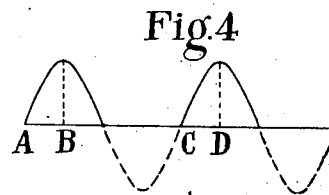
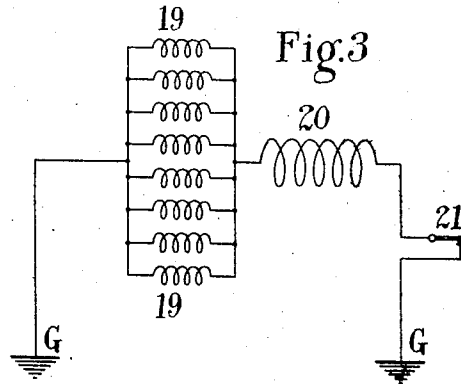
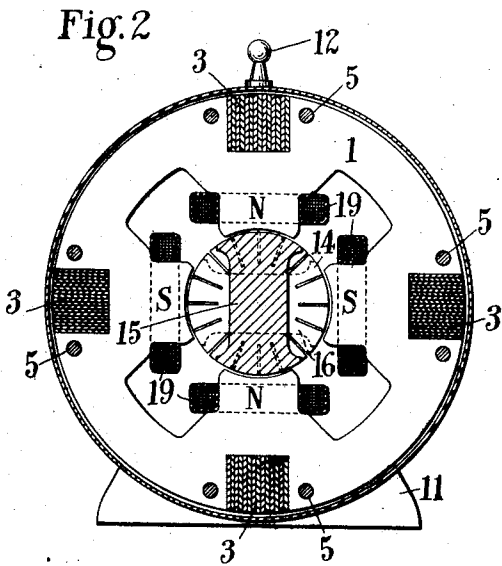
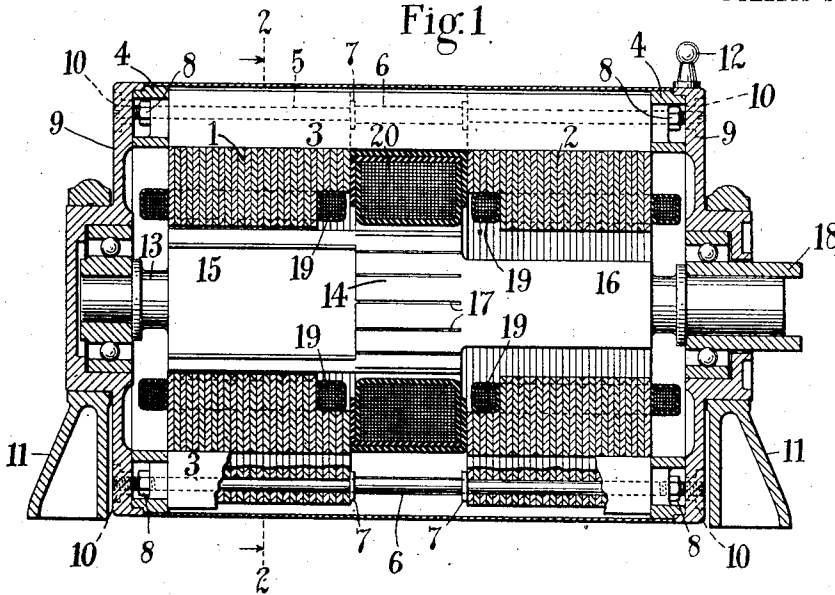


L. J. LE PONTOIS.
INDUCTION ALTERNATOR.
APPLICATION FILED JAN. 13, 1909.

1,058,244.

Patented Apr. 8, 1913.

2 SHEETS—SHEET 1.



Witnesses:
Edmund O. Dubocq.

