July 11, 1939. H. C. SMITH ET AL 2,165,584

ROLLER BIT

Original Filed July 22, 1936

Fig. 1

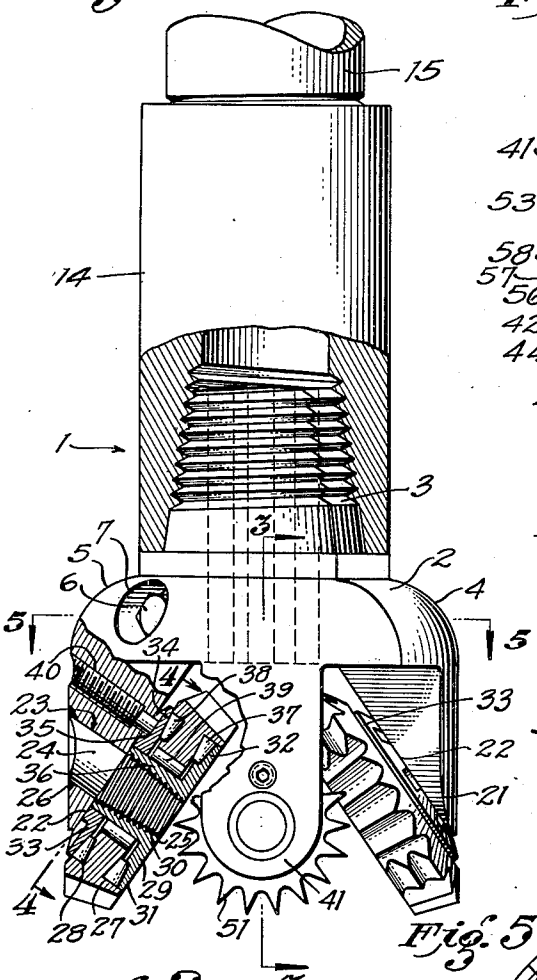


Fig. 3

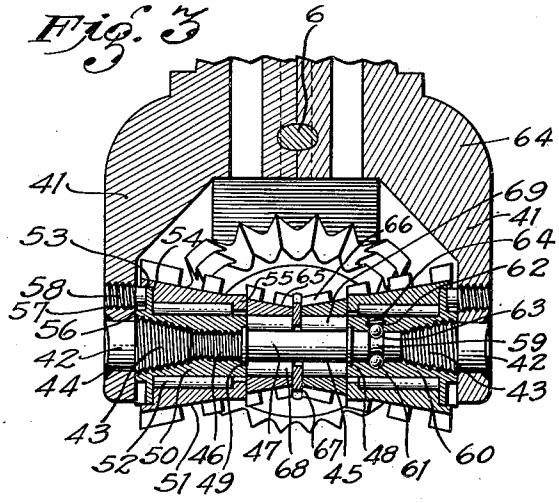


Fig. 4

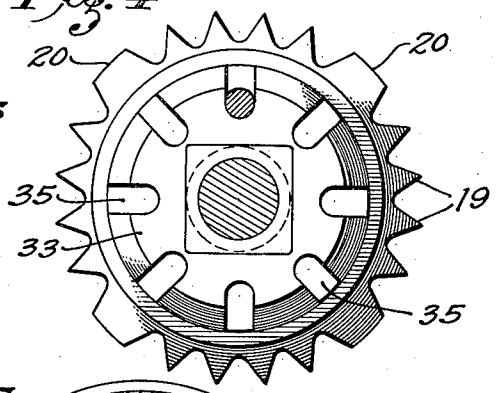


Fig. 5

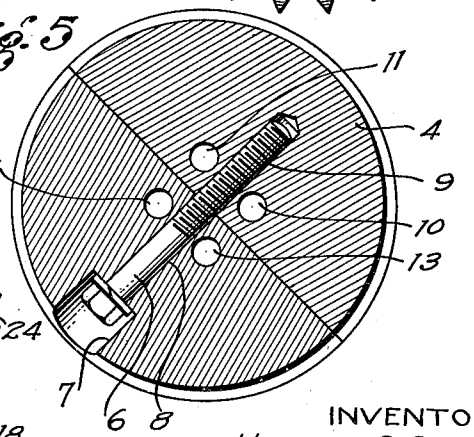
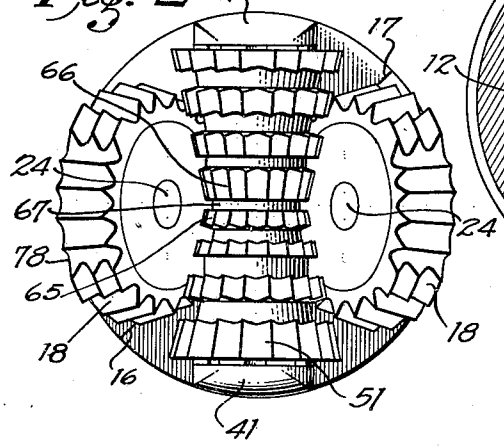


Fig. 2



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2,165,584

ROLLER BIT

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Original application July 22, 1936, Serial No. 91,830. Divided and this application June 21, 1937, Serial No. 149,339

4 Claims. (Cl. 255—71)

This application is a division of our co-pending application for United States Letters Patent entitled Roller bits, Serial No. 91,830, filed July 22, 1936 now Patent No. 2,094,856, granted October 5, 1937.

This invention relates to roller bits, and has for an object the provision of a device wherein the roller bits are so arranged as to at all times maintain the gauge of the hole being bored.

Another object is the provision of a roller bit wherein the roller members freely turn and without wobble.

Another object is the provision of a roller bit wherein certain of the cutter elements are so arranged that the thrust thereon is compensated in a novel manner, to the end that the roller or rollers turn without substantial friction on their bearings.

Another object is the provision of a roller bit which may be readily assembled or disassembled in a novel manner.

Other objects will become apparent from the description which follows.

The invention is inexpensive in cost of manufacture, designed for long wear and freedom from repairs, and generally superior to roller bits now known to the inventors.

With the above objects and others in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as depicted in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claims.

In the drawing:

