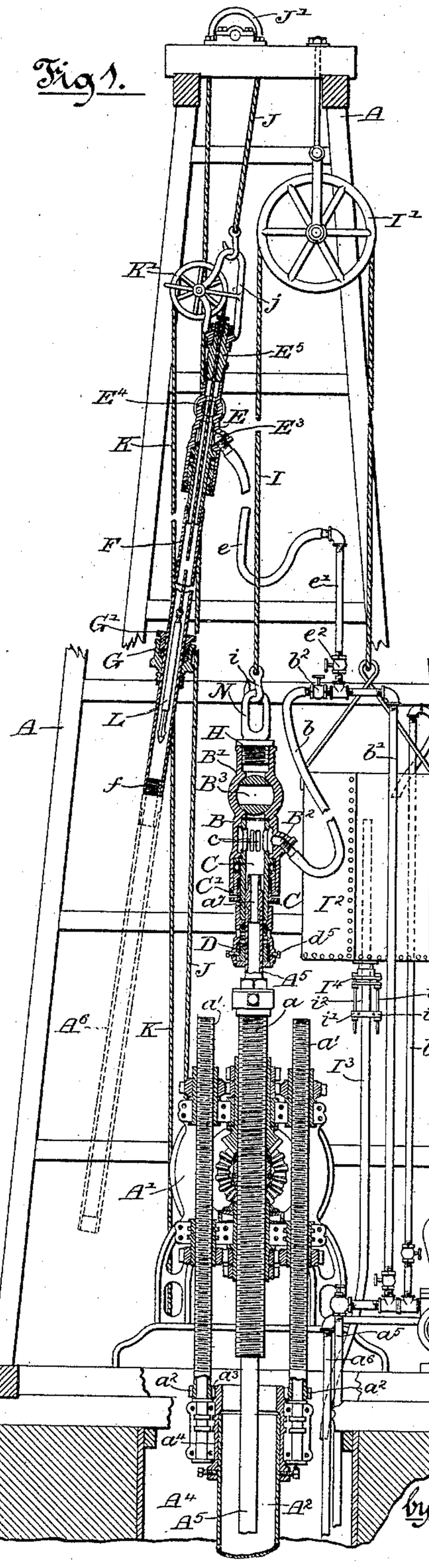
(No Model.) 2 Sheets—Sheet 1.

S. W. DOUGLASS.

WATER SWIVEL FOR DRILLING APPARATUS.

No. 473,918. Patented May 3, 1892.

Fig 1.



Witnesses

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(No Model.) 2 Sheets—Sheet 2

S. W. DOUGLASS.

WATER SWIVEL FOR DRILLING APPARATUS.

No. 473,918. Patented May 3, 1892.

Fig 2.