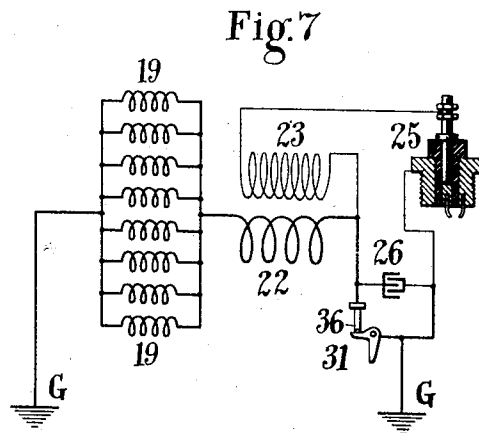
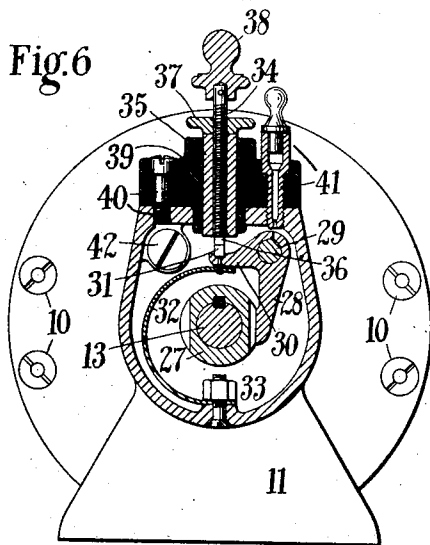
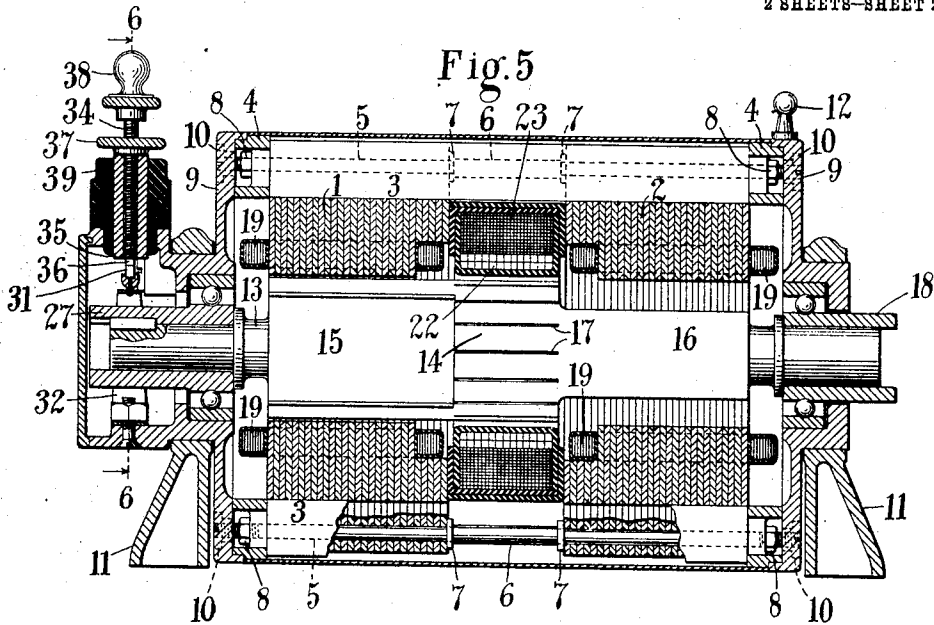
Leon J. Le Pontois Inventor
By *his Attorneys*
Edwards, Sager & Worcester

L. J. LE PONTOIS.
INDUCTION ALTERNATOR.
APPLICATION FILED JAN. 13, 1909.

1,058,244.

Patented Apr. 8, 1913.

2 SHEETS—SHEET 2.



Witnesses:
Wm. H. Kerr
Edmund O. Dubocq

Leon J. Le Pontois Inventor
By *his Attorneys*
Edwards, Sager & Woodruff

UNITED STATES PATENT OFFICE.

LEON J. LE PONTOIS, OF NEW ROCHELLE, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO H. W. JOHNS.

INDUCTION-ALTERNATOR.

1,058,244.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed January 13, 1909. Serial No. 471,997.

To all whom it may concern:

Be it known that I, LEON J. LE PONTOIS, a citizen of the Republic of France, residing at New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Induction-Alternators, of which the following is a full, clear, and exact specification.

