May 21, 1940. J. A. ZUBLIN 2,201,570

ROTARY EARTH BORING BIT

Filed Jan. 3, 1939

Fig. 1.

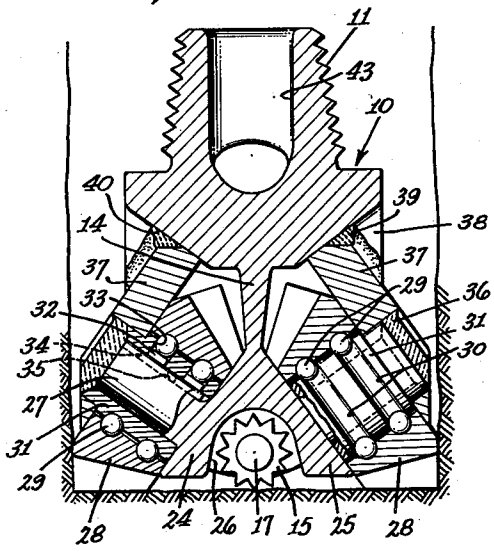


Fig. 2.

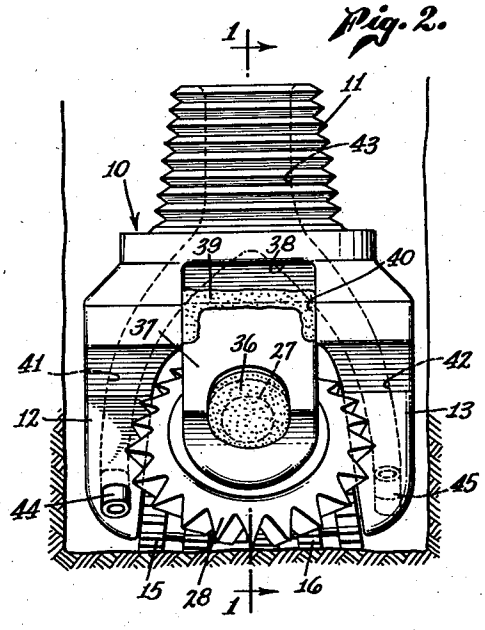


Fig. 3.

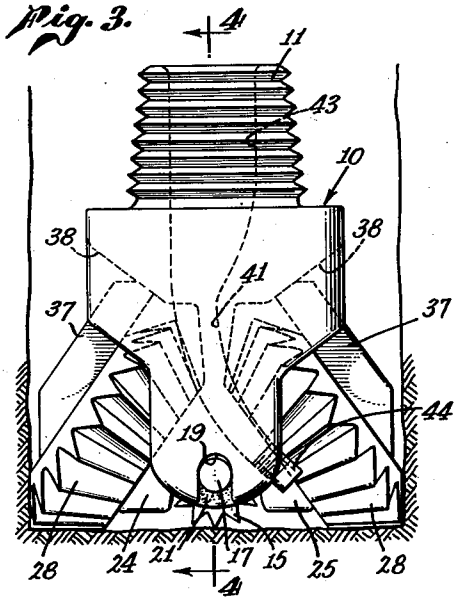
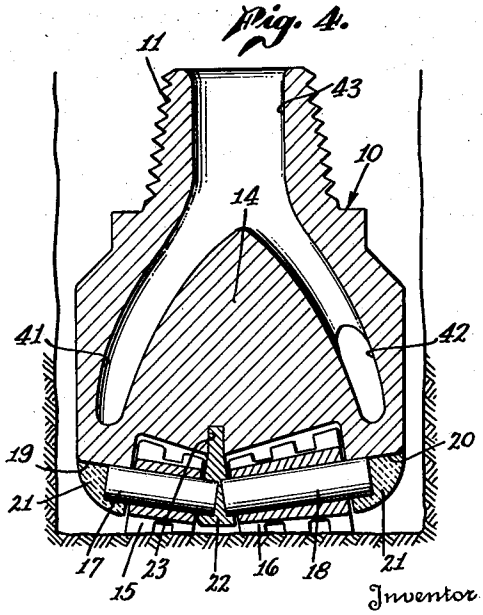


Fig. 4.



