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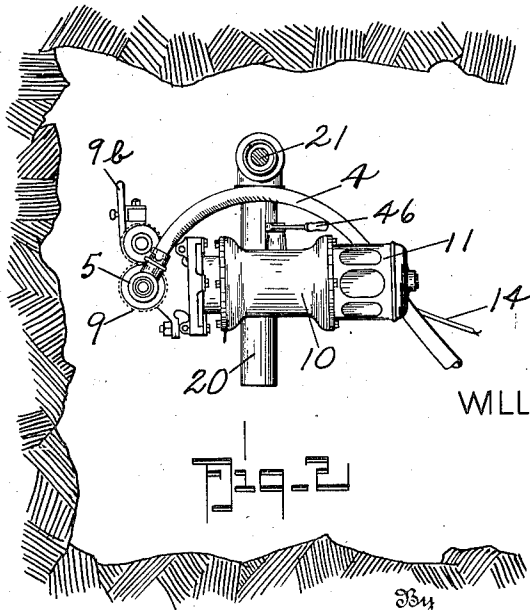
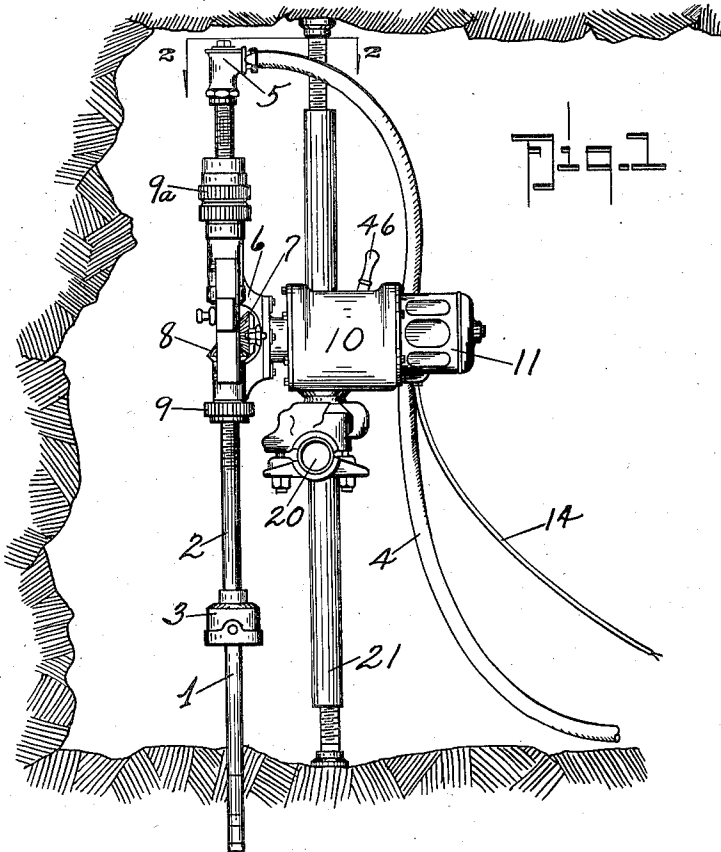
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2,000,976

