

June 24, 1930.

W. D. GRANT

1,766,628

SUBAQUATIC DRILL

Filed Aug. 6, 1928

2 Sheets-Sheet 1

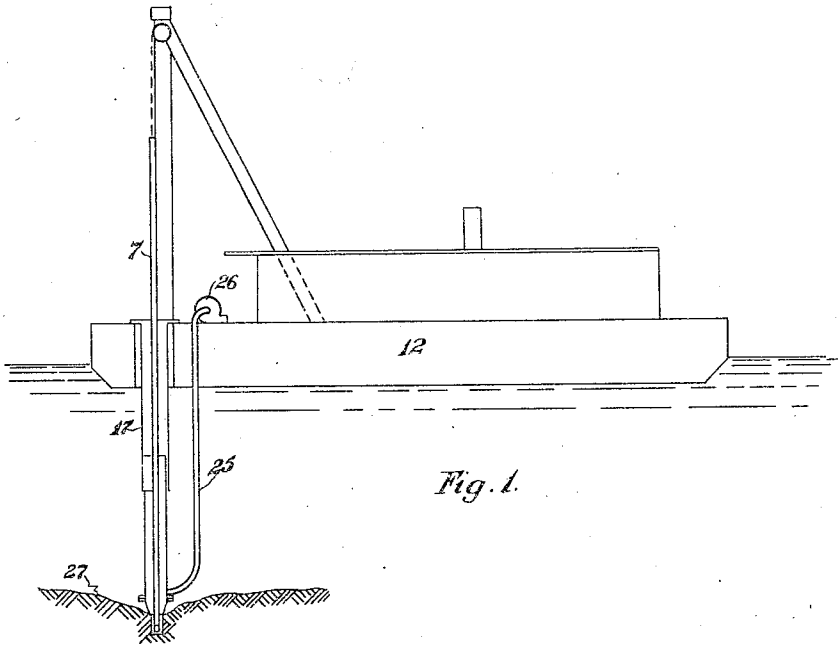


Fig. 1.

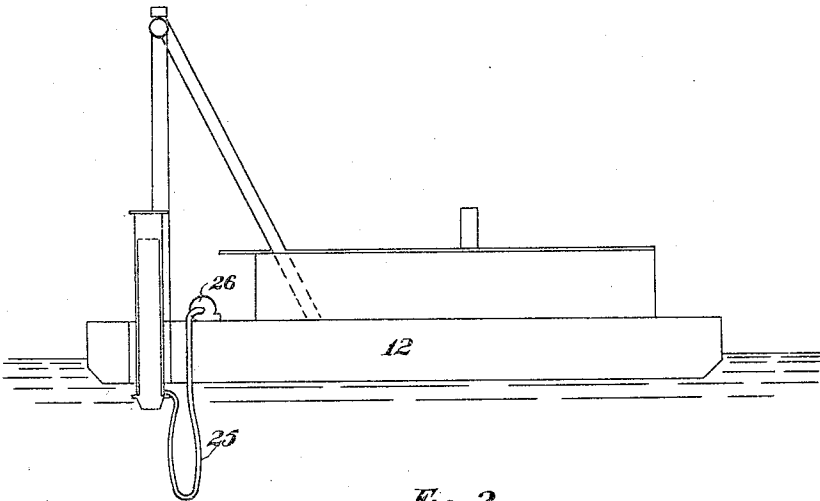
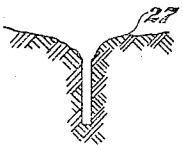


Fig. 2.



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2 Sheets-Sheet 2

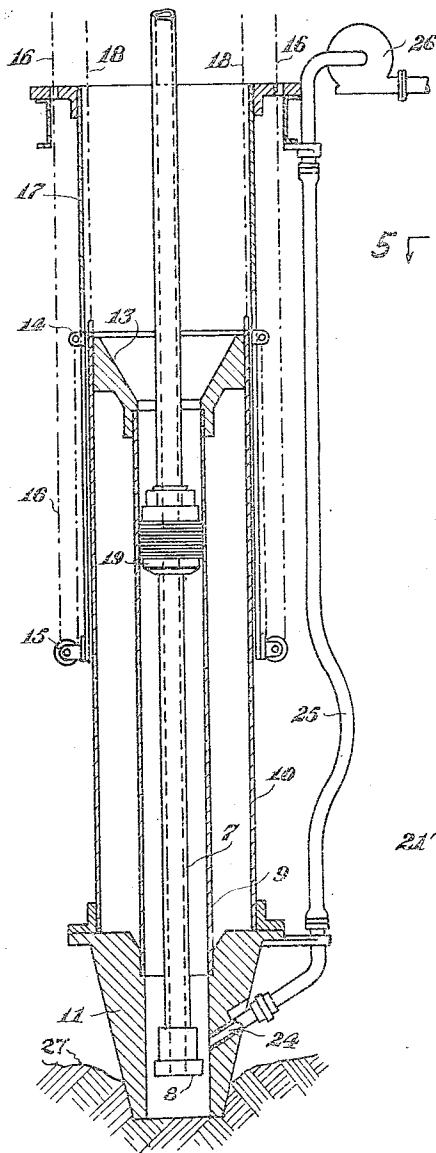


Fig. 3.

