

Nov. 1, 1932.

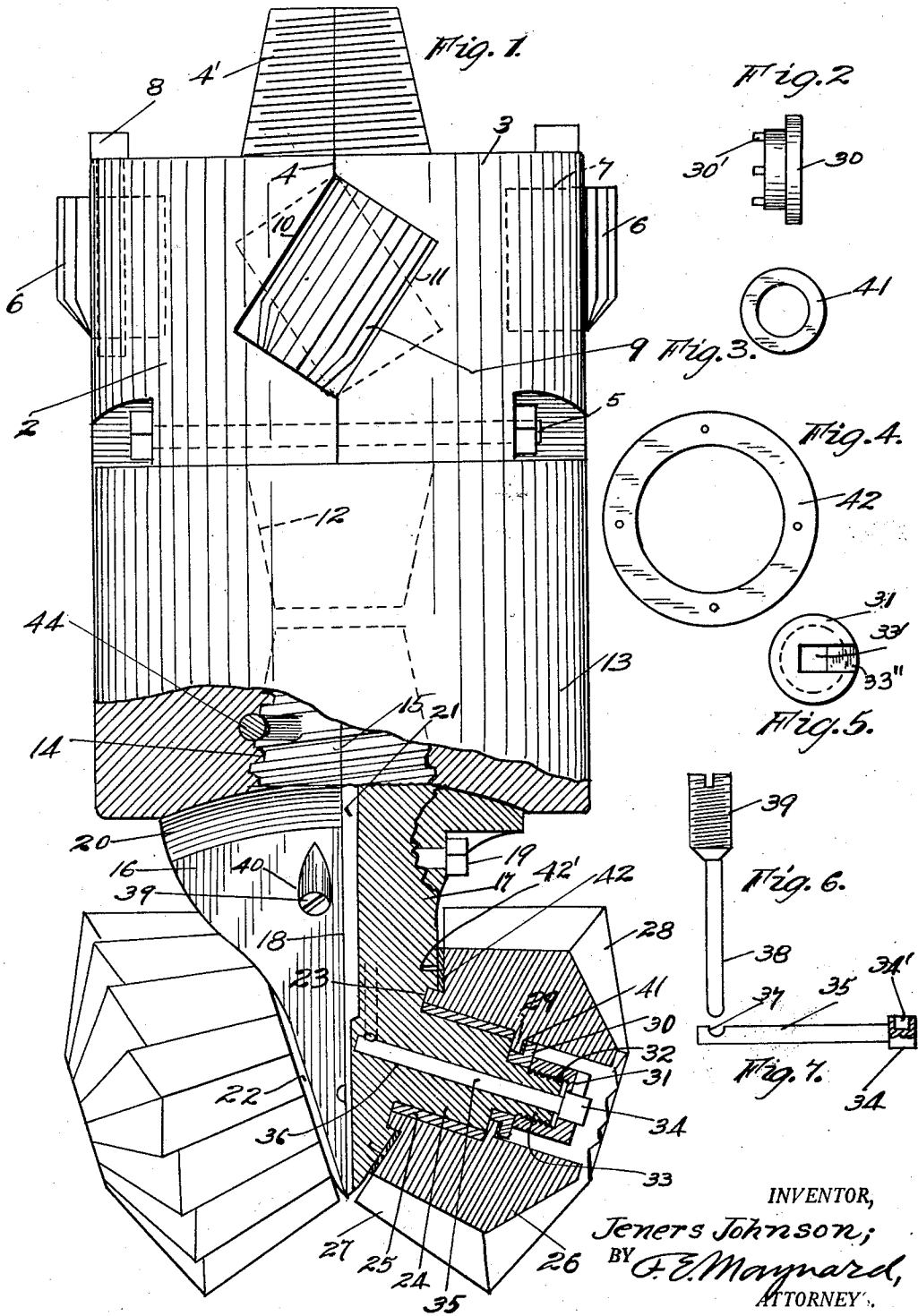
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ROTARY DRILL

