

Oct. 30, 1934.

W. A. ROSS

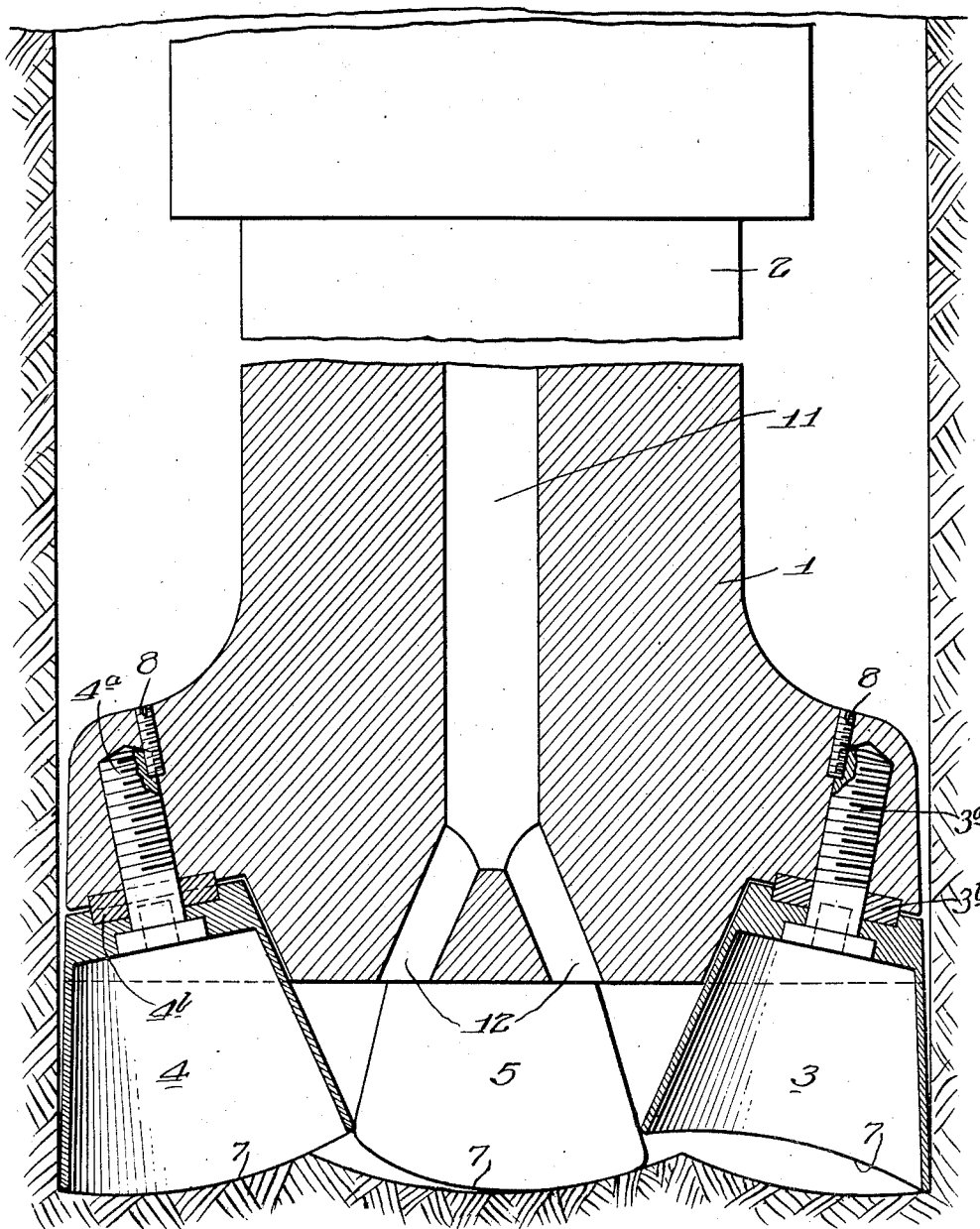
1,978,436

DRILLING DEVICE

Filed May 19, 1928

3 Sheets-Sheet 1

Fig. 1



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