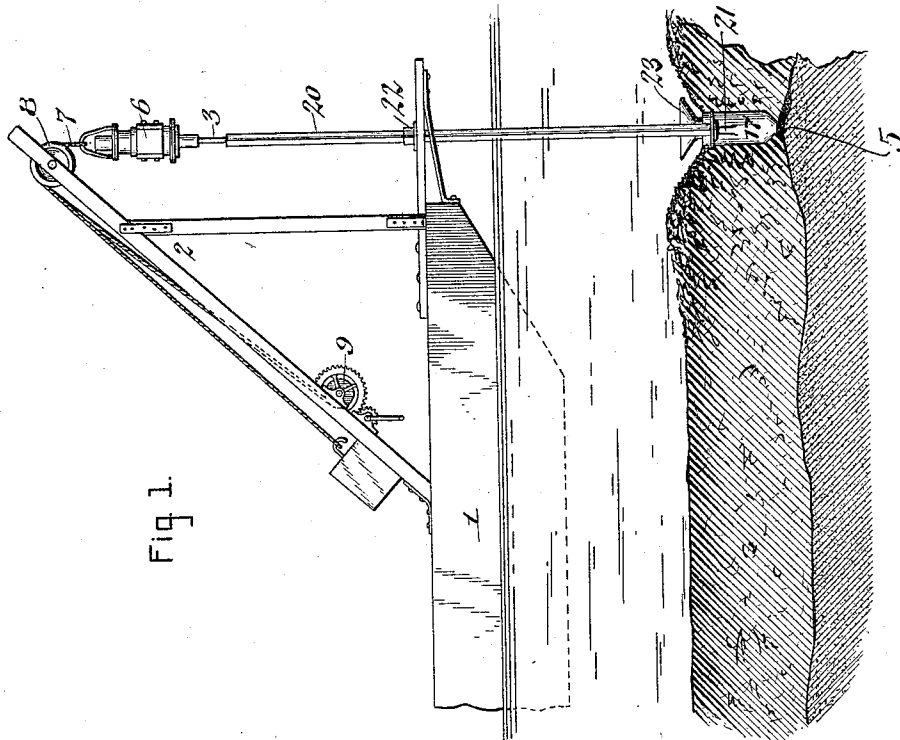
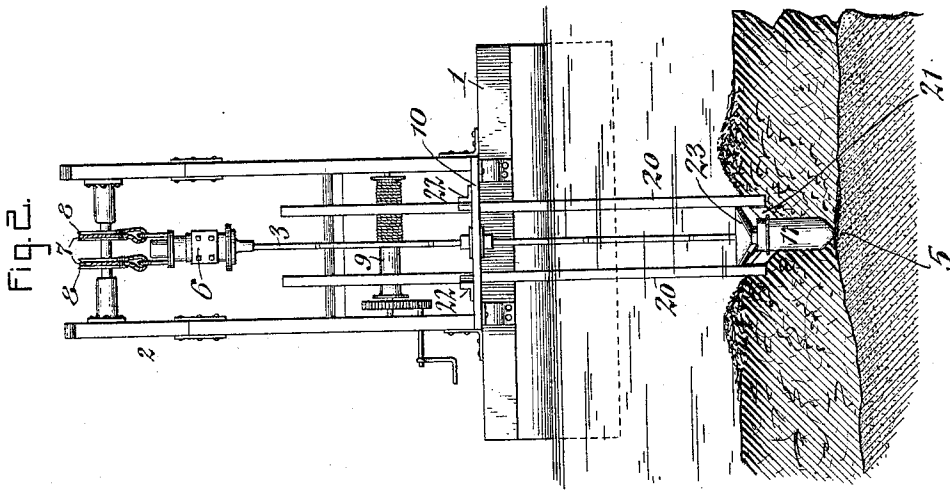


H. T. DUNBAR.
 DRILLING APPARATUS.
 APPLICATION FILED FEB. 3, 1915.

Patented Mar. 14, 1916.
 2 SHEETS—SHEET 1.

1,175,725.



