(No Model.) 4 Sheets—Sheet 1.

F. GARDNER.

APPARATUS FOR BORING WELLS.

No. 455,037. Patented June 30, 1891.

Fig. 1.

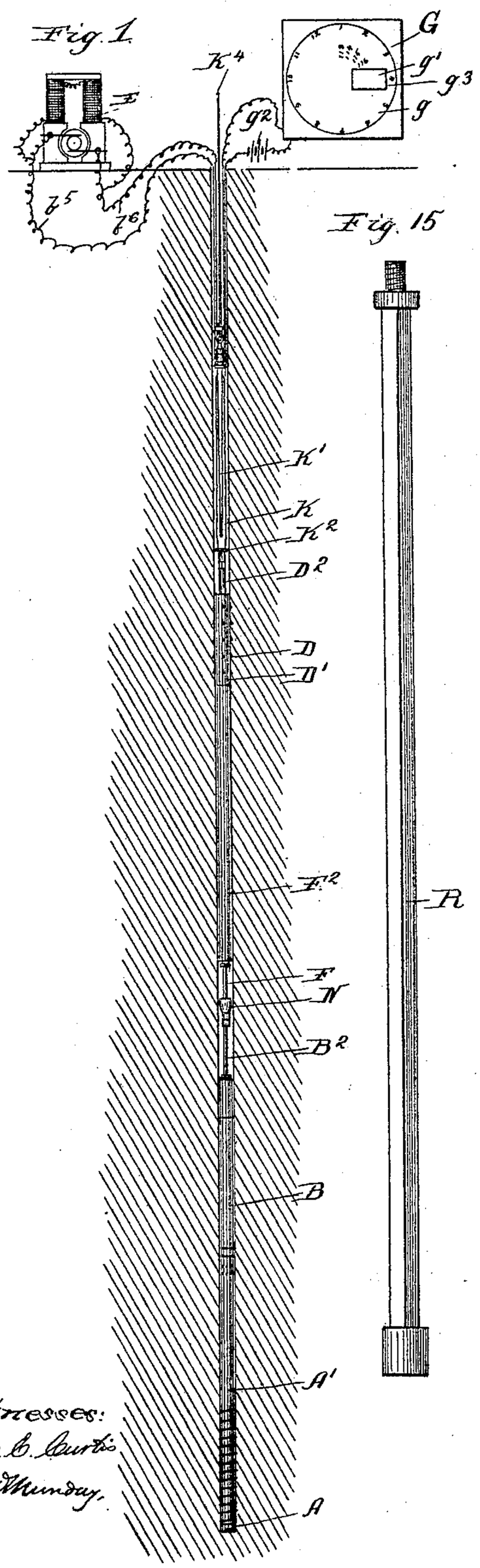


Fig. 15.

Fig. 13.

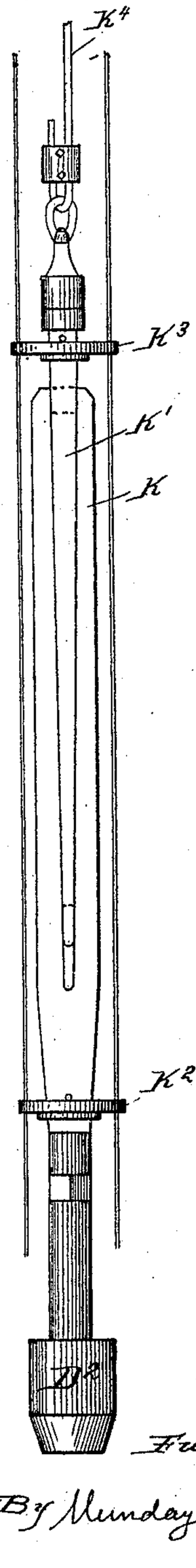
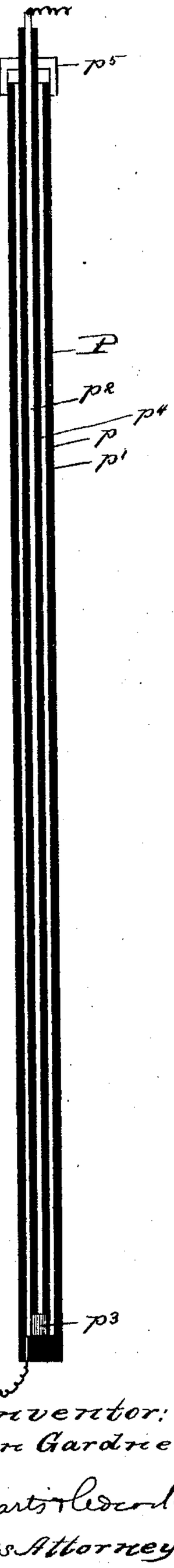


Fig. 12.



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(No Model.) 4 Sheets—Sheet 2.

F. GARDNER.

APPARATUS FOR BORING WELLS.

No. 455,037. Patented June 30, 1891.

Fig. 2.

