M. SCHÄFER.

MAGNETO ELECTRIC SPARKING APPARATUS.

APPLICATION FILED AUG. 20, 1919.

1,399,803.

Patented Dec. 13, 1921.

4 SHEETS—SHEET 1.

Fig.1.

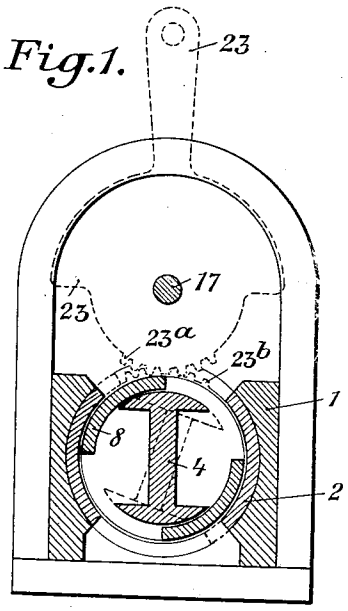


Fig.3.

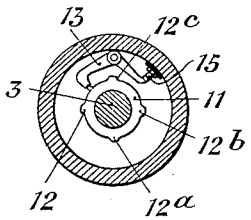
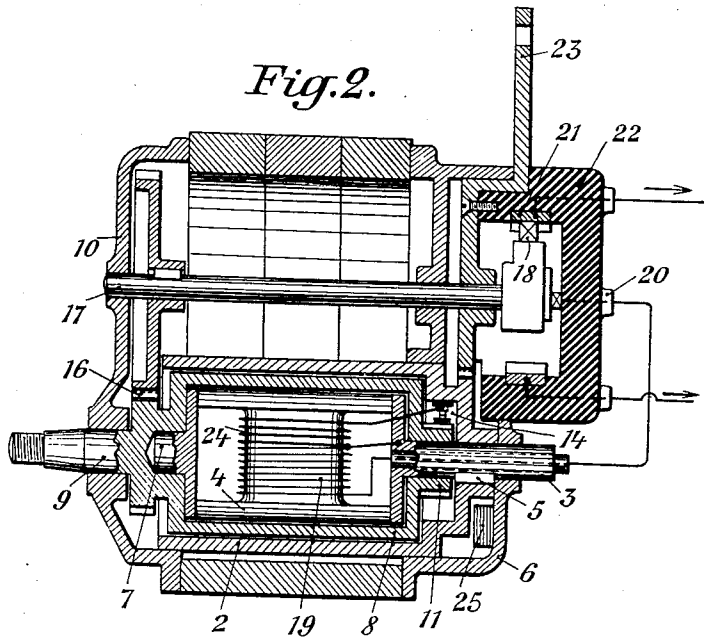


Fig.2.



Max Schäfer, INVENTOR

BY ATTORNEYS

Bennie Davis, Marvin & Edmonds.

M. SCHÄFER.

MAGNETO ELECTRIC SPARKING APPARATUS.

APPLICATION FILED AUG. 20, 1919.

1,399,803.

Patented Dec. 13, 1921.

4 SHEETS—SHEET 2.

Fig.4.

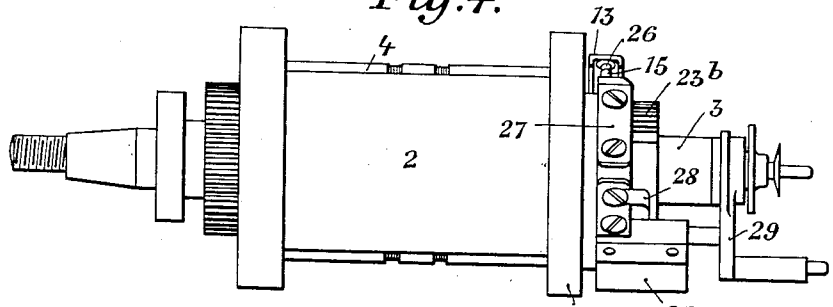


Fig.5.

