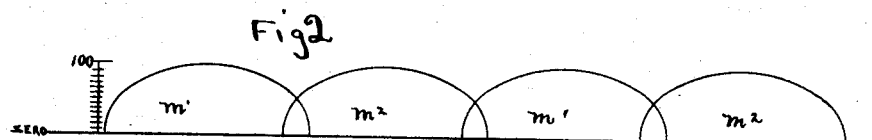
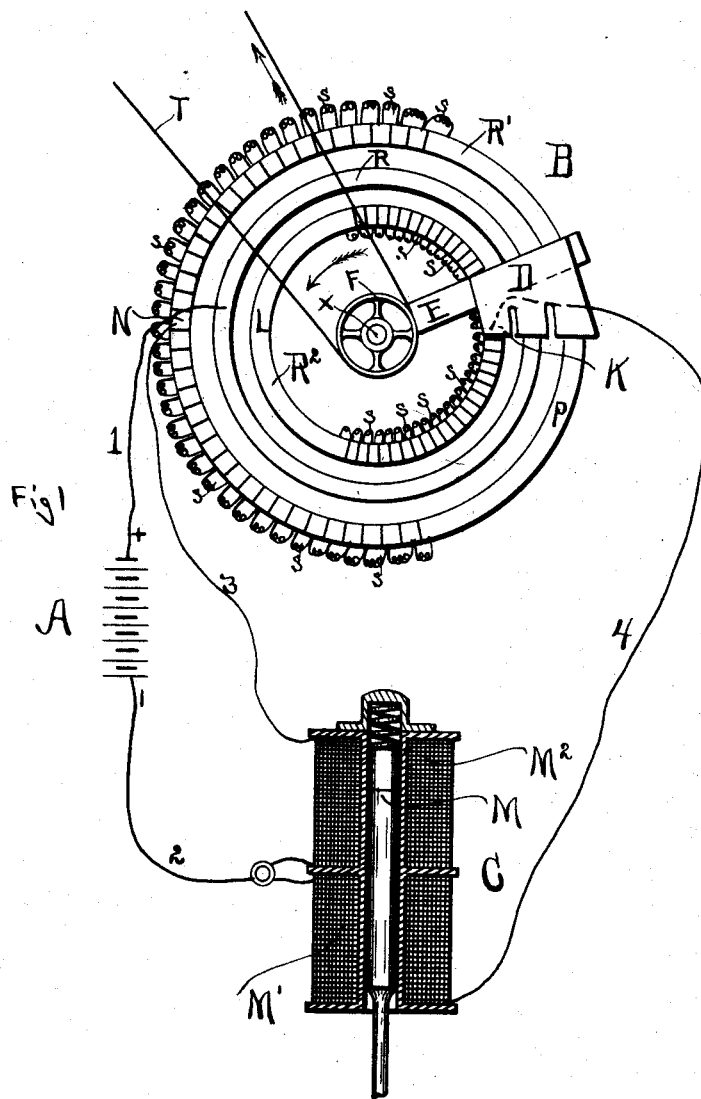


(No Model.)

H. N. MARVIN.  
ELECTRIC RECIPROCATING TOOL.

No. 420,080.

Patented Jan. 28, 1890.



Witnesses  
C E Lipe  
E D Brown

Inventor  
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# UNITED STATES PATENT OFFICE.

HARRY N. MARVIN, OF SYRACUSE, NEW YORK.

## ELECTRIC RECIPROCATING TOOL.

SPECIFICATION forming part of Letters Patent No. 420,080, dated January 28, 1890.

Application filed April 29, 1889. Serial No. 309,132. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY N. MARVIN, a citizen of the United States, residing in Syracuse, in the county of Onondaga, in the State of New York, have invented certain new and useful Improvements in Electric Reciprocating Tools, of which the following is a specification.

My invention relates to the construction and organization of apparatus for producing reciprocating movements by means of electricity.

The object of my invention is to provide a system for operating reciprocating tools that shall be simple in construction and operation and capable of being operated upon existing electric circuits.

In the construction of tools of this character it has been customary to employ two solenoids or electro-magnets adapted to impart by their alternate action a reciprocating movement to the tool. In the operation of such tools it has been customary to shift the current abruptly from coil to coil by some form of circuit-controller. I have found that while such devices may answer where the amount of energy thus shifted is slight and the coils employed are small, when it is desired to employ large electro-magnets and great amounts of energy it is very desirable to give to the current an undulatory or pulsatory character—that is to say, to admit to the coil first an extremely small amount of energy and to gradually increase this current until a maximum is reached, when the current is as gradually reduced to a minimum again. To accomplish this I have resorted to the plan for which I seek a patent.

