

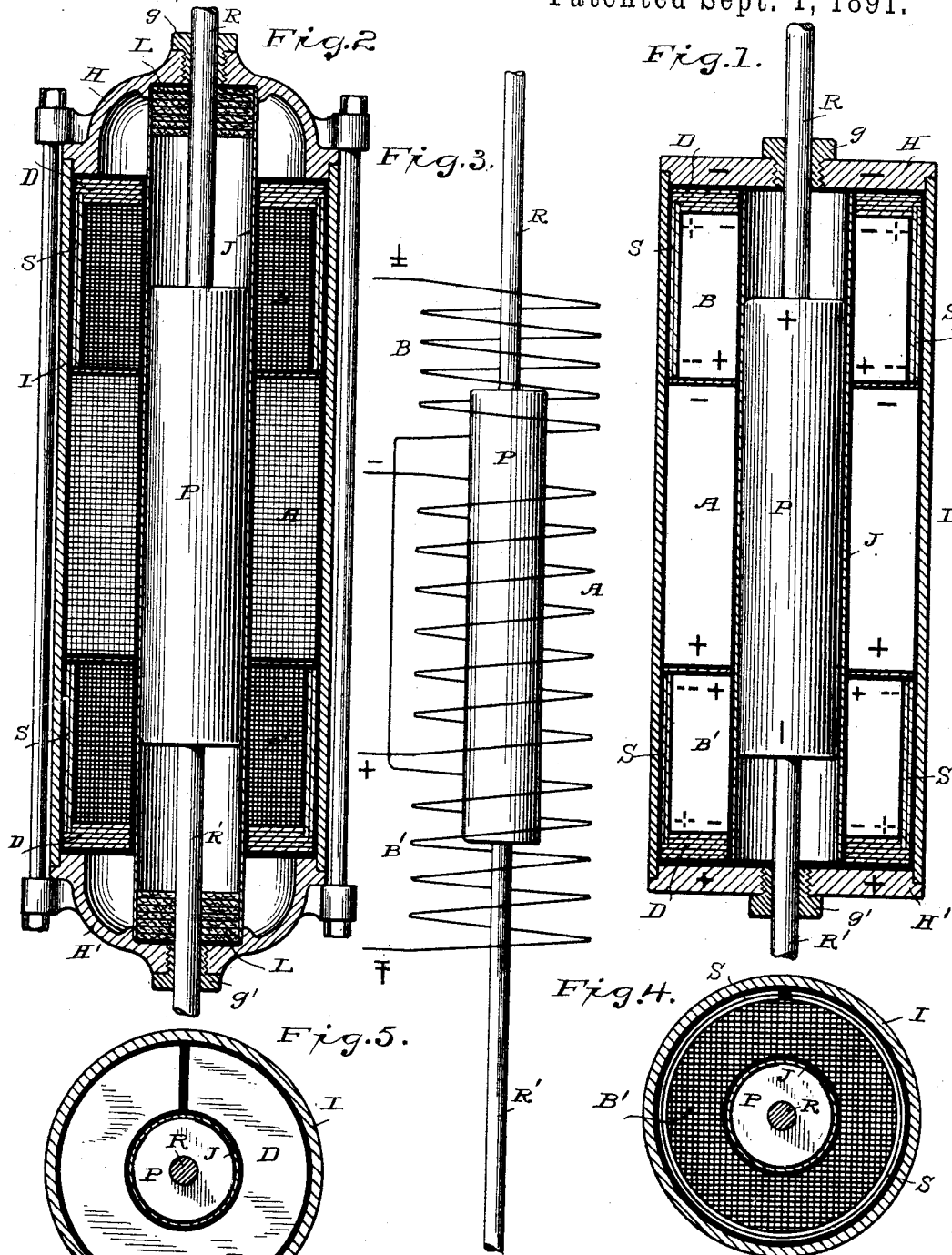
(No Model.)