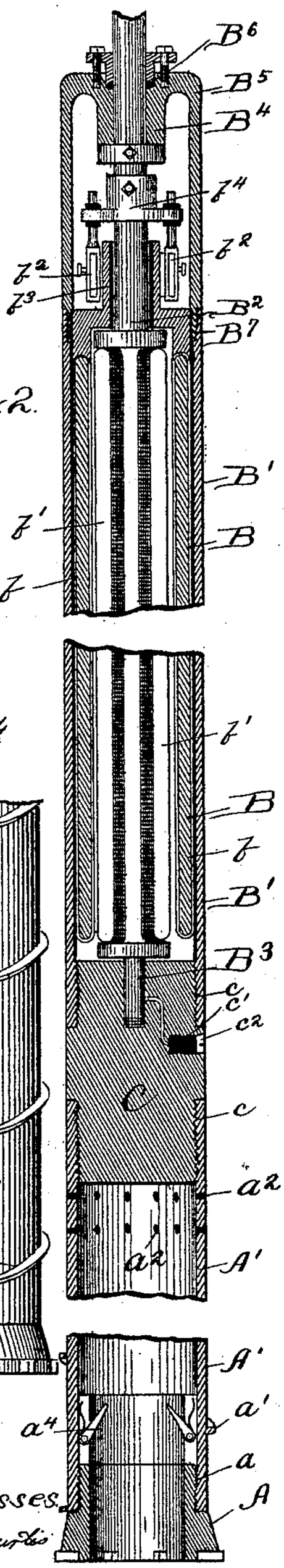
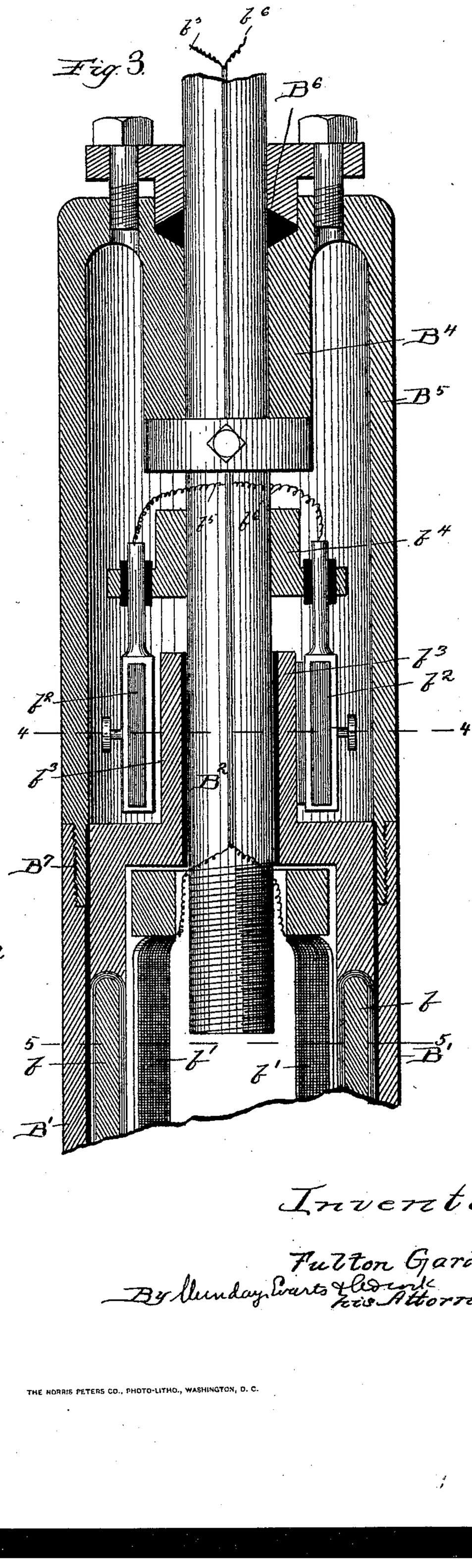


Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

F. GARDNER.

APPARATUS FOR BORING WELLS.

No. 455,037. Patented June 30, 1891.

Fig. 4.

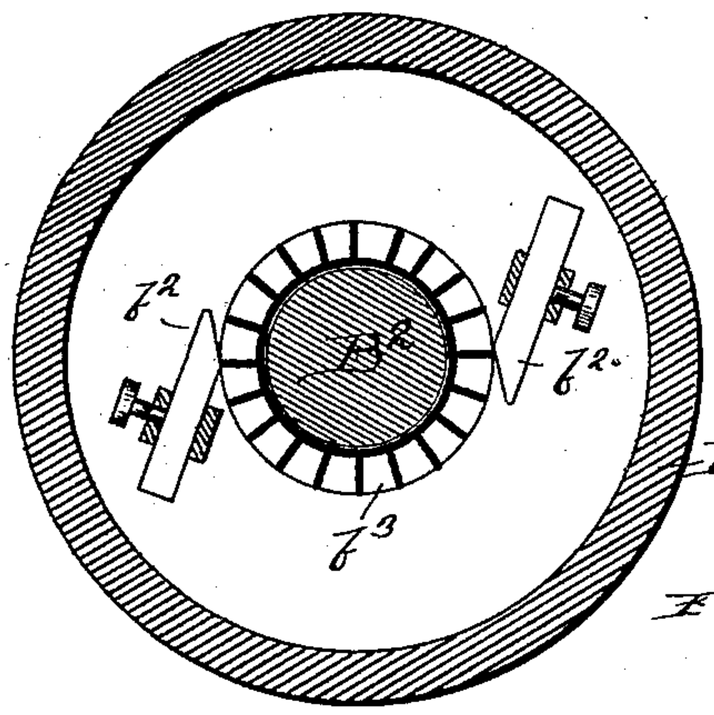


Fig. 5.