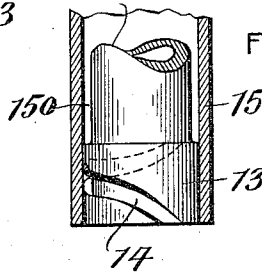
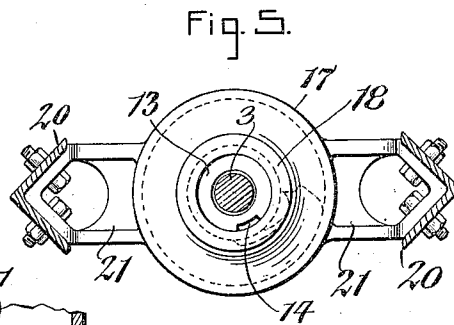
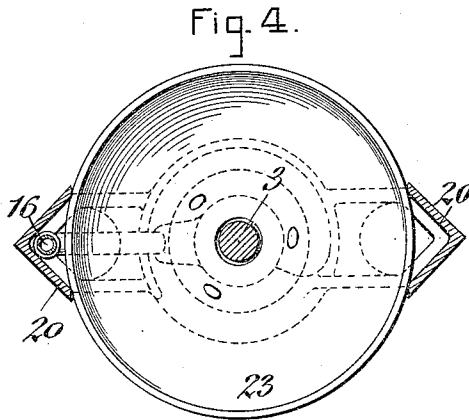
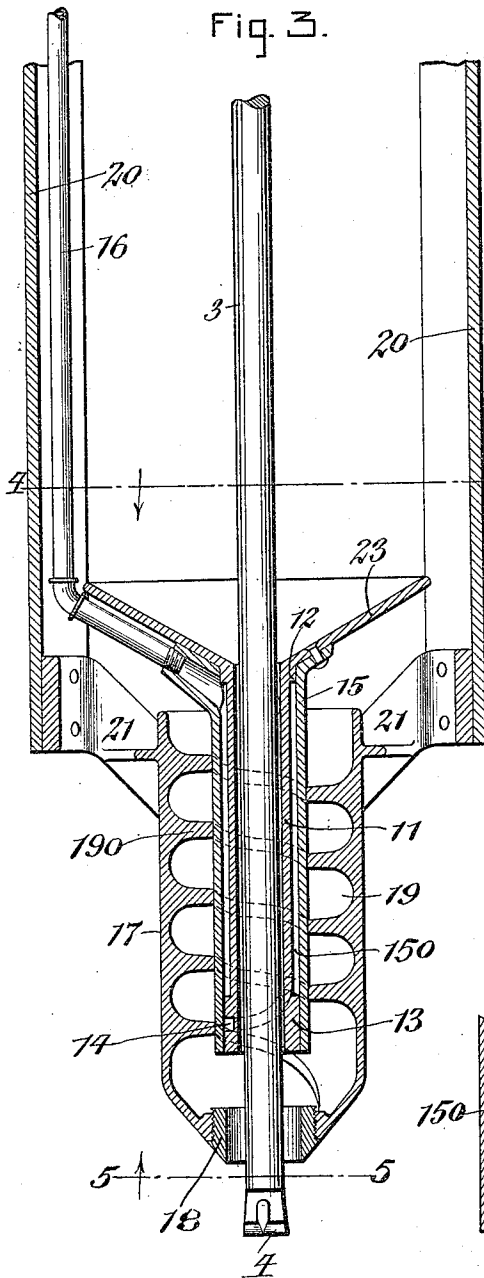
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UNITED STATES PATENT OFFICE.

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DRILLING APPARATUS.

1,175,725.

Specification of Letters Patent.

Patented Mar. 14, 1916.

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To all whom it may concern:

Be it known that I, HARRIS T. DUNBAR, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Drilling Apparatus, of which the following is a specification.

This invention relates to a drilling apparatus which is more particularly designed for drilling holes in rock which is submerged under water. It frequently happens that the submerged body of rock into which holes are to be drilled is covered more or less with mud, gravel or other loose material which interferes with the drilling operation on account of the tendency of the mud or gravel to flow into the drill hole and preventing the free escape of the pulverized rock as the drilling progresses.

The object of this invention is to provide an improved rock drilling apparatus having simple and efficient means whereby the mud, gravel and the like are held back and prevented from entering the hole which is being drilled in the rock and also means for washing away the mud, gravel or the like which may be deposited on the rock immediately above the place where the hole is being drilled and to also remove the pulverized rock due to drilling the hole in the same, so that the drilling operation can be effected more rapidly and economically.

