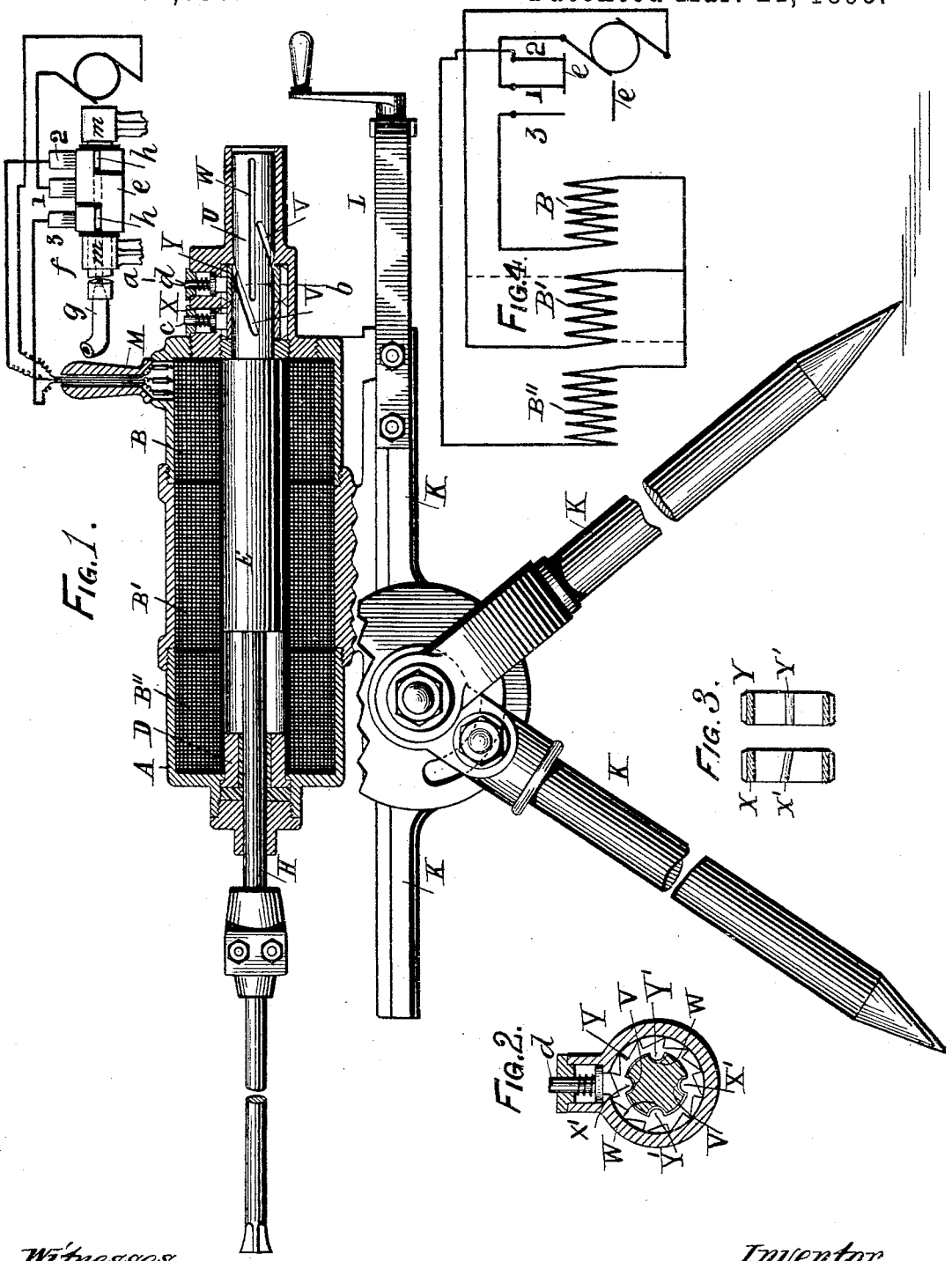
(No Model.)

W. A'C. G. BIRKIN.

RECIPROCATING ELECTRIC DRILL.

No. 494,053. Patented Mar. 21, 1893.



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UNITED STATES PATENT OFFICE.

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RECIPROCATING ELECTRIC DRILL.

SPECIFICATION forming part of Letters Patent No. 494,053, dated March 21, 1893.

Application filed April 23, 1892. Serial No. 430,421. (No model.) Patented in England June 11, 1891, No. 9,936, and in France April 4, 1892, No. 220,659.

To all whom it may concern:

Be it known that I, WILLIAM A'COURT GRANVILLE BIRKIN, a subject of the Queen of Great Britain, residing at Nottingham, England, have invented certain new and useful Improved Means and Appliances for Operating the Stocks of Percussive Drills and other Like Apparatus, of which the following is a specification, and for which I have obtained patents in Great Britain, No. 9,936, dated June 11, 1891, and in France, No. 220,659, dated April 4, 1892.

This invention relates to percussive drills and similar tools and consists in certain features of construction and novel combinations of devices in a drill operating mechanism actuated through a solenoid and in which provision is made to impart a semi-rotary movement to the tool, as hereinafter more particularly set forth.

