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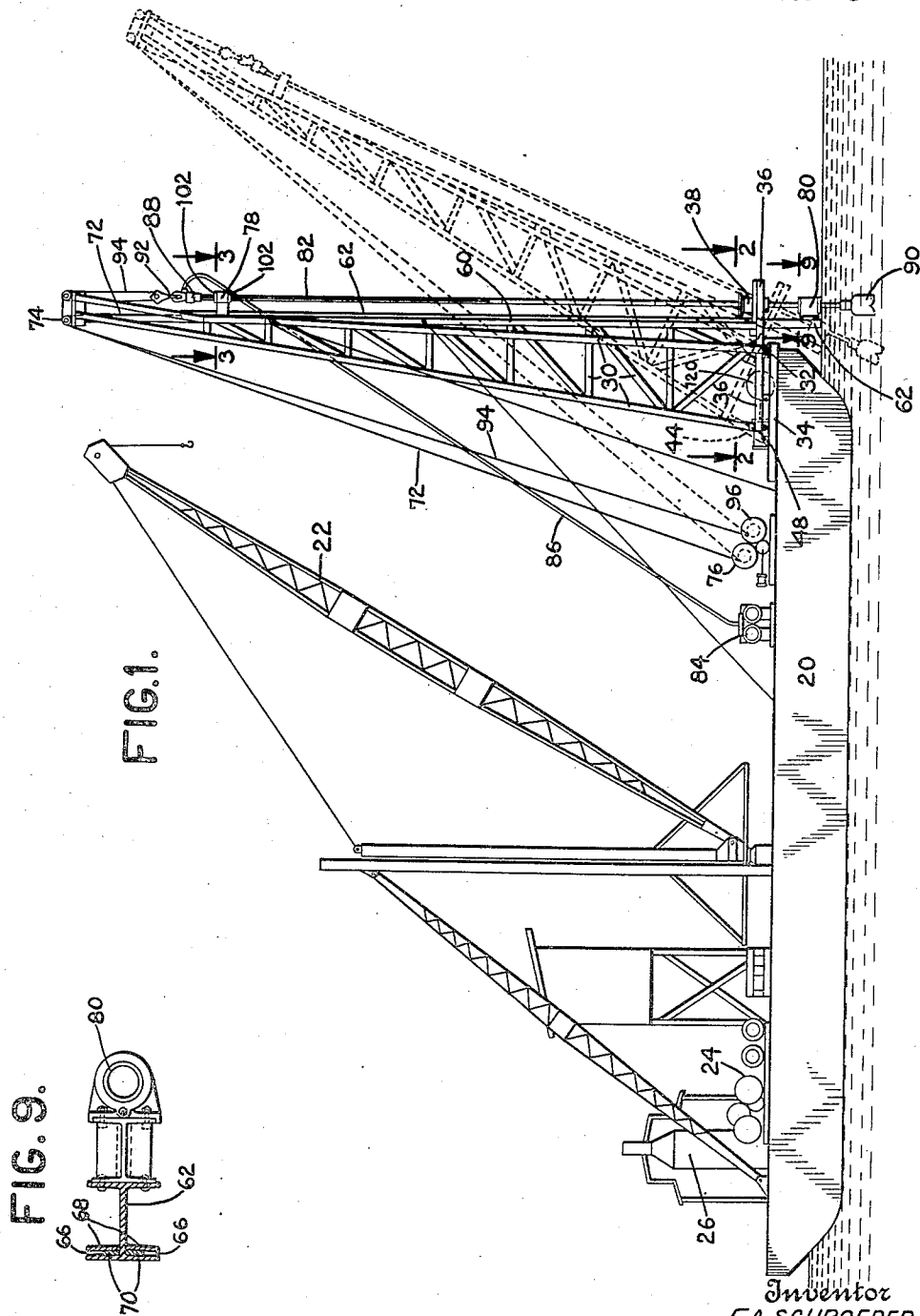
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1,829,304