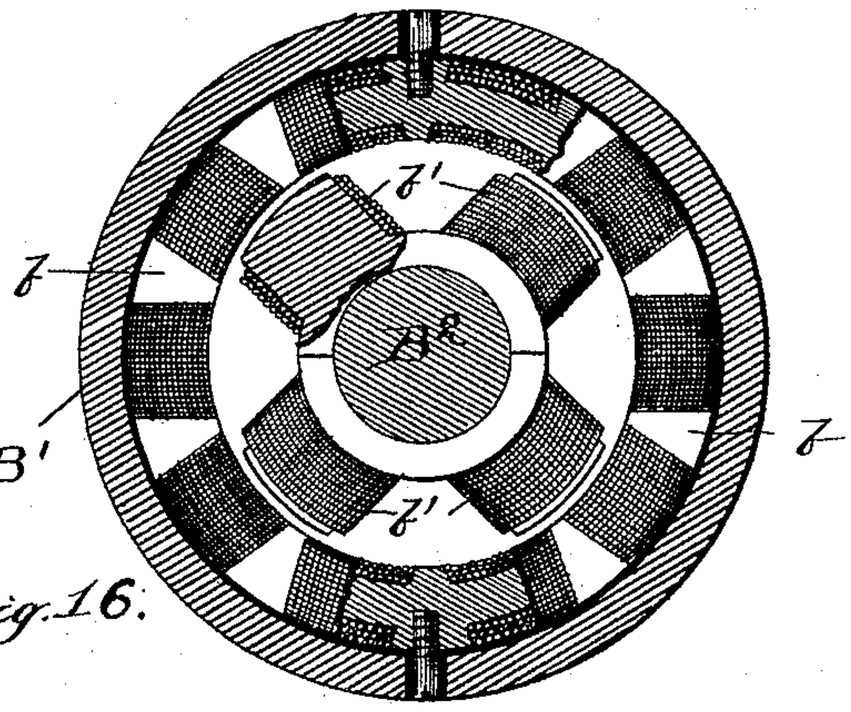


Fig. 16.

