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724,160

No. 724,160. PATENTED MAR. 31, 1903.

W. H. CLARK & F. J. CURRIER.

DRILL FOR BORING WELLS.

APPLICATION FILED JAN. 27, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

(Fig. 5) (Fig. 6) (Fig. 7)

Fig. 2.

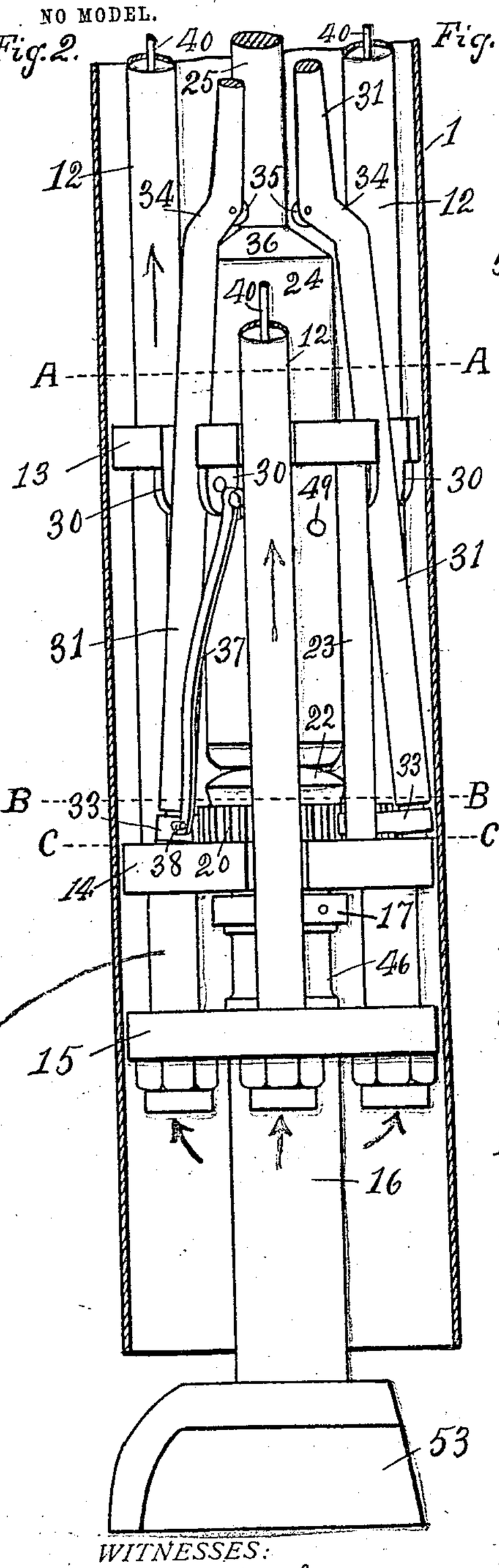


Fig. 1.

