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MEANS FOR SUPPLYING ABRASIVE MATERIAL TO DRILLS

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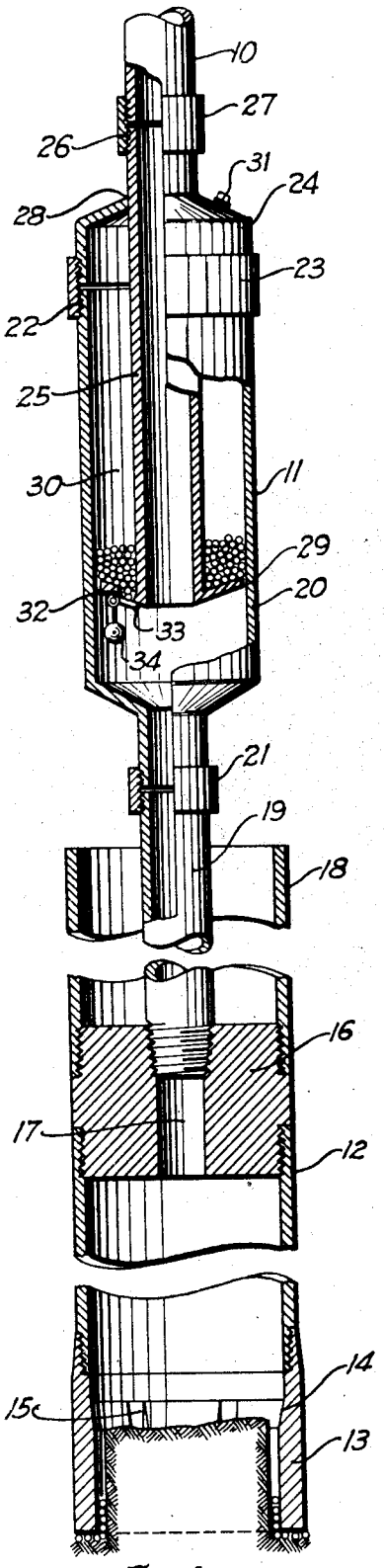


Fig. 1

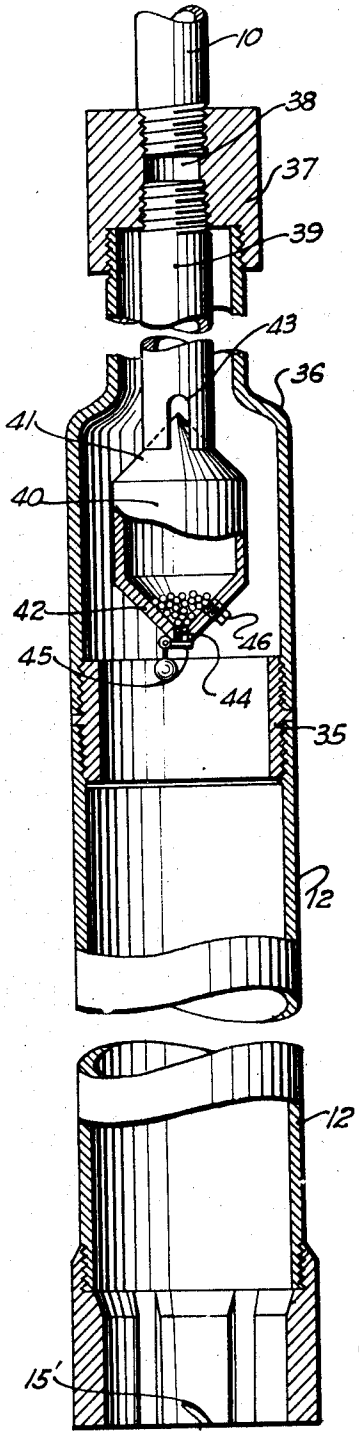


Fig. 2

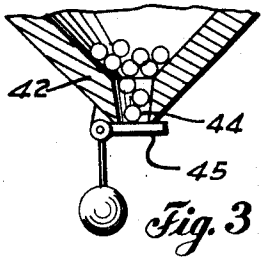


Fig. 3

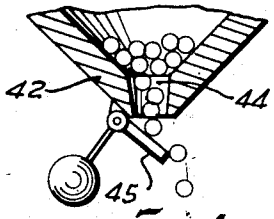


Fig. 4

Inventor
FRANCIS F. DAVIS

By Jack Ashley
Attorney

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MEANS FOR SUPPLYING ABRASIVE MATERIAL TO DRILLS

Francis F. Davis, Houston, Tex.

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7 Claims. (Cl. 255—61)

This invention relates to means for supplying a drilling medium to a drill.

In drilling bores in the earth, there are oftentimes encountered very hard materials which ordinary bits or drills will not penetrate. It has been common practice for a number of years to use some type of drill and feed an abrasive material from the top of the well, and shot is commonly used which is dropped from the surface of the well and must travel down the entire length of the drill stem which may be four or five thousand feet, or shorter, or longer. There is no way of determining when the shot reaches the bit and there also is no way of feeding said shot at regular intervals so that it will be fed constantly to the bit, as the shot must fall down through the drilling mud and often becomes lodged in the coupling, or will still be in the process of falling down to the bit when the drill string is being pulled out of the well.

