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G. A. MONTGOMERY

DRILLING APPLIANCE

Filed Sept. 15, 1925

Fig. 1.

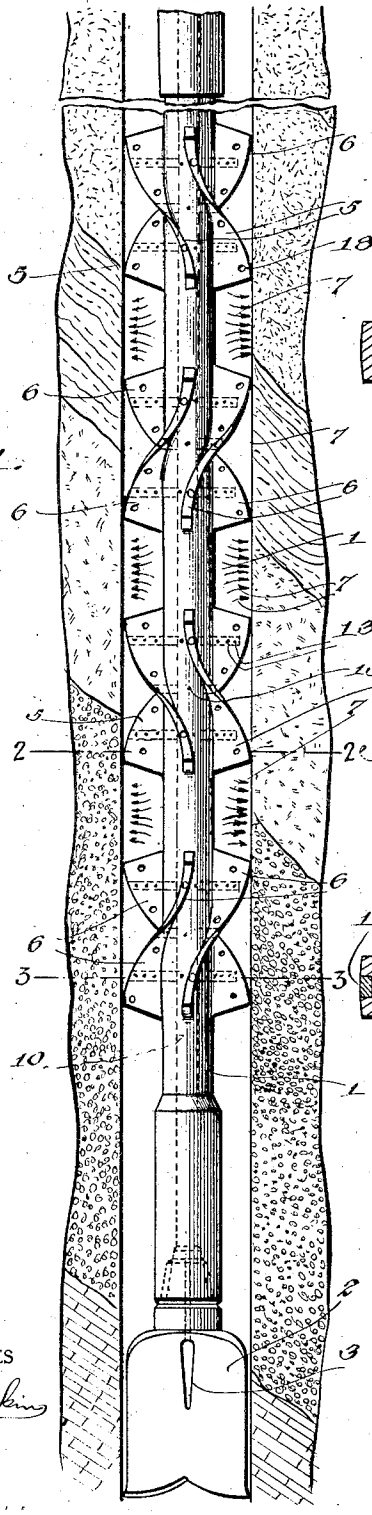


Fig. 2.

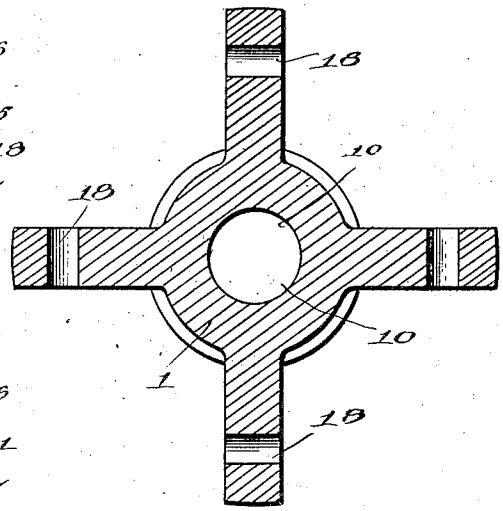
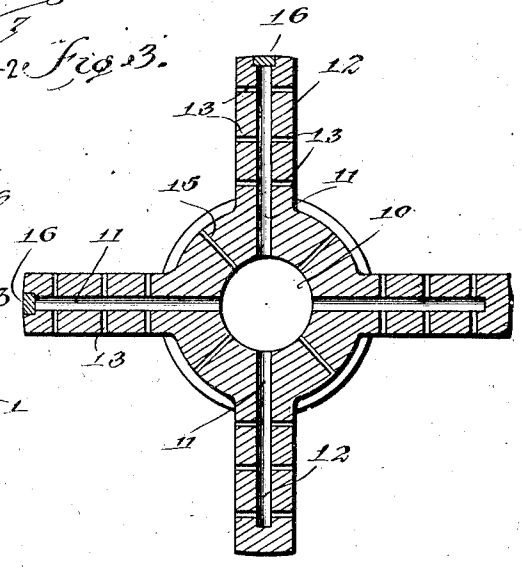


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

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DRILLING APPLIANCE.

Application filed September 15, 1925. Serial No. 56,526.

This invention relates to a drilling device or appliance which is adapted for use as a drill stem or drill stem and collar with the percussion or cable tool system or with the rotary system of drilling.

Among the objects of the invention is the provision of a device of this character which precludes the possibility of drilling a crooked hole and facilitates and insures the drilling of a true, straight well hole of uniform cross section, which is so constituted as to prevent the unscrewing of the joints of the drill stem or the twisting of the cable block lines when pulling out or running in drill pipe, which so breaks up, pulverizes and handles the drillings or detritus as to facilitate and insure the upflow thereof and preclude the possibility of the drilling equipment mudding up and sticking in the well hole, which sets up regions or zones of high pressure, causing the mud to plaster or line the wall of the well hole and thereby seal off the outlying formation and which is of simple and durable construction, reliable and efficient in operation and adapted to be manufactured at a comparatively slight expense from materials by means of facilities ordinarily available.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:—

Figure 1 is a fragmentary view in elevation showing the invention embodied in a rotary drilling tool, and

Figures 2 and 3 are horizontal sectional views on lines 2—2 and 3—3, respectively, of Figure 1.

Referring to the drawings it will be seen that for the sake of illustration the invention is shown as embodied in a rotary drilling tool but it should be understood that it is equally well adapted for embodiment in the percussion or cable type tool.

In the embodiment shown a hollow rotary drill stem is designated at 1 and carries a drill bit or cutter 2 at its forward end, the bit 2 having a conventional discharge opening 3 for the mud or washing fluid.

