

May 8, 1934.

C. C. HANSEN

1,958,041

SUBMARINE DRILL UNIT

Filed July 21, 1932

2 Sheets-Sheet 1

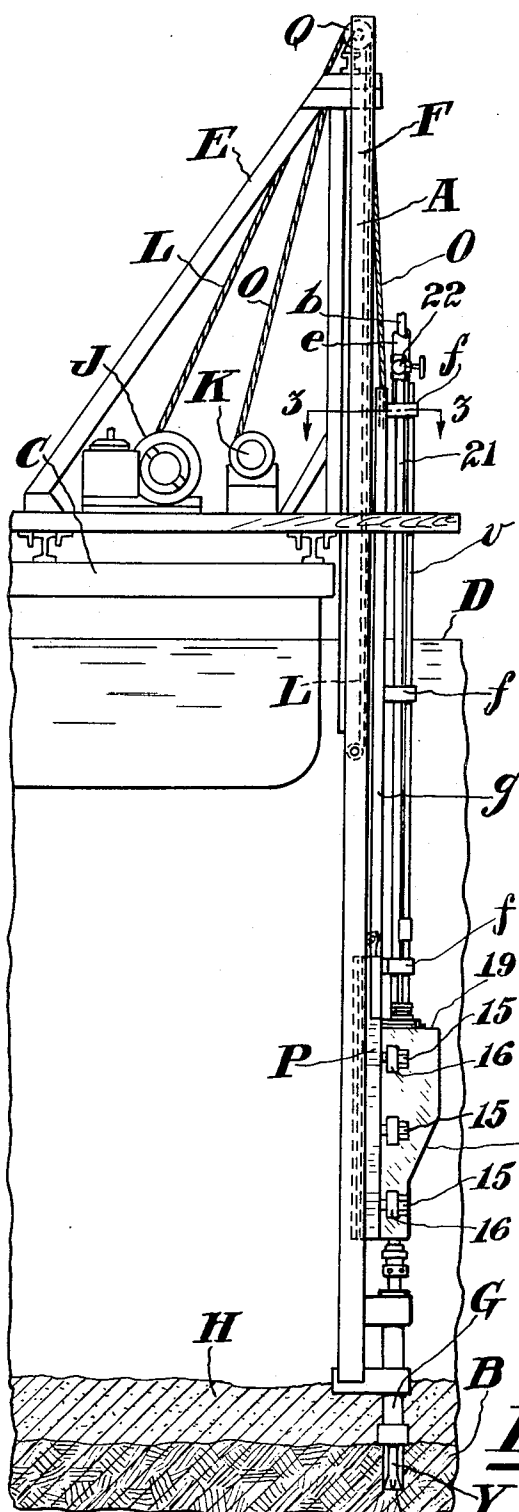


FIG. 1.

