

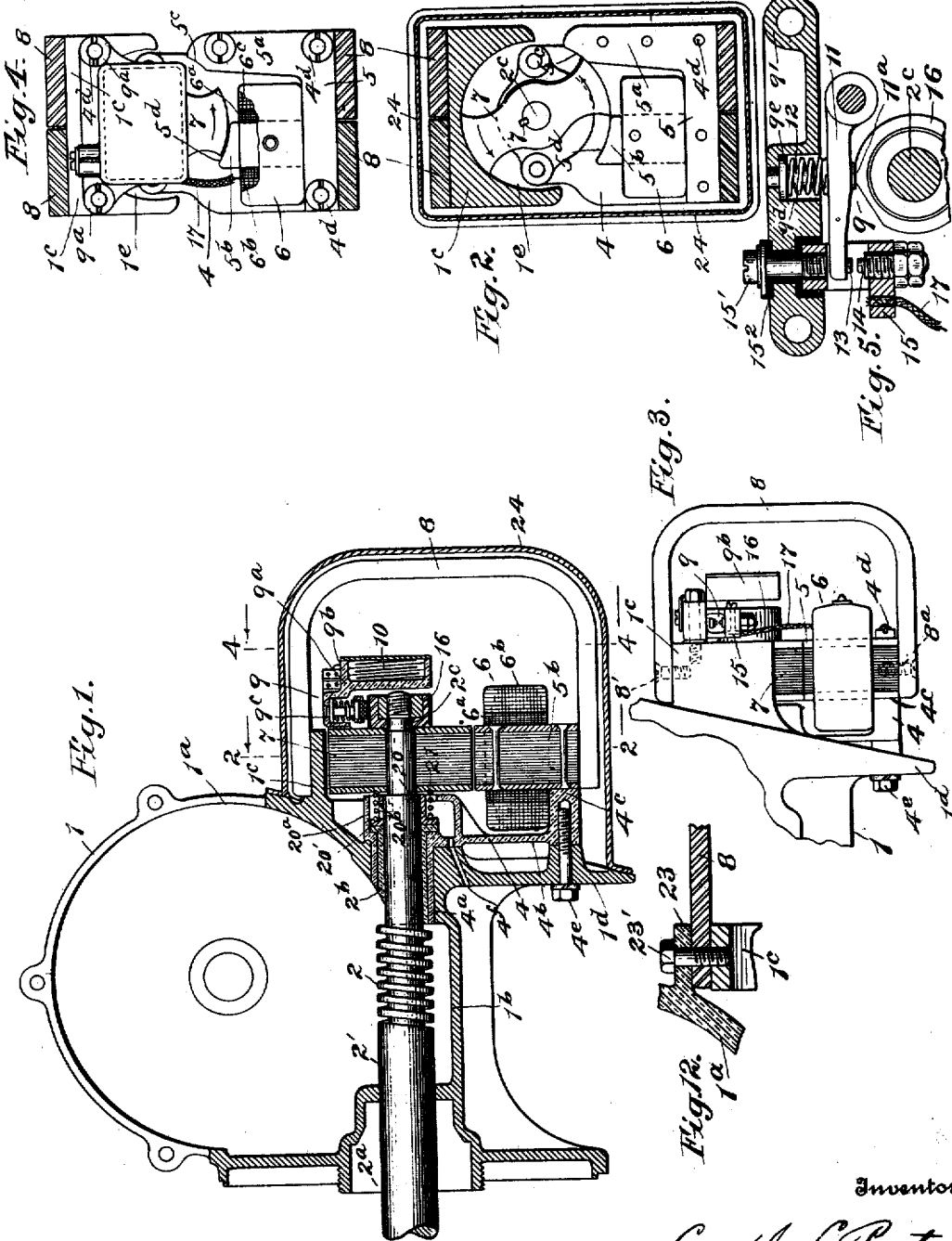
L. J. LE PONTOIS.
J. G. KIPP, GUARDIAN.
ELECTRIC GENERATOR.

APPLICATION FILED OCT. 26, 1914. RENEWED MAY 4, 1918.

Patented Feb. 3, 1920.