ROTARY DRILLING MACHINE

Filed July 24, 1933

2 Sheets-Sheet 1



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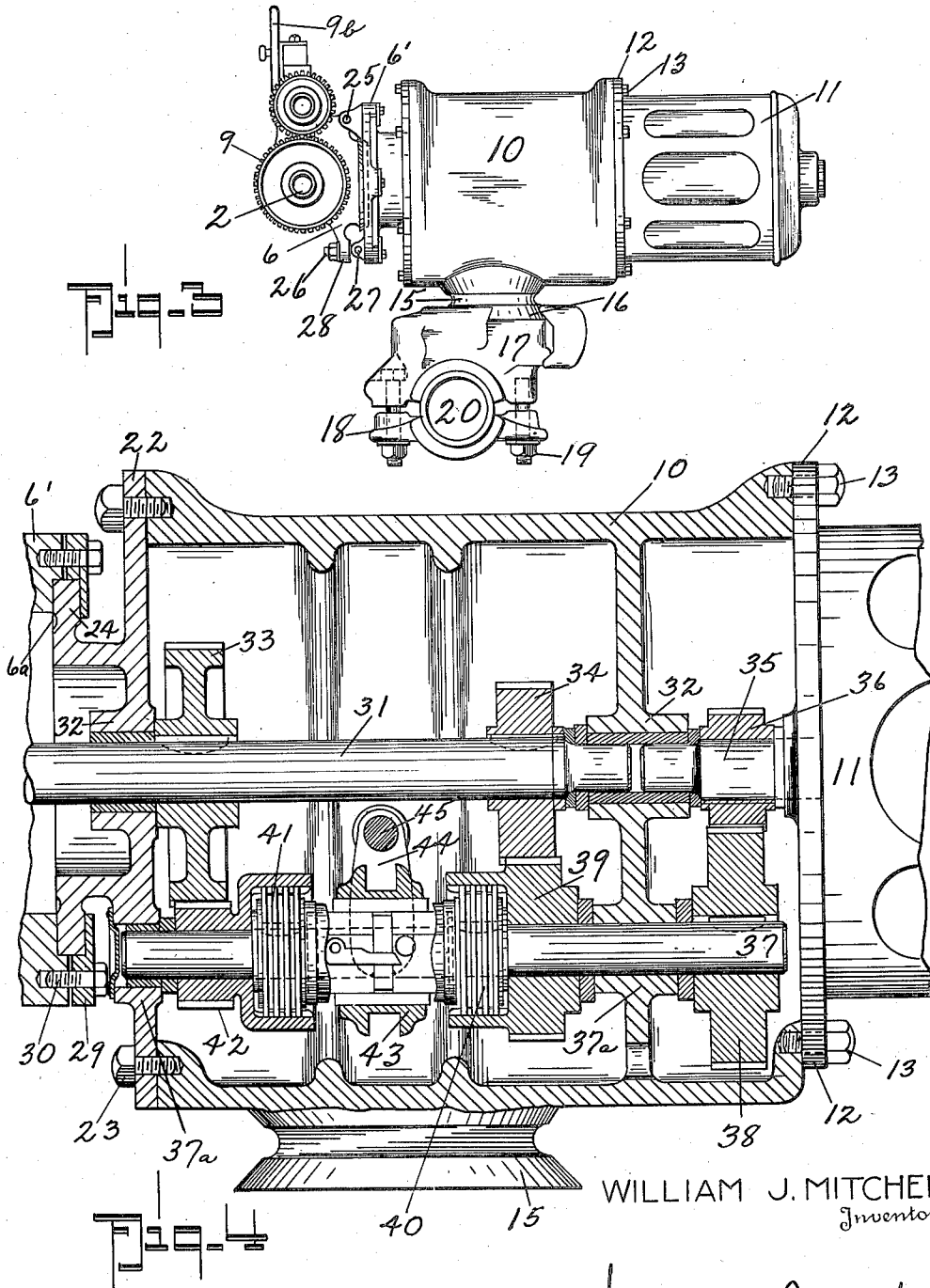
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UNITED STATES PATENT OFFICE

2,000,976

ROTARY DRILLING MACHINE

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Application July 24, 1933, Serial No. 681,864

13 Claims. (Cl. 255-53)

My present invention relates to an improved rotary drilling machine which, while herein illustrated is especially adapted for underground engineering, as in mining, is also adapted for surface drilling in earth engineering problems.

The drilling machine is of that type which employs a swivel arrangement for the drill-head, and in which the entire machine may be supported for subterranean work on the horizontal arm of an upright jack, or the machine when employed in surface work may be supported on the usual tripod appliance.

In carrying out my invention I have simplified the construction and operation of the drilling machine by the utilization and arrangement of three essential elements, as the motor, the transmission mechanism, and the swiveled drill-head, and other features are employed to insure the use of a minimum number of parts, compact arrangement of the parts, and ready access to the various parts as required.

