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J. PRINCE, JR

2,765,148

DRILL RIG FOR HARD ROCK MINING

Filed June 15, 1953

2 Sheets-Sheet 1

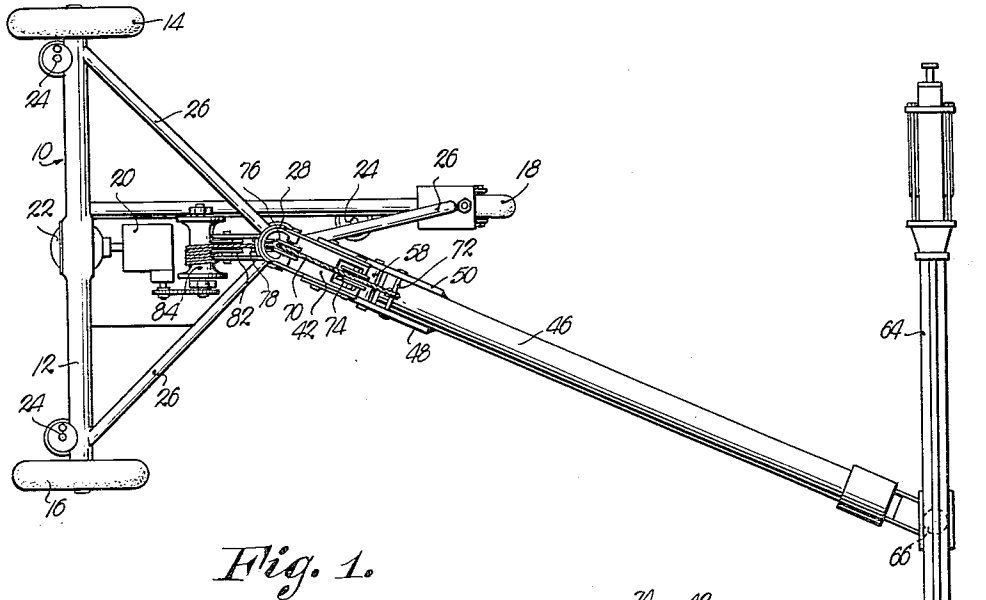


Fig. 1.