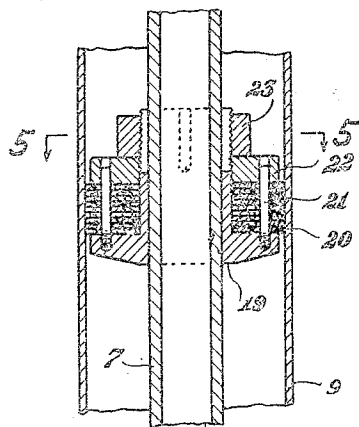


Fig. 4.

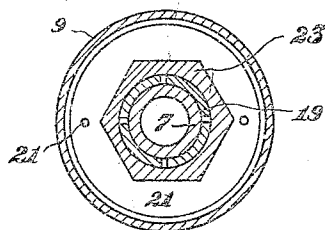


Fig. 5.

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UNITED STATES PATENT OFFICE

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SUBAQUATIC DRILL

Application filed August 6, 1928. Serial No. 297,893.

This invention relates to an outer casing for a subaquatic drill of that class wherein the drill head is secured to the lower end of a comparatively heavy drill rod which is lifted and allowed to fall, or is driven down by steam or mechanical means, and thus effects the cutting or smashing up of the rock or other hard material on which it is operating.

Such drills are usually enclosed in a casing of circular section to above water level and wash water under pressure is delivered to the drill head through the centre of the drill rod, the detritus being blown through the casing a short distance above the bottom.

An alternative method is to supply the wash water into the closed casing surrounding the drill and to remove the detritus upwards through the centre of the drill.

The advantage of either method depends upon the nature of the rock encountered, and in certain classes of work the material refuses to be fractured into pieces but pulverizes to a fine mud which settles upon or near the bottom of the drill hole and extends up into the lower part of the drill casing greatly impeding the action of the drill.

In the method which is the subject of the present application the drill casing is further enclosed within a larger casing which may be of circular, square, rectangular or other desirable cross section and which is provided with a heavy shoe on the bottom end, adapted to centre upon and enter the taper hole made by the drill before it has found its centre, the detritus produced by the drill sealing the contacting surface at the bottom of the shoe.

This outer casing or "spud" is made telescopic so as to accommodate itself to varying depths of water and the circular drill casing is axially secured within the lower section. Wash water under considerable pressure is either continuously or intermittently delivered to the drill through the hollow rod and the rock crushings and mud violently agitated thereby.

In order to readily remove the material produced by the operation of the drill, an

opening is made in the outer casing at any convenient height through which the mud, silt and rock particles can escape. This opening may be connected by a hose of suitable proportions to an ejector pump operated from the deck of the drilling scow, in order to remove the back pressure of the water, and thereby assist the wash water in the task of scouring out the detritus resulting from the operation of the drill.

In order to concentrate the pressure of the wash water in the casing upon the material around the drill a plunger or stopper is provided between the drill rod and the drill casing, which prevents such water from escaping upwards and confines it to the lower portion of the drill casing. This stopper is made adjustable upon the rod and can be clamped or secured thereto at any convenient height above the drill head, thus ensuring the concentration of the scouring effect upon the lower portion of the drill casing.

The equipment is suspended in the usual way from suitable beams or supports projecting from the deck of the drill scow as described in Patent No. 1,517,556 dated December 2, 1924, and may if desired be placed in one or more of the "spuds" provided and used for holding the position of the scow, the "spuds" thus becoming the outer casings above referred to. The "spud" may if desired pass directly through the scow and be secured in position thereto as indicated on Figure 1 and Figure 2.

The invention is more clearly described by reference to the drawings herewith which accompany and form part of this application and in which:

Fig. 1 is a general view of a drill scow showing the equipment in use drilling a hole in rock.

Fig. 2 is a similar view showing the outer casing retracted and the scow ready to be moved.

Fig. 3 represents a vertical and partly sectional view of the invention to a larger scale illustrating the relative position of the drill rod, plunger, inner casing and outer casing.

Fig. 4 is an enlarged sectional view of the plunger shown in Fig. 1.

Fig. 5 is a section of the inner casing taken on the line 5—5 in Fig. 4.

In these drawings 7 represents the hollow drill rod, fitted at the lower end with the drill head 8. This rod when operating has a vertical reciprocating motion in the inner casing 9 which is circular in cross section. Surrounding the casing 9 is the outer casing 10, which may be of circular, square, or rectangular section, and the lower end of which terminates in the heavy metal shoe 11, which is adapted to locate and secure the lower end of the inner casing 9, and is axially perforated in order to allow the drill 8 to operate upon the rock 27 underneath.

