Nov. 1, 1966 L. A. D. PAULSON ETAL 3,282,356

DRILLING DEVICE

Filed Dec. 2, 1963

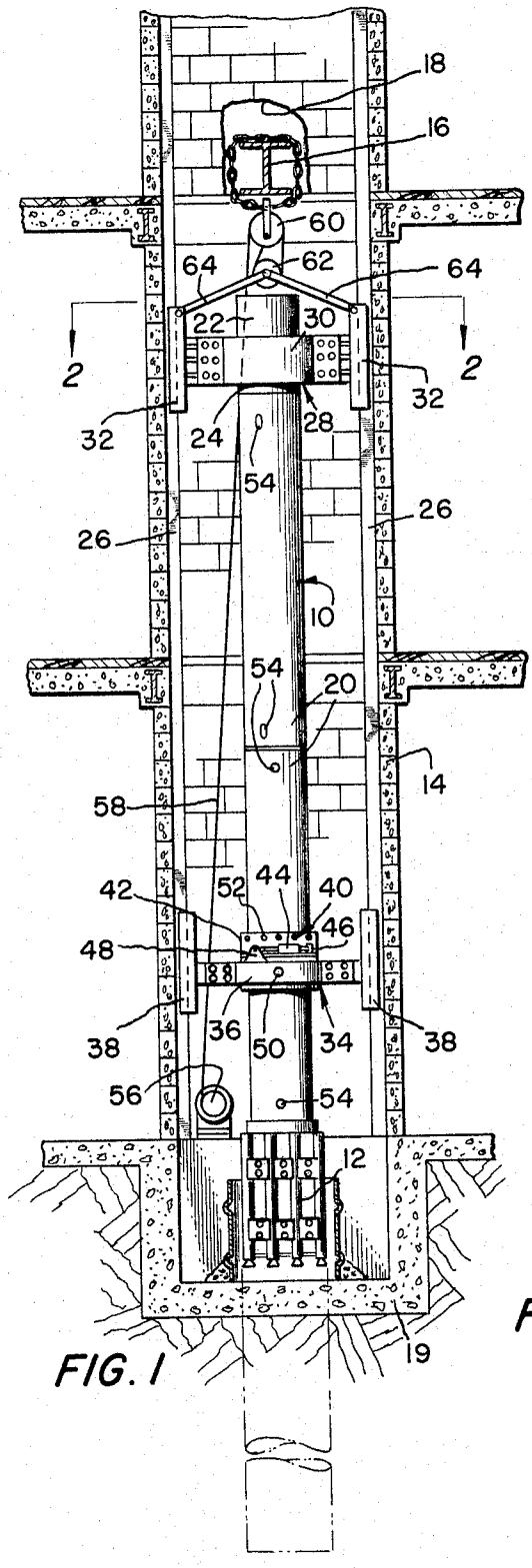


FIG. 1

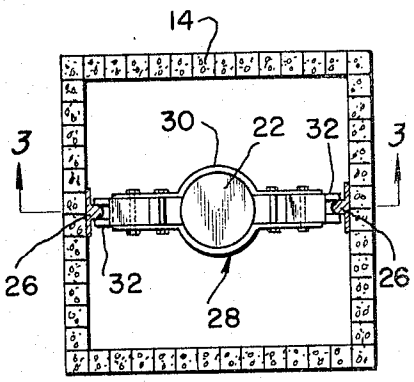


FIG. 2

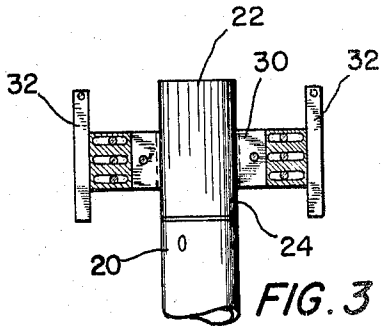


FIG. 3

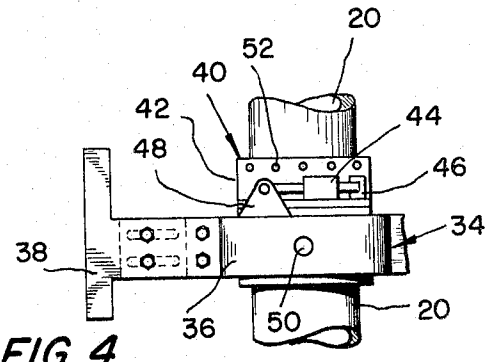


FIG. 4

INVENTORS

LOREE A.D. PAULSON

JOHN W. ADAMS

BY

Arthur Frederick

ATTORNEY

United States Patent Office

3,282,356

Patented Nov. 1, 1966

3,282,356

DRILLING DEVICE

Loree A. D. Paulson and John W. Adams, Phillipsburg, N.J., assignors to Ingersoll-Rand Company, New York, N.Y., a corporation of New Jersey

