(No Model.) 2 Sheets—Sheet 1.

H. N. MARVIN.

ELECTRICALLY RECIPROCATED TOOL.

No. 420,816. Patented Feb. 4, 1890.

Fig. 1

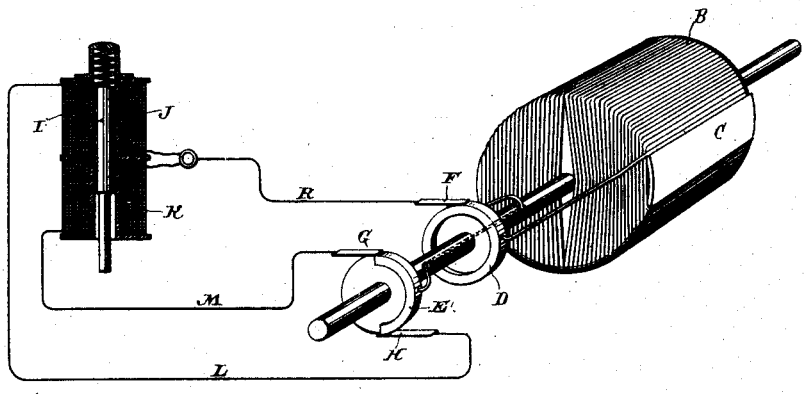

Fig. 2

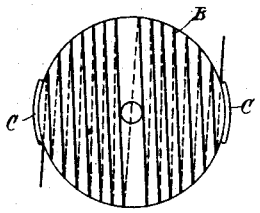

Fig. 3

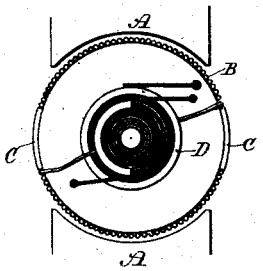

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Fig. 4.

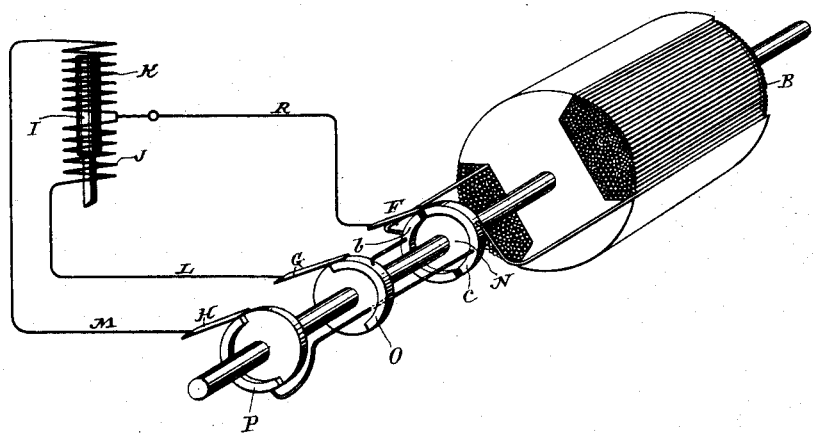
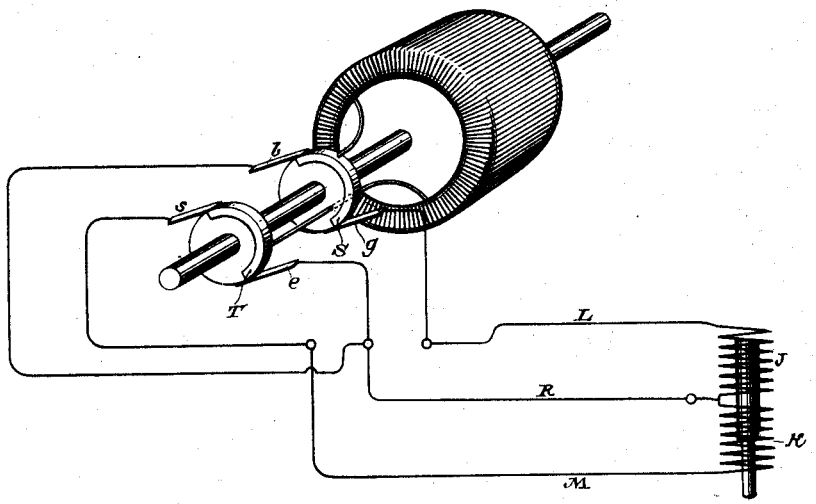


Fig. 5.