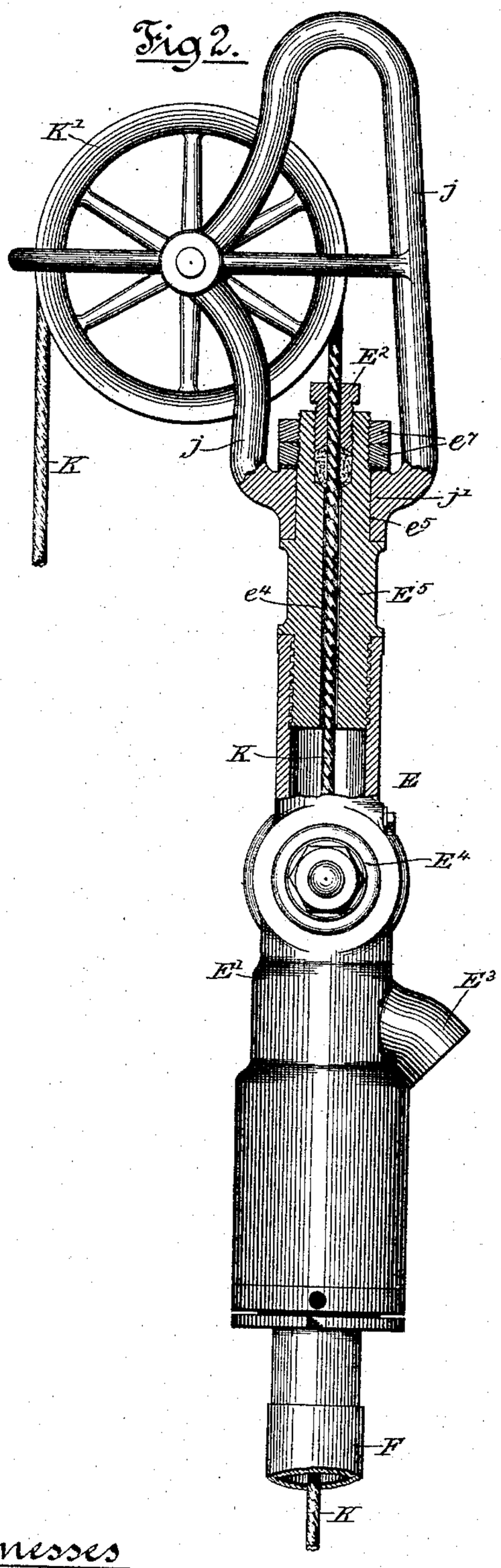
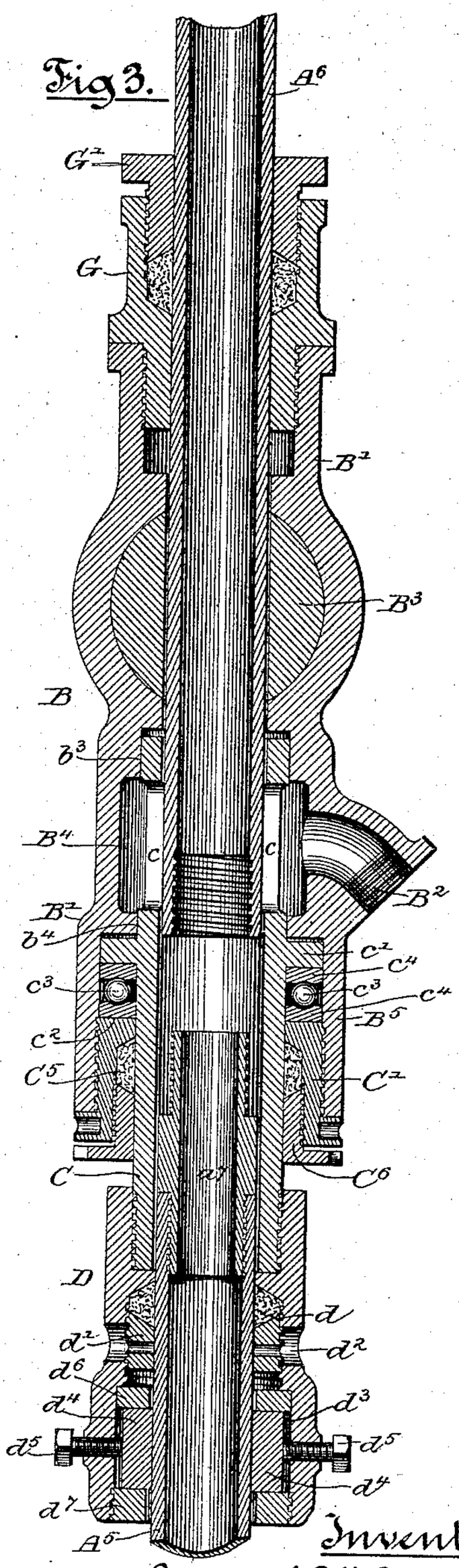


Fig 3.



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UNITED STATES PATENT OFFICE.

SAMUEL W. DOUGLASS, OF CHICAGO, ILLINOIS, ASSIGNOR TO MILAN C. BULLOCK, OF SAME PLACE.

WATER-SWIVEL FOR DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 473,918, dated May 3, 1892.

Application filed January 28, 1891. Serial No. 379,397. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL W. DOUGLASS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Water-Swivels for Drilling Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which a form part of this specification.

