

No. 873,056.

PATENTED DEC. 10, 1907.

S. LAKE.  
DRILL.

APPLICATION FILED MAR. 22, 1907.

3 SHEETS—SHEET 1.

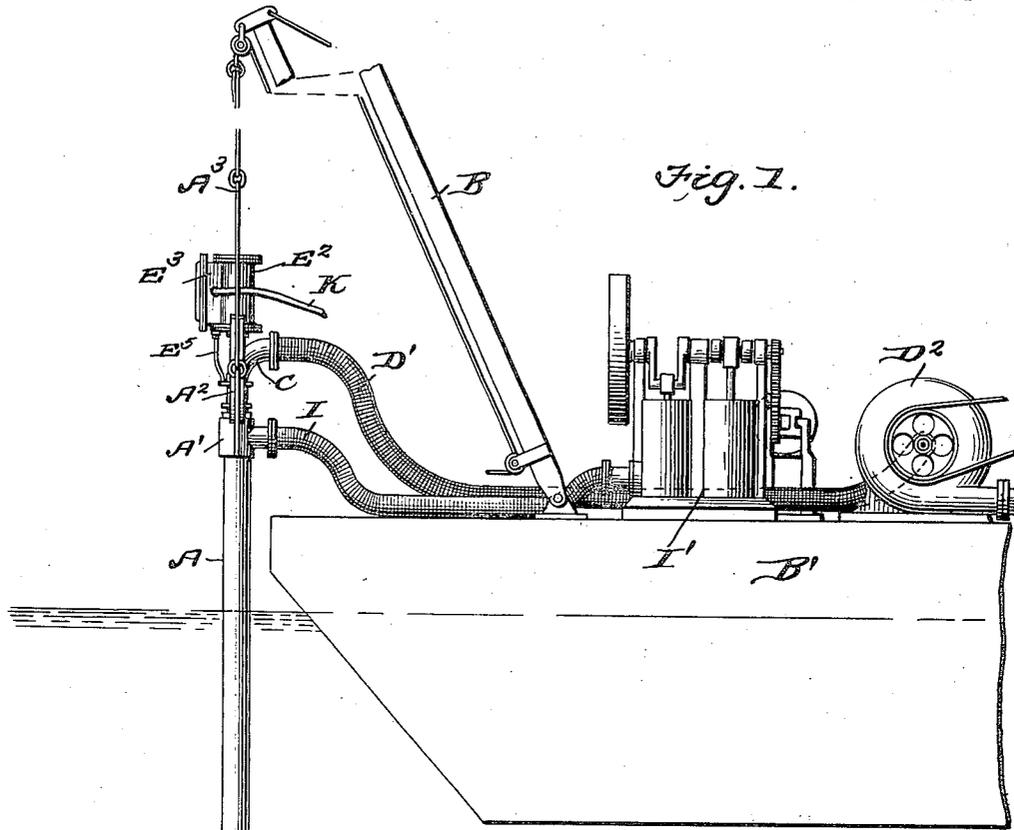


Fig. 1.

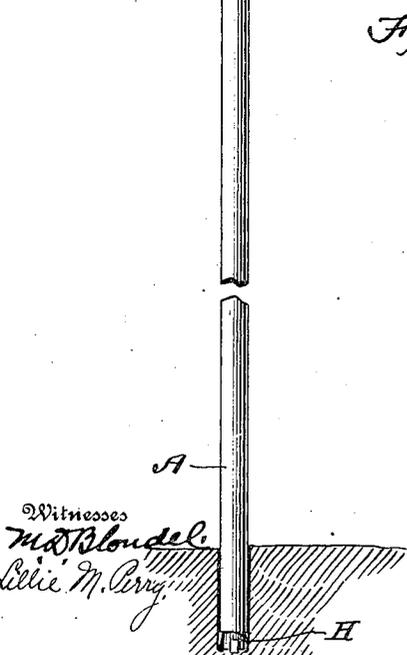
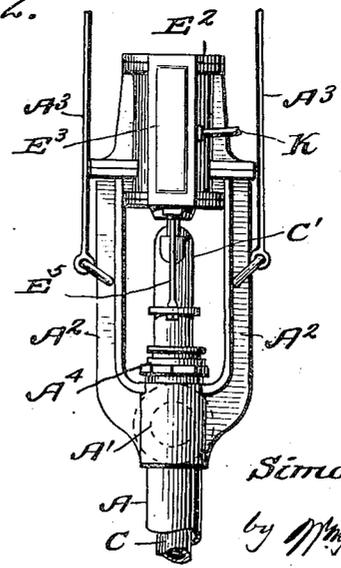


Fig. 2.