The present invention resides in the provision of a plurality of sets of wings or paddles at spaced intervals along the drill stem, designated at 5 and 6. Each set of wings includes a number of parallel wings twisted in spiral fashion around the drill stem.

In the embodiment illustrated four wings are shown in each set. The wings 5 are in the form of left hand spirals, the wings 6 in the form of right hand spirals, that is, the wings 5 and 6 are oppositely inclined around the drill stem with respect to each other. All of the wings are relatively short, have the same longitudinal extent along, and are spaced at equal angular intervals about the drill stem.

One of the important features of the invention resides in the provision of the oppositely directed sets of spirally extending wings, the wings being relatively short and the sets being spaced along the drill stem. In the operation of the tool this arrangement sets up in the spaces intervening between the wing high pressure areas 7 due to the fact that the mud fluid is forced into these areas by adjacent sets of wings. These high pressure areas result in directing the mud fluid laterally outward against the wall of the mud hole and cause the mud fluid to plaster or line the wall of the well hole to seal off the outlying formations.

The drill stem 1 is provided with an axial opening 10 through which the washing fluid is pumped in the usual way. In order to aid the action of the spaced sets of relatively short and oppositely directed spiral blades breaking up and pulverizing the drillings or detritus especially when drilling through sticky formations, such as gumbo or the like, the drill stem and wings are provided with fluid passages 11 and 12 which extend from the opening 10 laterally out through the blades and which communicate with transversely extending passages 13 constituting discharge jets, the passages 13 being relatively small. Similar discharge jets or passages 15 are provided in the drill stem between the wings. The passages 11 and 12 may be formed by drilling through one wing and the drill stem and out through the opposite wing to a point adjacent to but spaced from its periphery and then closing the opening 12 where it leads out through one of the wings by means of a suitable plug 16.

The discharge jets 13 open through the faces of the blades so that the washing fluid under pressure is forced out at points distributed over the faces of the blades, there-

by washing away any accumulations that may tend to build up thereon.

The circulation and agitation of the drillings is further enhanced by the provision of relatively large transverse openings 18 in the wings, the openings 18 permitting some of the mud and fluid to pass by the blades and thereby aid the fluid in the prevention of clogging or sticking. Of course, it is to be understood that the drillings or detritus are carried up to the surface by the washing fluid which is pumped down through the drill stem under pressure and which rises up on the outside of the drill stem and carries the drillings or detritus with it. The wings which applicant provides are constituted to cause the tool to drill a true and straight hole of uniform formation and yet preclude against any possibility of the tool sticking even in gummy or sticky formations. The feature of providing sets of oppositely inclined blades or wings causes the wings of one set to counteract the tendency of the wings of the other set to turn the tool and in this way will prevent unscrewing of the joints or twisting of the casing block lines in pulling out or running in the drill pipe which would otherwise occur as the result of the frictional engagement of the wings of the stem with the wall of the well hole. This advantage is not possible with any tool heretofore proposed. The provision of a plurality of spaced sets of relatively short blades adds little, if any, weight to the conventional drill stem and yet provides a stiff and rigid stem of great strength. The spiral wings being oppositely directed will cut away any inwardly directed projections that may occur on the walls of the well hole. In this respect the feature of having oppositely directed blades is especially important since it prevents hard inwardly extending projections from acting as keys and merely causing the wings to turn on the projections. Moreover, the oppositely directed spiral wings insure the formation of a truly circular well hole since the wings exert a shearing action on the wall of the well hole in both directions. Due to the churning action of the oppositely directed spiral wings and to the action of the transverse mixing holes 18 the drillings are broken up and pulverized and are prevented from building up a solid and continuous mass. The cruciform cross section of each set of wings enables it to be cheaply and easily formed by ordinary forging methods. As illustrated in the drawings the wings are preferably integral with the drill stem. Of course, they may be separate and suitably connected thereto.

I claim:—

1. In a drill, a one piece drill stem section having a plurality of spaced sets of relatively short spiral wings integrally formed with the stem, said wings of the adjacent sets being alternately oppositely sloped.

2. In a drilling device of the character described, a drill stem having a plurality of spaced sets of relatively short spiral wings, the wings of longitudinally adjacent sets being oppositely sloped.

3. In a drilling device of the character described, a cruciform in cross section body affording radial wings, each wing being provided with a plurality of radially extending fluid passages therethrough, the said wings being relatively short and being arranged in spaced sets longitudinally of the drill stem with alternate wings of each set extending spirally and oppositely sloped.

4. In a drilling device of the character described, a hollow drill stem, and a plurality of sets of relatively short and oppositely sloped spiral wings arranged at spaced intervals along the drill stem, each wing having a number of lateral fluid passages communicating with the hollow drill stem and with small transverse passages constituting discharge jets.

5. In a drilling device of the character described, a hollow drill stem, and a plurality of sets of relatively short and oppositely sloped spiral wings arranged at spaced intervals along the drill stem, each wing having a number of lateral fluid passages communicating with the hollow drill stem and with small transverse passages constituting discharge jets, said wings also having relatively large transverse openings facilitating circulation and agitation of the mud fluid.

6. In a drilling device of the character described, a hollow drill stem, and a plurality of sets of relatively short and oppositely sloped spiral wings arranged at spaced intervals along the drill stem, each wing having a number of lateral fluid passages communicating with the hollow drill stem and with small transverse passages constituting discharge jets, said wings also having relatively large transverse openings facilitating circulation and agitation of the mud fluid, said drill stem having fluid discharge passages intermediate the wings.

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