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DRILLING APPARATUS

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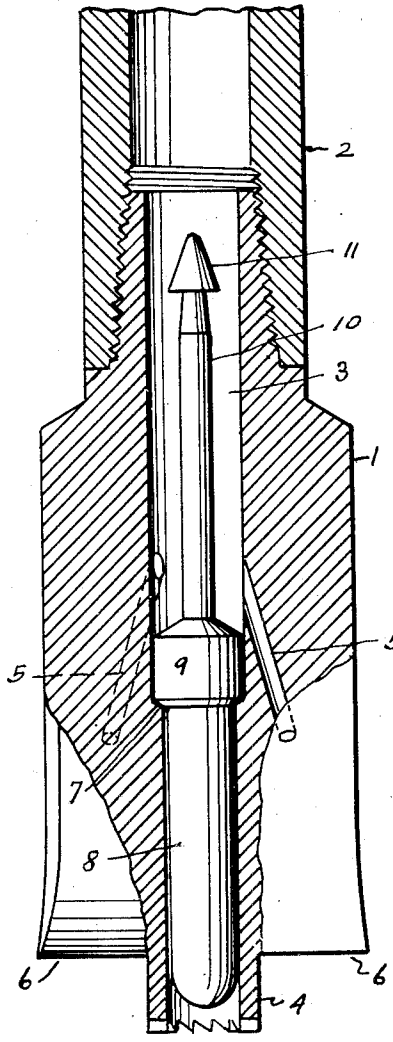


Fig. 1.

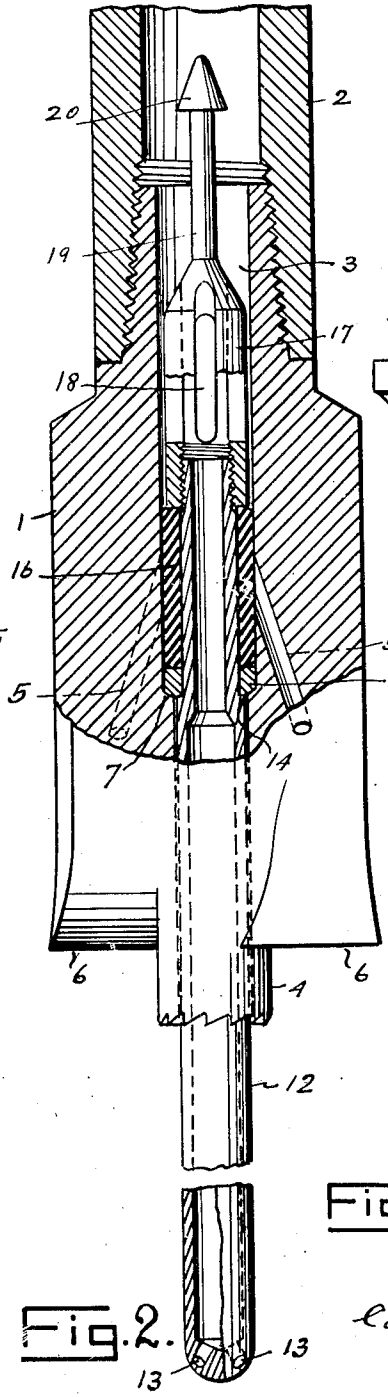


Fig. 2.

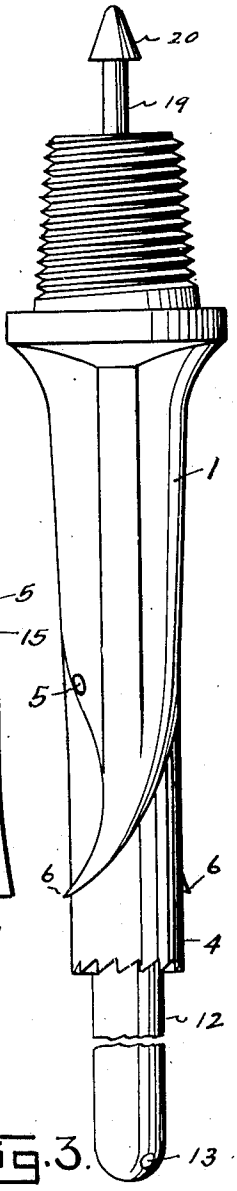


Fig. 3.

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DRILLING APPARATUS

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2 Claims. (Cl. 255—61)

This invention relates to drilling apparatus and has more particular relation to drilling apparatus equipped with means for flushing out the "rat hole", or bottom of the bore preparatory to making a test of the formation encountered. It is an object of the invention to provide the combination with a drill of means for controlling the discharge of the drilling, or flushing, fluid into the bore.

It is another object of the invention to provide the combination with a drill of means whereby the passageways for the drilling fluid through the drill may be closed when it is desired to flush out the "rat hole", and whereby the flushing fluid may be conducted on down beneath the drill and discharged into the "rat hole", or the reduced lower end of the bore. In the process of drilling wells when a stratum, thought to contain oil has been reached, it is common practice to withdraw the drill stem and drill and replace the drill with one of a reduced diameter and to lower the reduced drill back into the bore for the purpose of reducing the bore and drilling on into the pay strata. This reduced bore is commonly known as a "rat hole." This "rat hole" is usually of considerable depth. After the "rat hole" is formed it is sometimes desirable to withdraw the drill and replace it with one of a larger diameter, that is, having a diameter the same as that of the enlarged bore above the "rat hole", for the purpose of reaming the enlarged bore on down a distance. During this reaming process the "rat hole" may become partly filled with cuttings or very heavy drilling fluid so that it must be washed out or flushed out preparatory to making a test. The apparatus herein described may be used during the reaming process so that after the reaming is completed the "rat hole" may be washed out without withdrawing the drill thus saving an extra trip.

