

Jan. 5, 1960

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2,919,899

DRILLING RIG

Filed Oct. 29, 1956

3 Sheets-Sheet 1

FIG. 1.

FIG. 2.

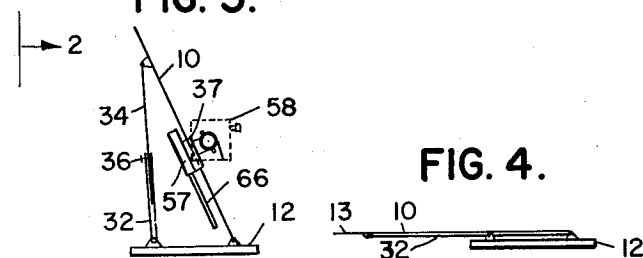
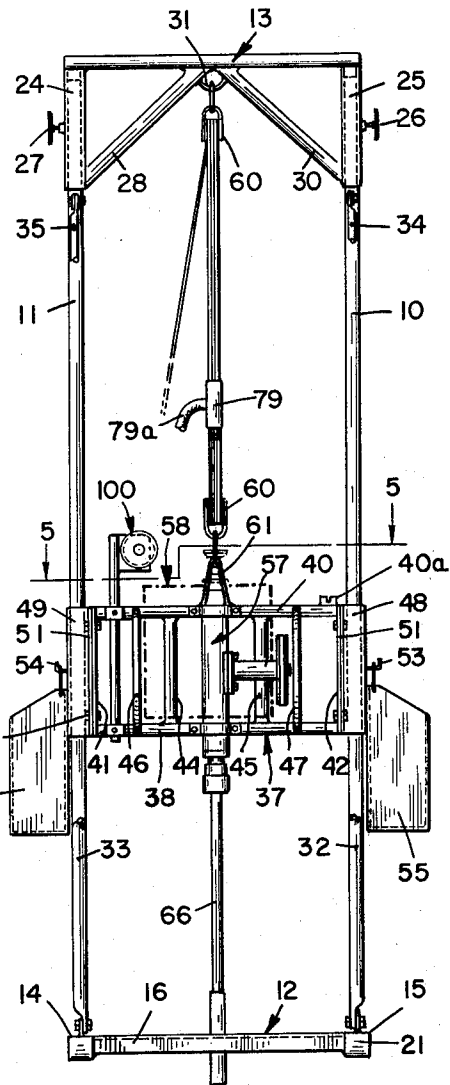
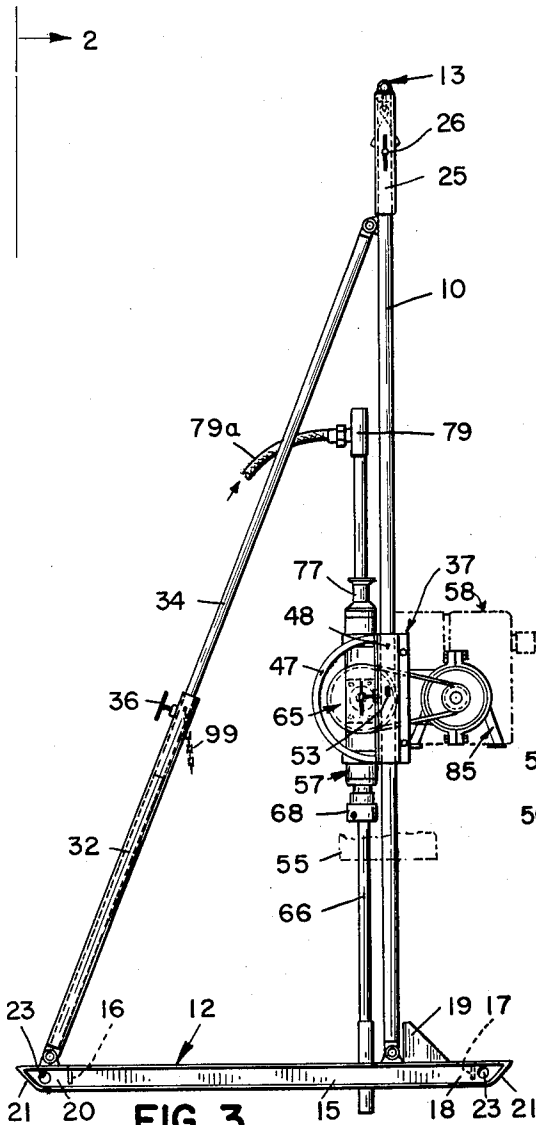


FIG. 4.

