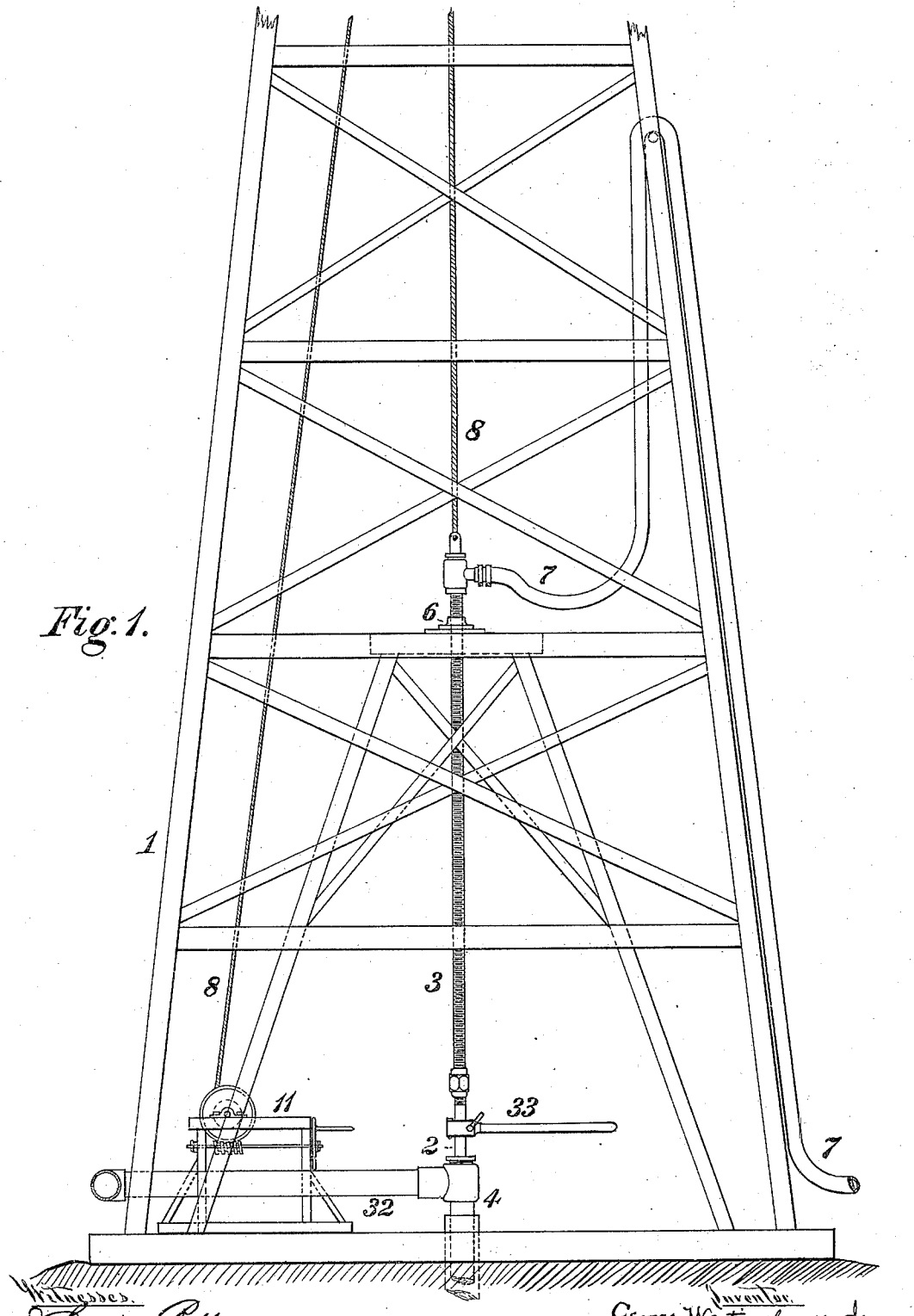
(No Model.) 4 Sheets—Sheet 1.

G. WESTINGHOUSE, Jr.

WELL DRILLING APPARATUS FOR OIL, GAS, OR WATER.

No. 307,606. Patented Nov. 4, 1884.

Fig. 1.



Witnesses.
Thorndyke Bell.
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Inventor.
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by George H. Christy Atty.

