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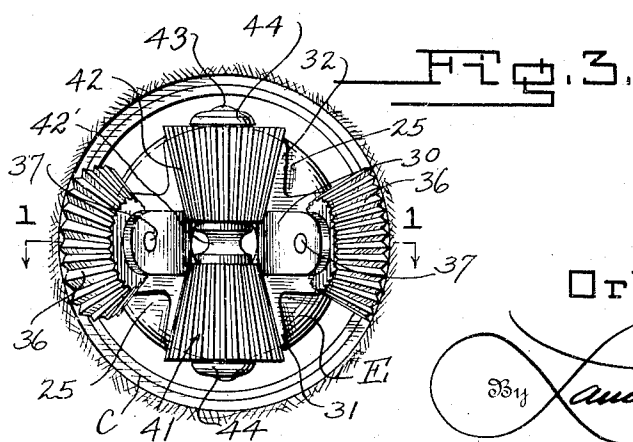
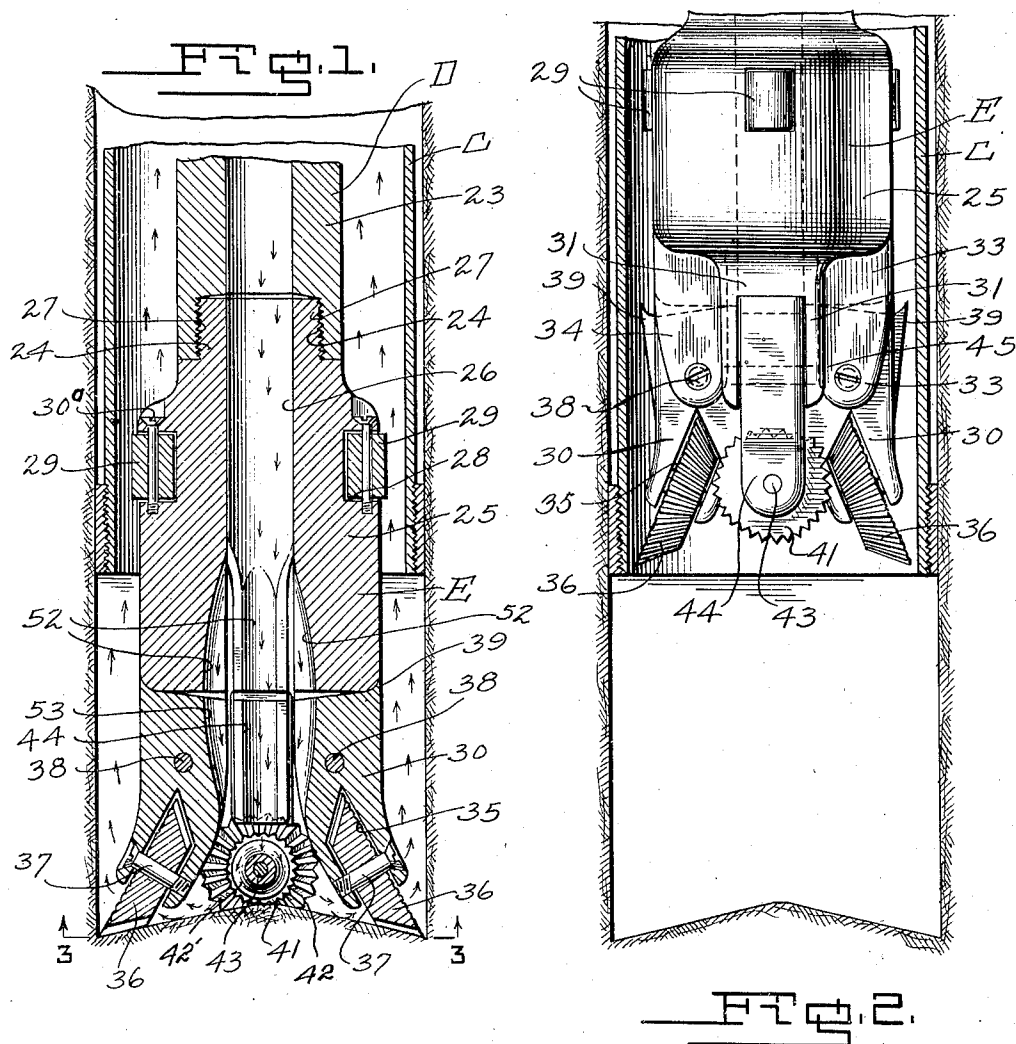
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O. B. WALL

WELL DRILLING APPARATUS

Filed March 28, 1922

3 Sheets-Sheet 1



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Feb. 2, 1926.