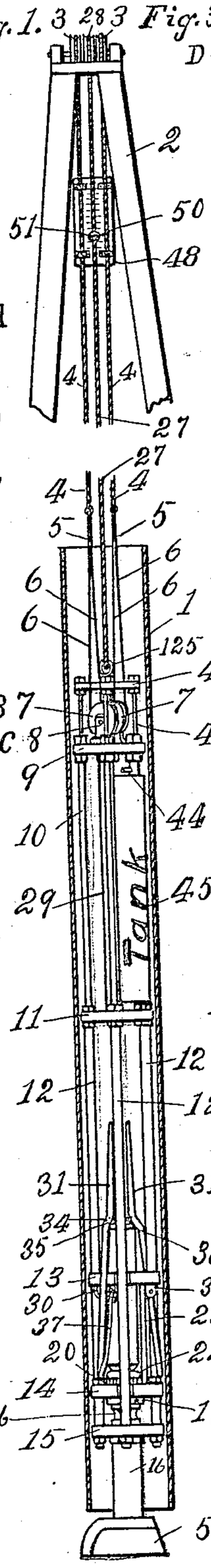
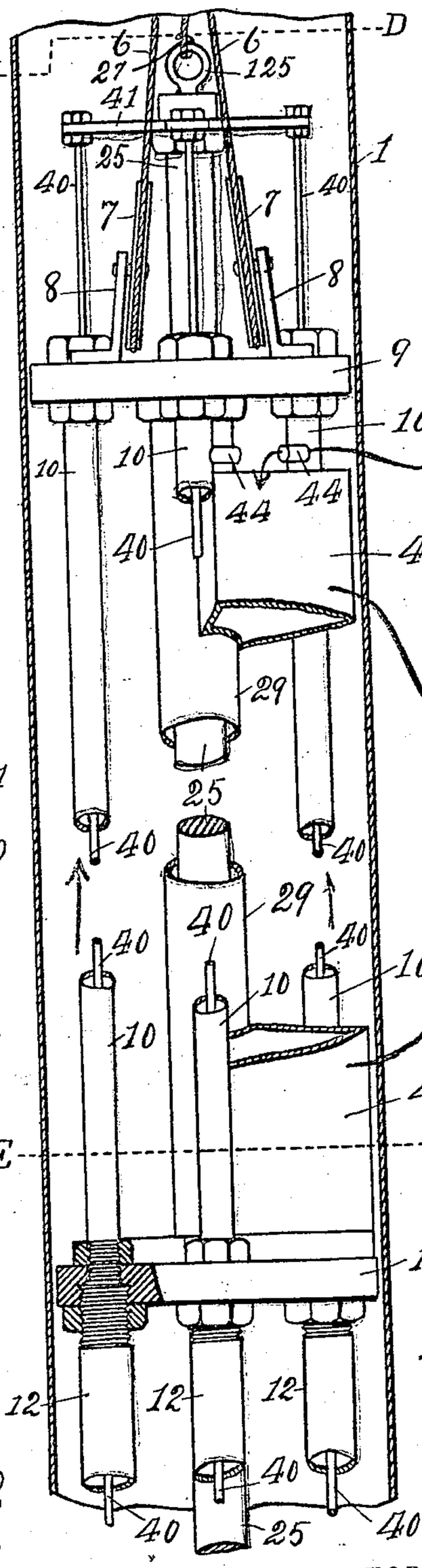


Fig. 3.



(Fig. 8) Discharge spouts

Sediment tank (Fig. 9)

Pump cylinders

WITNESSES:

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K Lockwood Devine.

INVENTORS

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Frank J. Currier

BY Frances M. Wright.

ATTORNEY.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

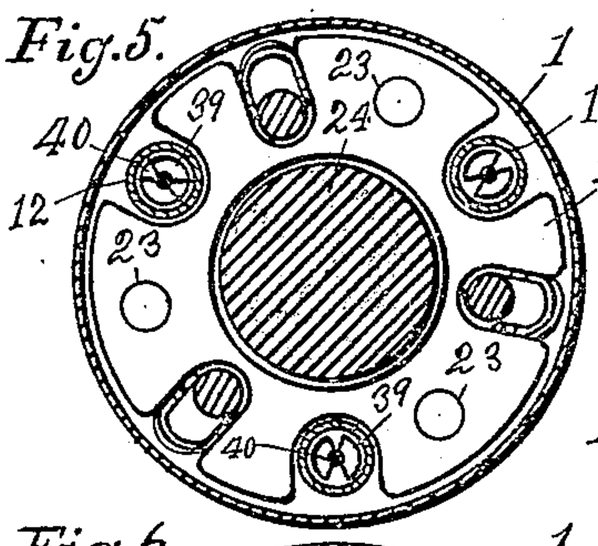


Fig. 6.