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UNITED STATES PATENT OFFICE.

HARRY N. MARVIN, OF SYRACUSE, NEW YORK.

ELECTRICALLY-RECIPROCATED TOOL.

SPECIFICATION forming part of Letters Patent No. 420,816, dated February 4, 1890.

Application filed November 19, 1889. Serial No. 330,908. (No model.)

To all whom it may concern:

Be it known that I, HARRY N. MARVIN, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Electrically-Reciprocated Tools, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This invention pertains to that class of tools or devices which are reciprocated by electro-magnetic agency, and which comprises such tools as rock-drills and the like.

The invention, owing to its especial adaptability thereto, will be herein described as applied to such tools, and the character and purpose of the invention will be understood from the following statement of what for the purposes of this case constitutes the prior state of the art.

Drills or similar instruments comprising a magnetic spring-retracted plunger working in a solenoid have been reciprocated by intermittent and pulsating currents. In other cases the plunger has been associated with two oppositely-acting coils and reciprocated by the action of currents directed through both coils, such currents being in some instances of the same potential and direction and directed through the coils alternately, in others of rising and falling potential, and generally of alternately opposite direction. In the latter case the pulsations or alternations of current in the two coils have in some instances occurred simultaneously, but differed in phase, the maximum period of one coinciding with the minimum period of the other, while in others the pulsations or alternations occurred alternately in the two coils of the drill.

The only means of which I am aware which have been heretofore employed for securing the last-described condition, or that in which the pulsations or alternations occurred in the two coils alternately, comprised a single-line circuit from a generator yielding a pulsating or alternating current and a switch or current-shifting device operated directly or indirectly by the action of the currents themselves and intermediate of the generator and the engine and adapted to direct succeeding alternations or pulsations alternately through the two coils of the drill or engine.

My present invention is an improvement upon this plan; and it consists in combining with the two coils of the drill and two line or working circuits including the same a source or generator of pulsating or alternating currents adapted to develop in said working-circuits alternately such pulsations or alternations as distinguished from a generator which produces pulsations or alternations of current in one circuit from which they are directed into others. This plan I have found by an extended experience to be by far the most successful if not the only practicable way of operating tools of this general description. It avoids the use of intermediate switches or current-shifting mechanism, confines the sparking, when such occurs, to the generator, and results in the minimum of loss of energy which occurs in any system wherein two opposing currents exist simultaneously. It furthermore secures absolute precision in commutation or the directing of the current-impulses through the two coils by the simplest form of mechanism, a result not possible with other forms of apparatus, and enables me to operate to better advantage any desired number of drills or similar tools from the same generator.

More specifically stated, my invention consists in the combination of a reciprocating tool composed of a magnetic plunger and two oppositely-acting coils, the generator having a single induced or current-generating circuit, two working-circuits from the generator to the tool, and a commutator or current-shifter, mechanically connected with the movable element of the generator and adapted to connect the terminals of the generating-coils alternately with the working-circuits. This plan or system may be carried out in various ways, the best and most practicable of which, so far as known to me, I shall now describe by reference to the accompanying drawings.

Figure 1 is an illustration of a drill or reciprocating tool in section, the operative parts of the generator being in perspective. Fig. 2 is an end view of the generator-armature, showing the winding diagrammatically. Fig.

3 is an end view of the generator, showing the character and location of the field-magnet. Fig. 4 is a modified form of the generator shown in perspective. Fig. 5 is another modification in perspective of the generator.

