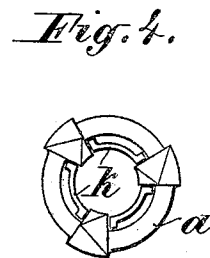
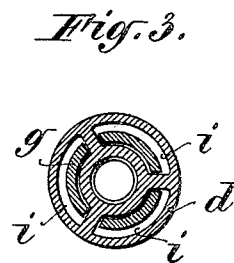
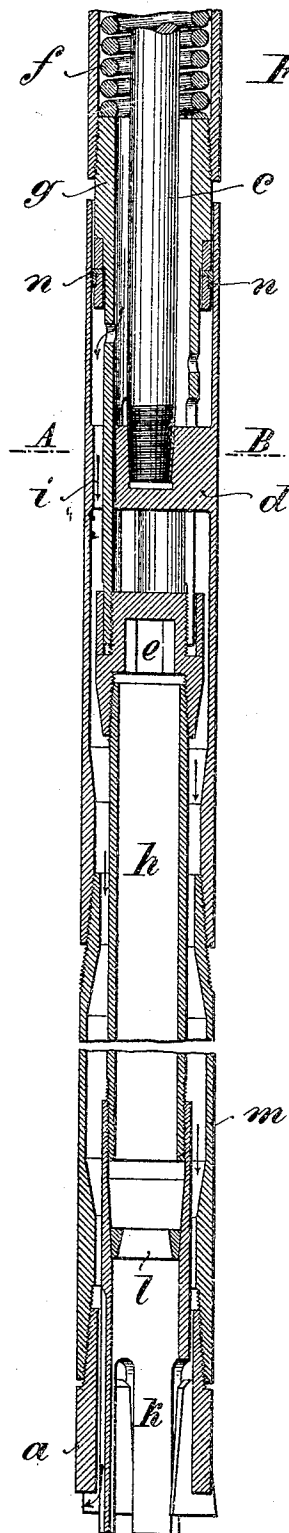
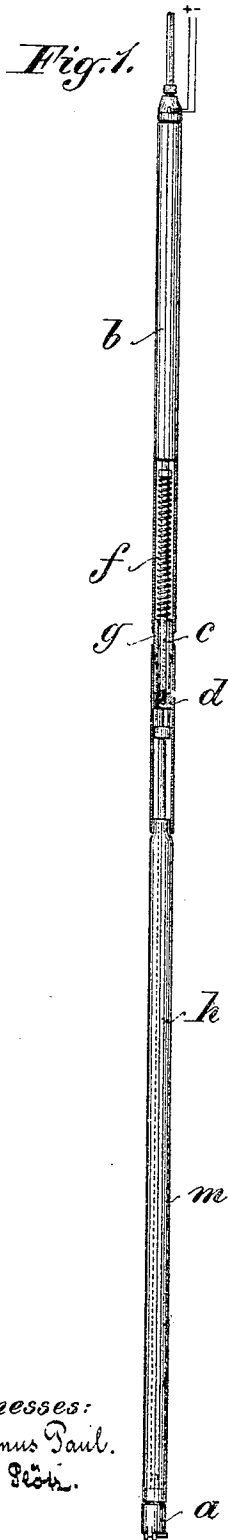


No. 801,072.

PATENTED OCT. 3, 1905.

E. FRIEH.
DEEP BORING APPARATUS.
APPLICATION FILED MAY 3, 1905.



Witnesses:
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UNITED STATES PATENT OFFICE.

EDUARD FRIEH, OF NORDHAUSEN, GERMANY, ASSIGNOR TO DEUTSCHE TIEFBOHR AKTIEN-GESELLSCHAFT, OF NORDHAUSEN, PRUSSIA, GERMANY, A CORPORATION.

DEEP-BORING APPARATUS.

No. 801,072.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed May 3, 1905. Serial No. 258,713.

To all whom it may concern:

Be it known that I, EDUARD FRIEH, a subject of the German Emperor, residing at Nordhausen, Prussia, German Empire, (whose post-office address is No. 18 Erfurterstrasse, Nordhausen,) have invented new and useful Improvements in Deep-Boring Apparatus, of which the following is a specification.

This invention relates to improvements in deep-boring apparatus.

