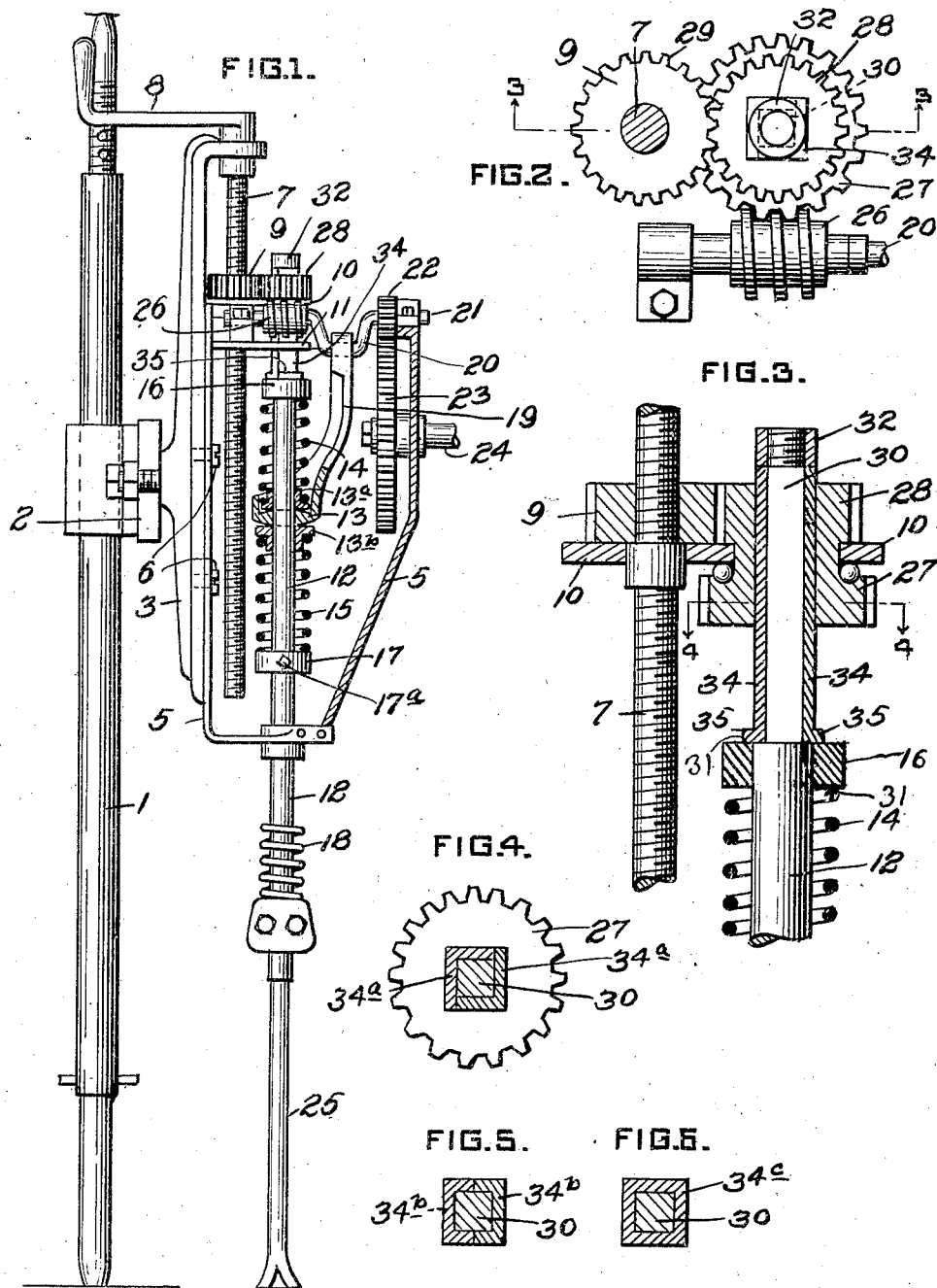


R. BINNIE.
 ROTARY RECIPROCATING DRILL.
 APPLICATION FILED NOV. 12, 1919.

1,362,387.