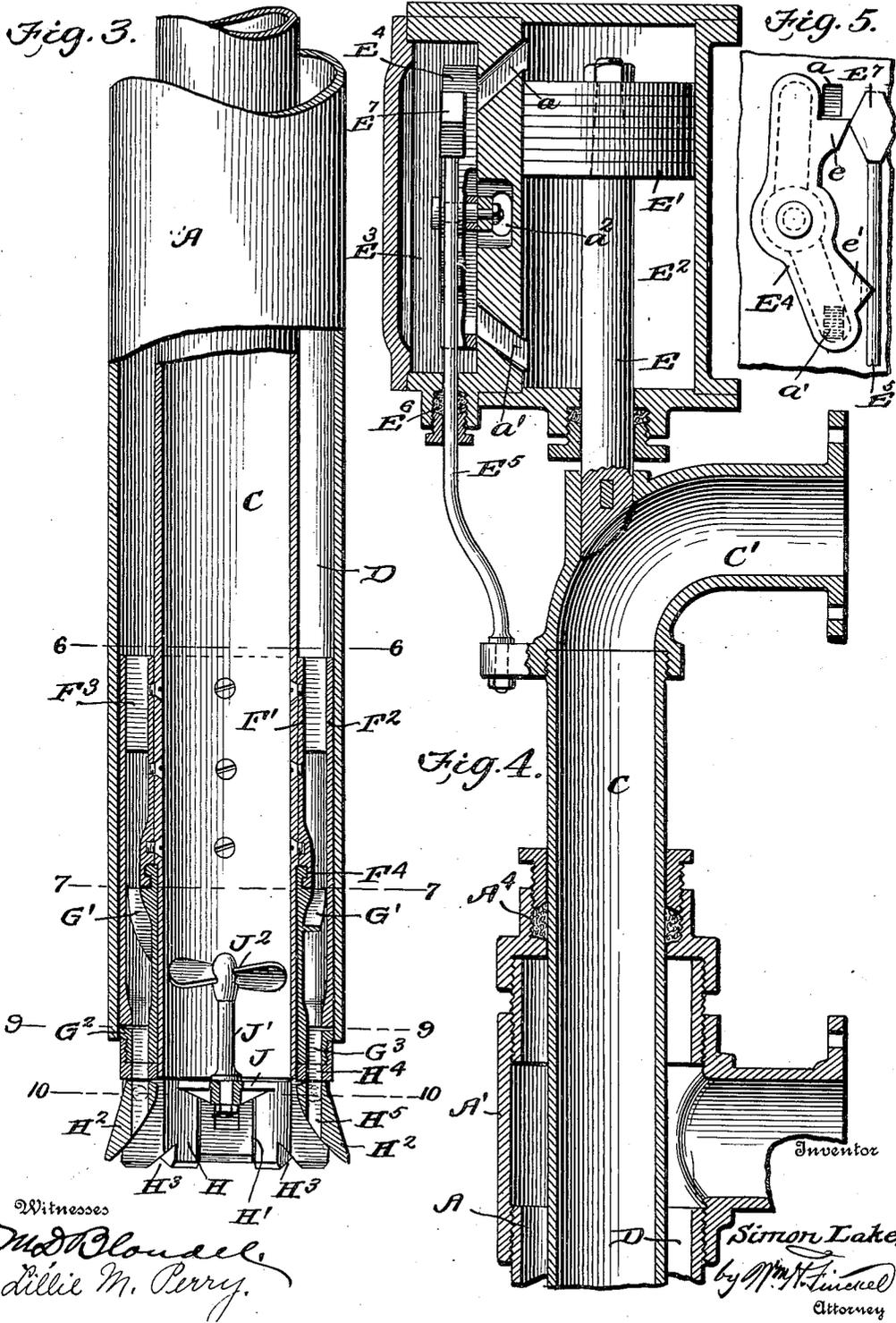
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 6.

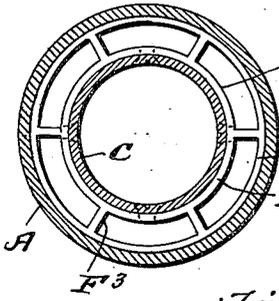


Fig. 7.

