

April 7, 1931.

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DEEP WELL DRILLING MACHINE

Filed Jan. 3, 1928

3 Sheets-Sheet 1

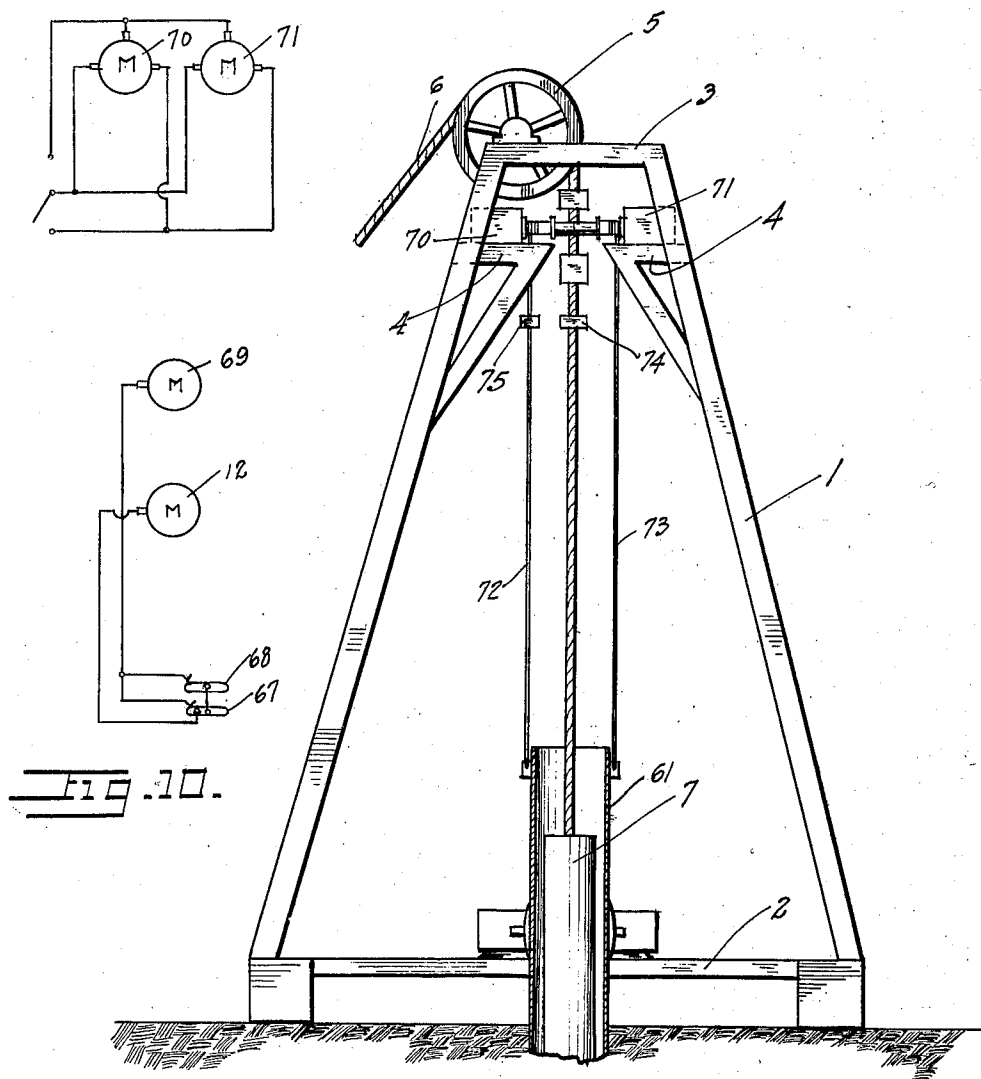


Fig. 10.

Fig. 1.