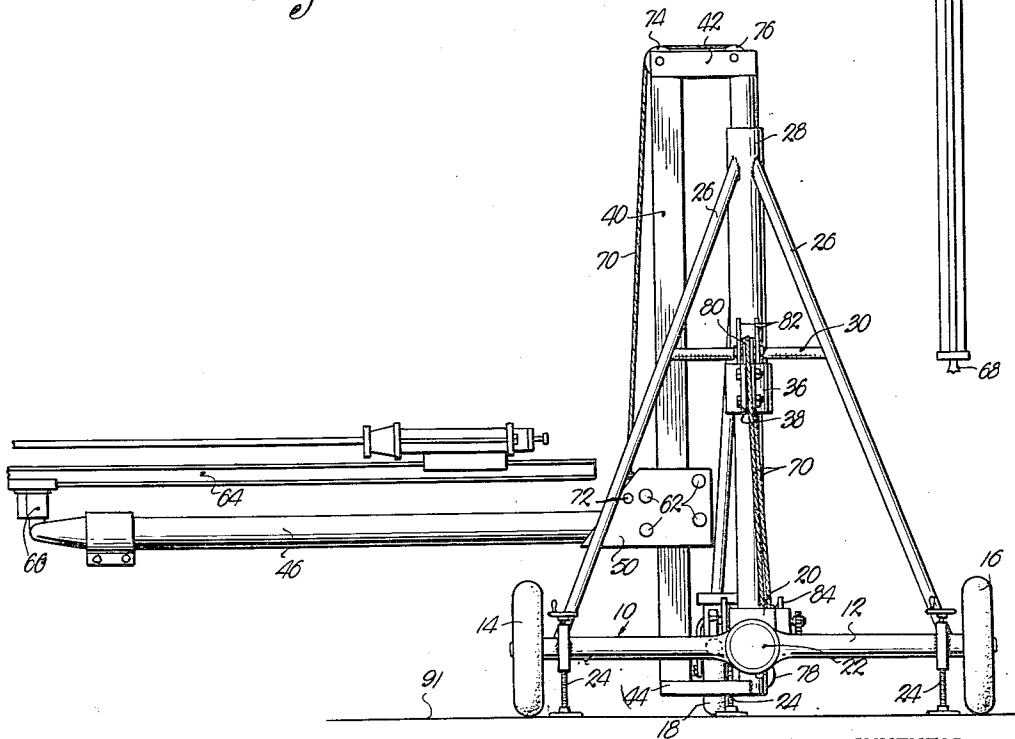


Fig. 2.

INVENTOR.
John Prince, Jr.
BY *Carl Honey*
ATTORNEY.

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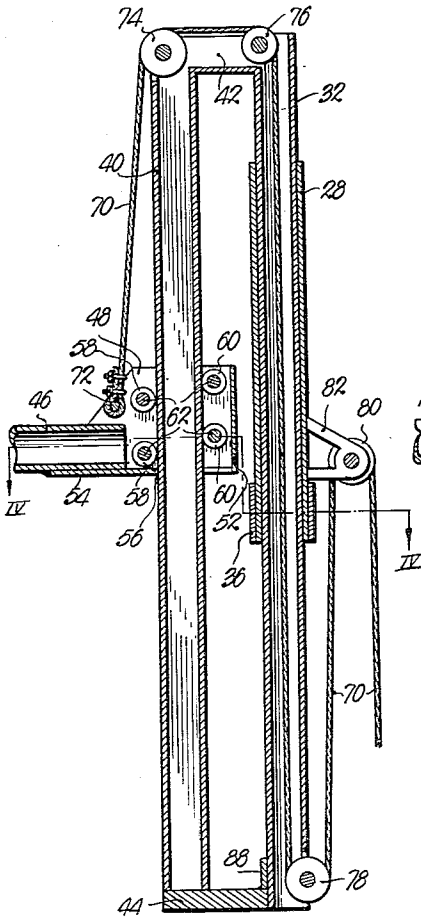


Fig. 3.

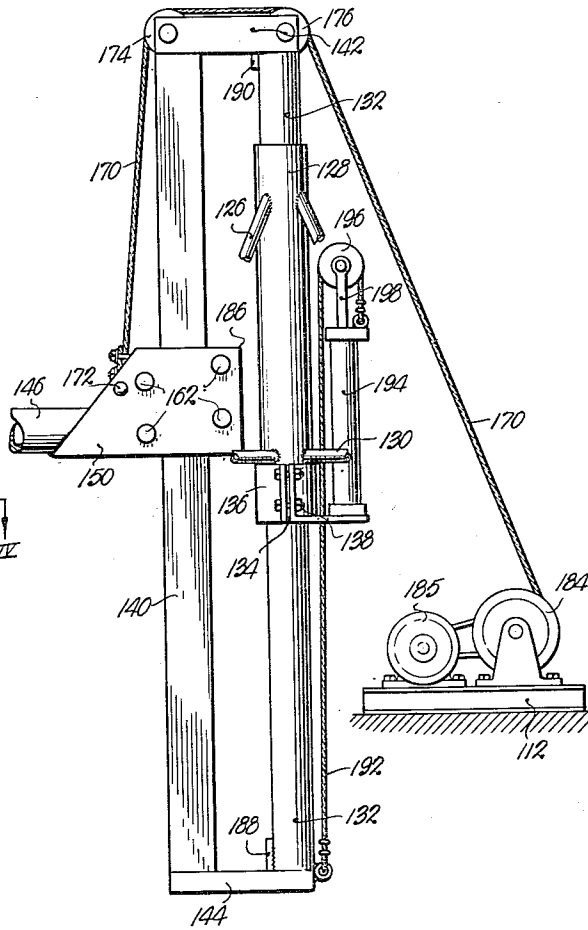


Fig. 5.

