May 19, 1931. J. C. WRIGHT ET AL. 1,805,898

WELL BIT

Filed Oct. 1, 1927

Fig. 1.

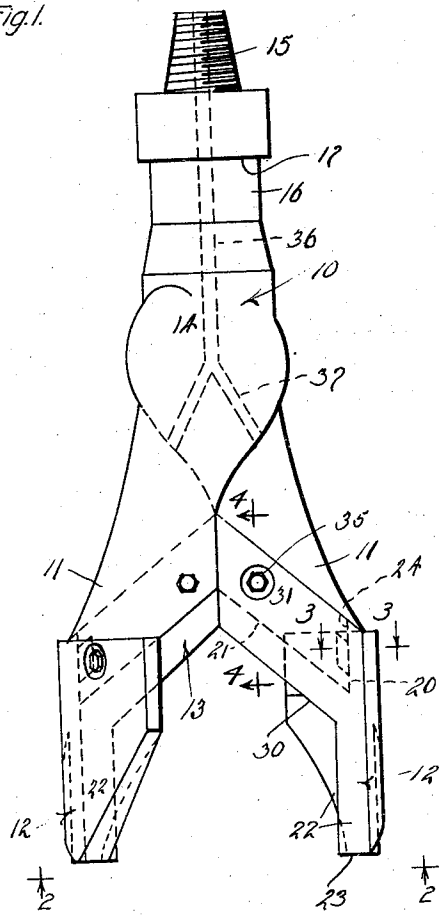


Fig. 5.

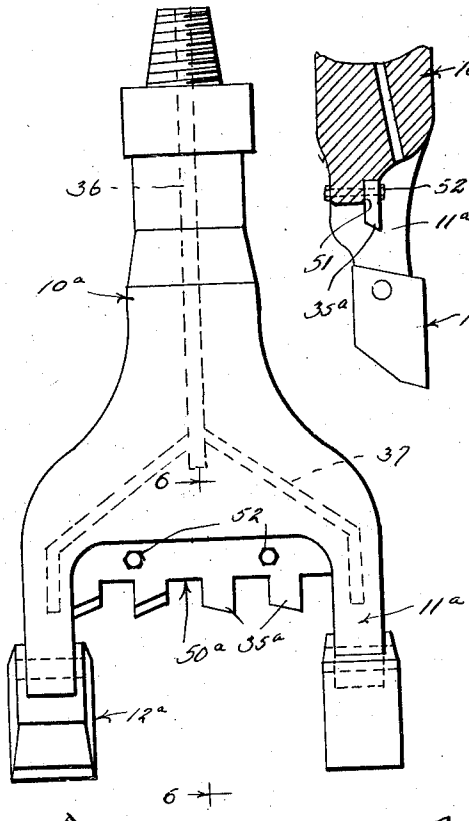


Fig. 6.

Fig. 2.

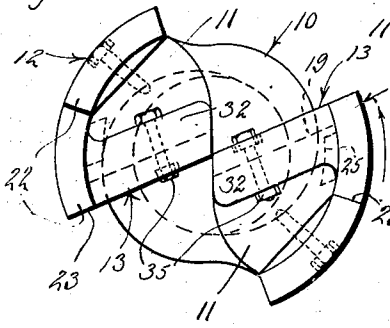


Fig. 3.

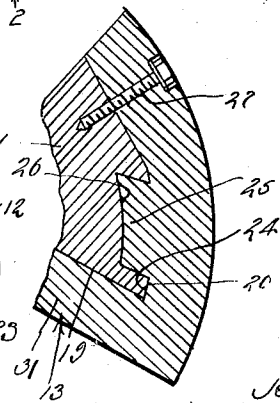
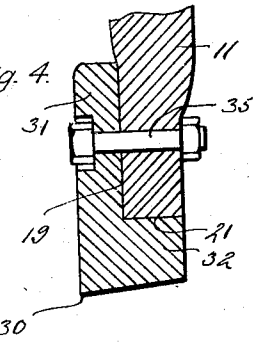


Fig. 4.



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UNITED STATES PATENT OFFICE

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WELL BIT

Application filed October 1, 1927. Serial No. 223,340.

This invention relates to a well drilling bit and has particular reference to a bit for use in drilling with the rotary method. It is a general object of this invention to provide a simple, practical and improved well drilling bit of the type in which there is a leading cutting means operable to form a core and core removing means spaced above the cutting means to destroy the core.

Our present invention has to do with that general type of bit set forth and claimed in our co-pending applications, Serial No. 214,963 and Serial No. 214,964, filed August 23, 1927.

A general object of this invention is to provide an improved and simplified construction and arrangement of parts in a bit of the type mentioned.