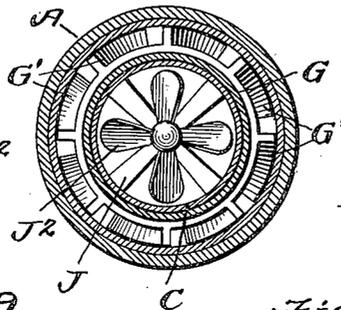


Fig. 8.

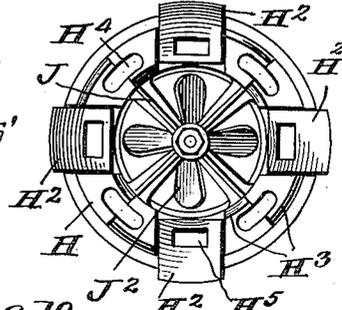


Fig. 9.

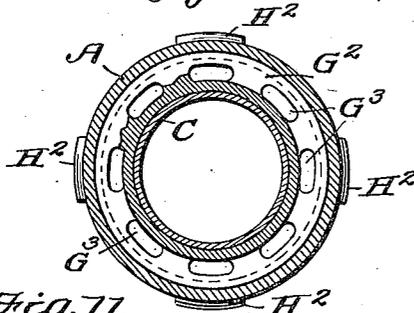


Fig. 10.

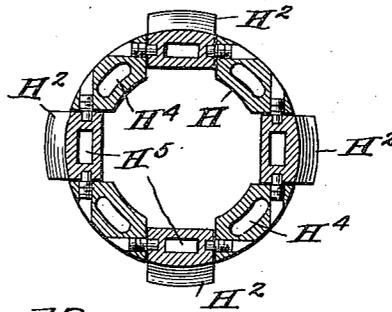


Fig. 11.

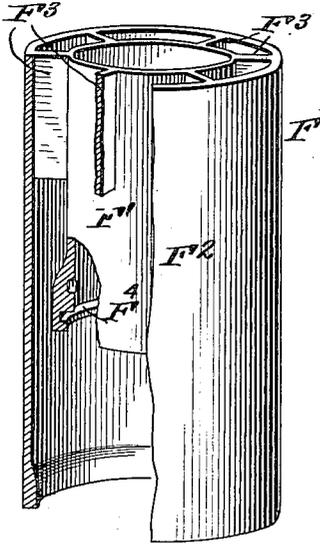


Fig. 12.

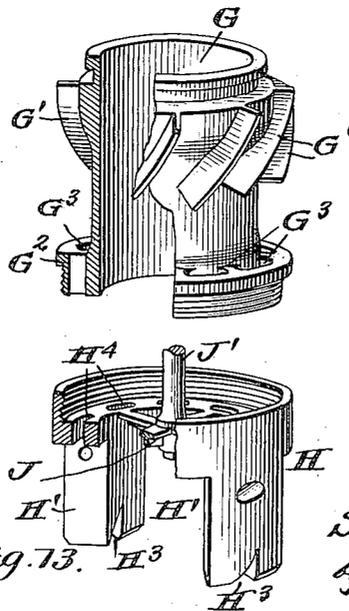
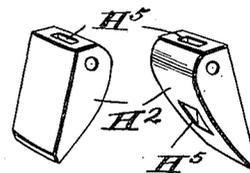


Fig. 14.



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# UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BERLIN, GERMANY.

## DRILL.

No. 873,056.

Specification of Letters Patent.

Patented Dec. 10, 1907.

Application filed March 22, 1907. Serial No. 363,943.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, at present residing at 23 Friedrich Wilhelmstrasse, Berlin, Germany, have invented a certain new and useful Improvement in Drills, of which the following is a full, clear, and exact description.

This invention relates to an improvement in drills particularly adapted for use in prospecting purposes in water beds where it is necessary to penetrate the over burden or rocky bottoms of the bed of the water, but which may be used with equal facility in dry drilling on land for the same purpose.

The object of the invention is to provide a drill especially adapted for rapidly cutting through the over burden, or through rock itself, in quartz mining and for lifting the samples of material and delivering them to the surface where the nature of the solids may be tested by any of the well known processes.

A further object is to provide a device in which the point of the drill is given a revolving movement together, and simultaneously with a percussive movement, and in utilizing the same medium employed for revolving the cutting point to lift the gold or other metals together with the particles severed from the bed and delivering them upon the surface; means being provided for accelerating the upflow of water as well as means for furnishing a percussive movement to the drill and also additional means for supplying a medium under pressure to revolve the point and lift and deliver the gold and other materials to and upon the surface.