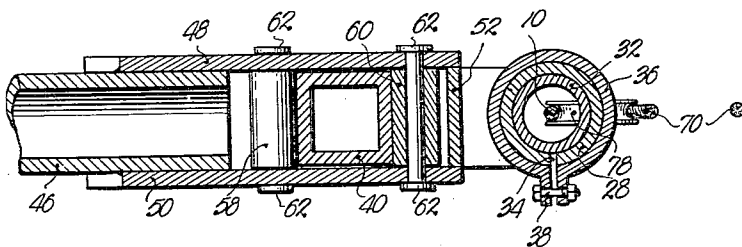


Fig. 4.

INVENTOR.
John Prince, Jr.
BY *Carl H. Young*
ATTORNEY.

1

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DRILL RIG FOR HARD ROCK MINING

John Prince, Jr., Prairie Village, Kans.

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3 Claims. (Cl. 255—51)

This invention relates to drilling equipment and particularly to that class of machinery adapted for use in rock quarries to form the necessary openings within the rock to permit blasting, the primary object being to provide a drill rig wherein it is possible to drill a number of bores converging to a predetermined point or otherwise disposed but in a common horizontal or substantially horizontal plane in parallelism with the floor of the quarry upon which the drilling rig rests during use.

It is common practice in drilling for dynamite blasts in rock quarries to provide a number of bores in the bed of rock, all converging to a substantially common apex, but it is difficult through use of conventional equipment to maintain the bores within a common, substantially horizontal plane. Oftentimes a number of series of such bores are drilled, each series being at a differing height and it is, therefore, desirable that the planes thereof be parallel rather than relatively converging or diverging as is frequently the case in use of presently available equipment.

It is the most important object of the present invention therefore, to provide a drilling rig wherein the longitudinal axis of the drill bit itself is always horizontal or substantially parallel with the bed of the quarry to the end that as the bit is raised or lowered all of the bores will be in parallelism with the bores of horizontal planes thereabove and therebelow.

Another important object of this invention is to provide a drill rig wherein the mount for the drill maintains the latter horizontal at all times regardless of the adjusted height of the drill, and wherein the novel mount thereof permits swinging of the drill to a large number of differing angles with respect to a single vertical rotating axis.

Another important object of the present invention is to provide a drill rig having a drill supporting arm that is not only mounted for swinging movement on a vertical axis, but is vertically reciprocable rectilinearly with respect to its swingable support.

A further object hereof is to provide a drill rig adapted for use in hard rock mining wherein the drill supporting arm is not only vertically reciprocable with respect to its support, but vertically reciprocable with the support therefor.

Other objects include the way in which there is provided in the drill rig hereof a standard that is rotatable and vertically reciprocable with respect to a support; the manner of providing a guide that is secured to the standard for vertical reciprocation and swinging movement therewith; the way in which an arm for the drill is slidably mounted on the guide for vertical reciprocation thereon and for swinging movement therewith; the way in which a drill mount is secured to the arm for swinging movement on a vertical axis with respect thereto; and the way in which there is provided a wide variance in vertical adjustment through a novel multiplying arrangement.

2

In the drawings:

Figure 1 is a top plan view of a drill rig for hard rock mining made pursuant to the present invention.

Fig. 2 is a rear elevational view thereof showing the swingable structure swung to a different position with respect to the mobile chassis therefor.

Fig. 3 is a fragmentary, vertical, cross-sectional view showing a portion only of the drill supporting arm and eliminating the mobile chassis.

Fig. 4 is an enlarged, fragmentary, detailed, cross-sectional view taken on irregular line IV—IV of Fig. 3 looking in the direction of the arrows; and

Fig. 5 is a fragmentary, elevational view showing a modified form of the present invention.