Patented Dec. 14, 1920.



WITNESSES

J. Herbert Bradley.
 Jo. Bailey Brown

INVENTOR

Robert Binnie
 by Winter & Brown
 his attorneys

UNITED STATES PATENT OFFICE.

ROBERT BINNIE, OF BOLIVAR, PENNSYLVANIA.

ROTARY RECIPROCATING DRILL.

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Specification of Letters Patent.

Patented Dec. 14, 1920.

Application filed November 12, 1919. Serial No. 337,470.

To all whom it may concern:

Be it known that I, ROBERT BINNIE, a resident of Bolivar, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Rotary Reciprocating Drills, of which the following is a specification.

This invention relates to rotary reciprocating drills, and more particularly to the means for imparting rotary motion to such drills. The object of the invention is to provide a connection between the drill rod and the means for rotating it, which is durable, and which may be readily repaired or renewed after it has become worn.

Referring to the drawings Figure 1 is an elevation, with a part of the frame in section, of one form of drill to which this improvement may be applied; Fig. 2 is an enlarged plan view of the drill rotating means; Fig. 3 is a vertical section on the line 3—3 of Fig. 2; Fig. 4 is a section on the line 4—4 of Fig. 3; and Figs. 5 and 6 show modifications of a special bushing.

The drill is mounted on a suitable standard or post 1, to which is adjustably attached a plate 2 which carries rigidly mounted thereon a stationary drill frame member 3. A movable frame member 5 is slidably mounted on the stationary frame member 3, and the relative movement of these two members is limited by bolts 6 which extend through slots in the frame member 5, and are threaded into the frame member 3. The movable frame member 5 is adapted to be driven up and down on the member 3, as the drill advances, by means of a driving screw 7. This may be actuated by means of a hand crank 8, as illustrated, but is also adapted to automatic feeding by means of a nut 9 which surrounds it and is adapted to be rotated from the driven shaft as more fully described below.

The frame member 5, which preferably is in the form of a casing to house the driving parts, is provided with brackets 10 and 11 through which the drill rod 12 passes loosely in order to permit reciprocation of the rod therein. This rod can be reciprocated by any suitable mechanism, that illustrated comprising a yoke 13 slidably on the drill rod and located between two cushioning springs 14 and 15 whose outer ends bear against collars 16 and 17 respectively. The collar 16 seats against the base of a bushing described below. Collar 17 may be se-

cured to the drill shaft in any desired manner, as by set screw 17^a. The springs serve to take up shocks as will be obvious. Contact between the springs and the yoke 13 is made by two slidable oval faced collars 13^a and 13^b, upon which the ends of the springs seat. The yoke has oval faces in contact with the said collars of oval shape, and this permits the yoke to rock freely and without undue friction on the collars 13^a and 13^b. A further cushioning spring 18 may be provided on the drill rod below the frame 5, to prevent too violent upward movement of the drill rod. This spring is, however, not essential. The yoke 13 is carried at one end of a connecting rod 19, the other end of which is connected to a crank or eccentric 20 on an operating shaft 21, suitably mounted in the frame member 5 and provided with a pinion 22 meshing with a gear 23 on the driving shaft 24. By this arrangement the drill is reciprocated when power is applied to the shaft 24 as will be obvious. A drill bit 25 of any suitable construction is mounted at the lower end of the drill rod 12.

The driving shaft 21 carries a worm 26 which meshes with a worm wheel 27, which surrounds the drill rod and is mounted between the brackets 10 and 11 of the frame member in a manner to allow it to rotate, but which prevents its movement up and down. The worm gear 27 carries rigidly mounted thereon a second gear portion 28, which meshes with the gear face 29 of the driving nut 9, which is mounted upon the screw 7. This arrangement automatically rotates the driving nut and so feeds the drill down as it bores into the material being operated upon.