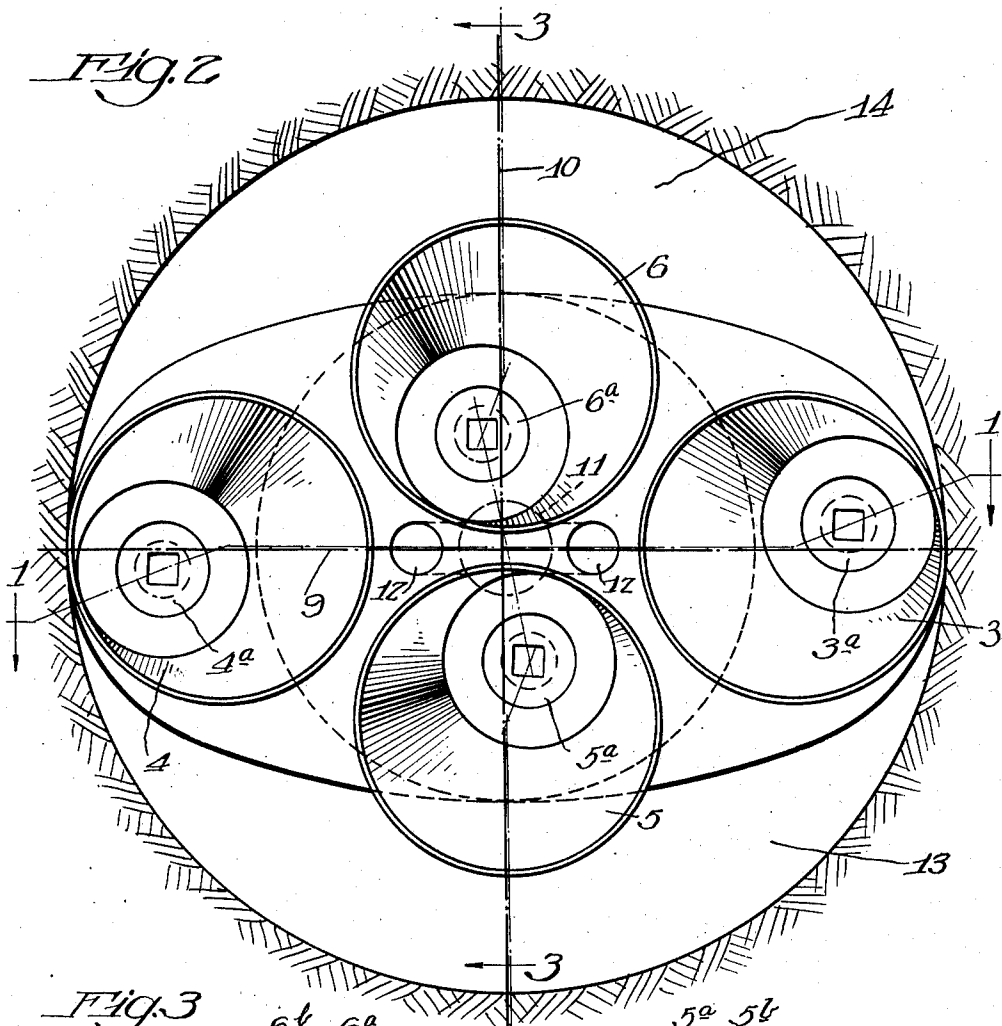
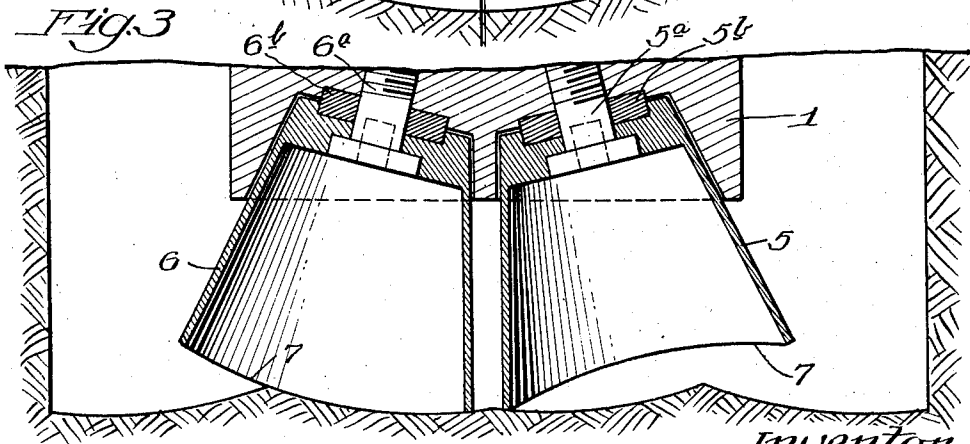
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3 Sheets-Sheet 2