Figure 1 is an elevation, partly in section, of the improved roller bit,

Figure 2 is a bottom plan view of the roller bit,

Figure 3 is a sectional view on the line 3—3 of Figure 1,

Figure 4 is a sectional view on the line 4—4 of Figure 1, and,

Figure 5 is a sectional view on the line 5—5 of Figure 1.

Referring now to the drawing, the roller bit is designated as an entirety by the numeral 1, and the same includes a body 2 provided with a pin 3. The body and its pin are formed in two parts, as illustrated at 4 and 5, the two parts being held together after the various roller members, to be hereinafter described, have been assembled, through the medium of a bolt 6, shown in Figure 5. In this connection, one of the body members 5 is formed with a recessed portion 7 and both body portions are provided with bores 8 and 9, which axially align when the two parts are in cooperation with one of said bores 9 screw-threaded to receive the threaded portion of the bolt. The head of the bolt is received within the recess so that there is no external projection thereof beyond the body. Both body halves are provided with elongated bores 10, 11, 12 and 13, the bores being parallel to the axis of the body and extending through both halves of the pin, as shown in Figure 1 by dotted lines and in Figure 3 by full lines. When the two halves of the body are cooperating, the pin is received within a collar 14, which collar in turn is secured to a drill stem 15, through which stem a liquid may pass to in turn be passed through the bores 10 to 13, inclusive, and adjacent the cutters carried by the body. Each body half is, of course, identical in construction, and in Figure 2, the lines 16 and 17 indicate the meeting edges between the two body halves, and wherein it will be observed that each body half is adapted to carry a cutter roller or disc 18. As each body half carries identical type rollers, the same reference characters will apply.