Means are provided whereby the swiveled drill-head may be turned on its axis and locked in adjusted position for drilling operations, and a hinged arrangement is utilized whereby the drill head may be swung away from the work after disconnection from the drilling tool in order that the tool, or drill rods, may be pulled, without disturbing the drilling position of the machine, and by the arrangement of the various parts of the machine a well balanced, smooth-operating, and highly efficient machine is provided, all as will hereinafter be pointed out.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention wherein the parts are combined and arranged according to one mode I have thus far devised for the practical application of the principles of my invention.

Figure 1 is a view in elevation showing machine set up for subterranean, or mining operations, with the drilling unit in upright position, and the whole machine supported on the horizontal arm or bar of the usual upright jack.

Figure 2 is a top plan view of the machine as at line 2-2 of Figure 1 and showing the jack in section.

Figure 3 is a side view or side elevation, showing the machine mounted on the horizontal bar, but with the drill-head turned for horizontal drilling, as distinguished from the vertical drilling position of Figure 1.

Figure 4 is an enlarged vertical sectional view of the transmission gear case, and gears, intermediate the swiveled drill head and the motor,

the latter being rigidly mounted on the drill case.

In the assembly view of Figure 1 a tubular, sectional, drill rod is indicated as 1, and connected to the tubular drill spindle and feed screw 2 by means of a usual type of detachable chuck 3, and by means of the latter the drilling machine may be disconnected from the drilling tool for the purpose of adding sections to the tool as the work progresses. To assist in the drilling operations of the rotary tool, water is supplied thereto from the water pipe 4 and the connection 5 through the tubular spindle and the tubular drill rods, to the bit at the end of the rod.

The swiveled drill-head 6 on which the operating parts of the drill are mounted is fashioned with a hollow formation to accommodate a vertically arranged bevel-gear or driving gear 7, and a driven, complementary gear 8, the latter on the spindle 2 and transmitting rotary motion thereto and to the drilling tool.

The screw feed of the spindle 2, as the work progresses, is operated through gears 9, and the reverse feed is accomplished through gears 9a, under control of the hand lever 9b.

As indicated in the drawings the drill head 6 is located at one end of the case 10, in which the transmission gears are contained, and the motor 11 is located at the opposite end of the case, the drill head and the motor being supported solely by the intermediate gear case. The drill head is swiveled on the gear case by use of a swivel-ring 6', but the motor is rigidly attached to one end of the case by means of the attaching flange 12 of the motor and the bolts 13. As here shown, the electric motor 11 is provided with wires as 14, but it will be understood that a fluid motor, as a pneumatic motor may also be employed in lieu of the electric motor.

These three well balanced units, i. e. the swiveled drill-head, the transmission gear case, and the motor, have a single support by means of the conical or tapered swivel head or disk 15 rigid with the bottom portion of the cylindrical gear case 10, and the swivel-disk is enclosed within the swivel flange 16 on the clamp head 17. The clamp head is provided with the usual clamp plate or saddle 18 and the latter is bolted, as at 19 to the horizontal arm or bar 20 of the usual upright jack or post 21. By means of this swivel arrangement the entire drilling machine may be turned to adjusted position on a vertical axis, and while I have shown the machine supported on the arm or lateral bar of a jack, it will be understood that the entire machine comprising

the three main units and the swivel disk 15 may be mounted for support on the usual surface tripod, for surface drilling.

In the compact and balanced arrangement of the three units of the machine, the gear case 10 is fashioned with a detachable end-head 22 bolted at 23 to the end of the cylindrical case 10, and this end-head or end-plate is fashioned with a reduced, annular flange 24 that affords a stationary support for the drill-head through its swivel ring 6', to which ring the drill-head is hinged as at 25.

A locking bolt or eye-bolt 26 is hinged or pivoted at 27 on the swivel-ring 6', opposite to the hinge or hinges 25, and the drill head is fashioned with a forked or slotted lug 28 that receives the pivoted lock bolt. Thus, after the chuck 3 has been disconnected from the drilling tool 1 and the chuck retracted slightly, the bolt 26 may be loosened and turned free of the lug 28, and then the drill head may be swung on its hinge or hinges 25 out of the way, to give access to the drill rod.

