E. S. HUFF.

MAGNETO.

APPLICATION FILED MAR. 2, 1908.

1,066,729.

Patented July 8, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

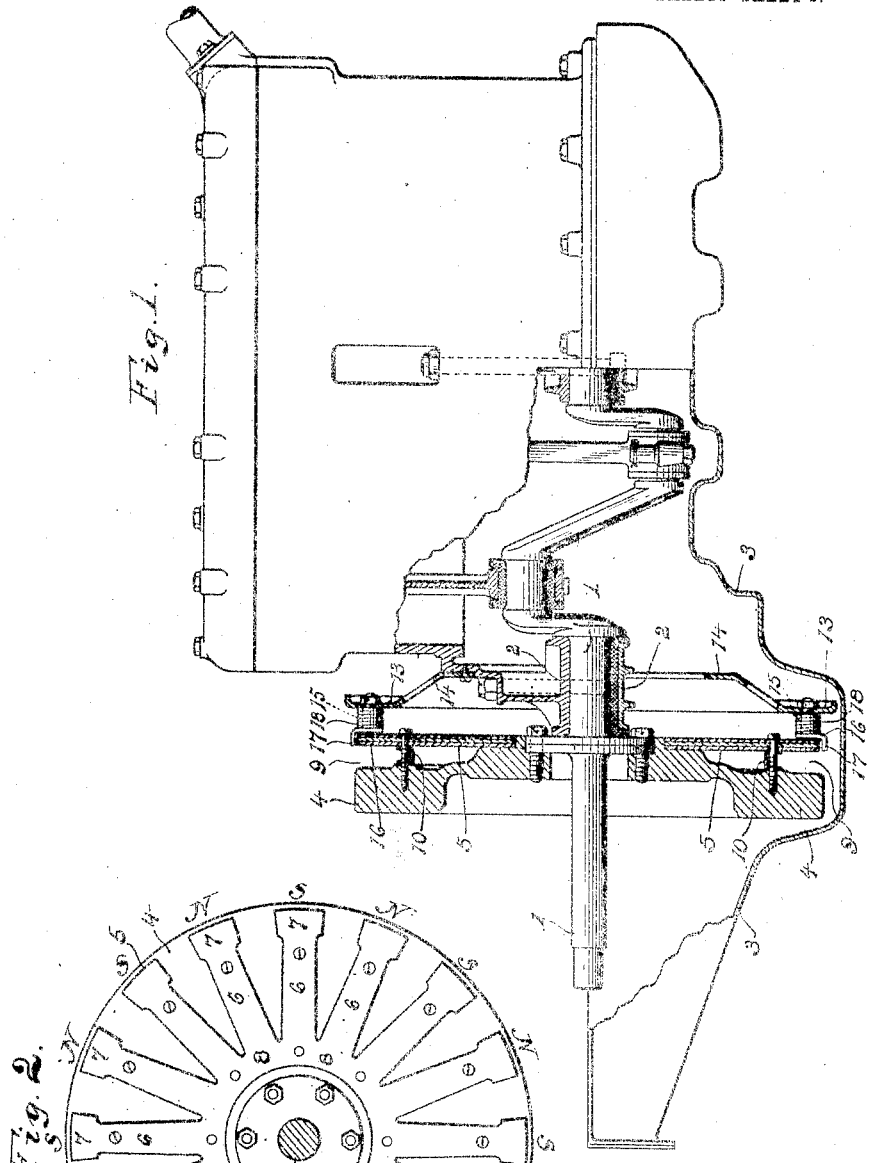
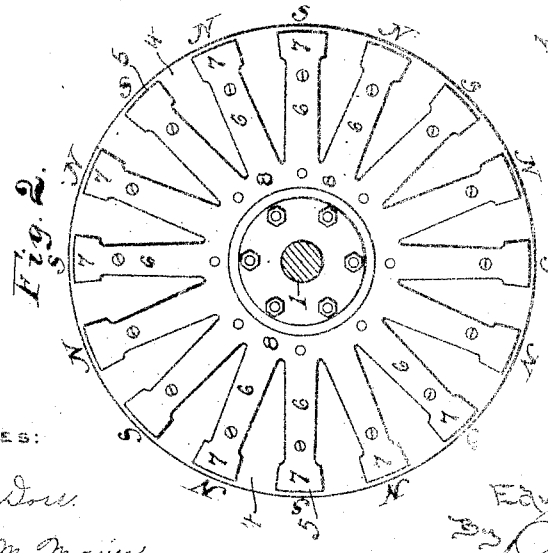


