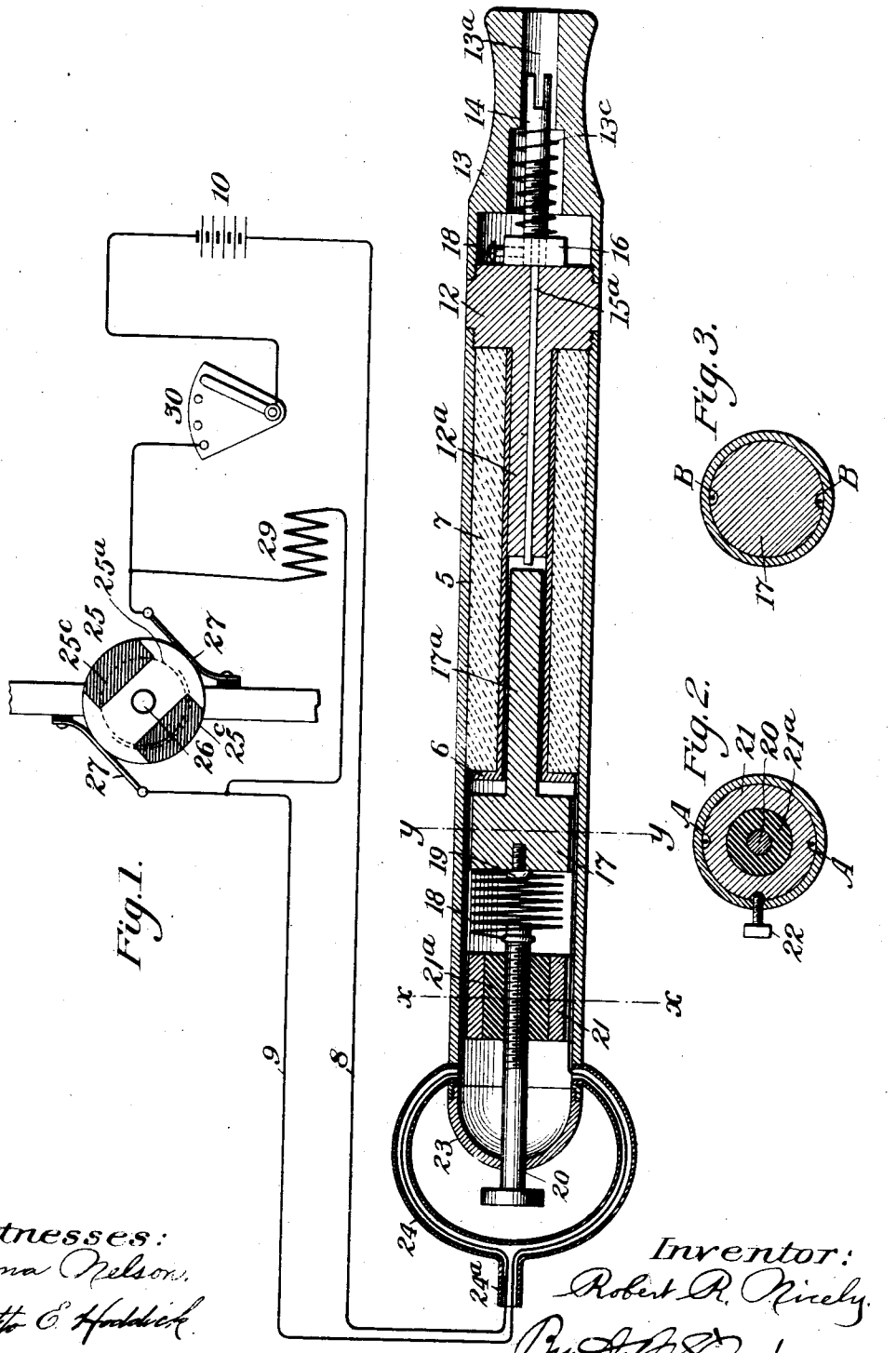
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R. R. NICELY.