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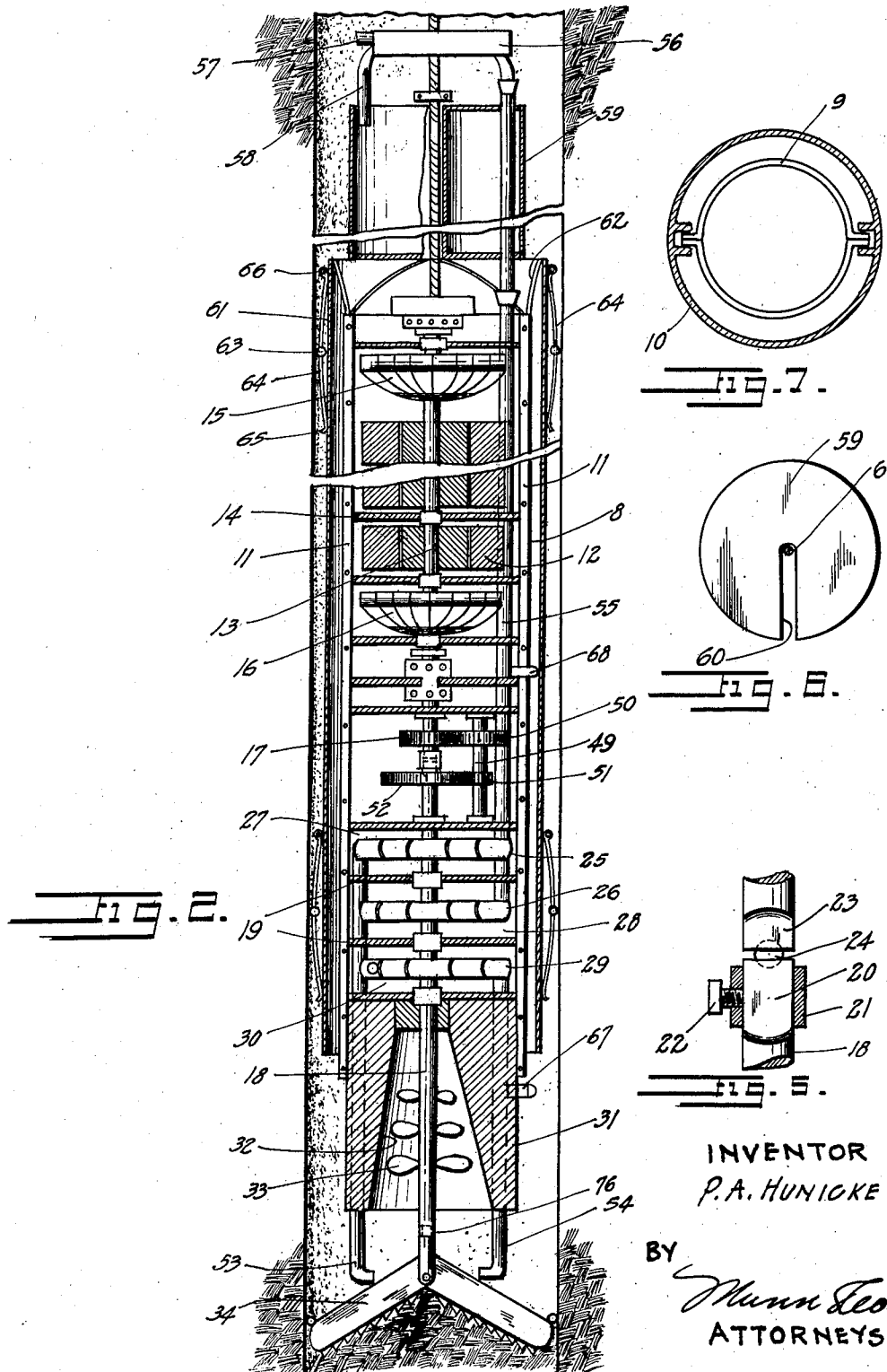
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