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ELECTRIC GENERATOR

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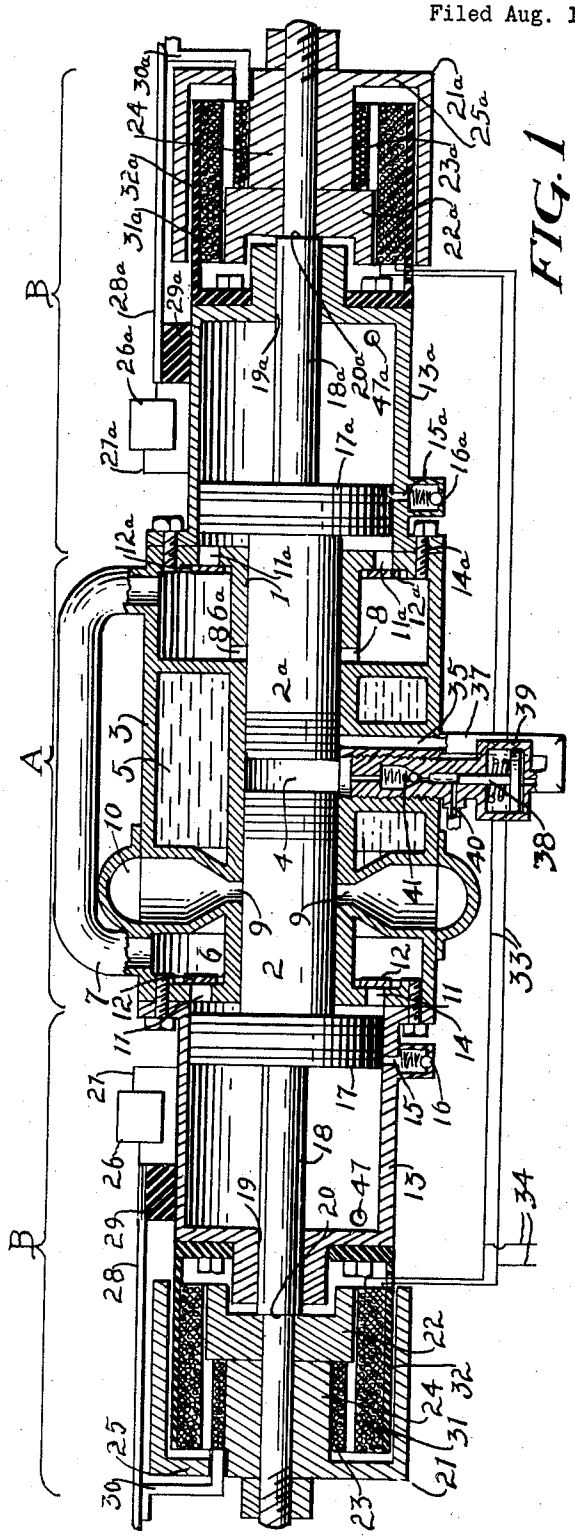

FIG. 1

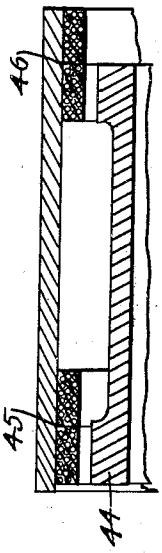

FIG. 3

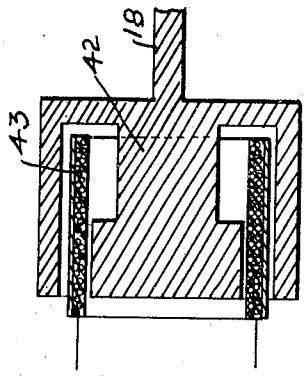

FIG. 2

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ELECTRIC GENERATOR

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3 Claims. (Cl. 290—1)

The present invention relates to a method and means for generating electricity, but differs from most said devices in that a reciprocating magnetic field is used instead of a rotating magnetic field.

It is one object of the present invention to utilize the direct thrust from an elastic cushion to energize a coil of wire by reciprocating a magnet therein.

It is another object to provide a method and means for generating electricity whereby all rotary bearings and connecting rods are eliminated, and whereby either single or polyphase currents may be produced.

It is also an object of the invention to provide a means of the character indicated that will be simple in form and construction, economical to manufacture, one wherein the elastic cushions formed in a free piston engine are utilized to reciprocate a magnet in a coil of wire to energize the same, and one that will be highly efficient in its practical application.

Other objects and advantages will appear in the following description, in which—

Figure 1 is a longitudnal sectional view through a device embodying my invention, partly in elevation and parts being broken away.

Figure 2 is a detail illustration showing a modification of the invention, with parts broken away.

Figure 3 is a detail illustration showing the invention as modified for producing polyphase currents.

In the particular embodiment of the invention herein disclosed I show at A a free piston engine and at B—B two single phase generators operated thereby.

