H. C. MUELLER.

IGNITION MAGNETO GENERATOR.

APPLICATION FILED JULY 17, 1913.

1,133,053.

Patented Mar. 23, 1915.

2 SHEETS—SHEET 1.

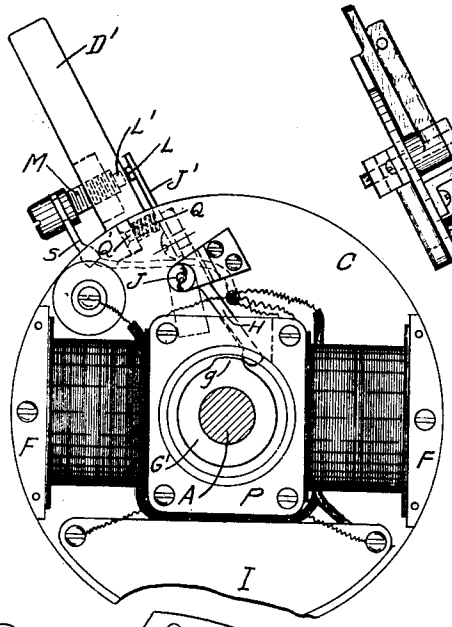


Fig. 1.

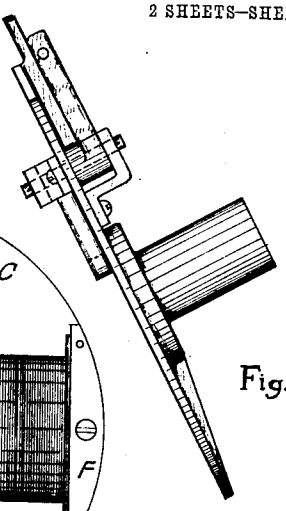


Fig. 2

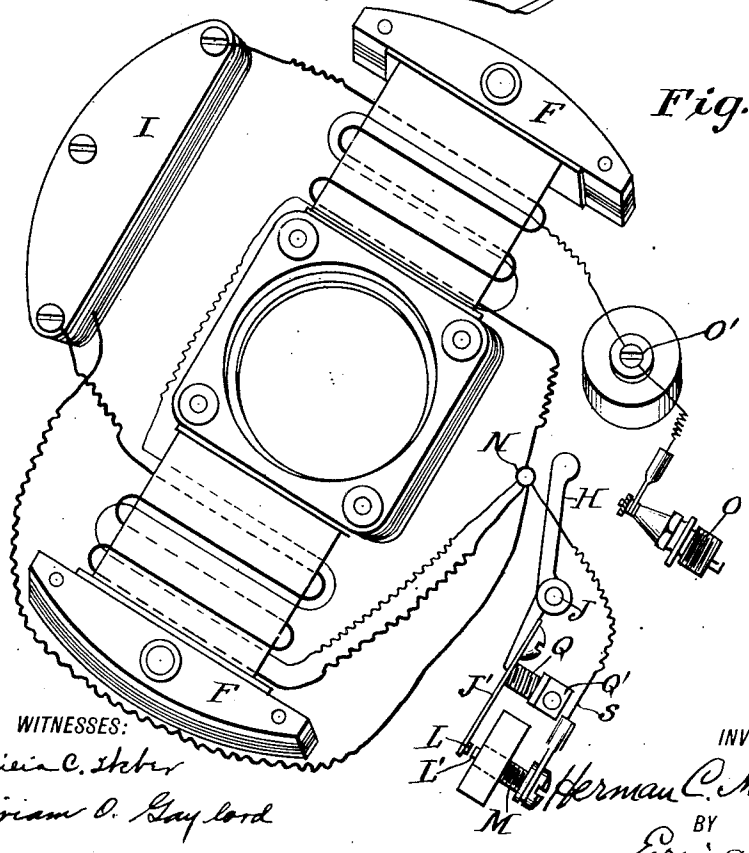


Fig. 5.

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Fig. 3.