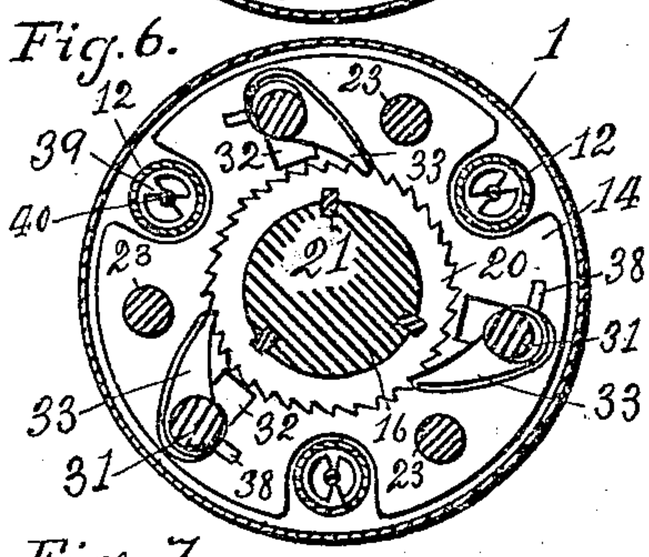


Fig. 7.

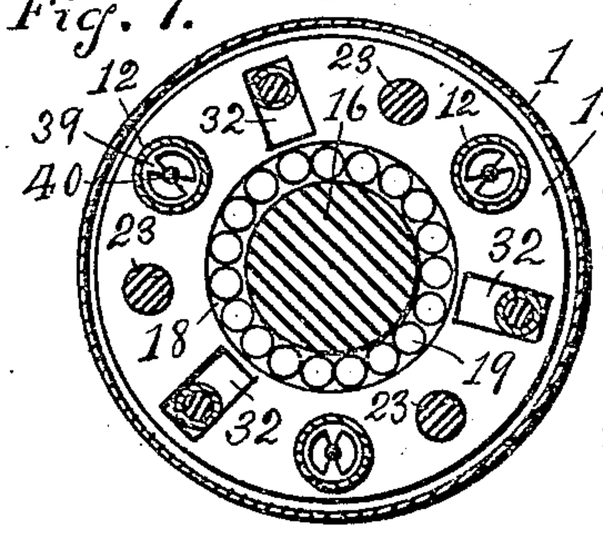
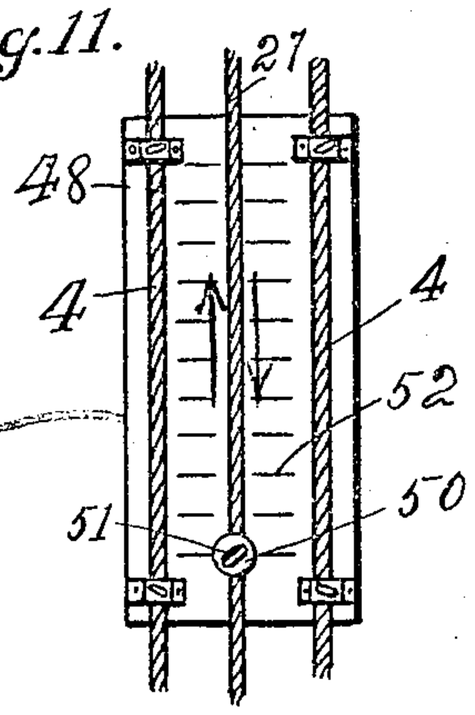


Fig. 11.



Indicates direction of drill feed

Fig. 4.