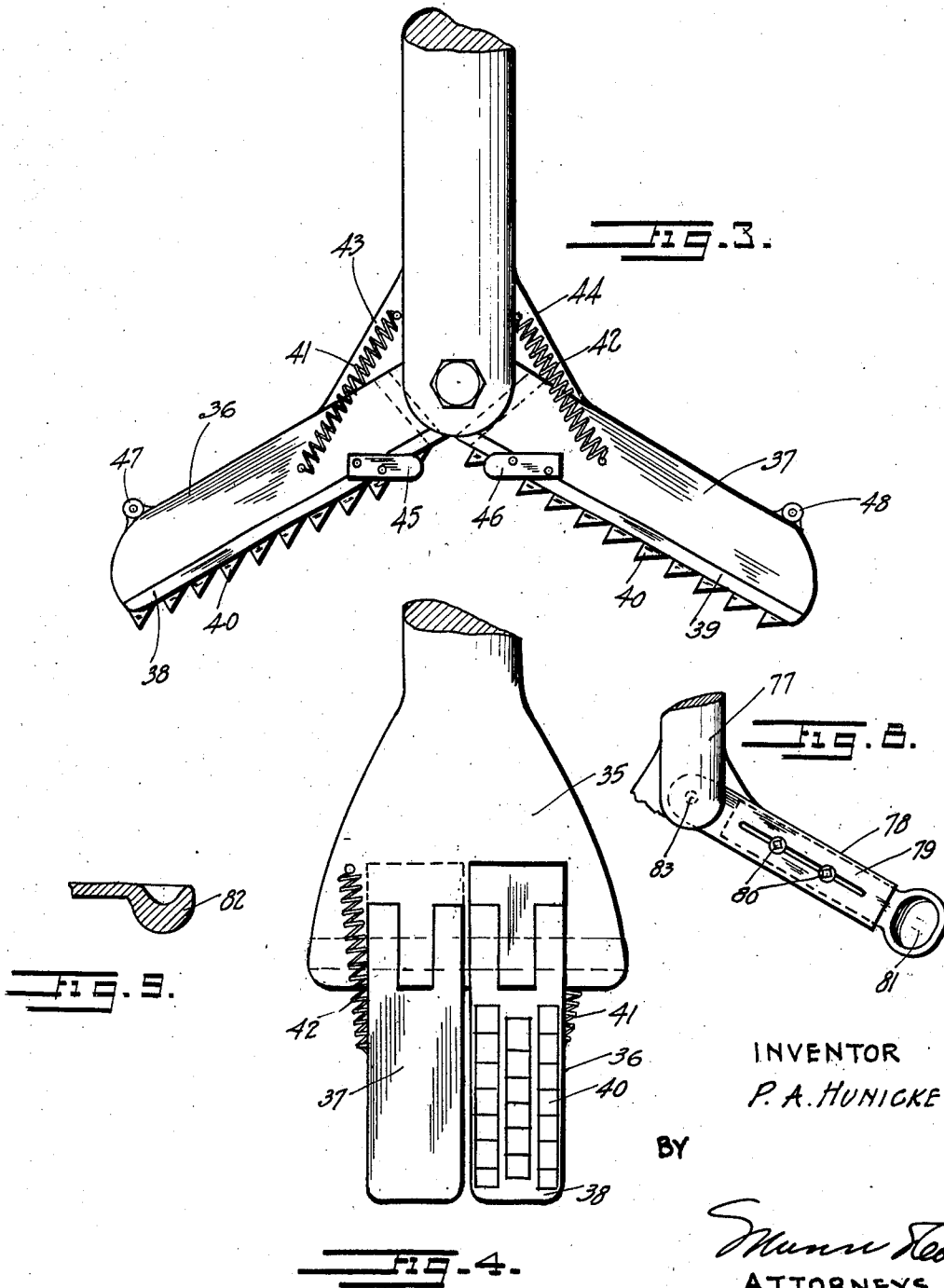
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DEEP WELL DRILLING MACHINE