ELECTROMAGNETIC TOOL.

(Application filed Mar. 8, 1901.)

(No Model.)



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ELECTROMAGNETIC TOOL.

SPECIFICATION forming part of Letters Patent No. 713,486, dated November 11, 1902.

Application filed March 8, 1901. Serial No. 50,403. (No model.)

To all whom it may concern:

Be it known that I, ROBERT RUSSELL NICELY, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, 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 the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in reciprocating tools operated by electromagnetism, and while more especially intended for use as a dental mallet it may be used as a tool for chipping stone, as a riveting-hammer, as a tool for chipping rough castings, as a mining-drill, and all similar uses; and the improvement consists of the features, arrangements, and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a longitudinal section taken through my improved instrument. Fig. 2 is a cross-section taken on the line x x, Fig. 1. Fig. 3 is a similar section taken on the line y y, Fig. 1.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a case or shell composed of soft iron or other suitable magnetic material, within which is located and secured a spool 6, composed of non-magnetic material, as brass, upon which spool is wound a coil 7, to which lead conductors 8 and 9 from a source of electricity 10. Within the rear end of the shell 5 is screwed or otherwise suitably fastened a soft-iron plug 12, having a stem 12^a projecting into the opening of the spool 6 and, as shown in the drawings, passing about half-way through the same. To the rear extremity of the plug 12 is screwed or otherwise suitably secured a casing part 13, provided with an opening 13^a, in which the holder 14 for the tool (not shown) operates. The part 13 is provided with a shoulder 13^c, against which bears one extremity of a coil-spring 15, which surrounds the holder 14. The opposite extremity of this spring bears against a nut 16, screwed upon the holder, which is provided with a stem 15^a, which passes through an opening formed in the plug 12 and its part 12^a and protrudes beyond the part 12^a, whereby it is exposed to the action of the reciprocating hammer 17. By the adjustment of the nut 16 the distance which the stem 15^a projects beyond the part 12^a may be regulated. Hence the length of the stroke may be determined by the adjustment of this nut. The nut when properly adjusted is locked in place by a set-screw 18, passing through a threaded opening therein to engagement with the holder 14. The hammer 17 is composed of magnetic material, as soft iron, and is provided with a reduced portion 7^a, which projects into the opening in the spool and acts on the stem 15^a of the holder 15. In front of and engaging the hammer is a coil-spring 18, one extremity of which is fastened to the hammer by a screw 19. To the opposite extremity of this spring is swiveled an adjusting-screw 20, passing through a threaded opening formed in the central insulating portion 21^a of a plug 21, inserted in the front end of the shell and fastened by a set-screw 22 or any other suitable manner. The forward extremity of the shell is closed by an oval cap 23, which is screwed into the shell. This cap is provided with an opening through which the adjusting-screw 20 passes, the head of the screw being exposed beyond the cap. Pivotally attached to the forward extremity of the shell and projecting beyond the cap 23 is a hollow bail 24, through which the circuit-wires 8 and 9 pass to the coil 7. These conductors or circuit-wires enter the bail at an opening 24^a, pass therethrough into the shell, and thence through grooves A and B, provided for the purpose, in the plug 21 and the hammer 17, respectively. It is evident that by adjusting the screw 20 the hammer may be moved back and forth in the shell at will through the instrumentality of the spring 18, forming the connection between the screw and the hammer, as aforesaid, the said spring being of sufficient strength to perform the required function. Hence the length of the hammer-stroke may be regulated and controlled by the adjustment of the said screw.

As shown in the drawings, the circuit in which the magnet-coil 7 is located is alternately closed and broken by a rotary circuit-breaker 25, composed of a metal part 25^a and insulating parts 25^c. As the device rotates on its spindle 26 the metal and insulating parts are alternately brought into contact with the metal brushes 27. The means for making and breaking the circuit in connection with my improved instrument may be of any suitable construction and operated in any suitable manner. The rapidity of the stroke of the instrument may be controlled by the speed of the circuit-breaker's rotation.

