as a matter of further and special improvement I provide the base or bevel-gear  $d'$  with a number of screw-threaded rods or standards  $d^{10}$ . Each screw-threaded rod or standard is provided with an adjusting nut  $d^{11}$ , the latter having bosses  $d^{12}$ , which extend through openings  $d^{13}$  in the flat ring  $d^2$ , and each boss being provided at its end with a collar  $d^{14}$ . By such arrangement the ring  $d^2$  is supported by the standards  $d^{10}$ , through the medium of the adjusting-nuts  $d^{11}$ , the said ring being held between the nuts and the collars  $d^{14}$ , and by rotating the nuts the ring or plate  $d^2$  may be adjusted vertically along the rods or standards  $d^{10}$ . The adjusting-nuts may be turned or rotated by hand; but for the purpose of simultaneously rotating the nuts the latter may be provided with sprocket-teeth  $d^{15}$  and a sprocket-chain  $d^{16}$  arranged about the sprockets thus formed or provided. (See Fig. 1.) One of the adjusting-nuts may be provided with a suitable hand-wheel  $d^{17}$ , and by turning the latter it is evident that the gripping-rolls may be caused to simultaneously grip or release the drill-rod, according to the direction in which the hand-wheel is rotated, for it will readily be seen that the arrangement is such that the ring and rolls may be regarded as being adjustable in a direction parallel with the drill-rod and that the oblique guideways constitute means for causing the rolls to either swing outward or inward as they are moved up and down and for thus causing them to either grip or release the rod.

As a simple arrangement for driving the rotary head D the base portion  $d'$  is, as pre-



viously stated, provided with teeth and adapted for service as a bevel-gear. The driving-shaft E is provided with a bevel-gear F, the teeth of which latter mesh with the teeth of bevel-gear  $d'$ , and by connecting the driving-shaft with any suitable source of power it is obvious that the drill may be rotated at any desired speed. To prevent undue rise or displacement on the part of the rotary head, the bed-plate may be provided with guards  $d^2$ , which extend upwardly and over the base  $d'$ , and with such provision there will be no liability of the base  $d'$  being forced from its bearings by the gear F. It is obvious, however, that the rotary head may be driven in various ways, and for such reason I do not limit myself to any particular device or arrangement for so doing.

In operation the drill-rod is first extended through the central openings of the bed-plate and rotary head and the ring  $d^2$  then adjusted by turning the hand-wheel  $d^7$  so as to cause the gripping-rollers to grip the said drill-rod. The rotary head D is then rotated for the purpose of rotating the drill, and the gripping-rollers slowly turning in their bearings as the drill works its way into the rock or soil permit the drill-rod to descend for its full length without a readjustment of the rotating device. Thus it will be seen that I provide a device which may be firmly and positively locked against relative rotation on the part of the drill-rod, but which permits a free longitudinal or end movement of the latter relative to the rotating device; that by the combination of threaded standards and upwardly-divergent guideways I secure a powerful and effective gripping of the drill-rod, as by such combination the power of a screw is practically augmented by the power of a wedge; that the novel construction and arrangement permits the use of drill-rods of various sizes without substituting or changing the parts of the device, as the gripping-rollers may be given a wide range of shift or adjustment and in such way adapted to firmly grip a drill-rod regardless of the latter's size or thickness, and, as a further advantage, that the provision of three relatively-equidistant gripping-rolls insures a firm gripping of the rod regardless of its shape or form, as this number and arrangement of rolls permit each roll to be brought into contact with the rod whether the latter be round, polygonal, oval, or irregular in cross-section.

What I claim as my invention is—

1. A device for gripping and rotating drill-rods or the like comprising a plurality of rolls having peripheries adapted to bite or engage the said rod or the like and movable to and from the latter; a roll-adjusting member through which the said rod or the like extends and which is, together with the said rolls with which it has suitable connection, adjustable in a direction parallel with the axis of rotation; and means whereby said adjustment of the roll-adjusting member and

rolls will cause the latter to move to or from the drill-rod or the like.

2. A device for rotating and gripping drill-rods or well-tubes comprising a plurality of gripping-rolls which are movable to or from the rod; a ring or centrally-apertured plate through which the drill-rod extends and which is, together with the said gripping-rolls with which it is suitably connected, adjustable in a direction parallel with the said rod; and means whereby such adjustment of the roll-adjusting member and rolls will cause the latter to move toward or away from the drill-rod.

3. A device for gripping and rotating rotary drills or the like comprising a couple of members through which the drill-rod extends and which are connected for relative adjustment in a direction parallel, or substantially parallel, with the axis of rotation; a plurality of gripping-rolls which are movable toward or away from the drill-rod; means for connecting the said rolls with one of said members, the connection being such that the relative adjustment of the two members operates to adjust both the rolls and the member with which the same are connected in a direction parallel, or substantially parallel, with the drill-rod; and means whereby said adjustment of the rolls and member with which they are connected will cause the rolls to either grip or release the drill-rod.

