C. B. MARTIN.

WELL DIGGING APPARATUS.

APPLICATION FILED APR. 14, 1910.

1,003,284. **Patented Sept. 12, 1911.**

2 SHEETS—SHEET 1.

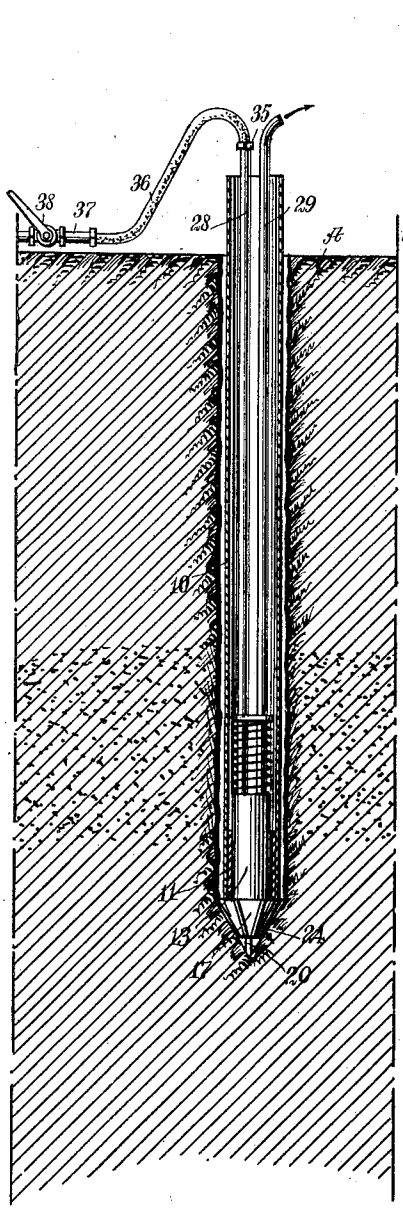

Fig. 1

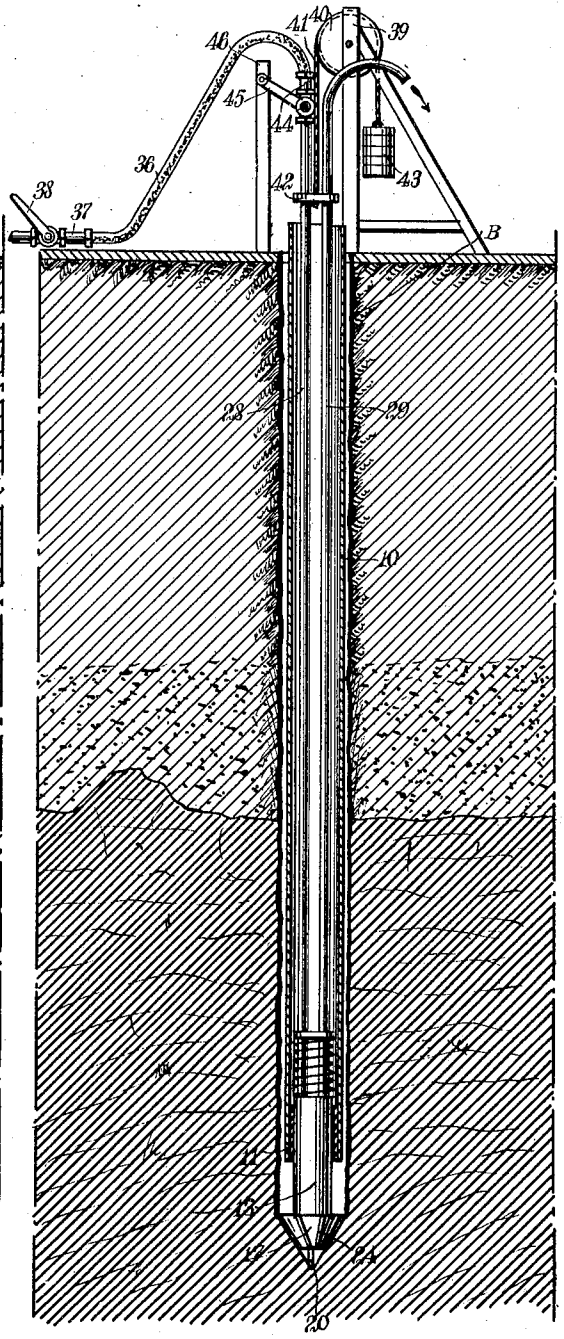

Fig. 2

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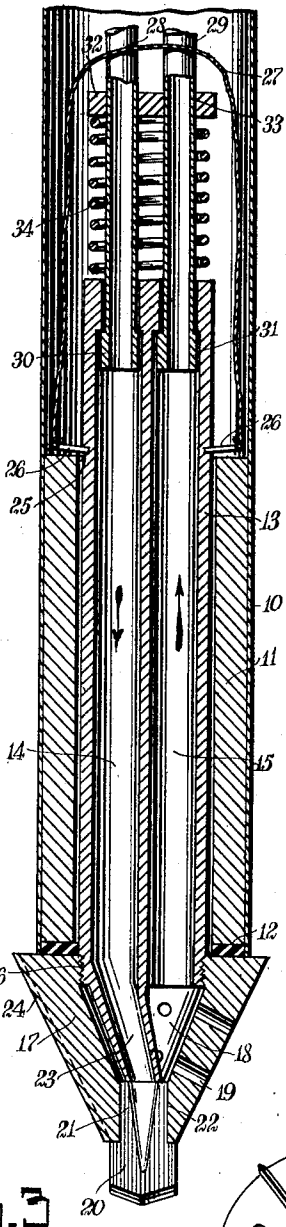

Fig. 3

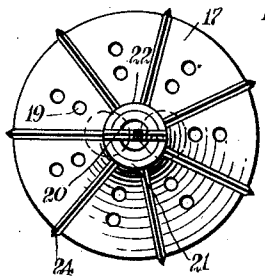

Fig. 5

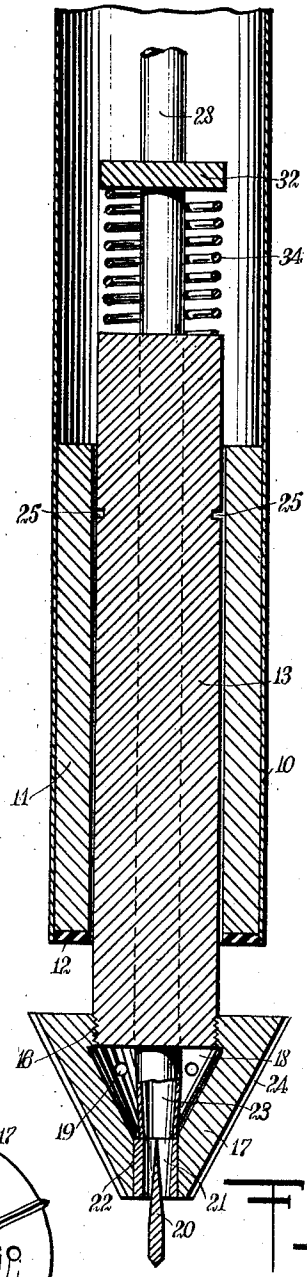

Fig. 4

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CHARLES B. MARTIN, OF PORTLAND, OREGON.

WELL-DIGGING APPARATUS.

1,003,284. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed April 14, 1910. Serial No. 555,409.

To all whom it may concern:

Be it known that I, CHARLES B. MARTIN, a citizen of the United States, and a resident of Portland, in the county of Multnomah and State of Oregon, have invented a new and Improved Well-Digging Apparatus, of which the following is a full, clear, and exact description.

This invention relates to apparatus for digging wells, and for forming bores in the earth, for different purposes, and has reference more particularly to apparatus of this class comprising a casing adapted to be advanced into the bore as it is formed, a drill head associated with the casing, and means for conducting fluid pressure to the drill head to cause the same to advance into the earth.

The object of the invention is to provide a simple, strong and efficient apparatus for digging Artesian, oil or other wells, in which fluid pressure is used for operating the drill head, by means of which bores can be drilled rapidly and at comparatively low cost, which can be employed for forming bores through sand, earth, or rock, by means of which the work can be carried on rapidly and without interruption, which does not easily become disarranged, and which requires comparatively little supervision.