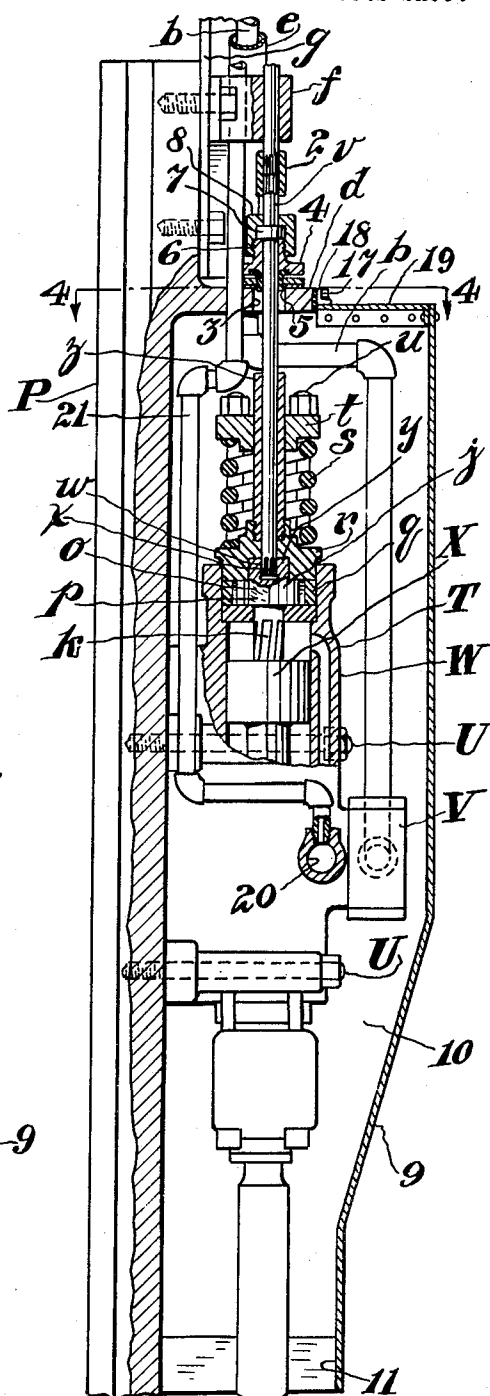


FIG. 2.

INVENTOR.

Charles C. Hansen

BY *Charles D. Allen*

HIS ATTORNEY.

May 8, 1934.