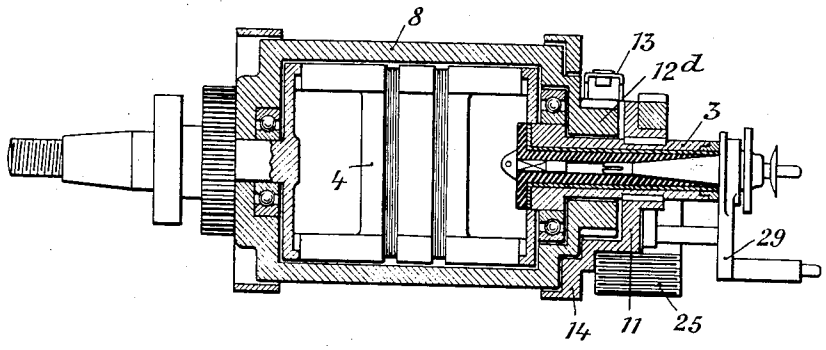


Fig.6.

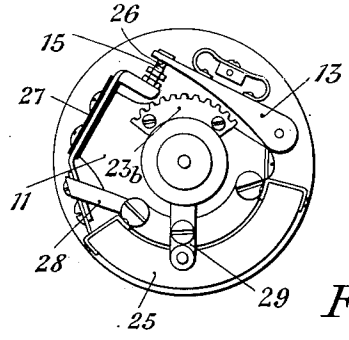


Fig.8.

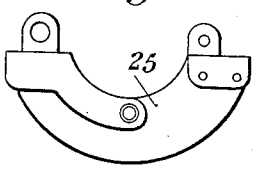
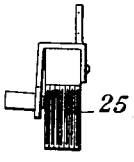


Fig.7.



INVENTOR

Max Schäfer.

BY ATTORNEYS

Pennie, Davis, Marvin & Edmonds.

M. SCHÄFER.

MAGNETO ELECTRIC SPARKING APPARATUS.

APPLICATION FILED AUG. 20, 1919.

1,399,803.

Patented Dec. 13, 1921.

4 SHEETS—SHEET 3.

Fig. 9.

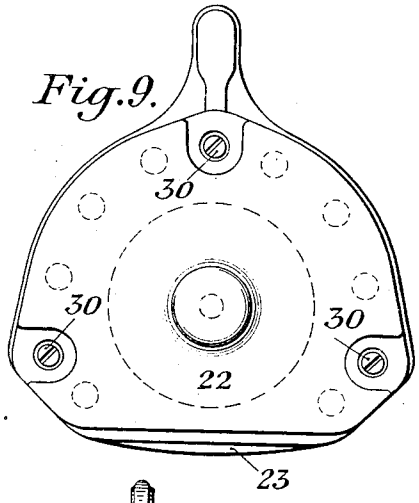
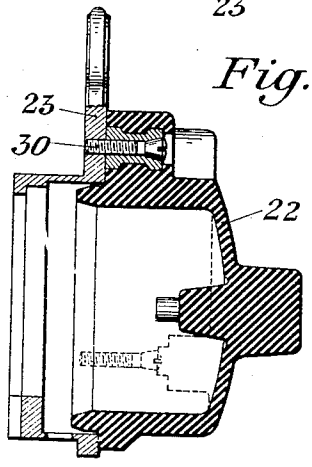


Fig. 10.



INVENTOR

Max Schäfer.

BY ATTORNEYS

Pennie, Davis, Marvin & Edmonds.

M. SCHÄFER.

MAGNETO ELECTRIC SPARKING APPARATUS.

APPLICATION FILED AUG. 20, 1919.

1,399,803.

Patented Dec. 13, 1921.

4 SHEETS—SHEET 4.

Fig. 11.

