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DRILL

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2 Sheets-Sheet 1

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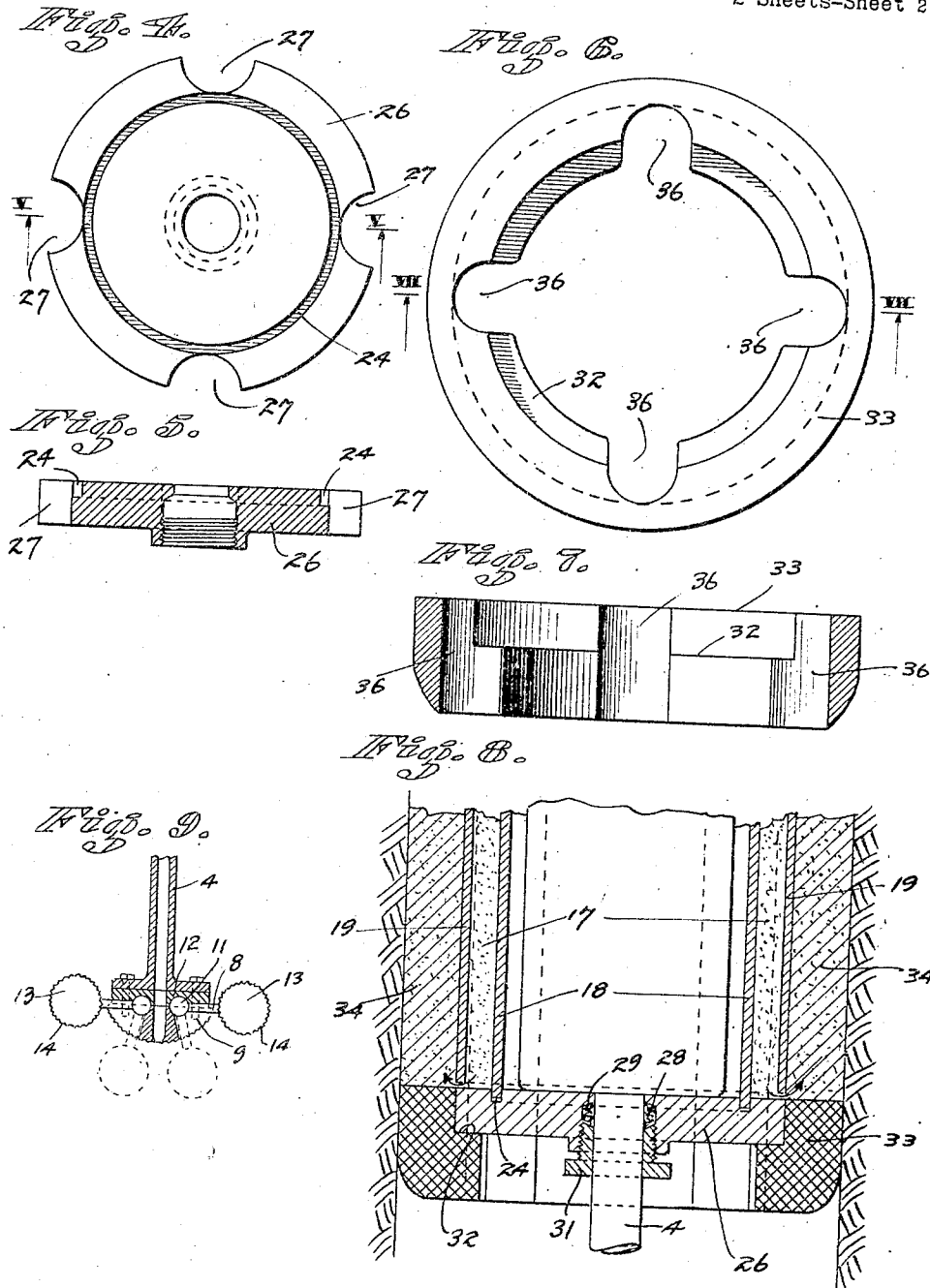
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UNITED STATES PATENT OFFICE.

ALFRED W. LASHER, OF OAKLAND, CALIFORNIA.

DRILL.

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To all whom it may concern:

Be it known that I, ALFRED W. LASHER, a citizen of the United States, and a resident of Oakland, in the county of Alameda and State of California, have invented a new and useful Drill, of which the following is a specification.

The present invention relates to improvements in drills, particularly for deep wells, and has for one of its particular objects to provide means for building up a lining or casing for the well during the actual drilling operation. It is proposed to utilize for this purpose a drill that is driven by means of an electric motor which latter is fixed relative to the drill and descends with the latter into the well. It is proposed to combine with the housing for the said motor a casing surrounding the same and forming an annular chamber with the wall of the well which latter is filled progressively, beginning from the top, with concrete at the same rate that the drilling operation proceeds. For this purpose, an interior chamber is connected with the casing and dry concrete disposed in this interior chamber is fed into the outer chamber around the lower edge of the casing to unite with the lining previously formed so that the lining grows downwardly as the well grows in depth.

