No. 832,077.

PATENTED OCT. 2, 1906.

J. R. PEARCE.

GEARING FOR POWER DRILLS.

APPLICATION FILED MAY 6, 1905.

3 SHEETS—SHEET 1.

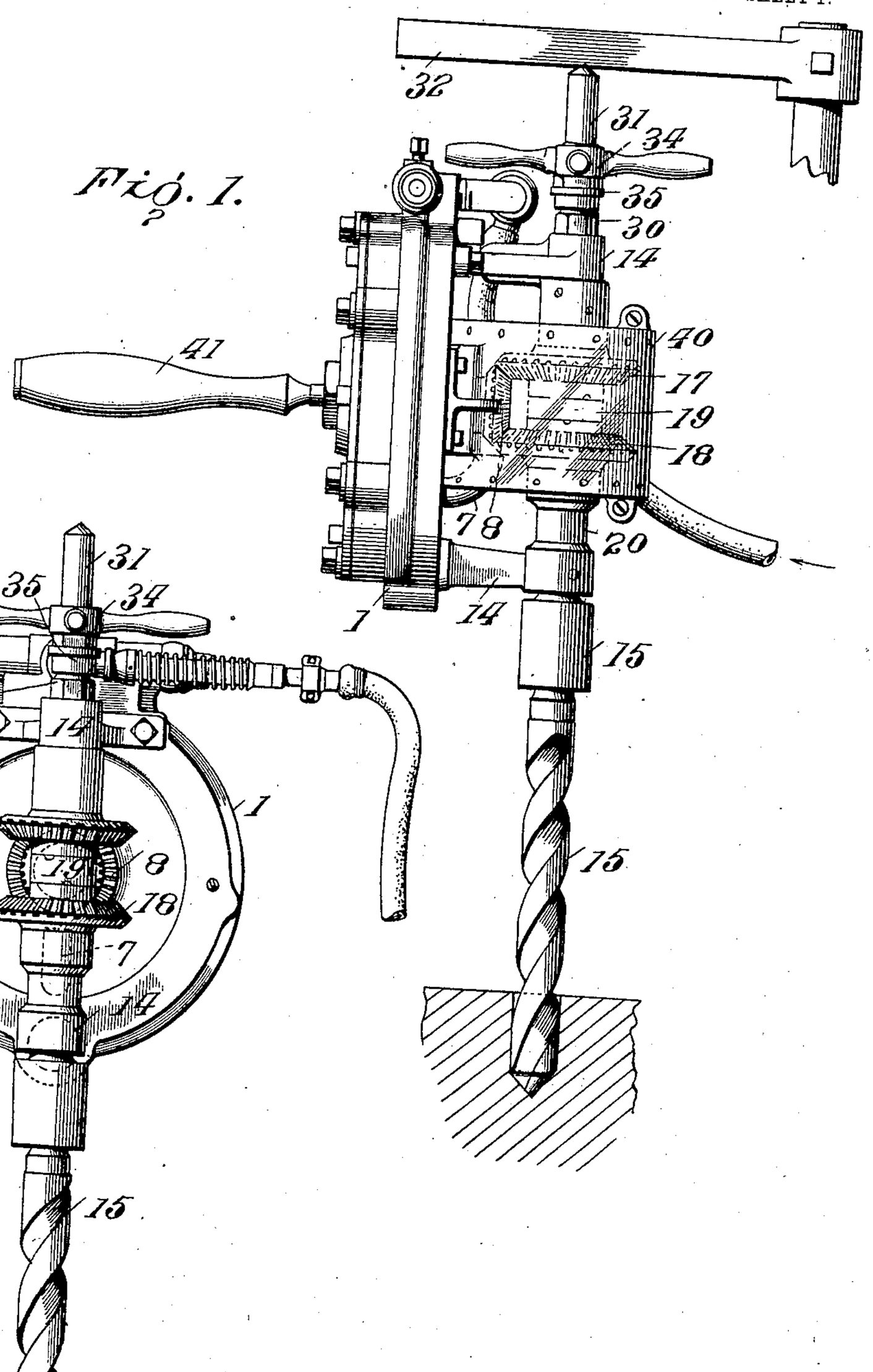

Fig. 1.

Fig. 2.