2 SHEETS—SHEET 1.

1,330,039.



Witnesses

S. W. Brainerd.
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384

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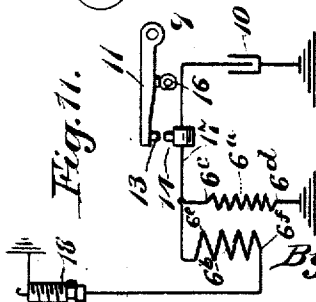
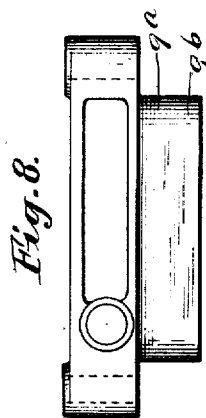
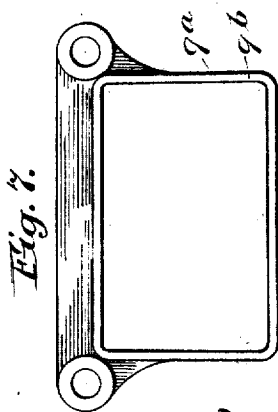
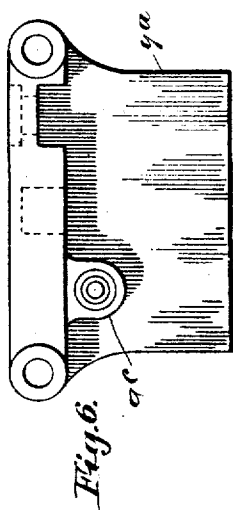
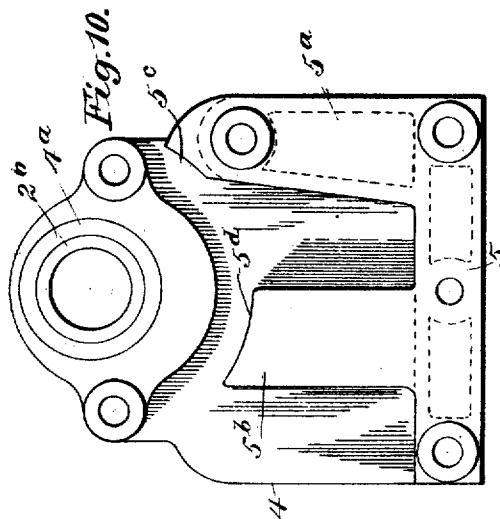
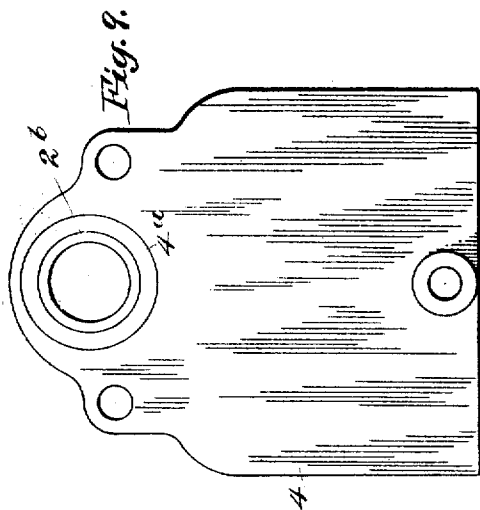
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2 SHEETS—SHEET 2.



Witnesses:
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E. L. Beller

Inventor.
Leon J. Le Pontois.
By Edward A. Mander.
Attorney.

UNITED STATES PATENT OFFICE.

LEON J. LE PONTOIS, OF LAKEWOOD, OHIO; J. G. KIPP GUARDIAN OF THE PERSON AND ESTATE OF SAID LEON J. LE PONTOIS, SAID LE PONTOIS ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE TEAGLE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ELECTRIC GENERATOR.

1,330,039.

Specification of Letters Patent.

Patented Feb. 3, 1920.

Application filed October 28, 1914, Serial No. 868,567. Renewed May 4, 1918, Serial No. 232,659.

To all whom it may concern:

Be it known that I, LEON J. LE PONTOIS, a citizen of the Republic of France, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in and Relating to Electric Generators, of which the following is a specification.

