H. J. PODLEŠÁK & T. E. PODLÉSAK.

INDUCTOR GENERATOR FOR IGNITION PURPOSES.

APPLICATION FILED JAN. 28, 1908.

948,483.

Patented Feb. 8, 1910.

Fig. 1.

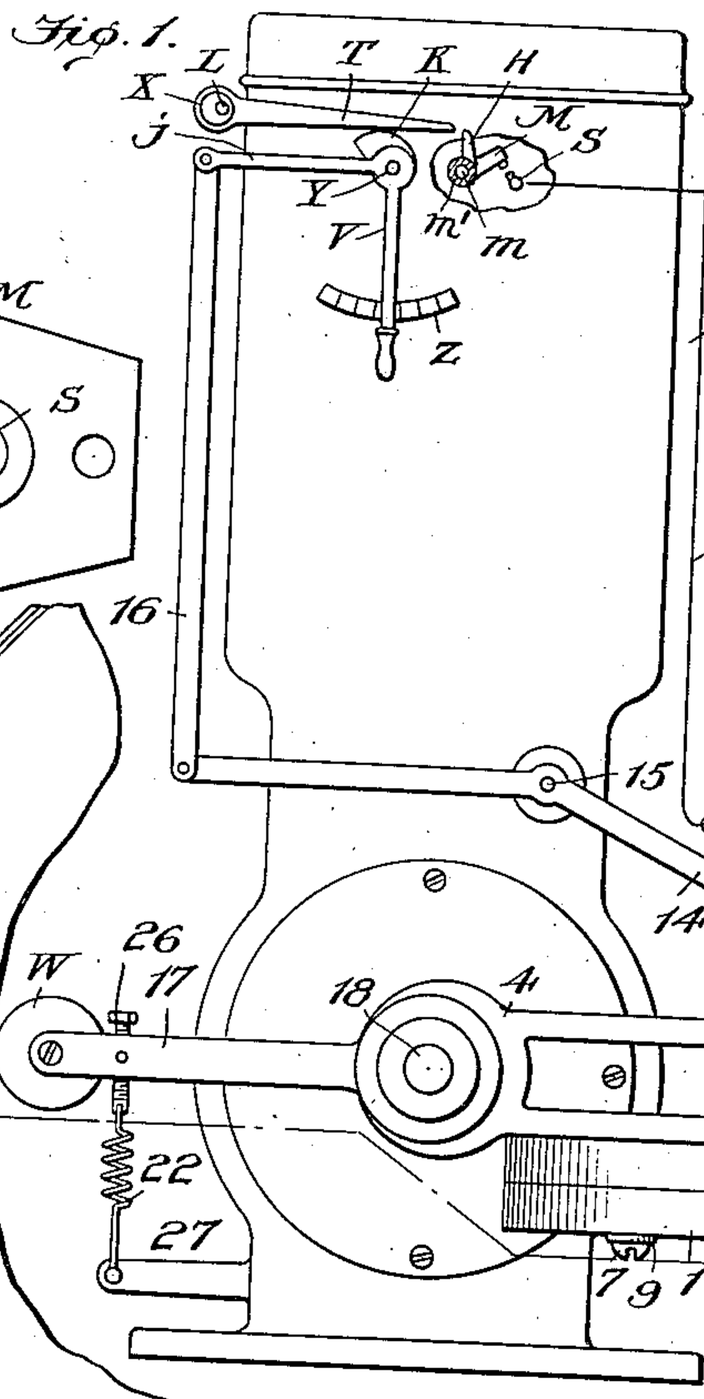


Fig. 3.

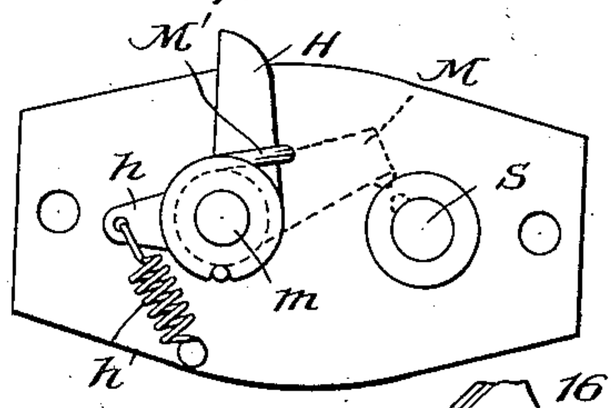


Fig. 4.