My invention relates to induction alternators, and although capable of use for various purposes, is particularly well adapted for the production of an ignition spark for gas engines.

Among the objects of my invention may be mentioned the production of a generator which will be of high efficiency for the purposes desired, of small size, comparatively well protected from possibility of injury, durable and requiring little or no care or attention.

A further object of my invention is the simplification of the necessary controlling means usually required in ignition apparatus, particularly the elimination of auxiliary induction coils, my improved generator embodying means for the production of high tension energy for spark ignition in spark plugs of ordinary type in a simpler and more substantial manner than heretofore. I prefer to utilize generators of the magneto type, and in order to secure small size of the field magnets and permanency of magnetization, I provide exciting coils which serve to maintain the magnetization of the field and also serve as generating coils and cooperate with the main generating coil or coils in the production of energy.

These and other objects of my invention will be understood by those skilled in the art from the following description and accompanying drawings.

Figure 1 is a longitudinal sectional view of one form of machine embodying my invention; Fig. 2 is a sectional view on the line 2-2 of Fig. 1; Fig. 3 is a diagram of one form of connections; Fig. 4 is a wave diagram; Fig. 5 is a longitudinal sectional view of a modified form of generator embodying my invention; Fig. 6 is a sectional view on the line 6-6 of Fig. 5; and Fig. 7 is a diagram of one form of connections.

Referring to Figs. 1 and 2, the machine is shown as having a field frame made up of two sets of laminæ 1, 2, each set comprising a plurality of stampings having four poles

N, S, N, S. The stamping comprising the four polar projections and connecting yokes is preferably made integral, and each stamping is preferably hardened and permanently magnetized separately excepting the polar projections, which remain soft and of high magnetic permeability. I prefer to magnetize and harden the stampings as described in my Patent No. 902,499, granted October 27, 1908. Between the two sets of assembled laminæ 1, 2, extend four connecting portions 3, each made up of laminæ of soft iron which are closely fitted in recesses opposite polar projections of the two sets of laminæ. At the outer ends of the field frame are rings 4 which, together with tie rods 5, serve to clamp the laminæ of the two sets firmly together. The tie rods are each provided with an enlarged central portion 6 which, with washers 7, serve to space the two sets of laminæ at a fixed distance from each other, and the nuts 8 on the tie rods serve to clamp the laminæ and end rings 4 firmly together. The field frame is provided with end supports or brackets 9, which are shown held in place by nuts 10 on the tie rods 5, and the end supports are in turn supported by pedestals 11, 11, being journaled therein in order to permit angular adjustment of the field frame with reference to the rotor for the purpose of varying or controlling the time of generation of maximum electromotive force or the time of spark ignition. For the purpose of obtaining this angular adjustment of the field conveniently, one of the end supports 9 is provided with a projection 12 to which may be connected a lever or other means of control.

Within the end supports is journaled by means of roller bearings the shaft 13 of the rotating element. The latter comprises three portions, a central portion 14 cylindrical in form and of such diameter as will permit endwise withdrawal of the rotor through the field frame, an end portion 15 of the form shown in full lines in Fig. 2 and adapted to vary the paths of the magnetic flux through the pole pieces, and an opposite end portion 16 of the same form as the part 15, but angularly displaced so as to be at right angles to the portion 15, as shown by dotted lines in Fig. 2. The central portion 14 of the rotor is shown as having radial saw-cuts 17 extending inwardly from the cylindrical surface for the purpose

of reducing eddy currents therein. The rotor shaft is shown as having a jaw clutch 18 at one end for the purpose of coupling to the shaft of the gas engine or other driving device.

Each of the polar projections of the field frame is provided with a coil 19 and in the space between the two sets of laminae and encircling the portion 14 of the rotor is a main generating coil 20. The coil 20 is connected in series with the eight coils 19, and which, in Fig. 3, are shown connected in parallel with each other, although other connections of the coils may sometimes be desirable. Fig. 3 shows the circuit of the windings as being closed through ground connections G and through a make-and-break spark device 21. This arrangement of connections is adapted for an ignition system of the make-and-break type, the means for operating the breaker 21 of the engine cylinder and the distributing circuits not being indicated, as the latter form no part of my invention and any suitable means known in the art might be utilized.