C. J. VAN DEPOELE.

ELECTRO MAGNETIC RECIPROCATING ENGINE.

No. 458,872.

Patented Sept. 1, 1891.



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CHARLES J. VAN DEPOELE, OF LYNN, MASSACHUSETTS.

ELECTRO-MAGNETIC RECIPROCATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 458,872, dated September 1, 1891.

Application filed March 19, 1891. Serial No. 385,690. (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 Electro-Magnetic Reciprocating Engines, of which the following is a description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention is an improvement in the construction of electro-magnetic reciprocating engines, and refers in the present instance to the construction and disposition of the various parts which determine the position and strength of the magnetic fields of force under the influence of which the moving part or plunger is reciprocated. A general description of this class of machines has been given in numerous prior applications for Letters Patent—for instance, Cases Serial Nos. 376,610 and 382,877.

My improvement is herein shown in connection with a reciprocating engine in which three magnetizing-coils are used, the central coil being under the influence of a pulsating current of constant direction, while the current energizing the end coils is alternating in character. I do not, however, restrict myself to this or any particular construction, as my invention may be applied to reciprocating engines of different forms and having any desirable number of coils.

In the drawings, Figure 1 is a longitudinal elevation, partly in section, showing an engine embodying the invention. Fig. 2 is also a longitudinal sectional elevation showing the disposition of the coils and other parts of a completed machine. Fig. 3 is a diagrammatic view of the circuits employed in the particular engine used in illustrating the present improvement. Figs. 4 and 5 are views in detail showing the magnetic shields.

In Fig. 1, H H' are iron heads, and I the iron shell which joins them together to form the external envelope of the engine, which is at the same time the main magnetic system thereof. A diamagnetic tube J is fixed to the heads H H', and the plunger is free to reciprocate therein. The said plunger has guide-rods R R', which project to the outside of the cylinder through glands g g', prefer-

ably made of diamagnetic material and accurately bored and acting to guide the plunger in fixed relation to the interior protecting-tube J. Between the said tube and the outer shell I are disposed the coils A B B'. These are carefully insulated electrically from the outer envelope I; also from each other and from the magnetic plunger P. The said coil A is placed between the diamagnetic tube J and the shell I, and as it is energized by a current of constant direction its polarity will be constant and it will establish constant poles in the plunger P, heads H H', and shell I, as clearly shown by the + and - signs marked thereon. The coils B B' being traversed by slowly rising and falling currents of alternating polarity will alternately attract and repel the plunger P and impart reciprocating motion thereto. It is essential that these coils B B' be as thoroughly insulated from the magnetic influence of the heads H H' and shell I as possible; otherwise detrimental induced currents would be set up therein and heating and a useless waste of magnetic force result.

Referring again to the drawings, Figs. 1 and 2, it will be seen that I have placed around the coils B B' and between them and the outer iron shell I a number of thin sheets of iron S S S S, preferably tinned and thoroughly insulated from each other by mica, shellacked paper, or any other good non-conducting material. These sheets of metal form magnetic shields, and are rendered discontinuous by slits in their vertical length or through the line of the axis of the machine, in order to prevent the formation of induced currents in them by the change of polarity of coils B B'.

Between the heads H H' and the coils B B', I have placed a number of disks D D D D, of material similar to that of the shields S S S S and insulated from each other. These disks are also slitted to prevent the generation of induced currents by the action of coils B B'.

Fig. 4 shows the position of the shields S relative to the coils and outer shell I, and Fig. 5 the position of the disks D with respect to the same.

In Fig. 2 I have shown a machine completed so far as the construction herein referred to is concerned. It will be noticed

that the heads H H' of this engine are so formed as to leave air-spaces between them and the disks D D D on top of the coils B B'. In practice, this space will be disposed
 5 as found desirable, so that the constantly-magnetized heads H H' may be arranged nearer to or farther from the plunger P, as it is sometimes desirable that the magnetism of the shell I and heads H H' be brought to bear
 10 upon the plunger with more or less effect. The distance between the heads H H' and the coils B B' and the magnetic disks D D D will prevent as far as possible any detrimental effect incident upon the change of po-
 15 larity in the said coils.