Witnesses

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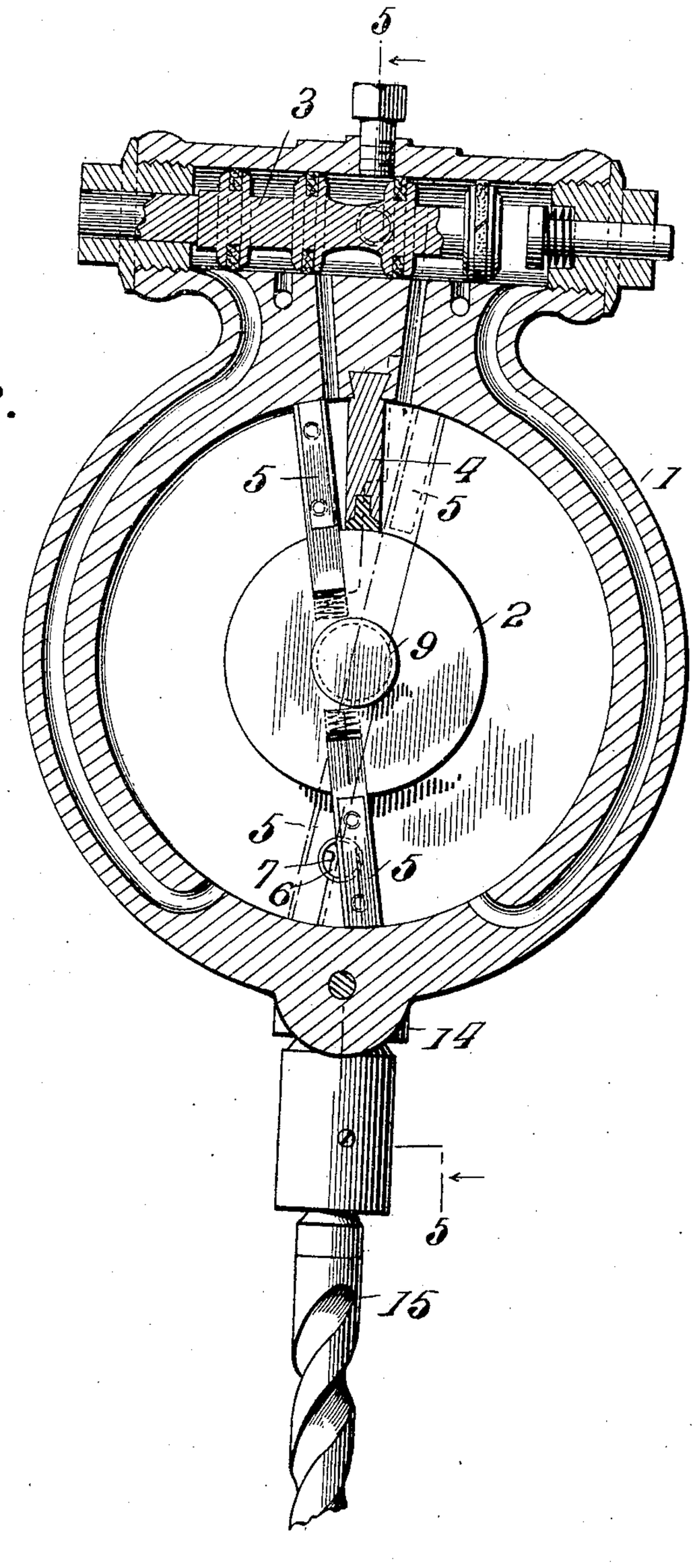
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 5.

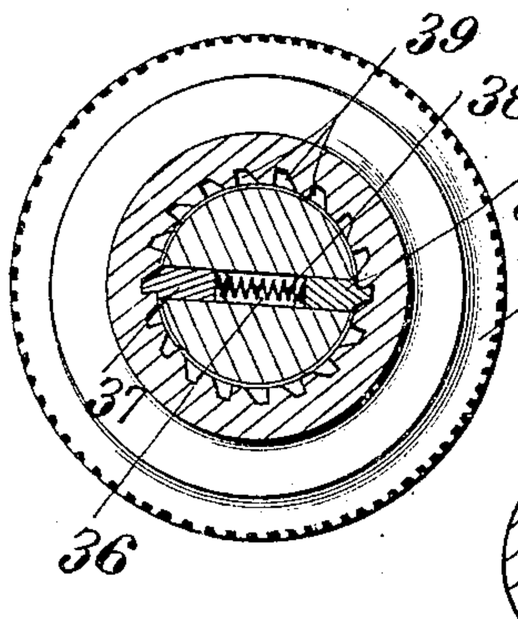

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN R. PEARCE, OF MEMPHIS, TENNESSEE, ASSIGNOR OF ONE-THIRD TO R. H. BRIGGS, SR., OF MEMPHIS, TENNESSEE.