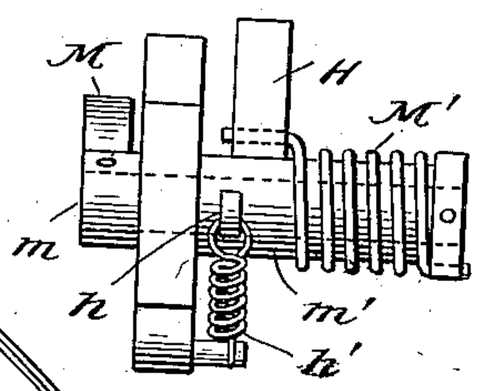
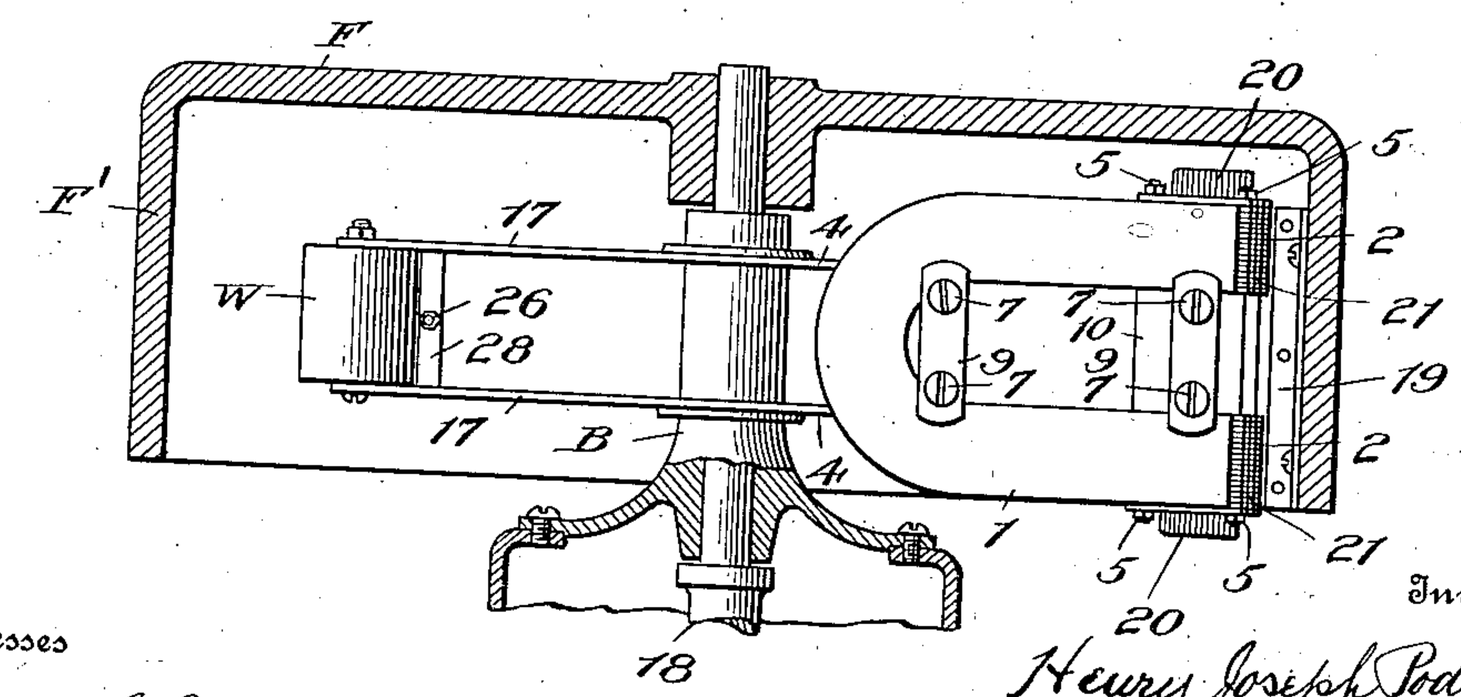


Fig. 2.