The invention comprises means for accomplishing the stated objects and others, all as hereinafter more particularly set forth and finally claimed.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1, is an elevation showing diagrammatically the arrangement of my improvement. Fig. 2, is a detail elevation of the upper end of the tubes having the operating cylinder in position and which is employed for imparting a percussive movement to the drill. Fig. 3, is a detail sectional elevation of the lower ends of the tubes. Fig. 4, is a similar view of the upper ends thereof. Fig. 5, is a detail view illustrating the operation of the slide valve for controlling the supply of the operating influence to the piston cylinder. Fig.

6, is a detail section on the line 6—6 of Fig. 3. Fig. 7, is a similar view on the line 7—7 of Fig. 3. Fig. 8, is an end view of the cutting head. Fig. 9, is a detail section drawn on the line 9—9 of Fig. 3. Fig. 10, is a similar view on the line 10—10 of Fig. 3. Fig. 11, is a sectional perspective view of the sleeve employed for supporting the turbine. Fig. 12, is a similar view of the turbine. Fig. 13, is a similar view of the cutter head. Fig. 14, shows detail views in perspective of one of the movable cutting points.

In the drawings A, designates a tube which terminates at its upper end in a head A', from which project vertically extending arms A<sup>2</sup>, connected by links A<sup>3</sup>, to the beam of a crane B, carried by a surface vessel B', and by which the tube and parts carried thereby are supported and suspended in a vertical position.

Operating through the tube A, and through a stuffing box A<sup>4</sup>, in the head, is a tube C, of somewhat smaller diameter than the tube A; and extending the full length thereof which provides an annular space D, extending throughout the length of the tubes. Connected to the upper end of the tube is an elbow pipe C', to which is connected a flexible pipe D', whose opposite end is connected to a suction pump D<sup>2</sup>, located upon the surface vessel and operated in any suitable manner. To the elbow is also connected a piston rod E, carried by a piston head E', operating in a cylinder E<sup>2</sup>, which in the present instance, is shown as a steam cylinder, but which may be an air or hydraulic cylinder, the said cylinder being supported in a vertical position by the arms A<sup>2</sup>, of the head A'. When the piston is operated, it imparts a vertical reciprocating movement to the tube and the cutter carried thereby, as will be explained later on.

The cylinder is provided with a steam chest E<sup>3</sup>, having an oscillating valve E<sup>4</sup>, controlling the inlet and exhaust ports to and from the cylinder; the valve being operated by a valve rod E<sup>5</sup>, carried by the elbow C', and extending through a stuffing box E<sup>6</sup>, formed upon the steam chest.

The valve rod is provided with a double faced cam head E<sup>7</sup>, upon its upper end, which alternately engages beveled projections e, and e', extending from the valve. The operation of the valve will be best understood from the general description of the operation of the device.

A steam pipe K, is connected to the steam chest for supplying steam thereto and extends from a steam boiler (not shown) of the surface vessel and which might be the ships' boiler.

To the lower end of the tube C, is secured, preferably by screws, a double sleeve F, comprising an inner section F', that surrounds and snugly fits the lower end of the tube C, and an outer section F<sup>2</sup>, which snugly fits the interior of the tube A, and extends nearly to the lower end thereof, the sections being connected by webs F<sup>3</sup> formed integral with the sections. The section F', is somewhat shorter than the outer section F<sup>2</sup>, is increased in thickness at its lower end, and has an internal annular groove F<sup>4</sup>, in which is revolubly held the upper flanged end of a turbine wheel or sleeve G, having angularly arranged blades G', at its upper end and an externally threaded flange G<sup>2</sup>, at its lower end. Screwed to the flange G<sup>2</sup>, is a cutter head H, having diametrically arranged recesses H', in each of which is pivotally held a tapering or wedge shaped cutter H<sup>2</sup>, all of which cutters are designed to swing outwardly upon the downward movement of the cutter head to cut or bore a larger hole than and thus form a clearance space for the tube A. The lower faces of the cutter head between the recesses are beveled in opposite direction, as shown at H<sup>3</sup>, to provide a plurality of cutting edges and the flange of the turbine G, is provided with a series of openings G<sup>3</sup>, which register with openings H<sup>4</sup>, and H<sup>5</sup>, of the cutter head and the pivoted cutter points respectively, which permit of the escape of the water after acting upon the turbine.