Fig. 2.



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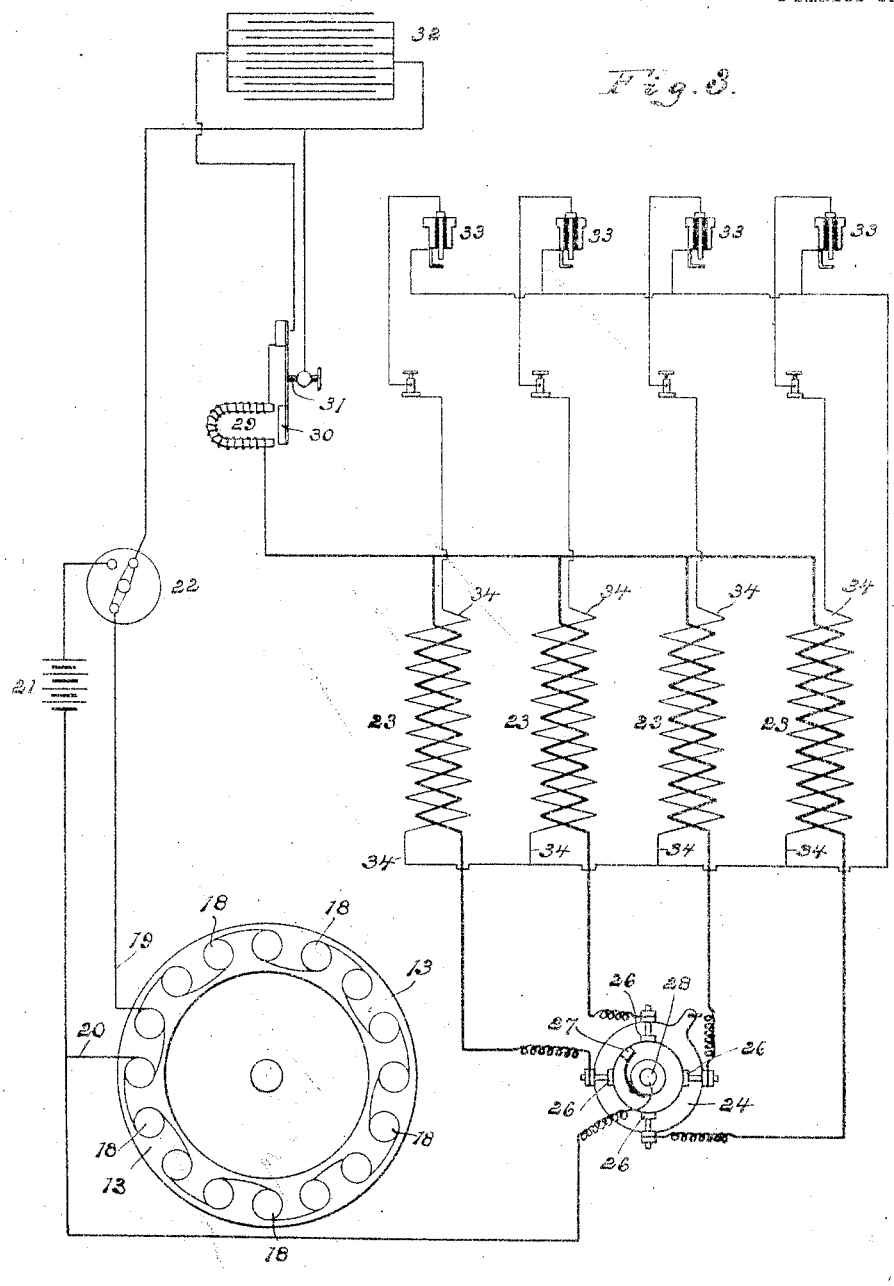

Fig. 3.