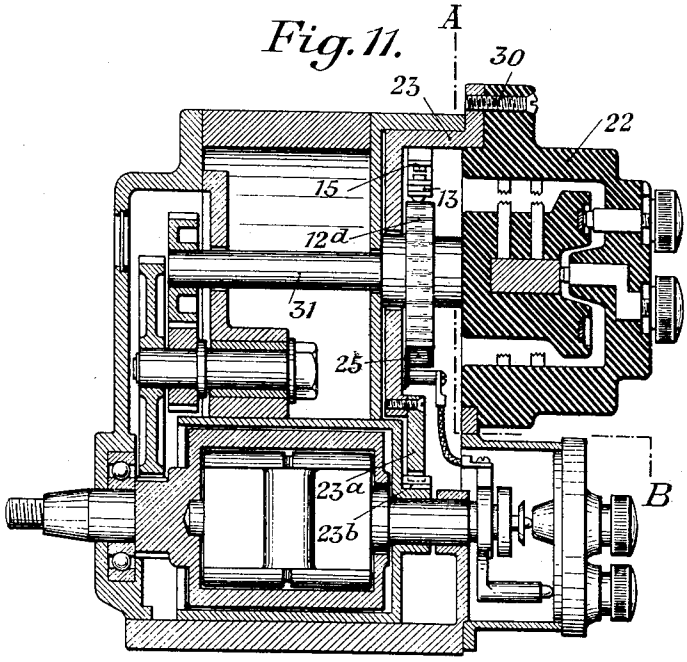
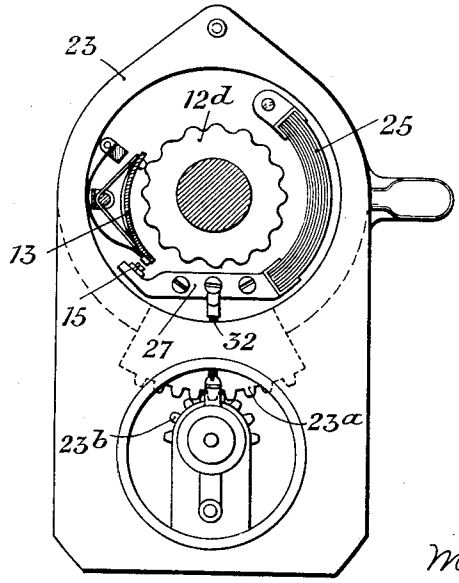


Fig. 12.



INVENTOR

Max Schäfer

BY ATTORNEYS

Pennie, Davis, Marvin & Edmonds.

UNITED STATES PATENT OFFICE.

MAX SCHÄFER, OF STUTTGART, GERMANY, ASSIGNOR TO FIRM OF ROBERT BOSCH AKTIENGESELLSCHAFT, OF STUTTGART, GERMANY.

MAGNETO-ELECTRIC SPARKING APPARATUS.

1,399,803. Specification of Letters Patent. Patented Dec. 13, 1921.

Application filed August 20, 1919. Serial No. 318,769.

To all whom it may concern:

Be it known that I, MAX SCHÄFER, a citizen of Germany, residing at and whose post-office address is Stuttgart, Johannesstrasse 96, Germany, have invented certain new and useful Improvements in Magneto-Electric Sparking Apparatus, (for which I have filed applications in Germany on Oct. 20, 1915, Feb. 28, 1916, March 15, 1916, June 23, 1917, and in Austria Oct. 1, 1917;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

It is known that in the ordinary sparking magneto generator with revolving armature a slotted cylindrical shell may be provided and adjusted to extend the edges of the pole faces when the interrupter is shifted into the late igniting position, in order to cause the spark to occur at the moment in which the change in lines of force is greatest. These magnetos produce only two sparks during each revolution. Sparking generators are also known in which a slotted shell rotating between a stationary armature and the inner pole faces of the field magnets controls the path taken by the lines of force through the armature. These generators produce four sparks during each revolution, but are deficient in that the spark occurs at the instant when the change in lines of force is greatest for only one particular time of ignition, thus materially reducing the strength of the spark for certain settings of the interrupter.

The present invention combines the advantages of both these known systems and at the same time avoids their drawbacks by obtaining a generator that produces four sparks per revolution and changes in lines of force equally great for all times of ignition. This is accomplished by constructing a magneto generator with a stationary armature, stationary field magnets having curved adjustable pole faces, and flux controlling pieces rotating between the poles and the armature. The pole faces and armature are interconnected so that they may be shifted together when the time of ignition is changed, the pole faces in their shifted position providing a path for the lines of force causing them to pass through the armature in the same relative direction as before, and consequently producing equal changes in the lines of force at all times of ignition.

The invention is illustrated in the drawing in which—

Figure 1 shows a cross section of the magneto.

Fig. 2 a longitudinal section of the magneto and

Fig. 3 a cross section of the interrupter of a type of the new magneto generator in which the interrupter is inserted in the interior of the adjustable field-shifting shell.

Fig. 4 illustrates a lateral view,

Fig. 5 a vertical section,

Fig. 6 an end view of an adjustable shell set belonging to a magneto generator and

Figs. 7 and 8 a section and a front view of a second of form of a condenser thereof, while,

Fig. 9 represents a front view and

Fig. 10 a vertical section of the adjusting handle with the distributing disk.

