

(No Model.)

H. S. McKAY.

ELECTRIC MECHANISM FOR GIVING RECIPROCATING MOTION.

No. 519,869.

Patented May 15, 1894.

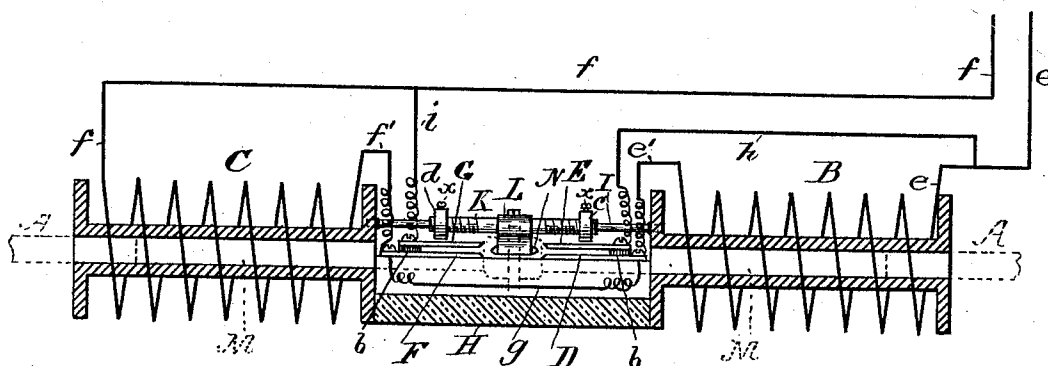


Fig. 1.

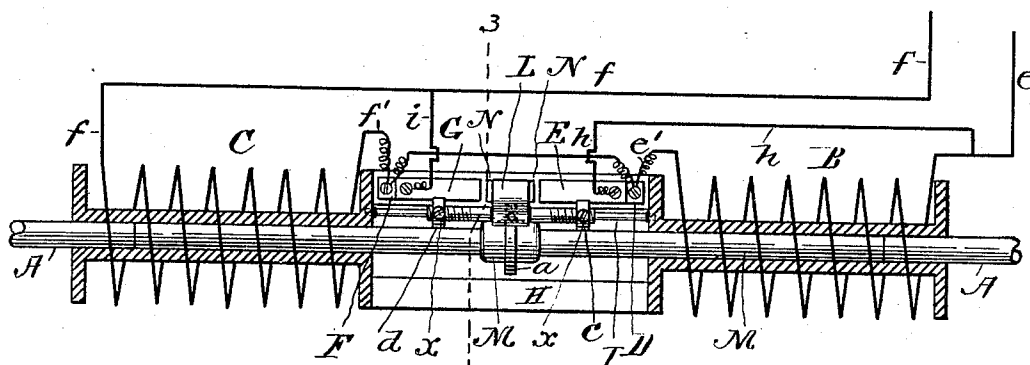


Fig. 2.

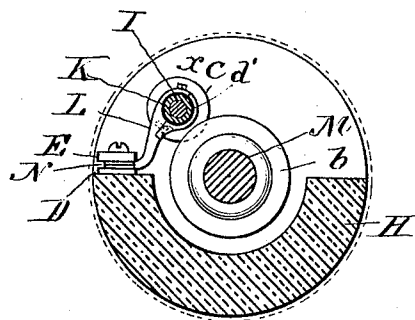


Fig. 3.

WITNESSES.

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ELECTRIC MECHANISM FOR GIVING RECIPROCATING MOTION.

SPECIFICATION forming part of Letters Patent No. 519,869, dated May 15, 1894.

Application filed March 12, 1892. Serial No. 424,628. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. MCKAY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Mechanism for Giving Reciprocating Motion; and I do hereby 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.

My invention relates to improvements in non-circuit breaking commutators, and means for operating the same, to be used in electromagnetic reciprocating tools.

My invention consists generally of a special arrangement of the movable contact, the fixed contacts for engagement therewith, and the electric connections between said contacts, the magnets and the main circuit, combined with the reciprocating armature, whereby the reciprocation of said armature will cause the commutator to change the course of the electric current to alternately energize the magnets, and de-energize the same by short circuits.

