May 4, 1943. W. M. BURCH 2,318,370

OIL WELL DRILLING BIT

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FIG. 1.

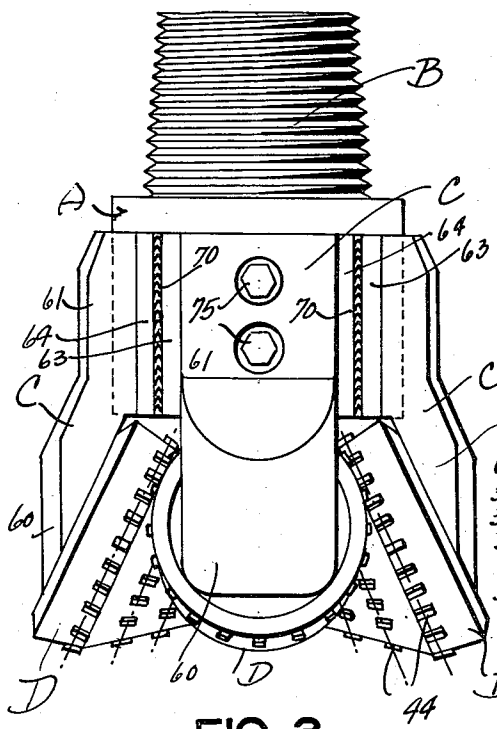


FIG. 2.

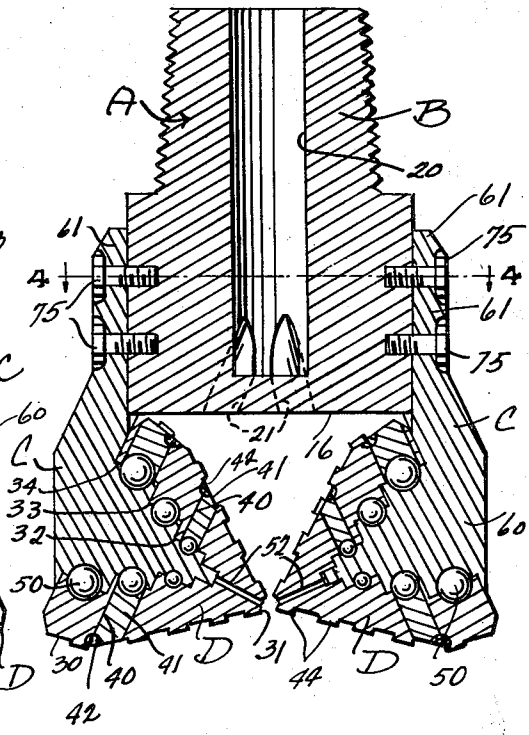


FIG. 3.

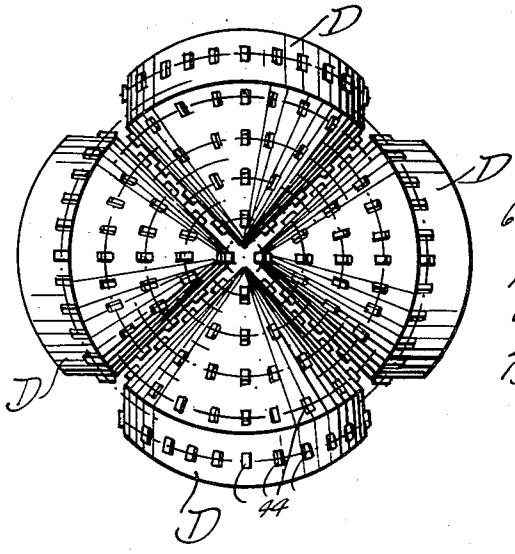
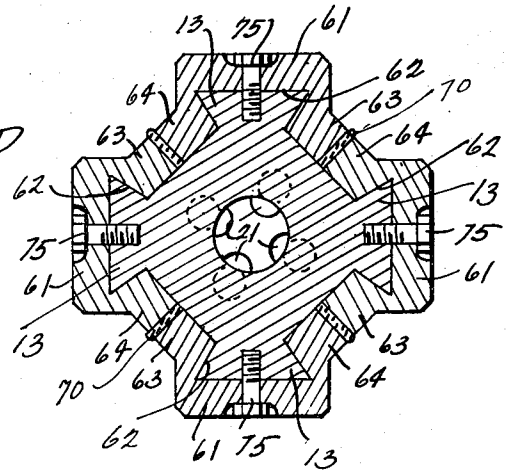


FIG. 4.