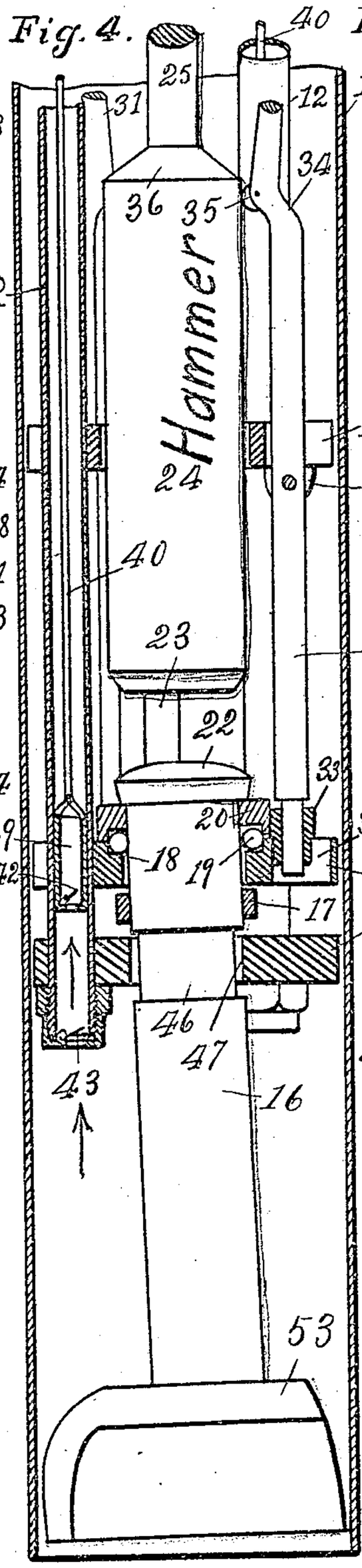


Fig. 10.

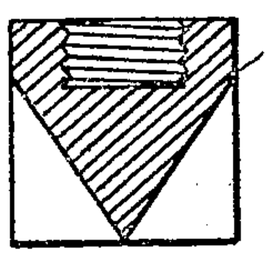


Fig. 8.

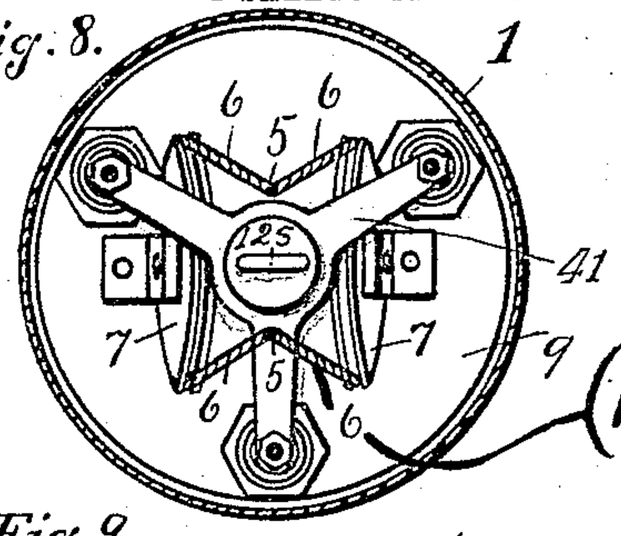
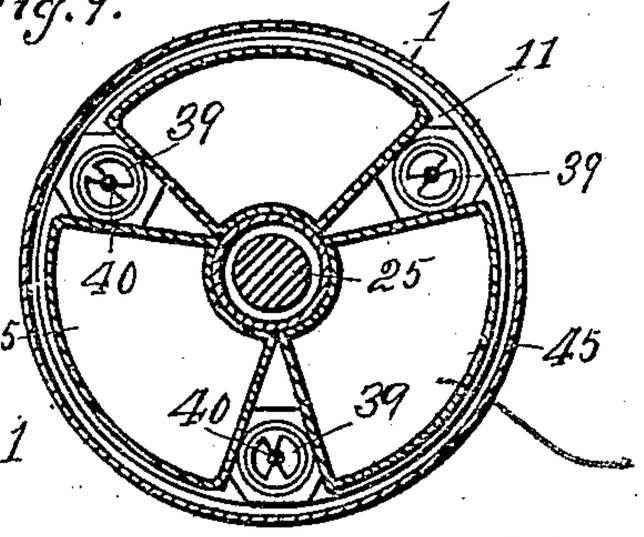


Fig. 9.



Sediment tanks

Fig. 14.

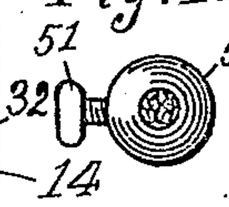


Fig. 15.