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3 Sheets-Sheet 3



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DEEP-WELL-DRILLING MACHINE

Application filed January 3, 1928. Serial No. 244,278.

My invention relates to improvements in deep well drilling machines, and it consists in the combinations, constructions, and arrangements herein described and claimed.

5 An object of my invention is to provide an electrically operated drilling machine in which the power mechanism is disposed in the casing and follows the drill bit into the hole.

10 A further object of my invention is to provide a device of the type described which has novel means for packing the walls of the hole, thus preventing the walls from caving in when the device is removed from the hole.

15 A further object of my invention is to provide a device of the type described which removes the mud and loosened substance from the hole during the operation thereof.

20 A further object of my invention is to provide a device of the type described which has novel means for cutting a large space in the sand at the bottom of the well.

25 Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

30 Figure 1 is a side elevation of my device, a portion thereof being shown in section,

Figure 2 is a sectional view of the main portion of my device,

35 Figure 3 is a side elevation of the drill bit,

Figure 4 is an end elevation of the drill bit,

Figure 5 is a fragmentary view of a portion of my device,

Figure 6 is a top plan view of a portion of my device,

40 Figure 7 is a detailed sectional view of the casing and housing,

Figure 8 is a front elevation of a portion of my device,

45 Figure 9 is a sectional view through a portion of the construction shown in Figure 8, and

Figure 10 is a wiring diagram.

50 In carrying out my invention, I provide a supporting frame 1 having a base 2, a top 3, and motor supports 4. A pulley 5 is ro-

tatably mounted upon the top 3 and is arranged to receive a conductor supporting cable 6. The conductor supporting cable 6 has one end secured to the drilling unit 7.

The drilling unit is composed of a hous- 55 ing 8 formed of semi-cylindrical portions 9 and 10 which have outwardly extending flange portions 11 provided with a plurality of openings. The semi-cylindrical portions 9 and 10 may be rigidly secured to each other 60 by any suitable means, such as bolts or rivets. A plurality of motors 12 is mounted concentric with a motor shaft 13. Between each of the motors are provided bearing supports 14 through which the motor shaft 13 65 extends and by means of which the motor shaft is held against lateral displacement. Mercury flywheels 15 and 16 are mounted upon the motor shaft 13 above and beneath the motors. A motor gear 17 is rigidly 70 mounted upon the lower end of the motor shaft.

A driven shaft 18 is supported against lateral displacement by a plurality of bearing supports 19. The upper end of the 75 driven shaft 18 is provided with a square-shaped portion 20 upon which a collar 21 is disposed. A set screw 22 is disposed in the collar 21 for a purpose hereinafter described. The lower end of the motor shaft 80 13 is also provided with a squared portion 23. The motor or drive shaft 13 is supported by the driven shaft 18, or rather by a ball bearing 24 which is disposed between the adjacent ends of the shafts and which is 85 receivable in arcuate-shaped recesses therein.

A pair of substance-removing pumps 25 and 26 is rigidly mounted upon the driven shaft 18 within compartments 27 and 28, 90 respectively. An agitating pump 29 is rigidly mounted upon the driven shaft 18 within a compartment 30.

A weight end or bottom 31, which may be constructed of any suitable material, but which is preferably constructed of a sheet 95 metal casing filled with lead, is disposed at the lower extremity of the housing 8. The weight end is provided with a conical-shaped inner portion 32 through which the driven shaft 18 extends. A series of propellers 33 100

is mounted upon the driven shaft 18 within the conical-shaped inner portion 32. A bit 34 is pivotally mounted upon the lower end of the driven shaft 18, see Figures 3 and 4. The lower end of the shaft 18 is provided with an enlarged portion 35 having cutaway portions arranged to receive jaw members 36 and 37 of the bit. The jaw members are provided with teeth-retaining plates 38 and 39, respectively, which are arranged to receive a plurality of teeth 40. The plates 38 and 39 may be removably secured to the jaw members 36 and 37 by any suitable means, not shown. Tension springs 41 and 42 have their upper ends secured to the enlarged portion 35 and their lower ends secured to the jaw members 36 and 37, respectively. Stop portions 43 and 44 are carried by the jaw members 36 and 37 for engaging with the enlarged portion 35 for limiting the movement outwardly of the jaws. Abutments 45 and 46 are carried by the jaws 36 and 37, respectively, for limiting the inward movement of the jaws. Rollers 47 and 48 are disposed upon the upper surfaces of the jaw members 36 and 37 for a purpose hereinafter described.