Therefore, it is an important object of this invention to provide new and improved means for supplying drilling or abrasive material to a drill bit so that said abrasive material coacts with the drill in drilling.

Another object of the invention is to provide a new and improved means supplying an abrasive material to a drill by centrifugal force controlling the feeding of said abrasive material.

Still another object of the invention is to provide an improved means for supplying an abrasive material to a drill bit, and said supplying means capable of being placed at any desirable point.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing, in which an example of the invention is shown, and wherein:

Figure 1 is a vertical view, partly in section and partly in elevation, showing one means for carrying out this invention,

Figure 2 is a vertical view, partly in section and partly in elevation, showing another means for carrying out this invention,

Figure 3 is an enlarged fragmentary view in section, showing the feeding means, constructed in accordance with the invention, in its closed position, and

Figure 4 is a view similar to Figure 3, showing the feeding means in its opened position.

In the drawing, the numeral 10 designates a drill pipe. Suspended on the lower end of the drill pipe 10 is a shot feeding mechanism 11, and suspended on the lower end of said shot feed is a core drill 12. The core drill 12 is one that is commonly used where the shot is fed from the surface of the well. As may be seen in the drawing, the drill is provided with an enlarged drilling head 13 which has an inwardly and downwardly directed slanting shoulder 14 provided on its inner surface.

A plurality of longitudinal grooves 15 are also provided on the inner circumference of the head 13 so as to allow the shot to travel down past the core and prevent the shot from becoming lodged between the core and drilling head. However, it is pointed out that said shot is free to pass between the core and the inner circumference of the head. The grooves 15 also are provided so that the drilling fluid or mud may pass down through the drilling head and around the core. Provided in the lower portion of said drilling head are a plurality of slots 15' (as shown in Figure 2), or what are commonly termed "shot heels," which allow circulation, and also allow the shot or abrasive material to get under said bit. The upper end of the core driller is connected to a collar 16 which is provided with an axial bore 17 extending therethrough.

An upstanding collar 18 is shown mounted on top of the collar 16, and this collar 18 may or may not be employed; the principle being that the shot which escapes from the bottom of the drilling head will be carried up the well bore by the drilling fluid, and after it passes the upper end of the collar 18, the mud will lose some of its velocity and the shot will fall out and fall into the collar 18. This is common practice and has been used for some time; but, as pointed out, this collar 18 may be employed or left off. It is further pointed out that any type of bit may be suspended from the collar 16 and is not necessarily limited to a core drill.

The upper end of the axial bore of the collar 16 is internally screw-threaded and receives a pipe 19, said pipe being connected to the lower end of the shot feed or the feed for the abrasive material. The shot feed includes a hollow cylindrical housing 20 which has its lower end reduced so that it may be engaged within a coupling 21 which receives the pipe 19. The upper end of the housing 20 is externally screw-threaded at 22 and receives a coupling 23 which is attached to a conical-shaped head 24.

Extending down through the head 24 and through the housing 20 is a hollow cylindrical

pipe 25. As may be seen in the drawing, said pipe extends above the head 24 and is provided with external screw-threads 26 at its uppermost end so that a coupling 27 may connect said pipe to the drill pipe 10. The head 24 is welded or suitably secured to the pipe 25 at its uppermost end 28.

The lower end of the pipe 25 is provided with an external upwardly directed flange 29, and the periphery of said flange engages the inner surface of the housing 20. Thus, there is formed by the pipe 25 and the housing 20 a cylindrical chamber 30 within the housing 20 and surrounding the pipe 25. As may be seen from the drawing, the fluid or drilling mud from the drilling pipe 10 is free to flow through the housing 20, the pipe 19 and the collar 16, to the bit 12.

On the upper end of the head 24 there is provided a screw-threaded opening and plug 31 so that the chamber 30 may be filled with a suitable abrasive material, such as chilled shot. An opening 32 is provided in the flange 29 at a point adjacent the pipe 25 so that the abrasive material which has been placed in the chamber 30 may flow through said opening. To close the opening, there is provided an ordinary flap valve 33 which has a weighted arm 34 connected thereto. The weight 34 will hold the flap valve 33 in the position shown in Figure 1 when the pipe or the housing is not rotated; but, upon rotation, the weight 34 will swing outwardly away from the central axis of the housing, thereby moving the valve 33 away from the opening 32 and allow the shot or abrasive material to drop through the opening 32. When the rotation of the pipe or housing is stopped, the weight 34 will again swing the valve 33 back against the flange, as shown in Figure 1, and no more abrasive material may flow therefrom. Therefore, as may be seen from the drawings, the shot or abrasive material is at a point in close proximity to the drill bit and the shot is fed continuously and at an even rate of flow while the pipe or housing is rotated, but the flow of the abrasive material is shut off immediately upon the stopping of the rotation of the housing 20.