This invention relates to a novel construction in rock-drilling or earth-boring apparatus, and more especially to that class of such apparatus having an annular revolving cutting-head acting by attrition.

The invention relates more particularly to a novel construction and arrangement of the apparatus for securing a continuous flow of water under pressure through the drill-rod and outside the same between it and the walls of the hole in either direction and at all times, so that the said flow of water under pressure can be maintained when the core-barrel is being drawn up for the removal of pieces of the rock-core or when it is found necessary to lengthen the drill-rod by the addition of a length or section to the same or in other circumstances where it is usually necessary to discontinue the flow of water.

In the accompanying drawings, Figure 1 is a view in side elevation of a derrick and engine employed for well-drilling provided with devices embodying my invention and shown partly in section, said devices comprising, essentially, an upper and a lower water-swivel having suitable pipes and passages and communicating with a source for supplying water under pressure. Fig. 2 is a detail side view, partly in vertical section and on an enlarged scale, of the upper water-swivel. Fig. 3 is a detail view in central vertical section of the lower water-swivel.

In said drawings, A indicates a derrick of the ordinary construction, which is used for supporting well-drilling devices.

A′ indicates a drill-actuating machine located near the bottom of the derrick and provided with a drive-spindle *a* for driving and turning the drill-rod and having also auxiliary spindles *a′ a′*, which are connected with and adapted to feed forward a casing-tube A^3 and which are provided at their lower ends with gear-pinions a^2 a^2, engaging gear-teeth a^3 on a chuck a^4, attached to the top of the casing-tube for giving rotary motion to said casing-tube.

I contemplate using any desired form of drill-actuating machine, but have shown in the drawings a preferred form, which is more fully shown and described in Letters Patent No. 443,750, dated December 30, 1890. The said machine is also provided with suitable hoisting-drums, hereinafter referred to.

A^3 indicates a force-pump located near the bottom of the derrick A and provided with a pipe a^5, which may be used for supplying water under pressure to the casing-tube, and a suction-pipe a^6 to keep the shaft A^4 clear of water, such shaft being sunk under the derrick to facilitate the handling of the casing-tube sections.

A^5 indicates the upper portion of a tubular drill-rod, which is connected with the drive-spindle *a*. The upper end of said drill-rod is provided with a coupling a^7, hereinafter referred to.

B indicates as a whole a water-swivel, which is adapted for attachment to the upper end of the drill-rod, and is connected by means of hose *b* and pipe *b′* with the force-pump A^3, whereby water under pressure can be supplied to said drill-rod during the rotation of the latter. A stop-cock b^2, arranged in said pipe, enables the flow of water therein to be regulated as desired. The said water-swivel B comprises, Fig. 3, a barrel B′, having a lateral inlet-port B^2 located at a point between its ends, with which the hose *b* is connected, and with a transverse plug-valve B^3, the said valve being of proper size to admit a drill-rod when the valve is open.

C is a tube adapted to turn in the barrel B′ and connected by a water-tight joint therewith, said tube being attached by means of a chuck D to the drill-rod A^5 and constructed to allow the free flow of water from the inlet B^2 to the drill-rod when the latter is turning. The details of construction in these parts will be hereinafter described.

E is a second or upper water-swivel, which is generally like the water-swivel B, and com-

prises a barrel E′, having a gland E^2 at its upper end, a water-inlet E^3, and a plug-valve E^4 between the water-inlet and the gland.

F is a tube adapted to turn in the barrel E′ and connected by a water-tight joint therewith, said tube being made of considerable length and of the same external size as the drill-rod A^5. At its lower end said tube F is provided with screw-threads *f* or other means for attaching it with a water-tight joint to a section of the drill-rod. The water-inlet E^3 is connected by means of a hose *e* and pipe *e′* with the water-supply pipe *b′*, said pipe having a stop-cock e^2.