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Fig. 4

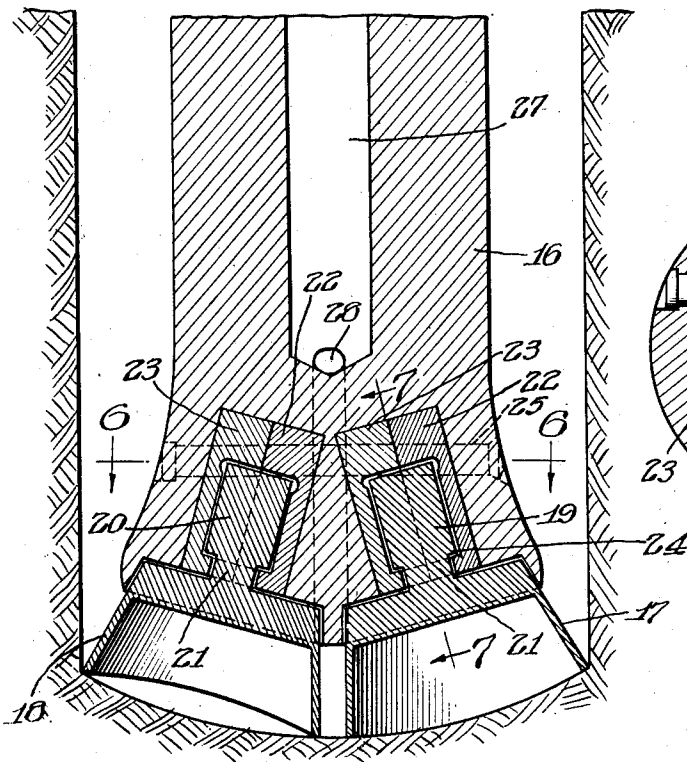


Fig. 6

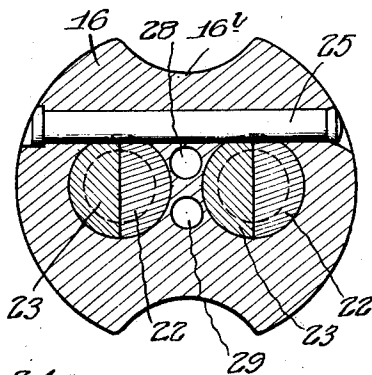


Fig. 7

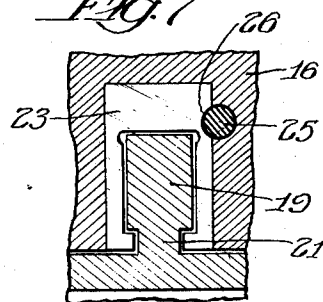


Fig. 5

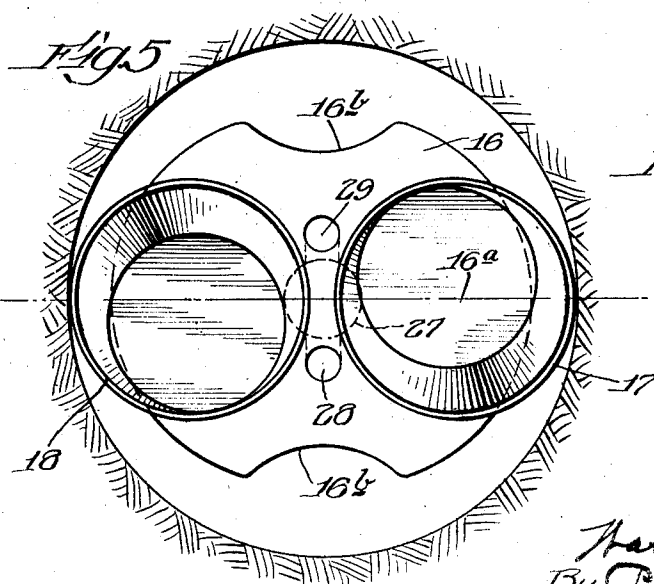
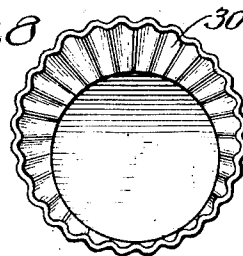


Fig. 8



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UNITED STATES PATENT OFFICE

1,978,436

DRILLING DEVICE

Warren A. Ross, Chicago, Ill., assignor, by direct and mesne assignments, to Donald M. Carter, Chicago, Ill.

Application May 19, 1928, Serial No. 279,016

7 Claims. (Cl. 255—71)

This invention relates to drilling devices and has for its object to provide a new and improved device of this description.

The invention has as a further object to provide a drilling device which will maintain a substantially constant gauge hole.

The invention has as a further object to provide a drilling device where the cutting edge of the cutters will be maintained at substantially the same thickness throughout the life of the cutters as the cutting edge is worn away.

The invention has further objects which are more particularly pointed out in the accompanying description.

Referring now to the drawings, Fig. 1 is a sectional view taken on line 1—1 of Fig. 2 showing one form of device embodying the invention.

Fig. 2 is a bottom view of the device illustrated in Fig. 1.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional view showing the invention applied to a percussion drill.

Fig. 5 is a bottom view of the device shown in Fig. 4.

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 4.

Fig. 8 shows a modified form of cutter.