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FIG. 5.

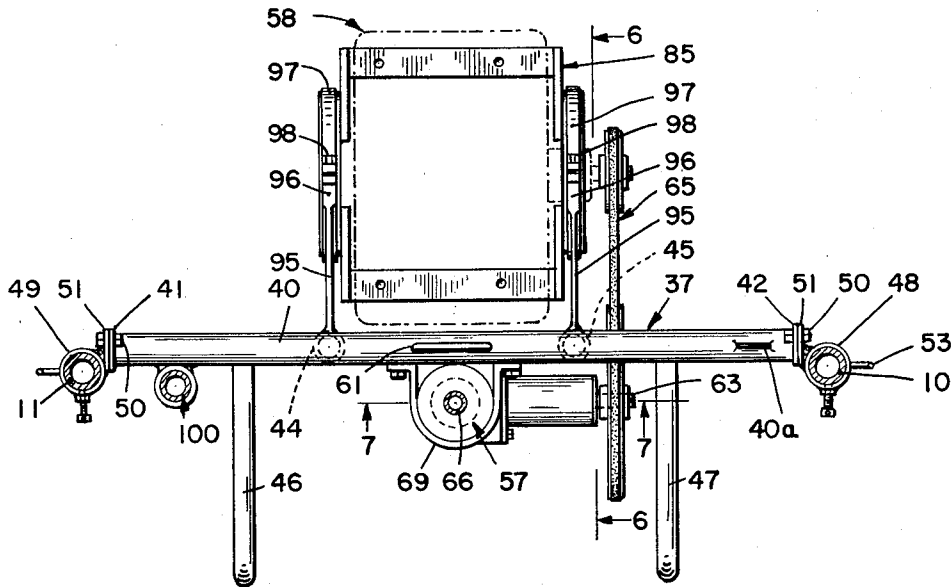


FIG. 7.

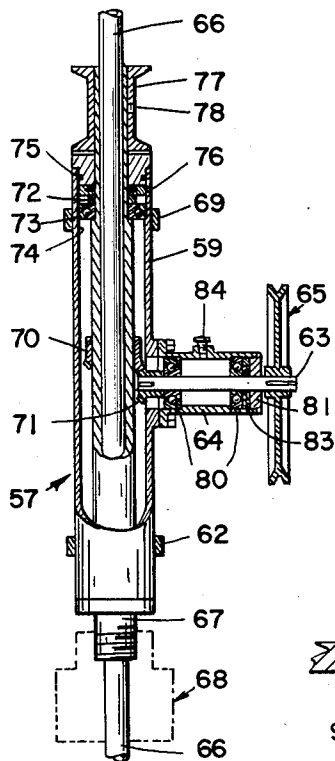


FIG. 6.

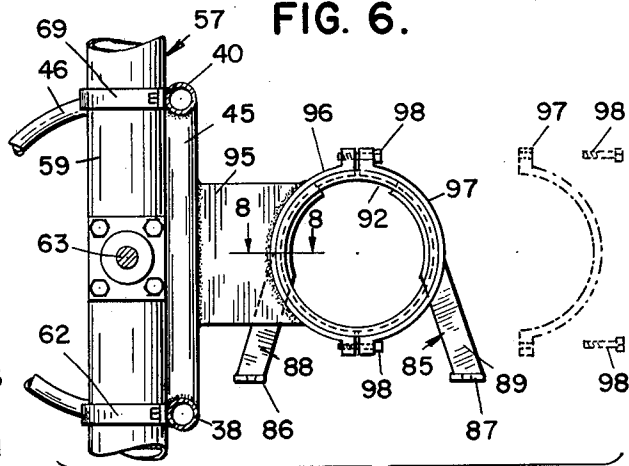
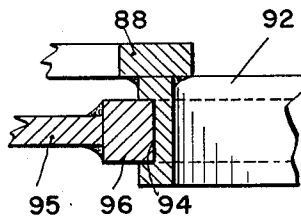


FIG. 8.



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FIG. 9.