G is a tubular cap or sleeve provided with a gland or packing G′. The said sleeve is adapted to fit and slide upon the drill-rod sections and the tube F, and is constructed for attachment to the upper end of the barrel B′ of the lower swivel, preferably by means of a screw-joint. H is a plug, which is inserted in and closes the top of said barrel B′ during the operation of the drilling apparatus, the sleeve G being connected with said barrel only at the time of inserting a drill-rod or removing a section of the rock core formed by the drill.

I is a rope attached to the plug H, passing over a pulley I′ at the top of the derrick and attached to a counter-balance I^2. Said weight serves to counteract the gravity of the line of drill-rods and takes a part of the weight of the same from the feed devices of the drill-actuating machine.

J is a rope attached to and sustaining the upper water-swivel, said rope being attached to a yoke *j* upon the swivel and passing over a pulley J′ and thence downwardly to the hoisting-drum of the machine A′.

K is a rope passing through the upper water-swivel E and the gland E^2 thereof and over a pulley K′ in the yoke *j* to the winding-drum of the machine A′. Attached to the end of the rope within the tube F is an automatically-acting grapple or implement L, known as a "harpoon," for engaging and lifting a core-barrel or other tool or object through the hollow drill-rod.

In the operation of drilling, water for lubricating the cutting-head and removing detritus therefrom flows from the hose *b′* through the lower water-swivel B downwardly through the drill-rod, to the upper end of which said water-swivel is attached. To attach a new section of drill-rod a section A^6 of drill-tube is attached to the tube F, the plug H is removed from the lower water-swivel, the end of the drill-tube section A^6 is inserted in the top of the barrel B′ of said lower water-swivel, and the sleeve G then slipped down over the tube F and the drill-tube section A^6 and secured to the top of said barrel. The water is then allowed to flow into the upper water-swivel, after which the valve B^3 of the lower swivel is opened, allowing the water to flow from the upper water-swivel downwardly through the tube F, the drill-rod section A^6, and the lower water-swivel into the drill-rod A^5. The upper water-swivel is then lowered until the lower end of the drill-rod section A^6 comes in contact with the coupling a^7, when the said section is turned or rotated by the use of pipe-tongs or otherwise until a tight joint is made with the drill-rod A^5. The chuck D is then released from the drill-rod A^5, and the lower water-swivel slipped downwardly over the drill-rod section A^6 until the upper end thereof is below the valve B^3 and is in the same position as the top of the drill-rod A^5 as shown in the drawings. The chuck is then tightened on the drill-rod section and the tube F unscrewed therefrom, after which the latter is pulled upwardly through the sleeve G until above the valve B^3. As soon as the said tube F is disconnected from the drill-rod section water will flow from the hose *b′* through the lower water-swivel into the drill-rod and the valve B^3 may be closed, the flow of water thus being continuous throughout the entire operation of inserting the new drill-rod section. After the valve B^3 is closed the sleeve G is disconnected from the lower water-swivel and the tube F, with the sleeve thereon, is swung to one side and the plug H again inserted.

If a core-barrel or any other object is to be removed during the insertion of a drill-rod section, the harpoon L, with the object attached is lifted through the drill-tube and into the tube F, when said tube F is connected with the lower water-swivel, said object being removed from the tube F after the latter has been detached from the water-swivel and swung to one side of the same. In case it is desired to remove a rock core or other object at other time than when a drill-rod section is being inserted, the tube F is inserted in the lower water-swivel, the core-barrel or other object is drawn upwardly into the said tube F, and the latter then withdrawn from the water-swivel without stopping the flow of water through the drill-rod, as above described.

The details of construction in the several parts above mentioned will now be more particularly described.