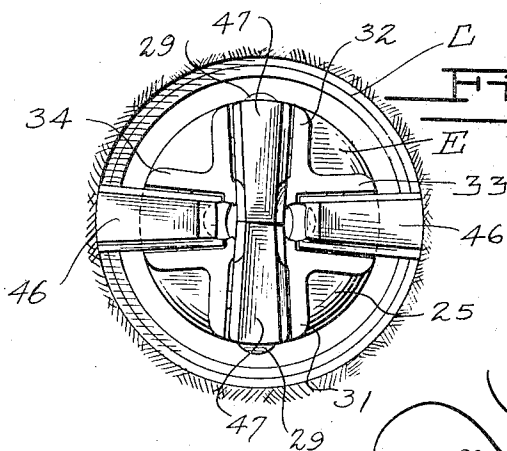
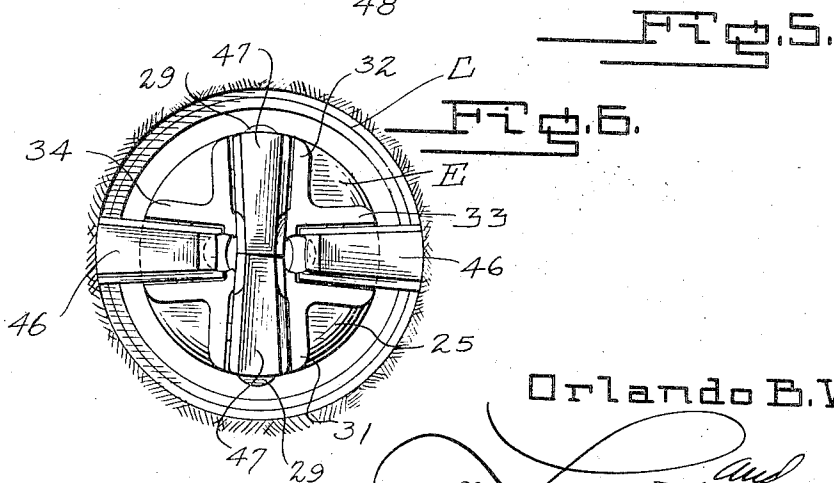
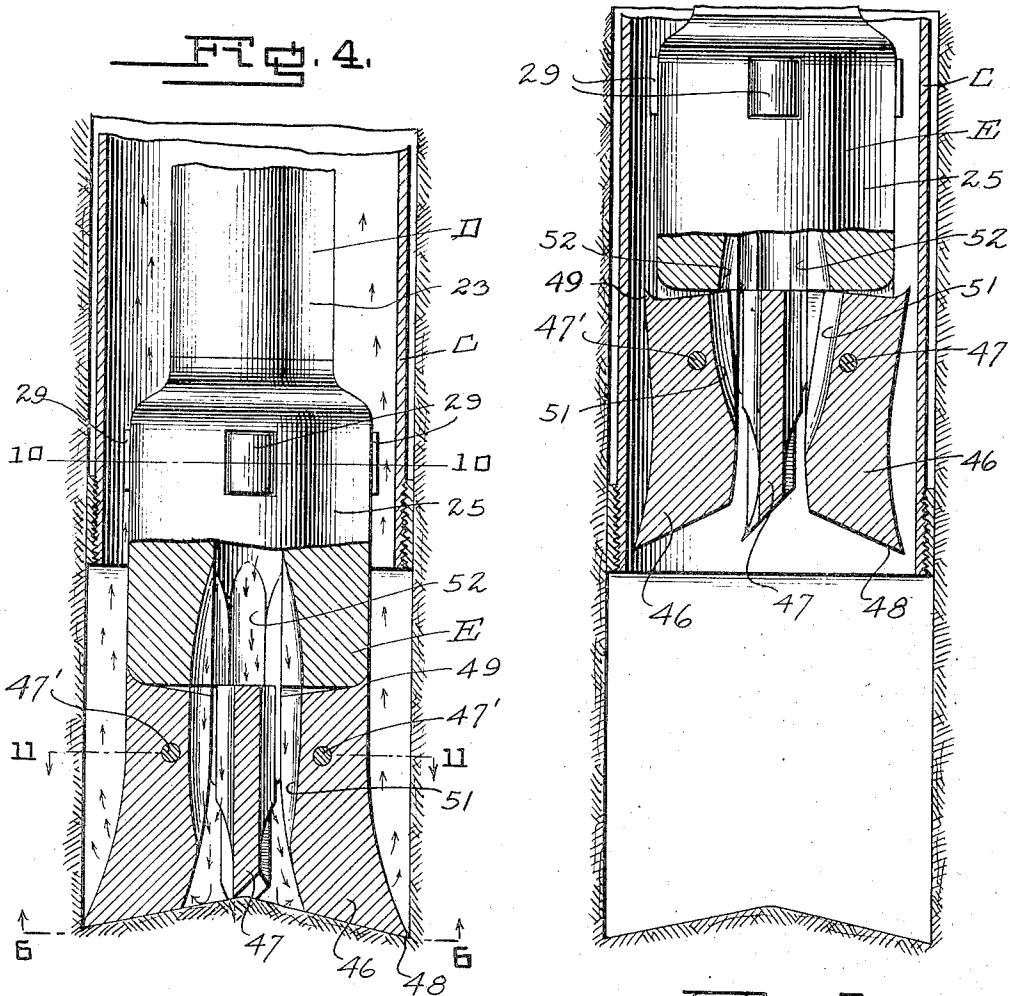
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WELL DRILLING APPARATUS