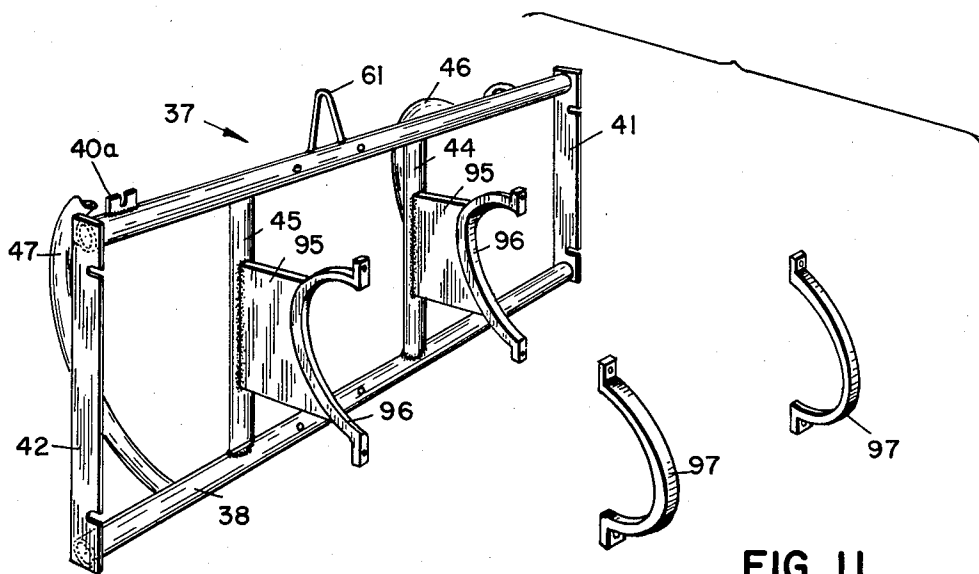


FIG. 10.

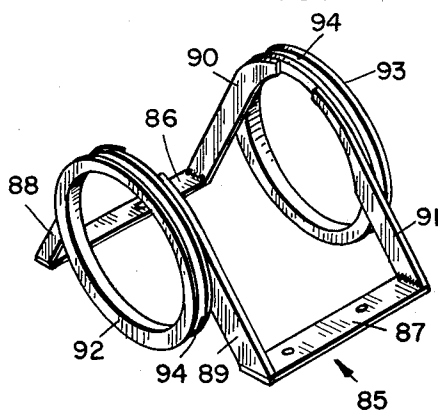


FIG. 12.

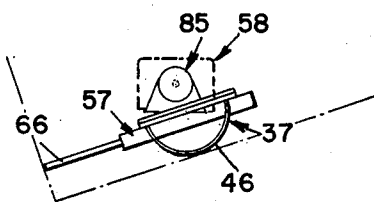
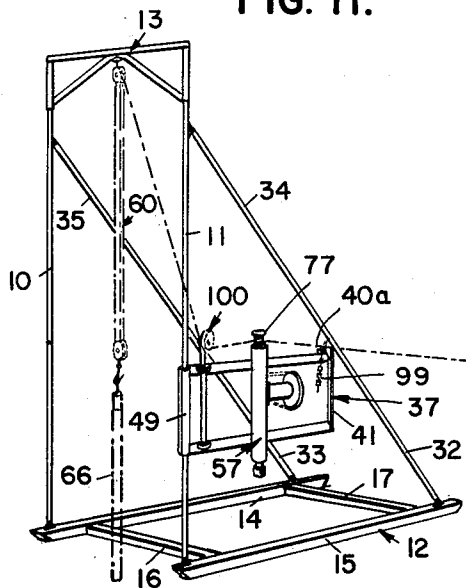


FIG. 11.



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## DRILLING RIG

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6 Claims. (Cl. 255—19)

This invention relates to drilling apparatus and more particularly to a portable and soil drilling rig.

In the past it has been the conventional practice in the excavation field, as well as other fields, to employ a drill rig carrying rock or soil drilling apparatus for drilling holes such as are required preparatory to the excavating of a vertical shaft. Conventional drill rigs are unnecessarily unwieldly and cumbersome to set up for operation and to service. For example, most drill rigs employed in the field of hard rock drilling are required to be firmly anchored to near-by structures or the adjacent ground area. At times the anchoring arrangement may become quite extensive. Furthermore, it is difficult for conventional drill rigs to be employed for drilling at an angle since means are not provided for maintaining the drill driving means in an upright position so that its performance will be of maximum efficiency. It is also difficult to pull out or extract a drill rod from its bored hole by manual methods.