With the above and other objects in view the invention has particular relation to certain novel features of construction, arrangement of parts and use, an example of which is given in this specification and illustrated in the accompanying drawing, wherein:

Figure 1 shows a vertical sectional view of a drill showing the central bore closed so as to permit a discharge of the drilling fluid to the drill in the usual way while carrying on ordinary drilling operations.

Figure 2 shows a side view of the drill, partly in section showing, assembled therewith, means for closing the drilling fluid channels of the drill and for conducting the drilling fluid channels of the drill and for conducting a flushing fluid down into the "rat hole" and

Figure 3 shows an edge view thereof.

Referring now more particularly to the drawing wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a drill, which, in the present instance is shown as a drill of the fish tail type. The upper end of the drill is reduced and outwardly threaded to receive the lower end of the drill collar 2 which forms a part of the drill stem extending to the ground surface and whereby the drill is driven. The drill has an axial bore 3 extending from the upper to the lower end thereof and in the present illustration there is shown a pilot 4 around the bore and extending beneath the drill. The drill is provided with the channels 5, 5 for the discharge of the drilling fluid on to the blades or cutters 6 of the drill. These channels lead downwardly and outwardly from the central bore 3 and beneath the upper ends of the channels the bore 3 is reduced in diameter forming an inside annular shoulder 7.

While carrying on the reaming operations as hereinabove described it is necessary that the bore 3 be closed and the channels 5 left open. For this purpose a plug 8 is dropped down through the drill stem into the drill and this plug has the enlarged head 9 at its upper end whose outside diameter is approximately the same as that of the inside diameter of the enlarged portion of the bore 3 and whose lower end is shaped to conform to the shape of, and to fit on, the seat 7 whereby the bore 3 will be closed to prevent the passage of the drilling fluid downwardly through the bore. When the head 9 is seated on the seat 7 its upper end will clear the upper ends of the channels 5 so that the drilling fluid will be forced to pass out through said channels 5 on to the cutters 6. The channels 5 are restricted so that the drilling fluid will pass through them at a high velocity to keep the cutters 6 cleansed and to flush out the cuttings from the bottom of the bore. The plug 8 has an upstanding stem 10 whose upper end carries a conical shaped head 11 with which a conventional type of grapple may be engaged. This grapple is carried by the lower end of a cable in the usual way and may be let down through the drill stem and engaged with the head 11 and the plug 8 withdrawn when it is desired to withdraw the same.

When the reaming operation has been completed the plug may be withdrawn and the flushing apparatus hereinafter described may be lowered in its place. This flushing apparatus

comprises an elongated barrel 12 whose lower end is closed and provided with the reduced discharge outlets 13. The upper end of the barrel is reduced forming an external annular shoulder 14 and surrounding the reduced upper end of the barrel and resting on said shoulder there is a junk ring 15 on which is located an expansible sleeve 16 forming a packer. Screwed on to the upper end of the barrel there is a tubular cage 17 whose lower end abuts the upper end of the packer and whose upper end has the inlet openings 18. A stem 19 upstands from the cage and is provided with a conical shaped head 20 with which the grappling tool hereinabove described may be engaged.

When the plug 8 has been removed the drill may be elevated and the flushing apparatus dropped down through the drill stem with the junk ring 15 landed on the seat 7. In this position the lower end of the barrel will extend beneath the drill down into the rat hole as illustrated in Figure 2 and the packer 16 is of sufficient length to close the upper end of the channels 5. A clean flushing fluid may then be forced down through the drill stem and it will pass inwardly through the openings 18 and down through the tubular barrel 12 and out through the outlet openings 13 into the "rat hole" and said flushing fluid will return up around the drill and drill stem thus flushing out all clogging material from the "rat hole" preparatory to lowering a testing tool to test the formation pierced by the "rat hole". It may be stated that while flushing out the "rat hole" the pressure of the fluid against the upper end of the packer 16 will cause the flexible packer to buckle and/or bend outwardly into sealing engagement with the drill passage thereby effectively closing the channels 5, during which buckling action of the flexible sleeve the loosely mounted junk ring 15 follows the lower end of the latter upwardly and somewhat supports the same throughout the sealing operation. In other words, there is relative movement between the flexible sleeve, junk ring and the drill barrel which permits a more effective sealing of the drill channels in the manner just described.

After the "rat hole" has been thoroughly cleansed the grappling tool hereinabove adverted may be lowered and engaged with the head 20 and the flushing apparatus withdrawn to the ground surface.

The drawing and description disclose what is now considered to be a preferred form of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. The combination with a drill having an axial bore extending from the upper to the lower end of the drill and having an inside seat around the bore, a discharge channel leading downwardly from the bore above said seat, of a tubular barrel shaped to fit through the bore, annular means loosely mounted on said barrel to engage said seat, an expansible packing on said barrel and engaging said annular means, said packing and annular means being movable with respect to said barrel whereby fluid pressure forces said packing to seal said channel.

2. In drilling apparatus, a drill having an axial bore whose lower end is reduced forming an inside upwardly facing seat, said drill having a channel leading downwardly from the bore above said seat, a tubular barrel having a ring thereon adapted to rest on said seat, said barrel being extended beneath the drill and formed into a nozzle having a lower end outlet, and an expansible sleeve on said barrel and seated on said ring, said ring and sleeve being movable with respect to said barrel whereby said sleeve is adapted to be expanded to close the upper end of said channel.

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