In the form of my invention shown by Figs. 1 to 4 inclusive, there is provided a suitable chassis broadly designated by the numeral 10 that includes a frame 12 that is rendered mobile by a pair of opposed, ground-engaging wheels 14 and 16, and a caster wheel 18 in tri-cycle arrangement. The chassis 10 may be rendered self-propelled through use of a prime mover 20 operably coupled with a differential 22 that is in turn operably joined to the wheels 14 and 16. Steering means not herein illustrated, and operably coupled with the wheel 18, facilitates guiding the entire rig to desired positions within the quarry whereupon the same is stabilized through the medium of jack means 24 connected with the frame 12.

A tripot arrangement forming a part of the frame 12 includes a plurality of upstanding, relatively converging beams 26 that receive a tubular support 28 which is preferably circular in transverse cross-section as shown in Fig. 4 of the drawings. The cylindrical support 28 is additionally stabilized through the medium of horizontal frame pieces 30 connecting with the beams 26.

Support 28 receives an elongated, tubular standard 32 telescoped therein for vertical, rectilinear reciprocation and for rotational movement with respect to the support 28 on the vertical, longitudinal axes of support 28 and standard 32. The support 28 is split as at 34 (Fig. 4) and receives a collar 36 provided with bolt and nut means 38 for clamping the same to the support 28 and for squeezing the latter into clamping relationship to the standard 32 to the end that the latter is held in selected positions and not only against rotational movement with respect to the support 28, but with respect to vertical reciprocation relative thereto.

Standard 32 has a vertical guide 40 attached thereto through the medium of uppermost and lowermost cross members 42 and 44 respectively. The vertical, longitudinal axis of the guide 44 is parallel with the longitudinal axis of the standard 32, and guide 40 is preferably polygonal in cross section as shown in Fig. 4 of the drawings.

An elongated, substantially horizontal arm 46 is mounted on the guide 40 for vertical reciprocation along the longitudinal axis of the latter and for swinging movement with the guide 40 and with the standard 32 on the longitudinal axis of the latter. The innermost end of the arm 46 extends between a pair of spaced, parallel plates 48 and 50, and is welded directly thereto. Plates 48 and 50 are connected by an end wall 52 and by a bottom wall 54, the latter having a clearance opening 56 therein for the guide 40.

Plates 48 and 50 are interconnected by a pair of spaced rollers 58 engaging the outermost face of the guide 40 and by a second pair of spaced rollers 60 disposed between the rear wall 52 and the opposite face of the guide 40 in engagement with the latter. Rollers 58 and 60 are rotatably mounted between the plates 48 and 50 through the medium of pintles 62. As noted in

3

Figs. 2 and 4 of the drawings, the rollers 60 are offset above the rollers 58.

The arm 46 carries a drill mount 64 at the outermost end thereof for swinging movement on a vertical axis 66, the nature of the mount 64 being of no importance to the present invention, and it may be pointed out that the same is adapted to drive a horizontal bit 68 in the usual manner.

Means for raising and lowering the arm 46 and the drill mount 64 thereon, includes a cable 70 that is connected at one end thereof to plates 48 and 50 by a pin 72 joining the same. The cable 70 extends from the pin 72 upwardly and around a pulley 74 rotatably carried by the guide 40 partially therewithin at its uppermost end. From pulley 74 the cable 70 extends around a pulley 76 rotatably carried by the standard 32 at its uppermost end, and from the pulley 76, the cable 70 extends downwardly through the tubular standard 28 around a pulley 78 rotatably carried by the standard 32 at its lowermost end. A pulley 80 is rotatably mounted on a bracket 82 that is rigidly secured to the support 28. Cable 70 extends from the pulley 78 upwardly and around the pulley 80 and thence downwardly for connection with a power winch 84 (Figs. 1 and 2) that is carried by the frame 12 and operably coupled with prime mover 20.