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a vertical section showing an embodiment of my invention in operation in comparatively soft material, such as dirt or sand; Fig. 2 is a similar view showing the apparatus used for drilling a bore through rock; Fig. 3 is an enlarged longitudinal section of the lower end of the drill casing and the drill head; Fig. 4 is a similar view, the section being taken at right angles to the section shown in Fig. 3; and Fig. 5 is an end view of the drill point.

Before proceeding to a more detailed explanation of my invention, it should be clearly understood, that while the apparatus is particularly useful for digging oil and Artesian wells, it can also be advantageously employed for forming bores in the earth, for other purposes.

I employ fluid pressure, preferably hydraulic pressure. As will appear more clearly hereinafter, when the apparatus is being used in soft material, such as sand or dirt, the hydraulic pressure is employed to force the drill head and point gradually through the material, without repeated impacts, as is the case in an ordinary drilling operation. If rock is encountered, however, the hydraulic pressure is used to raise the drill head and point a distance, whereupon it descends gravitationally when the pressure is released. By repeating these operations a bore can be drilled with ease, through rock. The pressure is turned off automatically when the drill head rises, and consequently the parts descend under the influence of their weight, and strike a heavy blow at the lower end of the bore, with a corresponding cutting action. Any suitable, available pressure can be employed. I have found that hydraulic pressure of two hundred and fifty pounds to the square inch, with a flow of one thousand gallons a minute, is adequate for the operation of my apparatus, under ordinary circumstances.