This invention relates to improvements in ignition mechanism for internal combustion engines, more particularly to an electric generator for producing high tension electrical impulses for ignition purposes.

One of the objects of my invention has been to provide an ignition generator in which parts of an internal combustion motor are utilized as parts of the generator, thereby reducing the number of parts required as compared with the number for such a motor and a standard ignition generator or magneto.

Another object of my invention has been to dispense with additional gears or gearing for driving a magneto and to utilize as a rotor shaft a necessary shaft of the internal combustion motor with which a generator of my improved type is incorporated, thereby insuring more perfect ignition synchronism than is obtainable where a plurality of gears or gearing is introduced between a motor shaft and any of the standard forms of ignition generators or magnetos now in general use.

Other objects of my invention will be obvious to those skilled in the art to which it relates, from the disclosures herein of a mechanism embodying it which I have selected as an example.

Figure 1 is a vertical longitudinal section of mechanism embodying my invention.

Fig. 2 is a section on the line 2—2, Fig. 1.

Fig. 3 is a side of the generator with cover removed.

Fig. 4 is a section on the line 4—4, Fig. 1, all the parts being enlarged.

Fig. 5 is a view, partly in side elevation and partly in section of the circuit closing mechanism.

Figs. 6, 7, and 8 are details.

Fig. 9 is a rear elevation of a part of the stator.

Fig. 10 is a front elevation of the parts shown in Fig. 9.

Fig. 11 is a wiring diagram.

Fig. 12 is a detail showing of a modification.

I have elected to disclose my invention in connection with the gear case of a motor of the type employed for propelling a tractor wheel for a bicycle.

The gear casing 1 may be of any suitable material. That illustrated in Figs. 1, 2, 3 and 4, is formed of iron and comprises an enlarged section 1^a to receive a driven gear—in this example a worm gear, not shown—and a section 1^b, communicating therewith, to receive the driving gear 2 on the crank shaft 2'. This shaft is mounted in the casing in suitable bearings at 2^a, 2^b, and has an outwardly projecting end 2^c. When the motor gear casing is made of iron, it is possible and economical to form one pole piece of the magneto integral with the casing casting. Accordingly, I have, in Fig. 1, shown the laterally extending pole piece 1^c to be formed integral with the casing 1. This casing also has a downwardly extending arm or portion 1^d. 4 is a pole supporting and spacing piece of non-magnetic material. It comprises a tubular section 4^a fitted into the gear casing to receive the bearing 2^b for the crank shaft, an off-set portion 4^b to provide space for the generating coil to be hereinafter described, and a shoulder 4^c. This piece 4 may be secured to the gear casing in any suitable manner, as by bolts 4^d of non-magnetic material, and may be a pressure casting if desired.

5 is a pole piece having polar projections 5^a and 5^b with polar surfaces 5^c and 5^d, respectively. This pole piece is preferably made of laminæ of iron and may be secured to the non-magnetic supporting plate 4 in any suitable manner. I have shown this to be accomplished by means of studs and caps 4^b of non-magnetic material.

A generating winding 6 is supported by the pole piece 5 and preferably surrounds the polar projections 5^b thereof. This winding preferably consists of a section 6^a of 100 relatively coarse wire, the primary winding, and a section 6^b of relatively fine wire, the secondary winding.

7 is an unwound inductor rotor, preferably made of laminæ of iron and carried by the portion 2^c of the shaft 2' with which it is rigidly connected, as by a key 7'. The polar surface 1^c of the pole piece 1^c is

formed in the arc of the circle containing the polar surfaces 5^c and 5^d, and of which the axis of the rotor is the center. The polar surfaces of the rotor 7 cooperate with the polar surfaces 1^c, 5^c and 5^d in a manner to be hereinafter set forth.

8 is a field magnet. The one shown consists of the well known horseshoe type of permanent magnet. Each magnet has its upper leg resting upon and secured to the pole piece 1^c as by means of a screw 8'. The lower leg of each of these magnets is in magnetic contact with the laminated pole piece 5 and preferably secured thereto by screws 8".