As best seen in Figure 4, the face of the swivel ring, which adjoins the supporting flange 24, is countersunk or recessed at 6a to receive the flange and to turn on the flange, and the swivel ring is provided with an annular series of retaining lugs 23 secured thereto by bolts 30, and the lugs overlap the flange 24 to rigidly hold the swivel-ring by clamping the flange against the ring. When the bolts are loosened to free the clamp-lugs, the drill head and the swivel ring may be turned to adjusted position on the flange, and then the bolts are tightened to clamp the drill head in adjusted position for drilling operations.

Within the gear case a drive shaft 31 is journaled in bearings 32, and this shaft, upon which the driving or bevel gear 7 is mounted, projects through the swivel flange 24 and the swivel ring 6', and its center is the axis on which the drill head is swiveled, thus insuring that the drive gear 7 and the driven gear 8, of the drill, are in operative relationship, regardless of the position of the swiveled drill head.

Upon the drive shaft are mounted two transmission gears 33 and 34, the former for low speed revolutions of the drill, and the latter for transmitting high speed to the revolving or rotary drill, and as indicated in Figure 4, this drive shaft 31 is axially aligned with, but separate from, the motor shaft 35, which also is journaled in one of the bearings 32 for the drive shaft 31.

A driving pinion 36 is mounted on the motor shaft and power is transmitted therefrom to the clutch shaft 37 that is journaled in bearings 37a, and has keyed thereto the main drive or transmission gear 38 meshing with the pinion 36.

For high speed transmission the clutch shaft is provided with a loose high speed gear 39 and high speed clutch 40 combined therewith, and for low speed transmission a low-speed clutch 41 is combined with a low speed pinion 42. The parts of the variable speed transmission mechanism are spaced apart in order that the loose gear 39 will always engage the gear 34, and the loose clutch gear or pinion 42 will always engage the gear 33, and the clutch devices 40 and 41 are alternately engaged and disengaged for securing the variable speeds.

A clutch spool 43 is shown on the clutch shaft intermediate the two clutches, and the fork 44 for shifting the spool is operated by the rock shaft

45 through manipulation of the handle or hand lever 46 shown in Figures 1 and 2.

From this description taken in connection with the drawings, it will be apparent that the whole appliance may readily be set up as in Figure 1 and supported on the lateral arm of the stationary jack or post, or column, and thereafter a wide range of adjustments may be made without disturbing the set-up. For instance, the whole appliance that is supported on the clamp of the arm 20 may be turned on a vertical axis to adjusted position for drilling operations. In addition the drill head per se may be turned on a horizontal axis to adjusted position for drilling, without disturbing the remaining parts of the appliance, and the hinged drill-head may be turned on its hinges, after the chuck 3 is disconnected, and then returned to its prior operative position without disturbing the set-up of the appliance, and also with the assurance that the drilling tool will operate without binding, because of the fact that the drill head and the drilling tool are readily and automatically returned to aligned position.

While the drill rod 1 is shown as operating in a perpendicular and downward position, it will be understood that the drill head is free to be turned within the complete circle of 360° to bring the drill rod to desired position.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a drilling machine, the combination with a transmission case, a motor rigidly attached at one end of the case and a motor shaft, of a drill head and a swivel connection between said drill head and the other end of the case, a drive shaft aligned with the motor shaft and disposed as the axis for the swivel connection, variable speed transmission mechanism between the motor shaft and the drive shaft and operating means in the drill head actuated by said drive shaft.

2. In a rotary drilling machine, the combination with a stationary support and a transmission case mounted thereon, of a motor rigidly mounted at one end of said case, a swivel ring disposed transversely of the longitudinal axis of the case and means for locking said ring at the other end of the case, a drill-head and a hinged connection between said head and ring, drill-operating means mounted in said ring, and variable speed transmission mechanism located in the case operatively connecting said motor and the drill operating mechanism.