These difficulties are overcome in accordance with one form of the present invention wherein a drill cradle is movably carried by a derrick comprising a pair of parallel guides pivotally mounted on a rectangular base. The drill cradle carries a drilling mechanism and rotatable means for the driving thereof. A feature resides in the fact that the drill driving means is rotatably mounted so that the driving means may be positioned to any desirable position when the drill angle is other than upright or vertical. Also, the drill cradle may be detached from the derrick and the drilling mechanism operated without difficulty.

It is an object of the present invention to provide a novel mounting means for a drilling mechanism and driving means which shall be adapted to be readily applied to a drilling machine rig of the character stated, which shall be simple and durable, and which may be manufactured and sold at a low cost.

Another object is to provide a portable drilling mechanism and driving means which may be readily detached from a supporting derrick and operated to bore a hole at any angle without placing the driving means in other than an upright position.

It is another object to provide means carried by the drilling rig for extracting the drill rod out of the hole it has bored. In the present instance, the driving means for the drilling mechanism may be employed for drill rod extraction functions in addition to driving the drill mechanism.

Still another object of the present invention is to provide a novel means whereby the driving means for the drilling mechanisms can be maintained in an upright or at least in a substantially vertical plane while the drilling mechanism is operating in a different plane than the driving means.

Other objects of this invention will be apparent from the following description with reference to the accompanying drawings, wherein:

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Figure 1 is a side elevational view of the drill rig embodying the present invention;

Figure 2 is a rear elevation view looking in the direction of the arrows 2—2 of Figure 1 showing the drilling mechanism carried by the drill cradle supported by the derrick;

Figure 3 is a reduced side elevational schematic of the drill rig of Figure 1 showing its employment for angular drilling;

Figure 4 is a reduced side elevational schematic of the drill rig of Figure 1 showing the derrick without the drill cradle mounted and being folded for transporting;

Figure 5 is an enlarged cross-sectional view taken along line 5—5 of Figure 2 illustrating the drill driving means and the drill mechanism in relation to the drill cradle and the derrick;

Figure 6 is a sectional view taken along line 6—6 of Figure 5 showing the drill cradle and a supporting arrangement for the drill driving means;

Figure 7 is a sectional view taken along line 7—7 of Figure 5 showing the drill mechanism;

Figure 8 is a sectional view of the drill driving means supporting arrangement taken along line 8—8 of Figure 6;

Figure 9 is a perspective drawing of the drill cradle of Figure 5 showing the arrangement for supporting the drill driving means being detached;

Figure 10 is a perspective drawing of a mounting frame to which the drill driving means is attached. The mounting frame, in turn, is coupled to the drill cradle of Figure 9 by the supporting arrangement shown therein;

Figure 11 is a schematic drawing of the drill rig illustrating means for extracting the drill rod from a bored hole; and

Figure 12 is a schematic drawing illustrating the use of the drill mechanism, drill driving means and drill cradle independent of the supporting derrick as contemplated by the present invention.

Referring to Figures 1 and 2, a drill rig is shown in accordance with the present invention comprising a pair of parallel supports 10 and 11 coupled together on one end by means of a base 12 and on their other end by means of a cross bar 13. The base is rectangular in shape having a pair of parallel base members 14 and 15 rigidly secured together by a pair of base connectors 16 and 17. The pair of base members may be suitably constructed from sections of conventional "I" beams or channel sections. The pair of supports is pivotally attached to the base members at a distance from one end, as for example, an end 18, equal to approximately one-quarter length of a base member. Base ends 18 and 20 are provided with angled surfaces such as surface 21 so that uneven terrain may be easily traversed when transporting the drill rig to a drilling location. A plurality of holes such as hole 23 are bored through the ends of each base member and may be employed for towing the drill rig. A pair of stops 19 are secured to each base member and are employed for limiting the pivotal movement of the pair of supports.