It is further proposed to combine with this casing means for effecting a perfect circulation of water from top to bottom and from bottom to top to carry off the mud from the bottom of the well.

A further object of the invention is to provide in connection with my drill a suitable drill bit that will enlarge the hole to maintain the desired outer diameter while it will collapse so as to clear the lining when the drill is pulled upwardly for the purpose of withdrawing the same.

Other objects and advantages of my invention will appear as the specification proceeds.

The preferred form of my invention is illustrated in the accompanying drawing, in which

Figure 1 shows a vertical section through my drilling unit.

Figure 2 a horizontal section taken along line II—II of Figure 1.

Figure 3 a horizontal section taken along line III—III of Figure 1.

Figure 4 a top plan view of a base plate for the drilling unit.

Figure 5 a section taken along line V—V of Figure 4.

Figure 6 a top plan view of a ring or washer forming the bottom of the chamber to be filled with concrete.

Figure 7 a vertical section through the same taken along line VII—VII of Figure 6.

Figure 8 a vertical section through the lower part of the drilling unit, taken at right angles to that shown in Figure 1.

Figure 9 a vertical section through the drill bit arrangement, and Figure 10 a fragmentary cross section taken along line X—X of Figure 1.

While I have shown only the preferred form of the invention, it should be understood that various changes or modifications may be made within the scope of the claims hereto attached without departing from the spirit of the invention.

The power plant for my drill comprises a cylindrical motor housing 1, having field windings secured thereto and an armature on the hollow shaft 4 revolvable in the field. The shaft terminates at a distance from the bottom of the motor housing in the drill bit 6, which may be of any suitable form and which is shown in the drawing as comprising a round bottom face 7 knurled to attack the central portion of the bottom of the well when the shaft is rotated. A plurality of arms 8 are adapted to swing in radial recesses 9 of the drill bit and are provided at their inner ends with balls 11 mounted for universal motion in spherical sockets 12 so that the arms 8 may revolve on their own axes when the drill is rotated. At the outer ends of the arms 8 I provide heavy weights 13 preferably ball shaped, with toothed or knurled surfaces 14 to break up an annular portion around the central part of the bottom of the well. It will be noted that when the motor housing is drawn upwardly by means of the cable 16, the weights 13 will drop downwardly and will allow the same to be withdrawn through a hole smaller than the one drilled.

The motor is mounted within an annular chamber 17 formed between two casings 18, 19, which latter has a plurality of vertical tubes 21, formed integral therewith, the

inner faces of the tubes connecting with the inner casing 18, as shown at 22, and being welded thereto. The two casings 18, 19, are connected at the top, as shown at 23, but the tubes 21 are open on top as well as at the bottom. As shown in Figure 8, the inner casing 18 extends slightly below the outer casing 19 and engages with an annular groove 24 in the base plate 26 which latter is of a diameter to come flush with the outer face of the outer casing and is notched as shown at 27 to accommodate the tubes 21. The armature shaft 4 extends through the base plate 26 and packing 28 forced into a recess 29 by means of the gland 31 insures against leakage of water and mud past the base plate. The outer edge of the latter plate rests on a ledge 32 of the washer 33 which latter extends to the wall of the well as originally drilled and forms the bottom of a chamber 34 surrounding the outer casing 19. The washer 33 which is preferably made of rubber or similar elastic material is also provided with recesses 36 to allow the tubes 21 to extend therethrough. It will be seen that in this manner the two annular chambers 34 and 17 as well as the motor housing are completely protected against moisture from the bottom, while the pipes 21 allow water to circulate therethrough from top to bottom or bottom to top respectively. To regulate the flow of water, I preferably provide spiral conveyors 37 in two of the tubes, the conveyors being actuated from the motor shaft 4 by the chain drive 38 so that water is made to ascend in these two tubes while the other tubes allow the water to descend therein.

The motor housing has lateral wings 39 extending therefrom which ride in grooves 41 formed between ribs 42 so as to prevent revolving motion of the motor housing relative to the inner casing. Above the motor housing I provide a reservoir 43 for compressed air having an outlet 44 leading into the chamber 17 between the inner and outer casings. The space between the reservoir and the base plate is sufficiently large to allow of slight upward and downward play of the casings relative to the motor housing.

Before the whole unit is introduced into the well for the purpose of deepening the same, it is turned upside down and the inner chamber 17 formed between the two casings 18 and 19 is filled or partly filled with concrete material in a dry state. The base plate 26 is then applied and the washer 33 placed around the same in the manner illustrated in Figure 8. The device is then lowered into the well by means of the cable 16 which latter is preferably also used as a conduit for wires to the windings of the motor. After the drill bit has reached or come within close proximity of the bottom of the well, the motor is started and the centrifugal

force of the rotary motion of the drill bit swings the arms 8 upwardly so that after the bottom has been reached, the central drill bit and the weights or balls 13 cooperate in deepening the well throughout its circumference. The two casings 18 and 19 descend within the well but are raised by the concrete material forced around the lower edge of the outer casing so that the bottom of the outer casing clears the base plate 26, as illustrated in Figure 8.