In the accompanying drawings: Figure 1 is a side elevation of a drilling apparatus mounted on a drill boat and embodying my improvements. Fig. 2 is a front elevation of the same. Fig. 3 is a fragmentary vertical transverse section, on an enlarged scale, of the drilling apparatus containing my invention. Figs. 4 and 5 are horizontal sections taken in the correspondingly numbered lines in Fig. 3 and looking in the direction of the arrows associated with these lines. Fig. 6 is a fragmentary vertical section, on an enlarged scale of the lower part of the drill bar guide and partition tube forming the inlet passage for the clearing fluid.

Similar characters of reference indicate corresponding parts throughout the several views.

My improved drilling apparatus may be mounted in any suitable manner so that the same can be transported from one place to

another as required, but as shown in Figs. 1 and 2 of the drawings the same is mounted on a drill boat or scow 1 of the usual and well known type commonly employed for drilling and having a derrick 2 for raising and lowering the drilling apparatus and associated parts.

3 represents the drill bar which is usually arranged in an upright position and provided at its lower end with a bit 4 whereby a hole is drilled in the body of rock 5 below the surface of the water upon which the boat floats. A vertically reciprocating movement is imparted to the drill bar by any suitable means so that the drill bar is fed downwardly as the hole which is being drilled in the rock increases in depth. As shown in Figs. 1 and 2 of the drawings, this reciprocating movement is effected by a motor 6 which is operatively connected with the upper end of the drill bar so as to impart a vertically reciprocating movement to the same and which is mounted on the derrick so as to be capable of vertical adjustment thereon, for instance, by means which comprise two hoisting lines or cables 7 passing with their intermediate parts around pulleys 8 on the upper, overhanging part of the derrick and connected at one of their ends with the motor 6 while the other ends of said cables pass around a hoisting drum 9 mounted on the lower part of the derrick. Between its upper and lower ends the drill bar is guided in a cross bar 10 on the lower overhanging part of the derrick, as shown in Figs. 1 and 2, or by any other suitable means. As the bit gradually increases the depth of the hole in the rock which is being drilled the drill bar together with the motor associated therewith is lowered in the same measure for maintaining the bit in the proper working position relative to the rock.

My improvements which are associated with the drill bar for keeping the mud, gravel, &c., out of the drill hole and also washing away the pulverized rock due to the drilling operation are constructed as follows: 11 represents a guide for the drill bar the same being preferably of tubular form and surrounding the lower part of the drill above the bit thereof. The bore of this guide is of such diameter that the drill bar and bit are free to be moved vertically through the same when lowering the drill

bar into its operative position in which it engages the surface of the rock or is withdrawn therefrom for the purpose of sharpening the bit of the drill bar or replacing the same by a sharp one when necessary. At its upper and lower ends the guide tube is provided with upper and lower external collars 12, 13, the periphery of the lower collar 13 being provided with a spiral groove 14 extending from the upper end to the lower end thereof. Surrounding the guide tube is a partition sleeve or tube 15 which engages its upper and lower ends with the periphery of said collars and thereby closes the outer side of the reduced central part 150 of the guide tube and the spiral groove in its lower collar, whereby a downwardly extending inlet passage for a pressure fluid is formed between the guide tube and the partition sleeve. The pressure fluid preferably consists of water and this is supplied by a tube or pipe 16 connected at its lower end with the upper end of the partition sleeve so as to empty into the upper end of the inlet passage while the upper end of the supply pipe may be connected with a pump or other suitable means for forcing water into this pipe. 17 represents a shield or guard, preferably of tubular form, arranged around the lower parts of the drill bar, partition sleeve and guide tube and having its upper end wide open while its lower end tapers downwardly and has an opening in which a bearing ring 18 of steel or other hard metal is secured by a screw joint, as shown, or by any other suitable means, so that this bearing ring is arranged below the lower ends of the partition sleeve and guide tube. An outlet passage 19 is formed between the shield or guard and the partition sleeve which extends upwardly from the lower end of the downwardly extending passage to the exterior of the shield or guard at the upper end thereof. This upwardly extending outlet passage is preferably of spiral form and constructed by a spiral rib 190 on the inner side or bore of the tubular shield engaging with the periphery of the partition sleeve, as shown in Fig. 3. The partition sleeve is secured in place within the spiral rib in any suitable manner so that the same are retained in this relation and compelled to move up and down together. While raising and lowering the shield, partition sleeve, guide tube and parts connected therewith the same are guided by means which may comprise two upright guide bars 20, 20 connected at their lower end with brackets 21 projecting laterally from opposite sides of the shield at the upper end thereof and sliding in ways 22 formed in the cross bar 10 of the derrick. Projecting laterally from the upper ends of the partition sleeve and over the upper end of the shield is an annular deflector 23 which is

preferably of upwardly flaring form and constructed integrally with the guide tube.

