Nov. 24, 1953 L. L. GAGE ET AL 2,660,250

MEANS FOR REMOVING FOREIGN MATTER FROM DRILL HOLES

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FIG. 1.

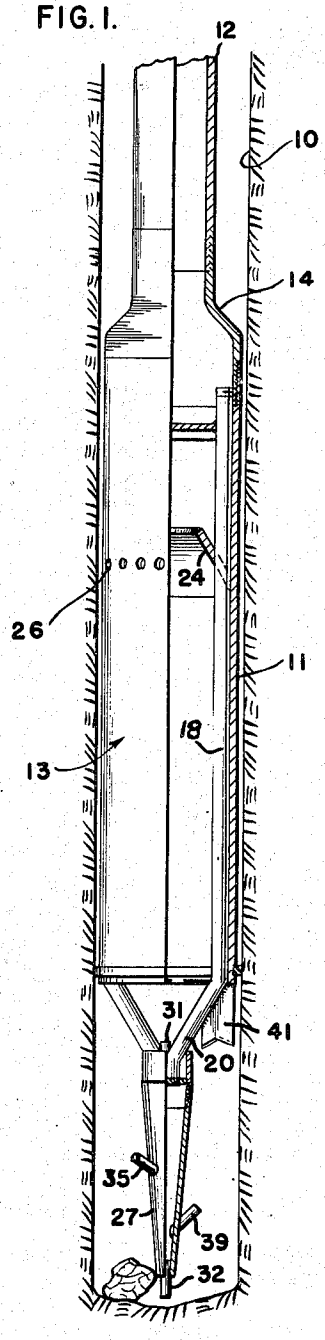


FIG. 2.

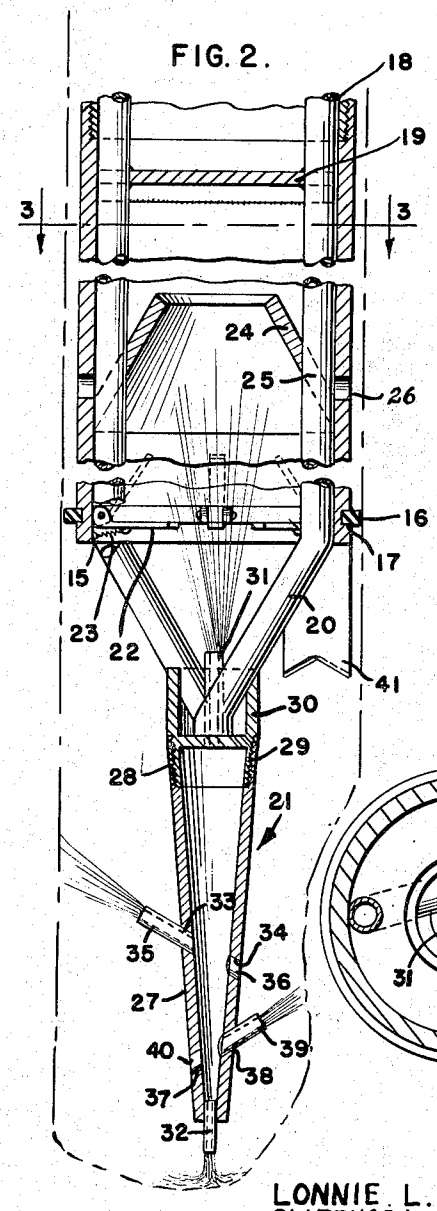


FIG. 4.

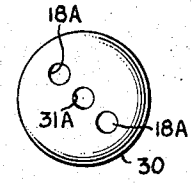
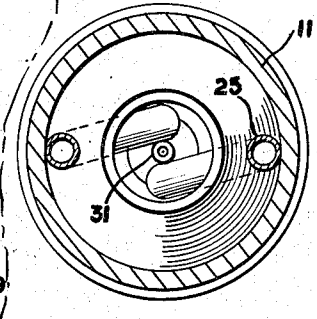


FIG. 3.



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MEANS FOR REMOVING FOREIGN MATTER FROM DRILL HOLES

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6 Claims. (Cl. 166—19)

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The present invention relates to a means for removing foreign matter from oil, water and similar wells, and more particularly has reference to a method of and means for removing the "cones" and "junk" from the hole in a single operation.

An important object of the present invention is to provide means for isolating the lower area of the hole and directing fluid into the isolated area whereby the fluid pressure will force the "cones" and "junk" to a point beyond the isolated area and prevent the removed "cones" and "junk" from re-entering the isolated area.

Yet another object of the invention is to provide a tool for use in the drilling field which is adapted to be lowered into the hole by the use of conventional drill pipe, the tool being provided with means to isolate that portion of the hole below the tool and with further means to direct fluid into the isolated area, the fluid serving to direct the "cones" and "junk" into the tool, which is provided with further means to retain the "cones" and "junk" within the tool.

