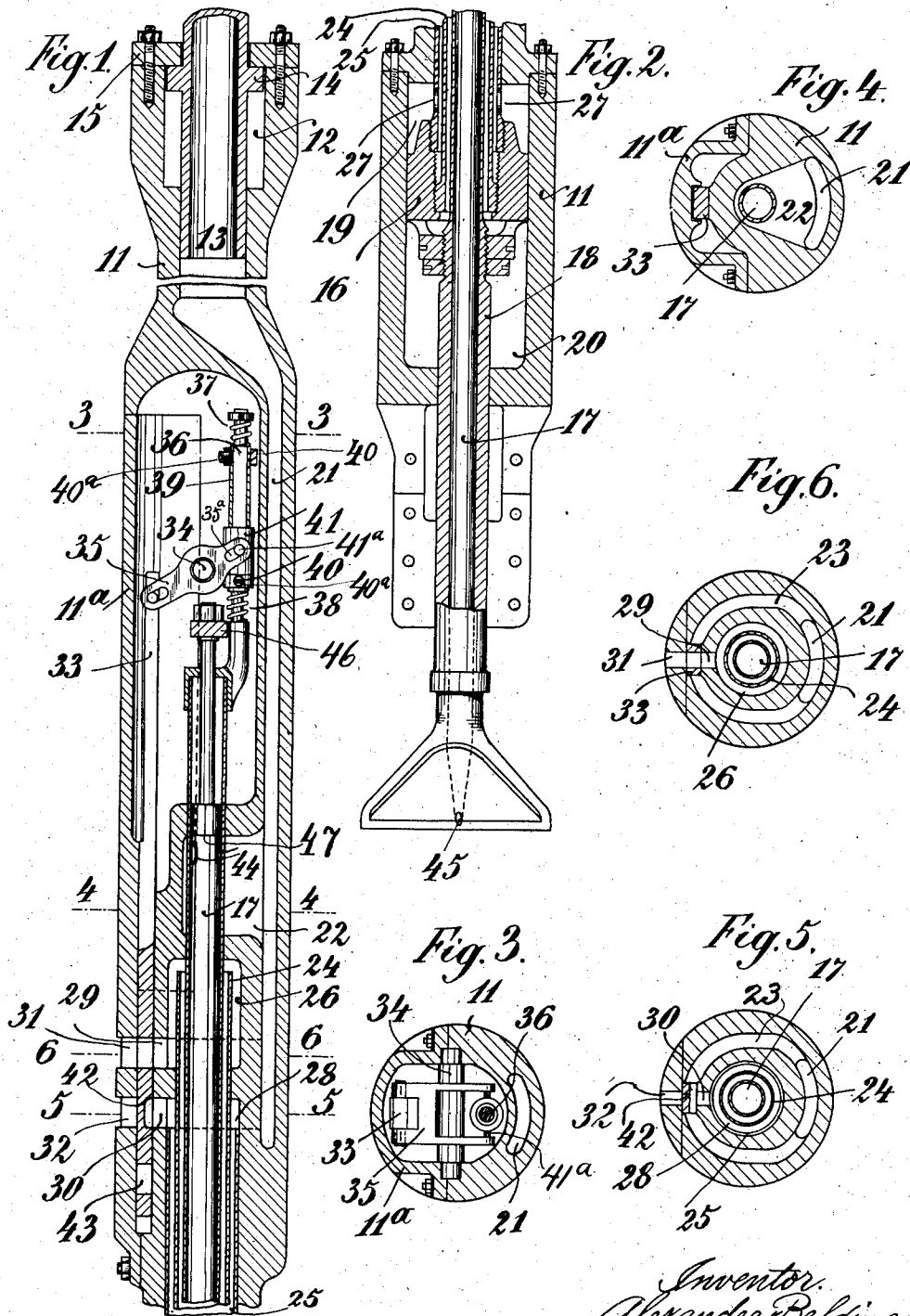


No. 878,856.

PATENTED FEB. 11, 1908.

A. BELDIMAN.
EARTH BORING TOOL.
APPLICATION FILED DEC. 13, 1906.



Witnesses:
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UNITED STATES PATENT OFFICE.

ALEXANDER BELDIMAN, OF BERLIN, GERMANY.

EARTH-BORING TOOL.

No. 878,856.

Specification of Letters Patent.

Patented Feb. 11, 1908.