The chamber 30 may be made any desirable and suitable length so as to hold as much abrasive material as desired by the user. Further, the chamber 30 and the housing 20 may be placed at any suitable point and is not limited to being placed in close proximity to the drill bit.

In the use of the device shown in Figure 1, the drill pipe is made up with the core drill 12 and the shot feed or abrasive feeding device 11 suspended on the lower end thereof, while it is being run into the bore. Naturally, the chamber 30 has been filled through the plug 31 before it is inserted into the bore and when the bottom has been reached, the pipe is rotated. This rotation will open the valve 33 and allow the shot or abrasive material to commence feeding to the drill 13. When it is desired to retrieve the core cut, the ordinary procedure is to drop gravel or a similar substance down through the drill pipe 10 which will travel down through the pipe 25, the pipe 19 and the collar 16, to the bit, and will lodge upon the inclined shoulder 14, thereby wedging the core in the core drill. Thus, by pulling upwardly, the core is broken off and is held within the core drill by the gravel or similar substance until it has reached the surface. At that time the core drill is unscrewed from the collar 16 and the core removed from the core drill; and then the core drill replaced on the collar 16 and, if necessary, the plug 31 of the housing 20 removed and more shot poured into the chamber 30, and the device again run into the well. This operation is repeated until the desired orienting is completed.

In Figure 2, there is shown another means for carrying out this method. In this form the core drill 12 is identical to that shown in Figure 1, except that it is connected to an internal collar 35 instead of to the collar 16. Connected to the upper end of the collar 35 is an elongated bell 36 which is connected to a collar 37 having an axial bore 38 therethrough. To the upper end of the collar 37, the drill pipe 10 is suitably connected.

The lower portion of the axial bore 38 of the collar 37 receives a hollow pipe 39, which extends downwardly into the bell 36 and has a housing 40 connected to the lower end thereof. The housing 40 is provided with conical-shaped ends 41 and 42 which may be of any desired length. The end 41 is suitably connected to the lower end of the pipe 39, and said pipe is provided with slots 43 so that drilling fluid or gravel, such as described in Figure 1, may flow down through the pipe 10 and pipe 39, and out through the slots 43. Thus, the housing 40 does not interfere with the normal flow of drilling fluid or the use of gravel when desired. As may be seen from the drawing, there is no strain placed upon the shot or abrasive feeder, and therefore it may be made of a lighter metal than that shown in Figure 1.

The lower end 42 of the housing is provided with an opening 44 which is closed by a flap valve 45 constructed similarly to the flap valve shown in Figure 1. Also provided on the end 42 is a screw-threaded opening and plug 46 through which the chamber within the housing 40 is filled with a suitable abrasive material.

In the operation, this form functions similarly to the form shown in Figure 1, that is, when the device is in the bore and rotation is started, the flap valve 45 will open, allowing the abrasive material to feed out through the opening 44 and down to the core drill, and the drilling fluid may flow out through the slots 43, down to the core drill. In removing the core, gravel may also flow through the slots 43 and lodge upon the inclined shoulder, thereby holding the core so that it may be removed from the well bore. Likewise, as in Figure 1, this shot feed may be placed at any suitable point and any suitable drill may be employed therewith.

Various changes, alterations and modifications may be made in the size, shape and arrangement of the herein described elements, within the scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

1. An abrasive feeding device for a rotary drilling mechanism having a drill member at its lower end and a flow passage communicating with the member including, a reservoir disposed within the drilling mechanism above said member for receiving an abrasive material, the reservoir having centrifugally-actuated closure means for normally preventing the escape of the abrasive material therefrom, whereby the closure means is opened to feed said abrasive material from said reservoir to the drill member upon rotation of said drilling mechanism and is closed upon cessation of rotation of the mechanism.

2. An abrasive feeding device as set forth in

claim 1 wherein the closure means of the reservoir is pivotally supported.

3. An abrasive feeding device as set forth in claim 1 wherein the closure means of the reservoir includes a closure portion and a weight portion adapted to be actuated by centrifugal action, whereby the weight portion will be swung outwardly upon rotation of the drilling mechanism to move the closure portion away from said reservoir to permit feeding of the abrasive material to the drill member.

4. An abrasive feeding device as set forth in claim 1 wherein the closure means of the reservoir includes a pivotally-mounted member with a weight depending therefrom adapted to be actuated by centrifugal action.

5. An abrasive feeding device as set forth in claim 1 wherein the reservoir has a discharge opening in its lower portion, the closure means including an angular pivotally-mounted member having a flap valve for normally closing the discharge opening of said reservoir and a weighted arm for normally holding the flap valve in its closed position, the weighted arm being actuated by centrifugal action to swing said flap valve to its open position.

6. An abrasive feeding device in accordance with claim 1 wherein the reservoir includes an annular chamber through the bore of which the flow passage of the drilling mechanism extends, whereby flow through said passage is unobstructed.

7. An abrasive feeding device in accordance with claim 1 wherein the reservoir includes a cylindrical housing disposed within the flow passage of the drilling mechanism, whereby a portion of said passage is annular in cross-section and surrounds the housing.

FRANCIS F. DAVIS.