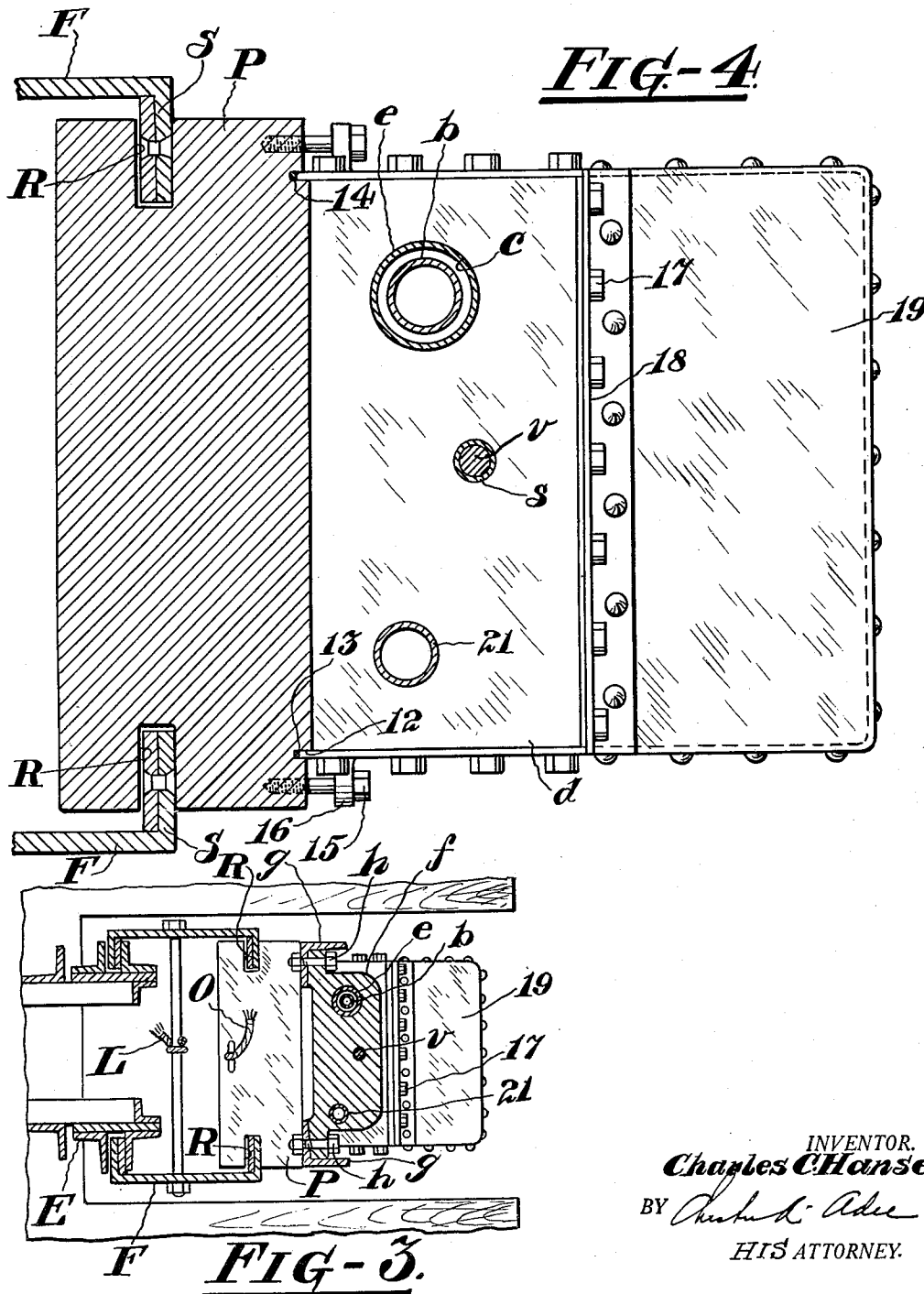
C. C. HANSEN

1,958,041

SUBMARINE DRILL UNIT

Filed July 21, 1932

2 Sheets-Sheet 2



INVENTOR.
Charles C. Hansen.
 BY *Charles H. Adie*
 HIS ATTORNEY.

UNITED STATES PATENT OFFICE

1,958,041

SUBMARINE DRILL UNIT

Charles C. Hansen, Easton, Pa., assignor to
Ingersoll-Rand Company, Jersey City, N. J., a
corporation of New Jersey

Application July 21, 1932, Serial No. 623,733

7 Claims. (Cl. 255—51)

This invention relates to submarine drilling apparatus, and more particularly to apparatus of this character wherein the rock drill is adapted to be submerged in the water overlying the material intended to be drilled.

The objects of the invention are to improve, in general, the efficiency of the drilling apparatus and more particularly to adequately protect the various wearing and bearing surfaces of the elements of the rock drill against exposure to water and entrained solids, to equip the rock drill with means whereby the action of the percussive and rotative elements of a submerged rock drill may be noted from the operator's position, and to prevent power losses in the pressure fluid during its transmission from a source to the rock drill.

Other objects will be in part obvious and in part pointed out hereinafter.

In the accompanying drawings forming a part of this specification and in which similar reference characters refer to similar parts,

Figure 1 is a side elevation of a submarine drilling unit constructed in accordance with the practice of the invention,

Figure 2 is a sectional elevation, partly broken away, of the rock drill and the elements that constitute the casing wherein the rock drill is arranged and whereby it is supported, and

Figures 3 and 4 are transverse views taken on the lines 3—3 and 4—4 of Figures 1 and 2 respectively looking in the directions indicated by the arrows.

Referring more particularly to the drawings, A represents, in general, a submarine drilling unit adapted to drill holes in the bed of a stream, such as rock B. The drilling unit A is shown mounted upon a barge C resting upon the water D which overlies the rock B.

The support elements of the drilling unit may be of known construction and are herein illustrated as comprising a derrick E which may be affixed to the barge C to serve as a vertical guide for a guide frame F. The guide frame is mounted slidably on the derrick and carries at its lowermost end a sand pipe G which extends through silt H overlying the rock B and seats upon the rock.

Upon the barge may be mounted suitable hoisting mechanism, as for instance those designated J and K, for lowering and raising such elements of the drilling unit as may require adjustment to suit the contour of the working face. For instance, the hoisting mechanism J may be connected, as by means of a cable L, to the guide frame F for actuating said guide frame with re-

spect to the derrick E, and a cable O of the hoisting mechanism K is connected to a support plate P slidably upon the guide frame F. Both cables L and O may be trained over a sheave or sheaves Q arranged at the top or head of the derrick E.

The support plate P may be slidably connected to the guide frame F in any suitable manner, as for instance by providing the support plate P with slots R in opposite sides thereof to receive extensions or legs S of the guide frame.

Mounted on the support plate P is a rock drill T which may be secured to the support plate P by means of bolts U threaded into the support plate. The rock drill T is represented as being of the type adapted to be actuated by compressed air or steam and is accordingly provided with a valve mechanism, only the chest V of which is shown, for effecting the distribution of pressure fluid to the ends of the cylinder W of the rock drill.

Within the cylinder W is a reciprocating piston X which may be connected in known manner to a working implement, such as a drill steel Y for reciprocating said working implement to cut holes Z in the rock B.

The means whereby the steam employed for actuating the piston X is conveyed to the valve chest V consists of a pipe b leading from a source of supply (not shown) but which may be located upon the barge C. The pipe b extends through an aperture c in a lateral flange d on the support plate P and is encased by a pipe e secured to the lateral flange d. The pipe e is of sufficiently larger diameter than the pipe b to form an annular space between the two and thereby insulate the pipe b from the water wherein it is submerged.