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3 Sheets-Sheet 2



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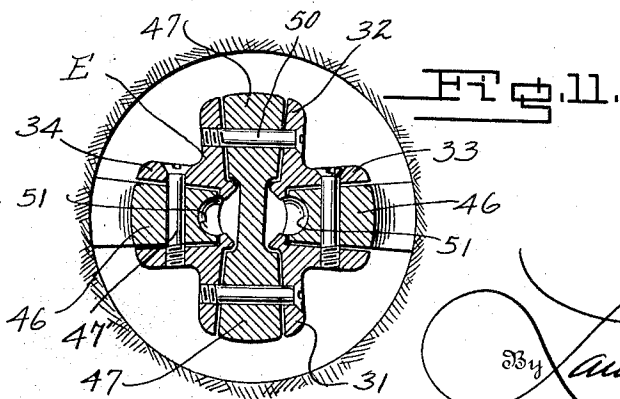
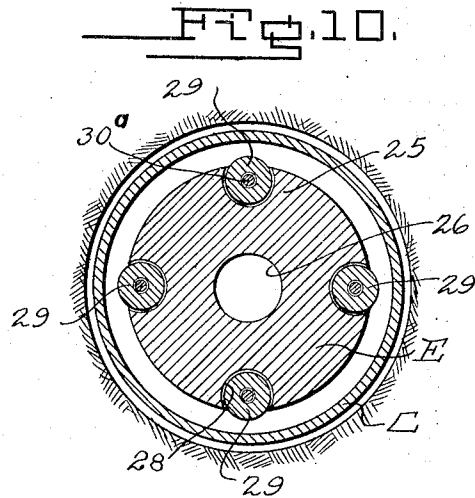
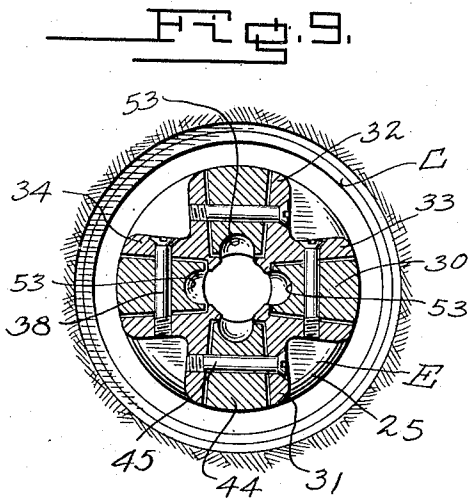
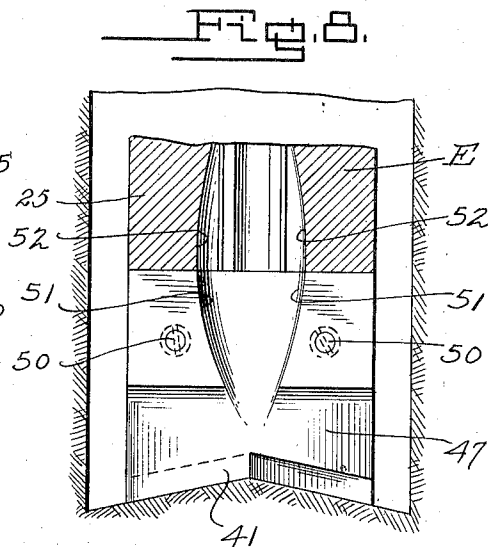
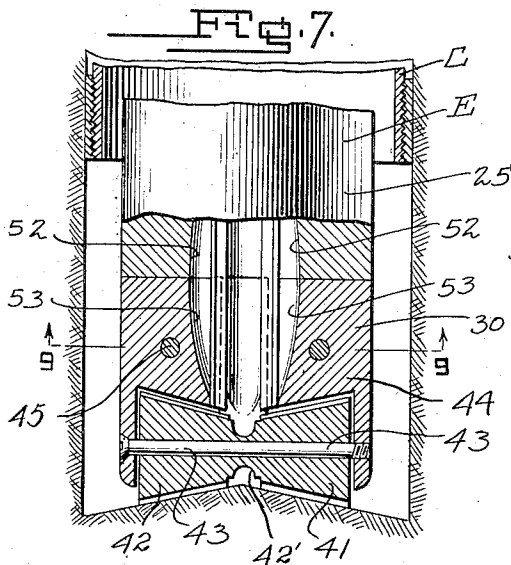
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WELL DRILLING APPARATUS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