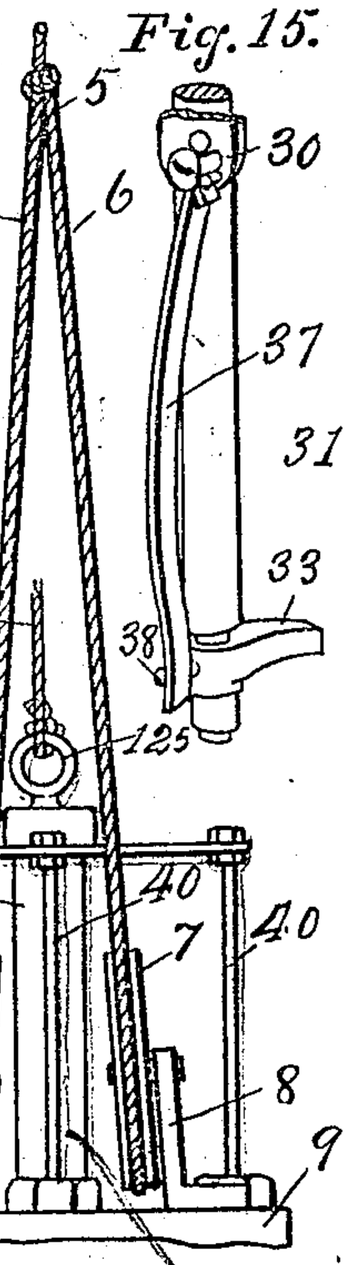


Fig. 13.

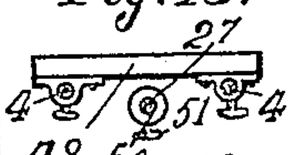


Fig. 12.

Hammer stem

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UNITED STATES PATENT OFFICE.

WILLIAM H. CLARK AND FRANK J. CURRIER, OF SAN FRANCISCO, CALIFORNIA.

DRILL FOR BORING WELLS.

SPECIFICATION forming part of Letters Patent No. 724,160, dated March 31, 1903.

Application filed January 27, 1902. Serial No. 91,376. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. CLARK and FRANK J. CURRIER, citizens of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Drills for Boring Wells, of which the following is a specification.

Our invention relates to improvements in drills for drilling wells, the object of our invention being to provide a drill particularly adapted for drilling deep wells, such as oil or Artesian wells.

One object of our invention is to provide a drill of this character by means of which a hole can be formed of slightly-greater diameter than the casing in which the drill works, so that the casing will sink easily into said hole as fast as it is drilled.

A further object is to provide means for rotating the drill automatically by the operation of reciprocating the same.

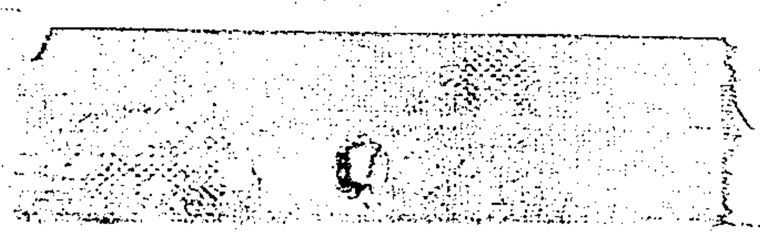
A further object is to provide improved means for applying water at the bottom of the well to remove the sediment created by the drilling and also improved means for disposing of said sediment.

Our invention also resides in the novel construction, combination, and arrangement of parts for the above ends, hereinafter fully specified, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of the entire well, showing also the top of the derrick. Fig. 2 is a vertical section of the lower portion of the casing, the drill and the lower part of the drill-frame being shown in elevation. Fig. 3 is a similar view of a portion of the casing and of the drill-frame above that shown in Fig. 2. Fig. 4 is a vertical section of the lower portion of the casing, showing also the drill-frame in section. Fig. 5 is a cross-section on the line A A of Fig. 2. Fig. 6 is a cross-section on the line B B of Fig. 2. Fig. 7 is a cross-section on the line C C of Fig. 2. Fig. 8 is a cross-section on the line D D of Fig. 3. Fig. 9 is a cross-section on the line E E of Fig. 3. Fig. 10 is a cross-section of the drill-shoe. Fig. 11 is a detail showing the indicating-board. Fig. 12 is an end elevation showing the pulleys for raising the frame. Figs. 13 and 14 are details of the indicating-balls on the ropes, and Fig. 15 is a perspective view of the foot of one of the levers.