The pipe e may be additionally supported by bearings f spaced along the length of an extension or extensions g secured to the support plate P. The bearings f are secured to the extensions g by bolts h, and the extensions g, which may be arranged in parallelism with respect to the guide frame F, are of suitable length to extend above the surface of the water D in the submerged position of the rock drill T.

The rock drill T is shown as being provided with rotation mechanism, designated in general by j, for effecting rotary movement of the working implement Y through the instrumentality of the piston X to which the working implement is attached. The rotation mechanism j is shown as being of the type comprising a rifle bar k which may interlockingly engage the piston X in a well known manner and has a head o carrying

pawl devices *p* for engagement with a ratchet ring *q* which encircles the head *o*.

The ratchet ring *q* and the rifle bar *k* are held against endwise movement by a head *r* seated upon the ratchet ring *q*. The head *r* is pressed against the ratchet ring by a spring *s* interposed between it and a spring seat *t* mounted upon bolts *u* which may be affixed to the rock drill T.

As may be readily appreciated, it is a difficult matter for the operator of a submerged rock drill to ascertain whether the piston X short strokes or exceeds its nominal stroke or, whether maximum drilling progress is being made. The present invention contemplates the provision of means visible from the operator's platform to indicate the action of the movable elements of the rock drill. A preferred means intended to serve this function comprises a rod *v* having a splined end *w* which engages a socket *x* formed in the present instance in an extension *y* of the head *o* of the rifle bar. Preferably a sleeve *z* is threadedly connected to the head *r* and said sleeve extends through the spring seats *t* and encircles that portion of the rod *v* adjacent the rock drill T to form a bearing surface for the rod.

The rod *v* may, if desired, consist of a single member but is preferably formed in sections of which the ends are splined and are suitably connected together by means of a splined sleeve 2 which holds the several sections of the rod against relative rotative movement, thus making it possible to add to or remove sections from the rod *v* in accordance with the depth of the water overlying the rock being drilled.

The rod *v* is shown as extending through an aperture 3 in the lateral flange *d* and on the flange *d* is arranged a stuffing box 4 having a packing member 5 to effect a seal around the rod *v* at this point. The stuffing box 4 also serves as a guide for the rod *v* and is provided with an externally threaded extension 6, the rear end of which serves as a seat for one end of a collar 7 carried by the rod *v*. A nut 8 which is suitably recessed to receive the collar 7 is threaded upon the extension 6 and acts against the other end of the collar 7 to retain the splined end *w* in engagement with the rifle bar.

To the end that the rock drill T may be adequately protected against the entrance of water thereinto a casing 9 is disposed thereabout to form a chamber 10 into which pressure medium may be introduced for air-packing the rock drill and thus exclude the water from the various exposed bearing surfaces of the rock drill and from such openings as may be in communication with the various movable elements of the rock drill. The casing 9 may be constructed of sheet steel and has a restricted opening 11 at its lowermost end through which the working implement Y may extend.

In the support plate P are grooves 12 into which the edges 13 of the casing extend, and in the bottom of the grooves 12 may be arranged packing material 14 to prevent leakage of water through the grooves 12 into the chamber 10.

The casing 9 is securely affixed to the support plate P by bolts 15 which extend through lugs 16 on the exterior of the casing and are threaded into the support plate P. The casing 9 is additionally secured to the support plate P by bolts 17 which extend through a flange 18 of an end wall 19 of the casing and are threaded into the lateral flange *d*.

Owing to the construction described the casing 9 will be suitably sealed at all points above

the opening 11 which is the only point of ingress for water. In order, however, that the water may be prevented from rising to an elevation within the chamber 10 at which it might gain entrance into the rock drill, the rock drill exhausts directly into the chamber 10 through a port 20. In this way steam and uncondensable gases within the chamber 10 will maintain the water at a low level adjacent the opening 11 and at the same time the heat of the elements within the chamber 10 will assure a high temperature of the rock drill.

The retention of these elements within the casing has the effect of also reducing condensation of the steam flowing through that portion of the pipe *b* which lies within the chamber 10 as well as within the rock drill T. The rock drill T will, as will be readily understood, be enveloped by the steam and hot gases and at the same time the steam exhausted into the chamber 10 will be condensed by the comparatively cool surface of the casing 9 which is exposed on its exterior surface to the surrounding water.