The following is a description of my invention, reference being made to the accompanying drawings, in which—

Figure 1 is a diagram showing a diagram of a source of electric currents, a section of a reciprocating tool, and a top view of the circuit-controller. Fig. 2 represents the curves obtained by plotting the variation of current in the two circuits, including the coils  $M'$  and  $M^2$ . The horizontal line is the zero-line or line of lowest current and corresponds to the current flowing from the brush D to the plates L and P. Elevation represents current-

strength, while horizontal extension represents position of brush D.

Referring to the drawings, A represents a source of electric currents.

B represents the end view of a current director or distributor, whose function is to alternately direct to two coils or electro-magnets  $M'$  and  $M^2$  of engine or tool C currents of a pulsatory nature or currents gradually rising and falling from minimum to maximum. Its organization is as follows: R R' R<sup>2</sup> are three concentric contact rings or plates. R is a continuous plate, to which is connected conductor 1. R' and R<sup>2</sup> are subdivided rings, the adjacent blocks or sections of which are connected through resistance-coils s s s s s after the manner of rheostats. The blocks L and P of rings R<sup>2</sup> and R' respectively are of greater width than the other blocks in the rings. To block N, the middle of the series in ring R', is connected conductor 3, while to block K is connected conductor 4. The insulated arm E swings around on the post X, and is driven here by the pulley F, carrying the belt T. The arm E carries the brush D, that establishes sliding connection between the three rings. The coils s are coils of material of low conducting-power, the coils increasing in resistance from the blocks N and K to the blocks P and L, respectively.

The tool C consists of two coils or electro-magnets, between which travels the plunger M. To M is attached the tool.

The action of the system is as follows: Suppose a current to start from the battery A and flow thence through the conductor 1 to the plate R. Thence it passes through the brush D to the ring R<sup>2</sup> by way of block K at the instant shown. From block K it flows through conductor 4 to coil M', and through coil M' to conductor 2, and thence by conductor 2 to battery A, completing the circuit. Thus it will appear that coil M' is energized by a current of maximums intensely unimpeded by any external resistance, and bar M is drawn down into coil M'. The current at this moment energizing coil M<sup>2</sup> is extremely feeble, since in leaving brush D and passing to block P of ring R' the current is compelled to pass through all of the coils s s s s s, in order to reach conductor 3, connected to block N, and

these coils are in the aggregate of extremely high resistance. Now as the brush-arm E and brush D revolve around the post X, being driven in any suitable manner in the direction shown by the arrow, the brush D makes contact with the coils *s s s* successively, and thus gradually introduces these coils into the circuit, thereby increasing the resistance of the circuit and reducing the current flowing through coil M'. When the resistances connected into ring R<sup>2</sup> have been largely introduced into circuit with coil M' and current therein has become considerably reduced, brush D begins to make contact with blocks in the ring R' and to cut out the resistance-coils *s s*, connected in this ring from the circuit of the coil M<sup>2</sup>, and the result is that the current in the coil M<sup>2</sup> begins to increase. This action continues, the current increasing in coil M<sup>2</sup> and diminishing in coil M' until it has become extremely small in coil M' and a maximum in coil M<sup>2</sup>, and plunger M is thus drawn up into coil M<sup>2</sup>. By properly proportioning the resistances *s s s* the character shown by the curves *m'* and *m*<sup>2</sup> is given to the current in the coils M' and M<sup>2</sup>. These curves show the rise and fall of the current in the coils during the complete revolution of the circuit-controller, current starting at zero and rising along the curve, and thus falling to zero again. It will be noticed that the curves lap so as never to leave the bar M without magnetism. An important feature is the arrangement of parts adapted to start the current in one coil while it still has considerable strength

in the other, as thereby the stroke is cushioned when the tool meets no object, and, further, the plunger M is never left without an exciting-current, and in consequence its magnetism never falls much below the saturation-point, and the heating incident to great fluxuations of magnetism is avoided.

I claim as my invention—

1. The combination, with a source of continuous currents, of an electro-magnetic reciprocating tool having two energizing-circuits, a switch mechanism actuated by a source of power and adapted to connect the source of continuous currents alternately with the two circuits of the tool, and rheostats or variable resistances between the tool-circuits and the switch mechanism, whereby the current directed into such circuits is varied in the manner herein set forth.

2. The combination, with a source of continuous currents, a rotary switch-lever connected to said source and two series of contact-terminals over which the lever sweeps, and artificial resistances through which said contacts are connected, of a reciprocating tool having two energizing-circuits connected, respectively, to the series of contacts at or near the middle of the same, whereby a rising and falling current will be directed through the tool-circuits alternately, as set forth.

H. N. MARVIN.

Witnesses:

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