(No Model.) 4 Sheets—Sheet 2.

G. WESTINGHOUSE, Jr.

WELL DRILLING APPARATUS FOR OIL, GAS, OR WATER.

No. 307,606. Patented Nov. 4, 1884.

Fig. 2.

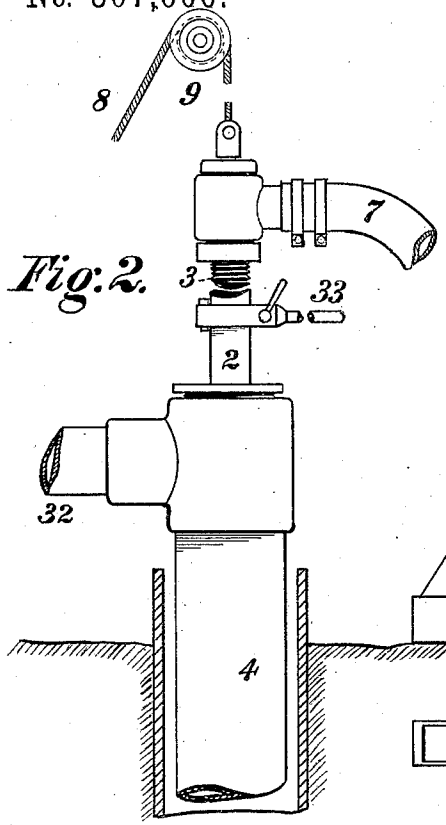


Fig. 3.

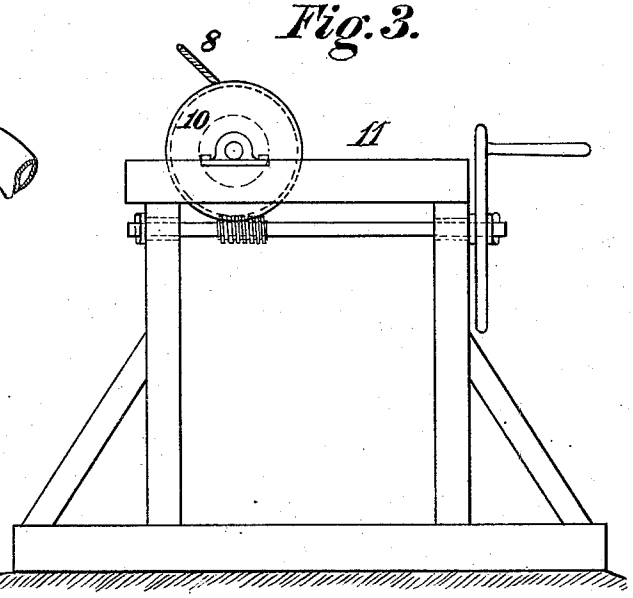
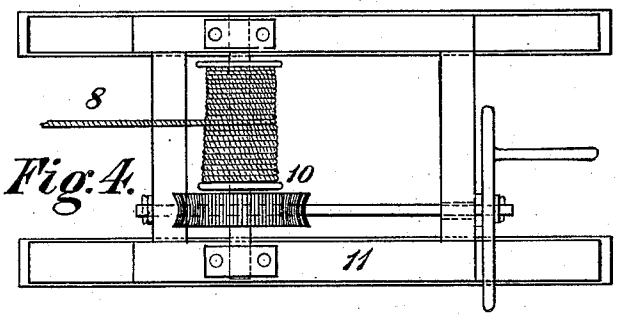


Fig. 4.



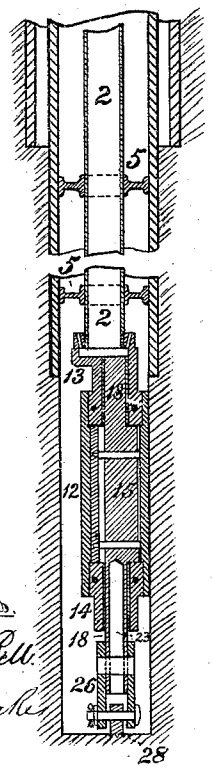


Fig. 5.

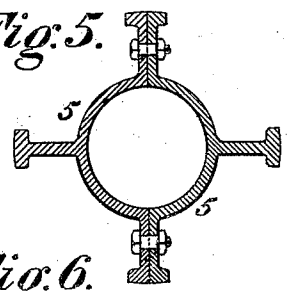


Fig. 6.