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FIG. 5.

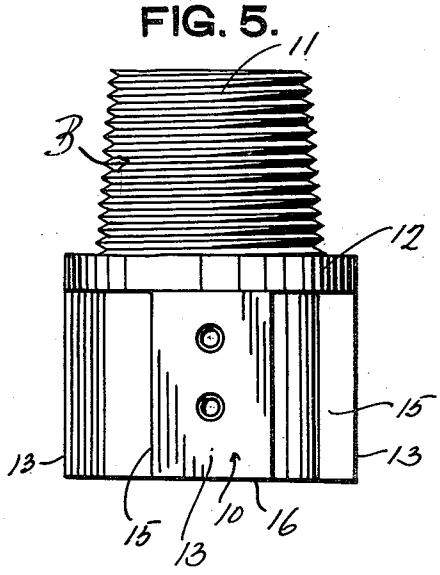


FIG. 6.

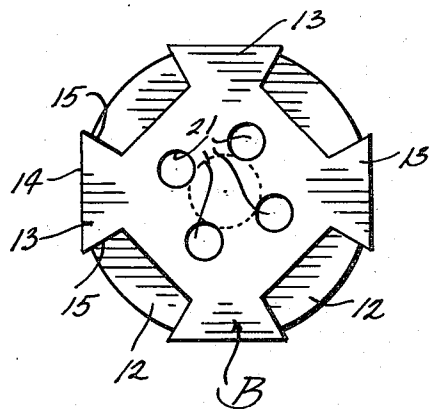


FIG. 7.

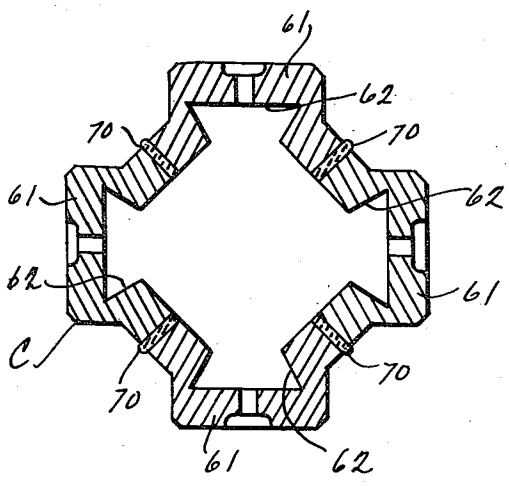
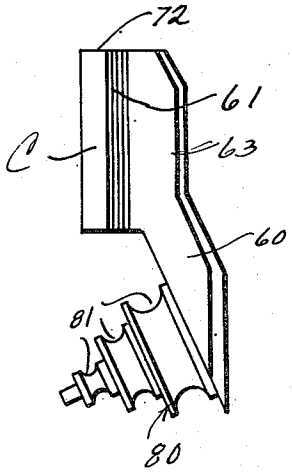


FIG. 8.



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OIL WELL DRILLING BIT

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Application December 6, 1940, Serial No. 368,921

3 Claims. (Cl. 255—71)

This invention relates to improvements in oil well drilling bits.

The primary object of this invention is the provision of well drilling bits which are provided with a bit head upon which rotary or other cutting bits are mounted in such manner that the cutters are readily detachable for replacement or redressing.