To first refer to the construction of the lower water-swivel B, the barrel B′ of said water-swivel at either side of the valve-plug B^3 is made in interior diameter slightly larger than the exterior diameter of the drill-rod, and the port of the valve-plug is of about the same diameter as said barrel, so that the drill-rod can freely pass through said barrel and the valve-port. At a point within the barrel adjacent to the inlet-port B^2 is formed an annular enlargement or chamber B^4, with which said inlet-port communicates. The tube C is fitted and adapted to turn in the barrel B′ and forms the rotating part or member of the water-swivel, the joint between the barrel B′ and tube C being packed to make it water-tight and also provided with an anti-friction thrust-bearing to lessen the friction when a part of the weight of the drill-rod is sustained

by the swivel-head, as is commonly the case in the operation of the apparatus. The joint between said parts B′ and C is constructed in detail as follows: The upper end of the said tube C is adapted to fit and turn within annular bearing-surfaces b^3 b^4 above and below the chamber B^4, the tube being provided with openings or ports *c* in its part within the chamber to allow the free passage of water from the chamber to the interior of the tube. Below the lower bearing-surface b^4 the tube is provided with an external annular flange *c′*, which is located within the tubular lower part B^5 of the barrel, which part B^5 is made considerably larger in internal diameter than the exterior of the tube.

C′ is a sleeve or ring inserted in the lower end of the part B^5 of the barrel and the upper end of which forms an upwardly-facing shoulder c^2, opposed to the flange *c′* and adapted to take the end-thrust of the tube C under the weight of the drill-rod attached thereto. Between the said shoulder c^2 and the flange *c′* is located a series of anti-friction balls or rollers c^3 c^3, bearing-rings c^4 c^4 being placed between the said shoulder and flange and the balls to take the wear of the same. In the particular construction shown the ring C′ is screw-threaded exteriorly and engages an interior screw-thread on the tubular part B^5 of the barrel.

A packing box or gland to make a tight joint between the barrel and the tube C is made as follows: The ring C′ fits closely against the tube C at its upper end, but is recessed in its lower part to contain a packing C^5, which is held in place by a ring C^6, having screw-threaded engagement with the ring C′, in the manner shown.

The chuck D is connected with the lower end of the stem C by means of a screw-threaded joint. A packing-gland *d*, to make a water-tight joint between the drill-rod and the tube C, is formed by means of an annular recess in the body D of the chuck, said recess being closed by a ring *d′*, inserted in said recess and having screw-threaded connection with the side walls of the same. Said ring *d′* is provided with spanner-holes for the insertion of a spanner or suitable tool to turn the same, the coupling being provided with slots or openings d^2 adjacent to said ring, through which said tool may be inserted.

In the lower end of the chuck D is formed a recess d^3, in which is placed a plurality of blocks d^4 d^4, constituting the jaws of the chuck and having roughened or serrated inner faces adapted to bear against the drill-rod. Said blocks are clamped against the drill-rod by means of set-screws d^5 d^5. The said blocks d^4 d^4 are held in place by means of two rings d^6 and d^7, located above and below the same, the ring d^6 being arranged to bear against a shoulder formed at the upper end of the recess d^3, while the ring d^7 is held in place by screw-threaded engagement with the lower part of the chuck.

The plug H in the upper end of the barrel B′ is conveniently provided with an eye N to engage a hook *i* upon the counterbalance-rope I. The said counter-balance, as herein shown, comprises a tank or receptacle, which is adapted to be filled with water by means of a pipe b^6, communicating at one end with said tank and at its other end with the force-pump.

I^3 is an overflow-pipe passing through a gland I^4 in the bottom of the tank and upwardly within the same. The said pipe is provided with a flange or suitable lateral projections *i′ i′*, through which pass headed bolts i^2 i^2, secured to the tank at their upper ends. The said bolts are provided with nuts to raise or lower the upper open end of said overflow-pipe I^3 within the tank to regulate the amount of water to be contained therein.

The upper water-swivel E is similar in construction to the lower water-swivel, but smaller in dimensions. The parts of the lower part of said upper water-swivel from the valve E^4 to the bottom of the barrel E′ are like the corresponding parts of the lower water-swivel B, and need not be herein described in detail. Forming the upper part of the barrel E′ is a head or plug E^5, having a small central opening e^4 for the passage of the rope K. The said plug E^5 is provided at its upper end with a journal-bearing e^5, around which is placed a hub *j′*, to which is attached the yoke *j*, said hub being held in place by nuts e^7 e^7. This construction affords a swivel-joint between the upper water-swivel and the yoke *j*, by which it is supported. The upper end portion of the central opening e^4 of the plug E^3 is enlarged and screw-threaded. The packing-gland E^2 is made in the upper end of the plug E^5 and forms a tight joint to prevent leakage of water around the rope. The tube F is made of considerable length in order to contain the lifting tool or harpoon and an object—such as a core-barrel—attached thereto. For the purpose of inserting the drill-rod sections said tube F need be only long enough to pass inwardly through the lower water-swivel a sufficient distance to reach the top end of a drill-tube engaged therewith.

