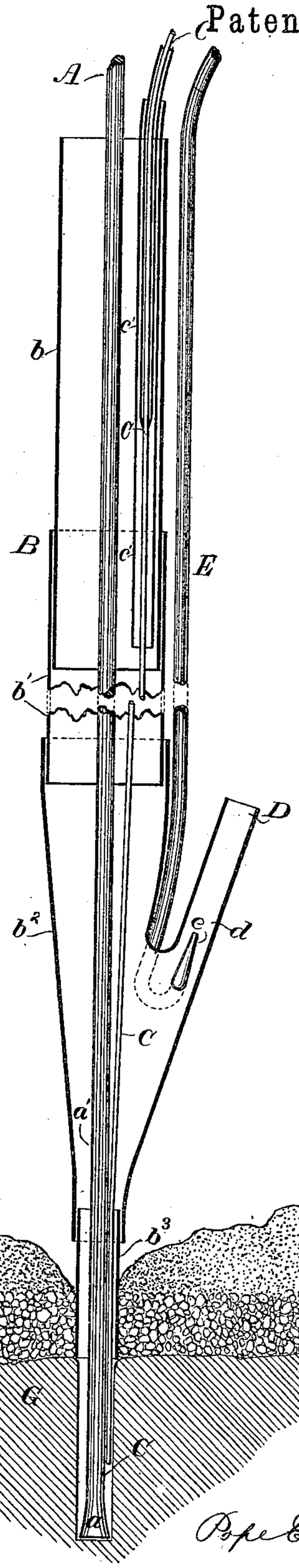
(No Model.)

W. L. SAUNDERS.

DRILLING APPARATUS.

No. 270,488. Patented Jan. 9, 1883.



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DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 270,488, dated January 9, 1883.

Application filed November 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. SAUNDERS, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Drilling Apparatus, of which the following is a specification.

This application is a division of my application for Letters Patent for rock-drilling apparatus, filed October 2, 1882, Serial No. 73,166.

My invention relates particularly to the class of drilling apparatus employed in connection with submarine excavations, where it is often necessary to drill into submerged rocks and to operate through superposed or overlying strata of sand, mud, or gravel.

The object of my invention is to relieve the drill from friction occasioned by the pressure of the sand or mud through which it may be necessary to pass in order to operate upon the rock, to remove the débris and cuttings from the point of the drill as rapidly as they accumulate, to permit the drill to be removed at any time, and at the same time preserving the hole, both through the bed of sand or mud and in the rock itself, free from obstructive accumulations, and to facilitate the insertion of blasting-cartridges.

My invention consists in surrounding a steel drill of the construction commonly employed for submarine work by a tube or hollow cylinder, preferably constructed in two or more sections, telescoping with each other. The lower section is provided with a conically-tapering extension, which in turn is united with a straight tube having an internal diameter preferably slightly exceeding that of the hole formed by the drill. Within this tube and parallel with the shank or steel of the drill extends a small pipe, terminating above the bit of the drill, and arranged to convey a continuous stream of water thereto. At a suitable distance above its lower extremity the conically-tapering section is provided with a lateral opening, through which the débris accumulating within the lower extension is discharged. The means for effecting this discharge consist of a suitable steam or water pipe extending downward along the inclosing cylinder or tube to the conical section thereof, into which it enters, terminating in a nozzle concentric with the discharge-opening, and constituting a device known as an "ejector." By forcing a jet of steam or stream of water downward through this pipe and out of the discharge-opening the water received through the pipe terminating at the bit of the drill and the accumulations forced by the same into the conical section will be carried out through the discharge-opening.

The accompanying drawing, which illustrates my invention, is a side elevation of the drill and the several pipes or tubes, partly in section, showing the method of its operation upon a submerged bed of sand and rock.

Referring to this drawing, A represents a drill of any suitable construction, which may be operated by machinery in the customary manner. Surrounding the drill A is an inclosing-case, B, which consists of two or more cylinders, *b* and *b'*, preferably metallic, one of which is constructed to slide into the other in the manner of the sections of a telescope, and of a conically-tapering terminal section, b^2, secured to the lower extremity of the section *b'*, and provided with a lower extension, b^3, consisting of a straight metallic pipe or tube. The sections *b* and *b'* serve to support the remaining portions of the apparatus, and, together with the extension b^3, to protect the same, as well as to control the direction of the drill. The section b^2 is preferably of cast-iron, and serves to unite the cylindrical portion of the inclosing-case with the tubular extension b^3. The tube b^3 follows the point of the drill through the comparatively soft earth or other material which may cover the rock to be operated upon, as shown at F, the width of the bit *a* being preferably nearly equal to the interior diameter of the tube. The tube b^3 thus forms an interior wall for the drill-hole, and prevents the surrounding earth F from pressing against the steel *a'* after the bit has penetrated the same. Upon reaching the surface of the rock G further descent of the tube b^3 is prevented, for the reason that the hole formed therein by the bit of the drill will not be of sufficient size to receive the tube. The latter will in consequence rest upon the upper surface of the rock, and while in that position serves to steady

the motion of the drill, causing its successive strokes to fall upon the same point until it has entered the rock. In this manner a clear passage is always maintained from the surface of the water to the bottom of the hole, whereby the drills may be removed and replaced with great facility, and through which the blasting-cartridge may afterward be inserted.