And still a further object of the invention is to provide a tool for use in drilling which includes means for directing fluid downwardly, angularly and upwardly respecting the tool whereby the "cones" and "junk" will be forced into the tool.

Yet a further object of the present invention is to provide a tool which is provided with means therein for receiving and retaining small "junk" bits, which are forced into the tool, and with further means yieldable in one direction to permit the "cones" to be forced into the tool and returnable automatically to the initial position to prevent the "cones" from leaving the tool.

Still a further object of this invention is to provide a drilling assemblage which is relatively simple in structural detail, positive and efficient in operation, and capable of being inexpensively manufactured.

With the foregoing and other objects in view, the invention consists in the details of construction, and in the arrangement and combination of parts to be hereinafter more fully set forth and claimed.

In describing the invention in detail, reference will be had to the accompanying drawings forming part of this application, wherein like characters denote corresponding parts in the several views, and in which:

Figure 1 is a view in side elevation, partly in section, and partly broken away, of the preferred form of the invention, the assemblage being depicted in operative relationship within a hole.

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Figure 2 is a fragmental view, partly in section and partly broken away, illustrating the salient features of the invention, and

Figure 3 is a sectional view taken along the line 3—3 of Figure 2, looking in the direction of the arrows, and,

Figure 4 is a top plan view on an enlarged scale of the joint to which the "stinger" is attached.

Referring to the drawings, and more particularly to Figure 1, a hole is designated 10, 11 denotes the drill assemblage generally, and 12 a joint connecting the assemblage 11 to the lower end of a standard drill pipe section.

The assemblage 11 comprises a circular body portion 13 of suitable material, the diameter of the body portion being slightly less than the diameter of the hole 10, and the upper end of the body 13 is reduced in diameter, as at 14, so that it may be threadedly attached to the conventional joint section 12. The lower end of the body 13 is open, as indicated at 15, and an annular packer or gasket 16 is lodged in a peripheral groove 17 a short distance above the open lower end 15, the purpose of the packer being to isolate the area of the hole below the packer so as to prevent fluid from being discharged upwardly of the hole between the body portion 13 and the hole wall, as will later be more fully described.

A pair of diametrically opposed fluid conduits 18 extend longitudinally of the body 13 and from a point slightly above a horizontally extending plate 19 to a point below the open end 15. The conduits 18 may be rigidly secured to the inner wall of the body portion 13 by welding, brazing, or any other suitable means and these conduits are of conventional material. As perhaps more clearly shown in Figure 2, the lower end of each conduit 18 is bent inwardly, as at 20, and is suitably attached to a "stinger" or mill 21, as will hereinafter be more fully described. The "stinger" 21 functions to direct fluid jets into the isolated area of the hole for the purpose of moving the foreign matter into the body portion 13. A plurality of fingers 22 are pivotally mounted to the inner wall of the body portion 13 in proximity to the open end 15, the fingers being movable forwardly about a horizontal axis, and a spring 23 connected to each finger and to the wall of the body 13 serves to normally maintain each finger in the position shown by the full lines in Figure 2, yet permit it to move to the broken line position. The fingers 22 function to admit the "cones" into the body portion and prevent them from leaving the interior of the body portion when the fingers are in the full line position.

At a point below the plate 19, it will be noted that a truncated conical member or basket 24 is conveniently attached to the inner wall of the body portion 13, the basket being provided with apertures 25 for receiving fluid conduits 18. The basket 24 serves to receive and retain the "junk" admitted into the interior of the body portion, the "junk" being deposited in the space between the walls of the basket and the inner wall of the body portion. A plurality of holes or ports 26 communicate with the space between the wall of the body portion 13 and the wall of the basket to provide a fluid outlet above the packer 16.

The "stinger" 21 includes a hollow tapered body 27 which is internally threaded adjacent its upper end, as shown at 28, to receive external threads 29 on a joint 30 to which the ends 20 of the fluid conduits 18 are attached. A nozzle 31 which is directed upwardly toward the body portion 13 is carried by the tool joint 30, and a downwardly directed nozzle 32 is fitted into the lower open end of the body 27 for the purpose of washing cuttings or "junk" from the bottom of the hole 10. More specifically, the joint 30 is provided with three openings therein in which the ends of the conduits 18 and the nozzle 31 are fixed. The openings for the ends of the conduits 18 are denoted 18A and the opening for the nozzle 31 is shown at 31A as best depicted in Figure 4.