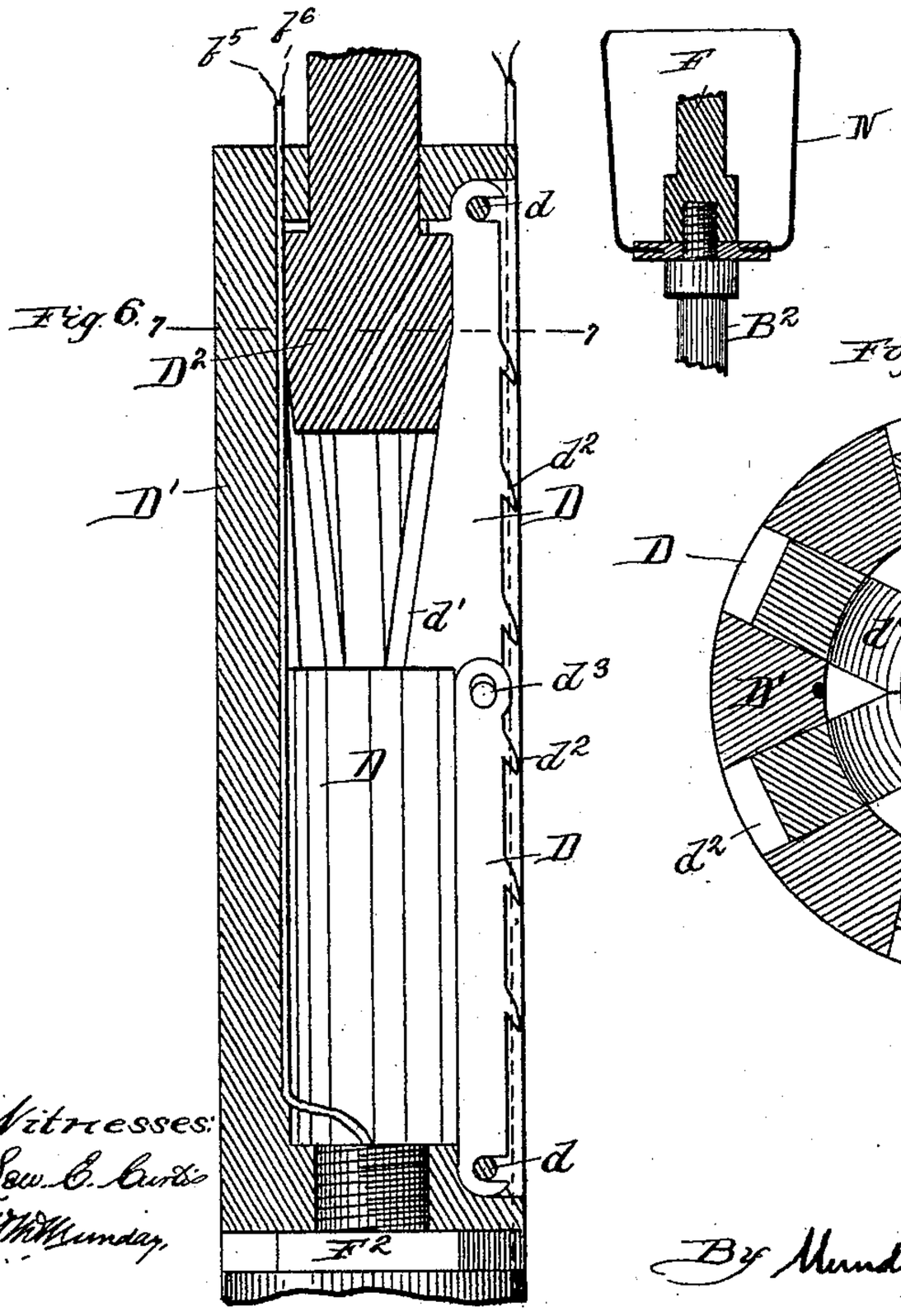


Fig. 6.

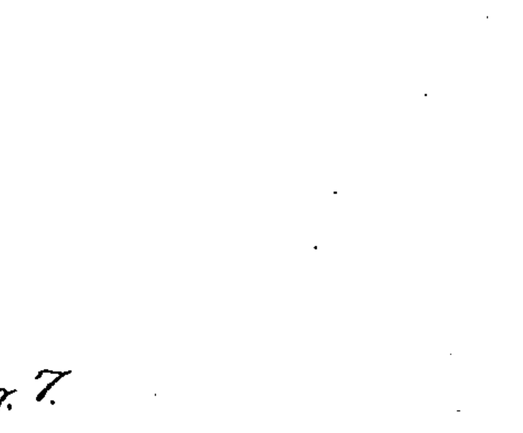
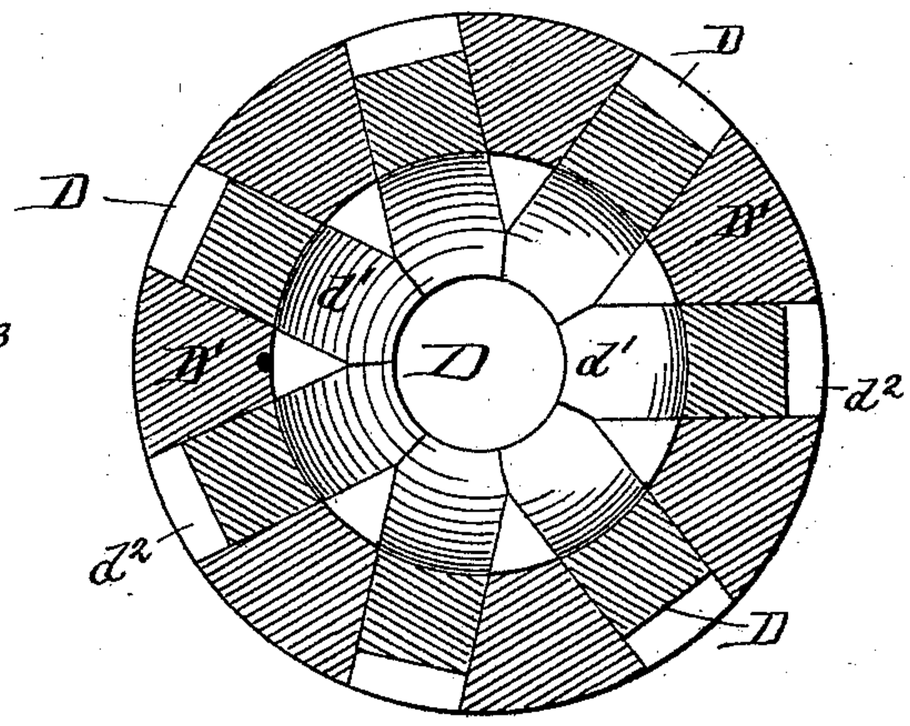


Fig. 7.



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(No Model.) 4 Sheets—Sheet 4.

F. GARDNER.

APPARATUS FOR BORING WELLS.

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Fig. 8.

