(No Model.)

C. J. VAN DEPOELE.

AUTOMATIC ELECTRIC PUMP.

No. 461,294. Patented Oct. 13, 1891.

Fig. 1.

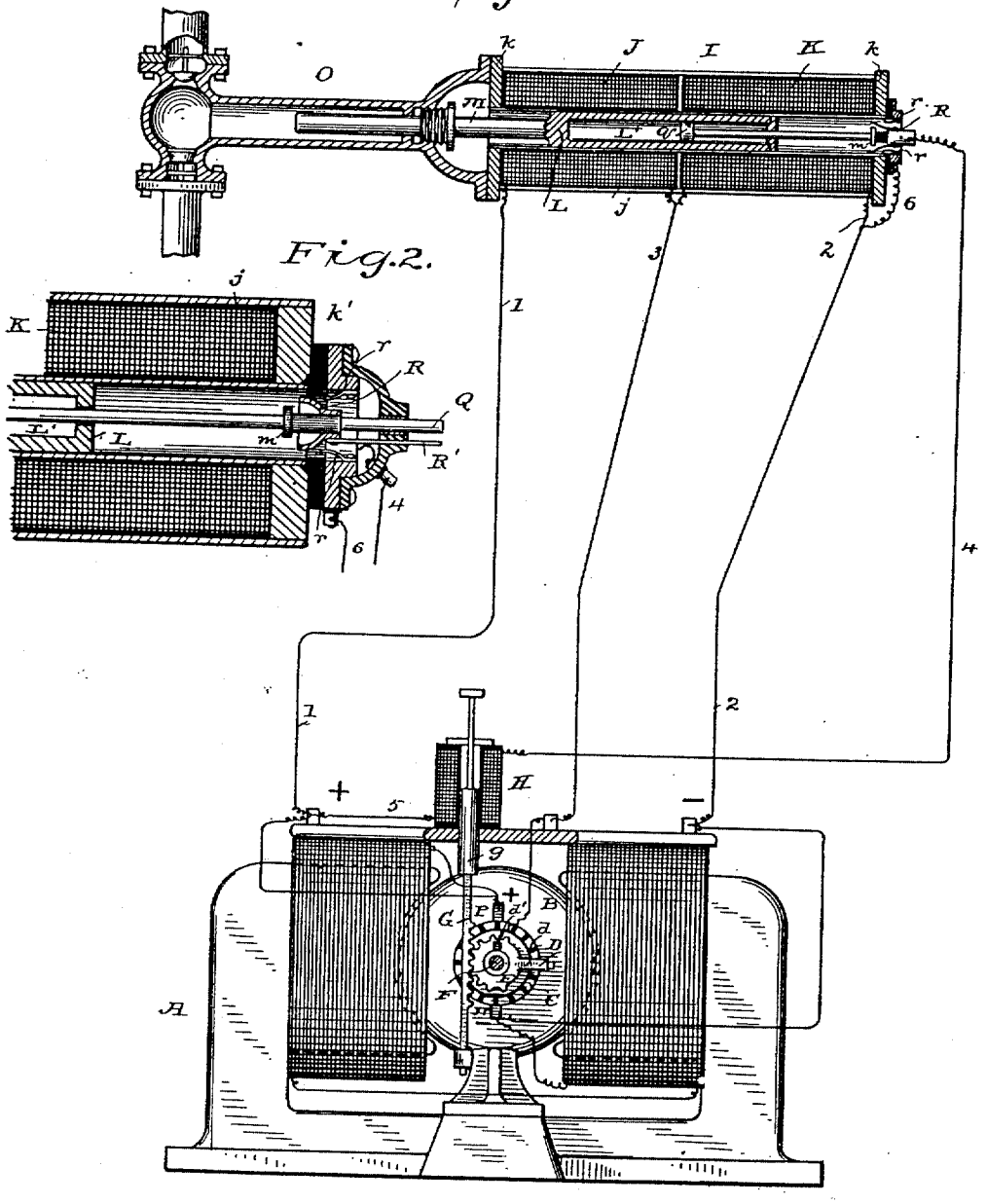


Fig. 2.

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AUTOMATIC ELECTRIC PUMP.

SPECIFICATION forming part of Letters Patent No. 461,294, dated October 13, 1891.

Application filed February 26, 1891. Serial No. 382,876. (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 Automatic Electric Pumps, 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 improvements in reciprocating electric engines; and while the hereinafter described improvements may be applied to many and various purposes the invention is particularly adapted for use in connection with a reciprocating pump, such a combination being therefore illustrated and explained.

