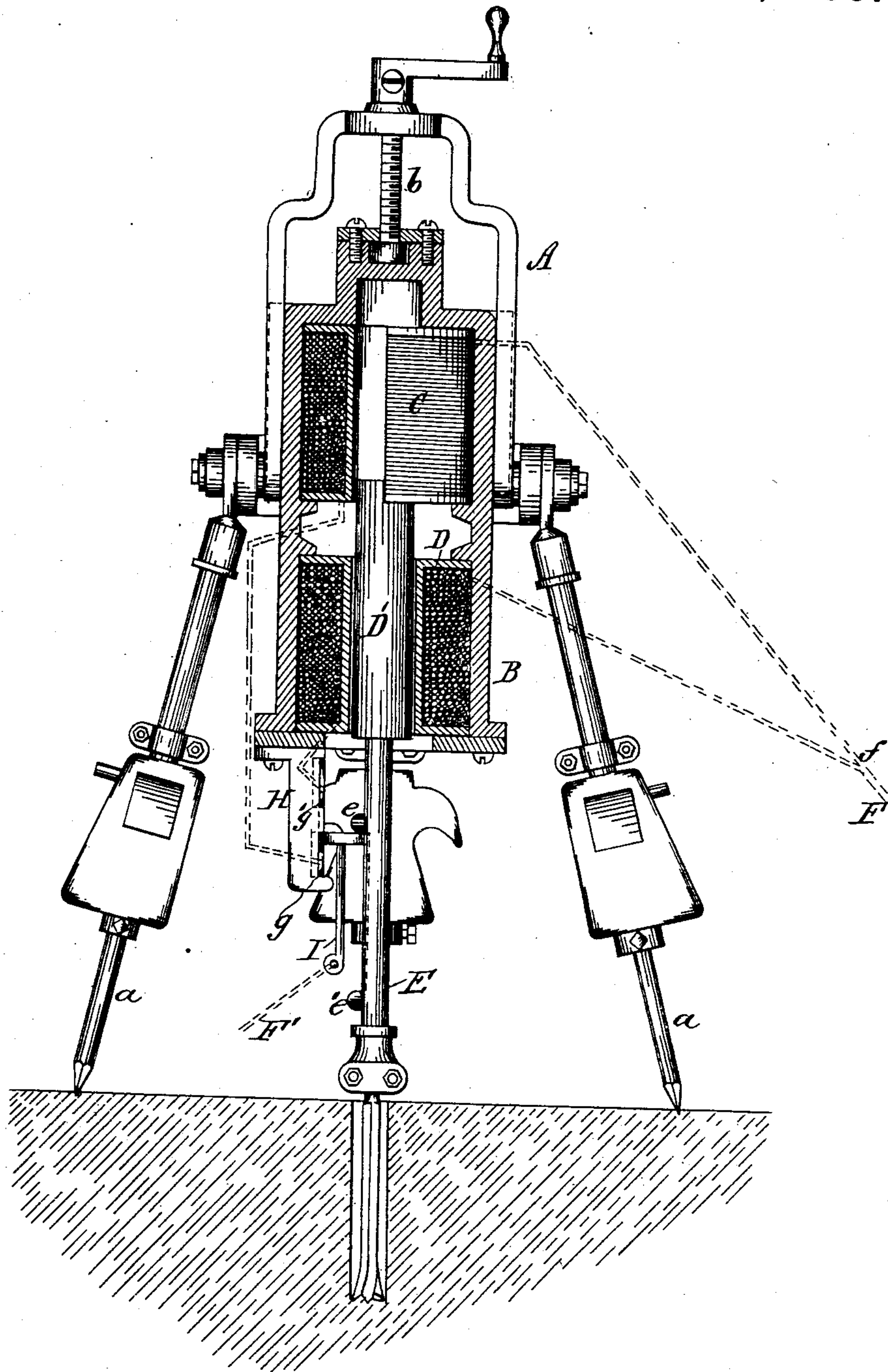


(No Model.)

C. E. BALL.
Electro Magnetic Rock Drill.

No. 235,195.

Patented Dec. 7, 1880.



WITNESSES:

S. J. VanStavoren
A. Connolly

INVENTOR,

Chas. E. Ball

By Connolly Bros.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CHARLES E. BALL, OF PHILADELPHIA, PA., ASSIGNOR TO CHARLES A. CHEEVER, TRUSTEE, OF NEW YORK, N. Y.

ELECTRO-MAGNETIC ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 235,195, dated December 7, 1880.

Application filed April 26, 1880. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BALL, a citizen of the United States, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Electric Drills, of which the following is a specification.