For the purpose of clearing the pulverized rock and clippings from the hole as rapidly as they are formed by the drill, and thereby preventing the formation of a collar about the steel above the bit, I employ a tube, C, for conveying a stream of water to the bottom of the hole, thereby occasioning a continuous agitation and outflow of water and débris. To the upper extremity of the tube C is attached a hose, *c*, of rubber or other suitable material, for convenience in handling. The hose *c* extends through a pipe, *c'*, secured to the interior of the section *b*, which section serves to retain the hose away from the steel of the drill and to prevent it from being bruised thereby. Suitable means are provided for allowing the pipe C to descend into the hole at the same rate as the drill, and for maintaining its lower extremity a short distance above the bit of the drill.

To facilitate the discharge of the water and powdered rock or other accumulations from the tube b^3, I provide a discharge-opening, D, which consists of a short branch tube, *d*, secured to the side of the conical section b^2, with the interior of which it communicates. A jet-pipe, E, extends downward from the upper extremity of the inclosing-case B, preferably outside of and parallel with the same, to the tapering section b^2, into the interior of which it extends, terminating in a nozzle, *e*, concentric with the discharge-opening D. The discharge-tube D and the nozzle *e* preferably extend in an upward direction from the section b^2, and they together form an ejector for discharging the muddy water from the tube b^3, suitable means being provided for forcing a stream of water or jet of steam through the pipe E.

During the operation of the drill streams of water or steam are constantly forced through the two tubes C and E, which keep the hole free from débris, and in this manner a hole may be drilled to a great depth into a submerged rock without necessitating the frequent removal of the drill and pumping out the hole, as has heretofore been customary.

Whenever it is desired to remove the drill it is simply withdrawn from the inclosing-case B, which latter is allowed to remain in position in order to facilitate the insertion of the charge of explosive material for blasting. This is preferably effected by introducing a suitable cartridge provided with a fuse, and having electric conductors attached thereto, within the tube B, and thus lowering it into the hole drilled into the rock. A graduated plunger is then employed for ascertaining whether the cartridge has descended to the bottom of the hole, and this may be readily determined by comparing the distance to which the drill has been sunk with that registered by the plunger when resting upon the cartridge. The tamping of sand or other suitable material is also introduced through the tube B, after which the latter is withdrawn or removed, the upper extremities of the electric conductors having been previously attached to floats for more readily securing them after the tube B has been drawn from over them.

The section b^3 is preferably detachable from the conical section b^2, and may be replaced by corresponding sections of different lengths for operating through strata of earth of varying thickness.

In excavating the opening to the rock through the overlying bed of sand, mud, or gravel it is in some instances unnecessary to employ the drill for loosening the same, as the stream of water forced through the jet-tube will be sufficient for the purpose. The débris will be discharged through the lateral opening in the same manner, and the tube will gradually descend to the rock.

The precise form of the section which contains the discharge-opening which I have illustrated in the drawing is not essential, as any convenient curvature may be employed for constructing the same without affecting the operation of the apparatus. For instance, it may be constructed at a greater angle near the upper extremity than through the lower portion, thus forming a bowl-shaped section; and other like modifications may be made, whereby the weight may be reduced or the apparatus made more convenient for handling in any particular case.

It will be evident that in some cases the rubber extension or hose *c* of the pipe C may be dispensed with, as also the surrounding tube *c'*, and the pipe C suspended freely by the side of the drill. Various modifications may, moreover, be made in the mechanical construction of the discharge-opening and nozzle or ejector without departing from my invention.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a rock-drill, a tubular inclosing-case, and an independent tube extending longitudinally within or through said inclosing-case, whereby the stream of fluid under pressure is discharged upon the débris in the neighborhood of the bit of said drill.

2. The combination, substantially as hereinbefore set forth, of a rock-drill, a tubular inclosing-case, an independent tube extending longitudinally through said inclosing-case and terminating in proximity to the bit of said drill, for discharging a stream of fluid under pressure upon the débris surrounding said bit, and a discharge-opening formed in the side of said inclosing-case.

3. The combination, substantially as hereinbefore set forth, of a rock-drill, a cylindrical inclosing-case, and an ejector consisting of a pipe extending from the upper extremity of

said inclosing-case and terminating within a discharge-tube leading from the lower portion of said case.

4. The combination, substantially as herein-before set forth, of a rock-drill, an inclosing-case consisting of two or more telescoping cylindrical sections surrounding the upper portion of said drill, a tubular extension of less diameter surrounding the lower portion of said drill, an intervening conically-tapering section, and a discharge opening or tube branching from said tapering section.

In testimony whereof I have hereunto subscribed my name this 9th day of November, A. D. 1882.

WM. L. SAUNDERS.

Witnesses:
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