Referring to the drawings, 1 represents the casing of a well, and 2 the upper portion of the derrick thereof. Upon the top of said derrick are mounted three rollers, over two of which, 3, are passed ropes 4, each of which is divided, as shown at 5, into two ropes 6, which pass underneath pulleys 7 and are then connected with the other rope 4. The object of this arrangement is that any inequality in the paying out of the ropes 4 will have no effect in tilting the frame suspended therefrom, since if one rope is paid out more than the other the only result will be to cause the ropes 6 to travel around the pulleys. Said pulleys are pivotally mounted on brackets 8, secured upon the plate 9. To said plate are secured symmetrically around the center three tubes 10, the lower ends of which are secured in apertures through a plate 11. In said apertures on the under side of the plate 11 are secured the upper ends of tubes 12, of somewhat larger size than the tubes 10. Said tubes 10 12 thus form three continuous conduits or passages. Said tubes 12 pass through recesses formed in plates 13 and 14, and their lower ends pass through and are secured to a plate 15. The highest and the lowest plates 9 15, together with the plate 11 and the tubes 10 12, thus form a frame in which the drill is suspended when not in use. The lowest plate has a circular aperture in its center through which passes, fitting snugly therein, the stem 16 of the drill. Upon the upper end of said stem is secured a collar 17, upon which rests the plate 14, and in a groove 18 in said plate 14 run balls 19 around the stem of the drill. Upon said balls rotates a ratchet-wheel 20, keyed, as shown at 21, to the stem of the drill, the enlarged head 22 of said stem resting upon said ratchet-wheel. Thus the plate 14 is secured to and moves vertically with the drill. With the plate 14 is rigidly connected the plate 13 by means of rods 23.

24 represents the hammer, having a ham-



mer-stem 25, passing upward through the plate 11 and the top plate 9, and having secured at its upper end an eye 125. To said eye is attached a cable 27, passing over a pulley 28 at the top of the derrick. A tube 29 surrounds the stem 25 between the plates 9 and 11. By reciprocating the cable the hammer can also be reciprocated, thereby delivering blows upon the head 22 of the drill, thus cutting or disintegrating the rock or soil at the bottom of the well.

In order to cause the drill to constantly rotate as it is reciprocated, we provide the following construction: From the plate 13 depend ears 30, in which are pivoted levers 31, moving in radial sockets 32 in the plate 14. Said levers have pivotally attached thereto at their lower ends pawls 33, engaging the teeth of the ratchet-wheel 20. At their upper ends said levers are bent inward, as shown at 34, and carry rollers 35, which in the ascent of the hammer are engaged by a sloping shoulder 36 on said hammer. The upper ends of the levers are thus pushed outward and the lower ends inward, thereby moving inward the pawls and advancing the ratchet-wheel. The advance of the ratchet-wheel through a small arc of a circle imparts a similar advance to the drill-stem, and thus causes the shoe of the drill to constantly rotate. If said shoe should be so firmly embedded in the rock or soil at the bottom of the well that it cannot be so turned by said levers and ratchet-wheel, then the effect of the engagement of the shoulder 36 with the rollers 35 will be to raise said levers, and thereby raise also the frame composed of the plates 13 14 and rods 23, and thereby also to raise the drill slightly. As soon as the drill is slightly raised it will be free to revolve, and the levers 31 will move outward, and the rotary movement will be imparted to the drill. 37 represents springs, which are secured at their upper ends to ears 30 and extend downward, their lower ends pressing against heels 38 on the rear sides of the pawls 33. The effect of these springs is twofold—first, to move the lower ends of the levers 31 outward when not in use, and, secondly, to move the points of the pawls inwardly, so that they engage the ratchet-teeth.