Cross bar 13 is provided with receptacles 24 and 25 welded thereto and adaptable to receive the ends of the pair of supports. Hand screws 26 and 27 extend through the receptacles to engage the supports and are provided for securing the cross bar and the pair of supports. The cross bar and the receptacles are strengthened by means of a pair of braces 28 and 30 forming an angular relationship with the cross bar and each of the receptacles. The braces provide a strengthened arrangement so that weight may be suspended from a ring 31 secured to the cross bar at a point where the pair of braces join the ring. A plurality of support members 32 to 35, inclusive, are associated with the pair of supports 10 and

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11 and are telescopically arranged so that members 34 and 35 slide within members 32 and 33 respectively. Members 32 and 33 are pivotally attached to end 20 of the base while members 34 and 35 are pivotally attached to the supports 10 and 11 respectively. A hand screw such as screw 36 is provided for securing the telescoping ends of the respective support members once the angle of the pair of supports has been established for a particular drilling operation with respect to the level of the terrain. For example, Figure 3 illustrates the supports 10 and 11 adjusted angularly to the perpendicular position shown in Figures 1 and 2 while members 32 to 35 inclusive have been adjusted to a perpendicular position. Thus, it can be seen that the drill angle may be variable when employing the drill rig of the present invention. For transporting the drill derrick from place to place the derrick may be adjusted to the position shown in Figure 4 so that the derrick may be suitably carried by truck or automobile or dragged over rough terrain. This may be accomplished by loosening screws 36 and disconnecting the telescopic arrangement of members 32 and 33 from members 34 and 35. Supports 10 and 11 may be pivoted on the base 12 and the last mentioned members laid parallel to each other.

Slidably mounted between the pair of supports is a drill cradle 37 which may be raised or lowered between the pair of supports. The drill cradle comprises a pair of parallel elements 38 and 40 having their respective ends joined by a pair of bars 41 and 42. The cradle is made rigid by means of rods 44 and 45 connecting the pair of elements. Added rigidity is accomplished by the connection of semi-circular rods 46 and 47 connected to the pair of elements between the bars and rods. The cradle is slidably mounted by means of a pair of side mounts 43 and 49 which slide on supports 10 and 11 respectively. Attachment is made between the cradle and the side mounts by means of nut and bolt arrangement 50 engaging the bars 41 and 42 and a flange 51 associated with the side mount. A pair of hooks 53 and 54 are attached to side mounts 43 and 49 respectively and are provided for carrying weights 55 and 56. The weights may take any desirable form, but as shown, the weights are represented by buckets filled with rock or sand. The cradle carries a drill mechanism 57 and a driving means 58 therefor which will be described later.

The entire cradle and its associated mechanism and the driving means is suspended between the supports by a suspension means comprising a conventional block and tackle arrangement 60 attached to ring 31 and connected to a V shaped ring 61 attached to element 40 of the cradle construction. Tension applied to the tackle urges the cradle to move up and down guided by the travel of the side mounts of supports 10 and 11.

As is seen more clearly in Figures 5 and 6, the cradle carries the drilling mechanism 57 and driving means 58. A casing 59 of the drilling mechanism is engaged by a pair of U shaped retainers 69 and 72 which are, in turn, bolted to elements 40 and 38 respectively. An input drive shaft 63 is driven by the engine and is enclosed in a housing 64 which is bolted onto the side of the drill casing. Power is transferred from the driving means to the drilling mechanism by means of a pulley and belt arrangement 65 connecting the driving means to the input shaft 63.

The drilling mechanism as shown in Figure 7 comprises casing 59 carried by the cradle which encloses a hollow drill rod 66 extending through the casing longitudinally. The drill rod is enclosed by a quill 67 and is fastened thereto by a conventional chuck 68. The quill and the drill rod are rotatable within the casing by means of engagement between a bevel gear 70 attached to the quill and a bevel pinion gear 71 fixed to the drive shaft. The quill is supported within the casing by means of a lock nut 72 securing a bearing 73 to the inner wall

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74 of the casing. An O ring 75 is associated with the quill and the casing ends to prevent escape of grease from the interior of the casing. A hole 76 is provided in the casing wall for grease to overflow when too much has been provided. A bearing identical to bearing 73 is provided on the opposite end of the drilling mechanism and is held in position by a lock nut similar to the lock nut 72. A collar 77 is fixed to the upper end of the quill by means of a set screw 78 and its function will be described later with reference to Figure 11. A conventional swivel unit 79 and hose 79a is attached to the end of the drill rod in order to supply a fluid flushing compound under pressure to the hollow drill rod 66. The compound travels through the drill rod into the bottom of the bore so that loosened or drilled earth may be flushed up to the surface through the drilled bore exteriorly of the drill rod. Any suitable flushing compound may be employed to facilitate the removal of drilled earth.