3. In a rotary drilling machine, the combination with a stationary support, a power transmission case, and a swivel connection between said support and case, of a motor rigidly mounted at one end of said case, a counterbalancing drill-head, a swivel-ring and a hinged connection between said head and ring, a transversely disposed supporting flange on the case at the other end thereof, means for locking said swivel ring on the flange, operating means mounted in the drill head, and variable speed transmission mechanism located in the case operatively connecting the motor and the operating means.

4. In a drilling machine, the combination with a transmission case having a motor rigidly mounted at one end and a transversely disposed swivel support rigidly mounted at its other end, of a swivel ring and means for locking said ring on the support, a drill-head hinged on the ring, operating means in the drill head, and variable speed transmission mechanism operatively connecting said motor and the operating means.

5. In a drilling machine, the combination with a transmission case having a motor rigidly mounted at one end and a rigidly transversely disposed mounted swivel-flange at its other end, of a swivel ring engaging said flange, a series of locking lugs mounted on the ring for engagement with said flange, a drill head hinged on said ring and operating means in said drill head, and variable speed transmission mechanism located in the case and operatively connecting said motor with the operating means.

6. In a drilling machine, the combination with a transmission case having an end-plate and an annular swivel flange rigid with the plate, and a drive shaft journaled in the case and axially aligned in said plate, a swivel ring engaging said flange and means for locking said ring on the flange, a drill head hinged on the ring, operating means including a bevel gear mounted in said head, and a complementary bevel gear on the drive shaft.

7. In a drilling machine, the combination with a transmission case having an end plate and an annular swivel flange rigid with the plate, and a drive shaft journaled in the case and axially aligned in said plate, a swivel ring engaging said flange, a series of locking lugs mounted on the ring for engagement with said flange, a drill head hinged on the ring, operating means including a bevel gear mounted in said head, and a complementary bevel gear on the drive shaft.

8. In a drilling machine, the combination with a support, a transmission case, and a swivel connection between said case and support whereby the case may be angularly adjusted on an axial line transversely intersecting the support, of a motor rigidly mounted at one end of said case, a counterbalancing drill head and a swivel connection between said drill head and the other end of the case whereby the drill head may be angularly adjusted in a plane at right angles to the plane of adjustment of the case, operating means mounted in the drill head, and transmission mechanism located in the case between the motor and the operating mechanism.

9. In a drilling machine, the combination, with a support, a transmission case, and a swivel connection between said case and support whereby the case may be angularly adjusted on an axial line transversely intersecting the support, of a

motor rigidly mounted at one end of the case and a swivel connection at the other end of the case, a counterbalancing drill-head hinged to said last mentioned swivel-connection whereby the drill head may be angularly adjusted in a plane at right angles to the plane of adjustment of the case, operating means mounted in the drill head, and transmission mechanism between the motor and the operating mechanism.

10. In a drilling machine the combination with a support, a power driving-unit, and a swivel connection between said support and unit whereby the unit may be angularly adjusted about the swivel-connection, a drill-head, a swivel-connection between the drill head and said unit whereby the drill head may be angularly adjusted in a plane at right angles to the plane of adjustment of the driving-unit, operating means mounted in the drill-head, and transmission mechanism between the operating means and the driving-unit.

11. In a drilling machine the combination with a support, a power driving-unit, and a swivel connection between said support and unit whereby the latter may be angularly adjusted about the swivel-connection, a second swivel-connection mounted on the driving-unit and disposed in a plane at right angles to the first swivel-connection, a drill-head hinged to one member of the second swivel-connection, operating means mounted in drill head, and transmission mechanism between the driving-unit and the operating mechanism.

12. In a rotary drilling machine, the combination with a power driving-unit, of a swivel member rigid with said unit, a second swivel member and means for rigidly locking said swivel members, a drill head hinged to the second swivel member, and operating means for the drill head actuated by said driving-unit.

13. In a rotary drilling machine, the combination with a power driving-unit, a swivel member mounted thereon, a supporting post, a complementary swivel member adjustable on the post, and means for locking said swivel members in adjusted position, of a drill head, a hinged connection between the drill head and the driving unit, operating means mounted in the drill head, and power transmission mechanism between the driving unit and the operating mechanism.

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