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UNITED STATES PATENT OFFICE

2,201,570

ROTARY EARTH BORING BIT

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Application January 3, 1939, Serial No. 248,993

8 Claims. (Cl. 255—71)

This invention relates generally to earth boring bits, and particularly to that type of bit adapted for the rotary drilling of bore holes, such as oil wells and the like.

It is an object of the present invention to provide an improved rotary drill bit of sturdy construction.

A further object of the invention is to provide a rotary drill bit including fluid means capable of effectively cleaning the hole bottom of cuttings, whereby the cutters can disintegrate the formation material more readily.

Another object of the invention is to provide a rotary drill bit that is easily assembled and disassembled, permitting reemployment of unworn parts.

This invention possesses many other advantages and has other objects that will become apparent from a consideration of an embodiment of the invention. For this purpose, a form is shown in the drawing accompanying and forming part of the present specification, which embodiment will now be described in detail, illustrating the general principles of the invention. However, it is to be understood that this detailed description is not to be taken in a limited sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawing:

Figure 1 is a longitudinal section through the bit, taken on the plane 1—1 of Figure 2;

Figure 2 is an elevation of the bit, as seen from the left of Figure 1;

Figure 3 is a side elevation of the bit, as seen from the left of Figure 2; and

Figure 4 is a longitudinal section of the bit, taken along the plane 4—4 of Figure 3.

The drill bit includes a main body 10 having a threaded pin 11 at its upper end for connecting the tool to a string of drill pipe (not shown). The body is provided with a pair of integral depending legs 12, 13 between which extends an integral web 14. Cross cutter rollers 15, 16 are carried from the depending legs, and also from the web, if desired, by rotatably mounting them on shafts 17, 18, the outer ends of which seat within pockets 19, 20 provided in the legs and in which welding material 21 can be deposited for rigidly securing the shafts to the leg portions of the body of the bit. The inner ends of the shafts are received within a depending support 22 which fits within a suitable recess 23 provided in the lower part of the web 14. The inner ends of the shafts can be welded to this support, which can also be welded to the bit body in the region of the web recess 23. It is preferred that one of the cross cutter rollers 16 extend substantially to the axis of the bore being produced in order that all central portions of the bottom of the hole will be covered by the cross cutters.

The lower part of the web 14 is provided with a pair of downwardly diverging wings 24, 25 forming a suitable pocket 26 around the cross cutter rollers 15, 16 and their intermediate support 22. From each wing there extends an integral shaft 27, on each of which is rotatably carried a roller cutter 28 positioned to remove the outer portions of the formation material and also to maintain the hole to gauge. These cutters can be mounted on suitable bearings; in the specific instance disclosed being rotatable on bearing balls 29 rollable in the raceways 30 provided on the exterior of a bearing sleeve 31. The sleeve can be keyed to the shaft by means of the buttons 32 closing the holes 33 in the sleeve through which the bearing balls can be inserted into proper position in the raceways, the buttons having rectangular portions 34 slidable within a suitable keyway 35 formed in the shaft. This general bearing arrangement is both described and claimed in my co-pending application "Compact roller drilling bits," Serial No. 191,622, filed February 21, 1938.

The side cutters 28 can each be mounted on its associated bearing sleeve 31 by placing the cutter over the sleeve and then inserting the bearing balls 29 through the holes 33 in the sleeve. Thereafter, the buttons 32 can be placed in the holes, and this assembly slid over the shaft with the rectangular button portions 34 riding in the shaft keyway 35. Removal of this assembly can be prevented by suitably securing the outer end of the sleeve to the shaft, as by the employment of the welding material 36. The outer ends of the shaft and sleeve are further supported by piloting the sleeve into an end plate or support 37, the upper end of which is receivable within a pocket 38 in the side of the bit body. The lower portion of this plate can be rigidly secured to the shaft and sleeve by use of the welding material 36 aforementioned. The upper portion of the plate can be integrated to the bit body by welding in material 39 in a U-shaped groove 40 formed between the plate and the side walls of the body recess.