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MAGNETO.

1,066,729. Specification of Letters Patent. Patented July 8, 1913.

Application filed March 2, 1908. Serial No. 418,811.

To all whom it may concern:

Be it known that I, EDWARD S. HUFF, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Magnetos, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to electric igniters for use with internal combustion engines and in connection therewith to a magneto electric generator for generating the igniting current, the object of the invention being to devise means best adapted from a commercial point of view to the transportation style of engine such as the multi-cylinder engines of automobiles and like vehicles where it is most desirable to have few and simple parts which when once properly adjusted require no further adjustment or manual operation and therefore can be placed together with the engine and drive gear in an outer moisture and dust proof casing.

To this end my invention embodies a magneto electric generator of the general type in which the fly wheel of the engine constitutes the motor and which generates at the normal speed of the engine an alternating current of sufficiently high maximum intensity to produce an effective spark in the secondary of an induction apparatus and which is organized to generate the current at such a high frequency that a maximum current wave will always be impressed upon the igniting circuit in the interval of time the circuit is closed by the operation of a mechanical circuit breaker timed wholly with reference to the requirement of the engine and without any reference to the time period of the current, all as more fully hereinafter described and shown in the accompanying drawings, in which—

Figure 1 is a sectional elevation showing part of the engine and the fly wheel with my magneto generator combined therewith; Fig. 2 is an elevation of the fly wheel and of the permanent magneto secured thereto and Fig. 3 is a diagrammatic representation of the sparking device as arranged for a four-cylinder engine.

As indicated by reference letters in the drawing, 1 represents the crank shaft of the engine, 2 one of the bearings in which it is journaled, 3 the crank casing and 4 the fly wheel, all the parts being of well known construction and operation.

The fly wheel carries a multipolar field magnet composed of one or more hard steel disks 5 substantially of the diameter of the fly wheel and radially divided from the central portion outwardly into separate permanently magnetized single pole limbs 6 of considerable length and forming a circular range of alternate positive and negative field poles 7. The central portion of the disks integrally unites the limbs at their inner ends and forms a hub 8 of suitable size for the support of the magnet; it is apertured to engage with the hub of the fly wheel and is directly secured thereto while the limbs are magnetically insulated therefrom by an air gap 9 and firmly secured thereto by suitable non-magnetic fastenings 10.

In juxtaposition to the multipolar field on the side toward the crank casing an armature is provided which consists of a magnetically continuous iron ring 13 provided with bracket extensions 14 by means of which it is secured to the crank casing. To this ring are secured a series of soft iron cores 15 corresponding to the magnetic poles of the field and provided with pole pieces 16 which are counter-parts of the field poles 7 and provided with peripheral flanges 17 extending outwardly over the same. The cores are provided with generating coils 18 which are connected in series with each other into the external circuits of the generator.

The magnetic generator being constructed as shown and described it will be understood that in the normal operation of an internal combustion engine of the kind used on self-propelling vehicles in which the crank shaft revolves at a relatively high speed, the rapid changes of the magnetic flux in the generator will result in generating an alternating current of high intensity and of very rapid alternation and in utilizing this current for jump spark ignition any of the known means applicable to work in connection with primary or secondary battery currents may be used. I preferably use the arrangement shown in Fig. 3 in diagram which shows it as applied to a four cylinder engine and wherein 19 and 20 represent the leads from the generators, 21 a primary battery in a shunt around the generator adapted to supply the current for start...g