Input shaft 63 is supported within housing 64 by a pair of bearings 80 secured within the housing by means of a cap 81. A seal 83 is provided for preventing loss of grease. A grease fitting 84 is provided so that the interior of the housing and casing may be periodically greased.

The driving means is a conventional gasoline engine having a rating of approximately 3.35 hp. and is bolted directly to a frame 85 such as is illustrated in Figure 10. The frame comprises a pair of attachment bars 86 and 87 having extensions 88 to 91 inclusive attached to the ends of each bar. Extensions 88 and 89 and extensions 90 and 91 are coupled together by a means of rings or a circular section 92 and 93 having integral channels 94 extending around their circumference. The circular sections form a trunnion mounting for the engine. The frame is carried by the cradle by means of mounting pieces 95 as shown in Figure 8. Each mounting piece is provided with a semi-circular member 96 which engages a portion of the channel of each circular section of the frame. The frame is secured to the mounting pieces by means of a pair of semi-circular retainers 97 which engages the portion of the channel of circular sections 92 and 93 not engaged by members 96. Attachment is made between the retainers and the mounting pieces by means of a bolt arrangement 98. The relationship between the retainers and the mounting pieces carried by the cradle is more clearly shown in Figure 9.

Figure 11 illustrates the cradle 37 having been pivoted on side mount 49 and by means of lug 40a on element 40, is coupled to member 32 by means of a chain 99 attached to member 32. Pivoting is achieved by removing nut and bolt arrangement 50 from flange 51 and bar 41 and swinging the cradle on side mount 49 until bar 41 meets member 32. Inasmuch as chain 99 is secured to member 32, the cradle cannot drop even though side mount 49 is not positively secured to support 11. Because member 32 is at an angle with respect to support 11, mount 49 will bind on the support when chain 99 is secured to member 32. Block and tackle 60 may be disengaged at this time. This arrangement allows the block and tackle arrangement 60 to be used for extracting the drill rod 66 from its bored hole. For this function a pulley attachment 100 is provided so that the tackle may be engaged therewith and looped around collar 77 associated with the drill mechanism so that the engine power may be employed. The collar is carried by the quill and is fastened thereto by set screw 78.

Should it be desirable to perform drilling operations without the derrick, cradle 37 may be removed and the drilling mechanism and driving means may be supported by semi-circular rods 46 and 47 as shown in Figure 12. This feature allows for great adaptability and operational flexibility of the drilling equipment. The engine may be rotated in its trunnion mounting, as previously described,

to an upright position regardless of the angle of drill operation.

In actual operation, supports 10 and 11 of the drill rig are initially positioned by pivoting on base 12 so that the drill mechanism 57 may be properly aligned with respect to the ground surface to drill the desired hole. While the supports are being positioned, members 34 and 35 slide within members 32 and 33 to accommodate the pivotal movement of the supports. Once the supports have been suitably positioned, hand screws 36 are tightened to prevent further sliding of members 32 to 35 inclusive. Once these supports have been positioned, drill cradle 37 is slid thereon to suitably position drill rod 66 for commencement of drilling operation. Weights 55 and 56 are placed on hooks 53 and 54 so as to provide a constant gravitational pull on the drilling mechanism. The engine 58 may now be started and its power transferred to drilling mechanism 57 by means of pulley and belt arrangement 65. The drill cradle may lower the drill rod to engage the ground by operating block and tackle 60 so that the weights 55 and 56 urge the drill cradle downwardly on the supports until engagement between a drill bit (not shown) carried by the drill rod and the ground surface is achieved.

As the drill bit bores deeper into the ground, the drilling mechanism carried by the drill cradle will be urged to follow downwardly on the supports by means of the weights. When the drill cradle has progressed to a position where the weights or drilling mechanism is about to bind with the ground surface, the engine may be stopped so that quill 67 may be disengaged from the drill rod and the drill cradle including the drilling mechanism is slid to a new position higher on the drill rod. Drilling operations can now be resumed and a deeper bore obtained.

During the drilling operations bored earth is transported upward through the interior of the drill rod and by means of the flushing compound the earth is carried to another location.