4. A rotary head for gripping and rotating drill-rods comprising a vertically-adjustable ring or centrally-apertured plate through which the drill-rod extends; a plurality of gripping-rolls which are carried by the said rotary head and which are adjustable for alternately gripping and releasing the drill-rod; a plurality of screw-threaded rods or standards which are mounted upon said head and which extend through openings in said ring or plate; an adjusting-nut on each rod, and means for connecting the said adjusting-nuts with the said ring or plate; means for simultaneously rotating the said adjusting-nuts for the purpose of adjusting the ring or plate along the screw-threaded rods in a direction parallel with the axis of the drill-rod, and means for causing such adjustment of the ring or plate to effect a lateral adjustment of the rolls relatively to the drill-rod; and suitable means for rotating the rotary head for the purpose of rotating the drill.

5. A rotary head for gripping and rotating a drill-rod or the like comprising a couple of circular members which are connected for relative adjustment in a direction parallel, or substantially parallel, with the axis of rotation; a plurality of gripping-rolls mounted upon swinging arms which are pivoted to one of said members, whereby the relative adjustment of the two members will cause the rolls and the member to which they are connected by the swinging arms to shift in a direction parallel, or substantially parallel, with the drill-rod; and means whereby said relative



adjustment on the part of the two members will cause the said swinging arms to swing to or from the drill-rod and thereby cause the rolls to either grip or release the said rod.

5 6. A device for gripping and rotating rotary drills or the like comprising three relatively-equidistant gripping-rolls; a roll-adjusting member through which the rod or the like extends and which is, together with the said  
10 three relatively-equidistant rolls with which it is suitably connected, adjustable in a direction parallel, or substantially parallel, with the axis of rotation, and means whereby such adjustment of the roll-adjusting member and  
15 the three rolls will cause the latter to move to or from the said rod.

7. A device whereby rods, shafts or pipes of various sizes and shapes may be effectively gripped and rotated and at the same time  
20 permitted to shift longitudinally, comprising three relatively-equidistant, or substantially-equidistant, gripping-rolls mounted upon a rotatable member and provided with peripheries adapted to bite the rod, pipe or shaft to  
25 be rotated; means for adjusting one or more of said rolls in a direction or directions radial to the said rod, pipe or shaft, and whereby the rolls may be caused to either grip or release the same; and means for rotating the  
30 said rotatable member.

8. A rotating device for rotary drills, comprising a rotary head through which the drill-rod extends, the said head being provided with a plurality of upwardly-divergent guideways, a plurality of gripping-rolls provided  
35 with peripheries adapted to engage the drill-rod and arranged for adjustment along the said guideways, a vertically-adjustable member with which the said rolls are suitably connected, means for adjusting the said vertically-adjustable member in a direction parallel  
40 with the axis of rotation, so as to cause the rolls to simultaneously slide along their respective guideways and thereby either grip or release the drill-rod, and means for rotating the rotary head for the purpose of rotating the drill.

9. A rotating device for rotary drills, comprising a rotary head provided with a plurality  
50 of upwardly-divergent guideways, and also with an opening through which the drill-rod extends; a plurality of adjustably-mounted gripping-rolls provided with peripheries adapted to engage or bite the drill-rod and arranged about the latter with their axes at  
55 right angles to the same; means for simultaneously adjusting the gripping-rolls along the said upwardly-divergent guideways, so as to cause the rolls to either grip or release the drill-rod, the adjusting mechanism and the said upwardly-divergent guideways cooperating to force the gripping-rolls into contact with the drill-rod, and means for rotating the rotary head for the purpose of rotating the  
60 drill.  
65 drill.

10. A rotating device for rotary drills comprising a rotary head having a central opening

through which the drill-rod extends; a plurality of adjustably-mounted gripping-rolls arranged about the drill-rod with their axes  
70 at right angles to the latter and provided with peripheries adapted to engage the said drill-rod; the said rolls being also arranged to occupy positions within a like number of radial recesses with which the rotary head is provided; an adjusting device adapted and operative to simultaneously adjust the rolls in  
75 and out of said recesses for the purpose of causing the rolls to grip or release the drill-rod, the said recesses being formed or constructed in such manner that their opposing side walls embrace the adjustable mountings which connect the gripping-rolls with the said  
80 adjusting device and whereby the latter will be relieved from the torsional or twisting strain incident to a rapid rotation of the drill; and suitable means for rotating the said rotary head for the purpose of rotating the drill.

11. A rotating device for rotary drills comprising a rotary head having a central opening through which the drill-rod extends, three  
90 radial recesses leading from said central opening and providing three upwardly-divergent guideways, three gripping-rolls mounted and arranged for adjustment along said upwardly-divergent guideways, the said rolls being  
95 adapted to bite the said drill-rod, means for simultaneously adjusting the said rolls along the said three upwardly-divergent guideways for the purpose of causing the three rolls to either grip or release the drill-rod, and means  
100 for rotating the said rotary head for the purpose of rotating the said drill.