In the accompanying drawings,—Figure 1 illustrates a diagrammatical view, showing the application of my invention in elevation and partly in section, and with the armature rod shown in dotted lines. Fig. 2, is a plan of the device shown in Fig. 1, but with the rod and attached parts in full lines. Fig. 3, is a cross section in the line 3 3 of Fig. 2.

Similar letters represent to like parts in all the figures.

A is a rod to which reciprocating motion is to be given.

B and C are two electro magnets or solenoids, situated some distance apart, and with their centers in the same line, and with the rod A passing through their centers. The portion of the rod A indicated by M is the armature to be alternately attracted by the magnets B and C and *a* is an annular flange or collar surrounding said armature between the two solenoids B and C for a purpose hereinafter to be described.

D E and F G are two pairs of stationary conducting springs or contacts situated between the two magnets B and C, parallel with the rod A, and with the free ends of the two

pairs of contacts extending toward each other, and with the upper and lower contacts of one pair being in the same plane with the corresponding contacts of the other pair respectively. The two lower contacts D and F rest and are firmly secured on some insulating substance H inclosed between the two magnets B and C, and the upper contacts E G are separated from their lower contacts D F respectively by insulation *b* near the outer ends of the contacts, the two contacts of each pair and the interposed insulation being firmly secured together by a screw or other means, and the free ends or portions of each pair of contacts having a space between them in which a movable conducting switch may slide.

I is a fixed rod situated between the rod A and the contacts D E F and G, parallel with said rod A and contacts, and insulated or separated from the magnets B and C.

K is a loose sleeve surrounding the rod I, and having its outer periphery provided with a screw thread, on which are adapted to engage two nuts *c* and *d*. These nuts are situated respectively on each side of the flange or collar *a* of the rod A, in order that said flange, during the reciprocation of the rod A, will strike the nuts alternately and carry along the sleeve K first in one direction and then in the other. Extending laterally outward from the sleeve K is an extension L, said extension being separated from said sleeve by insulation *d'* and to the free end of which extension is secured a conducting switch or movable contact N. This switch is of a thickness slightly greater than the space between the upper and lower fixed contacts D E and F G, and of a length somewhat less than the distance between the two pairs of said fixed contacts. The switch N is thus adapted by the sliding movement of the sleeve K to enter between the contacts D E and F G, and to make electrical connection between the two contacts of each pair. The two ends of the switch N and the free ends of the fixed contacts D E F and G are beveled as shown in Fig. 1, in order to facilitate the entrance of the switch N between the fixed contacts, and to insure a more perfect electric connection.

One end of the solenoid B connects with

one pole of the main circuit by the wire *e*, and the other end of said solenoid connects with the lower stationary contact D by the wire *e'*. One end of the solenoid C connects
 5 with the opposite pole of the main circuit to which the solenoid B is connected, by the wire *f*, and the other end of said solenoid B is connected to the lower stationary contact F by the wire *f'*.
 10 The two lower contacts D and F are connected by a short wire *g*, and the two upper contacts E and G are connected respectively with the wires *e* and *f* by the short circuit wires *h* and *i*.
 15 By screwing the nuts *c d* closer together on the sleeve K, the collar *a* is made to act more quickly upon said nuts and to sooner bring the switch N into contact with the two pairs of stationary brushes and thus more quickly
 20 energize the two magnets alternately, and consequently cause a quicker stroke to the rod A. By separating the nuts *c* and *d* farther apart, the stroke of the rod A is made slower. In order to firmly secure the nuts *c*
 25 and *d* in any adjusted position upon the sleeve K, I have provided set screws *x* which pass through the nuts and enter between the threads on said sleeve.
 The operation is as follows: When the parts
 30 of the apparatus are in the positions shown in Fig. 1, with the commutator switch N not touching any of the stationary contacts D E F or G, the electric current will be continuous from the wire *e* through solenoid B, contact D, wire *g*, contact F solenoid C and wire
 35 *f* back to the main circuit; both solenoids will be equally energized, and the magnetic attraction of each will counterbalance that of the other, so that the armature M and rod A
 40 will not be moved in either direction. But if the rod A be first moved in either direction sufficiently to cause the collar *a* to push the switch N between and in contact with either
 45 of the pairs of fixed contacts, the opposite magnet to said contacts will be at once completely energized, by a short circuit to attract the armature M, while the magnet nearest
 50 said contacts will be almost entirely thrown out of the circuit, by reason of the much higher resistance it offers over that of the short circuit. For example, if the helix end
 55 C of the apparatus be lowered so that the rod A with the armature M will drop by gravity, the collar *a* will strike against the nut *d* carrying with it the sleeve K and switch N between and in contact with the contacts F and
 60 G, the circuit will be completed through the contacts F G and switch N, the wire *g*, contact D, helix B, to one pole of the main circuit, and from the contact G through the short
 65 wire *i* and the wire *f* to the opposite pole of the main circuit; the wire *i* short circuiting the wire *f* and returning along said wire *f* directly to the main circuit instead of the current passing through the long and high resistance coil C. The magnet B being energized as above stated, it will draw the arma-