The cutter rollers or discs 18 are commonly called side cutters, for the reason that said cutter rollers are held at an angle, with the toothed elements thereof adapted to gauge a hole. It will be observed upon reference to Figures 2 and 4 that the rollers are provided with a plurality of transverse cutter teeth 19 and with a plurality of teeth 20 having the cutting edges thereof in the plane of the roller and substantially at right angles to the cutting edges of the teeth 19. In Figure 4, there is first provided a series of teeth 19, then teeth 20, again followed by teeth 19, and so on. In order to carry rollers of this character, each half of the body is provided with a leg 21, one face of which 22 is angularly related to the axis of the body. Describing one side of the device, the leg 21 is provided with a bore 23 substantially at right angles to the face 22. Passed through said bore is a trunnion 24. The trunnion extends beyond the face 22 and is provided with a tapered, screw-threaded area 25. The opposite end of the trunnion is substantially flush with the periphery of the body and is preferably welded thereto, as indicated at 26.

Considering the assembly of one of the cutters 18 and viewing Figure 1, each cutter is substantially annular in form. Opposite side faces of the cutter are provided with tapered annular recesses or grooves 27 and 28. A main bearing member 29 is provided with a screw-threaded

bore 30, and a flange portion 31, which flange has its innermost face provided with an annularly tapered portion 32 facing the facial annular grooves 27 of the cutter disc. A lock washer 33 has one face thereof provided with a tapered groove 34, the taper of which faces the groove 28 in the cutter disc. The opposite face of said washer is formed with a plurality of spaced apart radially arranged pits 35. The central bore in said lock washer is of a size sufficient to permit it to be received upon the shank of the main bearing 29, as shown in Figure 1, at 36. Adapted for placement between the grooves of the roller disc and the main bearings are tapered rollers 37. Tapered rollers 38 are also placed between the groove of the washer and the cutter disc, and cylindrical rollers 39 interposed between the periphery of the shank of the main bearing and the wall bounding the central bore of the cutter disc. When the main bearing, together with the cutter disc and washer have been placed in position of assemblage, the main bearing may be screw-threaded upon the trunnion, after which a lock screw, threaded within a bore 40 of the leg 21, may have an end thereof received within one of the pits 35 of the washer. This construction will hold the cutter disc in a given position and adapted for ready rotation. It will be observed further upon reference to Figure 1, that what may be termed the top of the cutter disc has the teeth elements thereof beveled so that the hole cut or bored may be gauged as to size, when the tool is in operation. Disposed 90° relative to the trunnion of each half of the body, are depending legs 41 (see Figure 3). Each leg carries an inwardly extending trunnion 42, which is provided with a tapered thread 43, the trunnions in each instance being suitably secured to the respective legs by welding, or otherwise, as indicated at 44.

Interposed between ends of the trunnions, assuming that the two halves of the body are in cooperation, is a tie and bearing pin 45. One end of said pin is screw-threaded at 46; a median zone of said pin is provided with a smooth area 47 bounded by spaced-apart annular flanges 48 and 49. The zone between the two flanges acts as a bearing area. Adapted to be screw-threaded to the tie pin and the trunnion 42 is a bearing 50. Adapted to surround the bearing 50 are what are known as core cutters 51. Rollers 52 are interposed between the bearing 50 and the bore in the shank of the core cutters. The roller bearings are conveniently held in position by providing one end of the main bearing with an annular flange 53, which fits within an annular recess 54 of the core cutter, and the opposite end of the core cutter is provided with an annular flange 55. Between the flanges 53 and 55 are disposed the roller bearings. The end flange 53 is provided on its outer face with a plurality of spaced-apart pits 56, similar to the type of pits shown at 35. The leg 41 is provided with a screw-threaded bore 57 adapted to receive a locking pin 58, one end of which may be received in one of the pits 56.

It will be observed that the end opposite the threaded portion of the tie pin is provided with a peripheral groove 59 and that the main bearing member, here designated as 60, is provided with a groove 61 adapted to be in complement with the groove 59 when the parts of the device are in position of assemblage. The main bearing member is provided with a transverse threaded bore 62, leading to the grooves 60 and 61, and ball bearings 63 are adapted to be dropped through said transverse bore and between the complementary grooves 60 and 61 for the purpose of locking the tie pin to the bearing, after which a screw 64 is received within the bore 62. The character of the core cutters for this end of the device is the same as before, as is likewise the arrangement of the roller bearings and the lock for the main bearing. Adapted to be carried upon the bearing portion of the tie pin 45 are further core cutters 65 and 66. The core cutters are maintained spaced apart through the medium of a washer 67. Roller bearings 68 and 69 are interposed between the peripheral surface of the bearing portion of the pin 45 and the inner annular surface of each core cutter. While the core cutter teeth all taper for both sets inwardly, still the character of the teeth is somewhat different, in that certain of the teeth are of greater transverse width than others, as best illustrated in Figure 2. It has been found advantageous, under actual service conditions, to vary the width of the teeth.

