(No Model.)

C. F. CARPENTER.

ELECTROMAGNETIC TOOL.

No. 519,662. Patented May 8, 1894.

Fig. 1

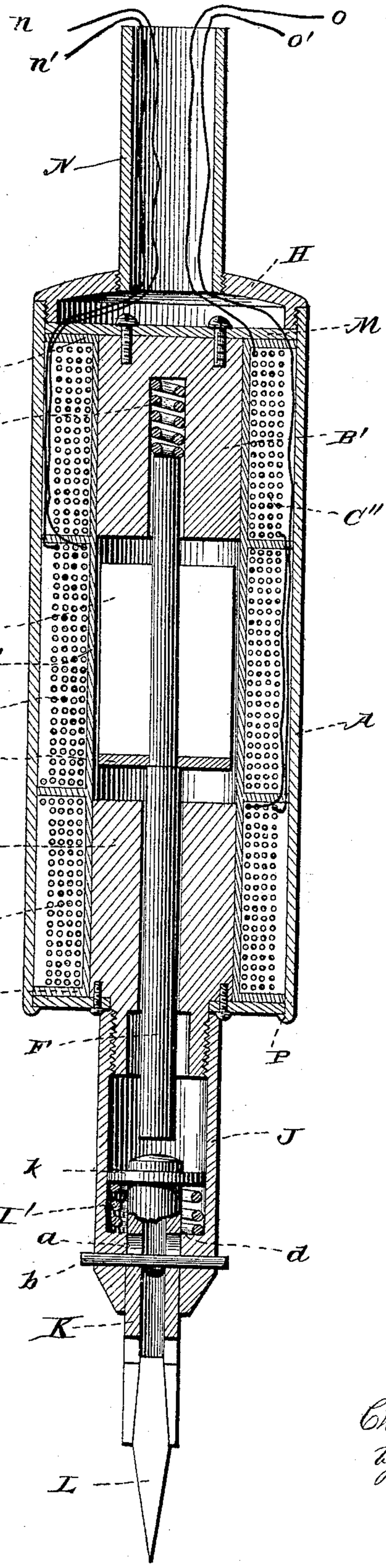
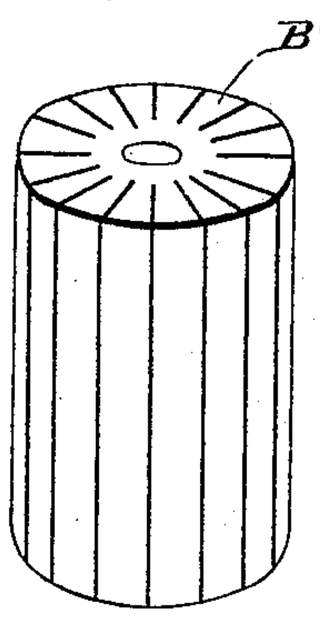


Fig. 2.



Witnesses

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ELECTROMAGNETIC TOOL.

SPECIFICATION forming part of Letters Patent No. 519,662, dated May 8, 1894.

Application filed June 20, 1891. Serial No. 396,973. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. CARPENTER, a citizen of the United States, and a resident of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Electromagnetic Tools; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a longitudinal section. Fig. 2 is a detail view of one of the cylinders.

This invention has relation to instruments for effecting rapid intermittent blows or strokes when influenced by an electric current, and is designed chiefly for cutting stone and other hard substances.

In the accompanying drawings the letter A designates a cylinder or case having a rim P projecting inwardly, which may be made of soft iron and supporting a bottom plate to which is connected an inner hollow or bored cylinder or core B of soft iron, which is surrounded with the coil or helix C of insulated wire (the size of this wire may be from No. 12 to No. 24, according to the voltage of the electric current that is to pass through it), forming an electro magnet.

B′ represents another cylinder of soft iron inside cylinder A at the upper portion and surrounded by the coil or helix C″, forming another electro magnet.

G represents another cylinder or core of soft iron surrounded by the coil or helix C′ forming an electro magnet.

Attached to the cylinder G is the central rod-hammer F, which is of bronze or some metal of no magnetic power. This central rod-hammer passes through the hollow core cylinder B, and its end operates on the end of the anvil piece or bit carrier K, the other end of the said central rod-hammer playing to and fro in a hole in the end of the cylinder B′ which keeps the said rod in proper position, so that the cylindrical armature G (which is attached to the rod) can play freely to and fro within the coil or helix C′.

I is a spring or buffer to arrest the upward movement of the rod-hammer F.