When using this drilling apparatus the supporting frame comprising the guide bars 20 and brackets 21 and parts mounted thereon is lowered in the water, mud, gravel, &c., until the lower end of the guard rests on the surface of the rock in which a hole is to be drilled. During its passage downward through the mud, &c., the water supplied by the pipe 16 passes downwardly through the passage between the drill bar guide and the tubular partition and into the lower end of the tubular shield or guard, and thence upwardly through the passage between the partition and the tubular guard and escapes at the upper end of the latter to the exterior of the apparatus. As the water issues from the upper end of the guard or shield any mud, gravel or the like which tends to fall into the path of the submerged part of the drilling apparatus is constantly washed upwardly and turned laterally outward by the deflector 23 which causes this material to be held back and pile up around the place where the drilling apparatus passes through the mud, &c., to the surface of the rock to be drilled. In addition to holding back the earthy matter from above, the submerged part of the guard tube, partition and drill guide, the stream of water issuing from the nozzle formed by the downwardly and upwardly extending passages causes any loose earthy matter or pulverized rock entering the lower end of the shield or guard through the opening in the respective end of the guard from the drill hole to be carried upwardly and discharged upon the top of the surrounding body of mud or rock. As the water issues from the lower end of the downwardly extending passage, the same has a swirling or spiral motion or wedge action which is imparted to it by the spiral groove 14 in the lower collar of the drill bar guide and as the water passes through the upwardly extending passage 19, the latter, owing to its spiral formation, continues to impart the swirling motion to the water, whereby the effect of the water for carrying mud, &c., upwardly out of the guard tube and its effect for holding back the mud &c. above the guard tube and associated parts is greatly increased. By means of the spiral outlet passage 19 the material is lifted by a gradual wedge action so that less power is required for expelling the dirt than removing the same by a direct vertical lift.

The trend of the spiral groove 14 at the lower end of the downwardly extending passage is preferably the same as that of the spiral upwardly extending passage, as shown in the drawings, so that the swirling action imparted to the water continues without interruption and its efficiency is thereby increased. By this means the drill bar is

able to work more freely and rapidly when boring a hole in a rock submerged below water, mud and the like, inasmuch as interference of foreign matter with the operation of the bit is practically eliminated.

I claim as my invention:

1. A drilling apparatus comprising a vertical drill bar provided at its lower end with a bit and adapted to be reciprocated vertically for causing the bit to form a hole in the body to be drilled, a tubular guide in which the lower part of the drill bar slides, a tubular guard surrounding said guide and adapted to rest at its lower end on the surface of the body to be drilled and provided with an opening for the passage of the drill bar and its bit, and means for conducting a stream of water downwardly to the lower end of the guard and from the lower end of the guard to the upper end thereof, comprising a partition tube arranged between the guide and the guard and forming with the guide an inner inlet passage which communicates at its upper end with a fluid supply and opens at its lower end into the guard, and forming with said guard an outlet passage which communicates at its lower end with the corresponding end of the inlet passage and opens at its upper end to the exterior.

2. A drilling apparatus comprising a vertical drill bar provided at its lower end with a bit and adapted to be reciprocated vertically for causing the bit to form a hole in the body to be drilled, a tubular guide in which the lower part of the drill bar slides, a tubular guard surrounding said guide and adapted to rest at its lower end on the surface of the body to be drilled and provided with an opening for the passage of the drill bar and its bit, and means for conducting a stream of water downwardly to the lower end of the guard and from the lower end of the guard to the upper end thereof, comprising a partition tube arranged between the guide and the guard and forming with the guide an inner inlet passage which communicates at its upper end with a fluid supply and opens at its lower end into the guard and forming with said guard an outlet passage which communicates at its lower end with the corresponding end of the inlet passage and opens at its upper end to the exterior, said outlet passage having a part thereof constructed of spiral form.

