ABSTRACT OF THE DISCLOSURE

A hydraulic jetting tool for drilling during the installation of deep wells and other uses having a jet tube spaced inwardly from an outer annular casing, a jetting means mounted on the lower end of the jet tube, water flowing upwardly between said tube and outer casing for carrying mud with it, a ram head attached to the jetting tube driving the outer casing downwardly.

A particular object of the invention is to provide a jetting tool that is sufficiently efficient as to replace more conventional well drilling tools such as churn drills, rotary drills, and the like, in installing deep wells.

Jetting tools of the prior art have not had this efficiency and it is an object to provide a greater efficiency in a jetting tool by surrounding a water jetting area underneath the tool with an outer casing surrounding on all sides the water jetting area, the outer casing being open on its underside to allow the jets to wash loose the earth, and the outer casing extending upwardly, whereby an annular mud-escape space is defined between the outer casing and the inner jet tube through which mud can rise, whereby the outer casing tends to contain the jetting effect and to cause it to be directed selectively into positions directly beneath the tool without wasteful excessive side-washing of water against the sides of the dredged earth cavity, as has been a characteristic of jetting tools for the prior art.

A further object of the invention is to provide a jetting tool as described provided with a compressed air line for delivering air for admixture with mud and water so that the air, because of the tendency of air to rise, helps the water flow to push the mud upwardly through the annular mud-escape space between the outer casing and the jet tube.

Still another object is to provide means for delivering the air near the bottom of the tool into the mud-escape space adjacent the nozzles alongside of or below the nozzles.

Still another object is to provide an outer casing as described provided with water escape openings throughout for the escape of water into the space between the outer casing and the earth for lubricating the latter space so that the outer casing is more free to be moved upwardly and downwardly with respect to the earth where a strata of cohesive material such as clay is present in great depth of strata. Cohesive material such as clay binds on the sides of a conventional jetting tool most seriously and the water escape or lubrication openings have been found to be a superb solution to this vexing problem.

Still another object is to provide a tool as described the outer casing of which is separable from the jet tube and in which a ram head is mounted at the upper end of the jet tube in a position for ramming the outer casing downwardly into the earth by impact from the ram head against the outer casing.

Other and further objects and advantages of the present invention will be apparent from the following detailed description, drawings and claims, the scope of the invention not being limited to the drawings themselves as the drawings are only for the purpose of illustrating a way in which the principles of this invention can be applied.

Other embodiments of the invention utilizing the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIGURE 1 is a top plan view of the tool of this invention.

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1.

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 2.

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 2.

The double tube jetting tool of this invention is generally indicated at 10 in FIGURE 1 and has a jet tube 16, preferably of cylindrical shape on its outer and inner sides, and normally used in an upstanding vertical position. An outer annular casing 20 surrounds and is spaced from the tube 16, the casing 20 being also cylindrical and coaxial with the tube 16.

Jetting means 30 is mounted on the lower end of the tube 16 and has downwardly directed outlet means, preferably in the form of a plurality of nozzles 40 for delivering jets of water downwardly from the lower end 44 of the jet tube 16, whereby the water tends to flow upwardly between the tube 16 and the outer casing 20, carrying mud with it as later described.

The outer casing 20 has a lower end 48 extending a substantial distance lower than the outlet means or nozzles 40, so that when the lowest part edge 50 of the outer casing 20 is in engagement with earth therebeneath, not shown, the nozzles 40 will be spaced therefrom.

The jet tube 16 has an impact means or assembly 70 mounted on its lower end and extending lower than the outlet means 76 of each of the various nozzles 40.

The impact means 70 is preferably formed with portions 78 which extend outwardly in a plurality of horizontal directions from the central axis 80 of the tube 16 as seen in bottom plan view with a nozzle supporting plate 90 extending transversely of the vertically elongated nozzles 40 and having openings therein at 94 for receiving the lower ends of the nozzles 40, respectively, in a snug manner for giving support to the nozzles 40.

The impact means 70 has its separate portion 78 provided with convexly curved upwardly and outwardly inclining lower edges 100, extending upwardly and outwardly from the central axis 80 at the lowest part center point of the impact means or assembly 70.