12. In a device for the purpose specified, the combination of the bevel-gear provided  
105 with upwardly-divergent guideways and a central opening, gripping-rolls mounted for adjustment along said upwardly-divergent guideways, adjusting-screws for simultaneously adjusting the rolls along said upwardly-divergent guideways, the said adjusting-screws and upwardly-divergent guideways  
110 cooperating to force the rolls into contact with the drill-rod, and means for rotating the said device for the purpose of rotating the drill.  
115 drill.

13. In a rotating device for rotary drills, the combination of the rotary base portion having a central opening through which extends the drill-rod, the said base portion being also provided with radial guideways, the  
120 ring or centrally-apertured plate arranged above the said base portion, a plurality of swinging arms depending from said ring or plate and arranged to slide in said guideways, gripping-rolls mounted at the free ends of said arms, means for causing a relative  
125 shift or adjustment of the said ring or plate and base portion, whereby the gripping-rolls may be adjusted toward or away from the drill-rod, and means for rotating the device for the purpose of rotating the drill.  
130 drill.

14. A rotating device for rotary drills, comprising a rotary head provided with a plu-



5 rality of upwardly-divergent guideways, and  
 also with an opening through which the drill-  
 rod extends; a plurality of swinging arms  
 mounted upon the said rotary head and adapt-  
 10 ed to slide in said guideways, and a plurality  
 of gripping-rollers journaled in the free ends  
 of said arms; the said rollers being provided  
 with peripheries adapted to engage the drill-  
 rod, and arranged about the latter with their  
 15 axes at right angles to the said drill-rod; means  
 for simultaneously adjusting the swinging  
 arms along the said guideways so as to cause  
 the rollers to grip or release the drill-rod, and  
 means for rotating the rotary head for the

15 purpose of rotating the drill.  
 15. A rotating device for rotary drills com-  
 prising a rotary head through which the drill-  
 rod extends, and a bed-plate adapted to af-  
 ford a suitable bearing for the rotary head;  
 20 the said rotary head consisting of a base por-  
 tion provided with radial recesses adapted to  
 afford a plurality of upwardly-divergent  
 guideways, and an upper portion adapted  
 and arranged for vertical adjustment rela-  
 25 tive to the said base portion; a plurality of  
 swinging arms supported by the said upper  
 adjustable portion, the said arms being adapt-  
 ed to rest and slide upon the guideways af-  
 farded by the said radial recesses, and a plu-  
 30 rality of gripping-rollers journaled in the free  
 ends of said arms; the said rollers being ar-  
 ranged about the drill-rod with their axes at  
 right angles to the latter, and provided with  
 peripheries adapted to engage the said drill-  
 35 rod; means for adjusting the said upper por-  
 tion of the head, so as to cause the gripping-  
 rollers to grip or release the drill-rod, and  
 means for rotating the rotary head for the  
 purpose of rotating the drill.

40 16. A rotating device for rotary drills, com-  
 prising the bed-plate and the rotary head

adapted to rotate thereon; the said rotary  
 head consisting of a base portion provided  
 with a central opening through which the  
 drill-rod extends and also provided with a 45  
 plurality of radial recesses adapted to afford  
 upwardly-divergent guideways, an upper ring  
 supported upon screw-threaded rods or stand-  
 ards which rise from the said base portion,  
 an adjusting-nut on each rod and means for 50  
 connecting the said nuts with the said ring,  
 the adjusting-nuts being provided with  
 sprocket-teeth and a sprocket-chain being  
 arranged about the sprockets thus formed and  
 provided, a hand-wheel on one or more of 55  
 said sprockets, swinging arms pivotally sup-  
 ported from said ring and adapted to slide  
 upon the said guideways, gripping-rollers  
 journaled in the free ends of said arms and  
 provided with peripheries adapted to engage 60  
 the drill-rod; and means for rotating the said  
 head for the purpose of rotating the drill.

17. A rotating device for rotary drills, com-  
 prising the stationary bed-plate having a cen-  
 tral opening, the bevel-gear having a central 65  
 opening and supported for rotation upon the  
 bed-plate, the vertically-adjustable ring sup-  
 ported upon the said bevel-gear, the grip-  
 ping-rollers supported from the under side of  
 the ring and arranged for adjustment along 70  
 upwardly-divergent guideways formed in the  
 said bevel-gear, the said guideways being  
 provided with grooves which permit the grip-  
 ping-rollers to turn on their respective axes,  
 means for adjusting the said ring so as to 75  
 cause the gripping-rollers to engage the drill-  
 rod with their peripheries, and a bevel-gear  
 for rotating the aforesaid bevel-gear.

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Witnesses:

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