Like numerals refer to like parts throughout the several figures.

I have shown in the drawings one form of construction with the view of simply illustrating the features of my invention as it may be applied in various ways other than shown in the drawings, the particular form being shown simply to make the invention readily understandable.

In this invention there is provided a cutter holder 1 connected with the drill pipe 2 which extends to the surface and which is operated in any of the usual manners. I have shown the construction as applied to a rotary drilling device. Connected with the cutter holder 1 are the cutters 3 and 4 and the cutters 5 and 6. These cutters are hollow cup shaped cutters and I have shown them cone shaped. The cutters have cutting edges 7 formed by the edges of the walls of the cup shaped cutters and these walls are preferably made substantially the same thickness so that the cutting edge will be substantially the same thickness as the cutters wear away and this condition holds throughout the life of the cutter.

It will be seen that these cutters will have a long life because of the length of the walls. The

cutters can be used until the walls are all substantially worn away. It will further be seen that the cutters are, as it were, self sharpening because the cutting edges remain the same thickness as they are worn away. The cutters are rotatably connected with the cutter holder 1 in any suitable manner. For purposes of illustration I have shown the cutters 3 and 4 as being rotatably mounted on threaded connecting members 3a and 4a. Thrust washers 3b and 4b are inserted between the cutters and the cutter holder 1.