ORLANDO B. WALL, OF WICHITA, KANSAS.

WELL-DRILLING APPARATUS.

Application filed March 28, 1922. Serial No. 547,445.

To all whom it may concern:

Be it known that I, ORLANDO B. WALL, a citizen of the United States, residing at Wichita, in the county of Sedgwick and State of Kansas, have invented certain new and useful Improvements in Well-Drilling Apparatus, of which the following is a specification.

This invention relates to earth boring and the primary object of the invention is the provision of a novel well drilling apparatus embodying a novel drill bit, which is so constructed that the same will expand after projection from the drill casing, the bit construction permitting the same to be withdrawn through the casing without the necessity of pulling the casing.

Another object of the invention is the provision of a novel expansible well drilling bit, in which the bit blades will automatically move out to their operative cutting positions, when the drill bit is projected out of the casing and into engagement with the work, and automatically moved inward to their inoperative non-cutting position when the drill is raised into the drill casing for any reason.

A further object of the invention is the provision of a novel expansible drill bit, in which the cutting blades thereof can be removed so that different types of cutters can be used with the same drill or bit head, the drill or bit construction permitting gear cutters to be used for hard formations or fish tail drill blades to be used for soft formations.

A further object of the invention is the provision of an improved drilling apparatus embodying an improved drill or bit including a head, arms pivotally associated with the head, having means for limiting their swinging movement into operative and inoperative positions, the arms having means for detachably receiving rotary gear cutters or rigid fish tail cutters.

A further object of the invention is the provision of a novel well drilling apparatus, embodying novel means for permitting the free circulation of water through the drill stem, around the drill cutters, and up through the casing around the stem, whereby all of the drill cuttings will be effectively carried away from the bit cutters.

With these and other objects in view, which will appear as the description pro-

ceeds, the invention consists in the novel construction, arrangement and formation of parts, as will be described and illustrated in the accompanying drawings forming a part of this specification, in which drawings:

Figure 1 is an enlarged diametric vertical section through the lower end of the drill stem casing and the drill bit, showing the same in operative cutting position in a shaft, and taken on the line 1—1 of Figure 3.

Figure 2 is a vertical, diametric section through the well drilling casing, showing the same in operative position in relation to the shaft or hole, the drill bit being shown in elevation and in its raised inoperative non-cutting position.