Air delivery means generally indicated at 110 and partially defined by a pipe 112 is provided, the pipe 112 extending from an inlet 114 opening outwardly of the casing 16 and at an upper portion thereof, and extending downwardly to communication with branches 120, which latter are pipes extending downwardly through a bottom wall 130 of the jetting tube 16 and then further downwardly and outwardly so as to have ends 136 opening upon the annular space 140 which is disposed between the tube 16 and the outer casing 20. The air passing through the air delivery means 110 and out through the outlets 140 tend to rise up in the annular space 140, having the effect of assisting the upward movement of water and mud in the space 140.

As best seen in FIGURE 2, the open ends 136 of the air branches 120 are disposed a substantial distance above the jetting nozzle 40 outlets 76.

A ramhead generally indicated at 210 and comprising a ram plate 220 is attaching to the jetting tube 16 in a position above the outer casing 20 and near but below the upper end 224 of the jetting tube 16.
The underside of the plate 210 is adapted to engage and am against the upper edge 226 of the outer casing 20 as best seen in FIGURE 2, as the jetting tube 16 is moved up and down, while the position of the outer casing 20 with respect to the jet tube 16 is maintained by annular side flange 240 fixed to and extending downwardly from the ram plate 220 and of cylindrical shape having an inner side 250 adapted to slidably and snugly engage the outer side of the cylindrical outer casing 20.

Gussets 260 brace the plate 220.

If desired spacers 270, vertically disposed, can be mounted on a plurality of sides of the jetting tube 16 for maintaining a spaced relationship between the tube 16 and the outer casing 20. The spacers 270 are to be found at the lower end of the casing 20.

At the uppermost end of the jetting tube 16 water inlet pipes 300 enter through an upper closure end 302 of the jetting tube 16 and a lifting bridle formed of cables or other suitable means is shown at 330 as attached to the jetting tube 16 by means of ears 334.

As thus described, in operation, it will be seen that when the jetting tube is raised and lowered, impact of its plate 220 against the outer casing 20 will push the outer casing into the ground while the water rushing up will tend to cause the ground to be loosened by the water to form mud rising in the annular space 140 assisted by the upwardly rising air therein and since the ram plate 220 has openings 340 therein, the mud and water can rise out through the openings 340.

It is to be particularly noticed that the jetting water from the lower ends 76 of the nozzles 40 is not admixed with air as it leaves the nozzle ends 76, and that it can strike the dirt with a full impact for forming mud.

It is only after this mud has risen to the area of the outlet ends 136 of the air pipe branches 120 that air enters the mud for assisting its upward rise.

As thus described, this invention is believed to have fulfilled the objectives above set forth in providing a superior jetting tool.

From the foregoing description, it is thought to be obvious that a double tube jetting tool constructed in accordance with my invention is particularly well adapted for use, by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention can be changed and modified without departing from the principles and spirit thereof, and for this reason, I do not wish to be deemed as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice, except as claimed.

I claim:

1. A jetting tool having a jet tube, an outer annular casing surrounding and spaced from said jet tube, jetting means mounted on the lower end of said jet tube, said jetting means having downwardly directed outlet means for delivering jets of water downwardly from a lower end of said jet tube, whereby said water tends to flow upwardly between said tube and said outer casing carrying mud with it, a ramhead attached to said tube above said outer casing, the lower side of said ramhead being adapted to ram against the upper sides of said outer casing for driving said outer casing into the earth as said tube is suddenly allowed to fall in a downward impact stroke.

2. The combination of claim 1 in which said jet tube and said casing define a tube and casing assembly, an air delivery means attached to said assembly and extending from the upper end of said assembly downwardly, said air delivery means having an air outlet means disposed inside said casing in a lower portion of said casing for introducing air into the mud in the lower portion of said casing to assist in the lifting of said mud, said air outlet means being separate from said jetting means outlet means.

3. The combination of claim 2 further comprising said air line having another air outlet means positioned similarly to said first-mentioned air outlet means but excepting that said other air outlet means is on an opposite side of said tube from said first-mentioned air outlet means.

4. The combination of claim 2 in which said air outlet means is disposed substantially spaced above said jetting means outlet means.

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