Fig. 11 shows a longitudinal section and

Fig. 12 an end-view of a modification of the new magneto generator in which the interrupter is built into the adjusting handle.

Abutting against the faces of the pole pieces 1 of a magneto generator is a shell 2 which is arranged so that a partial turn may be imparted to it. It is fixed by a key 5 to the shaft 3 of the armature 4. The shaft 3 of the armature 4 rests at one end in the side plate 6 and at the other end the armature is held by a stud 7 in the end wall of the rotating shell or flux-controlling member 8. A shaft 9 which is fixed to this shell, and which is coupled in a known manner to the internal combustion engine, is journaled in the side-plate 10, and at the other end the flux-controlling shell has a collar 11 that is journaled on the shaft 3 of the armature. On the periphery of the collar or hub 11 are the four cam projections or teeth 12, 12^a, 12^b, 12^c of the interrupter and the interrupter arm 13 rocks on a pivot attached to the inner surface of the end wall 14 of the adjustable shell 2. Opposite to the rocking contact of the interrupter arm is the fixed insulated contact 15. The rotating flux-controlling shell 8 revolves the distributer shaft 17 by means of the spur-wheel 16 and upon this shaft the rotating carbon brush 18 is fixed in the well-known manner. The sparking current is conducted to this brush from the secondary winding 19 of the armature by the terminal 20. The distributer segments 21 are embedded in the distributer disk 22 which is screwed fast to

the handle 23 by which the time at which ignitions take place is adjusted or set, this handle being mounted in a bearing in the side-plate 6 so that it may be swung to and fro. Attached to the adjusting handle 23 is a toothed segment 23^a which coöperates with a toothed segment 23^b that is arranged upon the adjustable shell 2. The primary winding 24 is connected to the insulated interrupter contact 15 and the coöperating interrupter contact is connected to the body of the generator. The condenser 25 is connected in parallel to the interrupter so as to form a shunt thereof.

The device operates as follows:

The two flux-controlling pieces forming the rotating shell give rise to four reversals of the magnetic flux in the armature and to four surges of pressure during each revolution in the known manner.

To change the time at which sparking takes place the adjusting handle 23 is swung over so that the adjustable shell 2 together with the armature 4 are turned. In Fig. 1 the adjustable shell is illustrated in solid lines in the position in which an early ignition would take place, and the position in which a late ignition would insure is indicated by broken lines. The interrupter is also shifted relatively to the cam teeth 12, 12^a, 12^b, 12^c when the adjusting shell is turned. As the distributed disk 22 is screwed fast to the adjusting handle 23 it also participates in the said movement so that in the case of late ignitions the distributer segments are reached later by the carbon distributing brush than if early ignitions occur.

In the adjustable magneto generator set shown in Figs. 4 to 8, in which the end-plate 14 of the adjustable shell is adapted to support the interrupter, the shell is formed with a hub and is supplied with a cap 11 into which the cam-ring 12^d attached to the shell 8 is inserted. The cap 11 has an aperture through which the interrupter arm or oscillator 13, that carries the movable platinum contact 26 and that is pivotally mounted on the end-plate, projects so as to engage with the cam-ring 12^d. The fixed platinum contact 15 is arranged upon a connecting piece 27 fixed to, but insulated from, the cap 11, the connecting piece being electrically connected by a suitable conductor 28 to the current-transferring member 29 that is fixed on the armature shaft. The conductor 28 is also connected to the condenser 25 whose shape is adapted to the round form of the end-plate. Fixed upon the cap 11 is the toothed segment 23^b which meshes with the toothed segment 23^a attached to the adjusting handle that is fitted into the rear side-plate of the magneto generator so as to be capable of being rocked, and to which the distributer disk 22 furnished with distributing segments is fixed by screws 30.

By mounting the interrupter and the condenser together upon a common base, and by making the end-plate of the adjustable shell in the shape of a cam-ring for the interrupter, a very compact construction of the whole adjustable set, and also a complete inclosure of the conductors connecting the armature with the interrupter, without the aid of any kind of rubbing contacts or wire connections, is obtained.