3. A drilling apparatus comprising a vertical drill bar provided at its lower end with a bit and adapted to be reciprocated vertically for causing the bit to form a hole in the body to be drilled, a tubular guide in which the lower part of the drill bar slides, a tubular guard surrounding said guide and adapted to rest at its lower end on the surface of the body to be drilled and provided with an opening for the passage of the drill

bar and its bit, and means for conducting a stream of water downwardly to the lower end of the guard and from the lower end of the guard to the upper end thereof, comprising a partition tube arranged between the guide and the guard and forming with the guide an inner inlet passage which communicates at its upper end with a fluid supply and opens at its lower end into the guard and forming with said guard an outlet passage which communicates at its lower end with the corresponding end of the inlet passage and opens at its upper end to the exterior, said outlet passage having a part thereof constructed of spiral form and said inlet passage having a part thereof also constructed of spiral form.

4. A drilling apparatus comprising a vertical drill bar provided at its lower end with a bit and adapted to be reciprocated vertically for causing the bit to form a hole in the body to be drilled, a tubular guide in which the lower part of the drill bar slides, a tubular guard surrounding said guide and adapted to rest at its lower end on the surface of the body to be drilled and provided with an opening for the passage of the drill bar and its bit, means for conducting a stream of water downwardly to the lower end of the guard and from the lower end of the guard to the upper end thereof, and a deflector projecting laterally from the upper end of said guide over the upper end of said guard.

5. A drilling apparatus comprising a drill bar provided at its lower end with a bit, a tubular guide which receives said drill bar and which is provided at its upper end with a laterally projecting deflector, a tubular guard surrounding said guide and a partition arranged between said guide and guard.

6. A drilling apparatus comprising a drill bar provided at its lower end with a bit, a tubular guide which receives said drill bar and which is provided at its lower end with an external collar having a spiral groove extending from the upper to the lower end of said collar, a partition sleeve surrounding said guide and engaging its upper and lower ends with the upper and lower parts of said guide while its intermediate part is separated therefrom for forming an inlet passage between these members, a fluid supply tube connected with the upper end of said inlet passage, and a tubular guard surrounding the partition and guide.

7. A drilling apparatus comprising a drill bar provided at its lower end with a bit, a tubular guide which receives said drill bar and which is provided at its lower end with an external collar having a spiral groove extending from the upper to the lower end of said collar, a partition sleeve surrounding said guide and engaging its upper and lower ends with the upper and lower parts of said

guide while its intermediate part is separated therefrom for forming an inlet passage between these members, a fluid supply tube connected with the upper end of said inlet passage, a tubular guard surrounding the partition and guide and provided at its lower end with a bearing ring through which said drill bar projects.

8. A drilling apparatus comprising a drill bar provided at its lower end with a bit, a tubular guide which receives said drill bar and which is provided at its lower end with an external collar having a spiral groove extending from the upper to the lower end of said collar, a partition sleeve surrounding said guide and engaging its upper and lower ends with the upper and lower parts of said guide while its intermediate part is separated therefrom for forming an inlet passage between these members, a fluid supply tube connected with the upper end of said inlet passage, and a tubular guard surrounding the partition and guide and provided at its lower end with an opening through which the drill bar projects and provided in its bore with a spiral rib engaging with the periphery of the partition and forming therewith a spiral outlet passage.

9. A drilling apparatus comprising a drill bar provided at its lower end with a bit, a tubular guide which receives said drill bar and which is provided at its lower end with an external collar having a spiral groove extending from the upper to the lower end of said collar, a partition sleeve surrounding said guide and engaging its upper and lower ends with the upper and lower parts of said guide while its intermediate part is separated therefrom for forming an inlet passage between these members, a fluid supply tube connected with the upper end of said inlet passage, a tubular guard surrounding the partition and guide and provided at its lower end with an opening through which the drill bar projects and provided in its bore with a spiral rib engaging with the periphery of the partition and forming therewith a spiral outlet passage and an upwardly flaring deflector projecting laterally from the upper end of said guide over the upper end of said guard.

Witness my hand this 2nd day of February, 1915.

HARRIS T. DUNBAR.

Witnesses:

THEO. L. POPP,
ANNA HEIGIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."