DRILLING APPARATUS

Filed Jan. 19, 1929

3 Sheets-Sheet 1



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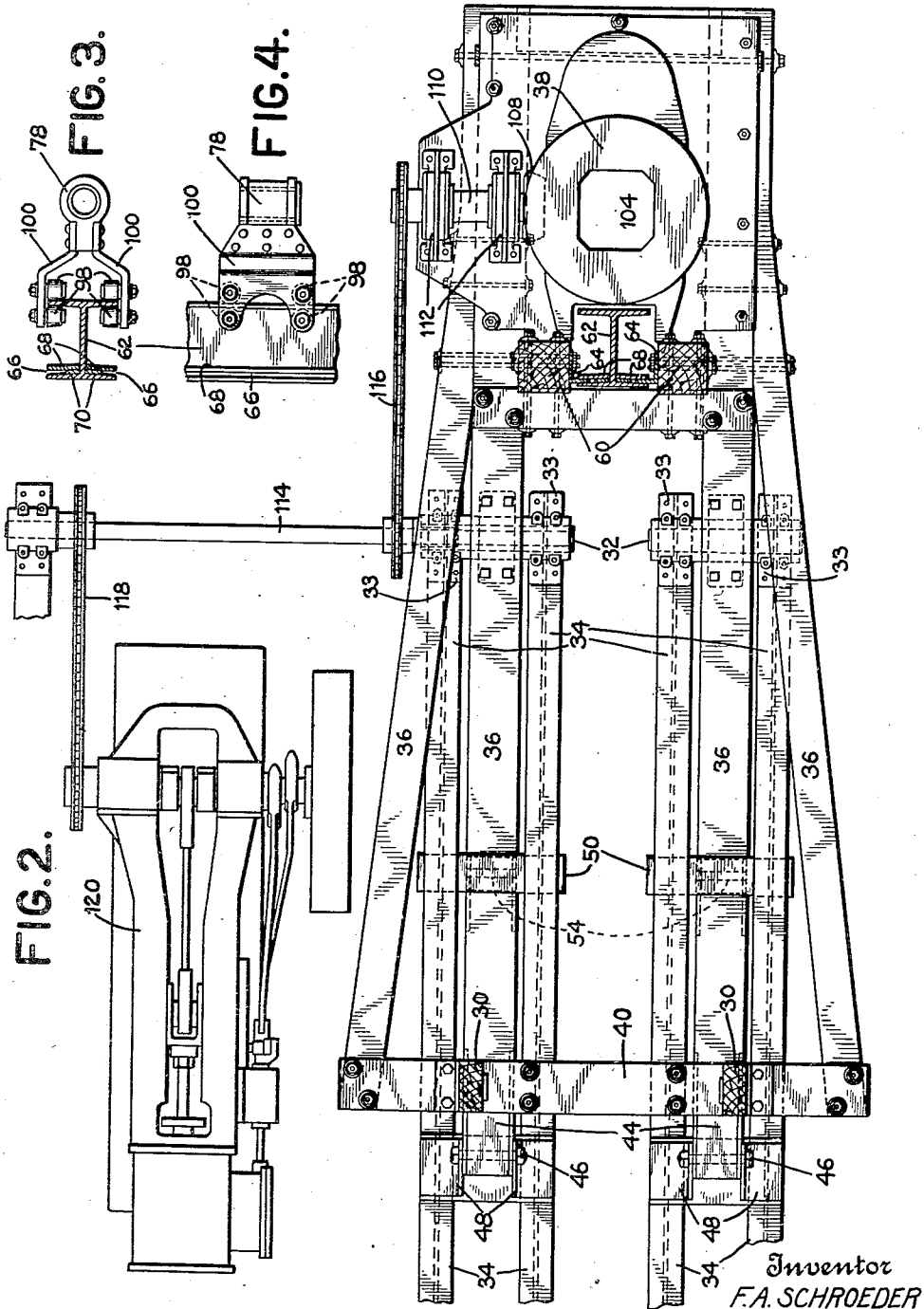
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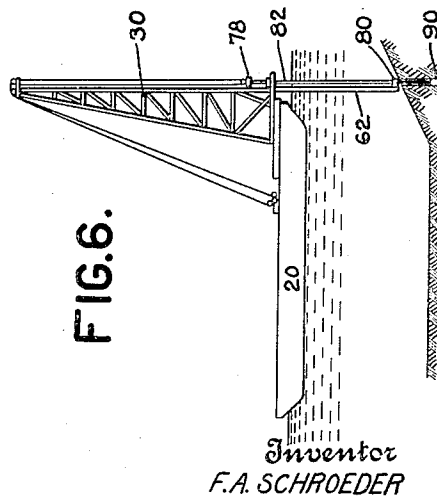