the engine, 22 a switch for cutting either the generator or battery out of circuit, 23 induction coils corresponding to the number of cylinders, 24 the stationary member of a mechanical circuit breaker, 26 the fixed contacts thereof, 27 the revolving contact member of the circuit breaker, 28 the shaft carrying the same and revolving it at the proper ratio of speed by suitable connection with the engine shaft, 29 the electro-magnet of an interrupter, 30 and 31 the contacts thereof, 32 a condenser in shunt around said contacts, 33 the spark plugs and 34 the secondaries of the induction coils including the spark plugs. The electrical connections between the different parts are conventionally represented in the diagram but it will be understood that as usual in the installation of these devices the engine cylinders and frame will form part of the circuits where it is more convenient to do so. The primaries of the induction coils are arranged in parallel and the circuit breaker being included in the main circuit of the generator opens and closes the circuit successively through the primaries in the order in which the spark is required and since the alternating current waves of the generator succeed each other at shorter periods of time than the interval of time between the closing and opening the circuit by the circuit breaker, there will always be a maximum current wave passing through the circuit and at this moment the magnet of the interrupter which is in series with the circuit breaker will attract the contact 30 and thus cause a rapid interruption of the current at the time of the passage of the maximum current wave and as a result a secondary current of maximum intensity will be generated in the secondary for the production of the spark. It will be seen from this operation that the magneto and the battery form interchanging sources of electricity with one and the same apparatus, merely by throwing the switch and the timing of the spark is accomplished with either source by the rotary adjustment of the contact carrying member 24 through suitable connection under the control of the operator. To make the timing uniform for all the cylinders, the number of poles of the field magnet of the generator must be an exact multiple of that of the engine cylinders and large enough to produce a current of such high frequency that a maximum current wave will always pass through the igniting circuit in the interval in which it is closed.

My construction of magneto-generator can be applied to most any kind of explosive engine of the transportation type; it requires but a limited space and as there is nothing that would need adjusting or oiling it can be inclosed by the general outer casing usually provided for the engine and drive mechanism. It adds but little extra weight to the fly-wheel and under no circumstances can it effect its balance since the magnet is in symmetrical relation thereto and the magnetic stress is equally distributed and active only through very small fraction of time during each revolution while at the same time the range for timing the spark is unlimited.

What I claim as my invention is:—

1. In an electric igniting device for explosive engines a fly-wheel magneto comprising a stationary circular series of bobbins wound with a generating conductor and mounted on the engine frame adjacent to the fly-wheel, a multipolar field magnet on the fly-wheel consisting of a permanently magnetized disk of steel of a diameter equal to that of the fly-wheel and centrally apertured, said disk composed of laminæ and radially divided from its central portion outwardly into separate single pole limbs integrally united at their inner ends with the undivided central portion of the disk, a fly-wheel provided with a central portion forming a seat for the central portion of the disk and to which the same is secured and with an outer portion forming an open space between it and the limbs of the magnet, means securing each limb separately to said outer portion at an interval therefrom and pole pieces mounted on the ends of the bobbins adjacent the poles of the field magnet and provided with flanges overlying the outer end faces thereof.

2. In an electric igniting device for explosive engines, a fly-wheel magneto comprising a multipolar field magnet mounted on the fly-wheel adjacent to the engine frame and consisting of a permanently magnetized steel disk composed of superposed laminæ radially divided from its central portion outwardly into separate single pole limbs integrally united at their inner ends to the undivided inner portion of the disk, said portion being apertured and secured upon the central portion of the fly-wheel and the limbs being singly secured to the fly-wheel near their outer ends, and a circular series of bobbins stationarily mounted on the engine frame in inductive proximity to the poles of the magnet, said bobbins provided with pole pieces conforming to the sides and ends of the polar ends of the limbs of the magnet.

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

EDWARD S. HUFF.

Witnesses:
C. R. Stickney,
Otto H. Barthel.