All of the parts so far described are of ordinary drill construction. The particular improvement constituting this invention has to do with the connection between the gear 27 and the drill rod 12. That portion of the drill rod which extends through the gear 27 is reduced in size and preferably squared or made of other non-circular cross section, thus providing a shaped portion 30 adapted to be reciprocated through the gear 27. In forming this shaped or squared section a shoulder 31 is formed at the lower end of the section 30, and at its upper end another shoulder is formed by mounting on the drill rod a removable collar 32. This may be threaded on the end of the drill rod, or may be attached by set screws, or in any other desired manner. The shaped portion 30, be-

tween these shoulders or collars is made slightly longer than the total reciprocating movement of the drill rod. The hole through gear 27 is made non-circular to conform to the particular shape of the section 30 and is of a size sufficiently large to allow the upper end of the drill rod to be inserted there-through. Between the gear 27 and the shaped portion 30 of the drill rod a bushing 34 adapted to fit closely on the portion 30 and to fill the space between that portion and the walls of the openings through the gear 27 is provided. Preferably this bushing is square, though any non-circular shape may be employed. It may be composed of two similar parts 34^a each of which is of angle shape, and which when assembled form a square bushing whose interior fits the squared portion 30 of the rod and whose exterior makes a slidable fit in the opening through the gear 27. It is not however necessary that the bushing be made of two angle shapes, as it may be made of two channel members 34^b adapted to fit together and form a square, or it may be made of a hollow square 34^a forming an integral bushing. In the latter case it is slipped over the end of the portion 30 before the removable collar 16 is placed in position. The shoulders or collars 31 and 32 bear against the lower and upper ends respectively of bushing 34, which is of proper length to fill the space between said shoulders, and consequently the bushing reciprocates with the drill rod through the opening in gear 27. The lower end of the bushing 34 is upset to form a flange or projection 35, which constitutes a seat for the slidable collar 16. Because of the non-circular form of the hole in the gear and the bushing, and the portion 30 of the drill rod embraced by the bushing, the drill is necessarily rotated by the gear.

The great advantage of this construction is that a removable bushing is provided to form the wearing surface of the reciprocating drill shaft. It may be made of a metal somewhat softer than the hole through gear 27 and therefore when the bushing is worn to such an extent as to be no longer useful it may be very quickly removed and replaced with a new one. It is hard to keep lubrication on this part of the drill which is exposed to abrasive dusts in which even in the best of condition the wear is very rapid. All of

the wearing is between the bushing and the gear. This can be readily compensated for by replacing the bushing with a new one, or by one with a slightly larger exterior size.

I claim:

1. In a drill, a reciprocating drill rod, a driving gear through which said rod extends, shoulders on said rod above and below said gear, and a removable bushing fitting between said shoulders and reciprocating in the gear, the opening in the gear the exterior and the interior faces of said bushing and the portion of the drill engaged by said bushing being of non-circular shape.

2. In a drill, a reciprocating drill rod, a driving gear through which said rod extends, collars on said rod above and below said gear, and a removable bushing fitting around the drill rod between said shoulders and reciprocating in the gear.

3. In a drill, a reciprocating drill rod, a driving gear through which said rod extends, a bushing surrounding the rod and extending through the driving gear, and means to reciprocate the drill rod while it is rotated by the said driving gear.

4. In a drill, a reciprocating drill rod provided with a non-circular portion of reduced size having bounding collars at each end of said reduced portion, a separable bushing engaging said non-circular portion of the rod and conforming internally in shape thereto and filling the space between the shoulders thereof, and a driving gear provided with a non-circular opening of a size slightly larger than the drill rod, said bushing in external shape conforming to said opening and reciprocating therein.

5. In a drill, a reciprocating drill rod, provided with a non-circular portion, a removable bushing engaging said non-circular portion of the said rod, and conforming internally in shape thereto, and a driving gear provided with a non-circular opening of size slightly larger than the drill rod, said bushing in external shape conforming to said opening and reciprocating therein.

In testimony whereof, I have hereunto set my hand.

ROBERT BINNIE.

Witness:

HOWARD L. SNIVELY.