To the head A', of the outer tube A, is connected a flexible pipe I, whose opposite end is connected to a force pump I', also located upon the surface vessel and operated in any suitable manner and by which water is forced down under pressure through the space D between the tubes to engage the turbine.

The cutter is formed at its upper end with a spider frame J, supporting a short vertically projecting spindle J', upon which is mounted a propeller J<sup>2</sup>, which acts with the cutter and accelerates the upflow of the water and material cut from the water bed.

Having described the general construction of my device, the advantages and operation thereof will be best understood from the following description of the operation. Assuming the piston is in the upper end of the cylinder and the tube C, and cutter or drill point proper, likewise elevated. Steam is admitted into the steam chest from which it escapes through the upper inlet port a, and acting upon the piston will drive it downwardly to the lower end of the cylinder and through the medium of the tube will force

the cutters into contact with the surface being operated upon. As the piston nears the end of its lower stroke the lower cam surface of the head E<sup>7</sup>, of the rod E<sup>5</sup>, will engage the cam surface e', of the controlling valve and shift it to the opposite position from that shown in Fig. 5, of the drawing, and which will uncover the lower inlet port a', and close the upper inlet a, and convert the latter into an exhaust which communicates with the exhaust a<sup>2</sup>, through the hollow body portion of the valve, thus permitting the escape of the expanded steam from the upper surface of the piston previously to the inlet of steam to the lower part of the cylinder which, acting upon the piston, will elevate the same and likewise the tube C, and the cutter, thus providing a reciprocating movement to the tube and a percussive action to cutter. Simultaneously with this operation the force and suction pumps are set in motion, and the former, which may be stated, is connected with a suitable supply, forces water down through the annular space or passage D, and forcibly projects it against the blades of the turbine, imparting a revolving movement thereto and likewise to the cutter, and after the water has acted upon the turbine it passes through the openings G<sup>3</sup>, H<sup>4</sup>, and H<sup>5</sup>, and is drawn up through the tube C, by the suction pump together with the particles cut from the surface operated upon, and delivered into any suitable receptacle provided therefor. The propeller J<sup>2</sup>, may be employed for agitating and accelerating the upflow of water and material, through the pipe C. The propeller as shown is operated by and simultaneously with the movement of the cutter.

It will thus be seen, I provide an exceedingly simple and highly efficient device for accomplishing the purpose stated, and it may be added that suitable plants may be employed and used in connection with the drill for separating the materials and testing the nature of the solids on board the same vessel carrying the drill and operating means therefor.

What I claim is:

1. A drill, comprising a water discharge tube, a cutter arranged adjacent to the end thereof, a suction tube adjacent to the cutter, means to revolve the cutter actuated by the water passing through the said discharge tube, means to force water through the tube, and means connected to the suction tube to lift the water and the material freed by the cutter.

2. A drill, comprising an inner tube and an outer tube, a cutter revolubly held at the lower ends of the tubes, means for revolving the cutter, means to force water down through the annular space between the said tubes and thereby actuate the cutter-revolving means, and means to lift the water and cuttings through the inner tube.

3. A device of the kind described, comprising an inner and an outer tube, said inner tube being of somewhat smaller diameter than the outer tube, thereby providing an annular space between the tubes, a cutter revolvably held at the lower ends of the tubes, means operable at the lower end of the said annular space for operating the cutter, means for forcing water down through the annular space for actuating the said cutter-revolving means, a propeller operating within the inner tube, and means for lifting the water in the said inner tube.

4. A device of the kind described, comprising an inner and an outer tube, a cutter revolvably held at the lower end of the tubes, means arranged between the inner and outer tubes at the lower ends thereof for revolving the cutter, means for supplying an actuating medium to the cutter-revolving means, and means for imparting a vertical reciprocating movement to the inner tube and cutter.

5. A device of the kind described comprising an inner and an outer tube, a cutter carried at the lower end of the inner tube, means for forcing water down through the space between the tubes, means for lifting the water through the inner tube and means for imparting a vertical reciprocating movement to the said inner tube and cutter.

6. A device of the kind described, comprising an inner and an outer tube, said inner tube being of less diameter than the outer tube thereby providing an annular space between the said tubes which extends throughout the length thereof, a cutter revolvably held adjacent to the lower ends of the tubes, means supported by the inner tube and connected to the cutter, means for forcing fluid under pressure down through the annular space between the tubes to act upon the supporting means of the cutter, and a suction device connected to the inner tubes for lifting the fluid and actuating the said revolving means.