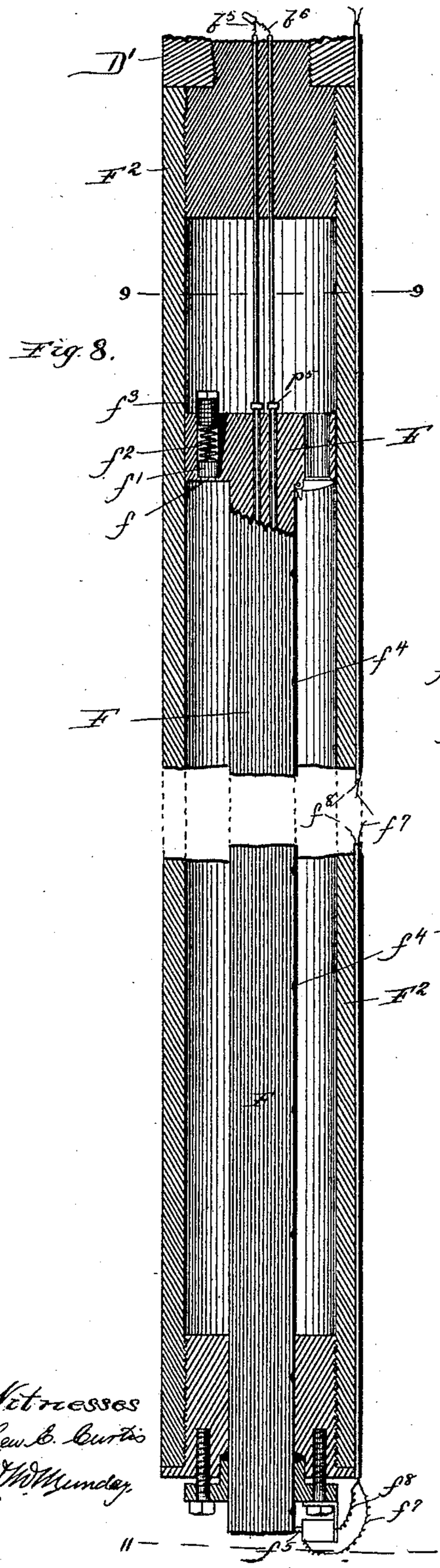


Fig. 9.

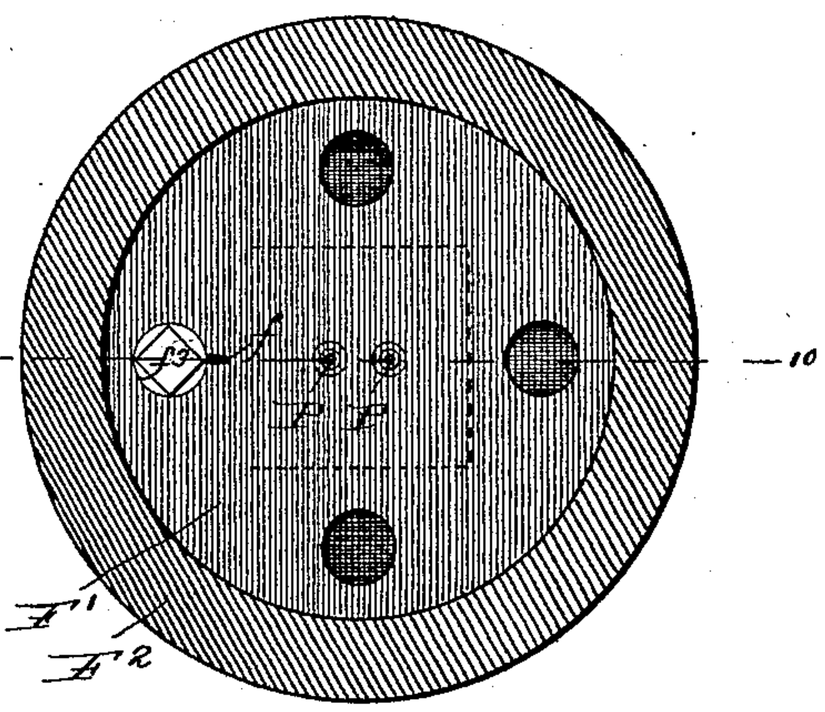


Fig. 10.