Attached to the cylinder by a screw is the tubular guide J, within which is carried the anvil piece or bit carrier K having upon it a guide collar *k*. This anvil piece is preferably of a cylindrical form, as also is the hammer rod and these parts are in axial relation to the cylinders B and B′. The anvil piece K is provided with a slot or guide as at *a*, which is engaged by the pin *b* which keeps the anvil piece from turning in the guide tube and restrains the upward motion of the anvil piece, which allows it a certain amount of reciprocating motion. This anvil piece is provided at its end with a chuck or socket for the bit L. Between the collar *k* and the lower interior shoulder *d* of the tubular guide is the retracting spring I′ of the anvil piece or tool carrier K.

e, *e′*, *e″* is a spool split longitudinally, preferably made of aluminum bronze which is divided in three sections, and is arranged inside the cylinder A and around the cylinders B, B′, and G. Around the middle section is wound the coil or helix C′ the ends of the wire coming out at *n*, *n′*. The end sections are wound with one piece of wire, the ends of the wire coming out at *o*, *o′*. In winding the helices in the end sections it must be done so that when an electric current passes through the wire *o*, *o′*, the inside ends of the cylinders B, B′, will have the same polarity. The cylinders or cores B, and B′ may be partially slotted lengthwise and radially into about sixteen sections as shown by Fig. 2. This construction is designed to prevent heating but a solid core may be employed if desired. The cylinder G may be made of a ribbon of No. 28 sheet iron, varnished and tightly coiled and supported at its lower end by a disk of soft iron R.

M is a yoke piece which retains the cylinder B′ in position.

N is a tubular handle which serves to protect the wires *n*, *n′*, *o*, *o′*, as they pass out of the instrument. This handle is secured in the screw cap plate H of the cylinders. When an electric current passes through the wires *o*, *o′*, the cylinders B and B′ become powerful magnets, their internal ends having the same polarity. This electric current should

be a continuous and a direct one. When an alternating current is passed through the wire n, n', the cylinder G becomes powerfully magnetic and its polarity changes as the current alternates; the consequence being a rapid reciprocating movement of the cylinder G and the hammer rod F, the spring I arresting the upward motion of the hammer rod while the downward motion or blow is expended on the end of the anvil piece or bit carrier K, causing the same to move forward sharply in its guide in an effective manner for working its bit or chisel in cutting stone.

The coils C, C', C'' and its spool may be removed and substituted by unscrewing the cap H.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an electro-magnetic tool, the combination with a pair of magnetic cores having their like poles separated from each other by an interval or space, and coils for energizing said cores, of an armature in said interval or space, a non-magnetic rod or plunger carried by said armature, and a coil surrounding said armature, said coil having means for its energization by an alternating current, substantially as specified.

2. In an electro-magnetic tool, the combination with a pair of magnet cores supported with their like poles separated from each other by an interval or space, and coils or helices surrounding said cores, of an armature placed between the said cores, and shorter than the distance separating their like poles, an axial non-magnetic rod or plunger carried by said armature, said rod passing loosely through a bore in one of said cores, and at its upper end working in a slot in the other of said cores, a spring in said slot against which the end of said rod or plunger seats, a bit-carrier operated by said rod or plunger, and a coil or helix of alternating polarity for energizing said armature, substantially as specified.

3. In an electro-magnetic tool, the combination with a pair of magnet-cores placed so that a pole of one is opposite to and faces a pole of the other, but separated therefrom by an interval, and coils or helices for energizing said cores, of an armature in said interval, and free to reciprocate therein, a rod or plunger carried by said armature, and a coil for energizing said armature, substantially as specified.

4. In an electro-magnetic tool, the cylinder or case in which are held the operating magnets, said shell at one extremity having the interior rim P, supporting a plate on which the core of the lower magnet is supported, said core having an axial threaded extension, through which the hammer rod passes, a tubular guide J connected to said extension, an axial pin or bit carrier k working in said guide, the bit carried thereby, and the retracting spring I', substantially as specified.

5. In an electro-magnetic tool, the combination with the cylinder or case A, of the longitudinally split spool therein divided into three sections and wound with three independent coils or helices, the stationary cores B, B' located within said spool at opposite extremities of the casing, and influenced by the end coils, so that their inner ends are of the same polarity, a loose armature core C capable of a reciprocating movement between the extremities of the end cores, and a non-magnetic hammer rod carried by and passing axially through said loose core, the coil of said core carrying an alternating current, substantially as specified.

6. In an electro-magnetic tool, the combination with a pair of electro-magnets having their like poles facing each other, and whose coils are energized by constant currents, of an armature between the said poles, and a surrounding coil or helix carrying an alternating current, whereby as the polarity of said armature is successively reversed, the said armature is rapidly reciprocated by the alternating direct attraction and repulsion of the said magnets upon its respective poles, substantially as specified.

7. In an electro-magnetic tool, having end magnets separated from each other by an intervening space, and presenting their like poles to each other, and a central magnet, carrying an alternating current having a loose armature core reciprocating between the inner extremities of the cores of the end magnets, and a bit operating hammer rod carried by said armature core, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES F. CARPENTER.

Witnesses:
JAMES DEALLY,
HENRY L. WERNE.