

(No Model.)

C. J. VAN DEPOELE.  
SYSTEM OF RECIPROCATING ELECTRIC ENGINES.

No. 458,954.

Patented Sept. 1, 1891.

Fig. 1.

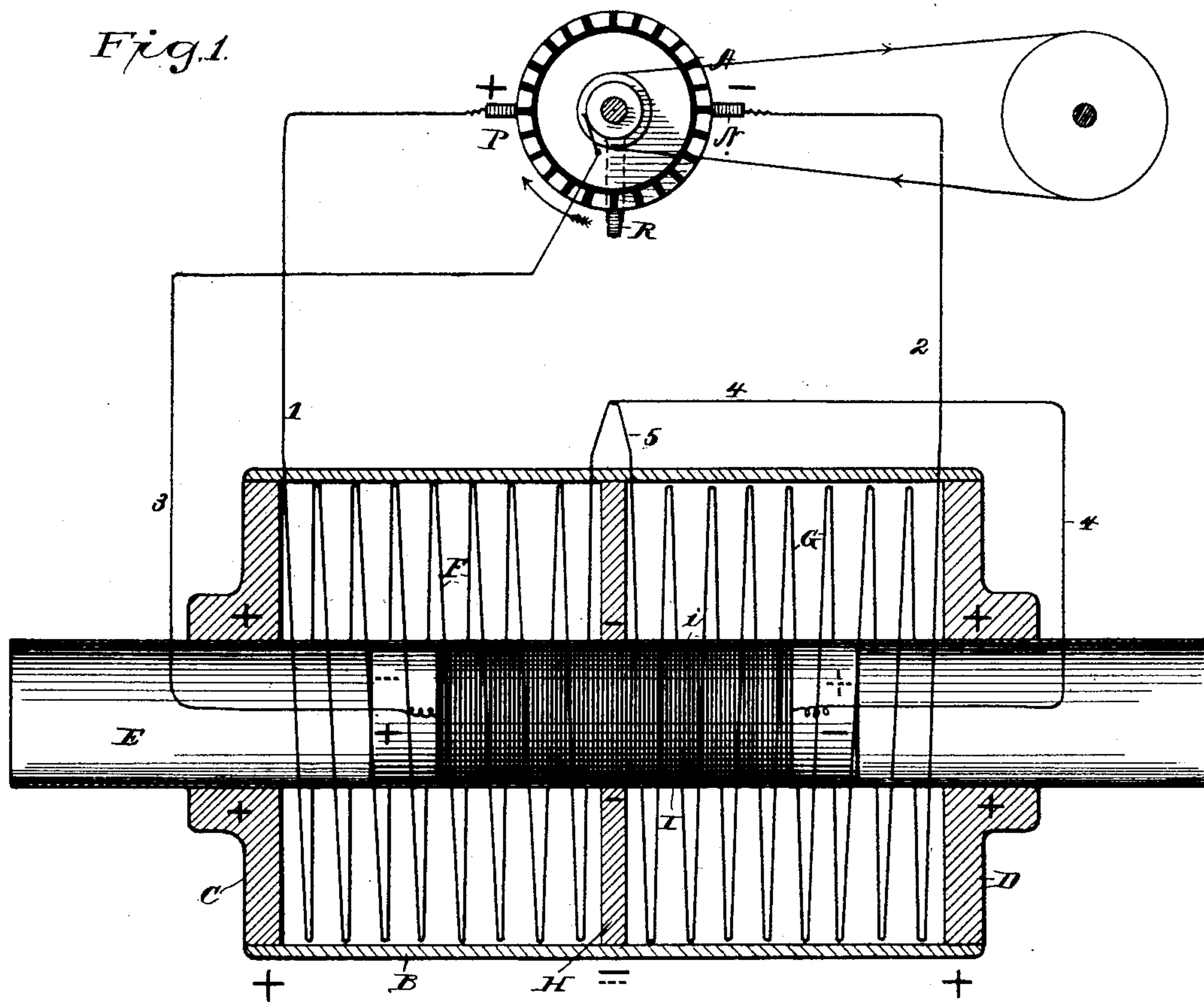
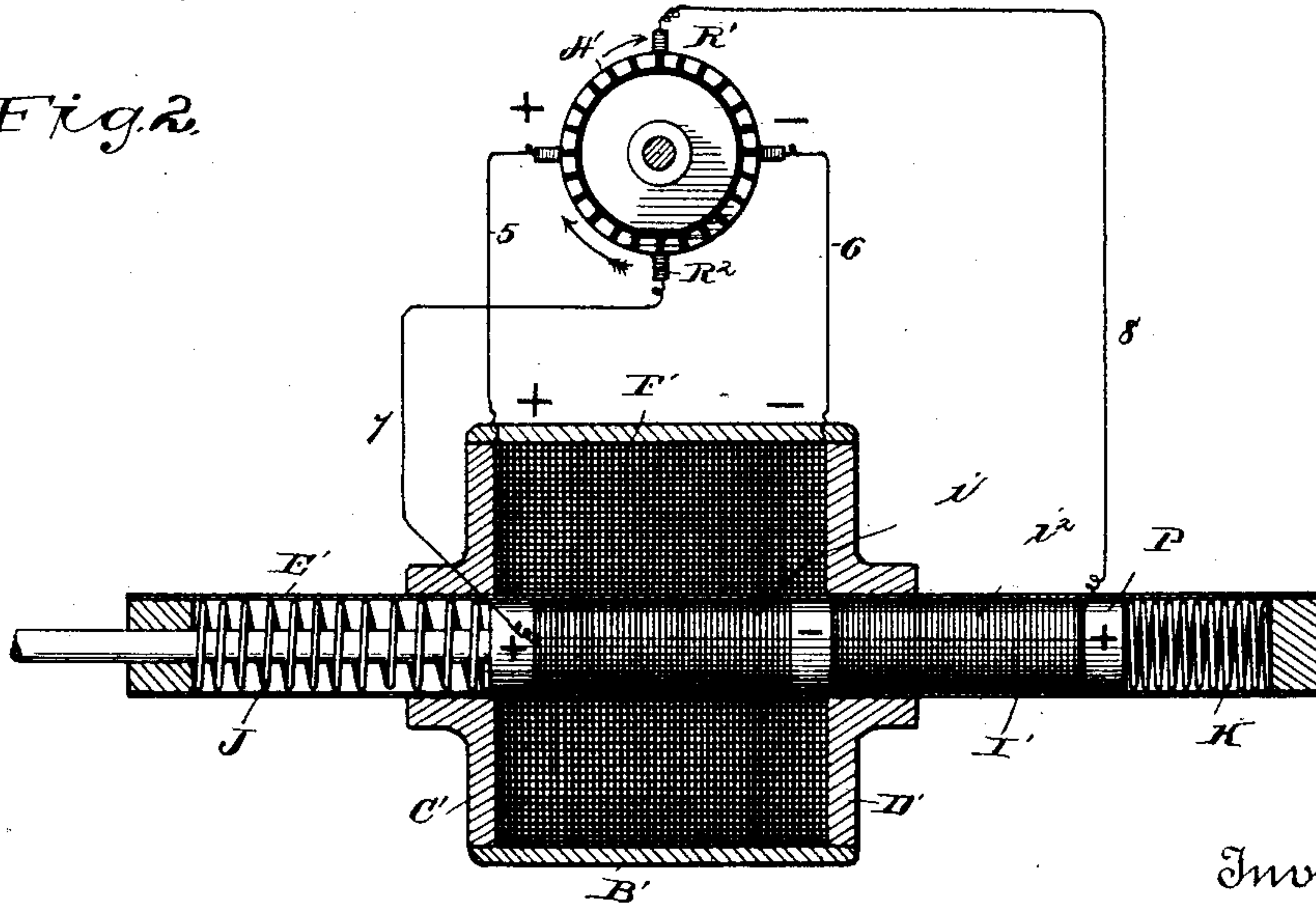