At the completion of drilling operations and if it is desired to withdraw the drill rod from its bore, the tackle may be placed into engagement with pulley attachment 100 and wound around collar 77. When the engine is reactivated the collar will rotate and cause the tackle to draw the drill rod upward out of its bore. Generally, in order to prevent binding of parts and to gain full torque value from the collar 77 the drill cradle is pivoted to a position between member 32 or 33 and support 10 or 11 so that chain 99 can be employed for suitably securing the drill cradle to member 32 or 33.

Having described only typical forms of the invention I do not wish to be limited to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

I claim:

1. In a drill rig, the combination comprising, derrick means having spaced upright supports pivotally carried on a base, a drill cradle movably supported by the derrick means disposed between the supports, drilling mechanism carried by the drill cradle parallel to the supports of the derrick means, primary power driving means carried by the drill cradle for supplying power to the drilling mechanism, telescoping means pivotally connected on the base between the base and the supports at a location remote from the base adjustable to vary the drill angle of the drilling mechanism, and mounting means for rotatably attaching the primary power driving means to the drill cradle so that the primary power driving means may be in an upright position regardless of the drill angle of the drilling mechanism.

2. In a drill rig for boring a hole, the combination comprising, a rectangular base, a derrick means pivotally carried by the base, a drill cradle slidably and detachably

supported on the derrick means, means suspended from the derrick means for positioning the drill cradle on the derrick means, drilling mechanism associated with the drill cradle extending in a parallel relationship with the derrick means, primary power means for driving the drilling mechanism rotatably carried by the drill cradle, and means carried on the drill cradle and associated with the drill mechanism and the means suspended from the derrick means for extracting the drill mechanism from the hole when the drill cradle is positioned substantially at a right angle to its position when slidably supported on the derrick means.

3. A drill rig for boring a hole comprising the combination of, a rectangular base, a plurality of members pivotally carried on one end of the base, a pair of supports pivotally carried on the base end opposite the pivotally carried members, a bracing means joining the pair of supports, a cradle slidably carried between the pair of supports and detachable therefrom to be secured between one support of the pair and one of the members, suspension means associated with the bracing means for sliding the cradle, drilling mechanism associated with the drill cradle extending in a parallel relationship with the pair of supports, primary power driving means for the drilling mechanism, clamping means detachably securing the driving means on the drill cradle so that the driving means is rotatably mounted on the drill cradle whereby the vertical axis of the driving means may be varied respectively to the longitudinal axis of the drilling mechanism, and means carried on the drilling mechanism for extracting the drilling mechanism from the hole in cooperation with said suspension means when the cradle is supported on one support and one of the members.

4. A drill rig for boring a hole comprising, the combination of, a rectangular base, a plurality of members pivotally carried on one end of the base, a pair of supports pivotally carried on the base end opposite the pivotally carried members, a bracing means joining the pair of supports, a cradle slidably carried between the pair of supports, suspension means associated with the bracing means for sliding the cradle, means for detachably connecting the cradle to the pair of supports, drilling mechanism carried by the cradle extending in parallel relationship with the pair of supports, a frame, primary power driving means for the drilling mechanism detachably connected to the frame, mounting means for rotatably connecting the frame on the cradle, a pair of rocker arms attached to the cradle for supporting the drill mechanism when the cradle is detached from the pair of supports, and means carried on the cradle arranged for cooperating with the suspension means for extracting the drilling mechanism from the hole.

5. A drill rig comprising, a cradle, drill mechanism carried on the cradle, a frame, a primary power means carried on the frame operably connected to the drill mechanism for driving the same, means rotatably mounting the frame on the cradle; and a pair of rocker arms connected to the cradle for supporting the cradle, drill mechanism and primary power means during operation of the drill mechanism.

6. In a drill rig for boring a hole, the combination comprising, a rectangular base, a derrick having a pair of spaced supports pivotally carried by the base, a drill cradle supported on the derrick in a first position which permits the drill cradle to slide on the derrick, first means suspended from the derrick for slidably positioning the drill cradle on the derrick, drilling mechanism associated with the drill cradle extending in a parallel relationship with the pair of derrick supports, primary power means for driving the drilling mechanism, clamp means secured to the cradle for rotatably mounting the power means thereon, and second means carried on the drill cradle and associated with the drill mechanism and the first mentioned means for extracting the drill mechanism from the hole when the drill cradle is in a second

position on the derrick at a substantially right angle to the first mentioned position.

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