It is customary with many types of well drilling bits to weld the parts into position upon the bit head. Very often the nature of the cutter and its support is such that the heat incidental to welding passes into the cutters and their supports; drawing the temper of the same and leaving the cutters etc. too soft for efficiently performing work. With the present invention I have provided a drilling bit in which the cutters are provided with supports which may be relatively welded together and properly attached to a bit head in such manner that the cutters will efficiently perform their work, and the heat incidental to welding will not pass into the cutters or adjacent thereto for destroying their efficiency.

A further object of this invention is a provision of an improved bit construction preferably employing rotary cutters, and having individual supports for the cutters which may be relatively welded together at the shop so that it is possible to redress the cutters and their supporting parts, without the necessity of complete replacement; thus economizing in equipment.

A further object of this invention is the provision of an improved cutter assemblage for well drilling bits which will start the cutting of the core at the extreme outer circumference of the opening; and leave an upwardly extending conical projection at the drilling surface. With such an arrangement the cutters will normally be thrust outward to maintain a drill passageway of uniform diameter, and also maintain the cutters in a true course.

A further object of this invention is the provision of an improved well drilling bit which is very compact in construction, providing durable cutting surfaces which will maintain a good footage during drilling, and which will perform the drilling operation efficiently over a long period of time.

Other objects and advantages will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views—

Figure 1 is a side elevation of the improved well drilling bit.

Figure 2 is a vertical cross-sectional view taken through the improved well drilling bit.

Figure 3 is a bottom plan view of the well drilling bit, showing more particularly the cutter arrangement.

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 2, through the well drilling bit.

Figure 5 is a side elevation of the bit head.

Figure 6 is a bottom plan view of the bit head.

Figure 7 is a cross-sectional view taken through the cutter supports, showing their assemblage and welded connections.

Figure 8 is a side elevation of one of the cutter supports, showing its body portion and cutter spindle.

In the drawings, wherein for the purpose of illustration is shown only preferred embodiment of the invention, the letter A may generally designate the improved bit, which may include a bit head B; cutter supports C and rotary cutters D mounted upon the latter.

Referring to the cutter head B, the same includes a body portion 10 having a reduced tapered screw-threaded drill line attaching shank 11 on the upper end thereof, which tapers with a decreasing diameter upwardly from the screw-threaded portion 10, as is usual. The portion 10 is provided with flanges 12 at its juncture with the tapered attaching shank 11, and has on the vertical side surfaces thereof, below the plane of the flanges 12, vertically positioned cutter support attaching tongues 13, the outer surfaces 14 of which are flat and the side surfaces 15 of which are in planes which relatively converge in the direction of the axis of the cutter head. This gives the tongues 13 a wedge shaped cross section. These attaching tongues 13 extend the entire distance to the lower surface 16 of the bit head. An axial water passageway 20 is provided through the bit head; the same terminating short of the bottom surface 16 of the bit head, and there being provided with laterally divergent ducts 21 which open upon the bottom surface 16 directly in facing relation with the rotary cutters D. One duct 21 is provided for each rotary cutter and opens laterally of the central portion thereof.

Referring at this time to the cutters D, each of the same includes an annular outer portion 30 and therefrom tapers to a bluntly pointed end 31. The inside of the cutter is hollowed to provide relatively stepped bearing passageways 32, 33 and

34, each of which is provided with a ball bearing race way. Suitable openings 40 are provided transversely through each cutter for each race way, opening on the outer surface thereof. Through these openings 40 the ball bearings 50 may be dropped into place in the races of the cutter D and spindle upon the cutter support. The openings 40 are plugged and spot welded at 42 after the bearings are in place. The plug pins 41 will be made of hard steel so that they will not wear from contact with bearings. The pins 41 are readily removable. Each rotary cutter D is provided with an axial duct 52 at the extreme tip thereof, which opens into the ball bearing recess in the cutter and opens at the tip end of the cutter, and through which water may circulate to provide lubrication for the bearings.

The external surface of each cutter D is provided with rigid cutting teeth or projections 44 having very sharp edges. They may be inclined to have their cutting edges at an acute angle to the direction of travel of the rotary cutters. These cutting teeth are preferably arranged in annular series. The teeth on one cutter D are so arranged that they do not track with the cutting path of the teeth of the adjacent cutter. Thus, as shown in Figure 3, the teeth on diametrically opposed cutters D are similar, and do not track with the teeth of the other two cutters.