The engine "A" comprises a cylinder 1 in which the pistons 2—2*a* reciprocate and which is surrounded by a second cylinder 3 having the annular water chamber 5 therein encompassing the explosion chamber 4 of the engine. Annular air chambers 6 are formed in the end portions of cylinder 3 as shown and are connected by a passage 7 whereby the air pressure in the two chambers is equalized. Intake passages as 8 lead from chamber 6*a* to the interior of cylinder 1, and discharge passages 9 lead from the opposite end portion of the cylinder 1 to discharge into manifold 10.

Inasmuch as the two ends of the device are duplicates one end only will be described in detail and similar parts on the other end will be indicated by similar characters followed by the character *a*.

Through the outer end of chamber 6 are formed passages as 11 fitted with inwardly opening check valves 12, the said passages leading to an annular cylinder 13 axially disposed relative to cylinder 1 and somewhat larger in diameter than said cylinder and mounted endwise thereon as at 14. This cylinder 13 is provided with an air intake passage at 15 fitted with an inwardly operating check valve as at 16 and disposed adjacent the inner end of said cylinder.

The piston 2 has an enlarged head 17 thereon to reciprocate in chamber 13, and a stem 18 projects axially outwardly from said head and through the bearing 19 in the outer end of the chamber 13 and has a shoulder 20 formed therein as shown, exteriorly of chamber 13 to form a seat for the magnet 21.

The magnet 21 is a field magnet, and in the present instance comprises a part 22, circular in form, seated on the shoulder 20, a second member 24 of smaller diameter seated on the member 22, and a winding of wire on the second member as indicated at 23 and grounded to said second part. This second member 24 is also provided with a flange 25 extending outwardly from its outer end at right angles to its axis, and then turned backwardly in parallel relation with the axis and with a diameter slightly greater than the chamber 13 to encompass the magnet parts 22 and 24 as shown. The winding 23 is energized by means of a battery at 26 grounded to the engine at 27 and connected to a bar 28 mounted upon the engine at 29 and extending forwardly thereof as indicated, in parallel relation with its axis. A shoe 30 slidably engages the bar 28 and is in fixed contact with the coil 23 so that the magnet is energized at all times regardless of its position with relation to the fixed end of the device.

The armature comprises a coil of wire as 31 within a supporting cylinder 32 mounted upon the outer end of chamber 13 to encompass the magnet parts 22 and 24. Wires as 33 connect the armatures 31 and 31*a*, and electricity is taken off of these wires as at 34.

When the device is in operation the outward movement of the piston heads 17—17*a* draw air into the chambers 13—13*a* through valves 16—16*a*, and on their inward movement push the air through valves 12 into chambers 6—6*a*. The air in chamber 6*a* is sufficiently compressed to flow forcibly into the cylinder 1 when the piston 2*a* uncovers the passages 8. The exhaust passages 9 are uncovered at substantially the same time as the passages 8 so that the air entering the cylinder 1 at 8 will scavenge the same

and carry out all of the burnt gases at 9 leaving the cylinder filled with fresh air.

But in the movement of pistons 2—2a just described the piston heads 17—17a compress the air entrapped in the chambers 13—13a, which form cushions which forcibly drive the said pistons back in cylinder 1 compressing the air therein. As the pistons approach each other the compressed air trapped between them, or at least a small portion thereof, is discharged through passage 35 and pipe 37 to actuate a plunger 38 in injector 39 in which the fuel oil is admitted at 40 and discharged through valve 41 into the combustion chamber 4. These parts are proportioned and arranged to form a combustible mixture at the moment when the pistons 2—2a approach each other most closely, the resulting explosion driving the pistons outwardly again to repeat the cycle. The valves at 47—47a are inserted in chambers 13—13a to permit the drawing of air into said chambers to compensate for such air as may leak out of the same past the heads 17—17a, or past bearings 19—19a.

In an engine of this kind the pistons 2—2a are reciprocated at high speed, upwards of some ten thousand times a minute, and the magnets 21—21a are, of course, reciprocated at the same high speed. In this manner the mechanical energy of the engine is converted into electrical energy, since the rapid reciprocation of the magnetic fields about the magnets 21—21a through the induction coils 31—31a will rapidly alter the number of lines of force passing through the coils.

In the form of the invention shown in Figure 2 the stem 18 terminates in a permanent magnet 42 which is axially reciprocated relative to the coils 43 to induce an electrical current therein, and in Figure 3 the permanent magnet 44 is reciprocated in the coils 45—46 to show that a polyphase generator may be constructed in substantially the same manner.

Since the rapidity of reciprocation of the two pistons 2—2a may be readily controlled the voltage delivered to wires 34 may be anywhere within the capacity of the engine, the wires connecting the two armatures 31—31a always maintaining the output of the two armatures in perfect balance.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with an engine including a pair of freely reciprocable pistons actuated by expanding gaseous charges both between and behind them: of a magnet reciprocated by each piston, and an induction coil operatively disposed relative to each magnet.

2. The combination with an engine including a pair of freely reciprocable pistons actuated by expanding gaseous charges both between and behind them; of a magnet reciprocated by each piston, an induction coil operatively disposed relative to each magnet, and electricity conducting means connecting the two induction coils.

3. The combination with an engine including a pair of freely reciprocable pistons actuated by expanding gaseous charges both between and behind them: of a magnet reciprocated by each piston, and an armature operatively disposed relative to each magnet.

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