With the construction and arrangement here shown, the glands g g' being made of diamagnetic material, the guide-rods R R' might with advantage be made of magnetic
 20 metal, such as steel or iron.

In the extreme ends of the diamagnetic tube J will be seen a series of elastic washers I L, which are so placed to prevent any hard concussion through the falling of the
 25 plunger within said tube should the current be suddenly cut off.

In Fig. 3 I have shown in diagram the coils A B B', and in full lines the plunger P and its guide-rods R R'.

30 The hereinbefore-described invention is capable of various modifications and changes, and many of such would occur to persons skilled in the art, and may be applied in accordance with the principles set forth without departing from the scope or nature of the
 35 invention.

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

40 1. An electro-magnetic reciprocating engine having a plurality of coils, an iron envelope surrounding said coils, and a magnetic shield or shields interposed between a portion of said coils and the surrounding envelope.

45 2. An electro-magnetic reciprocating engine having a plurality of coils, a plunger adapted to be reciprocated centrally through said coils, an iron envelope surrounding the coils and plunger, and magnetic shields inter-
 50 posed between a portion of the said coils and the surrounding envelope, shielding them therefrom, the remainder of said coils magnetizing the envelope and plunger.

55 3. An electro-magnetic reciprocating engine having a plurality of coils energized, respectively, by continuous and alternating currents, an iron envelope surrounding said coils, and magnetic shields interposed between the coils energized by the alternating currents
 60 and the said surrounding envelope.

4. An electro-magnetic reciprocating en-

gine having a plurality of coils energized by pulsating currents of continuous and alternating polarity, a plunger reciprocating there-
 65 through, an iron envelope surrounding said coils and plunger, and magnetic shields interposed between the envelope and the coils energized by the alternating currents, thereby con-
 70 fining the magnetic effect of said coils to the plunger, the continuously-excited coils being disposed so as to continuously magnetize the
 plunger and envelope.

5. An electro-magnetic reciprocating engine having a plurality of coils, an iron envelope surrounding said coils, and magnetic
 75 shields interposed between said envelope and a portion of said coils, the said shields consisting of thin sheets of magnetic metal slit-
 80 ted to prevent the circulation of electric currents therein and insulated from each other.

6. An electro-magnetic reciprocating engine having motor-coils, a continuous iron envelope or casing surrounding said coils, and
 85 heads therefor joined directly to the continuous envelope, but formed to leave spaces at the ends of the said motor-coils.

7. An electro-magnetic reciprocating engine having a plurality of coils, a plunger reciprocating under the magnetic influence of
 90 the coils, an envelope of magnetic material surrounding the coils and plunger, magnetic shields interposed between said envelope and
 95 part of the coils, and magnetic extensions upon the plunger reciprocating therewith and extending through the surrounding envelope.

8. An electro-magnetic reciprocating engine having a plurality of coils energized by
 100 currents of continuous and alternating polarity, a plunger reciprocating therethrough, a magnetic envelope surrounding said coils and plunger, magnetic shields interposed be-
 105 tween the envelope and the coils energized by the alternating currents, and magnetic extensions upon the plunger reciprocating there-
 with and extending through the surrounding envelope.

9. An electro-magnetic reciprocating engine having a plurality of coils, a plunger adapted to be reciprocated centrally through
 110 said coils, an iron envelope surrounding the coils and plunger, and magnetic shields interposed between a portion of the said coils and the surrounding envelope, the remainder of
 115 said coils magnetizing the envelope and plunger in a constant direction.

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

CHARLES J. VAN DEPOELE.

Witnesses:

JOHN W. GIBBONEY,
 CHAS. H. OLIN.