Filed Dec. 2, 1963, Ser. No. 327,362
4 Claims. (Cl. 175—103)

This invention relates to rock drilling apparatus, and more particularly to the use of a rock drilling apparatus within a building.

Presently, when it is required to drill a hole centrally through the floor and the underlying formation of an elevator shaft to install a hydraulic cylinder for a hydraulically operated elevator, various types of drills such as churn drills or calyx drills are used. With these types of drills, in particular when drilling is to be performed in unfavorable formations, the results are poor alignment of the hole being drilled and slow progress of drilling operations. Further disadvantages of the use of these types of drills are that the mountings for the drills, such as tower structures and rigs, are to be erected outside of the drilling site either within or outside of the building, requiring support, drive, and control cables to run through the building to the outside mountings, usually causing interference with work being done in those areas even remote from the drilling site.

With the present invention, however, tower structures and rigs are eliminated, rigging of the drill is considerably simplified and limited to the drilling site only, and drilling operations are substantially faster relative to the performance of the conventionally used drills.

It is an object of this invention to provide a drilling arrangement with which the presently used mountings are eliminated.

Another object of this invention is to provide a drilling arrangement with which drilling operations are performed faster than heretofore experienced.

Yet another object of this invention is to provide a drilling arrangement with which drilling operations are considerably simplified.

The foregoing and other objects of the invention will be obvious from the accompanying drawings wherein:

FIGURE 1 shows a longitudinal section of a portion of the elevator shaft in which a drilling device is positioned for drilling operations through the bottom and the underlying material of the elevator shaft,

FIG. 2 shows a cross section of the elevator shaft taken along the line 2—2 of FIG. 1, looking in the direction of the arrows,

FIG. 3 shows the centralizer means, partly in section, for the rear end portion of the drilling device, and

FIG. 4 shows the centralizer means for the forward end portion of the drilling device.

The drilling arrangement according to this invention is shown in FIG. 1 in its preferred embodiment, and comprises a drilling device **10** including a down-the-hole gang drill **12** of the type invented by Ewald H. Kurt and John W. Adams and disclosed in U.S. patent application, Serial No. 186,248, filed April 9, 1962. Drilling device **10** is positioned in an elevator shaft **14** suspended from a suitable support such as an I-beam **16**. I-beam **16** extends transversely of the elevator shaft through openings **18** temporarily made in two opposing side walls of the elevator shaft. As shown in FIG. 1, the drilling device **10** is positioned in a centralized position ready to start drilling operations to drill an opening through the center of the bottom **19** and the underlying material of the elevator shaft **14**.

The down-the-hole gang drill **12**, formed by a plurality of independently operative down-the-hole percussive drills mounted in a cluster or unit, is connected at its

rear end to drill steels **20** which are rotated to rotate the gang drill by a rotary head or drill motor **22** by means of a spindle **24** driven by the rotory head **22**. The gang drill is fed operating pressure fluid through the hollow drill steels **20** from a conventional source of supply (not shown) and the drill steels are simultaneously rotated by the rotary head, all of this being carried out by means similar to those used for a commonly known single down-the-hole drilling device such as shown in U.S. Patent No. 2,886,004, issued May 1959 to W. A. Morrison.

In order to maintain the proper position of the drilling device during operation thereof to drill an opening through the bottom and the underlying material of the elevator shaft substantially in axial alignment with the longitudinal axis of the elevator shaft, use is made of the elevator guides **26** furnished in the elevator shaft to guide the elevator (not shown) during its operation in the elevator shaft. Accordingly, centralizer means **28** and **34** are provided to be positioned at, respectively, the rear end portion and the forward end portion of the drilling device to cooperate with the elevator guides **26** to maintain the drilling device in a proper drilling position during drilling operations thereof.