An auxiliary shaft 49 is removably disposed in the housing 8 and is provided with a gear 50 which is arranged to be in mesh with the gear 17 of the motor shaft and a relatively small pinion 51 which is in mesh with a ring gear 52. The ring gear 52 is mounted upon the driven shaft 18 adjacent the upper end thereof.

A pipe 53 extends from a point adjacent the drill bit 34 through the weight end 31 and is in communication with each of the compartments 27, 28 and 30. A return pipe 54 also has one end positioned in close proximity to the drill bit 34 and extends through the weight end 31. The other end of the return pipe 54 is in communication with the compartment 30. A pipe 55 is in communication with the compartments 27 and 28 and extends upwardly and has its upper end in communication with a separator 56. The separator 56 is of the ordinary type for separating water from other substances. A water outlet 57 is provided for the separator. A substance outlet 58 extends from the separator 56 and empties into a container 59. The container 59 is provided with an inwardly extending recess portion 60 which is arranged to extend around the cable 6, see Figure 6.

A casing 61, which may be formed of a plurality of sections, is disposed concentric with the housing 8 and is provided with guide grooves 62 for receiving the flanges 11 of the housing. A plurality of rollers 63 is rotatably carried by spring members 64 having outwardly turned end portions 65 and which are pivotally mounted at 66 upon the casing 61.

A switch 67 is disposed in the weight end 31 and is provided with a rounded end arranged to engage with the casing 61. A switch 68 is carried by the housing 8 and is in engagement with the casing 61.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. In Figure 10, I have shown a wiring diagram illustrating the motors 12, a motor 69 of the separator 56, and motors 70 and 71 which operate in unison and which are operatively connected to the casing 61 by means of cables 72 and 73, respectively. In Figure 10, the switch 68 is shown in closed position and is held in closed position as long as the switch is in engagement with the casing 61. The switch 67 is shown in closed position and is held in closed position until the casing 61 engages therewith and opens the switch. Therefore, a circuit is closed, permitting a source of current to pass through the motors 12 and the motor 69. The cable 6, as heretofore stated, serves as a conductor for the source of current and also supports the main portion of the device. Let us assume that the source of current is passing through the motors 12. The energizing of the motors causes a rotation of the motor shaft 13 together with the mercury flywheels 15 and 16. At the beginning of the rotation of the motors, the mercury in the mercury flywheels 15 and 16 is at the bottom of each of the flywheels, but, as the momentum of the flywheels increases, the mercury passes upwardly and outwardly and serves as a weight for the flywheels when in their increased rotative motion.

The rotation of the motor shaft 13 causes the rotation of the gear 7, and, as the gear 50 is in mesh with the gear 7, the stub shaft 49 and the pinion 51 will be rotated. Rotation of the pinion 51 will rotate the ring gear 52 and the driven shaft 18. The ratio between the ring gear 52 and the pinion 51 is such that the driven shaft 18 is rotated at a much slower rate of speed than the motor shaft. As the driven shaft 18 is rotated, the housing is lowered, allowing the bit 34 to dig into the ground. As the drill bit 34 moves downwardly into the ground, water is placed within the drilled opening in the ground and caused to mix with the loosened substance by means of the propellers 33. The water is further mixed with the loosened substance by means of the mixing pump 29 which draws the water and loosened substance through the pipe 53 into the compartment 30, mixing the water thoroughly with the loosened substance, and breaking the loosened substance in smaller portions and forcing the water with the loosened substance through the pipe 54 back into the drilled opening.

The pumps 25 and 26 draw the mixed wa-

ter and loosened substance through the pipe 53, into the compartments 27 and 28, and force the loosened substance through the pipe 55 and into the separator 56. In the separator, the water is separated from the loosened substance and allowed to pass back into the drilled opening again. The loosened substance is passed through the tube 58 into the container 59. This operation is continued until the desired depth is reached by the drill bit 34.