The construction described is essentially a one-piece body 10 carrying both the cross cutter rollers 15, 16 and the side cutter rollers 28, 28. After the parts become worn, the various welds securing the cutter assemblies to the body can be cut away and new parts substituted.

Thus, the removal of the welds 36, 38 attaching the plates 37 to the bit body and to the bearing sleeve and shaft will permit the removal of the side cutters, without materially affecting the main body, and permitting its reemployment in connection with a new set of side cutters. Similarly, the cutting away of the cross cutter welds 21, 21 will permit the replacement of the worn cutter assembly with a new assembly. By use of the bit arrangement described, a relatively simple construction is achieved, composed essentially of a one-piece main body portion and a plurality of readily assembled and disassembled cutters. There is, therefore, a lessened danger of loss of parts in the hole, especially since the various stresses encountered in the drilling of bore holes are transmitted from the cutters substantially directly to the main body portion.

It is essential that the bottom of the hole be kept free from cuttings in order to permit maximum penetration of the cutter teeth into the formation. To achieve this objective, each leg 12, 13 is provided with a fluid channel 41 or 42 communicating with a fluid passageway 43 extending through the upper pin 11. The lower part of each channel is curved toward a side cutter 28 so that a nozzle 44 or 45 inserted therein can effect a discharge of a jet of fluid toward the side cutter and at the bottom of the hole to remove all cuttings from the teeth of these cutters. The nozzles extend preferably through the rear portion of each leg as regards the direction of rotation of the drilling tool, to sweep the hole bottom clean of cuttings in advance of the approaching teeth of the side cutters. This requires that the nozzles 44, 45 in the legs extend in mutually opposite directions in view of the opposite rotational direction of the cutters.

I claim:

1. An earth boring drill including a one piece bit body provided with a downwardly extending web having diverging wings, an integral shaft extending from each wing, a cutter rotatably carried by each shaft, and detachable supports secured respectively to the end of each of said shafts and to said body.

2. An earth boring drill including a bit body having a pair of depending legs, a web extending between said legs and terminating in a pair of downwardly diverging wings, an integral shaft extending from each wing, a cross cutter roller assembly carried by said legs, a side cutter rotatably carried by each shaft, and detachable supports secured to said body and the ends of said shafts.

3. An earth boring drill including a bit body having a pair of depending legs, a cross cutter assembly carried by said legs, a web extending between said legs and terminating in a pair of downwardly diverging wings, integral shafts extending upwardly and outwardly from said wings having axes substantially at right angles to the axis of said cross cutter assembly, a side cutter rotatably carried by each shaft, and detachable supports secured to said bit body and the ends of said shafts.

4. An earth boring drill including a bit body having a pair of depending legs, cross cutter means rotatably carried by said legs, side cutter rollers carried by said body for rotation in planes substantially at right angles to the rotational plane of said cross cutter means, fluid discharge means in each leg having its outlet opening at the bottom thereof to effect discharges of fluid against the bore bottom and clean it of cuttings.

5. An earth boring drill including a bit body having a pair of depending legs, cross cutter means rotatably carried by said legs, side cutter rollers carried by said body for rotation in planes substantially at right angles to the rotational plane of said cross cutter means, fluid discharge means in each leg having its outlet opening at the bottom thereof and its line of discharge directed toward a side cutter roller whereby to keep the path of operation of said side cutter rollers clear of cuttings.

6. An earth boring drill as defined in claim 5, said fluid discharge means in said legs being inclined in opposite directions downwardly and outwardly toward said side cutter rollers in advance thereof.

7. An earth boring drill including a one piece bit body provided with a downwardly extending web having diverging wings, an integral shaft extending from each wing, a cutter rotatably carried by each shaft, and individual detachable end supports respectively fitting over and secured to each of said shafts and each received within an individual recess in the bit body.

8. An earth boring drill including a bit body having a threaded connector at one end thereof and a plurality of integral shafts extending laterally therefrom, side cutters rotatably carried by said shafts, individual detachable end supports respectively fitting over and secured to each of said shafts and each received within an individual recess in the bit body, and cross cutters rotatably carried by said body.

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