Centralizer means **28** includes a central portion in the form of a clamp **30** within which the rotary head **22** is rigidly held against rotation. Radially disposed from the clamp **30** are wing sections **32** which are at one end adjustably connected to the outer end portions of clamp **30**, and at the other end slidably engaged with the guides **26** of the elevator shaft. Wing sections **32** are evenly spaced from the center of clamp **30**. Since guides **26** are positioned parallel to each other and to the longitudinal axis of the elevator shaft, and evenly spaced from the longitudinal axis of the elevator shaft, the rotary head **22** of the drilling device is held by centralizer **28** in a central position relative to the longitudinal axis of the elevator shaft while it is longitudinally moved along and guided by guides **26**. The adjustable wing sections of the centralizer provide for adaptability to the widths of the various elevator shafts within which the drilling device is to be operated.

Centralizer means **34** is provided to maintain the forward end portion of the drilling device in axial alignment with the longitudinal axis of the elevator shaft. Accordingly, centralizer **34** is positioned in the lower or forward end portion of the elevator shaft and includes a central portion in the form of a bushing **36** having an inner diameter slightly greater than the outer diameter of the drill rods **20** to permit rotation of the drill rods in bushing **36**. A pair of opposing wing sections **38** is adjustably connected to the outer ends of bushing **36** in a manner similar to the connection of the wing sections to centralizer **28** to provide for maintaining the forward end portion of the drilling device centralized, and for adaptability to the widths of the various elevator shafts within which the drilling device is to be operated. It is to be noted that centralizer **34** may be held against longitudinal movement along guides **26** in any suitable manner such as clamping the wing sections **38** against guides **26**. With this arrangement the drill rod at the lower or forward end portion of the elevator shaft is held in axial alignment with the longitudinal axis of the elevator shaft while the drill rods are permitted to be rotated and simultaneously moved longitudinally.

In order to feed the drill into the hole being drilled through the bottom of the elevator shaft and the underlying material thereof or to retract the drill from the hole being drilled, a suitable type commonly known hoist **56** is provided to either raise or lower the drilling device. Raising and lowering of the drilling device is achieved by means of a cable **58** reeved about sheaves **60** and **62**, sheave **60** being connected to I-beam support **16**, and

sheave **62** being connected to support the drilling device by means of arms **64** mounted on centralizer **28**.

Operation

When a hole is to be drilled centrally through the bottom of an elevator shaft and the underlying material thereof, the height of positioning I-beam support **16** and the number of drill rods to be used is determined by the depth of the hole to be drilled. In this instance, as illustrated in FIG. 1, drilling of an opening through the bottom of the elevator shaft and the underlying material thereof requires a drilling device including two ten-foot length drill rods **20**. The drill rods are screwed to each other to form a drill string, the rear end of the drill string being connected to the forward end portion of spindle **24** of the rotary head **22** while the forward end of the drill string is connected to gang drill **12**.

Gang drill **12** is of the rotary percussive down-the-hole type, pressure fluid to cause percussive action of the drill being conducted through the interior of the drill rods to drill **12** while rotary action of the drill is effected by transmission of rotary motion from spindle **24** of the rotary head **22** to the drill by means of the drill rods in a well known manner. As the hole through the bottom of the elevator shaft and the underlying material thereof is to be in axial alignment with the longitudinal axis of the elevator shaft, centralizers **28** and **34** cooperate with each other and with the elevator guides **26** of the elevator shaft to maintain the drilling device in a proper axial position relative to the longitudinal axis of the elevator shaft. While the drilling device is moving forwardly, drill **12** gradually but rapidly penetrates the material to be drilled, centralizer **28** guided by guides **26** maintaining the rear end portion of the drilling device, the rotary head **28**, in a proper drilling position relative to the hole being drilled. Centralizer **34** maintains the portion of the drilling device in the forward or lower end portion of the elevator shaft in a proper drilling position. Penetration of the drill into the material being drilled is controllable by hoist **56** by suitably feeding the drill by means of the cable **58**.

To provide for unscrewing of the drill rods from each other in case more than one drill rod is used, a rod breaker **40** incorporated with centralizer **34** is furnished. Rod breaker **40** includes a bushing **42** having an inner diameter slightly greater than the outer diameter of the drill rods and positioned rearwardly of bushing **36** of centralizer **34**. A conventional type pressure fluid motor **44** having the rear end of the cylinder portion of the motor pivotally connected to a support **46** welded or screwed to the outer wall of bushing **42** while the outer end of the piston rod of the motor is pivotally connected to a support **48** welded or screwed to the outer wall of bushing **36** in circumferentially spaced relationship relative to support **46**. Extension or retraction of the piston rod of motor **44** will cause rotation of the bushings in opposite directions, one relative to the other.