The said harpoon L above referred to is of a construction similar to that shown and described in an application for Letters Patent, Serial No. 278,571, filed by Milan C. Bullock in the United States Patent Office June 29, 1888, and is adapted to be used in connection with the method of removing the rock cores cut by an annular revolving cutting-head, which is claimed in another application for Letters Patent, Serial No. 278,572, filed by the same applicant of even date with said application for the apparatus, said method consisting, essentially, in removing the core-barrel and attached core upwardly through the drill-rod.

In Fig. 1 I have shown the parts above described in the positions they will occupy during the operation of drilling. In said figure

the lower water-swivel B is shown as connected with the upper end of the drill-rod and the plug H as inserted in the upper end of the water-swivel and connected with the counterbalance-weight. The upper water-swivel and harpoon are supported as described, but swing to one side, so as not to interfere with the operation of the other parts in drilling. The stop-cock b^2 is open to admit water to the lower water-swivel, from whence it passes down within the drill-rod to supply the cutting-head. The stop-cock B^3 of the water-swivel is closed and also the stop-cock e^2, which regulates the flow of water to the upper water-swivel.

When it is desired to add a section to the line of drill-rods, the lower water-swivel connected with the upper end of the drill-rod being near the lower limit of its movement, the rope I is first detached from the plug H and suitably attached to the derrick to sustain the counterbalance-weight. The plug H is then removed. The section of drill-rod A^6 is then attached to the lower end of the tube F. The latter is then hoisted and swung laterally into position above the lower water-swivel and lowered until its end enters the upper end thereof, after which the drill-rod sections are connected, as hereinbefore described. During this operation the drill-rod commonly continues to revolve; but it is preferable to allow it to revolve slowly, except when the sections are being secured together, when the drill-rod is stopped. The tube F turns in the upper water-swivel as soon as the sections of the drill-rod are connected. As soon as said connection is made the clutch-blocks d^4 d^4 are loosened by unscrewing the set-screws d^5, and the chuck D and lower water-swivel are slid upwardly over the added section of the drill-rod until they reach the upper end thereof and stand in the same relative position that they bore to the upper end of the drill-rod A^5. The clutch-blocks are then tightened to securely hold the said parts in position, and the tube F is then unscrewed from connection with the drill-rod section and is raised until its lower end is above the valve B^3. The stop-cocks e^2 and valve E^4 are then closed and the stop-cock b^2 opened, which directs the flow of water through the hose b into the lower water-swivel, as hereinbefore described. The sleeve is then unscrewed from the upper end of the said lower water-swivel and the pipe-section F hoisted out of the same, carrying with it the said sleeve, and is swung to one side. The plug is then replaced, the rope I connected therewith, and the drilling is continued until the drill-rod is advanced the length of another drill-rod section.

During the drilling operation the gravity of the counterbalance-weight may be changed, as desired, by lowering the overflow-pipe to let the water escape from the tank or by pumping more water into the same, so as to maintain an approximately equal load on the machine without regard to the length and weight of the drill-rod—as, for instance, when the drilling first begins the weight of the drill-rod is so slight that the forward feed thereof is accomplished mainly by the machine and the counterbalance-weight will not be in use. Later the resistance in cutting will balance the weight of the rod and the machine will have no strain thereon. After the drill-rod becomes so long that its weight is more than sufficient to produce the forward feed of the cutting-tool the feed device of the machine will act to check or hold back the rod and the counterbalance-weight comes into play, and the same may be made heavier by the introduction of more water as the length and weight of the drill-rod increases, so as to maintain a practical constant load on the machine.