When the metal brushes 27 are in the position shown in Fig. 1 of the drawings, the circuit is closed, and the magnetic force induced in the shell 5 and the parts 12 and 12^a causes the hammer to move rearwardly and deliver a blow upon the extremity 15^a of the holder 15, whereby the tool (not shown and which may be of any desired description) is driven or actuated in the performance of its function. As soon as the circuit-breaker is turned sufficiently to bring the parts 25^c in contact with the brushes 27 the circuit is broken and the magnetic parts deënergized. The recoil of the spring 18 then moves the hammer forward or returns it to its normal position, and the spring 15 performs the same function for the tool-holder 14.

A resistance or choke coil 29 is interposed in the circuit to prevent arcing or sparking at the brushes as the contact is broken by the rotation of the circuit-breaking device. This coil would only be required when a current of considerable strength is employed. The arrangement is such that the strength of the current is spent on this coil for the purpose stated. The coil is also of sufficient resistance to prevent the current from passing to the coil of the tool when the circuit is broken. A rheostat 30 is also interposed in the circuit to control and regulate the strength of the current. The circuit-breaker may be operated in any suitable manner. As shown in the drawings, the spindle 26, on which the circuit-breaker rotates, is provided with a pulley 31. (Shown by dotted lines, Fig. 1.) This pulley is connected with a belt 32, leading from any suitable source of power.

Having thus described my invention, what I claim is—

1. In an electromagnetic instrument, the combination of a shell composed of magnetic metal, a spool of non-magnetic metal located in the shell, a solenoid wound on the spool, a piece of magnetic metal inserted in the shell at one end of the spool and provided with an opening, a tool-holder having a stem passing through said opening and protruding into the spool-opening, a vibratory hammer composed of magnetic metal, located at the opposite extremity of the spool, a retracting-spring located in the shell and connected with the hammer at one extremity, a plug inserted in the shell forward of the spring, and a screw threaded in said plug and connected with the spring for regulating the strength of the hammer-stroke.

2. In an instrument of the class described, the combination of a shell or casing, a hollow spool located therein, a solenoid wound on the spool, a piece of magnetic metal located at the rear extremity of the spool and projecting into the opening therein, said piece of metal having an opening, a tool-holder passing through said opening and normally protruding beyond the forward extremity of said metal piece, a spring connected with the holder for maintaining it in its normal position, a soft-metal hammer located at the opposite extremity of the spool, and having a reduced portion entering the opening of the spool whereby it is adapted to strike the tool-holder.

3. In an electromagnetic instrument, the combination of a shell, a hollow spool located therein, a solenoid wound on the spool, a piece of magnetic metal attached to the shell at one extremity of the spool and provided with a reduced part entering the opening of the spool, said piece of metal being provided with an opening, a tool-holder provided with a stem passing through said opening, a spring surrounding the tool-holder and engaging a shoulder on the shell at one extremity, a stop adjustably mounted on the holder and against which the opposite extremity of the spring bears, said stop being normally held by the spring against the metal piece through which the stem of the holder passes, and a hammer located at the opposite extremity of the spool and having a reduced part protruding into the opening of the spool, whereby it is adapted to strike the tool-holder when the instrument is in use.

4. In an instrument of the class described, the combination of a soft-metal shell, a hollow spool located therein, a coil surrounding the spool, a circuit in which the coil is located, a soft-metal part inclosed by the shell, located at one end of the spool, and having a reduced part entering the opening of the spool, a tool-holder having a stem passing through said metal part, a vibratory hammer located at the opposite extremity of the spool, and provided with a reduced portion entering the opening of the spool, a spring connected with the hammer, an adjusting-screw connected with the spring, a plug located in the shell and having an insulating portion in which the screw is threaded, a hollow bail pivotally mounted on the forward extremity of the case, and forming a shield for the circuit-wires which pass therethrough into the case and thence to the coil of the spool.

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

ROBERT RUSSELL NICELY.

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