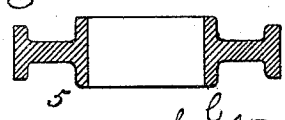
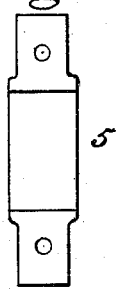


Fig. 7.



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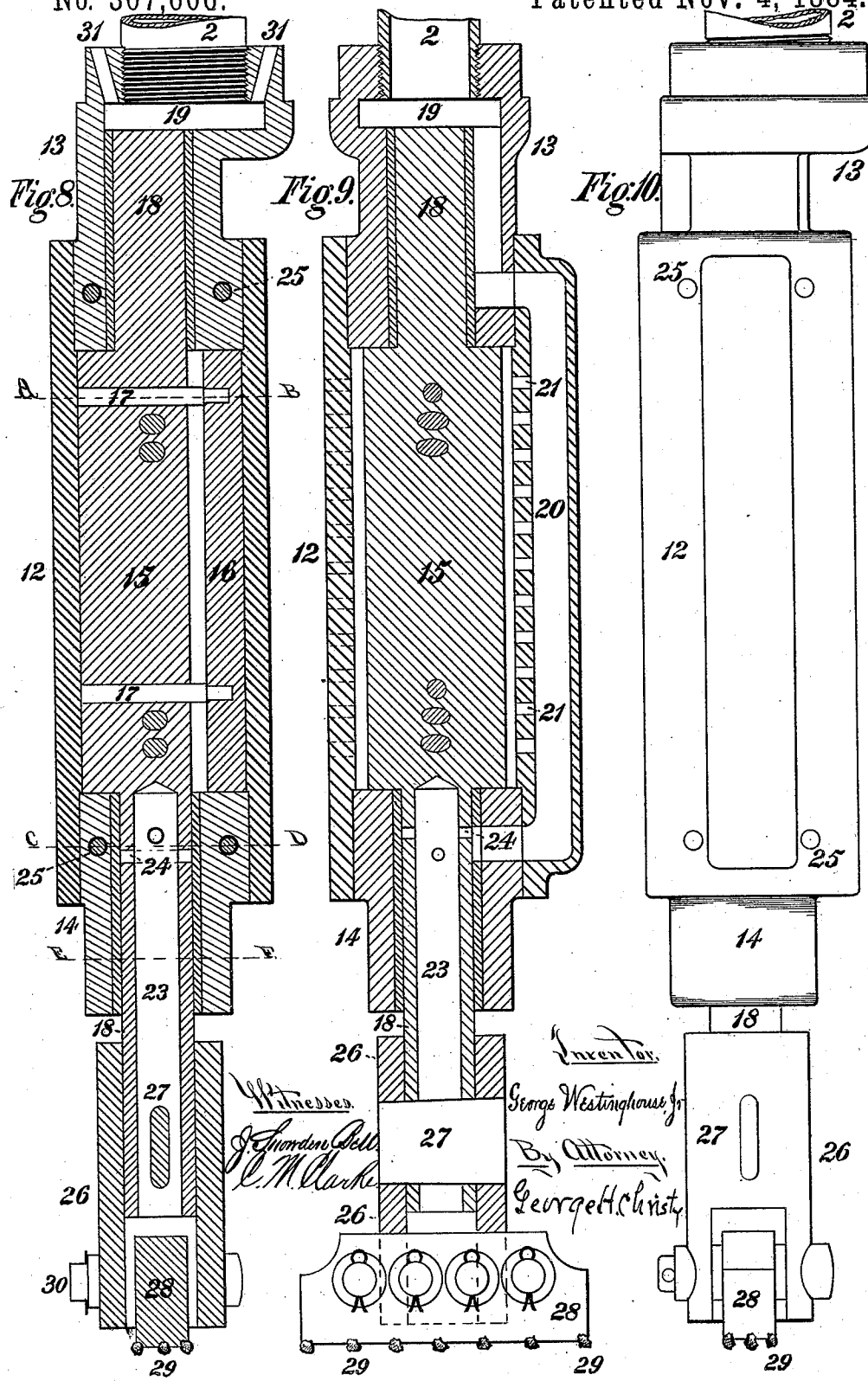
(No Model.) 4 Sheets—Sheet 3.