When it is desired to remove a detached section of rock-core cut by the apparatus, the tube F is connected with the upper end of the drill-rod in the same manner above described in connecting a new section of drill-rod therewith, and the flow of water is sent through the upper water-swivel and the said tube F. The harpoon L, suspended by the rope K within said pipe-section, is then lowered downwardly through the drill-rod to the core-barrel, which, with the core thereon, may be brought up into the tube F. The said tube is disconnected from the upper end of the drill-rod and swung to one side, as before described, and the core removed from the core-barrel. The tube is then swung back and connected with the upper end of the drill-rod in the manner before described, the core-barrel lowered into position, and the harpoon detached therefrom and brought up within the pipe-section, which is then disconnected from the drill-rod, swung to one side, and the drilling operation resumed, as before.

It will of course be understood that the core may be removed at the same time that a new section of drill-rod is added. Heretofore in removing the core-barrel containing a rock core which has been cut and is standing within the same, or when the detached pieces of the core become jammed therein, or when it is necessary to reset the diamonds of the cutting-head, it has been customary to stop the flow of water and remove the entire length of drill-rod from the hole. When a hole is very deep, the removal and replacement of the entire length of drill-rod each time a core is cut and removed occasions a great delay in the drilling operation, and in fact requires more time than the actual drilling of the rock. For instance, when a hole has reached the depth of two thousand feet it requires from eight to ten hours to remove the drill-rod, take out core, and replace said drill-rod. Another difficulty encountered, owing to the stoppage of the flow of water, is that the pressure being relieved from the walls of the hole deposits of quicksand or loose material, through which the hole may pass, are likely to run into the same and retard the drilling operation, and it often occurs that the raising and lowering

of the drill-rod loosens large detached pieces in the walls of the hole and allows them to fall down within the same and sometimes lodge between the walls thereof. All of these difficulties greatly impede the drilling of the hole, and to obviate the same I have devised the construction shown and described in this specification, by which a constant flow of water through the drill-rod is obtained, which flow is uninterrupted during the addition of new drill-rod sections, the removal of the core, or under other circumstances.

It will of course be understood that the apparatus above described operates in the same manner, whether the flow of water is downwardly through the drill-rod and upwardly exterior thereto or whether the water is forced downwardly between the said drill-rod and a casing-tube surrounding it and upwardly through said tube. When the water is directed as last described, it is of course necessary to close the top of the casing-tube about the drill-rod, so as to make a tight joint at this point.

I claim as my invention—

1. A drilling apparatus comprising a sectional revolving drill-rod, a water-swivel consisting of rotating and non-rotating parts and provided with a valved passage for the drill-rod extending through the same, a second water-swivel consisting of a non-rotating part and a rotating part adapted for attachment to a drill-rod section, and water-supply pipes connecting with both of said water-swivels, substantially as described.

2. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a chuck for attaching the same to the drill-rod and with a valved passage for the drill-rod extending through the same, a second water-swivel adapted for attachment to a drill-rod section, and water-supply pipes connected with both of said water-swivels, substantially as described.

3. A drilling apparatus comprising a sectional drill-rod, a water-swivel consisting of rotating and non-rotating parts and provided with a valved passage for the drill-rod extending through the same, a packing located upon said rotating part for making a tight joint with the drill-rod sections, and a removable sleeve adapted for attachment to the upper end of said rotating part and provided with a packing for making a tight joint with said sections, substantially as described.

4. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod extending through the same, a removable sleeve adapted for attachment to said water-swivel and provided with a packing for making a tight joint with the drill-rod section passing through the same, a second water-swivel adapted for attachment to a drill-rod section, and water-supply pipes connected with said water-swivels, substantially as described.

5. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod extending through the same, a removable sleeve adapted for attachment to said water-swivel and provided with a packing, and a second water-swivel provided with a tube adapted to receive the said sleeve when the latter is detached.

6. A drilling apparatus comprising a drill-rod, a water-swivel, and a counterbalance-weight connected with the water-swivel, said weight consisting of a tank having a water-supply pipe and exit-passages, whereby its gravity may be varied, as desired.

