(No Model.) 2 Sheets—Sheet 1.

H. S. McKAY.

MAGNETIC ENGINE FOR RECIPROCATING TOOLS.

No. 519,870. Patented May 15, 1894.

Fig. 1.

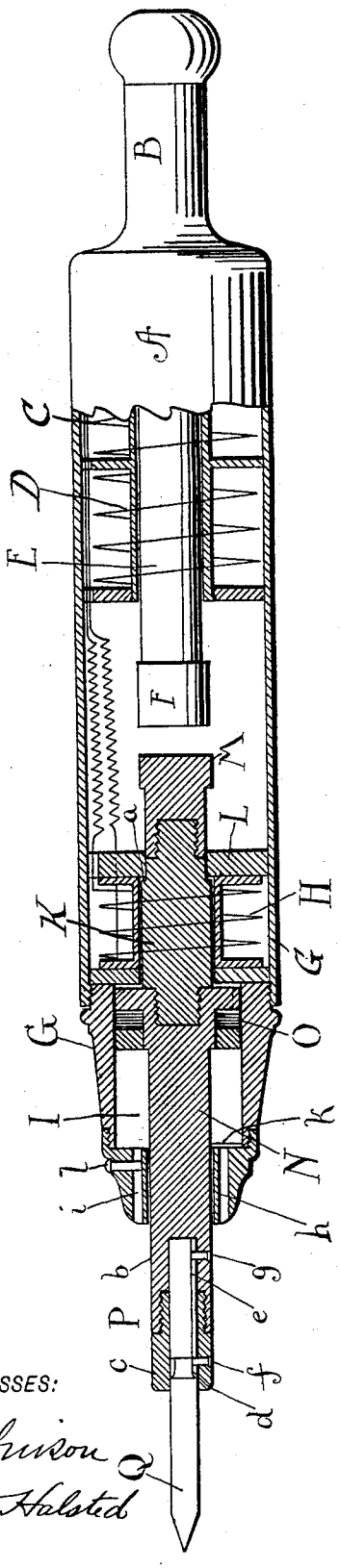
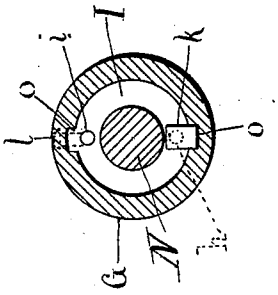


Fig. 4.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

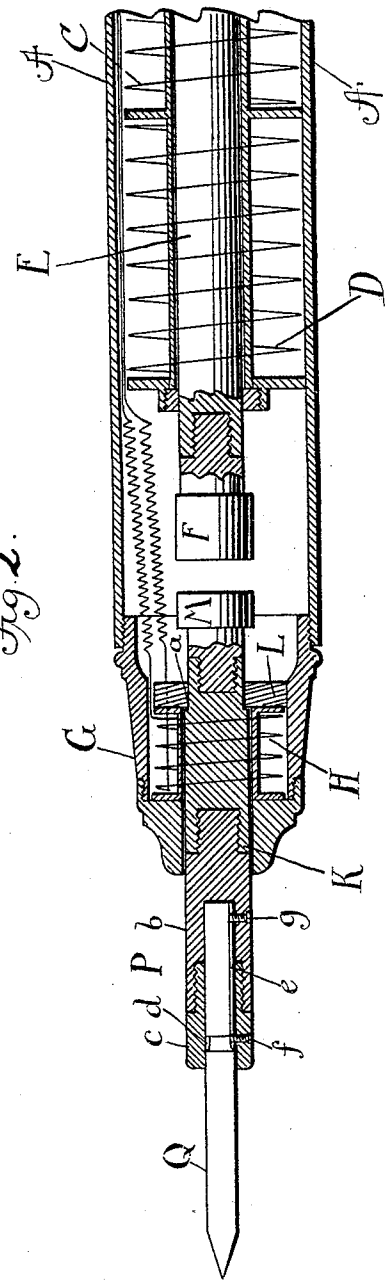
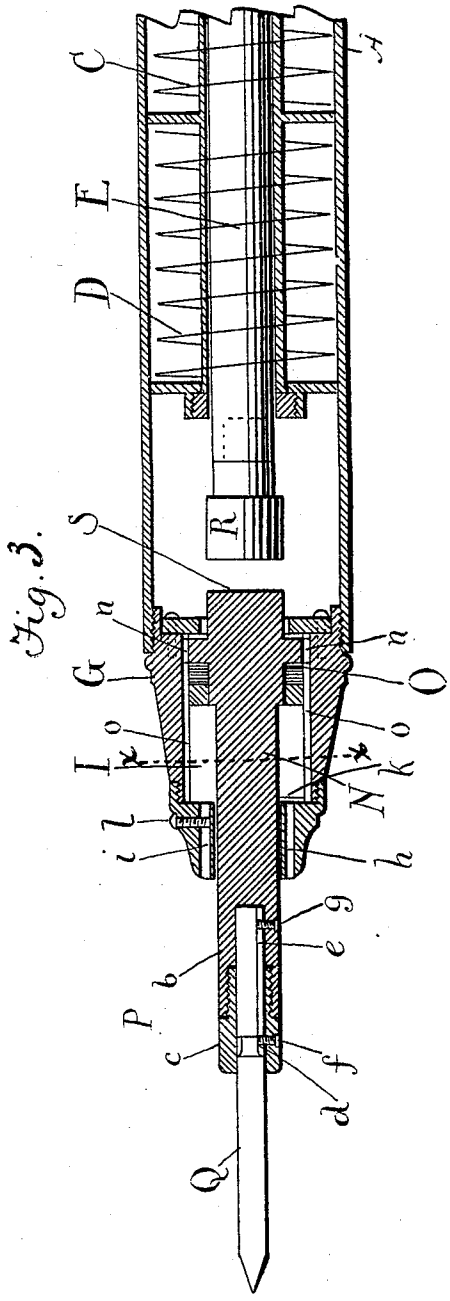