The outer casing 10 is capable of being moved vertically, sliding up telescopically inside the portion 17 which is made large enough for that purpose. The casing 17 is slotted for the passage of the cable lugs 14 and can be moved up through suitable guides in the drill scow 12. The whole outer casing can thus be collapsed and lifted up through the scow, when the latter is to be changed in position.

The upper end of the inner casing 9 is also located and spaced with reference to the outer casing 10 by means of the head casting 13 and a system of lugs 14, pulleys 15 and cables 16 is shown by which the lower portion 10 can be extended or protruded downwards, the cable 16 being operated from the scow winches, or by steam, hydraulic or electrical means. The haul-back cables 18 are for the purpose of retracting the casing 10 when required and are similarly operated.

The drill rod 7 is hollow, and wash water under pressure is delivered through the centre of the rod to the drill 8 at the bottom. This water is confined to the lower portion of the casing 9 by means of the stopper or plug 19. The latter, shown also in Fig. 4, consists of a central sleeve carrying a plurality of leather or fibre washers 20 located on pins 21 and compressed by a junk-ring 22, the latter being forced down by a nut 23, which compresses the packing against the inner walls of the casing 9. The upper portion of the central sleeve is slotted, and screwed with a taper so that the nut 23 is capable of tightening up or clamping the sleeve to the hollow drill rod 7 at any distance from the drill 8.

The stopper 19 may alternately be secured to the inside of the casing, and the drill rod allowed to move up and down therein, the same result being attained, namely, the concentration of the wash water pressure upon the lower end of the casing, and upon the mud and rock detritus which it is desired to remove.

The lower part of the outer casing is pro-

vided with an aperture, shown at 24, by which the rock detritus can be removed by the action of the wash water, and the action may be assisted by connecting this aperture, by means of flexible hose 25, to an ejector pump 26 of suitable type, whereby the back pressure of the surrounding water is removed from the bottom of the chamber, and the scouring action of the wash water increased.

Having now fully described my invention, what I claim and desire to be protected in by Letters Patent, is:

1. The combination with a subaquatic drill rod to which an endwise reciprocating motion is imparted, of two cylindrical casings surrounding said drill rod, the outer of the said casings being of the nature of a hollow column surrounding the inner casing, the said outer casing being in two parts telescopically connected and being adapted to act as a "spud" in connection with an operating scow for the said drill, a substantial closure member between the lower extremities of the said casings and having a conical exterior whereby it tends to seat and centre itself into the rock cavity formed by the drill, a second closure member between the top extremities of the said inner casing and the said outer casing formed with a conical recess on its upper surface whereby the entrance of the drill head may be self-centred below water level, means for the telescopic adjustment of the said outer casing from the deck of the said scow, a stopper member of the nature of a slidably adjustable stuffing box piston fitting the said inner casing and said drill rod whereby fluid pressure enclosed in the cavity of the said inner tube below said stopper may be intensified by the reciprocating action of the said stopper, an aperture in said bottom closure member connected to a source of vacuum whereby the detritus from the said drill rod may be withdrawn as desired.

2. The combination with a subaquatic drill rod to which an endwise reciprocating motion is imparted, of two cylindrical casings surrounding said drill rod, the outer of the said casings being of the nature of a hollow column surrounding the inner casing, the said outer casing being in two parts telescopically connected and being adapted to act as a "spud" in connection with and passing directly through an operating scow for the said drill, a substantial closure member between the lower extremities of the said casings and having a conical exterior whereby it tends to seat and centre itself into the rock cavity formed by the drill, a second closure member between the top extremities of the said inner casing and the said outer casing formed with a conical recess on its upper surface whereby the entrance of the drill head may be self-centred below water level, means

for the telescopic adjustment of the said outer casing from the deck of the said scow.

3. In combination with a subaquatic drill rod to which an endwise reciprocating motion is imparted, a cylindrical casing surrounding said drill rod, a second casing of the nature of a hollow column surrounding said inner casing, the said larger casing being in two portions telescopically connected, the said larger casing being adapted to act as a "spud" in connection with an operating scow for the said drill, a substantial closure member between the lower extremities of the said casings and having a conical exterior whereby it tends to seat and centre itself into the rock cavity formed by the drill, a second closure member between the top extremities of the said inner casing and the said outer casing formed with a conical recess on its upper surface whereby the entrance of the drill head may be self-centred below water level, means for the telescopic adjustment of the said outer casing from the deck of the said scow, a stopper member of the nature of a slidably adjustable stuffing box piston fitting the said inner casing and said drill rod whereby fluid pressure enclosed in the cavity of the said inner tube below said stopper may be intensified by the reciprocating action of the said stopper, an aperture in said bottom closure member adapted to permit the delivery of detritus from the said inner casing.

In testimony whereof I affix my signature.

WILLIAM D. GRANT.