Referring more particularly to the drawings, I employ a tubular casing 10, fashioned from metal piping or the like, and consisting preferably of sections which can be easily jointed together. As the casing descends into the bore with the progress of the drilling operation, additional sections can be added to lengthen the casing as necessary. At the lower end, the casing has therein a lining collar 11, at the lower edge of which is located, within the casing, a gasket or washer 12 of any suitable material. Within the lining collar is movably located a drill head 13 consisting of an elongated member which fits fairly snugly within the collar, and has two passages 14 and 15 respectively, extending longitudinally through it. Near the lower end, it is provided with threads 16 by means of which it can be screwed into a laterally extended, tapered drill point 17, which has a chamber 18 therein, and is provided with perforations 19. The point has a cutter 20 which has a tubular shank 21 positioned in an end opening or passage 22 of the point. The shank 21 communicates with a tubular extension 23 of the drill head. The extension is inclined to one side and

when the drill head and point are associated, extends to the outlet passage 22. The passage 15 of the head terminates at the end thereof, as is shown most clearly in Fig. 3.

The head 17 may be of any suitable size, and if so desired, may be provided with ribs 24. It extends laterally beyond the tubular casing 10, and in normal positions of the parts, seats against the lower end of the casing and the gasket 12. The drill head, near the upper end has recesses 25 in the opposite sides thereof, adapted to receive pegs or studs 26 which constitute keepers to hold the drill head and point in the positions shown in Fig. 3. The keepers 26 are connected by a flexible member or line 27 for a purpose which will appear hereinafter.

I employ a pressure pipe 28, and an escape pipe 29. These at the lower ends have extended parts 30 and 31, which are located in the passages 14 and 15 respectively. The latter have the upper ends reduced to form shoulders adapted to engage the extended parts of the pipes, so that the same are retained in position. A stop member 32 has openings 33 through which the pipes pass. It is rigidly secured to the pipes and forms an abutment for a helical spring 34. The latter is mounted about the pipes and engages the upper end of the drill head.

The pressure or supply pipe 28 has connected thereto at its upper end, by means of a suitable coupling 35, a hose 36, or other conduit, for supplying the fluid under pressure, from a suitable pipe system 37. I provide a valve 38 of any convenient type, by means of which the flow of fluid into the pipe 28 can be controlled and regulated. The escape pipe discharges at any convenient point, and if so desired, a dredge or other pump can be connected with the escape pipe, to facilitate the flow of the fluid through it. At times it will be found convenient to employ a counterweight. As is shown for example in Fig. 2, a suitable stand 39 is erected near the upper end of the bore, and has a pulley 40, over which a rope 41 passes. The rope is secured to a crosspiece 42, mounted near the upper ends of the pipes and has at the other extremity a suitable weight 43. The weight tends to lift the pipes, and the drill head and point associated therewith. In the form of the invention shown in Fig. 2, the supply pipe, at the upper end has a valve 44, an operating arm 45 of which is pivotally secured to a suitable support 46, for a purpose to appear hereinafter. The form of the apparatus shown in Fig. 1 is used for drilling through soft material, such as sand, or dirt. The bore A resulting, is formed by the erosive action of the fluid under pressure, as well as the weight of the apparatus. The water enters through the pipe 28 at high pressure, and flows through the drill head, escaping at the point, through the shank passage. It washes away the material so that the drill head gradually forces its way downward through the material. The water escapes by entering the chamber 18 through the openings 19, and flowing to the escape pipe, through the passage 15. A certain quantity of the water will also find its way to the surface of the earth through the bore A at the outside of the casing 10.

If it is desired to use the apparatus for drilling through rock or other resistive material, the keepers 26 are removed by means of a grapple which is let down into the casing and employed to seize the line 27. When the keepers are removed, the drill head is capable of a limited reciprocating movement vertically. The operation of the device is then as follows: The valve 38 is opened, the water at once rushes into the pipe 28, and to the head, escaping with great violence at the point. The result is that the reaction drives the drill head upward against the tension of the spring, compressing the same, and thus carrying the pipes 28 and 29 upward with it until the position of the parts shown in Fig. 3 is reached that is, until the point engages at the lower end of the casing. The upward movement of the pressure pipe 28 has closed the valve 44, the operating member 45 of which is secured to the support 46. This causes the pressure to cease, and the drill head gravitationally returns to its original position, striking the head a blow at the lower end of the bore B. This drilling action is repeated until the bore is carried as far as desired. The counterweight 43 assists in raising the drill head and the pressure and supply pipes. The spring assists the downward movement of the drill head when the pressure is shut off, and augments the force of the impact. It will be understood that the upward movement of the drill head, after the spring 34 has been compressed to a certain extent, causes a corresponding upward movement of the pipes 28 and 29, to effect the operation of the valve 44. When the drilling operation has been completed, the drill head is unscrewed and removed, together with the pipes, the spring and the collar. The drill point remains in the bore and as it is perforated, fluid can enter the well through it.