G. WESTINGHOUSE, Jr.

WELL DRILLING APPARATUS FOR OIL, GAS, OR WATER.

No. 307,606. Patented Nov. 4, 1884.



(No Model.) 4 Sheets—Sheet 4.

G. WESTINGHOUSE, Jr.

WELL DRILLING APPARATUS FOR OIL, GAS, OR WATER.

No. 307,606. Patented Nov. 4, 1884.

Fig. 11.

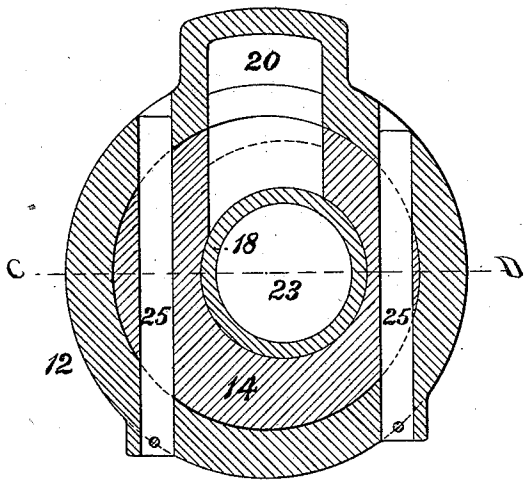


Fig. 12.

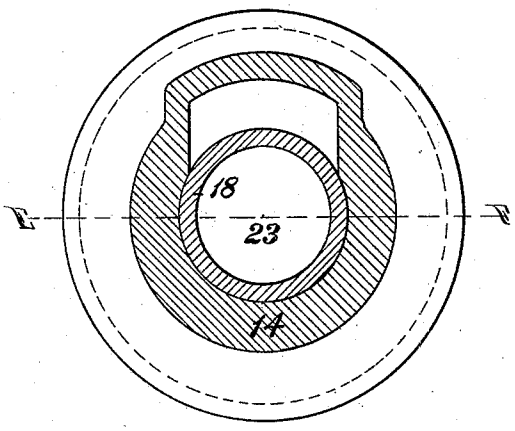


Fig. 13.

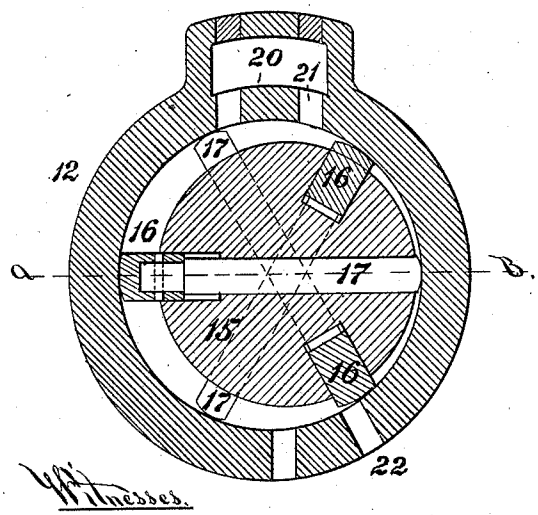
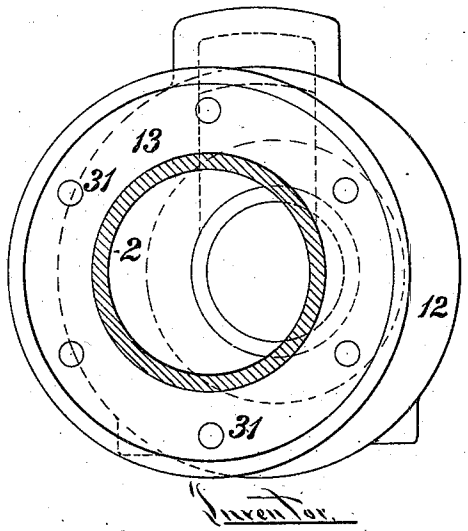


Fig. 14.



Witnesses.
J. Snowden Bell.
C. M. Clarke.

Inventor.
George Westinghouse, Jr.
by George H. Christy
Atty

UNITED STATES PATENT OFFICE.

GEORGE WESTINGHOUSE, JR., OF PITTSBURG, PENNSYLVANIA.