Mechanism for opening and closing the circuit of the primary winding 6^a may be of any suitable and well known character. In the drawings this breaker mechanism is indicated as an entirety by 9. 9' is a frame, preferably of non-magnetic material, such as a die casting, which may be secured to the pole piece 1^c by means of cap screws 9". It has a laterally extending box-like portion 9^b, in which a suitable condenser 10 may be positioned and held, and a rearwardly extending lug 9^c to which is pivotally connected the breaker arm 11 which carries a fiber shoe 11^a. A spring 12 mounted in a recess 9^d in the frame 9' and centered by the stud 9^e, bears at its lower end on the upper surface of the breaker arm 11 and serves to press its free end toward the axis of the driving shaft 2. 13 is an electrode carried by the free end of the arm 9 and adapted to make contact intermittently with the electrode 14 adjustably mounted in a support 15 supported from the frame 9 by the bolt 15' and insulated therefrom by the insulating material 15". 16 is a cam secured to and rotating with the driving shaft 2 and disposed so that its surface will engage with the shoe 11^a and cooperate with the spring 12 intermittently to effect the engagement and disengagement of the electrodes 13, 14 during the rotation of the shaft 2.

One terminal 16^c of the primary winding 6^a may be connected by the conductor 17 to the support 15 and electrode 14. The other terminal 6^d of the primary winding may be grounded. One terminal 6^e of the secondary winding may be connected to the terminal 6^d of the primary winding and the other terminal 6^f to one electrode of a suitable spark plug 18 in the engine cylinder, the other electrode of which is grounded to the frame in the well known manner. The condenser 10 is connected in parallel with the breaker electrodes 13, 14.

In order to prevent oil from the gear case 1 getting into the magneto proper, suitable gasketing or packing may be provided. I have illustrated a simple form which consists of a sleeve mounted on the shaft 2' and having a flange 20' engaging the adjacent

bearing flange, the sleeve having a slot, 20^a, and pin, 20^b, connection with the shaft. A spring 21 bearing at one end against the flange 20' and at its other end against the adjacent side of the rotor serves to maintain the sleeve 20 in place. Should any oil pass the sleeve, it will collect in a pocket in the piece 4, which pocket is drained by the duct 4'.

The operation of the mechanism will be readily apparent. During the rotation of the rotor 7 its polar surfaces will establish a path of least magnetic reluctance between the polar surface 5^d of the polar projection 5^b and the polar surface 1^c of the pole piece 1^c. When the parts are in this relationship the flux between the poles of the permanent magnet will extend through the polar projection 5^b, which practically serves as a core for the coil 6. As the rotor 7 is then rotated the reluctance of the path through the polar projection 5^b will increase and the density of the flux threading through the generating winding will decrease. I prefer to close the circuit of the primary winding during decrease of magnetic flux therethrough, so that the current generated in the primary winding when the circuit is closed will be always that due to flux decrease through the winding and its effect upon the permanent magnets, if any, will be in the direction to tend to build up rather than break down their magnetism. Finally, during its rotation, the rotor 7 will establish a path of least reluctance through the polar projection 5^a and entirely outside of the polar projection 5^b, in fact will cause an air gap to exist between the polar projection 5^d and the rotor. The cam 16 is timed with reference to the rotation of the shaft 2 so as to open the circuit of the primary winding substantially at the instant of generation of current therein due to maximum rate of flux decrease through that winding. Upon the opening of the primary circuit in this manner, a high electromotive force will be induced in the secondary 6^b which will cause a spark to jump the gap of the spark plug in the well known manner.

If it is desired to use a gear case 1 of non-magnetic material, this may be readily accomplished. In Fig. 12, I have shown a gear case which may be of non-magnetic material. It carries a laterally projecting lug or support 23. In this example, the pole piece 1^c of magnetic material is suitably formed and it and the upper leg of the magnet are suitably secured to the lug 23 by means of screws 23'. In order to make the operating parts of the magneto weather and practically water proof, a suitable external housing or casing may be employed. I have illustrated one at 24.

One of the problems in connection with the construction of a tractor wheel of the

type under consideration is to keep its power generating parts, including the motor proper and electric ignition generator therefor, within a reasonably small compass.