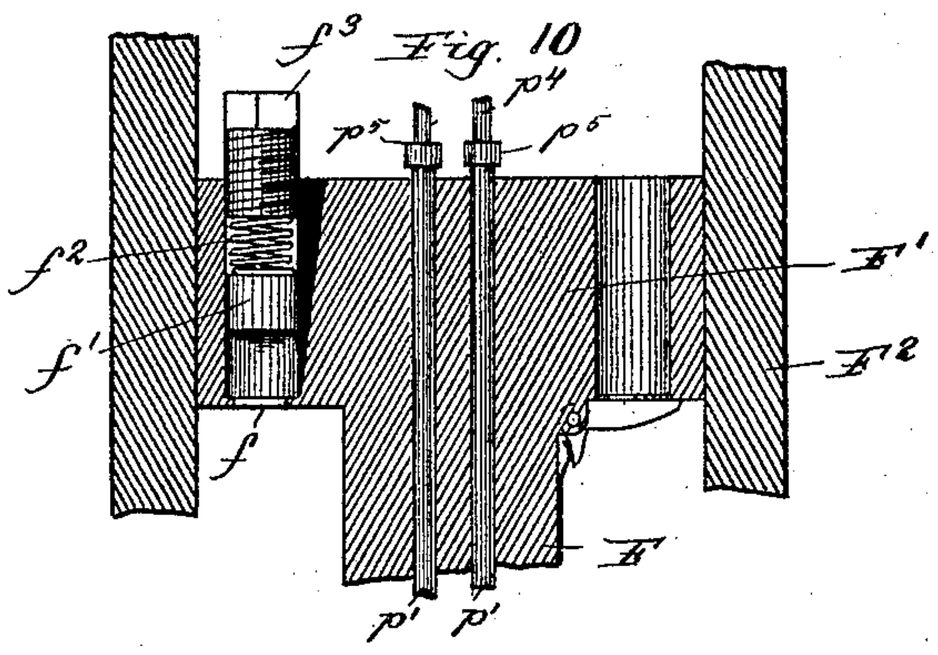
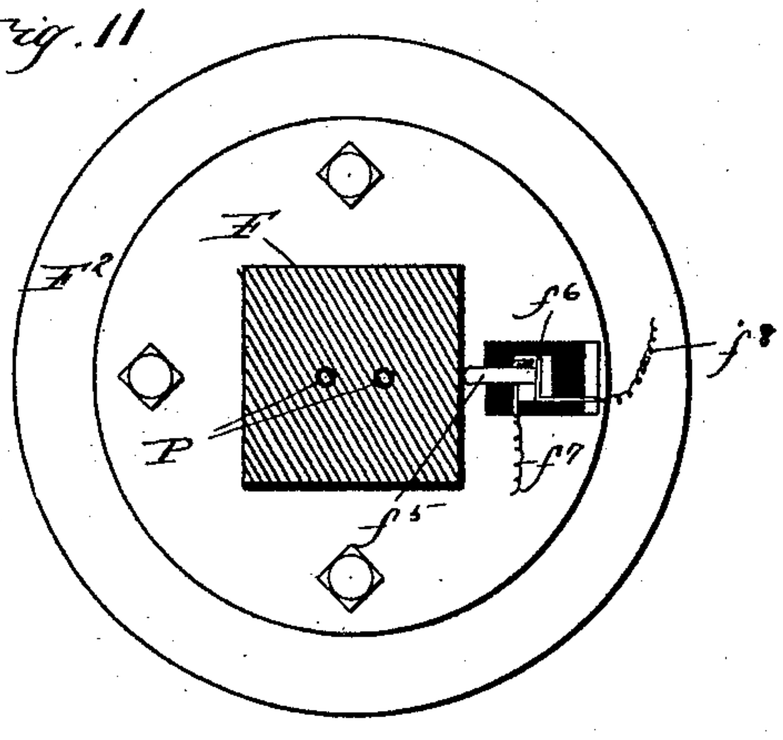


Fig. 11.



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Inventor:
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UNITED STATES PATENT OFFICE.

FULTON GARDNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO HIMSELF AND A. M. BUTZ, OF SAME PLACE.

APPARATUS FOR BORING WELLS.

SPECIFICATION forming part of Letters Patent No. 455,037, dated June 30, 1891.

Application filed September 1, 1890. Serial No. 363,676. (No model.)

To all whom it may concern:

Be it known that I, FULTON GARDNER, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Apparatus for Boring Wells, of which the following is a specification.

My invention relates to apparatus for boring Artesian, oil, and other wells which are required to be made of great depth, and more particularly to rotary drill or boring-tool mechanism.

Heretofore rotary drills or boring-tools used for boring wells have been operated from the surface of the ground through a long connecting-rod, by which the power of the engine is communicated to the drill. After the well reaches a considerable depth—as, for example, a thousand feet—owing to the great length and weight of the connecting-rod and the necessity for frequently removing the drill from the well and coupling and uncoupling the sections of the connecting-rod, the operation of boring the well is a very slow, tedious, and expensive one and involves a great loss of power in lifting the long and heavy connecting-rod in and out of the well and in transmitting the power through such great length of rod to the drill or boring-tool at the bottom. Another difficulty arising from the operation of the ordinary boring mechanism in deep wells is that the great length and weight of the connecting-rod would produce, if not counteracted, too great a pressure upon the boring-tool, so that the means and power must be employed for the purpose of obviating this.

The object of my invention is to produce a more simple and efficient means for revolving the drill and by which the long connecting-rod reaching from the top of the well to the drill may be dispensed with and the consequent time and power consumed in lifting its dead-weight in and out of the well saved.

To this end my invention consists in the novel devices and novel combinations of parts or devices herein shown and described, and more particularly pointed out in the claims.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of a device embodying my invention. Fig. 2 is an enlarged detail sectional view of the motor and the drill. Fig. 3 is an enlarged detail vertical sectional view of the motor. Fig. 4 is a cross-section on line 4 4 of Fig. 3. Fig. 5 is a cross-section on line 5 5 of Fig. 3. Fig. 6 is an enlarged sectional view of the locking or holding device by which the field-magnet of the motor is held from revolving. Fig. 7 is an enlarged cross-sectional view taken on line 7 7 of Fig. 6. Fig. 8 is an enlarged detail vertical sectional view showing the feed mechanism. Fig. 9 is a section on line 9 9 of Fig. 8. Fig. 10 is a section on line 10 10 of Fig. 9. Fig. 11 is a section on line 11 11 of Fig. 8. Fig. 12 is a central vertical sectional view of the telescopic or extensible connection in the circuit-wires. Fig. 13 is an enlarged detail view of the "jars" or mechanism for operating the locking or holding device, as well as for breaking or disconnecting the core of stone or other strata within the barrel of the drill or boring-tool. Fig. 14 is a detail elevation of the drill or boring-tool and its barrel. Fig. 15 is a detail elevation showing an ordinary "sub" or sub-bar which may be employed for extending the connection between the holding device and the motor when necessary in passing through strata of mud, quicksand, or soft material. Fig. 16 is a detail view of a cup or device for holding the borings and water above the boring-tool.