Fig. 2.



Witnesses

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CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

## SYSTEM OF RECIPROCATING ELECTRIC ENGINES.

SPECIFICATION forming part of Letters Patent No. 458,954, dated September 1, 1891.

Application filed September 19, 1890. Serial No. 365,545. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES J. VAN DEPOELE, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Systems of Reciprocating Electric Engines, of which the following is a description, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon.

My invention relates to an improvement in reciprocating electric engines, the same being an improvement upon the engine forming the subject-matter of my prior patent, No. 307,884, dated November 11, 1884.

In the present instance the movable plunger is energized by means of currents having a defined rising and falling quality, substantially as set forth in my patent, No. 422,855, of March 4, 1890, while the exterior iron envelope of the engine is continuously magnetized.

The various details of construction and operation will be hereinafter set forth and described, and referred to in the appended claims.

In the drawings, Figure 1 is a diagrammatic elevation showing a source of current, a reciprocating engine, and the circuits and connections between the same. Fig. 2 is a sectional elevation, partly in diagram and differing from Fig. 1 in showing a single as distinguished from a double engine.

In Fig. 1 of the drawings, A represents the commutator of a continuous-current machine, of which P N are the main stationary positive and negative commutator-brushes. R represents a third brush, also engaging the commutator and adapted to be rotated about the periphery thereof in any desirable manner.

B is an iron cylinder, which forms the outer envelope or shell of the engine. The ends of the shell B are iron heads C D, fitting the shell or cylinder B and centrally apertured to receive a brass or other diamagnetic tube E. Within the space between the tube E and the interior of the cylinder B are placed coils F G, which completely fill the same, but are separated by an iron disk or partition II. The coils F G are connected in series, and the outer terminals of the combined coils are separately connected by conductors 1 and 2

with the positive and negative brushes upon the commutator A. Continuous current flowing through the said coils F G will continuously magnetize the cylinder B and heads C D, as indicated by the signs, which show that both of the heads C D are positive, while the dividing-line II represents the consequent south pole of the magnetic system, the coils F G being of course wound in opposite directions in order to produce this effect.