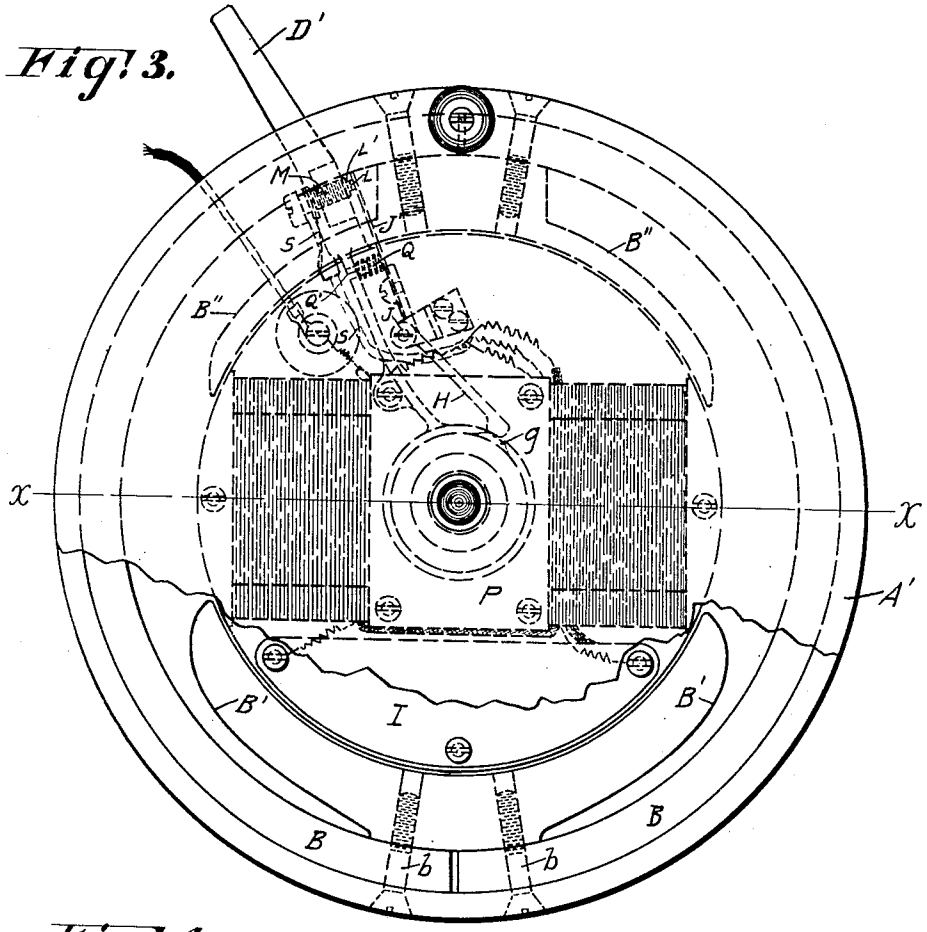
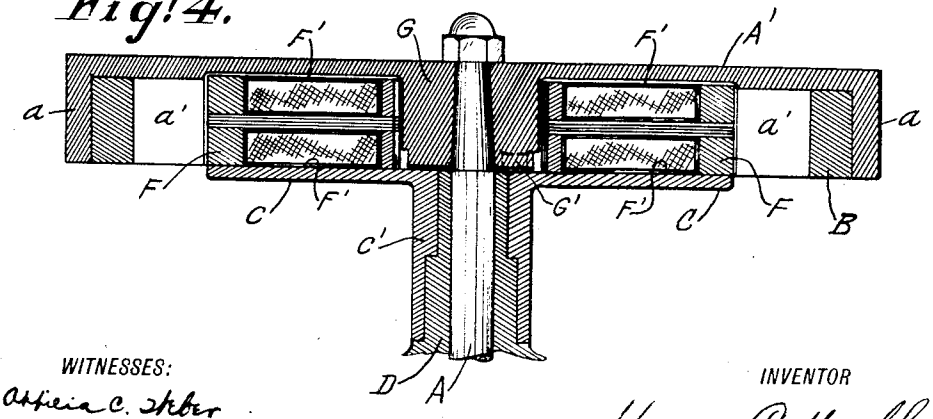


Fig. 4.



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IGNITION MAGNETO-GENERATOR.

1,133,053. Specification of Letters Patent. Patented Mar. 23, 1915.

Application filed July 17, 1913. Serial No. 779,423.

To all whom it may concern:

Be it known that I, HERMAN C. MUELLER, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Ignition Magneto-Generators, of which the following is a specification.

My invention relates to improvements in ignition magneto generators.

The object of my invention is two-fold, my primary object being to provide a simple and inexpensive form of reversible magneto generator, and a further object being to provide a simple and compact magneto generator adapted to be wholly contained within the fly-wheel of an internal combustion motor, a set of segmental, permanently magnetic field magnets being employed, which may be adjusted within and secured to the rim of the fly-wheel and revolved about an armature pivotally hung upon the crank shaft and provided with generating coils upon the respective end portions. The field pole pieces are made of different weights, whereby the heavier one may be utilized to counter-balance the weight of the crank, etc.