Figure 3 is a horizontal section taken on the line 3—3 of Figure 1, showing the bottom plan view of the improved drill or bit.

Figure 4 is a diametric section through the lower end of the well casing, stem and bit, showing parts of the bit in section and illustrating the fish tail cutter blades substituted for the gear cutters.

Figure 5 is a similar view showing the bit with the fish tail cutter blades in raised inoperative non-drilling position.

Figure 6 is a horizontal section taken on the line 6—6 of Figure 4, showing a bottom plan view of the drill with the fish tail cutter blades in position.

Figure 7 is a diametric section taken through the lower end of the drill or well casing and bit, showing the bit partly in section, the section being taken at right angles to Figure 1.

Figure 8 is a section similar to Figure 7, illustrating the arrangement of one of the fish tail bit blades in position.

Figure 9 is a horizontal section taken on the line 9—9 of Figure 7.

Figure 10 is a horizontal section taken on the line 10—10 of Figure 4.

Figure 11 is a horizontal section taken on the line 11—11 of Figure 4.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A generally indicates the improved well drilling apparatus, which may include the casing C, the drill stem D, and the novel bit or cutter E.

The drill casing C is of the usual or any preferred construction, and is made up of a string of pipes of the desired diameter and

connected together in the usual way. This casing is adapted to be gradually lowered as the shaft or hole is sunk, and new sections or pipe lengths added to the string as the casing is lowered.

The drill stem D is of hollow formation and is disposed in axial concentric relation to the casing, and this stem is also preferably made up of a plurality of sections or pipe lengths 23 which can be threadably connected or secured together in any preferred way. As shown in the drawings, each pipe or drill stem section has its lower end provided with an internally threaded socket 24, for the reception of an externally threaded nipple formed on the opposite end of the pipe or drill section with which it is connected.

The drill sections or pipe lengths are added to the stem as the shaft or hole is sunk.

The bit or drill E forms an important part of the present invention and comprises essentially a head 25, which is provided with an axial bore 26, which is adapted to align with the bore of the drill stem D, so that the passage of water through the drill head will be readily permitted. As shown, the upper end of the head 25 is provided with an externally threaded nipple 27 for insertion in the threaded socket 24 formed in the lower end of the lowermost section or length 23 of the stem D.

The head 25 is provided at spaced points with recesses 28 in its outer face for the reception of anti-friction rollers 29, which can be mounted upon removable fastening elements or bolts 30^a. These anti-friction rollers 29 are adapted to extend outwardly of the drill head 25, and form means for engaging the casing C in the event that the drill stem D comes out of alignment therewith through any reason. These anti-friction rollers will effectively prevent binding between the drill head and casing and prevent rotation of any of the pipe sections forming a part of the casing. This will effectively prevent displacement of any of the pipe sections from the string and the dropping of the pipe sections into the shaft or hole being sunk.

The lower end of the head 25 is bifurcated at diametrically opposite points to provide means for receiving suitable bits, or as shown, the lower end of the head 25 can be provided with pairs of ears 31, 32, 33 and 34, arranged at quarters for the reception of the blades 46 or cutter carriers or arms 30 and 44.

The pairs of ears 31 and 32 are disposed in diametric alignment, and the pairs of ears 33 and 34 are in diametric alignment.

Now, the improved bit head 25 is so constructed that either cutters of the gear type or cutters of the fish type can be utilized

therewith, and thus the drill can be effectively used for cutting in soft formation and for cutting in hard formation.

When the gear cutters are utilized for cutting in hard formation, the pairs of arms 30 are utilized, and these arms are disposed in the ears 33 and 34. The lower terminals of the arms 30 are bifurcated, as at 35, and extend outwardly at an angle to the vertical as clearly shown in Figure 1 of the drawings. These ears have disposed between the same the side gear cutters 36, which are rotatably mounted upon suitable pivot pins 37, which removably extend through the arms 30. The arms 30 are hingedly mounted upon suitable pivot pins 38, which extend through the pairs of ears 33 and 34, and thus these arms 30 are permitted to swing inwardly toward the axial center of the drill, and outwardly away from the axial center of the drill. The arms 30 at their outer ends are provided with limiting lugs 39 which are adapted to abut against the lower surface of the head 25, adjacent to the outer edge thereof.