In the drawings, A represents a revolving boring-tool or drill. This may be of any suitable or well-known construction.

A′ is the barrel or hollow sleeve, to which it is connected in the usual way by screw-threads *a*. The drill or barrel A′ is provided with a screw blade or web *a′*, extending around its periphery for the purpose of lifting or causing an upward current to carry away the water and borings from the drill. The barrel A′ is further furnished with holes or openings a^2 near its upper end to permit the water to flow inside the barrel and down to the drill or boring-tool. The openings a^2 should either be made fine or else covered with screens to prevent sand or detritus from falling through the same back to the drill.

B is an electric motor adapted to enter the bore of the well and by which the drill or boring-tool is operated or revolved. The barrel A′ of the boring-tool is connected to the re-

volving armature *b* of the motor by a coupling or block C. The coupling C has screw-threads *c* at each end, one end being threaded to the barrel A′ of the drill and the other to the case or shell B′, which incloses the motor and which carries or forms part of the revolving armature *b* of the motor. The field-magnets *b′* are secured to or form part of a central stem or bar B^2, the lower end of which is journaled at B^3 in the coupling-block C.

c′ is a cavity in the block C for containing oil, the same being closed by a screw-plug c^2. The armature bar or stem B^2 is journaled at B^4 in the cap-piece B^5 of the case or shell B^2, the same being provided with a packed joint B^6, whereby the motor and its brushes b^2 and the commutator b^3 are inclosed within a water-tight case or shell. The parts B′ and B^5 of the case or shell are screw-threaded together at B^7. The brush-holder b^4 is secured to the armature stem or rod B^2.

b^5 b^6 represent the circuit-wires, which extend from the motor to the dynamo E at the surface of the ground. These circuit-wires extend up along the field-magnet stem or bar B^2. The field-magnet stem or bar B^2 is prevented from revolving by a holding or locking device D, which engages the walls of the well. This holding or locking device D may be of any suitable construction adapted to prevent the revolution of the field-magnet stem B^2 by engaging the walls of the well. The construction which I prefer to employ consists of radially-moving holding-dogs pivoted at *d* to a radially-slotted tubular section D′ of the armature stem or rod B^2. The holding-dogs D have inclined inner faces *d′* and are operated by a plug or wedge D^2. The dogs D also preferably have downwardly-projecting teeth d^2 to penetrate the walls of the well, the downward inclination of the teeth serving to permit the holding device to be lifted out of the well and at the same time to prevent its descent into the well. The circuit-wires b^5 b^6 extend through suitable holes or channels in the section D′. The hollow section D′ is secured to an extension F^2 of the field-magnet stem B^2. The holding or locking dogs D are preferably made in an upper and a lower series pivoted together at d^3, so that the wedge or cone D^2, engaging the inclined face of the upper series, will also operate the lower series of dogs. The field-magnet stem or bar B^2 is provided with or connected to a square or rectangular section F, having a piston F′, which reciprocates in the tubular section F^2, the piston F′ having an opening *f*, the size of which may be regulated by a plug *f′*, spring f^2, and screw-plug f^3, so that the piston F′ and sleeve F^2 will operate as a dash-pot or hydraulic feed for the bar F and the motor and drill connected thereto. The telescopic section F F^2 is inserted between the holding device D and hollow section D′ and the motor, so that the motor and drill may feed down as required, while the holding device D and its section D′ may remain longitudinally stationary in the well. The bar F is provided with notches f^4, preferably at intervals of a foot, for the purpose of indicating the amount and rate of boring as the work proceeds. This is done by a sliding contact f^5, closing the circuit at f^6 through the circuit-wires f^7 f^8, which extend to the top of the well and there operate a registering mechanism G, consisting, preferably, of a clock-work-driven dial *g* and a magnet *g′*, battery g^2, and a printing or indicating device g^3, operated by the armature of the magnet when the circuit f^7 is closed at f^6 by the pin f^5 slipping into one of the notches f^4 on the bar F. The jar or blow striking mechanism is of the ordinary construction now commonly in use and consists of the hammer D^2 and slotted connecting-links K K′ and disks K^2 K^3 and the lifting-rope K^4.