In the drawings Figure 1 is a view of the relatively stationary member of my improved magneto generator in its relation to the rotary crank shaft and circuit breaking cam, the crank shaft being shown in cross section. Fig. 2 is a view of the stationary member, taken at right angles to Fig. 1, and showing the circuit breaker from the side. Fig. 3 is an elevation of a fly-wheel of an internal combustion engine in which my improved magneto generator is embodied, the fly-wheel being viewed from the outer side, with its wall partially broken away and the magneto generator illustrated partly by full and partly by dotted lines. Fig. 4 is a sectional view drawn on line *x*—*x* of Fig. 3. Fig. 5 is a detail view showing the armature, condenser, circuit breaker and spark plug detached, and with the circuit connections illustrated diagrammatically.

Like parts are identified by the same reference characters throughout the several views.

A is the crank shaft of an internal combustion engine upon which a fly-wheel A′ is mounted and provided with a rim *a* partially inclosing an interior cavity *a*′. Segmental magnets B are mounted within the rim *a*, and are secured thereto by screws *b*. These segmental magnets B are formed of permanently magnetic material and carry pole pieces B′, B″ of different weights, the pole piece B′ being sufficiently heavy to compensate for the weight of the crank, connecting rod, etc., the weight of which is added to the pole piece B″. A relatively stationary base C is supported by a sleeve C′ from a bearing member D through which the crank shaft A passes. The base C and sleeve C′ are normally stationary but are rotatably adjustable by means of a timer lever D′.

The base C carries a flat armature F having current generating windings F′, (preferably primary and secondary), upon its respective end portions. The central portion is apertured to receive the internal hub G of the fly-wheel A′. This hub carries a cam member G′ having a projection *g* adapted to actuate the arm H of an oscillatory circuit closer. In the construction shown, there is but one of these projections *g*, and therefore the arm H will be actuated once during each revolution of the fly-wheel. A condenser I is mounted upon the base C at one side of the armature, the circuit closer being located at the other side thereof, as clearly shown in Fig. 1.

The arm H is connected by a pivot bolt J with the base C. The pivot bolt oscillates with the arm and carries circuit closing arm J′, having a contact member L adapted to move to and from contact L′ which is adjustably supported by a screw M from lever D′, but insulated therefrom and electrically connected with one pole of the generating windings of the armature at N. (See Fig. 5). A spark plug O is connected through terminal O′ with one of the armature poles, the other pole being grounded to the frame.

It will be observed in Fig. 3, that the armature plates have plates P covering their central portions. The arm H is exterior to the space inclosed between these plates. This feature provides a flat compact structure adapted to be assembled for relative axial revolution within the fly wheel rim, the fly wheel, however, being the actual motor in the construction illustrated. I do not consider it necessary to describe the structure of the generator, condenser, circuit closer and spark plug in greater detail, since

it will be understood that the generator is of bi-polar type and the general features of structure and mode of operation of such generators for ignition purposes is well known. But it will be observed that the projection *g* occupies but a few degrees upon the periphery of the cam member G', and terminates abruptly at each end, whereby a movement of the fly-wheel in either direction from its position as illustrated in Fig. 3, will carry said projection *g* away from the arm H, whereupon the circuit will be broken by a quick positive retractive movement of the arm J', said arm being retracted by the reaction of a coiled spring Q interposed between it and a lug Q' carried by the timer arm D'.

The position of the cam is such that the circuit will be closed as the armature approaches a position where its head pieces span the gap between the pole pieces B', B'', and such circuit will then be quickly broken as the armature passes this neutral zone and reverses the magnetic flux. Instead of following the usual practice, therefore, of closing the circuit preparatory to or during the initial stage of the movement of the armature heads across the face of the pole pieces, and keeping it closed until such movement is completed, I close the circuit during the final movement of the armature across such field as it approaches the neutral position.

I have discovered that an equally effective discharge between the spark plug terminals may be secured, (probably owing to the sudden violent charging of the condenser), and I have also discovered that by employing a short arc circuit closing cam projection, I am able to reverse the engine with no readjustment of the igniter other than a possible short movement of the timer lever. The operation of the igniter also requires less power than is required where the circuit is closed during substantially the entire induction interval.