In the annexed drawings illustrating the invention: Figure 1, is a partly sectional elevation of a rock drill provided with operating mechanism constructed and arranged according to my improvements. Fig. 2, is a transverse section on the line *a*—*b* of Fig. 1, showing the means for producing a semi-rotary movement of the drill, say on the return stroke, and a straight forward movement. Fig. 3 is a longitudinal section of the ratchet wheels forming part of the mechanism for effecting a semi-rotary movement of the drill. Fig. 4, is a diagram of the solenoid connections.

The letter A designates a shell or jacket preferably constructed in sections, as shown, the end sections being composed of soft iron while the central portion or section is made from non-magnetizable material. Within this shell or jacket are inclosed three solenoids B, B′ and B″, as shown.

In one end of the shell or jacket A is secured a soft iron core D and within the central hollow portion of the solenoids a plunger E of soft iron, is arranged to reciprocate. The forward end of the plunger E is provided with a rod or stem H which projects through a longitudinal perforation in the core D and carries at its outer end the drill stock. In Fig. 1, the plunger or soft iron core E is shown in its extreme backward position and within the coils of the solenoids B and B′. At its rear end the plunger E is provided with an extension U, say of gun metal, which is constructed with sinuous grooves V and straight or longitudinal grooves W that alternate with each other as shown in Figs. 1 and 2. Two ratchet wheels X and Y Figs. 1 and 3 are arranged upon this extension U, one of said ratchet wheels being provided with ribs X′ of sinuous shape adapted to engage in the corresponding sinuous grooves V and the other with straight ribs Y′ for engaging the grooves W. These ratchet wheels are prevented from turning, except in one direction, by means of spring pawls or stops *c d*. Upon the backward movement of the plunger E the ratchet wheel X engaging in the sinuous grooves is prevented from turning by the stop *c*, the wheel Y at the same time being free to revolve, so that the plunger has consequently a twist imparted to it proportionate to the pitch of the groove. On the reverse or forward movement of the plunger the ratchet wheel X is free to revolve and the wheel Y is held by the stop *d*, consequently, as the wheel Y is provided with straight ribs engaged in the straight grooves W, the plunger and drill stock will move in a straight or direct line.

e is a commutator and M is a handle through which are passed the wires that make electrical connection with the solenoid coils. The commutator *e* is divided in such a manner that electrical connection is made between the brushes 1, 2 or 1, 3. In the former case the solenoid coils B, B′ and in the latter case the coils B′, B″ are excited to draw the plunger E back and forth. The commutator *e* is rotated by any suitable means, say, from the shaft of the dynamo whence the electro-motive force is derived.

The commutator shaft *f* is hollow and has inserted therein the nozzle *g* of a pipe that is arranged to convey a blast from a small air blower, not shown, which may be actuated automatically, by the movements of the plunger E, or otherwise. In the commutator shaft *f* are slots *h h*, arranged just between the segments of the commutator *e* and in line with the brushes 2 and 3; and as the breaking of the current and consequent sparking occurs where these slots are located, at which points the air blast is delivered at the very moment

when the sparks appear, it is obvious that they will be at once extinguished, thereby avoiding all destructive effects of sparking. The commutator shaft may be supported in bearings *m m*, as shown.

The drill apparatus and its operating mechanism may be mounted upon a stand K of ordinary construction and provided with the usual feed screw movement or adjustment L of the requisite length.

When the apparatus is in operation the electric current circulating around the solenoids magnetizes the jacket A and core D and produces an intense magnetic field in the hollow portions of the solenoids in such manner as to attract the plunger alternately in opposite directions and thereby cause a reciprocating movement thereof, together with the attached drill stock hereinbefore described, an alternate semi-rotary movement and direct or straight movement being meantime imparted to the tool by reason of the sinuous grooves V and straight grooves W with which the ratchet wheels X and Y are locked at intervals, as already explained.

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

1. The combination of the shell or jacket A composed of soft iron end sections and a central non-magnetizable section, a series of solenoids B, B′ and B″ inclosed in said shell, the soft iron core D attached to one end of the shell and projecting into the hollow of the adjacent solenoid, the plunger E inclosed by the solenoids and provided with a rod or stem H that projects longitudinally through the core D and carries a tool stock, the commutator *e*, and electrical connections with the solenoids, substantially as described.

2. The combination of the shell or jacket A, solenoids B, B′ B″ inclosed in said shell, the plunger E inclosed by the solenoids and having an extension U provided with sinuous grooves V and straight longitudinal grooves W, the ratchet wheel X provided with sinuous ribs X′, the ratchet wheel Y provided with straight ribs Y′, and the spring pawls or stops *c d*, substantially as described.

3. The combination of the shell A having a handle M, the solenoids B B′ B″ inclosed in said shell, the plunger E inclosed in the solenoids and carrying a tool stock, electrical connections passed through the handle M to the solenoids, and the segmental commutator *e* having brushes 1, 2, 3, substantially as described.

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

WILLIAM A'COURT GRANVILLE BIRKIN.

Witnesses:
EDGAR GEORGE ALGER,
MORTON WOOD LEE.