Referring to Figs. 1 to 3, A A represent the field-magnets of a magneto or dynamo machine. The armature of the machine is a cylindrical magnetic core wound with a coil B. This coil, it will be understood, may be composed of any number of sections, but it may be considered as a single coil or induced circuit. On opposite sides of the core I secure the projections C C and wind the coil around these projections and over the sides and ends of the core, generally in two sections, meeting midway between the projections, so that the wires at the ends of the cylindrical core are all parallel or nearly so. The projections C C may be of non-magnetic material. One terminal of the coil B is permanently connected with a continuous ring D, carried by the armature-shaft. The other terminal is connected with a half-ring or segment E, also carried by said shaft. Both rings D and E are insulated from the shaft. A single brush F bears upon the ring D and two brushes G H are placed in position to be alternately in contact with the half-ring E. These brushes form the terminals of two electric circuits, of which the conductor R forms the common return.

The reciprocating tool or drill may be constructed in any preferred manner, the only essential features being a magnetic core or plunger I, which carries or operates the drill or similar instrument, and the two oppositely-acting coils J K, which by their alternate attraction for the core I reciprocate the same. One of the coils, as J, is connected with the working or line circuit formed through wires L and R and the other with the circuit formed by wires M and R, so that current impulses or pulsations or alternations developed in or delivered into these circuits alternately will produce a reciprocation of the said core or plunger. This is effected by the relative positions of the half-ring E and the brushes G H, which is such that the coil B is connected with each circuit alternately at or about the time when from its position relatively to the field of force it begins to develop a current impulse or alternation.

Another means of producing the currents in the two working-circuits is shown in Fig. 4. In this case the two terminals of the coil B connect, respectively, with the two insulated segments of a ring N, carried by and insulated from the shaft. One of these segments, as *b*, is electrically connected with a half-ring or segment O, insulated from the shaft, and the other, as *c*, to a second half-ring or segment P, adjoining the first. A brush F bears upon the two segments *b c*, and brushes G H bear upon the half-segments O P, respectively. Two circuits are thus formed, one through brush G and wires L and R and brush F and including coil J of the drill, the other through brush H, wires M and R, and brush F, including the other drill-coil K. The relative position of the brushes G H and half-rings O and P is such that the current-impulses generated in the coil B are by the connection of such coil with the two circuits alternately produced in the same; but from the character of the commutator employed in this case it is obvious that the currents in each circuit are always in the same direction.

Other means of effecting the same result are shown in Fig. 5. In this case the armature is shown as of the ordinary Gramme type, wound with a continuous coil. Two wires are taken out from opposite points of the coil and carried to the half-rings S and T, insulated from one another and the shaft. Four brushes are employed, two for each half-ring, and these are so placed that each half-ring or segment is always in contact with at least one brush. As in the previous cases, two working-circuits are thus formed by the wires L and M and the return-wire R, and the same results are obtained as before by connecting the two brushes, as *d e*, to the said return-wire R. The brushes and collecting rings or plates are further arranged in such manner that the coil B is alternately connected with the two working-circuits by brushes *d f* at one time and *e g* at another.

In all the above-described plans or devices it will be observed that the operating-currents are developed in and supplied to the drill-coils through independent circuits, and that one exerts its full effect before the influence of the other is appreciably felt; hence, a great saving of energy is effected, and no current is produced that is not directly applied to performing useful work.

I do not claim in this application the broad idea of operating a drill or other similar tool by alternations or pulsations of current and in synchronism with the same, nor do I claim, broadly, this method, whether carried out by the use of a single working-circuit or two circuits. Furthermore, I do not claim, broadly, the method or means of operating such drills by directing through the two coils of the same alternately such pulsations or alternations, the claims of this application being confined to the means whereby I operate such drills by alternately developing in the circuits including said coils the pulsations or alternations of current which reciprocate the plunger.

What I claim is—

1. The combination, with a source or generator of pulsating or alternating currents and a reciprocating tool comprising a magnetic core or plunger and two oppositely-acting coils, of two working or line circuits, one for each of said coils, connected to the source of current, substantially in the manner hereinbefore described, so that an alternation or pulsation of current in the one circuit shall succeed and alternate with an alternation or pul-

sation in the other circuit, substantially as and for the purposes hereinbefore set forth.

2. The combination of a reciprocating tool consisting of a movable magnetic core or plunger and two oppositely-acting coils, two working-circuits, including said coils, respectively, a generator containing a single induced or current-generating coil, and a commutator rotated by the movable element of the generator and adapted to connect the terminals of the said induced circuit with the working-circuits alternately, as set forth.

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