Sufficient moisture will penetrate the concrete after the same has entered the outer chamber from the earth material surrounding the well to cause the concrete to harden and to provide a substantial wall or lining for the well. In this manner the wall or lining 34 is added to continuously and the same grows downwardly at the same rate of speed as the drill proceeds to deepen the well hole, the newly entering concrete being confined between previously formed lining material and the washer 33. Constant air pressure is maintained in the chamber between the two casings through a pressure regulator 45 in the pipe 44 from the reservoir 43 so that the dry concrete material is positively forced around the lower edge of the outer casing and always tends to fill all the available space of the outer chamber. Water circulates in the meantime through the tubes 21 being carried upward by the conveyors 37 in two of the tubes and descending correspondingly in the two other tubes. The mud carried upward by the conveyors is discharged centrally and collects within the inner casing on top of the reservoir 43, a tube 46 surrounding the cable to prevent the mud from entering the room accommodating the motor housing. From time to time, the whole unit is lifted by means of the cable 16, the mud dumped out of the upper portion of the inner casing, the inner chamber refilled with dry concrete, new air introduced in the reservoir 43 through any suitable intake as the valved pipe 50 and the core that may have formed in the hollow shaft 4 is removed, whereupon the same operation may be repeated. It is understood that when the unit is withdrawn, the motor housing engaging the lower face of the reservoir 43 raises the entire casing structure and thereby lifts the whole unit except the washer 33 which remains in its place, while the arms 8 of the drill bit drop downwardly so as to allow the balls 13 to pass through the reduced opening of the well. It will be understood that during the actual drilling operation, the weight of the motor housing forces the base plate 26 and the washer 33 downwardly while the air pressure behind the dry concrete mixture causes the two casings to float on the concrete escaping around the lower edge.

While in the above description reference is

had to dry concrete material, it should be mentioned that under certain conditions, particularly when the operation proceeds very fast, wet concrete material may be preferred.

I claim:

1. A drill of the character described, an annular chamber, means for causing the latter to travel downwardly with the drill and means for discharging material from the bottom of the said chamber to the outside thereof for building up a lining in the hole drilled during the drilling operation, the said chamber having means associated therewith allowing water to circulate there-through to the bottom of the hole without coming in contact with the lining material.

2. In a drill, a drill bit, an electric motor for driving the same fixed relative thereto and including a stationary motor housing and a revolving shaft, and an annular chamber surrounding the motor housing mounted for limited sliding motion relative thereto and holding the same against rotation having means associated therewith for building up a lining around the same during the drilling operation.

3. In a drill, a drill bit, an electric motor for driving the same fixed relative thereto and including a stationary motor housing and a revolving shaft, and an annular chamber surrounding the motor housing mounted for limited sliding motion relative thereto and holding the same against rotation having means associated therewith for building up a lining around the same during the drilling operation, the said chamber being formed to interlock with the lining for preventing rotary motion of the chamber.

4. In a drill, a drill bit, an electric motor for driving the same fixed relative thereto and including a stationary motor housing and a revolving shaft, and an annular chamber surrounding the motor housing mounted for limited sliding motion relative thereto and holding the same against rotation having means associated therewith for building up a lining around the same during the drilling operation, the said chamber having vertical water circulating pipes embodied therein formed to interlock with the lining for preventing rotary motion of the latter.

5. In combination with a drill of the character described, a drill bit comprising a central element adapted to attack a cen-

tral part of the bottom of a well when the drill is rotated and arms pivoted therein to swing in radial planes having weights secured at the ends thereof made to engage with an outer concentric portion of the well bottom for enlarging the hole.

6. In combination with a drill of the character described, a drill bit comprising a central element adapted to attack a central part of the bottom of a well when the drill is rotated and arms pivoted therein to swing in radial planes having weights secured at the ends thereof made to engage with an outer concentric portion of the well bottom for enlarging the hole, the arms being mounted with freedom of revolving motion on their own axes.

7. A drill of the character described, a casing associated therewith forming an annular chamber with the wall of the hole drilled and means for building up a lining in said chamber comprising a second casing fixed in concentric relation to the first casing so as to form an annular chamber therewith adapted to have lining material disposed therein and means for forcing the said material around the bottom edge of the casing during the drilling operation.

8. In well drilling apparatus, hole drilling mechanism, and means functioning in time with the drilling of a hole by said mechanism to apply a plastic material to the walls of said hole, and means separating the first said means from said mechanism to exclude liquid from the plastic faced walls formed by said first means.

9. In means for drilling a well and for lining the walls of the well with plastic material, sealing means for subdividing the well into a plurality of non-communicating spaces, hole drilling mechanism adapted to operate in one of said spaces and wall lining mechanism adapted to operate in the other of said spaces.

10. In mechanism of the class described, a drill, means for applying plastic coating material to the walls of a hole produced by the drill, means for excluding liquid from the plastic material during the process of applying it to said walls, and means for automatically conveying liquid and sediment away from the mechanism progressively with actions of the drill.

ALFRED W. LASHER.