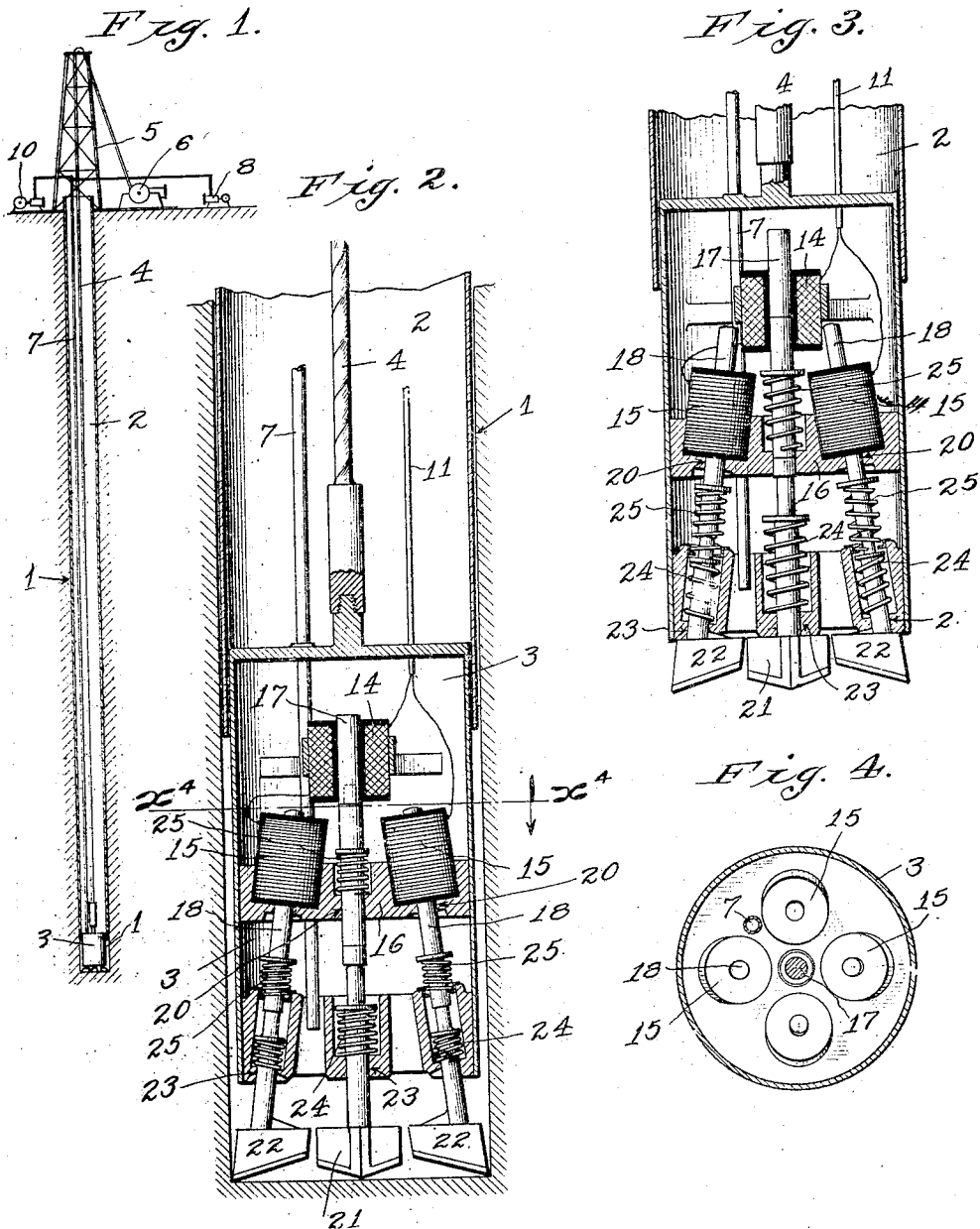


A. C. STEWART.
WELL DRILLING APPARATUS.
APPLICATION FILED OCT. 10, 1911.

Patented May 20, 1913.

1,062,050.



Witnesses:

J. D. Thornburgh.
Valley Forge.

Inventor:

Alfred C. Stewart.
Lawrence, atty.

UNITED STATES PATENT OFFICE.

ALFRED C. STEWART, OF LOS ANGELES, CALIFORNIA.

WELL-DRILLING APPARATUS.

1,062,050.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed October 10, 1911. Serial No. 653,950.

To all whom it may concern:

Be it known that I, ALFRED C. STEWART, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Well-Drilling Apparatus, of which the following is a specification.