ture M toward it, when the collar *a* will strike against the nut *c* carrying it, its sleeve K, and the switch N with it, said switch will pass
 70 between and come in contact with the contacts D E, when the magnet C will be energized by the circuit made through the wire *f* to the contact F through the wire *g* through the contact D, switch N, contact E, through
 75 the wire *h*, the wire *e* to the opposite pole of the main circuit, said wire *h* short circuiting the wire *e'* instead of the current passing through the long high resistance coil B. The magnet C is then immediately energized as
 80 above described, the action is repeated, and the armature M and rod A are reciprocated.

From the above, it will be seen, that during the operation of the apparatus, the circuit is never broken; for when the switch N is not
 85 in contact with any of the stationary contacts, the current passes from one pole of the main circuit through one magnet, the two lower stationary contacts, and wire *g* and the other magnet to the other pole of the main circuit.
 90 And when the switch N is in contact with one pair of stationary contacts, the current will pass from one pole of the main circuit to one magnet, from thence through the two
 95 lower stationary contacts by the wire *g*, through the switch N upper stationary contact, and is then short circuited back to the other pole of the main circuit.

I have shown in the accompanying drawings, the contacts and reciprocating switch
 100 located between the magnets or solenoids; but it will be evident that said contacts and switch need not, necessarily, be between the magnets, but may be situated beyond either
 105 end of both magnets, and adapted to be operated by the reciprocating rod as above described. In this case, the magnets may be placed close together.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination with an electric circuit, two electro-magnets or solenoids arranged in the same axial line, and connected in series with each other and with said circuit, the
 110 plunger armature adapted to be reciprocated by the alternate energizing of said magnets, the commutator for alternately energizing the magnets, and consisting of two pairs of stationary contacts situated apart from and having one contact of each pair connected in series
 120 with each other and with the magnets, and having the other contacts of said pairs short circuited to the main circuit, and a movable contact adapted to engage alternately with the two contacts of each pair, all
 125 as and for the purposes set forth.

2. In combination with an electric circuit two electro-magnets or solenoids arranged in the same axial line, and connected in series with each other and with said circuit, the
 130 plunger armature adapted to be reciprocated by the alternate energizing of said magnets, the commutator for alternately energizing the magnets, and consisting of two pairs of sta-

tionary contacts situated apart from and having one contact of each pair connected in series with each other and with the magnets, and having the other contacts of said pairs short circuited to the main circuit, and a movable contact of a length less than the distance between the two pairs of contacts, and adapted to engage alternately with the same, all as and for the purposes set forth.

10 3. In combination with an electric circuit, two electro-magnets or solenoids arranged in the same axial line, and connected in series with each other and with said circuit, the commutator for alternately energizing the magnets and consisting of two pairs of stationary
15 contacts situated apart from and having one contact of each pair connected in series with each other and with the magnets, and having the other contacts of said pairs short circuited
20 to the main circuit, and a movable contact adapted to engage with each of said pairs of contacts, and the reciprocating plunger ar-

mature inclosed within the magnets and by its movements adapted to directly move the movable contact of the commutator into engagement with the two pairs of contacts alternately, all as and for the purposes set forth. 25

4. In combination with two electro-magnets or solenoids connected in series, an armature adapted to be reciprocated by said magnets or solenoids, a flange or projection extending laterally from said armature, or from a rod connected therewith, a commutator switch having adjustable mechanism to be operated by said flange or projection, contacts for making connection with said commutator switch, and connected respectively with the two magnets or solenoids, whereby the stroke of said armature or armature and rod may be shortened or lengthened, all as set forth. 30 35

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Witnesses:

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