APPARATUS FOR SINKING AND CLEANING OIL AND WATER WELLS

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INVENTOR

MILFORD A. KING

WITNESS

ROBERT WROCKS
An object of this invention is to facilitate the boring and deepening of oil and water wells and removing from such wells, sand and silt accumulations.

The principle of this invention broadly considered is the combined application with a well boring bit, of hydraulic pressure and vacuum suction to remove the cuttings or débris from the bottom of the well hole; and in some instances I may apply the hydraulic force independently of any suction.

An object of the invention is to effect the work with a saving of water so that wells in arid countries can be sunk, cleaned and deepened with greater facility than heretofore.

I have discovered that by forcing water to the bottom of the bore of a well from which it is desired to remove cuttings or débris, and thus producing hydraulic pressure at the bottom of the hole and then loosening material at the bottom of the hole and applying suction throughout a zone at the bottom of the hole and discharging the water and cuttings above the ground, the work of removing the cuttings and loose material is facilitated; and that by allowing the loose material to settle out of the water discharged from the hole at the top of the ground, and then using the water to produce the hydraulic pressure at the bottom of the hole, a continuous circuit of the water may be effected, which will greatly facilitate the deepening or the cleaning of the hole, and in carrying out the invention in its preferred form, I provide a well with a casing, and provide said casing with an air tight casing head through which the rotary drill pipe extends and revolve such drill pipe with the cutter at its lower end and maintain the hydraulic pressure in the casing, and make the cutter open to the suction through the drill pipe and the hydraulic pressure at the bottom of the hole; so that pressure and suction are both applied to remove the material; and by this means the operation of deepening the hole may be greatly facilitated and the amount of water required may be minimized.

In order to facilitate the operation of adding new sections to the drill pipe, as the hole is deepened, I provide a casing head having an opening therethrough of sufficient size to allow the pipe collars to pass freely therethrough, and I provide a split collar above the casing head adapted to be movable above the casing head laterally and vertically, and provide a yielding packing adapted to fit the pipe, and a split bushing adapted to wedge upon the packing to hold it in place against the pipe; and provide yielding means for drawing the members of the split collar against the bushing, and adjustable means for drawing the split collar toward the casing head to wedge the bushing against the yielding packing; and I provide the yielding packing with a groove into which the collars may wedge as they descend, so as to compress the packing and spread the split collar and the sectional bushing to allow the drill pipe to descend into the casing without requiring the hydraulic pump to stop.

Another feature of the invention is that I provide cheap and simple means whereby the operator can determine by inspecting the connection between the drill pipe and the vacuum tank, whether or not the water is properly circulating.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

The accompanying drawing illustrates the invention.

Figure 1 is an elevation partly in section, of an apparatus constructed in accordance with this invention and arranged for practical operation in carrying out the principles of this improvement.

Fig. 2 is an enlarged fragmental sectional detail at right angles to the section in Fig. 1 and on the line $a^2$, Fig. 3.

Fig. 3 is a plan view in horizontal section on line $a^3$, Fig. 2.

Fig. 4 is a fragmental plan partly in section on irregular line $a^4-a^5$, Fig. 1.

Fig. 5 is a fragmental vertical section on line $a^6$, Fig. 1, showing the suction draw off at the upper portion of the tank. Arrows on the section lines in Figs. 1 and 3 indicate the direction of sight.

1 is a hollow vertical drill pipe or shaft provided at its bottom with a rotary cutter 2 adapted to operate at the lower end of the hole and the well casing 3, and driven by a gear 4 through a clamp 5 carried by standards 6 that are fixed to the gear 4.

The shaft 1 is made of sections 7 connected in the usual way by threaded collars 8, and the upper section 7 is detachably screwed into a swivel 9 that is adjustable.
up and down by suitable means as indicated by the cable 10; and a flexible hose 11 leads from the swivel to the valved inlet 12 at the upper portion of a settling vacuum and tank 13 to receive water and cuttings or debris from the hollow drill pipe or shaft 1. 14 is a suction pipe having a screened intake 15 at the upper end of the tank 13 below the level of the inlet 12, and having a valve 14' between said intake and the pump. 16 is a pump which may be of any desired character preferably a duplex plunger pump driven by any suitable power means not shown, and connected by its supply pipe 17 with the suction pipe 14 to draw water from the upper end of the tank 13; and said pump is connected by a discharge pipe 18 to deliver water through a force pipe 19 to the casing 3 of the well. The upper end of said casing is provided with a casing head or cap 20 and a split packing box or gland 21 so that the liquid driven by the pump 16 will be forced from the well hole into the hollow rotary cutter head 2, and thence up the drill pipe or hollow shaft 1 and through the swivel 9 and hose or flexible pipe 11 into the top of the settling tank 13.

When the pump 16 is operated, it tends to produce a vacuum in the tank 13, and said tank is shown provided with a sealed closure 22, a vacuum gage 23, and a supplementary fresh water supply pipe 24, which is provided with a cut-off valve 25 and extends down into a reservoir 26 that is connected by a pipe which is shown as a hose 27, to a T connection 28 connected through a valve 29 with the suction pipe 17 and also connected through a valve 30 and one limb of a Y 31 to the force pipe 19. The discharge pipe 18 is connected through a valve 30' and the other limb of the Y 31 with said hose 32 connected to the force pipe 19. The discharge pipe 18 is connected through a valve 30' and the other limb of the Y 31 with said hose 32 connected to the force pipe 19. 31 is a flush pipe connected to the pump discharge pipe 18 between the pump and the valve 30' and opens through a valve 32 into the tank 13 near the upper edge of the sloping bottom 33 opposite a clean-out hole 34' so that by closing the valves 14', 30 and 30' and opening the clean-out hole 33' and the valves 25, 29 and 32 and operating the pump, water may be drawn from the tank 26 and forced into the lower end of the settling tank 13 to drive out the accumulations from said tank.