Another object of this invention is to provide a simple and improved form of cutter for a bit of the character mentioned.

It is a further object of the present invention to provide a bit of the type mentioned in which the core forming cutters and core destroying cutters are in the form of detachable units.

The various objects and features of the invention will be best and more fully understood from the following detailed description of two typical applications of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a front elevation of a bit embodying the invention;

Fig. 2 is an end view of the bit, being a view taken as indicated by line 2—2 on Fig. 1;

Fig. 3 is a detailed sectional view taken as indicated by line 3—3 on Fig. 1;

Fig. 4 is a detailed sectional view, taken as indicated by line 4—4 on Fig. 1;

Fig. 5 is a view similar to Fig. 1 showing another form of construction; and

Fig. 6 is a detailed sectional view taken as indicated by line 6—6 on Fig. 5.

Our invention provides a bit including, generally, a body 10, having spaced projections or legs 11, outer cutters 12 carried by the legs to project downwardly therefrom and cut into the formation to leave a core, and inner cutters 13 spaced above the cutters 12 operable to remove or destroy the core. The body 10 includes, generally, a shank 14 provided at its upper end with a tapered screwthreaded pin projection 15. The pin 15 is provided as a means for attaching the bit to an operating member such, for instance, as a string of drill pipe. It is desirable, in practice, to provide the shank 14 with a reduced part 16 to form a downwardly facing shoulder 17 that can be engaged by an overshot or over fishing tool in the event that the bit becomes lost in the well.

The legs 11 are integral with the shank and extend downwardly and outwardly from the lower end of the shank so that their outer ends are spaced a considerable distance beyond the lower end of the shank and are outward of the shank. The legs are symmetrically disposed about the central axis of the bit, it being preferred in practice to form the bit with two legs 11 located diametrically opposite each other, as shown in the drawings.

Referring particularly to Figs. 1 to 4 of the drawings, inclusive, each leg 11 extends or projects from the lower end portion of the shank so that it has a substantially vertical forward side or front face 19 extending in a direction substantially parallel to a line extending radially from the center of the bit, a substantially vertical curved outer end wall 20 concentric with the axis of the bit, and a bottom or lower face 21 that is inclined to extend outwardly and downwardly in the general direction of the leg. The body or main portion of the leg extends upwardly and rearwardly from the faces just described and joins the shank.

In the form of the invention under consideration, each cutter unit includes an outer cutter 12 and an inner cutter 13. The cutter units may be castings or forgings and, as they are the same in construction and operation, we will describe only one of the units in detail, it being understood that such description applies also to the other.

The outer cutter 12 of the cutter unit is arcuate in form corresponding, generally, to

the curvature of configuration of the outer end face 20 of the leg 11. The cutter 12, when in place, extends or protects downwardly from the outer end portion of the leg 11 so that it operates to make an annular cut in the formation being drilled, leaving a core in the center of the hole and cutting outward clearance for the leg 11. The cutter 12 is comparatively narrow and long and is arcuately curved so that its rear portion will follow in the cut made by its forward portion. The cutter 12 is made to extend or project downwardly from the leg 11 to make a fairly deep cut in the formation ahead of the leg and is provided at its lower end with one or more cutting parts or teeth 22. In the drawings, we have shown the cutter 12 formed with two teeth 22, one located behind the other, the teeth being dressed to have downwardly and forwardly facing cutting edges 23.

The cutter 12 may be mounted or set on the outer portion of the leg 11 in any suitable manner. In the preferred form of construction, a recess or socket 24 is provided in the upper portion of the cutter 12 to receive the outer end portion of the leg 11. The socket has its various parts shaped so that it more or less closely or snugly receives the outer end portion of the leg 11. For instance, the socket has a curved part fitting the outer end face 21 of the leg and has an annularly disposed part fitting the bottom 21 of the leg. In the preferred form of the invention a lug 25 is formed on the cutter 12 in the socket 24 and a corresponding recess 26 is formed in the end face 20 of the leg to receive the lug. The lug and recess co-operate to hold the cutter in place on the leg and to transmit driving strain from the leg to the cutter. We provide locking means for positively retaining the cutter on the leg. In the drawings, we have shown a locking screw 27 extending through the upper portion of the cutter 12 and into the outer end portion of the leg 11. The locking screw 27 may be held against working loose by means of a lock washer or any other suitable device.