An iron plunger I is wound with a magnetizing-conductor  $i$  and fitted to be freely movable within the tube E. One terminal of the conductor  $i$  upon the plunger I is connected by conductor 3, brush  $r$ , and arm  $a$  with the moving commutator-brush R, while its other terminal is connected by conductor 4 with a loop 5, by which the coils F G are connected.

The arm  $a$ , which carries the rotating brush R, may be actuated in any desired manner. In the present instance I show a belt for producing the desired rotation. With this arrangement, as the brush R travels around the commutator toward and away from the main commutator-brushes current will flow through the circuit 3 4 and the coils  $i$  on the plunger, first in one direction and then in the other without changing the direction of the flow of current in the large coils F G, the result being that the said plunger will develop north and south poles at its extremities and in alternation, and be attracted and repelled, first to one end and then to the other of the tube E, the attractions and repulsions of the plunger being in accordance with the changes of polarity in its extremities, which changes will occur in synchronism with the movements of the rotating brush.

In Fig. 2 is seen an arrangement in which the parts are reversed—that is to say, a single coil is placed within a shorter cylinder B', while the plunger I' is provided with two wire-wound recesses  $i' i^2$ . A commutator A' is provided with stationary commutator-brushes, which are connected by conductors 5 6 to the terminals of the large coil F', magnetizing the heads C' D' with constant opposite polarity, indicated by the signs. Obviously if a single-coil plunger were used with this construction it would remain stationary within the coil F', but with the double-coil form of plunger shown the poles will be alternately north



and south at both extremities of the core. They will therefore react upon the stationary poles set up in the iron heads by the large coil  $F'$ , and reciprocation of the plunger will  
 5 take place in accordance with the changes of polarity produced therein by the currents supplied. Rising and falling currents of alternating polarity are supplied to the coils  $i'$   
 10  $i''$  of the plunger  $I'$  through conductors 7 8, connected to the extremities of said coils, and receiving current from two diametrically-opposite commutator-brushes  $R' R^2$ , which are  
 15 arranged to engage the surface of the commutator and to be rotated therearound or to be oscillated or rocked toward and away from the stationary commutator-brushes. The plunger  $I'$  is arranged to move freely within a diamagnetic tube  $E'$ , which passes axially through the coils  $F'$ , and, as here shown,  
 20 springs  $J K$  are inserted in said tube at each end of the plunger, in order to centralize said plunger with respect to the coil  $F'$  when not in operation, so that the machine will start whenever the current is turned on. This of  
 25 course is an advantage under some circumstances, although electrically considered the the springs are not necessary to the operation of the device.

The moving commutator-brushes  $R R' R^2$   
 30 may be caused to travel around the commutator, as indicated in dotted lines, or even rocked back and forth thereon in any convenient manner—for instance, as set forth in my patent above referred to.

35 It will be understood, of course, that the reciprocations of the plunger of my improved engine may be applied to the performance of a great variety of work, as, for instance, actuating a rock-drill, a hammer, a multiple re-  
 40 ciprocating engine, and many other useful purposes; and, further, that the connections between the coils upon the plungers and their supply-circuit will be made in any convenient and permanent manner, they being here  
 45 shown in diagram only for clearness of illustration. The iron mass of the plungers may be solid or hollow or laminated, or otherwise ventilated or subdivided, and however the  
 50 recessed to receive their magnetizing-coils. Furthermore, a modification consisting in

placing the iron envelope within instead of outside the main magnetizing-coils would be included in the invention.

Various minor changes and modifications 55 may be made in the hereinbefore-described invention without departing from the spirit or scope thereof.

Having described my invention, what I claim, and desire to secure by Letters Patent, 60 is—

1. In a system of reciprocating electric engines, the combination of a stationary electro-magnetic system in circuit with a source of continuous current, an electro-magnetic 65 plunger adapted to move axially there-through, and a circuit connected with and supplying to the energizing-coils of said plunger currents of alternating direction, having a defined rise and fall. 70

2. In a system of reciprocating electric engines, the combination of a source of continuous current, a magnetizing coil or coils in circuit therewith, a magnetic circuit or circuits energized by the coil or coils, an electro-magnetic plunger adapted to move axially 75 therethrough, and means supplying defined rising and falling currents of alternating direction to the energizing-coils of the plunger for reversing the polarities thereof. 80

3. In a system of reciprocating electric engines, the combination, with the commutator, of a continuous-current machine provided with stationary and moving brushes, an electro-magnetic system in circuit with and continuously energized by current received from the stationary commutator-brushes, an electro-magnetic plunger adapted to move axially 85 through the stationary electro-magnetic system, and connections between the magnetizing-coils of the plunger and the moving commutator-brushes, whereby the polarities of the plunger are continually reversed and the said plunger reciprocated through the stationary constant electro-magnetic system. 90 95

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

CHARLES J. VAN DEPOELE.

Witnesses:

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K. MCKEE.