To refill the tank 13 with fresh water, the pump will be stopped, the clean-out hole closed, and the pump again started, thus pumping water from the reservoir into the tank.

After the tank 13 is properly supplied with water, the valves 25, 29 and 32 will be closed and the valves at 12, 14' and 30 will be opened. Before starting the operation of cleaning or sinking, the well hole will be filled with water. This may be done by opening the valve 30 and allowing water to flow into the hole from the reservoir 26; and after the hole is filled, the valve 30 will be closed, together with the valves 25, 29 and 32; and the valves 12 and 14' will be open.

To operate for the purpose of deepening or cleaning the hole the valves 29, 32 and 25 will be closed and the valves 12, 14' and 30' will be opened and when the pump is started, water will be driven through the force pipe 19 into the hole and will be forced up through the cutter and the drill pipe and thence through the hose 11 into the tank above the level of the suction outlet 15 and the solids will settle to the bottom of the tank, and the water will be drawn out at 15 to return to the pump through the pipe 14. The pumping operation may be continued until it is necessary to remove the settled solids in the manner above described.

For convenience of inspection the hose 11 may be provided on opposite sides with holes corresponding to the hole a and a glass tube b inserted therethrough, or otherwise applied inside of the hose 11 so that a sight opening is provided in the hose; e indicates clamp bands applied to the hose and clamping the hose tightly against the inserted glass tube so that the operator may look through the glass and thus be able to determine when the circulation of water has begun and also may be able to determine whether or not the same is carrying debris from the hole.

The pipe coupling collars 8 are tapered at the lower ends as indicated at 33 and the casing head 20 has a central opening 36 through which the collars 8 may pass. Said opening is made air tight by a suitable yielding packing 37 inside an adjustable sectional taper bushing 38 that surrounds the compressible or yielding packing 37 which may be a ring of suitable material, as rubber, and the inner face of the ring at its upper end is chamfered as at 39, to receive the bevelled end 38 to assist in allowing the collar 8 to force its way through the packing ring as the drill pipe is lowered. The split ring 21 is formed of separable members 40 having lugs 41 through which tension bolts 42 slide and yet allow sufficient movement to permit the collars to pass the packing. In practice the swivel 9, pipe 1 with its
The combination with a drill pipe and a cutter on the lower end of such pipe adapted to bore a hole in the earth and means to raise and lower the pipe vertically; of a combined suction and settling tank adapted to contain water; a pump supply suction pipe open to the upper part of the tank and forming an outlet from the tank; a pump connected to the pump supply suction pipe and arranged to discharge into the hole; a lifting suction pipe connecting the upper end of the drill pipe with the suction tank above the level of said outlet; means to revolve the drill pipe and cutter head while the same are being lowered into the hole; and means to confine hydraulic pressure in the hole.

2. The combination with a drill pipe and a cutter on the lower end of such pipe adapted to bore a hole in the earth and means to raise and lower the pipe vertically; of a combined suction and settling tank adapted to contain water; a pump supply suction pipe open to the upper part of the tank and forming an outlet from the tank; a pump connected to the pump supply suction pipe and arranged to discharge into the hole; a lifting suction pipe connecting the upper end of the drill pipe with the suction tank above the level of said outlet; means to revolve the drill pipe and cutter head while the same are being lowered into the hole; a well casing in the hole, provided with a casing head at the top and a packing adapted to allow rotary and vertical movement of the drill pipe through said casing head and to confine hydraulic pressure in the hole so that hydraulic pressure and suction are both applied to remove solids carrying water from the bottom of the hole.

3. The combination with a vacuum settling tank, of a pump having its intake connected to the settling tank near the upper part thereof; a casing, a drill pipe in the casing, a rotary cutter on the drill pipe; a packing around the drill pipe to retain pressure in the casing; means to give rotary motion to the drill pipe; means to raise and lower the drill pipe; means to conduct liquid from the upper end of the drill pipe to the tank; a pump; a reservoir; valved means to conduct water from the reservoir to the pump; valved means to conduct water from the pump to the lower end of the tank; and valved means to conduct water from the pump to the casing.

4. The combination with a drill pipe having a rotary cutter and adapted to be operated in a hole in the ground; of a tank; means connected to the drill pipe and adapted to discharge into the upper part of the tank; a pump connected to draw water from the upper part of the tank and discharge it into the hole; a reservoir; means adapted to discharge water from the reservoir into the hole; a valve to control such means; and valved means between the pump intake and the means for conducting water from the reservoir to the hole.

5. The combination with a drill pipe having a rotary cutter and adapted to be operated in a hole in the ground; of a tank; means connected to the drill pipe and adapted to discharge into the upper part of the tank; a pump connected to draw water from the upper part of the tank and discharge it into the hole; a reservoir; means adapted to discharge water from the reservoir into the hole, a valve to control such means; and valved water conducting means between the pump intake and the means for conducting water from the reservoir to the hole; said tank being closed; and a valved pipe forming a connection between the top of the tank and the lower part of the reservoir.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 12th day of January, 1927.

MILFORD A. KING.