Witnesses

Edwin L. Bradford

C. C. Wright

Inventors

Henry Joseph Podlešák

Tesla Emil Podlésak

By Henry J. Podlesak

Attorney

UNITED STATES PATENT OFFICE.

HENRY JOSEPH PODLEŠÁK, OF CHICAGO, ILLINOIS, AND TESLA EMIL PODLÉSAK, OF MORRISTOWN, NEW JERSEY.

INDUCTOR-GENERATOR FOR IGNITION PURPOSES.

948,483. Specification of Letters Patent. Patented Feb. 8, 1910.

Original application filed September 25, 1901, Serial No. 76,559. Divided and this application filed January 28, 1908. Serial No. 413,069.

To all whom it may concern:

Be it known that we, HENRY JOSEPH PODLEŠÁK and TESLA EMIL PODLÉSAK, residing at Chicago, in the county of Cook and State of Illinois, and Morristown, county of Morris, State of New Jersey, respectively, have invented certain new and useful Improvements in Inductor-Generators for Ignition Purposes, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to ignition apparatus for internal combustion engines.

The subject matter herein presented is for a division of the subject matter presented in our application, Serial No. 76,559, filed September 25th, 1901, for inductor generators for ignition purposes.

One of the objects of our invention is to provide an inductor alternator which is readily adaptable to all classes of internal combustion motors, such as automobile, marine, and stationary motors, and to the special requirements of each class, and is readily adjustable for varying the period of generation of maximum electro-motive force relative to the position of a piston within an engine cylinder.

Another object of our invention is to so connect and correlate an electric generator to the ignition apparatus of an internal combustion motor, that the ignition apparatus and the said generator are simultaneously adjusted for the purpose of causing a spark to occur earlier or later in the stroke of the motor piston. This simultaneous adjustment of the electric generator with the ignition apparatus is for the purpose of insuring that the generator will produce the requisite electro-motive force for any position of adjustment of the ignition apparatus.

Still another object of our invention is to arrange and mount an electric generator in the fly wheel of an engine in such manner that the parts of the generator will be completely protected.

Figure 1 is a side elevation of a motor fitted with an inductor alternator embodying our invention, the fly wheel of the motor being shown partly broken away and partly in section. Fig. 2 is a section on the line 2—2, Fig. 1. Fig. 3 is an end elevation of parts of the igniter apparatus, detached. Fig. 4 is a side view of the parts shown in Fig. 3.

In the drawings—A represents an internal combustion motor of any well known construction.

B indicates the crank shaft bearing on the fly wheel side of the motor, the crank shaft itself being represented by 18.

F is the fly wheel of the motor having an inwardly extending flange F′.

1 indicates a permanent magnet, preferably horseshoe or U-shaped in form. It is composed of as many magnet sections, arranged in series, as may be required to establish the desired density of magnetic field.

4 is a frame, preferably of non-magnetic material, and employed to position and support in proper relation to each other the normally stationary parts of our inductor alternator. In the drawings, this supporting and positioning frame is mounted upon the crank shaft bearing B, and is capable of adjustment about the axis of the said crank shaft.

9 are clamp pieces or cleats arranged to bear against the outermost magnet section in each series, and 7 are bolts or screws extending through said cleats and into the frame 4, and adapted to clamp or bind the said frame and permanent magnet together.

21 are pole pieces composed of a suitable number of punchings or laminæ. A pair of these pole pieces is preferably used, assembled, one at either side of a suitable center piece or spacing piece 10 of non-magnetic material, and suitably bolted thereto by means of bolts 5. This non-magnetic spacing piece 10 is suitably secured to the frame 4 by means of bolts or screws 6 and 11, (shown in dotted lines), so as to hold the

laminated pole pieces 21 in close magnetic contact with the ends or poles of the permanent magnet-sections.

Each one of the pole pieces has a pair of polar projections 12, 12′, the former of which serves as a coil core upon which a winding or coil 20 of insulated wire is slipped, and to which the said coil is suitably secured. The coil core 12 on each pole piece is spaced by a suitable air gap from the adjacent polar projection 12′ on said pole piece. The outer faces or polar faces of the said polar projections 12, 12′, are suitably shaped to conform to the path of travel of a suitable inductor, hereinafter described. The polar faces on the polar projections 12′ are designated by 2, and hereinafter referred to as exciting polar faces, and the polar faces on the polar projections 12 are designated by 3, and hereinafter referred to as generating polar faces.