My invention relates to drills of the class reciprocated by electro-magnetism. Its object is to secure a simple, efficient, and durable machine; to which end my invention, broadly stated, consists in a novel organization of mechanism, whereby the drill is positively actuated in both directions by the direct action of the electric current.

The subject-matter of my invention is set forth in the claims at the end of this specification.

The essential elements of my improved organization are a suitable generator of electricity, a voltaic circuit, a series of helices, a core common to the helices reciprocating axially therethrough, a drilling-tool connected with the core, and a rheotome or circuit-breaker for reversing, changing, or switching the currents at the proper time to impart the desired motion to the tool.

The accompanying drawing represents a longitudinal central section through so much of an apparatus embodying all my improvements as is necessary to illustrate the subject-matter herein claimed in the best way known to me at the date of filing my application.

The details of construction of the apparatus being well known need not be particularly described herein, especially as such details constitute no part of the subject-matter herein claimed, and may be greatly varied without departing from the spirit of my invention.

The drawing shows a frame or yoke, A, mounted in usual well-known ways upon a tripod, the legs *a* of which are variable in length, so as to adjust the drilling-tool properly relatively to the substance to be operated upon. A stock or cylinder, B, slides freely endwise in the frame, its movement being controlled by an adjusting-screw, *b*. Coils or helices C D of insulated wire wound in a way usual with electro-magnets are secured in the stock B,

end to end, in the same axial plane, but with a space between them. An ordinary soft-iron core, D', common to both these helices, has the capacity of sliding freely endwise axially therethrough, the core, it will be observed, being about one-third longer than either coil, so as to always leave it within their magnetic field.

The upper end of the cylinder D terminates in a small chamber in which the core D' plays on its backstroke. The confined air in this chamber is thus compressed at each backstroke, and acts as a buffer to prevent shocks or jars. A tool-stock or drill-holder, E, constituting a prolongation of this core, carries the drilling-tool in usual well-known ways.

The conductor from a suitable dynamo or magneto electric machine or generator (not shown in the drawing) is divided, each branch being connected with its respective coil, so that the circuit may pass alternately through each one as it is shunted by the action of the rheotome or circuit-changer, hereinafter described.

One terminal of the coil C leads to contact *g*, and a terminal of the coil D likewise connects with another contact, *g'*, both of said contacts being insulated from each other, but secured to the same pendant or bracket H of the stock B.

The return-wire F' to the generator is secured to a T-shaped bar, I, located between the drill-stock E and pendant H, above mentioned.

With the parts in the position shown in the drawing one coil, C, is in circuit, while the other one, D, is inactive. The operative force of the coil C draws the core D' into it and retracts the drill, at the same time moving the bar I out of contact with the contact *g* and into contact with the contact *g'*, this bar being moved at the proper time by the tappets or wipers *e e'* on the drill-stock E. As the core D' reaches the limit of its backstroke the bar I comes in contact with the contact *g'*, thus changing the current from the back coil, C, to the front one, D, causing the core to be drawn forcibly into said coil, thus producing the necessary stroke of the drill. When the forward stroke of the drill is completed the

stud *e* strikes the plate *i* and forces it against the contact *g*, thus again throwing the coil C into circuit, and the coil D out of circuit and retracting the drill. These operations being repeated at every stroke of the drill produce a very rapid and effective reciprocation thereof.

I claim as of my own invention—

1. The combination, substantially as herein set forth, of a series of helices, a core reciprocating axially therethrough and actuated positively thereby in both directions, and a drilling-tool connected with the core.

2. The combination, substantially as herein set forth, of a series of helices, a core reciprocating axially therethrough, a drilling-tool connected with the core, and a commutator or circuit-breaker alternating the currents through the helices.

3. The combination, substantially as herein set forth, of a series of helices, a core reciprocating axially therethrough, a drilling-tool connected with the core, circuit-connections,

and a circuit-breaker actuated by the drill-stock.

4. The combination, substantially as herein set forth, of the yoke or frame, the stock, the mechanism for adjusting the stock in the frame, the coils mounted in the stock, the core reciprocating through the coils, and the drilling-tool connected with the core, whereby all the mechanism may be adjusted by a single instrumentality.

5. The combination, substantially as herein set forth, of the yoke or frame, its adjustable supports, the stock, the mechanism for adjusting it in the frame, the coils and circuit-breaking mechanism mounted on the stock, the core reciprocating axially through the coils, and the drilling-tool connected with the core, whereby the double adjustability of the drilling-tool is secured.

CHAS. E. BALL.

Witnesses:

W. D. BALDWIN,
W. L. CANDEE.