N is a cup, preferably of leather or other flexible material, for retaining the borings or detritus out of the way above the boring-tool. It may be located in any suitable point above the boring-tool, but preferably just above the motor at the connection between the rods F and B^2. To permit the longitudinal movement of the motor, the circuit-wires b^6 b^5 are each provided with a telescopic or extensible section P, preferably consisting of a copper tube *p*, inclosed in an insulating-case *p′*, and a copper rod p^2, having a copper or metal follower p^3, engaging the interior wall of the tube *p*, the rod or wire p^2 being also inclosed in an insulating case or tube p^4, which extends out through a cap p^5, secured at the upper end of the case *p′*. This connection may be inserted at any suitable point in the circuit, but preferably at the telescopic bar F and the tube F^2, as is clearly shown in Fig. 8. The barrel A′ of the boring-tool is also provided with the usual core-lifting dogs or devices a^4.

The sub-bar R may be inserted between the bars or sections B^2 F to increase the distance between the motor and the holding device when it is necessary in passing through soft strata to afford solid material for the holding device to engage in the walls of the well.

I claim—

1. The combination, with a boring-tool, of an electric motor for operating the boring-tool, said motor being of a diameter adapted to enter the bore of the well and follow up the boring-tool, a holding device, a telescopic connection between said holding device and the revolving part of the motor, and jars for operating said holding device, substantially as specified.

2. The combination, with a revolving boring-tool, of an electric motor having a revolving armature connected to the boring-tool, a locking or holding device consisting of radially-moving jars adapted to engage the walls of the well for holding the field-magnet of the motor from revolving, an extensible or telescoping connection located between said holding device and said boring-

tool to permit the feed of the latter, and jars for operating said holding device, substantially as specified.

3. The combination, with a revolving boring-tool, of an electric motor having a revolving armature connected to the boring-tool, a locking or holding device adapted to engage the walls of the well for holding the field-magnet of the motor from revolving, and an extensible or telescoping connection located between said holding device and said boring-tool to permit the feed of the latter, substantially as specified.

4. The combination of an electric motor with a boring-tool and a holding device consisting of radially-moving jars adapted to engage the walls of the well for holding the stationary part of the motor from revolving, an extensible or telescoping connection located between said holding device and said boring-tool to permit the feed of the latter, and jars for operating said holding device, substantially as specified.

5. The combination, with a revolving boring-tool having a hollow barrel furnished with openings or perforations through the same, and with a screw blade or web on its exterior periphery, whereby the borings or detritus are lifted from the tool and water supplied to the tool, of an electric motor having a revolving armature connected to the hollow barrel of said tool, substantially as specified.

6. The combination, with a revolving boring-tool having a hollow barrel furnished with openings or perforations through the same, and with a screw blade or web on its exterior periphery, whereby the borings or detritus are lifted from the tool and water supplied to the tool, of an electric motor having a revolving armature connected to the hollow barrel of said tool, and a coupling C^2, substantially as specified.

7. The combination, with a revolving boring-tool having a hollow barrel furnished with openings or perforations through the same, with a screw blade or web on its exterior periphery, whereby the borings or detritus are lifted from the tool and water supplied to the tool, of an electric motor furnished with a revolving case or shell connected with the armature of the motor, and a coupling C^2, connecting said shell with the barrel of said tool, the field-magnet stem of said motor having a bearing in said coupling C^2, substantially as specified.

8. The combination, with an electric motor, of a boring-tool connected to the exterior armature of the motor and a holding device engaging the walls of the well connected to the interior field-magnet stem of the motor, substantially as specified.

9. The combination, with a boring-tool, of an electric motor having its armature connected therewith and adapted to feed down with the tool, a holding device engaging the walls of the well, and a telescopic or extensible connection between said holding device and the field-magnet stem of the motor, substantially as specified.

10. The combination, with a boring-tool, of an electric motor having its armature connected therewith and adapted to feed down with the tool, a holding device engaging the walls of the well, and a telescopic or extensible connection between said holding device and the field-magnet stem of the motor, said telescopic connection consisting of a hollow tube and a bar sliding therein furnished with a piston, substantially as specified.

11. The combination, with a boring-tool, of an electric motor having its armature connected therewith and adapted to feed down with the tool, a holding device engaging the walls of the well, and a telescopic or extensible connection between said holding device and the field-magnet stem of the motor, said telescopic connection consisting of a hollow tube and a bar sliding therein furnished with a piston, said piston being furnished with an opening for regulating the feed of the boring-tool, substantially as specified.

12. The combination, with a boring-tool, of an electric motor having its armature connected with said tool, a holding device, and a dash-pot connection between said holding device and the field-magnet stem of said motor, substantially as specified.

13. The combination, with a boring-tool, of an electric motor having its armature connected therewith and adapted to feed down with the tool, a holding device engaging the walls of the well, and a telescopic or extensible connection between said holding device and the field-magnet stem of the motor, said telescopic connection consisting of a hollow tube and a bar sliding therein furnished with a piston, said piston-bar having notches at unit intervals, an electric circuit and registering mechanism, and a movable contact for closing said circuit operated by said notched bar, whereby the depth and the rate of boring may be automatically shown, substantially as specified.

14. The combination, with a revolving boring-tool having its barrel furnished with a screw-blade or web, of an electric motor, a holding device, and a cup or device for holding the borings lifted by said screw-blade above the motor and boring-tool, substantially as specified.

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