GEARING FOR POWER-DRILLS.

No. 832,077. Specification of Letters Patent. Patented Oct. 2, 1906.

Application filed May 6, 1905. Serial No. 259,162.

To all whom it may concern:

Be it known that I, JOHN R. PEARCE, a citizen of the United States of America, and a resident of Memphis, in the county of Shelby and State of Tennessee, have invented certain new and useful Improvements in Gearing for Power-Drills, of which the following is a specification.

My invention relates to gearing for a power-drill usually operated by air or steam and illustrated as a drill for reaming or tapping holes in iron, steel, or other metal. This motor is very similar to that shown in my prior patent, No. 527,072, granted October 9, 1894, and has a piston which oscillates or has a rotary reciprocation.

My invention relates chiefly to means for changing this reciprocation into continuous rotary motion and may be used for all power purposes, not being confined to drills.

To this end my invention consists in the general combination and various features of construction illustrated in the drawings, described in the specification, and particularly pointed out in the appended claims.

Referring to the drawings, Figure 1 is a front elevation of the apparatus. Fig. 2 is a perspective view with the gear-casing removed. Fig. 3 is a vertical section through the motor-casing, showing the piston-valve, the piston-chamber, and the related parts. Fig. 4 is a side elevation, partly in section, of the drill on a larger scale and showing the motor, gearing, &c. Fig. 5 is a detail of one of the gears, showing in section its ratchet mechanism.

As stated above, the motor is similar to that illustrated in my patent and consists of a casing 1, a rotary piston-head 2, a piston-valve 3, a fixed division 4, piston-wings 5, and appropriate steam-passages. These parts are common to the motor of the patent and to my improved motor; but in the latter I have made certain changes in the details of construction. I have added an opening 6 and pipe 7 at the back of the piston-chamber to carry off any oil which may find its way into the piston-chamber and to conduct it to the miter-gear 8, hereinafter described, and attached to the piston-shaft 9. I have also placed the wings to one side of a plane through the center of the piston-head, so that their active faces only are in this plane. In my previous construction the plane divided the piston-wings in half. The new position affords a longer stroke and is an improvement on the old arrangement. I have also altered the location of the packing-ring 10, for which I have provided a recess 11 in the cover 12, spiral springs 13 being provided between the bottom of the recess and the ring to force the same against the piston-head 2.

The operation of the motor has already been referred to and it is believed will be clear from the drawings and need not be set forth in detail. It is sufficient to say that the fluid acts alternately on the piston-wings to turn the motor-shaft first in one direction and then in the other.

At the back of the motor-casing are suitably-spaced brackets 14, in which, as clearly shown in Fig. 4, is journaled the drill-shaft 15. These brackets are an equal distance from the axis of the motor-shaft 9, which is journaled, by means of roller-bearings, in the motor-casing, and are vertically in line with each other. Fast to the motor-shaft 9 is the miter-gear 8. This gear meshes with oppositely-placed miter-gears 17 and 18, which are spaced apart by a suitable collar or filler 19 and are connected to the drill-shaft 15 by suitable oppositely-placed pawl-and-ratchet mechanisms, hereinafter more fully described. The lower gear 18 is held in position by a filler 20 between it and the lower bracket. The upper drill-shaft bracket has milled out therein a recess 21 to receive ball-bearings for the drill-shaft. These bearings are arranged as follows: The drill-shaft is turned down at its upper end to three sizes, thus constituting steps, which are made use of as follows: The lower step supports a ball ring or race 22, closely fitting the recess 21. This ring is suitably grooved, as shown, and balls 23 act between it and the face 24 of the second-sized portion of the drill-shaft. Resting upon the ring 22, and like it closely fitting the recess 21, is a second ball-ring 25. 26 is a cone-ring, the bottom of which is horizontal and rests on the first set of balls, preventing them from getting out of position. 27 is a bearing-plate at the bottom of the recess, resting upon the second set of balls 28. These balls coact with the said plate, the ball-ring, and the cone-ring. This has been found to be an efficient form of bearing, and I prefer to employ it; but other suitable bearings may be used.

