H. R. HUGHES.

REAMER.

APPLICATION FILED APR. 23, 1918.

1,399,863. Patented Dec. 13, 1921.

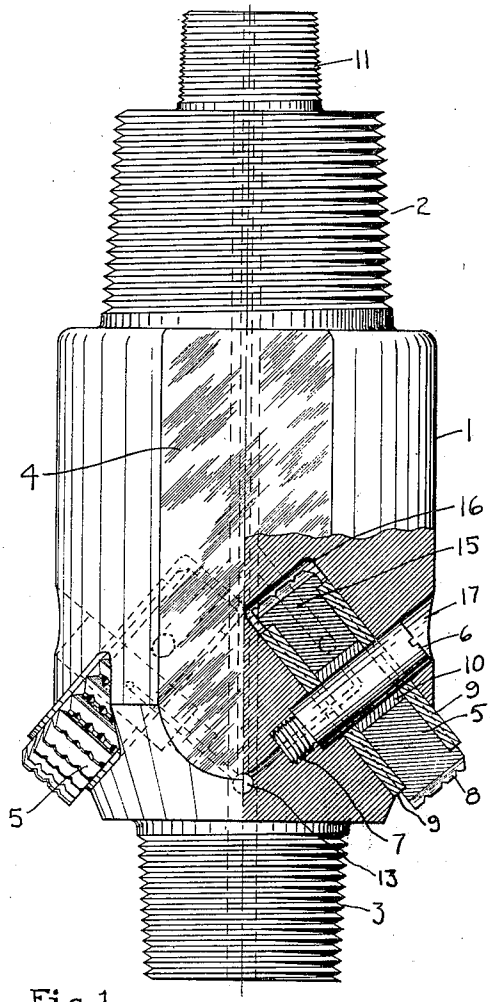


Fig. 1.

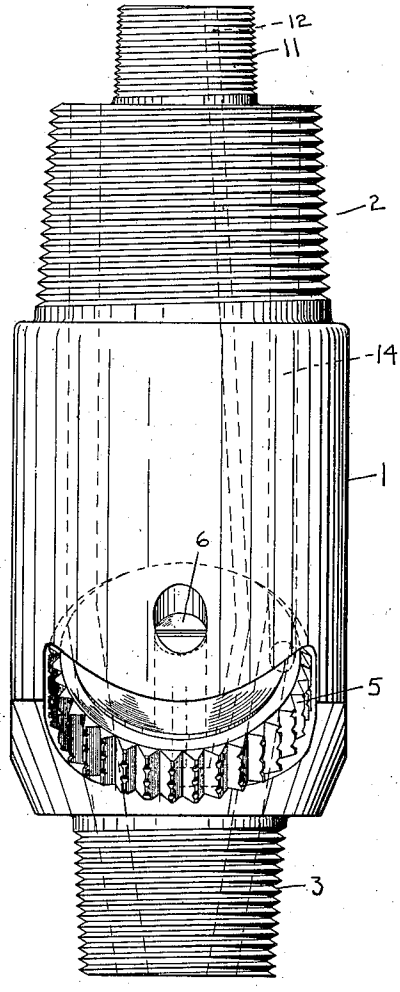


Fig. 3.

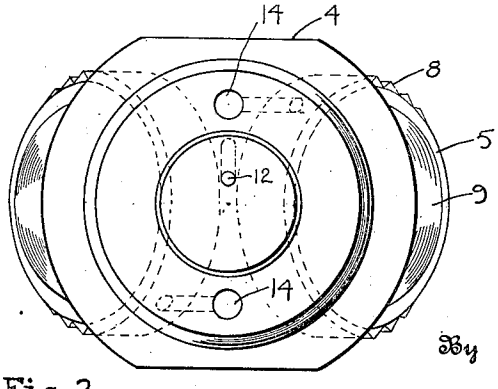


Fig. 2.

HOWARD R. HUGHES, Inventor

By His Attorney Jesse R. Stone

UNITED STATES PATENT OFFICE.

HOWARD R. HUGHES, OF HOUSTON, TEXAS.

REAMER.

1,399,863. Specification of Letters Patent. Patented Dec. 13, 1921.

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To all whom it may concern:

Be it known that I, HOWARD R. HUGHES, a citizen of the United States, residing at Houston, Harris county, Texas, have invented a certain new and useful Improvement in Reamers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to reamers for use in enlarging drill holes or wells or for assisting in maintaining the gage of holes dug by rotary boring drills.

In the process of drilling wells it is frequently necessary to enlarge a hole already dug so as to accommodate a larger size of casing and of drilling apparatus. This is done by the use of an enlarging reamer introduced into the hole. This reamer follows down the hole dug by the drill and has cutters mounted in the side thereof which act to cut away the material on the side of the hole. My invention is intended to serve the function described.

It is also contemplated that it may be adapted for use in direct connection with a rotary drill and serve to either enlarge the hole behind the bit or to maintain the size of the bore hole when the cutters of the bit become worn and lose their gage.

An object of my invention is to form the cutters on my device in a novel form and to place them in a position most advantageous for the reaming operation.

Another object is to construct my reamer in such manner that it may operate either alone or in conjunction with a drill bit attached thereto.

Other objects and advantages will more clearly appear in the description which follows.

Referring to drawings where like characters of reference refer to like parts throughout the several views Figure 1 is a longitudinal side view, partly in section, of my device. Fig. 2 is a top plan view thereof and Fig. 3 is a side view taken at right angles to the view shown in Fig. 1.