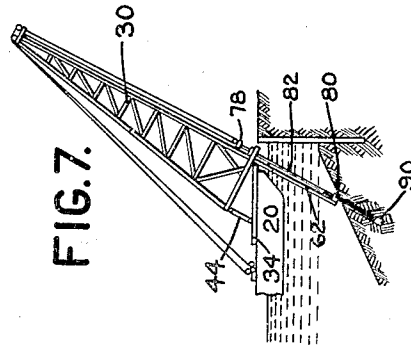
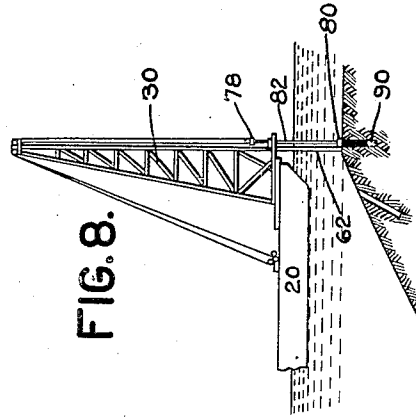
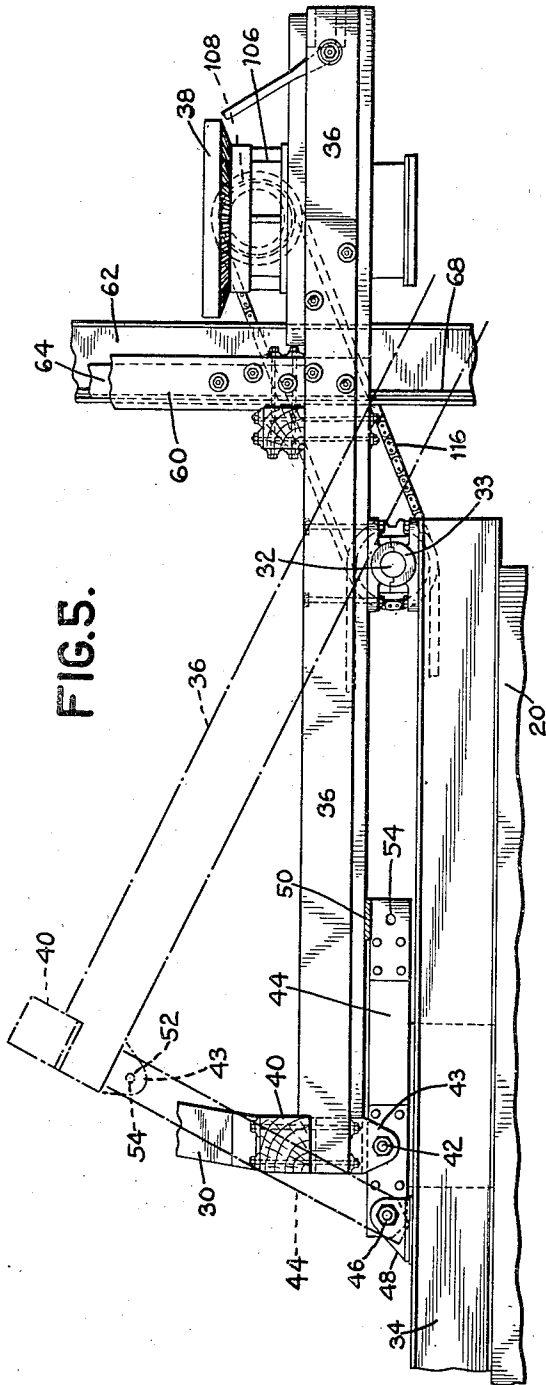
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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DRILLING APPARATUS