In order to get the best results from drilling, it is desirable that the drill shall be operated under water and that the debris caused by the drilling should be carried off by the water. For this purpose, having first supplied the bottom of the casing with a sufficient depth of water, the lower tubes 12 are utilized as pump-cylinders, and in said cylinders operate pump-plungers 39, each plunger being operated by a rod 40, passing upward through said tubes 12, also through the tubes 10 and out of the top thereof, and connected with the stem of the hammer by means of a spider 41. Thus whenever said hammer is raised the plungers will also be raised. Said plungers are provided with valves 42 in the bottom thereof, and the lower ends of the tubes 12 are also provided with valves 43. Thus by the rise of said plungers water is sucked into said cylinders and the water above the valves 42 is forced upward therein. The water passing upward through the tubes 10 12 discharges through lateral spouts 44, arranged in the sides of said tubes 10 at the top thereof and overhanging tanks 45. These tanks are arranged to fit between the plates 9 and 11 and also between the pipes 10 and are drawn up with the frame. The water pumped up in this way from the bottom of the well is discharged into said tanks and the sediment carried up with the water will be deposited therein, gradually settling at the bottom of said tanks. The water flowing off will be more or less cleared of sediment and will be returned to the bottom of the well to assist in the disintegration of the rock or soil. After operating the drill for a certain period of time, the length of which will depend upon the nature of the soil, the tanks will be so full of sediment that it will be necessary to remove the same in order to maintain the water sufficiently clear. For this purpose the whole frame, including the drill, will be drawn up by means of the ropes 4 to the top of the well, and then the sediment-tanks will be emptied of water and the sediment therein. They will then be restored to their original position, and the frame will be lowered to the bottom of the well, and the drill will be operated in like manner as before. We thus avoid the necessity of bringing the sediment up to the top of the well by pumping, which consumes considerable power and at the same time is not economical, because much of the sediment settles down in the water while the water is being pumped up, and thus is not brought to the top of the well.

In order to allow the bit 53 of the drill to pass inside the casing when it is being drawn up, the stem of the drill is constricted in diameter, as shown at 46, and when the frame is drawn up the aperture 47 in the plate 15, through which the stem passes, moves up around the constricted neck 46 of the drill. Said neck is sufficiently smaller in diameter than said aperture to permit the drill to tilt inward, and this it does when the sloping upper surface of the drill-bit contacts with the edge of the casing. In operation care is taken to insure that the frame around the drill shall be low enough for the aperture 47 to pass around the wide portion of the stem, and thus form a guide for the same after the drill is let down into position. It is particularly necessary to insure that the head of the drill, or rather the plate 14, attached thereto, should not descend into contact with the plate 15 while drilling; otherwise the impact of the hammer will tend to break the frame composed of the plate 9, 11, and 15 and the tubes 10 and 12. To avoid this, we provide a ball 50, adjustably secured by a set-screw 51

on the hammer-rope 27. Upon the ropes 4 is adjustably secured an indicating-board 48, graduated by lines 52. The position of the ball 50 indicates the height of the plate 14 with reference to the plate 15.

As is shown in the drawings, the bit 53 is made removable from the stem of the drill, being screwed thereon, so that different bits may be used as may be required, according to the formation of the rock or soil operated upon.

On reaching very soft or sandy soil it would not be desirable to allow the full weight of the hammer to fall upon the drill, as this would have the effect of driving the drill deep into the sand or soil at the bottom of the well. The effect of this might be to lower the drill so much with reference to the whole drill-frame that the latter would receive part of the jar of impact of the hammer, tending to destroy the same. Also injury might be caused by the sudden strain upon the rope supporting the hammer, the hammer not meeting with sufficient resistance upon impact with the drill. To avoid these results, we provide on the side of the hammer holes 49, through which plugs may be inserted, which plugs will, when the hammer is raised, engage the under side of the plate 13 and will raise said plate, thereby raising also the drill which is rigidly attached thereto by means of the plate 14. The movement of the hammer-rope therefore will then produce a chopping motion in the drill itself instead of driving it down by means of the hammer. The former result is desirable in very soft formations.