It is clear that upon operation of the winch 84, arm 46 and the drill mount 64 thereon will be raised and lowered with respect to the guide 40 to vary the height of the drill bit 68, but that upon loosening of the clamping means that includes the collar 36, the standard 32 will rise in the support 28 as soon as wall 52 engages the uppermost cross member 42. Thereupon the mount 64, arm 46, guide 40 and standard 32 will be raised as a unit with respect to the support 28 by the operation of winch 84 winding cable 70 thereon. A stop 88 on the standard 32 limits the extent of upward movement thereof by coming into engagement with the lowermost end of the tubular support 28.

When the winch 84 is operated in the opposite direction, standard 32 will descend with respect to the support 28 until cross member 42 engages the uppermost end of the support 28, whereupon the arm 46 will descend on the guide 40 until the wall 52 comes into engagement with the lowermost cross piece 44.

In the modification shown in Fig. 5 of the drawings, corresponding numerals of three digits each designate like parts and it is seen that in this form of the invention, the difference lies only in the manner of raising and lowering the arm 146 and the standard 132 with guide 140 thereon. Cable 170 passes over pulleys 174 and 176 and then directly to winch 184 on frame 112 that is driven in any suitable manner such as through an operable connection with a prime mover 185.

The standard 132 is raised and lowered separately in the form of the invention shown by Fig. 5 through the medium of a cable 192 secured at one end thereof to the standard 132 at the lowermost end of the latter and at its opposite end to a hydraulic cylinder 194. Cable 192 passes over a pulley 196 on the uppermost end of

4

a piston rod 198 that is in turn secured to a vertically reciprocable piston (not shown) within the cylinder 194. A stop 190 on standard 132 limits the extent of downward movement thereof relative to support 128.

It is now seen that in both forms of the invention the longitudinal axis of the drill 68 will always remain substantially horizontal or at least in parallelism with the floor 91 of the rock quarry, but that the height of the drill 68 may be raised and lowered as desired. Furthermore, the angularity of the longitudinal axis of the drill 68 may be varied with respect to the vertical axis of the support 28, not only by swinging of the mount 64 on the arm 46, but by swinging of the entire assembly with respect to the support 28 on the vertical axis of the latter.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In drilling apparatus, a support; a standard carried by the support for vertical reciprocation relative thereto; a guide attached to the standard for vertical reciprocation therewith; a drill-supporting arm carried by the guide for vertical reciprocation relative thereto; cable and pulley structure operably coupled with the support and the standard for raising and lowering the latter upon exertion of a pull on the cable of said structure; and means for raising and lowering the arm relative to the guide as the standard is reciprocated.

2. In drilling apparatus, a support; a standard carried by the support for vertical reciprocation relative thereto; a guide attached to the standard for vertical reciprocation therewith; a drill-supporting arm carried by the guide for vertical reciprocation relative thereto; a cable attached to the arm for raising and lowering the latter upon exertion of a pull on the cable; pulley means mounted on the standard at each end respectively of said standard; and pulley means carried by the support, said cable extending from the arm, over the pulley means at the upper end of the standard, under the pulley means at the lower end of the standard, and thence over the pulley means on the support, whereby the cable raises the standard after the arm is raised to the upper end of the guide.

3. In drilling apparatus, a support; a standard carried by the support for vertical reciprocation relative thereto; a guide attached to the standard for vertical reciprocation therewith; a drill-supporting arm carried by the guide for vertical reciprocation relative thereto; a first cable attached to the arm for raising and lowering the latter upon exertion of a pull on the first cable; pulley means mounted on the standard at the uppermost end of the latter, said cable extending from the arm and over the pulley means; a second cable interconnecting the standard and the support; and means on the support for exerting a pull on the second cable to raise and lower the standard.

References Cited in the file of this patent

UNITED STATES PATENTS

1,701,258	Clement et al. _____ Feb. 5, 1929
2,409,843	Feucht _____ Oct. 22, 1946