

(No Model.)

C. J. VAN DEPOELE.

SYSTEM OF RECIPROCATING ELECTRIC ENGINES.

No. 458,954.

Patented Sept. 1, 1891.

Fig. 1.

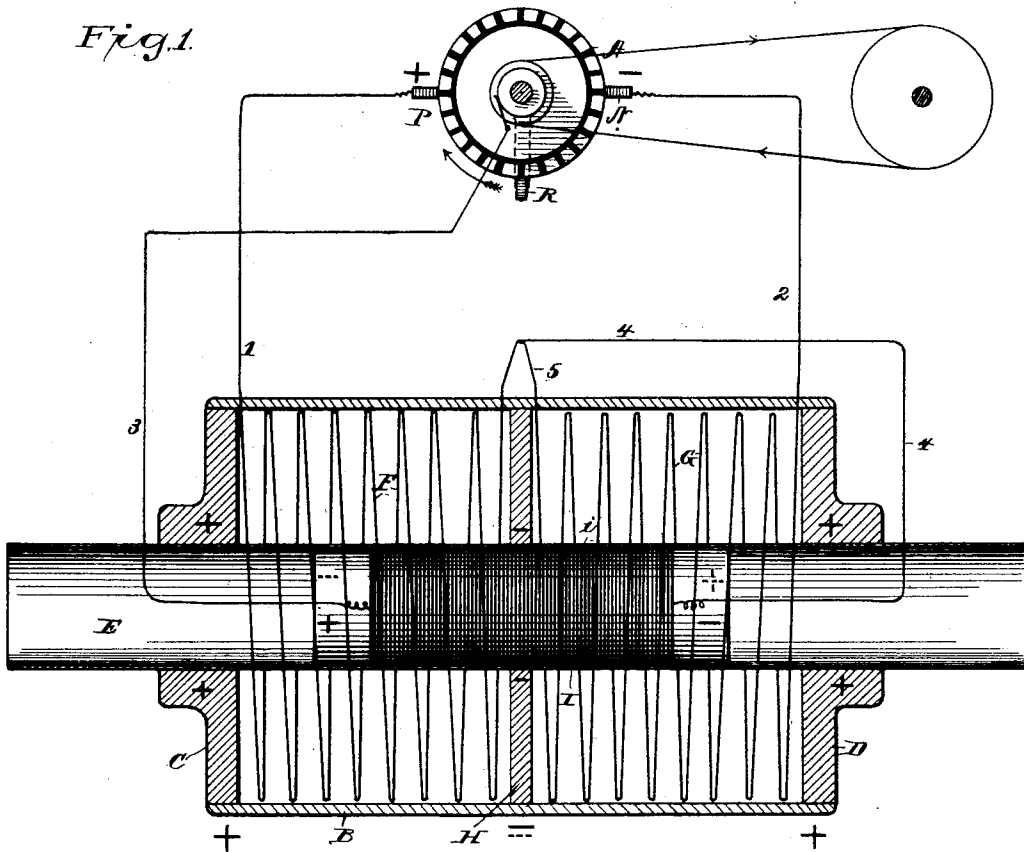
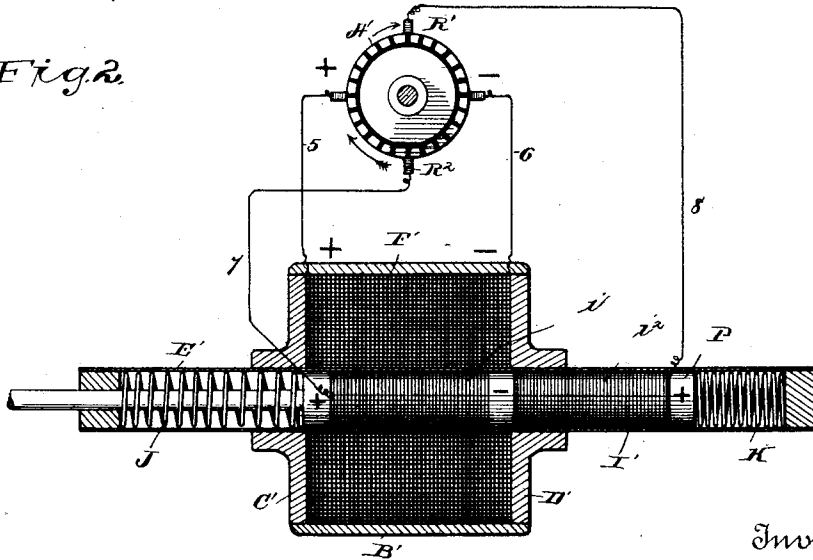


Fig. 2.



Witnesses

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# UNITED STATES PATENT OFFICE.

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## 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 DE-  
POELE, a citizen of the United States, residing  
at Lynn, in the county of Essex and State of  
5 Massachusetts, have invented certain new and  
useful Improvements in Systems of Recipro-  
cating Electric Engines, of which the follow-  
ing is a description, reference being had to  
the accompanying drawings, and to the let-  
10 ters and figures of reference marked thereon.

My invention relates to an improvement in  
reciprocating electric engines, the same be-  
ing an improvement upon the engine forming  
the subject-matter of my prior patent, No.  
15 307,884, dated November 11, 1884.

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

The various details of construction and op-  
eration will be hereinafter set forth and de-  
scribed, and referred to in the appended  
25 claims.

In the drawings, Figure 1 is a diagrammatic  
elevation showing a source of current, a reci-  
procatng engine, and the circuits and con-  
nections between the same. Fig. 2 is a sec-  
30 tional elevation, partly in diagram and dif-  
fering from Fig. 1 in showing a single as dis-  
tinguished from a double engine.

In Fig. 1 of the drawings, A represents the  
commutator of a continuous-current machine,  
35 of which P N are the main stationary posi-  
tive 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 man-  
40 ner.

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  
45 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.  
50 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 flow-  
ing through the said coils F G will contin-  
uously magnetize the cylinder B and heads C  
5 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  
60 F G being of course wound in opposite di-  
rections in order to produce this effect.

An iron plunger I is wound with a magnet-  
izing-conductor *i* and fitted to be freely mov-  
able within the tube E. One terminal of the  
65 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. 70

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 pro-  
ducing the desired rotation. With this ar-  
75 rangement, 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  
80 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 de-  
velop north and south poles at its extremi-  
ties and in alternation, and be attracted and  
85 repelled, first to one end and then to the  
other of the tube E, the attractions and re-  
pulsions of the plunger being in accordance  
with the changes of polarity in its extremi-  
ties, which changes will occur in synchronism  
90 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 sin-  
gle coil is placed within a shorter cylinder B',  
while the plunger I' is provided with two wire-  
95 wound recesses *i' i''*. A commutator A' is pro-  
vided 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,  
100 indicated by the signs. Obviously if a sin-  
gle-coil plunger were used with this construc-  
tion it would remain stationary within the  
coil F', but with the double-coil form of plun-  
ger 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 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<sup>2</sup>, 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  
 20 through the coils F', and, as here shown, 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  
 25 whenever the current is turned on. This of 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<sup>2</sup>  
 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 reciprocating engine, and many other useful  
 40 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 same are constructed they must be suitably  
 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 there-through, 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 85 continuously energized by current received from the stationary commutator-brushes, an electro-magnetic plunger adapted to move axially through the stationary electro-magnetic system, and connections between the magnetiz- 90 ing-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. 95

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

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Witnesses:

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