I attach particular importance to the provision of means for closing the igniter circuit during the final stage of the induction interval, for the reason that I am thus enabled to produce an extremely simple and easily controlled reversible igniter magneto, since the remainder of the interval of current generation for any given induction will be substantially equal to the interval of initial current generation in the opposite direction during the succeeding induction period, with such variation from substantial equality in duration as may result from the adjustments of the timer lever. I also attach great importance to the arrangement of the magneto generator with the rim of the fly-wheel in such a manner that its parts are all symmetrically disposed and not only contribute part of the weight of the fly-wheel, but are also adapted to balance the moving parts of the engine and thus do away with the necessity of providing balance weights as separate features or under conditions of increased cost of construction.

With the described construction, if it should be desirable at any time to connect up the circuit closer with a battery circuit, in substitution for the magneto, this can be easily accomplished by disconnecting the magneto lines of conduction S, and connecting the battery with screw M. Owing to the long circuit closing period which exists in magneto generators of ordinary type, this would not be practical, as the batteries would be quickly exhausted. This is an important consideration for the reason that in case the generator fails to operate properly, batteries and coil may be quickly substituted.

I claim—

1. An igniter magneto generator, comprising a set of segmental field magnets provided with polar projections having segmental inner faces, an armature provided with generating coils, an igniter, a condenser and a circuit closer in operative relation to said coils, means for providing relative rotation of the armature and field magnets, means for operating the circuit closer to close the generating circuit during the final stage of the induction interval and breaking such circuit during the initial stage of reversed induction, substantially as described, and means for holding the circuit closer in circuit breaking position at all other stages.

2. A reversible igniter magneto generator provided with a normally retracted circuit closer adapted to close a generating circuit of the magneto during an interval commencing in the final stage of an induction interval and terminating in the initial stage of the succeeding induction interval.

3. A reversible igniter magneto generator provided with a normally open circuit closing arm, controlling a generator circuit, a rotor provided with a short cam in operative relation to said circuit closing arm, and arranged to actuate the arm to circuit closing position during the final stage of an induction interval and release it during the initial stage of the succeeding induction interval.

4. In an igniter magneto generator, the combination of a permanently magnetic circular field adapted to fit within the rim of a fly-wheel and composed of segmental permanent magnets arranged with like poles in proximity, and provided with inwardly extending polar projections.

5. In an igniter magneto generator, the combination of a permanently magnetic circular field adapted to fit within the rim of a fly-wheel and composed of segmental per-

manent magnets arranged with like poles in proximity, and provided with inwardly extending polar projections of differing weights.

6. In an igniter magneto generator, the combination with a support revolving upon a central axis, of a set of permanent magnets carried thereby and having inwardly extending segmental pole pieces, said magnets and pole pieces being of greater weight at one side of the central axis than at the other side.

7. In an igniter magneto generator, the combination with a support revolving upon a central axis, of a set of permanent magnets carried thereby and having inwardly extending segmental pole pieces, said magnets and pole pieces being of greater weight at one side of the central axis than at the other, in combination with a flat armature centrally pivoted to oscillate about said axis and provided with current generating windings.

8. In an igniter magneto generator, the combination with a support revolving upon a central axis, of a set of permanent magnets carried thereby and having inwardly extending segmental pole pieces, said magnets and pole pieces being of greater weight at one side of the central axis than at the other, in combination with a flat armature centrally pivoted to oscillate about said axis and provided with current generating windings, and means for closing a generating circuit through said windings during an interval commencing in the final stage of an induction interval and terminating in the initial stage of the succeeding induction interval.

9. In an igniter magneto generator, the combination with a support revolving upon a central axis, of a set of permanent magnets carried thereby and having inwardly extending segmental pole pieces, said support having a cam member revolving about said central axis and provided with a cam projection, in combination with an armature pivotally supported to oscillate upon said axis, generating windings carried by said armature, and a circuit closer for said windings adapted to be actuated by said cam projection to circuit closing position, said cam being formed to permit the circuit to remain open during nearly an entire revolution of said support and said projection being positioned to actuate said circuit closer to closing position during the final movement of one of the armature heads past one of said pole pieces to a point where magnetic induction is established through said head from the other pole piece, substantially as described.

10. An igniter magneto generator, including permanently magnetic segments adapted to fit within the rim of a fly wheel, and provided with segmental polar projections, a relatively stationary armature, having head pieces adapted for relative traverse through the magnetic field, a normally open circuit closing switch controlling the armature circuit, and a cam on the fly wheel shaft, and a switch operating device adapted for engagement with the cam only during a period beginning with the final stage of relative traverse of the magnetic field by the armature heads and ending with the initial stage of the succeeding traverse of such field by said heads.

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

HERMAN C. MUELLER.

Witnesses:

LEVERETT C. WHEELER,

H. C. VAN RYN.