WELL-DRILLING APPARATUS FOR OIL, GAS, OR WATER.

SPECIFICATION forming part of Letters Patent No. 307,606, dated November 4, 1884.

Application filed June 21, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WESTINGHOUSE, Jr., a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Well-Drilling Apparatus for Oil, Gas, or Water, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1, Sheet 1, is a view in elevation of a derrick and other apparatus adapted to the practice of my invention; Fig. 2, Sheet 2, a view, partly in elevation and partly in vertical longitudinal section, of the tubing and motor; Fig. 3, a side view, in elevation, of the windlass; Fig. 4, a plan or top view of the same; Fig. 5, a horizontal section, on an enlarged scale, through a pair of guide-clamps; Fig. 6, a vertical section through the same; Fig. 7, a view in elevation of a guide-clamp as seen from the inside; Figs. 8 and 9, Sheet 3, longitudinal central sections, at right angles one to the other, through the motor; Fig. 10, a side view, in elevation, of the same; Fig. 11, Sheet 4, a transverse section through the motor at the line C D of Fig. 8; Fig. 12, a similar section at the line E F; Fig. 13, a similar section at the line A B, and Fig. 14 a plan or top view.

The object of my invention is to facilitate and expedite the drilling of wells for oil, gas, or water by obviating the delays heretofore occasioned by the necessity of intermitting the drilling operation to remove the cuttings and other solid matters from the bore of the well.

To this end my invention, generally stated, consists in the combination of a rotary cutting apparatus, a fluid-pressure motor actuating the same, and means for sustaining and feeding said cutting apparatus and motor, supplying the motor with fluid under pressure, and delivering the actuating-fluid into the bore of the well, in order to effect the requisite discharge of solid matter therefrom during the operation of the cutting apparatus.

The improvements claimed are hereinafter fully set forth.

To carry out my invention I erect above the point at which the well is to be bored a suitable derrick or vertical frame, 1, which serves for the support and adjustment in operation of the several members of the apparatus. A main pipe, 2, the upper section, 3, of which is externally threaded throughout its length, is located centrally within a discharge-casing, 4, within which it is guided, so as to be maintained in its longitudinal movements concentric with the axis thereof, by guide-clamps 5, secured in pairs around its periphery and fitting freely in the casing 4. The external thread of the upper section, 3, of the main pipe engages a nut, 6, secured upon the derrick, and preferably made in two sections, so as to be separable and removable from the section 3, to admit of the speedy elevation of the latter, as from time to time required, for the insertion of additional sections in the main pipe in the progress of the work. A flexible supply-pipe, 7, is connected to the threaded section 3 of the main pipe at or adjacent to its upper end, and a hoisting-rope, 8, is secured to the upper end of said section and led around a pulley, 9, on the derrick to the drum 10 of a windlass, 11. A rotary engine or motor of any suitable and approved construction is secured to the lower end of the main pipe 2, with its shaft preferably eccentric to the axis of the pipe, said main pipe performing the functions of supporting the motor, supplying motive fluid thereto, and acting as the medium through which the requisite progressive downward feed is imparted to the cutters.

The motor herein shown is a simple and compact rotary engine having a cylinder, 12, provided with upper and lower heads, 13 14, secured by transverse bolts 25, and an eccentric piston-drum, 15, formed together with or secured to a shaft, 18, mounted in bearings in the heads eccentrically to the main pipe 2, the drum being fitted with a series of pistons or abutments, 16, secured to transverse guide-stems 17, and working in radial slots in the piston-drum. The upper head, 13, is secured to the lower end of the main pipe 2, which communicates with a chamber, 19, in the head 13, from which a supply-passage, 20, extends along the cylinder to its lower head, 14. Motive fluid is delivered to the pistons through supply-ports 21, leading from the passage 20 to the bore of the cylinder, and after acting on the pistons is exhausted therefrom through discharge-ports 22 on the opposite side of the cylinder. A central passage, 23, formed in the motor-shaft 18 and extending from the piston-drum to the lower end of the shaft, communicates by ports 24 with the sup-

ply-passage 20, a constant discharge of fluid under the working-pressure being thereby effected at the lower end of the shaft during the operation of the engine. The motor above described does not, however, separately considered, form part of my present invention, and any other construction of engine capable of imparting rotation in a plane perpendicular to the axis of the main pipe may be substituted in the discretion of those skilled in the art. A socket or chuck, 26, secured by a key, 27, to the lower end of the motor-shaft 18, supports a cutter-head, 28, of any suitable form, to which are secured a series of tools or cutters, 29, of diamond or other material of a sufficient degree of hardness, the cutter-head being held in position by bolts 30, or otherwise connected, so as to be readily insertible and removable, as required. By locating the motor eccentrically to the main pipe, as specified, the area traversed by the cutters is correspondingly increased.