It will also be noted that the wall of the body 27 is provided with opposed apertures 33 and 34, the aperture 33 being directed upwardly with respect to the hole wall while the aperture 34 is directed downwardly. A nozzle 35 may be fixed in the aperture 33 in order that fluid may be directed upwardly, and the aperture 34 may be closed by a screw or the like 36. Intermediate the apertures 33 and 34 and the nozzle 32, the body portion is further provided with opposed apertures 37 and 38, an upwardly directed nozzle 39 being fixed in the aperture 38 while the aperture 37 is closed by a screw 40. The nozzles 35 and 39 will tend to wash the cuttings or "junk" and "cones" upwardly toward the interior of the body 13 in a manner to be more fully described.

A bit 41, preferably of the fishtail type is rigidly attached to the lower end of the body portion 13 and extends downwardly therefrom. The bit 41 will have a tendency to roll the "cones" or "junk" around and assist them in entering the interior of the body portion 13.

In order to facilitate the removal of the "cones" from the interior of the body portion 13 and also from the basket 24, the body portion intermediate the basket and the joint 12 may have a threaded connection to permit such intermediate area to be removed from the remainder of the body portion. It will further be appreciated that it is possible to replace either of the nozzles 35 and 39 by removing the screws 36 and 40, respectively, after which the respective nozzles may be "knocked out" through the apertures 34 and 27. The new nozzle for the aperture 33 is inserted by placing it through the aperture 34, and the same applies to the nozzle lodged in the aperture 38. This permits the new parts to be easily and quickly installed at a minimum cost.

In operation, assuming that the body portion 13 has been coupled to the lowermost drill pipe section by means of the joint 12 and the body portion has been lowered to the position shown in Figure 1, fluid is admitted into the drill pipe sections. By reason of the solid plate 19, all of the fluid will be directed into the conduits 18 and enter the "stinger" 21 through the joint 30. By virtue of the manner in which the nozzles 31, 32, 35 and 39 are located on the "stinger" 21, it can be seen that the nozzles 32, 35 and 39 will force the "cones" and "junk" upwardly into the path of the upwardly directed nozzle 31 whereby the nozzle 31 will force the "cones" and "junk" against the resiliently mounted fingers 22. Manifestly, the fingers 22 will pivot upwardly so that the "cones" and "junk" will enter the interior of the body portion 13 and the "junk" will ultimately be deposited in the space between the basket 24 and the inner periphery of the body portion 13. When the pressure of the springs 23 is sufficient to overcome the action of the upwardly directed material, the springs will urge the fingers downwardly and thus trap or prevent the "cones" from entering the area between the lower end of the body portion 13 and the bottom of the hole 10. By imparting a rotary motion to the body portion 13 with the rotary table, the fishtail bit 41 will also tend to roll the "cones" and small "junk" into the path of the nozzle 31.

It can be seen, therefore, that with the present invention, the flow of fluid is directed into the isolated space between the tool and the bottom of the hole, whereupon the fluid and foreign matter is forced into the hollow body of the tool with the flow of fluid and is entrapped in the body. The fluid escapes from the tool through the outlet ports 26 which communicate with the hole bore at a point above the packer 16. By virtue of the "stinger" 21 and the manner in which the nozzles are supported by the "stinger," it is possible to effectively remove the "cones" and "junk" in the isolated area and force them into the interior of the tool.

This invention is not to be confined to any strict conformity with the showing in the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

We claim:

1. An assembly for removing "cones" and "junk" from a drill hole comprising a hollow body portion provided with open ends adapted to be lowered into the hole in proximity to the bottom thereof, packing means carried by the body portion adapted to cooperate with the wall of the hole to isolate the area of the hole below said packing means, conduit means extending longitudinally of the body portion to a point below one of the open ends of the said hollow body portion, a hollow support connected to said conduit means at the point below the body portion, nozzles supported by the hollow support for directing fluid against the walls of the hole, further nozzle means on the support for directing fluid into the interior of the body portion, a basket within the body portion for trapping the "junk," yieldably mounted fingers pivotally attached to the body portion adapted to permit the "junk" and "cones" to be admitted into the interior of the body portion, and means to direct fluid through said conduit means whereby the nozzles will direct the "cones" and "junk" toward the further nozzle means for forcing the "cones" and "junk" into the body portion wherein the basket will trap the "junk" and the yieldably mounted fingers will trap the "cones."

2. An assembly as defined in and claimed by claim 1 further characterized in that fluid outlet ports provided in the hollow body portion communicate with the basket at a point above the packing means.

3. An assembly as defined in and claimed by claim 2 wherein said basket includes a truncated conical member rigidly supported by the hollow body portion.

4. An assembly as defined in and claimed by claim 1 further characterized in that at least some of the nozzles provided for said hollow support are directed angularly upwardly.

5. An assembly as defined in and claimed by claim 1 further characterized in that the lower end of said hollow body portion is provided with a bit rigidly secured thereto.

6. An assembly as defined in and claimed by claim 1 further characterized in that said yieldable fingers are mounted for pivotal movement about a horizontal axis.

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