Percussion core-drills with core-protecting tubes in which the core-protecting tube does not participate in the percussion movement are well known. The proper object of such protective tubes to protect the core against breaking and grinding is, however, only imperfectly attained in well-known apparatus, for each jamming of the core-protecting tube in the outer tube, which cannot be avoided when rinsing-water is dirty or the rock bored is very loose, results in the loosely-suspended core-protecting tube being raised, together with the boring-tool—that is to say, it is no longer prevented from participating in the percussion movement. Moreover, these drills have the drawback that they must be driven from the surface of the ground, so that their effectiveness depends on a large stroke and heavy mass, which easily leads to the breaking of their component parts, which are necessarily lightly built.

The above-mentioned drawbacks are obviated according to this invention by the core-protecting tube being rigidly secured to the boring-rod, the core-boring tool being in known manner driven by a motor mounted on the rod immediately above the borer. Only by arranging the drive under ground it becomes possible to secure the core-tube rigidly to the boring-rod in the same way as in diamond drills, so that it cannot possibly participate in the percussion movement, and in this way it is possible to obtain cores of the same nature as with diamond drills. Owing to the use of this kind of drive, which has the advantage of enabling small moving masses, short stroke, and a great number of shocks to be used, reliable working is insured and it becomes possible to obtain perfect cores and to bring them up in good condition.

In the accompanying drawings, Figure 1 shows the whole apparatus partly in section. Fig. 2 shows a longitudinal section of the op-

erating parts. Fig. 3 is a cross-section on the line A B of Fig. 2; Fig. 4, an elevation of the bore-crown with the core-tube.

The motor *b*, driving the boring crown or drill *a*, is constructed as a well-known solenoid boring-machine. The piston-rod *c* of the motor is secured to a cross-head *d*. In order that the outer tube *g*, secured to the motor and forming an abutment for its return-spring *f*, may extend down to the core-tube *h*, the cross-head *d* is provided with three slots *i*, having the shape of circular segments, through which slots the tube *g* is passed. At the bottom end this piece of tube is connected, by means of an intermediate part *e*, to the core-tube proper, *h*, which carries the core-tube shoe *k* with core-catching device *l* of any desired shape. The slots of the shoe *k* admit the chisel-cutters of the bore-crown *a* projecting inward, the said bore-crown being centrally guided on the shoe. In this way the diameter of the core obtained will be equal to the inside diameter of the core-tube. The shoe insures at the same time proper distance between the bore-crown *a* and the bottom of the bore-hole. The connection between the bore-crown *a* and the cross-head *d* is effected by means of the tube *m*. The path of the rinsing-water is shown by the arrows. The sleeve *n* prevents the rinsing-water from escaping at that point.

Fig. 3 is an elevation of a three-cutter bore-crown with the core-tube shoe.

The working of the apparatus will now be readily understood. The bore-crown *a*, the tube *m*, and the cross-head *d* reciprocate in the bore-hole; but the core-tube shoe *k*, core-tube *h*, and the piece of tube *g* do not participate in that movement. The core-tube is let down as the boring progresses and turned in accordance with the movement required. The consequence of this is to prevent the jamming of the core which takes place in the case of chisel-crowns without core-tubes and result in the necessity of immediately raising the core.

By using the drill according to this invention it is possible to make measurements to determine the dip and strike of the rock layers, which hitherto could be done only with diamond drills.

It is obvious that the application of this core-drill is not limited to the solenoid bor-

ing-machine. It can also be used with any other motor driven by water, air, or the like directly over the working place.

5 What I claim, and desire to secure by Letters Patent of the United States, is—

1. In deep-boring apparatus with percussion-drill and core-tube the combination of the boring-rod with the core-tube rigidly secured thereto, drill-driving apparatus within
10 the bore-hole immediately above the working spot and percussion-drill connected with the driving apparatus, essentially as and for the purpose described.

2. In deep-boring apparatus with percussion-drill and core-tube, the combination of
15 the boring-rod, the core-tube rigidly secured thereto and provided with slots in its lower extremity or shoe, drill-driving apparatus within the bore-hole, and a percussion-drill
20 connected with the driving apparatus and

provided with cutters which enter the end slots in the core-tube, essentially as and for the purpose described.

3. In deep-boring apparatus with percussion-drill and core-tube the combination of
25 the boring-rod with the core-tube rigidly secured thereto, a percussion-drill driven by a solenoid located within the bore-hole and slotted cross-head fixed to the piston-rod of the solenoid through which cross-head passes
30 the core-tube, essentially as and for the purpose described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDUARD FRIEH.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.