Application filed January 19, 1929. Serial No. 333,688.

This invention pertains to apparatus for drilling holes for piles, and has for its object the design of a machine especially adapted for drilling such holes at a considerable depth under water, or in ground too hard for jetting or drilling by usual methods, or at an angle from the vertical or in a variety of unusual or difficult situations.

An important feature of the invention is the provision of a bearing which may be moved and rigidly supported adjacent the drill, wherever the drill may be, for the purpose of positively guiding the drill in the direction it should take.

Another important feature is the provision of an inclinable structure which enables the drill to operate at any desired angle.

Further and other objects and advantages will be hereinafter set forth in the accompanying specification and claims, and shown in the drawings which by way of illustration show what is now considered the preferred embodiment of the invention.

Fig. 1 is a side view of the apparatus mounted on a barge.

Fig. 2 is an enlarged sectional detail on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional detail on the line 3—3 of Fig. 1.

Fig. 4 is a side view of Fig. 3.

Fig. 5 is a side view of a part of Fig. 2, showing the method of supporting the drill rig in inclined position.

Figs. 6, 7 and 8 are diagrammatic views showing the apparatus performing vertical and inclined drilling operations.

Fig. 9 is an enlarged detail on the line 9—9 of Fig. 1.

Referring to Fig. 1, the apparatus comprising the invention is shown mounted for operation on the right hand end of a barge 20. The crane 22 at the other end of the barge is used for tilting the derrick, for the handling of supplies and auxiliary work of that nature. It is operated by hoisting engine 24, supplied with steam by boiler 26, which also furnishes steam for the steam pump, and engines connected with the drilling apparatus.

The drilling rig comprises a derrick 30,

mounted on trunnions 32 in bearings 33 on bed plate or base 34 on top of the barge. The bottom horizontal members 36 of the derrick extend forwardly to support the rotary 38, and rearwardly to a cross member 40 which is normally locked by pins 42 and brackets 43 to strut 44 pivoted by bolts 46 in brackets 48 fast to beams 34. Boards or wedges 50, inserted above the free ends of struts 44 and below timbers 36, serve to lock the parts in the full line position shown in Fig. 5.

When the drill is to be operated in an inclined position, as for instance in Fig. 7, pins 42 and wedges 50 are removed from the positions in which they are shown, the derrick is tipped forward by the aid of crane 22 until it reaches the position of Fig. 7, and struts 44 are raised and attached to the lower rear corner of the tilted derrick by pins 52 passed through brackets 43 and holes 54 at the free ends of the struts. The derrick is then locked securely in the dotted line position of Figs. 1 and 5. By making struts 44 of suitable length any desired angle of inclination may be given to the derrick and drill.

Fast on the front of the derrick are the normally vertical timbers or leads 60. Between leads 60 is a vertical steel I-beam 62, guided for vertical movement by steel angles 64 bolted to the leads and entering channels 66 formed by riveting plates 68 and spacers 70 to the rear flange of beam 62 as shown in Figs. 2, 3 and 9. Beam 62 is supported from above by line 72 passing over sheave 74 to hoisting drum 76, by which the beam may be raised or lowered as desired.

The upper end of beam 62 is provided with a vertical shaft bearing 78 which supports for rotation the upper end of the drill rod 82. A bearing 80 at the lower end of beam 62 supports the lower end of the drill rod. The part of the drill rod passing through bearings 38 and 80 is of circular cross-section, the balance of the rod being square. The entire drill rod is hollow and water is forced through it by pump 84 through hose 86 and water swivel 88 to emerge at drill 90 on the lower end of the drill rod. The drill rod is supported from above by hook 92 engaging swivel 88

and in turn supported by cable 94 passing over head sheaves to hoisting drum 96 by which the drill rod and attached parts may be moved vertically.

Bearing 78 is guided for vertical movement on beam 62 by rollers 98 carried on brackets 100, as shown in detail in Figs. 3 and 4. Collars 102 fast to the drill rod above and below bearings 78 prevent the rod moving lengthwise through the bearing—therefore whenever the drill rod is moved vertically by cable 94 bearing 78 moves with it along beam 62. Bearing 80 on the other hand is fast to beam 62, therefore the drill rod may move vertically through that bearing.