If the interrupter is not arranged upon the end-plate of the adjustable shell, but inside the adjusting handle 23, the cam-disk 12^b is mounted on the distributer shaft 31, Fig. 11, and one end of the interrupter arm 13, which is pivoted in the adjusting handle, is arranged to bear upon the cam-disk. The stationary platinum contact 15 is mounted upon a connecting piece 27 to which the condenser 25 is connected similarly as in the set hereinbefore described, the connecting piece 27 and the condenser 25 being fixed to the adjusting handle and the shape of the condenser being adapted to the free space left between the border of the adjusting lever and the cam-disk 12^d. A short wire 32 connects the connecting piece 27 to the primary winding of the armature.

By arranging the interrupter and the condenser upon the adjusting handle of the distributer and by mounting the cam disk upon the distributer shaft, access to these parts and to the electrical connections between the condenser and the primary winding of the armature is made much more convenient; the more so because they are then situated much higher up and not so near to base-plate as if they were mounted upon the end-plate of the adjustable shell.

Sparking points may be provided in the distributer disk instead of wiped segments, particularly in the case of multicylinder engines. The sparking points may be arranged in parallel rows. A set of rotating current-distributing sparking points, which are interconnected and which correspond in number to the number of said parallel rows, are mounted upon the rotary distributing member so as to pass opposite to the said rows when the sparking apparatus is working.

By using this arrangement a reduction of the diameter of the distributer disk may be effected.

I claim:—

1. Magneto-electric sparking apparatus comprising, a stationary armature, a field magnet with pole pieces opposite to the said armature, movable pole faces between the pole pieces and coupled with the said armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, and means for turning the

movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, substantially as described.

2. Magneto-electric sparking apparatus comprising, a stationary armature, a frame comprising a side-plate at each end of the armature, a field magnet with pole pieces opposite to the sides of the said armature, movable pole faces between the pole pieces and coupled with the armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, and means for turning the movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, the said movable pole faces together with the flux-directing members and the armature forming a set of parts having a common supporting member in each of the said plates at the ends of the armature.

3. Magneto-electric sparking apparatus comprising, a stationary armature, a frame comprising a side-plate at each end of the armature, a field magnet with pole pieces opposite to the sides of the said armature, movable pole faces between the pole pieces and coupled with the armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, means for turning the movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, a shaft attached to the said armature and supported in one of the said side-plates, a shaft attached to the one end of the said flux-directing member and journaled in the second of the said side plates, the other end of the flux-directing member being journaled on the said armature shaft, and a pivotal connection between the flux-directing member and the end of the armature that is opposite to the armature shaft.

4. Magneto-electric sparking apparatus comprising, a stationary armature, a field magnet with pole pieces opposite to the said armature, movable pole faces betwen the pole pieces and coupled with the said armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, a handle for turning the movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, a rotating current distributing member, and a stationary distributer member fixed to the said handle so as to participate in its movement.

5. Magneto-electric sparking apparatus comprising, a stationary armature, a field magnet with pole pieces opposite to the said armature, movable pole faces between the pole pieces and coupled with the said armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, a handle for turning the movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, a rotating current distributing member, a stationary distributer member fixed to the said handle so as to participate in its movement, a condenser and an interrupter with a fixed and an oscillating contact fixed to the said handle, a primary and a secondary winding on the said armature, and a wire connection joining the said fixed interrupter contact, the condenser and the primary armature winding.

6. Magneto-electric sparking apparatus comprising, a stationary armature, a field magnet with pole pieces opposite to the said armature, movable pole faces between the pole pieces and coupled with the said armature, magnetic flux-directing members adapted to rotate between the pole faces and the armature, a handle for turning the movable pole faces with the armature so as to shift the magnetic flux that passes from the said pole pieces through the armature, a rotating current distributing member, a stationary distributer member fixed to the said handle so as to participate in its movement, a condenser and an interrupter with a fixed and an oscillating contact fixed to the said handle, a primary toothed segment fixed to the said handle, a secondary toothed segment meshing with the primary segment and fixed to the said movable pole faces, a primary and a secondary winding on the said armature, and a wire connection joining the said fixed interrupter contact, the condenser and the primary armature winding.

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

MAX SCHÄFER.

Witnesses:
ADOLF LEBBERS,
HERMANN SCHNEIDER.