The particular feature of the present application comprises an electric pump, which I have termed "automatic," since the piston thereof will receive power from the engine continuously until its stroke is completed in either direction, and whether the speed be fast or slow. The supply of current to the motor-coils of the engine depending entirely upon the movement of the piston thereof, with a constant supply of current the speed of the pumping apparatus would be determined by the height to which the water was to be raised. Obviously the supply of current can be adjusted as desired; but the main feature of the invention is found in the automatic action, which enables the pump to operate under varying conditions of load, its movements being slow, but continuous, with a heavy lift, and proportionately more rapid with less work.

In the accompanying drawings, Figure 1 is a diagrammatic view, partly in section, showing a dynamo-electric generator, a reciprocating electric engine with pump attached, and circuits and circuit-controlling apparatus between the reciprocating engine and the generator. Fig. 2 is an enlarged detail of one end of the reciprocating engine.

A is an electric generator of the continuous-current type, and as here shown, the field-magnets of said generator are connected in shunt relation with the main positive and negative commutator-brushes P N. B is the armature, and C the sectional commutator thereof. D is a third commutator-brush, so disposed as to be capable of being moved around upon the commutator-cylinder C, and said third brush D is carried by an arm *d*, which is connected with a sleeve E, rotatably mounted upon the armature-shaft F. The sleeve E is of course insulated from the commutator and its support and is provided with gear-teeth, which are in mesh with a vertically-moving rack-bar G, which, as shown, is secured to an iron plunger *g*, adapted to be moved up and down within and by a solenoid H, which, for convenience, is shown as placed upon the top of the frame of the generator A. The form of brush-actuating mechanism is not material, neither is its location, it being only essential that the hereinafter-described movements be imparted to the third brush D at the proper times.

I represents a reciprocating electric engine which is provided with any desired number of motor-coils arranged in any desired relation to each other to form two sets, one driving the plunger in one direction, the other set in the other, various different methods of construction and arrangement being set forth in prior applications for Letters Patent filed by me. It will be understood that any combination of coils or winding through which the plunger can be reciprocated, and which can be connected to operate in alternation by shifting the current from one set to the other, will be covered by the expression "two sets of motor-coils." In the present instance I have, however, shown only two motor-coils J K. The coils are inclosed within a suitable magnetic shell J, having iron heads *k k'*. A magnetic piston L is arranged to be reciprocated within the said motor-coils, and is provided at one end with an extension or piston-rod M, which may, as here shown, form the piston of a pump O, which is arranged and constructed to be attached to or operated in connection with the reciprocating engine I.

The positive and negative binding-posts of the generator are connected with the outer terminals of the motor-coils J K by conductors 1 2, and the third brush D is connected by conductor 3 with the inner terminals of the said motor-coils. The extremity of conductor 3 is connected with suitable binding-

post and thence by a wire to a stationary brush d', engaging a moving metallic portion of the support of the third brush D.

When no current is flowing in the solenoid H, the weight of the plunger g and connected parts will cause their descent and the consequent movement of the third brush into juxtaposition to the main positive commutator-brush. With the parts in this position the circuit of the coil K will be closed and current will flow therethrough and the plunger L be continually attracted and drawn into said coil until the conditions be changed. At the moment that the plunger L completes its movement into the coil K it, by so doing, closes the energizing-circuit of the solenoid H, which then lifts the plunger g and the rack-bar G, causing it to move the brush D half-way round the commutator—that is, from the positive brush to the negative brush. This changes conductor 3 from a positive to a negative wire and permits the current to flow therethrough to the coil J by conductors 1 and 3, when the said coil J will be energized and act upon the plunger L. It will therefore be understood that the solenoid H is to be actuated automatically from the reciprocating engine and in accordance with the movement of the reciprocating parts thereof.

The solenoid H forms a very simple and efficient means of shifting the brush D from its highest to its lowest position, more especially so since a rapid or spasmodic change of current from one set of motor-coils to the other is particularly desired in the present instance, to insure which the weight of the rack-bar G and plunger g may be supplemented by a spring to assist the descent of each part, if desired. In case it were preferred to arrange the brush-moving mechanism in a position other than vertical the action of the spring would obviously be substituted for that of gravity.

A double-acting solenoid might of course be substituted for what is here shown; but it would require an additional circuit-wire and set of circuit-closing apparatus, which may be dispensed with by the arrangement I have disclosed.