The cutters 3 and 4 are located at the outer edge of the cutter holder and their outer cutting edges are arranged to be substantially vertical so that as these cutting edges wear away they will be maintained at substantially the same position and this produces a substantially constant gauge hole. This result is produced by tilting the cutters the proper amount so that their axes are inclined with relation to the vertical central axis of the cutter holder. The cutters 5 and 6 are connected with the cutter holder intermediate the cutters 3 and 4, as shown in Fig. 2.

The cutters 5 and 6 are also rotatably connected with the cutter holder in any suitable manner as by the threaded connecting members 5a and 6a. Thrust washers 5b and 6b are interposed between the cutters and the cutter holder. All of the threaded connecting members are provided with means for preventing them from accidentally being loosened. This may be accomplished by the locking pieces 8. The cutters 5 and 6 are also preferably inclined the inclination being inwardly of the drilling head. The cutters 3 and 4 are offset with relation to each other, that is, their centers are on opposite sides of a line 9 passing through the center of the cutter holder, as shown in Fig. 2.

The cutters 6 and 7 are also offset with relation to each other their centers being on opposite sides of a line 10 through the center of the cutter holder, as shown in Fig. 2. This causes the cutters to cut on a curved section, as illustrated in Figs. 1 and 3. This projection is such as to project the cutters with the cutting edge toward the work as the cutter holder is rotated. The cutter holder is provided with the passageway 11 for the circulation of the fluid which carries up to the surface the material cut away by the cutters.

This passageway has the branches 12. It will be noted that the cutter holder is non-circular and does not fill the hole but is shaped so as to leave ample spaces 13 and 14 at the sides as shown in Fig. 2, for the fluid which carries the cuttings

to the surface. It will of course be understood that any of the customary methods of circulating water in and around the cutters may be used, the circulation of the water being no part of my present invention. It will be noted that this drilling device makes a constant gauge hole, that the cutters have a long life and are self sharpening, as it were, the cutting edge remaining substantially constant as the cutters wear away.

The cutters of Figs. 4 and 5 in addition to being offset, that is, having their centers on opposite sides of the line 16a extending through the center of the cutter holder, are tilted. By making the cutters conical shaped, the outside cutters may be tilted as shown in Fig. 1 without having the upper end project beyond the cutting edge. The cutting edge will, therefore, be in substantially the same position throughout the life of the cutter as the cutting edge is worn away so that a constant gauge hole may be easily maintained.

In Figs. 4, 5, and 6 I have shown the invention as applied to a percussion drill, that is, a drill where the drilling is accomplished by a series of blows ordinarily produced by a pneumatic appliance such as pistons and cylinders. In this construction, the cutter holder 16 is provided with the cup shaped cutters 17 and 18 provided with the shanks 19 and 20 having the reduced portions 21. The cutters are held in position by the bushings 22 and 23 which surround the shank as shown and which are made in separable parts. The bushings are received in recesses in the cutter holder 16. The lower portions of the bushings project under the shoulders 24. The fit of the shanks 19 and 20 in the bushings are such as to permit the cutters to rotate in the bushings.

The bushings are held in place in any suitable manner as by means of a single rivet 25 which extends through the cutter holder 16 and which fits into grooves 26 in the bushings 22 and 23. It will be seen that this rivet holds the bushings in position and prevents their rotation. In this construction the cutters are offset and are also tilted and only a portion of the edge of each cutter is acting as a cutting edge at any given time. The thinness of the cutting edge and the constant edge as the cutter wears away, permit lighter machinery for operating the device such as lighter pistons and the like. In the operation of this construction, the impulse or impact of the operating mechanism is transmitted through the bushings 22 and 23 to the cutters. The cutter holder is provided with the passageway 27 for the circulation of the fluid which carries the cuttings up to the surface. This passageway at the end is divided into a plurality of passageways 28 and 29.