19 is an inductor, preferably formed of punchings or laminæ of suitable metal. This inductor is adapted to be rotated so as to have one of its faces pass over and closely adjacent to the exciting polar faces 2 and the generating polar faces 3, by mere mechanical clearance, or, in other words, as close to said polar faces as mechanical conditions will permit. We have shown the said inductor 19 as secured to and carried by the flange F′ of the fly wheel F of the motor. The polar faces 2, 3, and the face of the inductor which passes adjacent to them are shaped to the arc of a circle struck from the axis of the crank shaft as a center.

Normally the lines of magnetic force emanate in a scattered way from all sides of the magnet and for about one-half of its length from its free ends, and some of these lines of force emanate from the pole pieces. The inductor 19, in operation, first spans the exciting polar faces 2 and causes the concentration of a dense flow of magnetic lines of force, a substantial magnetic short circuit, between the polar projections 12′, 12′, of the laminated pole pieces. The inductor then moves across the air gap between the exciting polar faces and the generating polar faces and causes a rapid and substantially complete diversion of the magnetic flux density, first concentrated across the exciting polar faces, into and through the coil cores 12 and across the generating polar faces, so as to establish a substantial magnetic short circuit across the generating polar faces. The inductor then leaves the generating polar faces, and the magnetic flux density through the induction windings is rapidly diminished, due to the fact that the lines of magnetic force instantly seek the path of least reluctance between the magnet poles.

In Figs. 1 and 2, the frame 4 of the inductor alternator is shown pivoted or journaled on the bearing B of the crank shaft at one side of the motor, as hereinbefore mentioned, in order that it may be oscillated through a part of a revolution to vary the instant of generation of maximum electromotive force, so as to accommodate the generator for operation with mechanism for varying the period of ignition within the engine cylinder.

13 is a link connected at its lower end with the generator frame, and having its upper end suitably connected to one end of a lever 14, which is pivoted at 15 to the frame of the motor.

The mechanism for advancing or retarding the time of ignition within the engine cylinder may be of any suitable and well known type. For the purpose of illustrating our invention, we have shown in the drawings, more or less diagrammatically, such a mechanism.

K is a cam connected to move with a bell crank lever V, said lever being pivoted at Y to the cylinder of the motor, and adapted to be oscillated and retained in any desired position of adjustment by the engagement of its downwardly extending arm with one of the teeth of a rack section Z.

16 is a link connected at its lower end to the upper end of the lever 14, and having its upper end connected to the outer end of the arm *j* of the bell crank lever V.

The make and break ignition mechanism for the engine may be of any well known and suitable construction. We have shown it as embodying the general features of construction and operation disclosed in Letters Patent of the United States No. 630,624, to C. H. Morse, Jr., and F. G. Hobart, for gas engine igniter, dated August 8th, 1899.

S is a suitably insulated stationary electrode.

M is the movable electrode having a shaft *m* extending through one wall of the cylinder. Upon the outer end of the shaft *m* is loosely mounted a sleeve *m′* having an upwardly projecting arm H and a laterally projecting arm *h*.

h′ is a spring having one end secured to the free end of the arm *h* and its other end connected to the motor cylinder and arranged to normally hold the electrodes M and S out of contact with each other.

M′ is a coiled spring arranged around the electrode shaft *m* and between its outer end and the sleeve *m′* thereon, so as to form a flexible connection between the said sleeve and shaft, which will permit the sleeve to rotate relative to the shaft against the action of said spring.

T is a reciprocable trip rod, which has one end mounted on an eccentric X carried by

the shaft L, the latter being driven from a suitable member of the motor. The driving connection for the shaft L has, for the sake of clearness, not been shown. The trip rod T rests upon and is guided by the cam K, and at its free end is arranged to engage the upper end of the electrode-operating arm H. During the operation of the motor, the trip rod T at the proper instant, engages the arm H and moves the said arm so as to cause the movable electrode M to engage the stationary electrode S. The trip rod then passes or trips off the arm H, and the spring *h'* immediately causes the separation of the electrode M from the electrode S, at which interval the spark occurs between the electrodes. By adjusting the cam K, the trip rod T is caused to bring about the separation of the electrodes and the consequent creation of a spark earlier or later in the stroke of the piston.