Many different forms of contact device to be operated by the plunger may be employed for this purpose; but they would necessarily all depend upon the movement of the plunger or other moving part of the engine, no matter what their disposition, and would therefore be the equivalent of the construction herein shown and described by way of illustration.

A convenient form of circuit-closer comprises a rod Q, passing through the head k' of the engine-casing. The inner extremity of the rod Q has a head or tappet q, which, as shown, is contained within a chamber L', formed within the plunger L. The rod Q is also provided with a tappet m near its outer extremity. The chamber in the piston L is of such size and length that the piston, when about to reach the forward end of its stroke, will engage the tappet q and pull upon the rod Q and connected parts, moving them a short distance and leaving them stationary. When said plunger is near the end of the return stroke, it will come against the said tappet q or the other tappet m and push the said rod Q back again into first position.

One terminal of the solenoid H is connected to the positive binding-post by conductor 5, its other terminal being connected by conductor 4 with a circuit-closer R, connected with the rod Q. Spring-contacts r, connected by conductor 6 with the main negative conductor 2 and well insulated from the circuit-closer R, are provided in position to be engaged by said circuit-closer, and when engaged thereby the circuit of the solenoid H is closed across the main terminals of the machine—that is, by conductors 5 and 4, circuit-closer R, contacts r, conductor 6, and back by conductor 2 to the negative binding-post.

By substituting a longer or shorter rod Q, or by placing the head q and the tappet m nearer together, the circuit-closer will be operated at less than full-stroke, thus affording a convenient means of varying the motion of the engine.

In Fig. 2 a sliding contact R' is shown for completing the circuit between conductor 4 and the circuit-closer R.

As pointed out in my patent, No. 422,858, March 4, 1890, a counter-electro-motive force device or distributer can be employed instead of a generator.

With this construction or its equivalent the action of the apparatus will be continuous and automatic, and the current will be switched from one motor-coil to the other at the moment that the plunger shall have completed its stroke. The mechanical details may of course be varied in many particulars; but any arrangement constructed and operating according to the principles herein set forth I shall consider within the scope of my invention.

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

1. An automatic electric reciprocating engine system comprising motor-coils, a magnetic piston to be reciprocated therethrough, a source of continuous current connected with the motor-coils, and means at the source controlled by the movements of the plunger for diverting the current at its source from one set of motor-coils to the other.

2. An automatic electric reciprocating engine system comprising motor-coils, a magnetic piston adapted to be reciprocated therethrough, a distant source of current connected with the motor-coils, and means located at the source and controlled by the movements of the piston thereof for shifting the current at the source from one set of motor-coils to the other.

3. An automatic electric reciprocating en-

gine system comprising motor-coils, a distant source of continuous current, separate connections between the source and the sets of coils, a magnetic piston adapted to be reciprocated through the coils under their alternate action, and means located at the source and controlled at the engine for automatically shifting the current at the source from one set of motor-coils to the other on the completion of any desired part of the movement of said plunger in either direction.

4. An automatic electric reciprocating engine system comprising two sets of motor-coils, a source of continuous current, separate connections between the source of current and the sets of coils, a magnetic piston adapted to be reciprocated through the sets of coils under their alternate action, and means at the source controlled by the movement of the plunger for automatically shifting the current at its source from one set of motor-coils to the other on the completion of its movement in either direction.

5. An automatic electric reciprocating engine system comprising two sets of motor-coils, a source of continuous current, separate connections between the source of current and the sets of coils, a magnetic piston adapted to be reciprocated through the sets of coils under their alternate action, a circuit-closer at the engine, an electro-magnetic circuit-changer at the source of supply, and means actuated by the movements of the plunger for closing the circuit of the circuit-closer on the completion of its desired movement in one direction, thereby shifting the current with the opposite set of motor-coils, and vice versa.

6. An automatic electric reciprocating engine system comprising motor-coils, a magnetic piston to be reciprocated therethrough, a source of current or generator of the continuous-current type, connections between the opposite terminal of the generator and the outer terminals of the motor-coil, an auxiliary commutator-brush adapted to be moved into juxtaposition to either of the main commutator-brushes, and connections from said movable brush to the inner terminals of the two sets of motor-coils to direct the supply-current through said coils in alternation, means, as a weight or spring, for moving the third brush in one direction, and means, as a solenoid, in derivation between the main terminals of the generator, for moving the said brush in the opposite direction, and a circuit-closer at the engine adapted to be actuated on the completion of either stroke of the plunger thereof for closing and opening the circuit of the solenoid.

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

CHARLES J. VAN DEPOELE.

Witnesses:
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