Application filed December 13, 1906. Serial No. 347,673.

To all whom it may concern:

Be it known that I, ALEXANDER BELDIMAN, a subject of the King of Roumania, and resident of Berlin, Germany, have invented certain new and useful Improvements in Earth-Boring Tools for Deep Boring with a Jumping Chisel, of which the following is a specification.

This invention relates to improvements in those hydraulic deep boring-devices which work with a jumping chisel, and in which the hydraulic motor is arranged between the rods and the chisel.

The innovation consists in conducting the water under pressure, not consumed by the motor, through the hollow shank of the chisel to the cutting edge of the chisel, where it is ejected in the form of one or several jets, for washing purposes, and in conducting the water to the motor in such a manner, that the cross-section of the bore-hole is not narrowed by other rods. The reversing of the device for conducting the water under pressure to the motor through the piston is effected automatically.

According to the embodiment of the invention disclosed in the present specification, the chisel is moved up and down by hydraulic power and the water in the shank of the chisel made to do motorial work.

Figures 1 and 2 show such a boring-device in a longitudinal section, Fig. 2 being the continuation of Fig. 1. Figs. 3 to 5 are cross-sections of Fig. 1 on the lines 3—3 and 4—4 and 5—5. Fig. 6 is a cross section on line 6—6, Fig. 1.

Similar numerals refer to similar parts throughout the several views.

All the parts of the boring-apparatus are arranged in a joint or common cast iron body 11, preferably composed of several parts. The upper end of the same is provided with a cylindrical cavity 12 and connected with the lower ends of the rod 13 in a manner that the latter can be axially shifted in the cast iron body. This axial shifting is limited by a projection 14 moving in the cylindrical cavity 12, and which is covered at the top by a plate 15 fastened to the cast body. This device is to be called in the following simply "fish-joint".

The piston 16 of the motor is arranged in the lower part of the cast body and connected at the top with the hollow piston rod 17, and at the bottom with the hollow chisel 18. The water is admitted from the hollow rod

13 to the working chambers 19 and 20 of the motor through a lateral channel 21 provided in the cast body, with which is connected on one side a chamber 22, and on the other an annular channel 23. (See Fig. 5.) The upper side of the piston 16 is provided with two tubes 24 and 25 concentrically surrounding the piston-rods; the first tube is connected, at its lower end, with the chamber 20 of the cylinder, and projects with its upper end into the chamber 26, provided in the cast body, while the tube 25 communicates at its lower end through openings 27, with the chamber 19 of the cylinder, and at its upper end with the annular chamber 28 arranged in the cast body. Both chambers, 26 and 28, are connected through channels 29, 30 with the annular channel 23, and therefore allow the water to pass from the channel 21 to the working chambers of the motor. From the cast body there further lead two openings 31, 32, and between these openings, on the one side, and the channels 29, 30 on the other, is arranged a reversing device 33 in the form of a slide in the construction shown in the drawing. The upper end of the latter is jointed to a double-armed lever 35, oscillating on the bolt 34 which is carried by the cast iron body 11. The hollow piston-rod 17 carries, at its upper end, a bar 36, on which slides a bush 39 between two springs 37, 38. Upon bush 39, are carried two collars 40 whose positions thereon may be adjusted by means of set-screws 40^a. Also on the bush 39 slides a second and shorter bush 41 and this, in its turn, is jointed to the two-armed lever 35 by means of pivots 41^a carried by bush 41, and slots 35^a in lever 35. If therefore the piston-rod moves out of the position shown in Fig. 1 in a downward direction, the slide 33 remains in its state of rest, until the upper projection 40 strikes against the bush 41. Now the two-armed lever 35 is turned to the right and thereby the slide 33 shifted higher up, so that through its shell 42 it connects the channel 29, and consequently the chamber 26, with the annular channel 23. In this position of the slide the water can enter through the chamber 26, and the tube 24, into the lower chamber 20 of the cylinder, and raise the piston of the motor. The waste-water can at the same time pass out of the upper chamber 19 of the cylinder through the holes 27, tube 25, chamber 28 and channels 30 and 32. If the piston of the

motor has returned into its upper position, the lower projection 40 effects the reversing of the slide 33, so that the latter returns into the position shown in Fig. 1, and the water can now pass out of the annular channel 23 into the chamber 28, and through the tube 25 into the space 19 of the cylinder, while the waste-water escapes out of the chamber 20 of the cylinder through the tube 24. The springs 37 and 38 only have the purpose to reduce the shock caused by the projections 40.