If so desired, suitable means can be provided for holding the casing 10 centrally within the bore. However, in the course of the drilling operation, earth and stones, or other material in the bore will gradually pack in around the casing at different points, and thus serve to center it within the bore.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent:—

1. Apparatus of the class described, comprising a casing, a movable drill head at

the lower end of said casing, means for conducting fluid under pressure to said head, and means for temporarily holding said head against movement relative to said casing.

2. Apparatus of the class described, comprising a casing, a movable drill head at the lower end of said casing, a pipe for conducting fluid under pressure to said head, a pipe for conducting fluid away from said head, and a removable keeper for holding said head against movement relative to said casing.

3. Apparatus of the class described, comprising a casing, a movable drill head at the lower end of said casing and having a drill point, a pipe for conducting fluid under pressure to said head, a valve controlling the flow of fluid through said pipe, a spring tending to depress said head, a pipe for conducting fluid away from said head, and a keeper for holding said head against movement relative to said casing, said keeper being releasable from a point remote from said head.

4. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having a limited movement, a pipe for supplying fluid pressure to said drill head to raise the same, a valve located near the entrance of the bore for regulating the fluid pressure in said pipe, and mechanical connections between said pipe and said valve whereby a movement of said pipe serves to close said valve.

5. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having passages therethrough, a drill point carried by said head and communicating with said passages, a spring tending to hold said head in a depressed position, a pipe for supplying fluid under pressure to said head and communicating with one of said passages, a fluid pressure escape pipe communicating with the other of said passages, a valve controlling a flow of fluid through said first pipe and located near the upper end thereof, and means for closing said valve by an upward movement of said pipe.

6. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having passages therethrough, a drill point carried by said head and communicating with said passages, a spring tending to hold said head in a depressed position, a pipe for supplying fluid under pressure to said head and communicating with one of said passages, a fluid pressure escape pipe communicating with the other of said passages, a valve controlling a flow of fluid through said first pipe, means for closing said valve by an upward movement of said pipe, and a counterweight tending to raise said pipe.

7. Appartaus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having a perforated drill point, said head having passages therethrough, pipes communicating with said passages, a stop member carried by said pipes, a spring engaging said stop member and said head, and tending to depress the latter, a valve for regulating the flow of fluid into one of said pipes, and a fixed support operatively connected to said valve, whereby a movement of said pipe having said valve serves to close the latter.

8. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having a perforated drill point, said head having passages therethrough, pipes communicating with said passages, a stop member carried by said pipes, a spring engaging said stop member and said head, and tending to depress the latter, a valve for regulating the flow of fluid into one of said pipes and connected therewith, a fixed support operatively connected to said valve, whereby a movement of said pipe having said valve serves to close the latter, said head having a recess, and a removable member located in said recess and serving to prevent the movement of said head relative to said casing.

9. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof and having a perforated drill point, said head having passages therethrough, pipes communicating with said passages, and extending longitudinally of said casing, a stop member carried by said pipes, a spring engaging said stop member and said head, and tending to depress the latter, a valve for regulating the flow of fluid into one of said pipes, said valve having an operating arm, a fixed support having said arm pivotally secured thereto, whereby a movement of said pipe having said valve, serves to close the latter, and a counterweight connected with said pipes and tending to raise the same.

10. Apparatus of the class described, comprising a casing, a reciprocating drill head at the lower end thereof, and having a perforated drill point, said head having passages therethrough, pipes communicating with said passages, and extending longitudinally of said casing, a stop member carried by said pipes, a spring engaging said stop member and said head, and tending to depress the latter, a valve for regulating the flow of fluid into one of said pipes, said valve having an operating arm, a fixed support having said arm pivotally secured thereto, whereby a movement of said pipe having said valve, serves to close the latter, and a counterweight connected with said pipes and tending to raise the same, said passages having the upper ends reduced, said pipes having enlarged parts located within

said passages, under said reduced ends thereof, whereby said pipes serve to limit the downward movement of said head.

11. Apparatus of the class described, comprising a casing having a lining collar at the lower end thereof, a drill head located at the lower end of said casing, within said lining collar, and having a drill point laterally extended beyond said casing, said drill point being of annular form at the upper end and adapted to seat at the lower end of said casing, and a gasket positioned at the lower end of said casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES B. MARTIN.

Witnesses:
ERNEST KOCH,
J. EDWARD WISE.