Filed April 3, 1931

2 Sheets-Sheet 1



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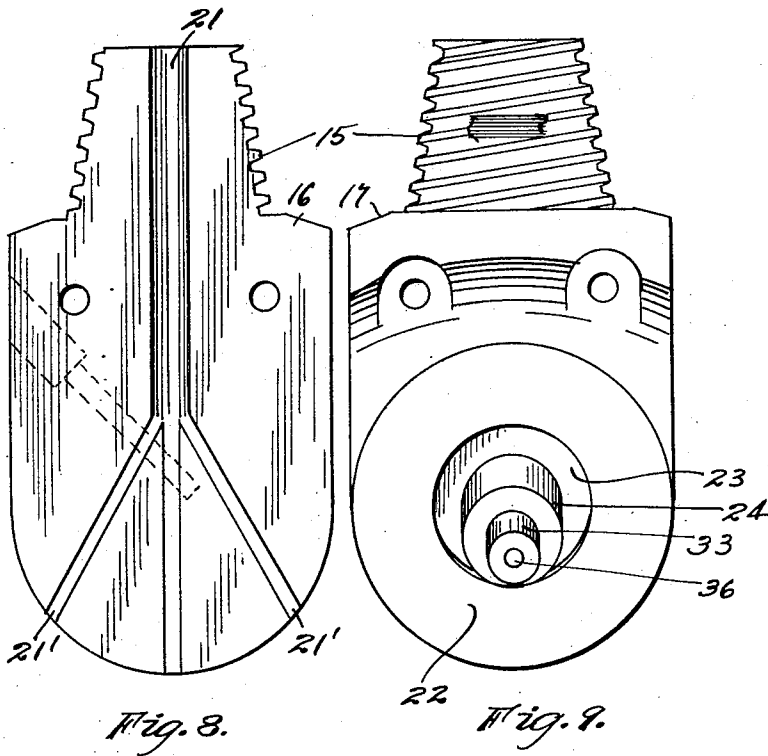
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ROTARY DRILL

Application filed April 3, 1931. Serial No. 527,379.

This invention relates to drill bits of the type having rotary, spur cutters on their bottom ends.

An object is to provide a practical, substantial and efficient means for securing the rotary cutters on the lower end of the bit body.

More especially, it is an object to provide a simple and highly effective pin and key fastening device to retain a trunnion nut in place.

A further object is to provide for the economical construction, interchange and assembly of the several parts.

An additional object is to provide a bit including a rotary, spur cutter presenting a system of hole-bottom, cutting spurs and also having spurs for cutting the side wall of the hole; and to provide a set of rotary cutters in such angular relation as to produce a central cone bottom in the formation in a manner to tend to operate efficiently in the cutting of a straight hole.

Figure 1 is a partial side elevation and section axially of the bit.

Figure 2 is a side elevation of a hub washer element.

Figure 3 is a plan of a hub gasket.

Figure 4 is a plan of perforated foot-stock washer.

Figure 5 is a plan of a cutter retaining cap.

Figure 6 is a side elevation of a bolt holding key.

Figure 7 is a side elevation of a cap holding bolt.

Figure 8 is an elevation of the inner, side face of a foot-stock section, and

Figure 9 is an outside, face elevation thereof.

The reamer comprises a body including semi-cylindrical sections 2 and 3 having meeting diametrical faces 4 and are secured face to face by cross bolts 5. These sections 2-3 have a screw pin 4' on their top end and also have side-wall cutting reamer cut-

ters 6 mounted in respective pockets 7 and turning on or with spindles 8; the cutters having longitudinal teeth and the cutters being parallel to the axis of the bit. Additional reamer cutters 9 are disposed on axes lying in planes obliquely to the axis of the bit and countersunk in respective recesses 10 and 11 in opposite sides of the body sections 2-3. The reamer features are described in more detail and claimed in application No. 571,252, filed October 26, 1931.

The reamer body sections 2-3 have a screw-pin 12 screwing into a bit body member 13 which has a central, threaded bore 14 to receive a pin 15 provided on a lower part of the body here called the foot-stock. This preferably consists of duplicate members 16-17 having diametrical meeting faces 18, lying in an axial plane of the bit, secured together by cross bolts 19. This sectional foot-stock has a crowned head 20 seating snugly against the bottom of the body member 13. The body of the bit, as a whole, consists of the parts 13, 16-17.

To provide desired water circulation to the bottom of the hole, an axial water passage 21 extends from the top pin 4 to the bottom edge of the foot-stock 16-17.

The foot-stock 16-17 presents an acute angled downwardly converging wedge whose opposite sides are thickened by circular boss surfaces 22 provided with undercut, annular channels 23 and having substantial lateral trunnions 24 with bronze or other suitable metal bushings 25 whose bottoms lie in the channels 23. In the drawings, one of the duplicate foot-stock sections is shown in side elevation and the other in section on the axis of its trunnion 24.

Each trunnion 24 carries a rotary, spur cutter 26 of suitable or approved shape of body and arrangement of teeth.

As here shown, each cutter 26 presents a truncated, conical body turnably fitted on its trunnion bushing 25, whose axis is at such an

angle to the axis of the bit that the system of teeth 27, about the cutter 26, produces, on the bottom of the hole, a line of cut which will, by rotation of the bit, form a conical, earth formation core.

The basal or outer side of the truncated cutter presents a system of teeth 28 whose ridges or tips have a flat, truncated, conical orbit. The teeth 28 produce a well-bore cut slightly larger in diameter than that of the reamer body elements 2—3 so that these do not roll on the wall of the well hole.