In order to make the reversing-devices, whose form of construction is not an essential feature of this invention, easily accessible, the cast body may be provided with a removable lid 11^a.

At the place where the hollow piston-rod passes through the chamber 22, it is provided with holes 44, through which the water can, if desired, enter directly into the shank of the chisel without having done work in the motor, from which shank it passes to one or several of the squirting holes 45 arranged near the cutting edge of the chisel. Out of these squirting holes the water passes with its full pressure into the immediate vicinity of the bottom of the bore-hole and washes the same, in consequence of which the deep-boring is facilitated.

If the water entering into the hollow piston-rod is also to do motorial work, this can be effected by fastening to a cross-piece 46 (see Fig. 1) fixed in the cast body a piston 47 projecting into the piston-rod, which offers an abutment to the water. The water entering into the hollow piston-rod consequently attempts to push the latter from the fixed piston 47, for the squirt-hole 45 is a great deal smaller than the cross-section of the piston 47, so that the water entering the hollow piston rod works motorially, and reinforces the action of the water entering the chamber 19 of the cylinder. In this way the cross-section of the deep-boring is utilized, as far as possible, for motorial work.

If it should occur that the descending chisel meets, in a hard rock, with a resistance which it cannot overcome with one single stroke, the piston of the motor could not finish its stroke, and the reversing-device would consequently not be reversed, that is to say the deep-boring device would be set out of action. In order to avoid this, the above mentioned fish-joint has been provided, for if the chisel cannot go downwards, the whole device will, with the exception of the chisel, be raised, and be shifted upwards towards the fixed hollow bars 13, so that, in this way, the motor will be sure to be reversed.

What I claim as my invention and desire to secure by United States Letters Patent is—

1. An earth boring tool comprising a body provided with a channel for water under

pressure, a motor in said body having communication with the channel, a chisel driven by the motor and provided with squirt holes, and a hollow rod connecting the aforesaid channel with the squirt holes in the chisel.

2. An earth boring tool comprising a body provided with a channel, a reciprocating piston arranged in said body and having its opposite faces adapted to receive from the channel water under pressure, a self acting reversing device for the piston, and a chisel provided with squirt holes having communication with the channel.

3. An earth boring tool comprising a body provided with a channel, a reciprocating piston arranged in said body, driven by water received from the channel, and provided with a hollow piston rod communicating at one end with the channel, and a hollow chisel communicating with the other end of the piston rod and provided with squirt holes.

4. An earth boring tool comprising a body provided with a channel and two chambers in communication with said channel, a reciprocating piston working in the body and provided with a piston rod, two tubes surrounding the piston rod, each of which opens at one end into one of the chambers in the body and at its other end to opposite sides of the piston.

5. An earth boring tool comprising a body provided with a channel, two chambers in communication with the channel, and two outlet channels for the chambers, a motor in the body having communication with the two chambers, and a reversing device placing the chambers alternately into and out of communication with the outlet channels.

6. An earth boring tool comprising a body provided with a channel, two chambers in communication with the channel and two outlet channels for the chambers, a reciprocating piston having a piston rod, a reversing device for placing the chambers alternately into and out of communication with the outlet channels, and an oscillating member, operated by the piston rod and connected to the reversing device to cause the reversing device to move in a direction opposite to the movement of the piston rod.

7. An earth boring tool comprising a body provided with a channel, a reciprocating piston driven by water received from said channel, arranged in said body and having a hollow piston rod opening to said channel, and a piston working in one end of said piston rod and fastened to the body to act as a motor.

8. An earth boring tool comprising a body provided with a channel, a motor driven by fluid received from said channel, a hollow reciprocating chisel driven by said motor and provided with squirt holes and having communication with the channel, and a piston adapted to act on the water within the hollow

chisel to assist in driving the chisel in one direction.

9. The combination with the hollow bore rod, of an earth boring tool a motor carried
5 thereby, and a joint between the bore rod and the tool, permitting the earth boring tool to move relatively to the bore rod.

The foregoing specification signed at Berlin this 23rd day of November, 1906.

ALEXANDER BELDIMAN.

In presence of—

WOLDEMAR HAUPT,
HENRY HASPER.