5 My invention lends itself peculiarly well to this end. Furthermore, a generator constructed in accordance with my idea will be suitably and rigidly supported and fully capable of withstanding the various and repeated shocks and strains to which it is subjected in the ordinary usage of the tractor wheel on the road. Where the gear case is of iron, and the pole piece 1^c is formed integral therewith, the latter may be machined at the same time that the gear case is being machined so as to afford the most economical method of manufacture.

It will be noted that the bearing 2^b, in addition to operating as a crank shaft bearing, performs the function of counteracting the stresses on the extended end 2^c of the shaft due to the action of the magnetic field on the rotor 7.

Many alterations in construction, and many widely differing embodiments and applications of my invention will suggest themselves to those skilled in the art of making mechanism of the class described, without departing from the scope and spirit thereof. My disclosures and description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. In a machine of the class described, an engine casing of iron, having a pole piece formed integrally therewith, a plurality of polar projections spaced from said pole piece and separated from said engine casing by a spacing piece of non-magnetic material supported by said engine casing, an engine shaft having one end projecting between the polar faces of said pole piece and said polar projections, an unwound rotor carried by the extended end of said engine shaft, a generating winding on one of said polar projections and a field magnet embracing said pole piece and polar projections.

2. In a machine of the class described, an engine casing of iron, having a pole piece formed integrally therewith, a plurality of polar projections spaced from said pole piece and separated from said engine casing by a spacing piece of non-magnetic material supported by said engine casing, an engine shaft having one end projecting between the polar faces of said pole piece and said polar projections, an unwound rotor carried by the extended end of said engine shaft, a generating winding on one of said polar projections, a field magnet embracing said pole piece and polar projections, a cam carried by said engine shaft adjacent said rotor, and circuit opening and closing mechanism actuated by said cam.

3. In a machine of the class described,

an engine casing of iron, having a pole piece formed integrally therewith, a plurality of polar projections spaced from said pole piece and separated from said engine casing by a spacing piece of non-magnetic material supported by said engine casing, an engine shaft having one end projecting between the polar faces of said pole piece and said polar projections, an unwound rotor carried by the extended end of said engine shaft, a generating winding on one of said polar projections, a field magnet embracing said pole piece and polar projections, a cam carried by said engine shaft adjacent said rotor, and circuit opening and closing mechanism mounted on said pole piece and actuated by said cam.

4. In a machine of the class described, an engine casing of iron, having a pole piece formed integrally therewith, a plurality of polar projections spaced from said pole piece and separated from said engine casing by a spacing piece of non-magnetic material supported by said engine casing, an engine shaft having one end projecting between the polar faces of said pole pieces and said polar projections, an unwound rotor carried by the extended end of said engine shaft, a generating winding on one of said polar projections, a field magnet embracing said pole piece and polar projections, a cam carried by said engine shaft, a condenser and breaker support secured to said casing, a condenser mounted on one side of said support, and a breaker mounted on the other side thereof and actuated by said cam.

5. In a machine of the class described, a pole piece and a plurality of polar projections suitably spaced and supported at either side of the extended end of an engine shaft, an unwound rotor on said engine shaft, a generating winding on one of said polar projections, and a field magnet having one pole in magnetic contact with said pole piece and its other pole in magnetic contact with said polar projections.

6. In a machine of the class described, an engine casing, an engine shaft extending therefrom, a pole piece extending from said casing parallel with said engine shaft and secured to the casing, a plurality of polar projections supported from said casing by a section of non-magnetic material and having polar faces oppositely disposed to the polar faces of said pole piece, a rotor carried by said shaft between the polar faces and said pole piece and polar projections, a generating winding, and a field magnet embracing said pole piece and polar projections and supported from said engine casing.

7. In mechanism of the class described, an engine casing, an engine shaft extending therethrough, a pole piece and a plurality of polar projections spaced apart at opposite sides of the extended end of said

engine shaft and supported from said engine casing, an unwound rotor connected to said extended end of said engine shaft and having polar faces disposed to cooperate with the polar faces of said pole piece and polar projections, a generating winding on one of said polar projections, and a field magnet embracing said pole piece and polar projections.