The assemblage of the core cutters is comparatively simple, and viewing Figure 3, the trunnions 42 are removed, it being assumed, of course, that they have not been welded to the said legs 41. The main bearing 60 is passed over the tie pin until the grooves 59 and 61 are in complementary relationship, this relationship being determined by looking through the bore 62. Roller bearings 63 are then dropped through the bore 62 and between said grooves, thus locking the two members together. The rollers 52 are then positioned about the main bearing and held by any suitable means, such as a rubber band, while the core cutters are partially passed thereover, after which the band is removed. The center core cutters, with their bearings, are then placed upon the pin followed by assemblage of the main bearing by screw-threading said main bearing on the threaded end of the pin. The rollers are then placed on the periphery of the last named main bearing and held in position while the core cutters are placed in position. It is, of course, understood that the lock-type washers have also been placed in position, after which both end trunnions may be screw-threaded within the main bearings and the lock washers locked in position by the locking pins. The trunnions are then welded in place, and the device is ready for use.

The operation, uses and advantages of the invention just described will be apparent to those skilled in the art. The cone type of core cutters will readily chip the formation without in any manner causing a balling of the formation. The gauge or side cutters will cut the formation in such a manner that the cutters will not ball up, and the gauge maintained due to the arrangement of the alternating teeth, which provide teeth at right angles to the axis, and teeth substantially parallel to the axis of each cutter roller. Furthermore, it is intended that liquid be forced through the courses to constantly flush the teeth of the cutters. The angularity of the gauge or side cutters, and the method of providing bearings therefor, reduces wear on the side cutters. The thrust upwardly against the side cutters is distributed through the roller bearings, to the end that friction due to rotation of the gauge or side cutters, is substantially overcome, and the component forces are balanced in such a manner that thrust upon the cutters does not produce a wobble.

We claim:

1. In a bit of the class disclosed, a body provided with a depending leg, a trunnion fitted in

and secured to said leg and provided with a threaded zone, a bearing member provided with a threaded shank in threaded engagement with the threads of said trunnion, an annular cutter disc, a second bearing member carried on the shank of the first bearing member, said annular cutter disc being interposed between said bearing members, and anti-friction means interposed between the bearing members and said cutter disc.

2. In a bit of the class disclosed, a body provided with a depending leg, a trunnion fitted in and secured to said leg and provided with a threaded zone, a bearing member provided with a threaded shank in threaded engagement with the threads of said trunnion, an annular cutter disc, a second bearing member carried on the shank of the first bearing member, said annular cutter disc being interposed between said bearing members, and anti-friction means interposed between the shank of one bearing member and the cutter disc and between sides of said cutter disc and said bearing members.

3. In a bit of the class disclosed, a body provided with a depending leg, a trunnion secured to said leg and provided with a threaded zone, a bearing member provided with a threaded shank in threaded engagement with the threads of said trunnion, an annular cutter disc, a second bearing member carried on the shank of the first bearing member, said annular cutter disc being interposed between said bearing members, anti-friction means interposed between the bearing members and said cutter disc, and means between said depending leg and one of said bearing members for locking the bearing members, cutter disc and rollers in assemblage to said depending leg.

4. In a bit of the class disclosed, a body provided with a depending leg, a trunnion secured to said leg and provided with a threaded zone, a bearing member provided with a threaded shank in threaded engagement with the threads of said trunnion, an annular cutter disc, a second bearing member carried on the shank of the first bearing member, said annular cutter disc being interposed between the bearing members and said cutter disc, said second bearing member being formed with a plurality of pits spaced circumferentially around the same, and a screw seated in said leg for engaging any one of said pits for locking the bearing members against rotation on said trunnion and for adjusting said second bearing member to take up wear of said anti-friction means.

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