Fig. 3.



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HENRY S. McKAY, OF BOSTON, MASSACHUSETTS.

MAGNETIC ENGINE FOR RECIPROCATING TOOLS.

SPECIFICATION forming part of Letters Patent No. 519,870, dated May 15, 1894.

Application filed July 5, 1892. Serial No. 438,860. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. McKAY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Magnetic Engines for Reciprocating Tools or other Devices; and I do hereby declare that the following is a full, clear, and exact description of the invention, which 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.

My invention relates to magnetic engines for reciprocating tools or other devices, and more particularly to the direct and immediate mechanism by which the tool or other device is adapted to be reciprocated.

My invention consists generally of mechanism by which the length of the stroke of the reciprocating tool or other device is made independent of the length of strokes of the operating armature.

My invention also consists of special means for securing the tool to its stock.

In the accompanying drawings,—Figure 1 illustrates a partial longitudinal section of a hand electro-magnetically operated reciprocating tool embodying my invention. Fig. 2 is a longitudinal section, partly broken away, illustrating a different manner of applying my invention. Fig. 3 is a similar section illustrating still another mode of applying my invention. Fig. 4 is a cross section through the line *x x* of Fig. 3.

Similar letters represent like parts in all the figures.

A is the casing of the engine, and B is its handle.

C and D are two electro magnets or solenoids, which are adapted to be connected with an electric circuit and alternately energized; and E is the plunger armature passing through said solenoids, and which is adapted to be reciprocated by the alternate energizing of said solenoids.

F is a hammer of hard metal, preferably steel secured to the lower or outer end of the armature E, for a purpose hereinafter to be described.

The part G of the casing beyond or in front of the hammer F, incloses an electro magnet or solenoid H, said solenoid or magnet being connected in series with the two solenoids or magnets C and D, so that the solenoid H will be continually energized during the flow of the electric current through the circuit, while the solenoids C and D are alternately energized. The outer end of the part G beyond the solenoid H is in the nature of a piston cylinder I.

K is a plunger armature passing through the solenoid H, and when in its normal position within the field of force of said solenoid, and having a shoulder *a* abutting against a fixed ring L, which extends across the upper or inner end of the part G of the casing, the inner end of the armature K extending through said ring.

M is a block secured to the inner end of the armature K, and on which the hammer F is adapted to strike.

N is the piston rod upon which is the piston O, which works in the cylinder I.

The tool holder P is formed of two parts, *b* and *c*, one of which screws into the other, and a hole or recess extends from the outer end of the part *c* into the part *b* for receiving the shank of the tool Q. Said shank has an annular groove *d*, and a longitudinal groove *e* extending from the groove *d* to the inner or free end of the shank. Pins or projections *f* and *g* extend into the recess or hole in the parts *b* and *c* of the holder, and into the grooves *d* and *e* respectively of the tool Q, for the purpose of securing said tool to the holder P.