The inner cutter 13 of the cutter unit is formed integral with the outer cutter 12 and is provided with a cutting edge 30 extending upwardly and inwardly from the forward edge or face of the cutter 12 to the center of the bit. The cutter 13 has a front part 31 which projects upwardly in front of the front face 19 of the leg to protect or shield the leg, and has a rearwardly extending bottom part 32 projecting under the bottom 21 of the leg 11 protecting the leg. The parts 31 and 32 of the cutter 13 forms a structure L-shaped in cross section to receive the leg 11. In practice, a locking screw 35 is provided to extend through the front part 31 of the cutter 13 and into the front face 19 of the leg 11. The front face 19 of the leg 11 is parallel with a line extending radially from the center of the bit and is offset rearwardly therefrom so that the cutting edge 30 of the cutter carried by the leg is or may be radial from the center of the bit.

The invention provides for the direction of circulating fluid to the cutting parts. For this purpose, a circulation opening 36 extends downwardly into the shank 14 from its upper end and branch openings 37 are formed in the lower portion of the shank or in the legs 11 to receive fluid from the opening 36 and discharge or direct it onto the cutters.

From the foregoing description of the general construction and arrangement of parts, it will be apparent how the cutters 12 operate to make a narrow annular cut in the formation being drilled, leaving a central core of the formation standing in the bottom of the hole. This core is cut away or broken down by the cutters 13 as the drill advances. It is to be noted that the spaced leg construction, having cutter units operated by the legs, provides clearance around the various parts so that the cuttings are effectively carried away by the circulating fluid and are prevented from accumulating in a manner to cause the bit to ball up. The teeth of the cutters 12 are the only parts of the bit extending into completely confined formation and, in view of the fact that the cutters 12 are comparatively narrow, this cut is made easily. The core left by the cutters 12, being unconfined, that is, being free in the hole, is readily cut away or destroyed by the cutters 13.

In the form of the invention illustrated in Figs. 5 and 6, two cutters 12*a*, without core cutting blades, are applied to the ligs 11*a* of the body 10*a*, and a separate core cutter 50*a* is mounted at the lower end of the shank 14 between the legs 11*a*. The legs 11*a* are spaced a substantial distance apart and have parts extending straight down to carry the cutters 12*a*. In this case, the lower end of the shank 14 between the legs 11*a* is formed with a recess 51 suitable for receiving the core cutter 50*a*. The core cutter 50*a*, shown in the drawings, is in the form of a plate mounted in the recess 51 by bolts 52 and having a plurality of downwardly projecting cutting teeth 35*a*. The teeth 35*a* at the two sides of the central axis of the tool are at different distances from the central axis so that they travel in different paths in a manner to completely cut away the core left by the cutters 12*a*. In using this form of the invention, it will be obvious that the cutter 50*a* may be provided with cutting parts of any suitable form. The core cutter 50 is carried by the shank 14 between the legs 11 so that strain is imparted from the cutter 50*a* directly to the shank, leaving the legs 11*a* to withstand only the strains due to the cutters 12*a*. The cutters

12*a* are designed to fit over and protect the legs 11*a* against wear and are dressed to have cutting parts that will make the desired annular cut in the formation.

It will be obvious that this form of the invention operates much the same as the other form, it being apparent how the cutters 12*a* operate to make an annular cut in the formation, leaving a core extending upwardly in a manner to guide and steady the bit. The core is destroyed or cut away by the cutter 50*a* as the bit advances.

The bit provided by our invention is particularly efficient and effective as the outer cutters, which cut directly into solid confined formation, are comparatively small and make a comparatively narrow cut. The core left in the bottom of the hole by the outer cutters, being unsupported or unconfined, is readily cut away or broken down by the inner cutting means. We have found, in practice, that the core cutting means in our type of bit shows very little wear, thus indicating that the core left by the outer cutting means is very easily removed.

Having described only typical forms of our invention, we do not wish to limit ourselves to the specific details set forth, but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described our invention, we claim:

1. A well drilling bit including a body having spaced oppositely disposed legs extending outwardly and downwardly from its lower end, a cutter unit carried by each leg, each unit including an outer cutter surrounding a portion of one leg and projecting downwardly from the outer end of the leg and an inner cutter extending inwardly from the upper end portion of the outer cutter, the unit having a lug extending into a recess in the leg.

2. A well drilling bit including, a body, spaced legs projecting from the body, cutter units mounted on the legs having sockets receiving the lower end parts of the legs, and lugs on the cutter units fitting recesses in the said end parts.

3. A well drilling bit including, a body, spaced legs projecting from the body, cutter units mounted on the legs having sockets receiving the lower end parts of the legs, and lugs on the cutter units in the sockets extending into recesses in the said end parts.

In witness that we claim the foregoing we have hereunto subscribed our names this 12th day of September, 1927.

JESSE C. WRIGHT.
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