7. A device of the kind described, comprising an inner and an outer tube, a turbine revolvably supported by the inner tube, a cutter head carried by the turbine, a propeller connected to and operated by the cutter, and means for forcing water under pressure down through the space between the tubes and into engagement with the turbine.

8. A device of the kind described, comprising an inner and an outer tube, a turbine revolvably supported by the inner tube, a cutter head carried by the turbine, a propeller connected to and operated by the cutter, means for forcing water under pressure down through the space between the tubes and into engagement with the turbine, and means for imparting a vertical reciprocating movement to the inner tube and parts carried thereby.

9. A device of the kind described, comprising

an inner and an outer tube, a turbine revolvably supported by and at the lower end of the inner tube and operating in the space between the said tubes, a circular cutting head supported by the turbine, a propeller connected with the head, means for forcing water under pressure through the annular space between the tubes into engagement with the turbine, and means for imparting a vertical reciprocating movement to the inner tube and parts carried thereby.

10. A device of the kind described, comprising an inner and an outer tube, a cutting head carried by the inner tube and at the lower end thereof, a piston rod connected to the tube and having a piston head, a cylinder in which the said head and rod operates, a rotary valve controlling the admission of the actuating medium to the cylinder, a valve rod carried by the said inner tube for operating the said valve, and means for forcing water under pressure through the space formed by the said tubes.

11. A device of the kind described, comprising an inner and an outer tube, a turbine carried by and at the lower end of the inner tube and supported within the space between the said tubes, a cutter head carried by the turbine, pivoted cutting sections carried by the cutter and adapted to swing outwardly when the inner tube is projected downwardly, means for imparting a vertical reciprocating motion to the said inner tube, a force pump connected to the outer tube for forcing water under pressure through the space between the tubes to actuate the turbine, and a suction pump connected to the said inner tube.

12. A device of the kind described, comprising an inner and an outer tube, the said inner tube being somewhat smaller in diameter than the outer tube, thereby providing an annular space between the tubes, a sleeve carried by the inner tube, a turbine rotatably connected with the sleeve, a circular cutting head carried by the turbine and having openings therein, movable cutting sections pivotally held in said openings, a propeller carried by the cutting head, means for imparting a vertical reciprocating movement to the said inner tube and parts carried thereby, means for forcing water down through the annular space under pressure to engage and operate the turbine, and means for lifting the water in the inner tube.

13. A device of the kind described, comprising a tube, a cylinder supported thereby, a piston operatively held within the cylinder and having a piston rod extending through one end of the cylinder, a tube connected to the rod and extending downwardly through the first mentioned tube, a valve controlling the inlet and exhaust ports to and from the cylinder, a valve rod connected to the last mentioned tube for actuating the valve, sub-

stantially as specified, a cutter carried by the lower end of the last mentioned tube, means revolubly held in the space between the tubes and connected to the cutter, a force  
5 pump connected to the first mentioned tube and a suction pump connected to the said last mentioned tube.

14. A device of the kind described, comprising an inner tube and an outer tube, a  
10 turbine revolubly supported by and at the lower end of the inner tube, a cutter supported by the turbine, a spindle projecting from the cutter and extending upwardly into the inner tube, a propeller fixedly held  
15 upon the upper end of the spindle, a force pump connected to the outer tube and adapted for forcing water under pressure down through the space between the tubes and into engagement with the turbine, a suc-  
20 tion pump connected to the inner tube and means supporting the inner tube and adapted for imparting a reciprocating movement to the tube.

15. A device of the kind described, com-

prising in combination with a surface vessel 25 and a supporting beam carried thereby, a tube supported by the beam, a cylinder carried by the tube, a piston operating within the cylinder and having a piston rod project-  
ing through the lower end thereof, a tube 30 connected to the said rod and extending downwardly throughout the length of the first mentioned tube, a valve actuated by the movement of the last mentioned tube for  
controlling the admission of an actuating 35 medium to the cylinder, a cutter head carried by and at the lower end of the said last mentioned tube, a force pump connected to the first mentioned tube and a suction pump  
connected to the last mentioned tube, said 40 pumps being carried by the said surface vessel, all for the purpose specified.

In testimony whereof I have hereunto set my hand this ninth day of March A. D. 1907.

SIMON LAKE.

Witnesses:

M. D. BLONDEL,  
HENRY HASPER.