8. In a machine of the class described, an engine casing, an engine shaft extending therethrough, a pole piece and a plurality of polar projections spaced apart at opposite sides of the extended end of said engine shaft, supported from said engine casing and having polar surfaces in arcs of a circle struck from the axis of said engine shaft as a center, an unwound rotor connected to said extended end of said engine shaft and having polar faces arranged between and cooperating with the polar surfaces of said pole piece and polar projections, a generating winding on one of said polar projections, and a field magnet embracing said pole pieces and polar projections.

9. In mechanisms of the class described, the combination of an engine casing, a rotatable engine shaft extending therethrough, a bearing for said shaft arranged in said casing adjacent the extended end of said shaft, a plurality of pole pieces supported from said casing at one side of said extended end of said shaft and having polar faces disposed in arcs of a circle struck from the axis of said shaft as a center, an unwound rotor carried by the extended end of said shaft adjacent said bearing and having polar faces disposed to cooperate with the polar faces of said polar projections, a generating winding on one of said polar projections, and a field magnet supported from said casing with its poles disposed in inductive relation to said polar projections and rotor, whereby stresses on said shaft due to magnetic action upon said rotor are counteracted by said bearing.

10. In mechanism of the class described, the combination of an engine casing, a crank shaft having one end extending through said casing, a bearing for said shaft arranged in said casing adjacent the extended end of said shaft, a plurality of pole pieces supported from said casing at one side of said extended end of said shaft and having polar faces disposed in arcs of a circle struck from the axis of said shaft as a center, an unwound rotor carried by the extended end of said shaft adjacent said bearing and having polar faces disposed to cooperate with the polar faces of said polar projections, a generating winding on one of said polar projections, and a field magnet supported from said casing with its poles disposed in inductive relation to said polar projections and

rotor, whereby said bearing operates both as a crank shaft bearing and to counteract the stresses on the extended end of the shaft due to the action of the magnetic field on the rotor.

11. In mechanism of the class described, the combination of an engine casing having a crank shaft bearing, an engine crank shaft having one end mounted in said bearing and extending outwardly therefrom, an unwound rotor formed independently of the engine parts and carried by said extended end of said crank shaft adjacent to said bearing, a field magnet supported by said casing with its poles in inductive relation to said rotor, a pole piece in inductive relation to one pole of said magnet, a generating winding carried by said pole piece, a cam also carried by the extended end of said crank shaft, and circuit closing and opening mechanism cooperating with said cam and said generating winding.

12. In mechanism of the class described, an engine casing, a rotatable engine shaft extending therethrough, a bearing for said shaft arranged in said casing and adjacent the extended end of said shaft, a stator detachably secured to said casing at one side of the extended end of said shaft and having a plurality of polar projections with polar faces disposed in arcs of a circle struck from the axis of said shaft as a center, a cam carried by the extended end of said shaft, an unwound rotor carried by the extended end of said shaft between said cam and said bearing, and having polar faces disposed to cooperate with the polar faces of said polar projections, a generating winding on one of said polar projections, a field magnet supported from said casing with its poles in inductive relation to said polar projections and rotor, and circuit closing and opening mechanism cooperating with said cam and said generating winding, whereby stresses on said shaft due to magnetic action upon said rotor are counteracted by said bearing.

13. In mechanism of the class described, the combination with a rotatable shaft of an internal combustion engine, of an ignition generator for said engine comprising an unwound rotor which is both mounted on said engine shaft and formed independently of the other engine parts, and a stationary generating coil supported by the engine frame in inductive relation to the rotor.

14. In mechanism of the class described, the combination with the casing and a rotatable shaft of an internal combustion engine, of an ignition generator for said engine having stator parts comprising a generating coil mounted on the engine casing and an unwound rotor which is both mounted on the engine shaft and formed independently of the other engine parts.

15. In mechanism of the class described,
the combination with a rotatable crank shaft
of an internal combustion engine, of an igni-
tion generator for said engine comprising
5 an unwound rotor mounted directly on said
shaft and formed independently of the other
engine parts.

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

LEON J. LE PONTOIS.

Witnesses:

JOHN C. BARKLEY,
EDWARD R. ALEXANDER.