With the portions 15, 16 of the rotor arranged at right angles to each other, the two groups of laminae 1, 2, are so placed that the upper and lower poles in each group are of north polarity and the intervening ones of south polarity. With this arrangement, it will be seen that in the position shown in Figs. 1 and 2, the magnetic flux will have a complete circuit from the two north poles of the left hand portion of the field frame, through the portions 15, 14 and 16 of the rotor to the two south poles of the right hand portion of the field frame, and thence by the connecting parts 3 and yoke portions of the field frame back to the north poles of the left hand portion. The magnetic flux thus passes through the generating coil 20 from left to right. The movement of the rotor will cause the magnetic flux to decrease, and when the rotor has turned 90 degrees, or 180 degrees, electrically, the flux will pass through the generating coil 20 in the opposite direction, the path being from the north poles of the right hand portion of the field frame to the portion 16 of the rotor, thence through the portions 14 and 15 to the south poles of the left hand portion of the field frame, and thence through the connecting parts 3 and yoke portions of the field frame back to the north poles at the right. Continued movement of the rotor will cause this change of flux to be repeated, and it will therefore be understood that in one revolution of the rotor, two complete waves of electromotive force will be generated in the winding 20. Fig. 4 illustrates two complete sine waves, and although of course the waves generated will not be of exactly this form, yet they may serve for the purpose of explanation. The

breaker will preferably be arranged so that the circuit will be closed at the time the electromotive force generated in one direction begins to increase, as at A of Fig. 4, and will remain closed until approximately the maximum electromotive force is generated, as at B, when the circuit will be opened at the breaker and cause the production of the spark for ignition purposes. The breaker will therefore remain open throughout the period of generation of electromotive force in the opposite direction and closed again at C, approximately, when the maximum electromotive force in the same direction as first considered begins to increase, and then open again at D when the maximum electromotive force, approximately, is generated, and remains open thereafter throughout the remainder of the cycle considered. It will thus be seen that two sparks per revolution of the gas engine and generator are produced, assuming a one-to-one ratio of driving connection. It will be seen that the coils 19 which inclose the field poles will also serve as generating windings due to the change of magnetic flux passing through them, and they will be connected in such relation to each other and to the main generating winding 20 that the electromotive forces generated in each winding will be in the same direction in the circuit, the electromotive force generated in the coils 19 substantially corresponding in phase with each other and with that generated in the main winding 20. Of course the flow of current in one direction through the windings 19 will be such as to tend to strengthen the magnetization of the field, whereas the passage of the current in the opposite direction will tend to de-magnetize the field. I therefore arrange the breaker in such relation to the angular position of the rotor, or vice versa, that the breaker will be open during the generation of electromotive force in such direction as would tend to de-magnetize the field frame if the circuit were closed. By referring to Fig. 4, it will be seen that the circuit is closed during periods of generation of electromotive forces in one direction only, and open during generation of electromotive forces in the opposite direction, and, as above stated, I relate the parts or connections in such manner that the flow of current during the closure of the circuit will cause the strengthening of the field. Also, by the connection of the main generating winding in series with the windings 19, the latter will be subjected to the current of the main circuit and thereby very appreciably increase the field strength and generation of energy in the circuit during the utilization thereof by the spark discharge. I thus produce a highly efficient magneto generator for the purpose described which is very compact, well protected and

5 durable, and in which all of the windings and circuit connections are stationary.