With the usual percussion drill, it is necessary to carry the cutter holder up out of the mine to the shop to be sharpened and then return it. With this device, it is only necessary to remove the cutters when they are worn out and replace them with new cutters. This is easily and quickly done by removing the rivet 25 and then removing the bushings and taking the cutters out and inserting new cutters and replacing the rivet. The rivet can be easily removed by removing the head thereof by means of a suitable tool for that purpose. This construction, therefore, permits the use of lighter machinery and prevents the loss of time and labor required to carry the steel to the shop for sharpening and back to the point of use.

This device, therefore, has a very high efficiency and a low cost. Instead of having the cutters smooth, I may make them corrugated, as shown

at 30, Fig. 8. The corrugated cutter may be used with any of the cutter holders. It will also be seen that this form of cutter may be used either with a rotary drill or a percussion drill. It will further be seen that any of the fastening means for the cutters may be used in any of the constructions.

I have described in detail a particular construction embodying the invention but it is, of course, evident that this construction may be varied in many particulars without departing from the spirit of the invention as embodied in the claims hereto appended and I, therefore, do not limit myself to the particular construction shown.

I claim:—

1. A well drilling device comprising a hollow, cup shaped cutter having an elongated wall, the edge of the wall forming a cutting edge which remains of substantially the same thickness as it wears away when the cutter is in use, a holder for said cutter and means for maintaining the outer portion of the cutting edge of said cutter at substantially the same distance from the center line of the holder as the cutter wears away so as to form a substantially constant gauge hole.

2. A drilling device for drilling wells comprising a rotary head, a plurality of hollow cup shaped cutters, carried by said head and arranged to cut a cylindrical hole, upon rotation and longitudinal feed of the head, for the head to go into, each cutter having a thin wall of substantial length surrounding the hollow thereof, the inner and outer surfaces of the wall being substantially parallel throughout a substantial length, portions of said wall successively forming the cutting edge of said cutters as the wall of said cutters is worn away in cutting.

3. A drilling device for wells comprising a head, a hollow cup shaped cutter carried by said head and arranged to cut a cylindrical hole upon rotation and longitudinal feed of the head, for the head to go into, said cutter having an elongated wall of substantial length, the edge of the wall at one end of the cutter forming the cutting edge when the cutter is in use, means for connecting the cutter to said head so as to maintain the cutting edge of the cutter in substantially the same position in relation to said head as the cutter is worn away, whereby a well of constant gauge is formed.

4. A well drilling device comprising a rotary head, a pair of cup shaped cutters connected with said head, and offset with rotation to each other, a second pair of cup shaped cutters connected with said head intermediate the first pair of cutters and offset with relation to each other, said cutters arranged to cut a cylindrical hole, upon rotation and longitudinal feed of the head, for the head to go into, each cutter having a comparatively thin wall, the edge of the wall farthest from said head forming the cutting edge of the cutter.

5. A well drilling device comprising a rotary head, a cup shaped cutter carried by the head and arranged to cut a cylindrical hole upon rotation and longitudinal feed of the head for the head to go into, said cutter having a comparatively thin wall, the edge of the wall farthest from said head forming the cutting edge of the cutter.

6. A drilling device for drilling wells, comprising a rotary head, a plurality of hollow cup shaped cutters carried by said head and arranged to cut a cylindrical hole upon rotation and longitudinal

- feed of the head for the head to go into, each cutter having a thin wall of substantial length surrounding the hollow therefor, the inner and outer surfaces of the wall being substantially parallel throughout a substantial length, portions of said wall successively forming the cutting edge of the cutters as the wall of the cutters is worn away in cutting, said cutters being offset with relation to each other.
- 10 7. A device for drilling wells, comprising a rotary head, a plurality of cup shaped cutters carried by the head and arranged to cut a cylindrical hole upon rotation and longitudinal feed of the head for the head to go into, each cutter comprising a thin elongated circular wall of substantial length, the edge of the cutter wall farthest from said head acting as the cutting edge as the wall wears away in use, and attaching means connected with the head, said attaching means being rotatably connected with the cutters and fixed with relation to the cutter holder.
- WARREN A. ROSS.

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