We claim—

1. In a drill, the combination, with the drill proper, of a plate around the stem of said drill, an upper plate, rods connecting said plates, levers pivotally supported by the upper plate, a hammer for driving the drill, and provided with means for rocking said levers by its reciprocation, a ratchet-wheel for rotating the drill, and means carried by said levers for rotating said ratchet-wheel, substantially as described.

2. In a drill, the combination, with the drill proper, of a plate around the stem of the drill, and having a circular groove, balls in said groove, a ratchet-wheel on said balls, said ratchet-wheel being secured to said drill, said drill having an enlarged head on said ratchet-wheel, a hammer for driving said drill, levers rocked by the reciprocation of said hammer and pawls carried by said levers and engaging said ratchet-wheel to rotate the same, substantially as described.

3. In a drill, the combination of a cylindrical casing, a frame in said casing, means for suspending said frame in said casing and for withdrawing it therefrom, a drill, reciprocating means for driving the drill, a pump-cylinder in said casing, a plunger in said cylinder operating synchronously with said driving means, and a sediment-tank supported by said frame within the casing independently of both the driving means and the drill, substantially as described.

4. In a drill, the combination, with the drill proper, of a hammer for driving the same, a frame for supporting said drill comprising upper and lower plates and tubes connecting said plates, plungers working in said tubes, a hammer with which said plungers are connected to reciprocate therewith, said tubes and plungers being provided with suitable valves, and a sediment-tank carried by said frame into which the water raised by the plunger discharges, substantially as described.

5. In a drill, the combination of three plates, tubes connecting the upper and middle plates, tubes connecting the middle and lower plates, and forming continuous passages with the upper tubes, a drill, a hammer for driving the drill, plungers working in the lower tubes being suitably valved to form suction-pumps, and sediment-tanks supported upon the middle plate and arranged between the upper tubes, the water raised by the plungers discharging from said upper tubes into said sediment-tanks, substantially as described.

6. In a drill, the combination of a drill proper having a head, a stem, and a constricted neck, of means for raising said drill by said head, and a frame for guiding said drill, said frame having a plate with a central aperture therein, through which aperture said stem passes snugly to guide the drill centrally, and through which aperture said neck passes loosely to permit lateral movement of the drill, substantially as described.

7. In a drill, the combination with a casing, of a drill-stem screw-threaded at its lower end, and a drill-bit having a substantially central screw-threaded recess into which the lower end of the stem is screwed, and a hammer for driving said drill, substantially as described.

8. In a drill, the combination, with the drill proper, of a frame for raising and lowering the same, a rope attached to said frame, a hammer, a rope for reciprocating said hammer, and indicators attached to said ropes to indicate the relative positions of the hammer and drill-frame, substantially as described.

9. In a drill, the combination, with the drill proper, of a frame for raising and lowering the same, pulleys attached to the top of said frame, ropes around said pulleys, two ropes attached to the four upper ends of said ropes, an indicating-board attached to the two ropes, a hammer, a rope for reciprocating the same, and an indicator adjustably attached to said hammer-rope, and by its position relatively to the board indicating the relative positions of the hammer and the drill-frame, substantially as described.

10. In a drill, the combination of a drill, a frame for supporting the drill, a hammer for driving said drill normally disconnected therewith, the lower end of the hammer and the upper end of the drill being provided with

flattened abutting surfaces suitable to receive impacts therebetween, said hammer and drill being normally disconnected, and means for attaching said drill-frame to said hammer when desired whereby the drill is reciprocated by the means for driving the hammer, substantially as described.

In witness whereof we have hereunto set our hands in the presence of two subscribing witnesses.

WM. H. CLARK.
F. J. CURRIER.

Witnesses:
FRANCIS M. WRIGHT,
B. GORFINKEL.