10 In Figs. 5, 6 and 7 I have illustrated a modified form of the generator particularly adapted for high tension ignition. The parts similarly numbered correspond to the parts already described and this description need not be repeated. In place of the main generating winding 20 I arrange two windings of similar form, the inner winding 22 being composed of a comparatively few turns of coarse wire and the outer winding 23 comprising a large number of turns of fine wire. The windings 19 with this form of construction are preferably of comparatively few turns and of low resistance, being indicated as formed of a ribbon conductor. Fig. 7 shows these windings 19 as connected in parallel with each other and in series with the winding 22, the circuit being completed through a breaker 36, 31 to the ground. The winding 23 which envelops the winding 22 is shown connected from one terminal of the winding 22 through a spark plug 25 and thence to ground, a condenser 26 being connected across the terminals of the breaker 24. The circuit connections to the engine cylinders and the distributor are not indicated in Fig. 7, as the particular means employed for this purpose forms no part of my present invention. The breaker 36, 31 and means for operating the same is illustrated in Figs. 5 and 6 and comprises a cam 27 of symmetrical form mounted on the shaft of the rotor, the cam operating to engage an arm 28 pivoted on a stud 29. An arm 30 extends from the arm 28 substantially at right angles thereto and carries a contact 31 which is normally forced upward by the leaf spring 32 fixed to the bottom of the inclosing case by a screw and nut 33. A threaded rod 34 adjustable within the sleeve 35 carries at its lower end a contact 36 co-operating with the contact 31 to form the interrupter. The rod 34 is provided with a check nut 37 and its upper terminal is shown as a ball 38 adapted to receive a spring clip terminal of the lead from the winding 22. The sleeve 35 and rod 34 are supported in a block of insulation 39, the latter being secured to the frame support by screws 40 and 41. The latter screw is shown as hollow and with a removable cap for permitting the insertion of oil for lubricating the support of arm 28. It will be seen that the arrangement of the parts is symmetrical so that the breaker may be adapted to either direction of rotation of the generator. Thus the arm 28 may be removed from its screw stud and reversed so as to be supported by the screw stud 42, the screws 40 and 41 may be interchanged, and the leaf spring 32 may be turned about its support so as to occupy a position reverse to that shown. The breaker is adapted to be opened twice dur-

ing each revolution of the generator, and consequently, with a driving connection in the ratio of one-to-one, the proper number of sparks will be produced per revolution for the usual four cylinder engine. The electromotive forces generated in the windings 22 and 19 will correspond to those described in connection with Figs. 1 to 4, and the parts are so related that the contacts 31, 36 will engage each other and close the circuit of the windings 19 and 22 upon themselves during the periods of electromotive force in one direction, as during the periods of A B and C D of Fig. 4. This results in the flow of a comparatively heavy current in the low resistance windings 19 and 22 and the passage of this heavy current tends to maintain the then existing path of the magnetic flux. When the maximum current is flowing in this closed circuit, the interrupter causes the contacts 31 and 36 to be separated, which removes any tendency to maintain the then existing paths of the magnetic flux, and as the rotor has at such time passed within the influence of adjacent poles and so provided new paths of low reluctance, there will be produced a very sudden change of magnetic flux through the windings 22 and 23. There is consequently caused a transfer of a considerable amount of energy during this brief period, and the high tension energy induced in the winding 23 thus produces a very effective spark discharge, the effectiveness being increased by the action of the condenser 26. The breaker will remain open during the generation of the waves in the opposite direction, and closed and opened again during the generation of electromotive force in the direction first considered, and then remain open during the generation of the wave of opposite direction. By this arrangement the windings 19 serve not only as generating windings, but also as exciting windings strengthening the magnetic field, as explained in connection with Figs. 1 to 4. Another advantage of my improved machine is that the rotating element is always balanced, the magnetic pull on the opposite faces of the parts 15, 16, always being substantially the same.

I have found by means of my present invention I can produce more efficient spark discharges with a smaller magneto generator than heretofore required and eliminate the auxiliary induction coils in addition.

It will be understood by those skilled in the art that various modifications of the machines above described may be devised without departing from the scope of my invention.