To provide for an additional direct delivery of fluid into the discharge-casing, a series of openings, 31, leading from the chamber 19, may be formed in the head 13, and a waste-pipe, 32, connected to the upper end of the discharge-casing, conveys the fluid and solid matters which pass upward through the same to any convenient point of delivery.

The downward feed of the cutters, as well as the movement of the motor-shaft in an orbit eccentric to the axis of the main pipe, is effected by gradual and intermittent movements of the main pipe about its axis, said movements producing a downward traverse of said pipe and the connected motor and cutter-head through the engagement of the threaded section 3 with the stationary nut 6. For this purpose a hand-lever, 33, actuated by the operator, is clamped to the main pipe in any convenient position, its location being varied from time to time as becomes necessary in the descent of the pipe as the drilling of the well progresses. The feed may be effected by automatic mechanism, if preferred; but its performance by the operator enables it to be more accurately regulated to the requirements of the work performed by the cutters.

In lieu of connecting the motor to the lower end of the main pipe and rotating only the motor-shaft and connected members, the cutter-head may be connected directly to the main pipe, and the pipe rotated by a motor exhausting thereinto, so as to discharge at a point or points adjacent to the cutters, as in the construction above described and shown, the functions of actuating the cutters and carrying off the solid matters being similarly performed by the motive fluid in both cases.

In operation, fluid under pressure, which may be steam, compressed air, or high-pressure gas—such as natural gas delivered from a well—being led into the supply-pipe 7, the same, passing to the motor, effects the rapid rotation of the cutter-head 28, the cutters of which, by their planing or abrading action, cut away in minute portions the earth or rock upon which they bear. The blast of fluid from the lower end of the motor-shaft drives the cuttings and sediment from the path of the cutters, and the upward current induced thereby, as well as by the exhaust of the motor and the direct discharge through the upper cylinder-head, carries with it the solid matters, which pass with the escaping fluid through the discharge-casing and discharge-pipe, thus permitting the drilling operation to be continued without intermission, as heretofore, for their removal. The main pipe is fed downwardly as required by the progress of the work, and when the lower end of the upper threaded section, 3, has been brought nearly to the top of the discharge-casing it is detached from the adjacent section of the main pipe, and the nut 6, having been removed, is elevated by the windlass for a sufficient distance to admit of the insertion of another section of the main pipe, which being properly connected and the nut 6 replaced, the operation is continued, additional sections being added until the depth required for the well has been attained.

I claim herein as my invention—

1. In a well-drilling apparatus, the combination of a cutting apparatus, a motor imparting rotation thereto, a main pipe supporting said cutting apparatus and establishing communication between the exhaust-passage of the motor and a discharge-opening adjacent to the cutting apparatus, and a discharge-casing inclosing said main pipe, substantially as set forth.

2. The combination of a cutting apparatus, a motor imparting rotation thereto, a main pipe supplying motive fluid for the actuation of the motor, and a port or passage above the motor affording a direct discharge of fluid from said main pipe into the bore or excavation in which the cutting apparatus operates, substantially as set forth.

3. The combination of a main supporting and fluid-supply pipe, a motor connected thereto, a cutting apparatus rotated by said motor, an exhaust-passage delivering fluid from the motor into the excavation in which the cutting apparatus operates, a discharge-casing inclosing the main pipe, guides interposed between said casing and pipe, a threaded section and an operating-lever, each connected to said pipe, and a fixed nut engaging said threaded section, substantially as set forth.

4. The combination of a main supporting and fluid-supply pipe, a rotary motor connected to said pipe eccentrically to its axis, and a cutting apparatus secured to the shaft of said motor, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEO. WESTINGHOUSE, JR.

Witnesses:

J. SNOWDEN BELL,

R. H. WHITTLESEY.