Each cutter 26 has an inner, annular shoulder-forming flange 29 to bear against the near end of its trunnion 24. A washer 30 is held against the shoulder 29 by a thimble 31 screwed at 32 on a reduced end part 33 of the trunnion 24, and thereby retains the applied cutter against end play but allows free rotation thereof.

It is highly desirable to provide means for preventing the accidental unscrewing of the thimble 31 and for this purpose the thimble is provided with a non-circular hole 33, Fig. 5, to receive a complementary head 34 of a bolt 35 which extends into an axial hole 36 provided therefor in the foot-stock trunnion 24. The inner end of the bolt 35 has a nick, slot or recess 37 adapted to register with a pin hole 40 in the foot-stock section, a key 38 being insertible into the hole 40 and to interlock in the nick 37 of the bolt 35, the key 38 having a head 39 screwed in the foot-stock and thus holding the bolt against accidental dislodgement.

When it is desired to remove a cutter 26, the key screw 39 is withdrawn sufficiently to release the holding bolt 35 and then any simple tool may be applied to the head 34, which, for this purpose, may have a tool socket 34' exposed in a lateral recess 33' provided in the cutter retaining thimble 31.

When the cutters 26 are in place, the thimbles 31 and the holding bolt heads 34 are sunk within the distal ends of the cutters so as to be protected.

Preferably, the bearing faces of the cutters 26 and their bushings 25 are protected against undue wear by provision of gaskets 41 lying against the shoulders 29 in the cutter bores, and by gaskets or washers 42, on the bosses 22, receiving the inner end faces 25' of the cutters.

The washer 30 is provided with holding pins 30' to engage in the end of the trunnion part 33 to prevent rotation of the washer; the latter being held by pins 42'.

It is desirable to prevent accidental dislodgment of the foot-stock parts from the driving body part 13 and for this purpose a cross-pin 44 in the driving body 13 engages a part of the screw pin 15 to lock this against turning.

Since the toe edge of the foot-stock of the bit body is of quite an acute angle, the axial

water duct 21 divides into a plurality of smaller ducts 21', Fig. 8, to distribute the desired volume of water without unduly weakening the stock by large ducts. The foot-stock is preferably made in two like pieces as this greatly facilitates handling and machining these members, though it could be of one piece if desired.

What is claimed is:

1. A rotary drill bit having a foot body provided with an outwardly extending trunnion having its outer end reduced and provided with a screw thread, and a peripheral trunnion shoulder between said body and said threaded end, a rotary cutter mounted on said trunnion and having an internal flange presenting a shoulder lapping on the trunnion shoulder, a washer on the reduced end of the trunnion and lying against said flange, and a lockable thimble on the trunnion end to retain the cutter in place.

2. A rotary drill bit having a foot body provided with an outwardly extending trunnion having a journal portion and having its outer end reduced and provided with a screw thread, and a peripheral trunnion shoulder between said journal portion and said threaded end, a rotary cutter mounted on said journal portion and having an internal flange presenting a shoulder lapping on said shoulder, a washer on the reduced end of the trunnion and lying against said flange, and a lockable thimble on the trunnion end to retain the cutter in place; the locking means for the thimble including a bolt whose head is non-rotatably seated in the thimble and whose inner end has in one side a key receiving nick, and a screw key whose inner end is adapted to lodge in said nick when the key is screwed into a respective opening therefor in said body.

3. A rotary drill bit provided with trunnions, rolling cutters journaled on the trunnions, screw thimbles on the ends of the trunnions to hold the cutters thereon against axial movement and having lateral head slots, bolts interlocked in the thimbles to prevent unscrewing thereof and having heads with sockets aligned with said slots for reception of a pulling tool, and means keying the bolts in place against rotation and extraction.

4. A rotary drill bit provided with trunnions, rolling cutters journaled on the trunnions, screw thimbles on the ends of the trunnions to retain the cutters in place thereon, bolts insertible and interlocked in the thimbles to prevent unscrewing thereof, and means keying the bolts in place; said thimbles having non-circular apertures and the bolts having heads complementary to the apertures, the thimbles and the heads of the bolts having, respectively, aligned lateral holes for insertion of a pulling device for the bolt.

5. A rotary drill bit provided with trunnions, rolling cutters journaled on the trunnions, thimbles screwed on the ends of the trunnions to retain the cutters in place thereon, bolts interlocked in the thimbles to prevent unscrewing thereof, and means keying the bolts in place; said bolts having heads having holes for accommodation of an extracting tool, and the thimbles having pockets complementary to the bolt heads and having lateral recesses aligned with the holes in the bolt heads.

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