The tool Q is secured and tightened in the holder P in the following manner: The part *c* is screwed into the part *b*, but not quite so far as it will go. The tool Q is then inserted in the socket and pushed into it, with the ends of the pins or projections *f*, *g*, entering into the longitudinal groove *e*, and until the end of the pin *f* will enter the annular groove or recess *d*, and the tool cannot be pushed in any farther. The part *c* of the holder P is then screwed down into the part *b* as far as it will go, or until the end of the tool shank comes in contact with the bottom of the recess or hole, thus turning the pin *f* around

with it in the groove *d* and carrying the tool Q with it in a longitudinal line, the groove *e* and pin *g* serving to guide said tool and prevent its turning. The tool is removed from the holder P by the reverse of the above described operation. Extending from the outer end of the cylinder I to the outside of the casing, are two air passages *h* and *i*, the inner end of the passage *h* being covered by a valve *k* so that on the inner movement of the holder P and piston O the air will be sucked into the cylinder I; but on the outward movement of the said holder and cylinder, the valve *k* will be forced by the pressure of the air to close the passage *k*, and thus prevent its escape through the passage *h*. The passage *i* is provided with a regulating screw valve *l* for regulating the escape of the air from the cylinder I, during the outward movement of the holder P and piston O.

The operation is as follows: The armature E is reciprocated by the alternate energizing of the two solenoids C and D, by making first one and then the other solenoid an electro-magnet to attract the armature. In the outward or downward movement of the armature E, the hammer F will strike the block M, and force it, the armature K, piston O, holder P, and tool Q down and outward, the air in front of the piston O serving as a cushion to the stroke of the holder, and in connection with the outlet *i* and valve *l*, a pneumatic regulating cushion and spring for receiving the blow of the holder, and assisting in returning it to its original position, the efficiency of the air cushion and spring being regulated by the valve *l* in connection with the air outlet *i*, the resistance to the armature K and holder P, caused by the continued attraction of said armature by the solenoid H, making a still further cushion to the outward blow of the holder. On the inner or return movement of the armature E, the solenoid H will draw back the armature K, piston O, tool holder and tool Q, until the shoulder *a* strikes against the ring L, when said parts will be prevented from moving farther in the same direction. The armature E will finish its upward or return stroke and then move back again until the hammer F strikes the block M when the above operation will be repeated.

In the construction shown in Fig. 2, the piston O, piston cylinder I and air passages and valves are omitted, and the holder P is secured directly to the armature K. With this construction, the resistance to the armature K, by the solenoid H will cause a cushion and spring for receiving the blow of the holder, and returning it to its original position.

In the construction shown in Fig. 3, the solenoid H, armature K and ring L are omitted; the holder P is secured directly to the piston rod N. The hammer R which is secured to the end of the armature E is a permanent magnet, and the inner end S of the piston rod N on which said hammer R is adapted to strike, is also a permanent magnet of opposite polarity to the hammer R.

On the downward or forward movement of the armature E and hammer R the part S of the armature K will be struck by said hammer, and said armature and the holder P will be pushed outward, the pneumatic regulator cushion and spring acting as hereinbefore described. On the return movement of the armature E and hammer R, the part S of the holder P will adhere to the hammer R by magnetic attraction, and said holder and the tool will be thus drawn back.

Two lugs *n n* extend out from the piston O, on opposite sides, and enter longitudinal grooves *o o* in the cylinder I for the purpose of guiding the holder and tool in their longitudinal movements, and limiting the backward stroke of the same, as the lugs *n n* striking against the shoulder formed by the ends of the grooves *o o*, will prevent the piston and rod, holder and tool, from moving any farther in this direction, when the hammer R will be pulled away from the piston rod by the armature E, and will continue to the end of its backward stroke. The above operation will then be repeated.

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

1. In an electro-magnetic machine for reciprocating tools, the combination with two or more magnets or solenoids, a plunger armature adapted to be reciprocated by the same, an independent sliding tool holder adapted to be struck and driven outward by the end of the armature, means for automatically drawing back the tool holder on the return movement of the armature, a piston O secured to the tool holder, the piston cylinder I and a pneumatic regulating cushion or spring for said piston and tool holder, all as and for the purposes set forth.

2. In an electro-magnetic engine for reciprocating tools, the combination with two or more magnets or solenoids a plunger armature adapted to be reciprocated by the same, a magnet or solenoid H situated beyond the other magnets and connected in series with the same so as to be always energized, an armature K, which in its normal position is in the field of force of the magnet H, an inward extension of the armature K adapted to be struck by the end of the plunger armature, and the tool holder adapted to be secured to the outer end of the armature K, all as and for the purposes set forth.

3. In an electro-magnetic engine for reciprocating tools, the combination with two or more magnets or solenoids, a plunger armature adapted to be reciprocated by the same, a magnet or solenoid H situated beyond the other magnets and connected with said magnets in series and so as to be always energized, an armature K, which in its normal

position is in the field of force of the magnet H, an inward extension of the armature K adapted to be struck by the end of the plunger armature, the tool holder adapted to be secured to the outer end of the armature K, a piston secured to said tool holder, the piston cylinder, and a pneumatic cushion or spring for said piston and holder, all as and for the purposes set forth.

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Witnesses:
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PENNINGTON HALSTED.