Disposed intermediate the side cutters 36 is the central cutter 41, which extends diametrically across the lower end of the bit in fixed relation with the head 25, and includes the oppositely disposed tapered members 42 which may be integrally connected by a centrally disposed grooved hub 42'. This central cutter 41 is mounted upon a pivot bolt 43, which is supported by depending arms 44. These arms 44 are disposed intermediate the ears 31 and 32 and securely held in place between the same by bolts 45.

Now, when the bit is to be used for cutting in soft formations, the arms 30 and 44 are removed from the head 25 and the pair of bit blades 46, and the cross blade 47 substituted therefor. The pair of blades 46 are connected to the ears 33 and 34 by means of pivot pins 47' and thus these blades are permitted to swing outwardly into operative cutting position when the drill is projected outwardly of the casing C. The lower terminals of the blades 46 are slightly flared outwardly, as at 48, and it is obvious that these blades will automatically be moved into their cutting position when they strike the lower end of the shaft or hole being sunk. The inward and outward swinging movement of the pair of blades 46 is limited by the upper face of the blades 46, and the upper edge of the blades at the outer edge thereof are provided with the limiting shoulders 49. The blade 47 is disposed intermediate the pair of blades 46, and takes the place of the central cutter 41 and as clearly shown in Figure 8 of the drawings provides a double cutter which is rigidly secured between the pair of ears 31 and 32 by means of bolts 50. As shown, the blade 47 is very similar to the ordinary type

of fish tail bit, now in use. The inner faces of the bit blades 46 and 47 are provided with grooves 51 which align and communicate with the grooves 52 formed in the inner bore 26 of the head 25. This permits the free circulation of water through the bit in order to effectively wash the cuttings away from the blades. By referring to Figure 1 of the drawings, it also can be seen that the arms 30 and 44 are also grooves, as at 53, to perform a similar function with the grooves 52 formed in the bore.

It is apparent that when the drill bit is projected through the casing C, and the cutters 36 or 46 come into engagement with the shaft to be drilled, the cutters will be automatically spread into their operative cutting positions. It is likewise apparent that when the bit is raised, the flared outer surface of the arms 30 or the cutters 46 will come into engagement with the casing, and thus be moved inwardly into their collapsed position, as clearly shown in Figures 2 and 5 of the drawings.

From the foregoing description, it can be seen that an exceptionally simple or novel drill or bit has been provided, in which the different characters of cutters can be associated with a common head, and the cutters permitted to be moved outwardly into an extended operative cutting position or into an inoperative non-cutting position.

Changes in details may be made without departing from the spirit or scope of this invention; but,

I claim:

1. A drill bit comprising a head having an axially disposed washing opening there-through, the lower end of the head having grooves communicating with the opening, and pivoted cutters carried by the head having grooves formed in the inner surfaces

for communicating with the first mentioned grooves.

2. A drill bit comprising a rotary head, a plurality of diametrically opposed pairs of ears carried by the lower face of the head, a diametrically extending non-swingable gear cutter carried by certain of the ears, and a pair of swinging gear cutters pivotally associated with the other ears.

3. A drill bit comprising a head including a plurality of pairs of diametrically opposed ears, a diametrically extending rotary cutter carried by certain of the ears, swinging arms pivotally associated with the other ears carried by the head, means for limiting the inward and outward swinging movement of the arms, and rotary gear cutters carried by the lower ends of the arms.

4. A drill bit comprising a head having a concentric waterway therethrough, a plurality of ears, depending arms rigidly carried by certain of the ears, a diametrically extending gear cutter carried by the arms, a pair of diametrically disposed pivot arms carried by the ears, the lower terminals of the last mentioned arms being bent outwardly, gear cutters carried by the bent terminals of the arms, the inner surfaces of the arms being all provided with grooves for communicating with the axial waterway.

5. A drill bit comprising a head, a diametrically extending removable rotary cutter carried by the head therebelow operating on a fixed diametrically disposed axis, and pivoted cutter members including rotary cutters at their outer ends carried by the head directly at opposite sides of the diametrically extending cutter and inwardly of the ends of said diametrically extending cutter swingable directly toward and away from the diametrically extending cutter.

ORLANDO B. WALL.