Bushing **36** is provided with two diametrically opposing openings **50**, while bushing **42** is provided with a series of diametrically opposing openings **52**. The distance between an opening **50** in bushing **36** and a longitudinally spaced and corresponding opening **52** in bushing **42** is equal to the distance between two longitudinally spaced and opposing openings **54** furnished in the end portions of the drill rods to cooperate with the rod breaker for unscrewing the drill rods from each other, as will be explained hereinafter.

When the proper depth of the drill hole is reached, hoist **56** raises the drilling device until the joint between the drill rods **20** is at the centralizer **34** such that opening **50** in bushing **36** registers with opening **54** in the upper end of the lower drill rod, and one of the openings **52** in bushing **42** registers with opening **54** in the lower end of the upper drill rod. A rod is then inserted in opening **50** to extend through bushing **36** and the upper end of lower drill rod **10**, while another rod is inserted in the

associated opening **52** of bushing **42** to extend through bushing **42** and the lower end of upper drill rod **10**. Motor **44** is then operated to rotate bushings **36** and **42** in opposite directions thereby rotating the drill rods in the proper opposite directions to unscrew the drill rods from each other. When more than two drill rods are used, each joint between the drill rods can be broken likewise. The joint between the spindle **24** and the upper drill rod may be broken in the same manner as hereinbefore described.

It is to be understood that although only one embodiment of the invention is shown and described, the invention is not confined to the exact features shown as various changes and modifications may be made within the scope of the claims.

We claim:

1. The combination with an elevator shaft having longitudinal guide means positioned interiorly of said shaft and opposing each other comprising,

(a) a support within said shaft displaced longitudinally from the bottom of said shaft,

(b) a rock drilling device of the rotary percussive type suspended from said support to be lowered to and retracted from the bottom of said shaft, and

(c) a centralizer slidably mounted on said guides having a central portion to receive and maintain said rock drilling device in a central position relative to said elevator shaft.

2. The combination with an elevator shaft having longitudinal guides positioned interiorly of said shaft and opposing each other comprising,

(a) a support within said shaft displaced longitudinally from the bottom of said shaft,

(b) a rock drilling device of the rotary percussive type suspended from said support to be lowered to and to be retracted from the bottom of said shaft,

(c) a first centralizer slidably mounted on said guides having a central portion positioned coaxially with the longitudinal axis of said shaft to hold the upper end portion of said drilling device coaxially with the longitudinal axis of said shaft, and

(d) a second centralizer rigidly mounted in said shaft having a central portion positioned coaxially with the longitudinal axis of said shaft to slidably receive and maintain the forward end portion of said rock drilling device in a central position relative to said elevator shaft.

3. The combination with an elevator shaft having longitudinal guides positioned interiorly of said shaft and opposing each other comprising,

(a) a support within said shaft displaced longitudinally from the bottom of said shaft,

(b) a rock drilling device suspended from said support to be lowered to and to be retracted from the bottom of said shaft, said rock drilling device including a rotary drill motor, a plurality of drill steels connected in end to end relation to each other to form a drill string having one end connected to said drill motor to be rotated thereby, a gang drill mounted on the free end of said drill string to be rotated thereby, and means to conduct pressure fluid to said drill motor and said gang drill for operation thereof,

(c) a first centralizer slidably mounted on said guides having a central portion positioned coaxially with the longitudinal axis of said shaft to hold said drill motor of said drilling device coaxially with the longitudinal axis of said shaft,

(d) a second centralizer rigidly mounted in said shaft having a central portion positioned coaxially with the longitudinal axis of said shaft to slidably receive and maintain said drill string of said rock drilling device in a central position relative to said elevator shaft, and

(e) means mounted on said second centralizer to co-

operate with said drill steels to effect rotation of one of said drill steels relative to the other of said drill steels.

4. The device claimed in claim 3 in which the outer end portions of said centralizers are radially adjustable relative to the central portion of said centralizers.

References Cited by the Examiner

UNITED STATES PATENTS

2,105,091 1/1938 MacKay ---------- 175—103 X

JACOB L. NACKENOFF, *Primary Examiner.*

N. C. BYERS, *Assistant Examiner.*