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

1. A magneto generator comprising a double set of laminated permanently mag-

- netized multipolar field elements axially displaced, axially extending portions of soft iron connecting said elements, a rotor cooperating with said elements, and a generating winding embracing said rotor.
2. A magneto generator comprising a double set of laminated permanently magnetized multipolar field elements axially displaced, axially extending portions of soft iron connecting said elements, a rotor cooperating with said elements, windings on said elements, and a generating winding embracing said rotor, said latter winding and first-named windings being connected in the same circuit.
3. A generator comprising a double set of field elements axially displaced, windings on polar projections of said elements, a rotor having outer portions cooperating with said field elements and an intermediate portion, and a winding embracing said intermediate portion, said first-named windings and said latter windings being connected in circuit with each other.
4. A generator comprising a double set of field elements axially displaced, each of said elements forming a multipolar field frame, windings on polar projections of said elements, a rotor having outer portions cooperating with said field elements and an intermediate portion, each of said outer portions being of symmetrical form and balanced, and a winding embracing said intermediate portion, said first-named windings and said latter windings being connected in circuit with each other.
5. A generator comprising a double set of stationary laminated field elements axially displaced, stationary portions of magnetic material for conducting the magnetic flux between said stationary elements, a plurality of windings on said elements and connected together in a circuit, a rotor cooperating with said elements, a generating winding embracing said rotor, said generating winding being connected in the circuit of said plurality of windings, a second winding subjected to change of magnetic flux through said generating winding, and means for making and breaking the circuit of said generating winding.
6. A generator comprising a double set of permanently magnetized laminated multipolar stationary field elements axially displaced, stationary portions of magnetic material for conducting the magnetic flux between said stationary elements, a rotor cooperating with said elements having balanced end portions, a generating winding embracing said rotor, a second winding subjected to change of magnetic flux through said generating winding and means for making and breaking the circuit of said generating winding.
7. A generator comprising a double set of field elements axially displaced, a rotor cooperating with said elements, windings on said elements, a generating winding embracing said rotor connected in circuit with said first-named windings, a second winding subjected to change of magnetic flux through said generating winding, and means for making and breaking the circuit of said generating winding.
8. A generator comprising a double set of permanently magnetized field elements axially displaced, a rotor cooperating with said elements, windings on said elements, a generating winding embracing said rotor and connected to said windings, a second winding subjected to change of magnetic flux through said generating winding, and means for closing the circuit of said winding during generation of electromotive force in a direction to increase the magnetization of said magnetized field elements and for keeping the circuit open during generation of electromotive force in the opposite direction.
9. A generator comprising a double set of permanently magnetized laminated multipolar field elements axially displaced, windings on said elements, a rotor cooperating with said elements having balanced end portions, a generating winding embracing said rotor connected to said windings, a second winding subjected to change of magnetic flux through said generating winding, and means for closing the circuit of said generating winding during generation of electromotive force in one direction and for keeping the circuit open during generation of electromotive force in the opposite direction.
10. A generator comprising a double set of field elements axially displaced, a rotor cooperating with said elements, windings on said elements, a generating winding embracing said rotor connected in circuit with said first-named windings, a second winding subjected to change of magnetic flux through said generating winding, and means for closing the circuit of said generating winding during generation of electromotive force in one direction and for keeping the circuit open during generation of electromotive force in the opposite direction.
11. A generator comprising a field frame, a winding on said field frame, a rotor, a generating winding embracing said rotor, said windings being connected in circuit with each other, and means for closing the circuit of said windings during generation of electromotive force in one direction and for keeping the circuit open during generation of electromotive force in the opposite direction.
12. A generator comprising a field frame, a winding on said field frame, a main generating winding, said windings being con-

neeted in circuit with each other, a secondary winding forming a part of said generator and subjected to change of magnetic flux through said generating winding, and means for closing the circuit of said first-named windings during generation of electromotive force in one direction and for keeping the circuit open during generation of electromotive force in the opposite direction.

13. A generator comprising a stationary field frame, a winding on said frame, a rotor, a stationary winding subjected to change of magnetic flux through said rotor, a secondary stationary winding in magnetic relation to said second-named winding, and means for closing the circuit of said first and second named windings during generation of electromotive force in one

direction and for keeping the circuit open during generation of electromotive force in the opposite direction.

14. A magneto generator comprising a double set of laminated permanently magnetized multipolar field elements axially displaced, axially extending portions of soft iron connecting said elements, a rotor co-operating with said elements, a generating winding embracing said rotor and a second winding subjected to change of magnetic flux through said generating winding.

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

LEON J. LE PONTOIS.

Witnesses:

L. K. SAGER,
GEO. U. KERR.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."