During this operation, the casing 61 is drawn upwardly and allowed to move downwardly within the opening. This movement of the casing 61 is caused by the opening and closing of a circuit for permitting a source of current to pass through the motors 70 and 71. The motors 70 and 71 operate in the usual manner in which the ordinary type of elevator motors operate; i. e., they allow the casing, due to its weight, to move downwardly in the opening. The purpose of the movement of the casing within the drilled opening is to cause the rollers 63 to contact with the wall of the opening and to pack the wall of the opening so that it will not cave in when the device is removed therefrom. The downward movement of the casing may be limited by the switch 67; that is, when the casing engages with the switch 67, the switch will be opened—thus breaking the circuit and stopping the rotation of the drill bit. The operator may then close another circuit to reverse the rotation of the motors 70 and 71 so that the casing 61 is raised. Markers 74 and 75 are disposed upon the cables 6 and 72, respectively. The purpose of the markers 74 and 75 is to indicate to the operator the position of the casing with respect to the housing.

When the opening is drilled the desired depth, the housing and the parts contained therein may be removed from the opening and the drill bit 34 may be removed from the driven shaft 18 by a threaded connection indicated at 76. A widening drill bit or scoop 77 is then secured to the lower end of the driven shaft 18. The drill scoop 77 is provided with hollow arms 78 arranged to receive scooping members 79 and adjustably secured in place by bolts 80. The scooping members 79 are provided with cup-shaped ends 81 having weighted portions 82. The arms 78 are pivotally secured at 83 so that they may be drawn in substantial alignment with the driven shaft as the housing is again lowered into the opening.

The stub shaft 49, together with the pinion 51 and the gear 50, is removed from the housing or moved so that the gear 50 is out of mesh with the gear 17 and the pinion 51 is out of mesh with the ring gear 52. The sleeve 21 is then raised so that it will receive the adjacent ends of the motor shaft 13 and the driven shaft 18. The set screw 22 is then

moved into close engagement with the shafts and they are locked together. By lowering the housing into the opening, the guide grooves 62 are so positioned that the flanges 11 of the housing will be received therein and the housing guided to the desired position. When the housing has been lowered to the desired position, the circuit is closed, allowing a source of current to energize the motors 12 and the motor 69. The energizing of the motors 12 causes a rotation of the motor shaft 13, and, due to the fact that the driven shaft 18 is directly connected to the motor shaft through the sleeve 21, the motor shaft and the drill scoop 77 are rotated at a relatively fast rate of speed. The weighted ends 82 cause the arms 78 to move outwardly into engagement with the walls of the opening. In this manner, a portion of the wall of the opening is made larger. The enlarged portion of the opening may be increased in height by raising the housing the desired distance. The drill scoop may be adjusted as often as desired by loosening the bolts 80 and allowing the scooping portions to be moved outwardly and then again locking them in place by the bolts. In this manner, the enlarged portion of the opening may be increased in size many times the diameter of the original drilled opening. It is obvious that the scooping portions may be drawn toward each other as the housing is lowered into the opening and that the rapid rotation of the shafts will cause the scooping members, due to the weighted portions 82, to swing outwardly about the pivot 83.

I claim:

1. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground, pumps mounted on said shaft within the tubular casing, a receptacle mounted on said tubular casing, a separator disposed above the receptacle and in communication with said pumps, said spaced-apart cylindrical casing and tubular casing being adapted for permitting water to flow from above the casings to a drilled opening adjacent the drill bit, said pumps communicating with pipe members, the ends of said pipe members being in communication with the drilled opening adjacent the drill bit, whereby the mixture of water and drill-

ings may be pumped to the separator, the drillings being deposited in the receptacle and the water returning to the drilled opening adjacent the drill bit, and cable means connected with the cylindrical casing and tubular casing whereby said casings may be raised or lowered independently of each other.

2. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground, pumps mounted on said shaft within the tubular casing, a receptacle mounted on said tubular casing, a separator disposed above the receptacle and in communication with said pumps, said spaced-apart cylindrical casing and tubular casing being adapted for permitting water to flow from above the casings to a drilled opening adjacent the drill bit, said pumps communicating with pipe members, the ends of said pipe members being in communication with the drilled opening adjacent the drill bit, whereby the mixture of water and drillings may be pumped to the separator, the drillings being deposited in the receptacle and the water returning to the drilled opening adjacent the drill bit, cable means connected with the cylindrical casing and tubular casing whereby said casings may be raised or lowered independently of each other, and weight means disposed on the lower side of said tubular casing for tensioning the cable means.

3. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground, pumps mounted on said shaft within the tubular casing, a receptacle mounted on said tubular casing, a separator disposed above the receptacle and in communication with said pumps, said spaced-apart cylindrical

casing and tubular casing being adapted for permitting water to flow from above the casings to a drilled opening adjacent the drill bit, said pumps communicating with pipe members, the ends of said pipe members being in communication with the drilled opening adjacent the drill bit, whereby the mixture of water and drillings may be pumped to the separator, the drillings being deposited in the receptacle and the water returning to the drilled opening adjacent the drill bit, cable means connected with the cylindrical casing and tubular casing whereby said casings may be raised or lowered independently of each other, weight means disposed on the lower side of said tubular casing for tensioning the cable means, and agitator blades mounted on said shaft and disposed within an opening of said weight for mixing the water and the drillings together.

4. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground, pumps mounted on said shaft within the tubular casing, a receptacle mounted on said tubular casing, a separator disposed above the receptacle and in communication with said pumps, said spaced-apart cylindrical casing and tubular casing being adapted for permitting water to flow from above the casings to a drilled opening adjacent the drill bit, said pumps communicating with pipe members, the ends of said pipe members being in communication with the drilled opening adjacent the drill bit, whereby the mixture of water and drillings may be pumped to the separator, the drillings being deposited in the receptacle and the water returning to the drilled opening adjacent the drill bit, cable means connected with the cylindrical casing and tubular casing whereby said casings may be raised or lowered independently of each other, weight means disposed on the lower side of said tubular casing for tensioning the cable means, agitator blades mounted on said shaft and disposed within an opening of said weight for mixing the water and the drillings together, and an agitator pump mounted on said shaft within the tubular member, said agitator pump being in communication with the area adjoining the drill bit, whereby the

water and the drillings may be further agitated.

5. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground, pumps mounted on said shaft within the tubular casing, a receptacle mounted on said tubular casing, a separator disposed above the receptacle and in communication with said pumps, said spaced-apart cylindrical casing and tubular casing being adapted for permitting water to flow from above the casings to a drilled opening adjacent the drill bit, said pumps communicating with pipe members, the ends of said pipe members being in communication with the drilled opening adjacent the drill bit, whereby the mixture of water and drillings may be pumped to the separator, the drillings being deposited in the receptacle and the water returning to the drilled opening adjacent the drill bit, cable means connected with the cylindrical casing and tubular casing whereby said casings may be raised or lowered independently of each other, weight means disposed on the lower side of said tubular casing for tensioning the cable means, agitator blades mounted on said shaft and disposed within an opening of said weight for mixing the water and the drillings together, an agitator pump mounted on said shaft within the tubular member, said agitator pump being in communication with the area adjoining the drill bit, whereby the water and the drillings may be further agitated, transmission means for varying the rotating speed of the driven shaft with that of the power means, switch means disposed on said tubular casing and adapted for engaging with the cylindrical casing, said switch means being in communication with the power means, whereby said power means may be started or stopped by the predetermined movement of the tubular casing with respect to the cylindrical casing.

Signed at Chicago, in the county of Cook and State of Illinois, this 28th day of December, A. D. 1927.

PAUL A. HUNICKE.

6. A device of the type described comprising a vertical cylindrical casing and a vertical tubular casing, said tubular casing being disposed within and spaced away from said cylindrical casing, said tubular casing being provided with longitudinally extending flanges receivable in a groove formed by longitudinally extending flanges on the inner side of the cylindrical casing whereby said tubular casing is slidable within the cylindrical casing, a vertical shaft mounted within the tubular casing, said shaft being provided with power means, the lower end of said shaft being connected with a drill bit whereby a cylindrical hole may be drilled in the ground,