My improved reamer is made up of a cylindrical body 1 reduced in diameter at its upper end and threaded as at 2 for attachment to the drill collar. It is flattened on two sides shown at 4 to provide space for the escape of flushing water projected downwardly through the device in the usual manner. The lower end is reduced in diameter and threaded at 3 for attachment to a drill bit, not shown.

Mounted in inclined slots 16, on opposite sides of the head 1, are two disk shaped cutters 5. These cutters are mounted rotatably upon a shaft or pin 6 inserted within the cylindrical recess 17 inclined downwardly toward the central axis of the head. These pins are reduced in diameter at the inner end and threaded, as at 7, for the purpose of securing the shaft within the head. The cutters are provided with a bushing 10 and outer and inner washers 9 in the usual manner for the purpose of taking up the wear incident to the rotation of the cutter. These bearings are lubricated by means of an ordinary lubricator attached to a threaded nipple 11 at the upper end of the head. A downwardly extending duct 12 is connected with the lubricator and passes downwardly at a slight angle as shown particularly in Fig. 3. This angular path of the lubricating duct is taken in order to avoid the narrow passage between the upper parts of the two cutters shown particularly in Fig. 1. The duct terminates in a horizontal channel 13 which communicates with smaller ducts leading through the end of the bearing pin 6 and through laterally directed channels therein to the bushings.

Channels for the flushing water are provided which are intended to supply the cutters 5 and also to supply water through the lower reduced portion 3 to the rotary drill which may be attached thereto. These channels 14 are two in number, one on each side of the head, preferably toward the flattened portion as shown in Fig. 2. These channels lead directly downward to the point adjacent to the upper part of the cutters and then take an inclined path leading to the lower end of the threaded portion 3. Branching off from the main channel 14, at the point where the bend in the channel occurs, is a smaller channel leading to the slot 16 and at a position slightly to the rear of the cutter as shown particularly in Fig. 2.

When my reamer is used for the purpose of enlarging a bore hole or a well a threaded cap may be screwed upon the lower end 3 for the purpose of protecting the threads thereon. The reamer is then inserted into the well and rotated by means of the usual rotary drill stem. The inclined cutters 5, which are toothed on the outer periphery as shown at 8, come in contact with the side

of the hole and during the rotation of the head act to cut away the material at the side thereof. It will be noted that the lower edge of the outer periphery will come in contact with the side of the hole at a point lower than the upper portion and that the hole is progressively widened by the contact of the cutter therewith.

When the reamer is intended for use in direct connection with a rotary drill bit, the upper part of the bit is connected directly with the lower threaded portion 3 of my device by means of the usual drill collar. The rotary drill may be of a diameter, at its lowest cutting point, exactly equal of the diameter of the hole cut by the reamer and, when this is the case, the reaming cutters 5 act only to maintain the gage of the hole in case the cutters on the drill bit become so worn as to otherwise decrease the diameter of the hole.

The drill bit used in connection with my reamer may, however, be of a diameter somewhat smaller than the reamer and in such case the reaming cutters act in the same manner that they do when used alone; that is they will serve to continuously cut away the material at the side of the hole and enlarge the diameter of the hole to the gage contemplated by my reamer itself.

By forming the cutters in the disk shape shown and placing them in the side of the head at the angle indicated an especially efficient action of the reaming cutters is obtained. This is due particularly to the comparatively large diameter of each of the reaming cutters. A comparatively small portion of the periphery of each of the cutters will come in contact with the side of the hole at the same time thus providing a large cutting circumference for the cutter which will not quickly become dulled in action. It will also be noted that by the inclination of the cutters on their axes in the manner shown, the cutters are presented in an especially efficient manner for the cutting operation. The thrust inwardly upon the bearing is practically at right angles to the bearing and the top of the disk is inclined inwardly toward the center of the track cut by the reamers. It is well known that in order to maintain the proper inclination of a wheel or other rolling disk shaped object which is being operated upon a circular track the upper part of the same will be inclined inwardly thus maintaining the proper thrust or pressure upon the base thereof. This same inclination is obtained in the present position of the cutters of my improved reamer the thrust being directed outwardly upon the periphery thereof in a line at right angles to the cutter shaft 6. The rotation of my device by means of the rotary drill stem is in the usual clockwise direction and by such rotation the cutters each in their rolling course about the circumference of the hole are given a counter-clockwise motion. Thus the flushing water is projected through the channel 15 upon the rearward side of the cutter and serves to flush away the disintegrated material which may be entering the slot 16 with the upwardly moving teeth 8 of the cutter. This serves to keep the teeth of the cutter clean and to prevent the clogging of the material in the slot or housing 16.

It will thus be seen that I have provided a device for the purpose intended which is especially efficient in the cutting operation and in which the thrust of the cutting operation is taken up by the bearing in such manner that the strain will come directly at right angles to the shaft upon which the cutter is mounted. This produces added strength and efficiency.

Having thus described my device what I claim as new and desire to protect by Letters Patent is:

1. An enlarging reamer for maintaining the gage of the hole comprising a head, threaded at one end for attachment to a drill stem and threaded at the other end for attachment to the drill, and disk-shaped reaming cutters housed in slots in the sides of said head and inclined outwardly and downwardly.

2. In a device of the character described, a head comprising a solid, flattened cylindrical casting threaded at the upper and lower ends, two flat disk shaped cutters mounted opposite each other in the rounded sides of said head, on bearings inclined upwardly from the longitudinal axis of the head and water channels in said head to conduct water to said cutters.

In testimony whereof I hereunto affix my signature this the 20th day of April, 1918.

HOWARD R. HUGHES.