Referring to the cutter supports C, one is provided for each cutter D. Each support C includes a body portion 60, which is normally positioned at an acute angle to the vertical, and a vertically positioned shank 61 which is provided with a wedge-shaped recess 62 to snugly receive a tongue 13 of the bit body B. As is best shown in Figure 4 of the drawings, each cutter support attaching shank 61 is provided with laterally extending divergently flared flanges 63 and 64. They extend into closely spaced proximity with the facing surfaces of similar flanges of the adjacent cutter supports C, as shown in Figure 4. These facing surfaces of the flanges 63 and 64 are welded together at 70, as shown in Figure 4 to provide a well braced integral construction. The recesses 62 open the entire length of the shanks so that the supports may be slipped onto the wedge-shaped tongues 13 of the bit body B, with the top surfaces 72 of the shank supports in engagement with the under surfaces of the flanges 12 of the bit body. Each attaching shank 61 is provided with a pair of openings therein to receive bolts 75; the latter being screw-threaded into openings provided in the tongue portions 13 of the bit body, as is shown in Figures 2, 4 and 5 of the drawings.

The cutter supporting body 60 is provided with an integral spindle 80. The latter has relatively stepped ball bearing race ways 81, complementary with the race ways provided in the rotary cutters D, and adapted to receive ball bearings in a manner which is perfectly apparent. The axes of the spindles 80 are downwardly and convergently arranged, and so related that when the cutters D are placed upon the spindles, the bit will cut from the extreme outer circumference of the passageway, at its lowest point with a cone shaped core at the bottom of the passageway, extending upwardly. This arrangement will permit of a true course being held during drilling, and will properly center the bit.

It is to be noted that the thrust, incident to the arrangement of cutting teeth on the cutters, is such that the cutters will be forced outwardly. This will insure that a passageway of uniform diameter will be drilled.

It will be readily apparent from the foregoing that the cutters of my improved bit are interchangeable at the location of the well. All of the bit cutters and cutter supports are interchangeable, and the only welding necessary, in order to provide a very well reinforced structure, is the welding of the cutter support shanks together at their adjacent edges. This welding operation is usually accomplished in the shop after the redressing of the cutters. Thus, there is no damaging of the cutters, bearings or bearing supports. It will be noted that the cutters and cutter supports come off in one piece. The usual practice is to cut the welded surfaces of the cutter support shanks apart, remove the ball bearings and cutters, and replace them. The cutter supports are then placed upon a jig and welded together in the construction above described, and the entire cutter assemblage is ready for replacement upon a bit body.

Various changes in detail may be made to the form of the invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a drill bit construction the combination of a bit head having the outer side walls thereof provided with a plurality of tongues, the side edges of each of which relatively converge in the general direction of the axis of the bit head, said tongues extending to the lower end of said bit head, a plurality of cutters, cutter supports having recesses removably fitting upon said tongues in dovetailed manner to prevent lateral disconnection of the cutter supports from their respective tongues, welds connecting in rigid relation the adjacent side edges of said cutter supports to hold them in an integral construction, and means to prevent endwise relative disconnection of the bit head and cutter supports.

2. In a drill bit construction the combination of a bit head, a cutter supporting construction comprising a sleevelike body adapted to be slipped upwardly over the lower end of the bit head, the bit head and sleeve-like body having complementary portions of wedge-shape cross section whereby the bit head and sleeve-like body will be dovetailed together, the cutter support having relatively spaced depending portions on the lower end thereof having means thereon to receive cutters.

3. In a cutter supporting structure for the bit heads of drills, the combination of an integral bit head attaching construction of sleeve-like form having a passageway therethru to receive the body of a cutter head, said passageway having bit head attaching recesses, each of which faces the axis of the cutter supporting structure, and each recess converging towards said axis, and cutter supporting portions upon said bit head attaching construction.

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