To provide for feeding the drill, a feed-screw 29, having an angular locking portion

30, is screw-threaded into a correspondingly-threaded recess in the top bracket. Upon this feed-screw is located a correspondingly-screw-threaded sleeve 31, the upper part of which is conical and coacts with a rest 32 and the lower part of which is provided with a hexagonal or other angular portion 33, on which is closely fitted the feed-wheel 34, which is prevented from slipping off the lower end of the sleeve should it become loose thereon by means of an enlarged portion 35 of the sleeve 31.

The operation of the feed mechanism is as follows: When the drill is in position with the conical portion of the sleeve 31 in contact with the rest 32 and it is desired to feed the drill with respect to the work, the sleeve 31 is rotated by means of the feed-wheel 34. The sleeve being held immovable vertically by the rest 32, vertical movement is given to the feed-screw and to the upper drill-shaft bracket, and thus to the motor and drill.

Referring again to the means by which the drill-shaft is driven, and particularly to Figs. 4 to 6, illustrating the details of this construction, the drill-shaft is provided with two transverse slots 36, extending through it and preferably, as shown, at right angles to each other. Each of these slots 36 corresponds to one of the gears 17 and 18 and is designed to retain dogs 37 and springs 38, acting to force them outwardly. Each dog has at its outer end a tooth having an abrupt face and a sloping face. Each miter-gear 17 and 18 is provided with internal teeth 39, having abrupt and sloping faces and adapted to coact with the corresponding faces of the teeth of the dogs. The internal teeth of the lower gear and of the dogs coacting therewith are faced oppositely to the internal teeth of the upper gear and of the dogs coacting therewith. The result of this construction will readily be apparent. When either gear is turned so that the abrupt faces of its teeth contact with the corresponding abrupt tooth-faces of the dogs, the movement of the gear will drive the shaft; but when the gear is turned in the opposite direction the sloping faces of the teeth of the gear and of the dogs will coact and have a wedging action, which will force the dogs back into the slot against the action of the springs and will allow the gear to rotate idly on the drill-shaft. As the two ratchet mechanisms are oppositely faced, one of the gears will always be driving and the other will always be turning idly, the gears alternating in this respect. The miter-gear 8, which is given a rotary reciprocation by the motor, will therefore drive the drill-shaft first by one of the gears 17 18 and then by the other, thus giving to the drill a continuous rotation.

A suitable removable gear-casing 40 is provided for the protection of the bevel-gears, and the cover of the motor has affixed to it a handle 41 for convenience in manipulating the drill.

It will be apparent that I have devised an exceedingly simple and compact construction whereby a reciprocatory motor is enabled to produce positive and continuous rotation and that I have arranged for the ready adjustment of the rotating element.

What I claim as new, and desire to protect by Letters Patent, is—

1. The combination of a casing, opposite brackets on said casing substantially equidistant from its center, a shaft mounted centrally of said casing, means within the casing for reciprocating said shaft, a second shaft journaled in said brackets, separate oppositely-disposed clutch mechanisms for said second shaft, and means on the first shaft for giving motion simultaneously to both said mechanisms and for rendering them alternately effective to rotate said second shaft, substantially as described.

2. A shaft, means for reciprocating the same, a bevel-gear on said shaft, a driven shaft provided with slots at right angles to each other, bevel-gears oppositely disposed on said driven shaft and both meshing simultaneously with the bevel-gear on the driving-shaft, annular series of teeth within each gear on said driven shaft, pawls in pairs in said slots, a plurality of springs acting on both members of each pair to cause them to coact with the annular teeth, said annular series and pawls constituting oppositely-acting clutch mechanism, whereby each member of the pair alternately drives the shaft and moves idly, thus causing the driven shaft to rotate continuously, substantially as described.

3. In combination, a shaft adapted for rotary reciprocation, a bevel-gear thereon, a second shaft adjacent to said first shaft, a pair of separate bevel-gears on said second shaft both of which mesh at all times with the gear on the first shaft, each gear of said pair being loose on said second shaft and having an internal annular toothed portion, means to retain said gears in position, said second shaft having slots, and dogs therein each spring-pressed outwardly at a plurality of points and adapted to coact with said internal annular toothed portions, the teeth of the annular portion of one gear of the pair and of the dogs coacting therewith being oppositely faced to those of the other to cause continuous rotation by the alternate effective action in a single direction of the gears of the pair, substantially as described.

Signed by me at Memphis, Tennessee, this 24th day of April, 1905.

JOHN R. PEARCE.

Witnesses:
C. G. BOYER,
W. HY. BOYER.