Adjusting the bell crank lever Y to the left, or clockwise, will turn the cam K so as to elevate the free end of the trip rod T. This will cause the earlier disengagement of the electrodes within the cylinder, thus advancing the time of ignition. Adjusting the bell crank lever Y to the right, or anti-clockwise, will relatively lower the free end of the trip rod T, which will cause a later separation of the electrodes within the engine cylinder and the consequent retardation of the time of ignition. The connections between the said bell crank lever V and the frame 4 are so proportioned and correlated that, as the period of ignition in the cylinder is changed by the operation of the bell crank lever to either advance or retard the spark, the electric generator is also shifted or adjusted into a position to generate the requisite electro-motive force at the moment the electrodes of the make and break apparatus in the cylinder separate to produce the desired spark.

W is a weight secured between the arms 17 extending from the frame 4, the said weight being suitable to counterbalance the weight carried at the opposite end of the said frame 4. 22 is a spring having its lower end attached to a bracket 27 carried by the motor frame, and its upper end secured to an adjusting screw 26 which extends through a cross bar 28 carried by the arm 17. This spring serves to supplement the weight W and affords an additional means for facilitating the adjustment of the electric generator.

The winding on each pole piece may be in one or more separate coils of any suitable construction, all of which are suitably and properly connected together, either in parallel or in series, as may be desired. A suitable connection from the terminals of the induction windings may be made with the electrodes of the igniter mechanism. For this purpose we have shown an insulated electric conductor 30 electrically connecting the stationary electrode S with the generating windings of the electric generator. The movable electrode M is suitably grounded.

In the embodiment of our invention herein set forth and described for the purpose of illustration, we have shown one of our generators arranged within the fly wheel in protected position and in such manner as to economize space, which is of considerable importance in small motors, especially for automobile and marine work.

What we claim is—

1. In an apparatus of the class described, the combination of an igniter-mechanism associated with an internal-combustion engine, a shaft projecting from the engine-casing, a magnetic field-frame adjustably mounted upon said shaft and provided with a winding, a movable inductor for varying the magnetic flux through said winding, an arm pivotally connected at one end with said field-frame and at the other end with said igniter-niechanism, and means for actuating said arm for simultaneously adjusting said igniter-mechanism and said field-frame.

2. In an apparatus of the class described, the combination of an igniter-mechanism associated with an internal-combustion engine, a shaft projecting from the engine-casing, a frame of non-magnetic material adjustably mounted upon said shaft, a permanent magnet secured to said frame and provided with a winding, a movable inductor for varying the magnetic flux through said winding, an arm pivotally connected at one end with said field-frame and at the other end with said igniter-mechanism, and means for actuating said arm for simultaneously adjusting said igniter-mechanism and said field-frame.

3. In an apparatus of the class described, the combination of an igniter-mechanism associated with an internal-combustion engine, a shaft projecting from the engine-casing, a magnetic field-frame adjustably mounted upon said shaft and provided with a winding, a flywheel supported by said shaft, an inductor carried by said flywheel for varying the magnetic flux through said winding, an arm pivotally connected at one end with said field-frame and at the other end with said igniter-mechanism, and means for actuating said arm for simultaneously adjusting said igniter-mechanism and said field-frame.

4. In an apparatus of the class described, the combination of an igniter-mechanism associated with an internal-combustion engine, a shaft projecting from the engine-

casing, a frame of non-magnetic material adjustably mounted upon said shaft, a permanent magnet secured to said frame and provided with a winding, a flywheel supported by said shaft, an inductor carried by said flywheel for varying the magnetic flux through said winding, an arm pivotally connected at one end to said frame and at the other end with said igniter-mechanism, and means for actuating said arm for simultaneously adjusting said igniter-mechanism and said field-frame.

In witness whereof we affix our signatures, in the presence of two witnesses.

HENRY JOSEPH PODLEŠÁK.
TESLA EMIL PODLÉSAK.

Witnesses to the signature of Henry Joseph Podlešák:

J. SOBEK,
F. PTÁČEK.

Witnesses to the signature of Tesla Emil Podlésak:

LILLIAN B. SHERMAN,
JOHN H. BONSALL.