The condensate resulting from this action, of course, precipitates and is expelled from the chamber 10 by the pressure of the uncondensable gases within the chamber. Preferably the pressure of the gases within the chamber 10 is maintained at a value only sufficiently greater than the pressure of the water to maintain the water within the casing at a low level since, were this pressure excessively high, an unnecessarily high back pressure would exist within the casing.

In order, therefore, to assure the maintenance of a correct pressure within the casing, the rock drill T is provided with a pipe 21 which may be connected to the rock drill at a point immediately adjacent the exhaust port 20 and extends through the flange *d* to a point above the surface of the water. In the pipe 21 may be interposed a suitable controlling device, such as a valve 22, for regulating the exhaust of such steam and uncondensable gases from the chamber 10 as may be in excess of the pressure required to prevent the rise of water to the rock drill.

From the foregoing description it will be readily apparent that the rock drill T may be conveniently protected against the admission of water thereinto and that, in such instances as where the rock drill is actuated by steam, the temperature of the rock drill may be maintained at a high value and that excessive condensation of steam flowing from the source of supply will be prevented both during its passage through that portion of the supply line which is submerged in the water and also within the rock drill itself.

It will further be apparent that by providing the rock drill with the tell-tale rod *v* the operator may be constantly aware of the actions of the reciprocatory and rotative elements of the rock drill, as when the piston X is operating at normal stroke and during which time the rotation mechanism will, of course, describe a partial rotary movement of a given arc upon each stroke of the piston X, this action of the piston will be indicated by the rod *v*. On the other hand, should the piston X short stroke or merely flutter as is frequently the case when the drill steel becomes stuck or encounters great resistance to rotation the rod *v* will, of course, move through an arc of considerably smaller extent, thus indicating that little or no drilling progress is being made.

I claim:

1. A submarine drill unit having a main frame, a guide frame slidable on the main frame, a

casing on the guide frame and having an opening, a fluid actuated rock drill in the casing adapted to be submerged and exhausting into the casing to air-pack the rock drill, and means for controlling the pressure of the exhaust fluid within the casing.

2. A submarine drill unit having a main frame, a guide frame slidable on the main frame, a casing on the guide frame and having an opening at one end, a submersible fluid actuated rock drill within and supported by the casing and exhausting thereinto to air-pack the rock drill, and means for controlling the pressure of the exhaust fluid within the casing.

3. A submarine drill unit having a main frame, a guide frame slidable on the main frame, a support plate on the guide frame, a fluid actuated rock drill adapted to be submerged and being supported by the support plate, a casing on the support plate forming a chamber around the rock drill and into which the exhaust fluid of the rock drill flows for air-packing said rock drill, a conduit for conveying discharge fluid from the casing, and valve means for controlling the flow of fluid through the conduit.

4. A submarine drill unit having a support member, a submersible rock drill thereon having a working implement, a reciprocatory piston for actuating the working implement, rotation mechanism for rotating the working implement, and an indicating device rotated by the rotation mechanism and being visible at the surface of the water wherein the rock drill is submerged to indicate the action of the rotation mechanism.

5. A submarine drill unit having a support member, a casing cooperating therewith to form a chamber having a wall at one end and an open-

ing at the other end, a rock drill in the chamber and being supported by the support member, rotation mechanism for the rock drill, a rod rotated by the rotation mechanism and extending above the surface of the water wherein the rock drill is submerged, and a packing device on the wall to prevent leakage of water along the rod into the chamber.

6. A submarine drill unit having a support member, a guide frame therefor, a submersible fluid actuated rock drill supported by the support member and having rotation mechanism, a casing on the support member and cooperating therewith to form a chamber around the rock drill and into which the exhaust fluid from the rock drill flows for air-packing the rock drill, a rod rotated by the rotation mechanism extending through the casing and above the water wherein the rock drill is submerged, and a packing device on the casing to prevent leakage of water and air along the rod.

7. A submarine drill unit having a support member, a guide frame therefor, a submersible fluid actuated rock drill supported by the support member, a casing on the support member forming a chamber wherein the rock drill is arranged and into which the exhaust fluid flows to air-pack the rock drill, a conduit for conveying a portion of exhaust fluid from the chamber to the atmosphere, a pressure fluid supply line for the rock drill, and protection means encircling the supply line and being spaced therefrom to prevent exposure of the supply line to the water through which it extends.

CHARLES C. HANSEN.

40

45

50

55

60

65

70

75

80

85

90

95

110

115

120

125

130

135

140

145

150