The drill is square in cross-section throughout its length except for the end portions which pass through bearings 38 and 80. The square part of the rod passes through a square hole 104 in bevel gear 38 which is supported for rotation in bearing or housing 106 mounted on the forward extension of 36. Gear 38, known as the "rotary", is driven by pinion 108 on the end of shaft 110 carried in bearings 112. Shaft 110 is driven from countershaft 114 by chain 116 and appropriate sprockets. Shaft 114 is in turn driven by chain 118 from engine 120. This shaft is in axial alignment with trunnions 32, therefore the drive of the rotary is not affected when the drill rig is inclined.

With the above description in mind the action and utility of the apparatus will be readily understood. When it is desired to bore a hole below water level, drill 90 and guide member 62 are lowered until the drill reaches the ground to be drilled, with bearing 80 immediately above the drill. Supported in this manner the drill is able to start holes in hard pan, sloping surfaces, or other difficult conditions which could not be handled with former equipment. Not only can the holes be started exactly where wanted, but they can be drilled exactly on the line desired because the drill stem is supported at the ground surface by bearing 80, as shown in Figs. 6, 7 and 8. It will be understood that as the drilling proceeds, guide member 62 remains stationary, while the drill and drill rod move downwardly relatively thereto. As the drill moves down the drill rod slides through the rotary, and through bearing 80, while bearing 78 moves down with the rod.

When it is necessary to drill an inclined hole for batter piles the derrick is tilted as described and the drilling then proceeds exactly as if the rig were vertical. Such a situation is illustrated in Fig. 7.

The invention has particular utility in cutting continuous trenches for concrete sheet piling. In such work the machine accurately drills a series of holes close together, and then in a separate operation drills out the partitions between the holes. Work of this kind requires very accurate drilling, which

only the present machine can perform on account of its means for guiding and supporting the drill.

It is to be understood that the invention is not limited to the construction herein specifically illustrated but can be embodied in other forms without departure from its spirit as defined in the appended claims.

I claim—

1. In an apparatus for drilling holes for piles in ground below water level, a drill rod, means above the water level for rotating the drill rod, a drill on the lower end of said rod, and a bearing supported by said apparatus adjacent the ground for guiding said drill rod for rotation whereby said drill is held on the desired drilling line.

2. In an apparatus for drilling holes for piles in ground below water level, a drill rod, a drill on said rod, means for rotating said rod to actuate said drill, a bearing surrounding said rod adjacent said drill, means for lowering said drill to ground level, means for lowering said bearing, and means for supporting said bearing at a point near the ground level for guiding said drill while it is being actuated.

3. In apparatus for drilling holes for piles, in combination, a vertical guide beam, a drill rod supported for rotation by said guide beam, and means for moving said beam and said drill rod vertically.

4. In apparatus for drilling holes for piles, in combination, a derrick, a vertical guide beam on said derrick, a shaft bearing rigidly mounted on the lower end of said beam, a shaft bearing mounted to move along the upper end of said beam, a vertical drill rod supported for rotation by said upper and lower bearings and means for moving said drill rod and upper bearing along said beam while the lower end of said rod moves vertically through said lower bearing.

5. The invention set forth in claim 4 in which means is also provided for moving said beam vertically on said derrick.

6. In apparatus for drilling holes for piles, in combination, a derrick, drilling apparatus mounted on said derrick, a trunnion, means for rotating said derrick about said trunnion whereby said derrick may be set in any desired inclined position, and means for driving said apparatus, said driving means including a countershaft in axial alignment with said trunnion whereby said driving means may without adjustment thereof drive said apparatus in any position of said derrick.

7. In apparatus for drilling holes for piles, in combination, a base, a derrick on said base, a trunnion connecting the front edge of said derrick to said base, means for rotating said derrick to an inclined position on said trunnion, means comprising a strut for interconnecting said base and the rear edge of said

derrick when said derrick is so inclined, drilling apparatus mounted on said derrick, and means for actuating said apparatus while said derrick is in its inclined position.

5 In testimony whereof I hereto affix my signature.

FREDERICK A. SCHROEDER.

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