7. A drilling apparatus comprising a drill-rod, a water-swivel, and a counterbalance-weight connected with the water-swivel, said weight consisting of a tank provided with a water-supply pipe and with an exit-pipe extending upwardly through the bottom of the tank and adjustable vertically therein, substantially as described.

8. A drilling apparatus comprising a sectional drill-rod, a water-swivel consisting of rotating and non-rotating parts and provided with a valved passage for the drill-rod through the same, a second water-swivel consisting of rotating and non-rotating parts and provided with a passage for a hoisting-rope, a hoisting-rope extending through the said passage, a gripping or other tool attached to said rope, a tube attached to the rotating part of the second water-swivel to receive the said tool, and water-supply pipes connected with both of said water-swivels, substantially as described.

9. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod sections extending through the same, a second water-swivel provided with a passage for a hoisting-rope, a hoisting-rope extending through said passage, a pulley for the said rope, and a yoke for supporting the pulley connected by a swiveled joint with the water-swivel.

10. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod sections extending through the same, a second water-swivel adapted for the attachment of its lower end to a drill-rod section and having a passage for a hoisting-rope, a packing in said passage for making a water-tight joint with the hoisting-rope passing through the same, and water-supply pipes connected with both of said water-swivels, substantially as described.

11. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod extending through the same, a second water-swivel adapted for attachment to a drill-rod section and provided with a hoisting-rope, and water-supply pipes connected with both of said water-swivels, substantially as described.

12. A drilling apparatus comprising a sectional drill-rod, a water-swivel provided with a valved passage for the drill-rod extending through the same, a second water-swivel provided with a passage for a hoisting-rope, a hoisting-rope extending through said passage, a grappling or other tool attached to said rope, a hoisting-rope attached to said last-mentioned water-swivel, and water-supply pipes connected with both of said water-swivels, substantially as described.

13. A drilling apparatus comprising a sectional drill-rod, a water-swivel consisting of rotating and non-rotating parts and provided with a valved passage for the drill-rod sections extending through the same, a second water-swivel also consisting of rotating and non-rotating parts having a valved passage extending through the same and having its rotating part adapted to attachment to a drill-rod section, and water-supply pipes connected with both of said water-swivels, substantially as described.

14. A drilling apparatus comprising a sectional drill-rod and a water-swivel provided with a passage for the drill-rod sections extending through the same, said water-swivel comprising a barrel B′, a tube C in the lower end of said barrel and adapted for attachment to the drill-rod sections, an external annular flange *c′* on said tube, a sleeve or ring C′ in the lower end of said barrel surrounding said tube, and a water-supply pipe connected with said water-swivel, substantially as described.

15. A drilling apparatus comprising a sectional drill-rod and a water-swivel provided with a passage for the drill-rod sections extending through the same, said water-swivel comprising a barrel B′, a tube C in the lower end of said barrel and adapted for attachment to the drill-rod sections, an external annular flange *c′* on said tube, a sleeve or ring C′ in the lower end of said barrel surrounding said tube, a packing in said sleeve for making a water-tight joint with the tube, and a water-supply pipe connected with said water-swivel, substantially as described.

16. A drilling apparatus comprising a sectional drill-rod and a water-swivel provided with a passage for the drill-rod sections extending through the same, said water-swivel comprising a barrel B′, a tube C in the lower end of said barrel, a chuck D on said tube, and a water-supply pipe connected with said water-swivel, substantially as described.

17. A drilling apparatus comprising a sectional drill-rod and a water-swivel provided with a valved passage for the drill-rod sections extending through the same, said water-swivel comprising a barrel B′, having an annular chamber B^4 communicating with a source of water-supply, and a tube C in the lower end of said barrel and adapted for attachment to the drill-rod sections, said tube extending past said chamber B^4 and having ports *c* adjacent to said chamber, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

SAMUEL W. DOUGLASS.

Witnesses:
C. CLARENCE POOLE,
GEORGE W. HIGGINS, Jr.