The main object of the invention is to provide an apparatus for drilling wells by power developed and applied at or near the bottom of the well. In drilling wells it has been usual to provide an engine or motor at the surface and to drive or operate the drilling means by cables, rods or rotary casings, extending from the surface to the bit at the bottom of the well. According to my invention, the motor for operating the bit is located at or near the bottom of the well and is connected directly to the drilling means, the bit and motive device therefor being lowered as the work progresses.

Another object of the invention is to protect the motive device for the drill from the water and mud at the bottom of the well.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate an embodiment of my invention, and referring thereto:

Figure 1 is a vertical section of the well. Fig. 2 is a vertical section of the lower part of a well bore, showing the drill operating therein. Fig. 3 is a view similar to Fig. 2, showing the position of the parts for withdrawal of the drill. Fig. 4 is a section on line x^1-x^1 in Fig. 2.

1 designates the well or bore which is being drilled, and 2 the casing therein. The drilling device is mounted in a caisson or bell 3, closed at the top and sides and open at the bottom, this caisson being, for example, cylindrical and of a size to permit it to pass down through the well casing. Said caisson is supported by a cable or other suspension means 4, hung from the usual derrick 5 and drum 6 at the top of the well. A pipe 7 leads from an air pump 8 or source of compressed air at the top of the well and extends down to the caisson 3 and connects with the interior of said caisson. This pipe may also be used for supplying water for the drilling operation, being connected to a source of water supply, for example, a pump 10.

The drill mechanism is located within the caisson 3 and operates one or more bits extending from the caisson at its lower end. I prefer to use electrically operated drilling means supplied by flexible insulated electric conductors 11, connected to any source of electric current at the top of the well, and extending down through the well and connected to the electrically operated motive device within the caisson. Said electrically operated motive device may consist of solenoids 14 and 15 mounted on a frame 16 in caisson 3 and connected to wires 11, the cores 17 and 18 for said solenoids being mounted to slide in guides 20 and acting as hammers to strike the bits 21 and 22. Said bits 21 and 22 are mounted to slide in guides 23 and springs 24 and 25 are provided for raising the bits and cores after each operation. The number and arrangement of the bits may be varied. I have shown a central bit 21 and a plurality of bits 22 around the central bit, the operating solenoids being correspondingly disposed, and in order to provide for underreaming to permit free descent of the casing, the outer bits 22 and their operating devices may be arranged with their axes of motion inclined outward so that each bit tends to move outward in its downward movement.

The operation is as follows: The caisson is lowered into the well, with the drilling devices and electromotive means therefor, and compressed air is supplied to the caisson through pipe 7, so as to exclude water from the caisson or at least from the upper part of the caisson, containing the motive devices. Water may also be supplied through pipe 7, but said pipe preferably opens at the lower part of the caisson, so that such water immediately passes out through the open bottom of the caisson and up around the caisson, leaving the upper part of the caisson clear. The motive devices in the upper part of the caisson therefore operate without interference by the water. The current passing to said motive devices through wires 11 is controlled by any suitable means, so as to produce alternating or intermittent excitation of the solenoids with reciprocation of the cores 17 under the action of the solenoids and of the springs 25. These cores so operated act as hammers on the bits 21 and 22, the operation being similar to that of a mining drill. By deenergizing all of the solenoids, the

cores and bits are forced to raised position by springs 24 and 25, and in this position the bits are drawn inwardly as shown in Fig. 3, so that the drilling means as a whole, may be drawn up through the casing 2.

What I claim is:

1. A well drilling apparatus comprising an open-bottomed caisson, means for lowering and raising said caisson, means for supplying compressed air to said caisson to maintain a portion thereof free of water, drilling devices located in said caisson and motive means for said drilling devices located adjacent the drilling devices and operating directly thereon.

2. A well drilling apparatus comprising an open-bottomed caisson, means for lowering and raising said caisson, means for supplying compressed air to said caisson to maintain a portion thereof free of water, means for supplying water to said caisson, drilling devices located in the lower part of said caisson, and motive devices for said drilling devices located in the upper part of said caisson.

3. In a well drilling apparatus, an open-bottomed caisson, a cable connected to said

caisson, means for operating said cable for lowering said caisson in the well, drilling devices in said caisson, electric motive devices in said caisson connected to operate said drilling devices, means for supplying compressed air to said caisson to exclude water from said motive devices and electrical supply connections extending to said motive devices from the top of the well.

4. In a well drilling apparatus, the combination of a caisson, means for raising and lowering said caisson, drills mounted to reciprocate in said caisson so as to move in paths inclined to the vertical, cutters carried by said drills and moving in the operation of the drills so as to project when in their lower positions beyond the wall of the caisson, and motive means within the caisson for operating said drills.

In testimony whereof, I have hereunto set my hand at Los Angeles, California this 29th day of September, 1911.

ALFRED C. STEWART.

In presence of—

ARTHUR P. KNIGHT,
GLADYS RUSSELL.