No. 778,707. PATENTED DEC. 27, 1904.

F. REICHENBACH.

IGNITING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 26, 1904.

2 SHEETS—SHEET 1.

Fig. 1

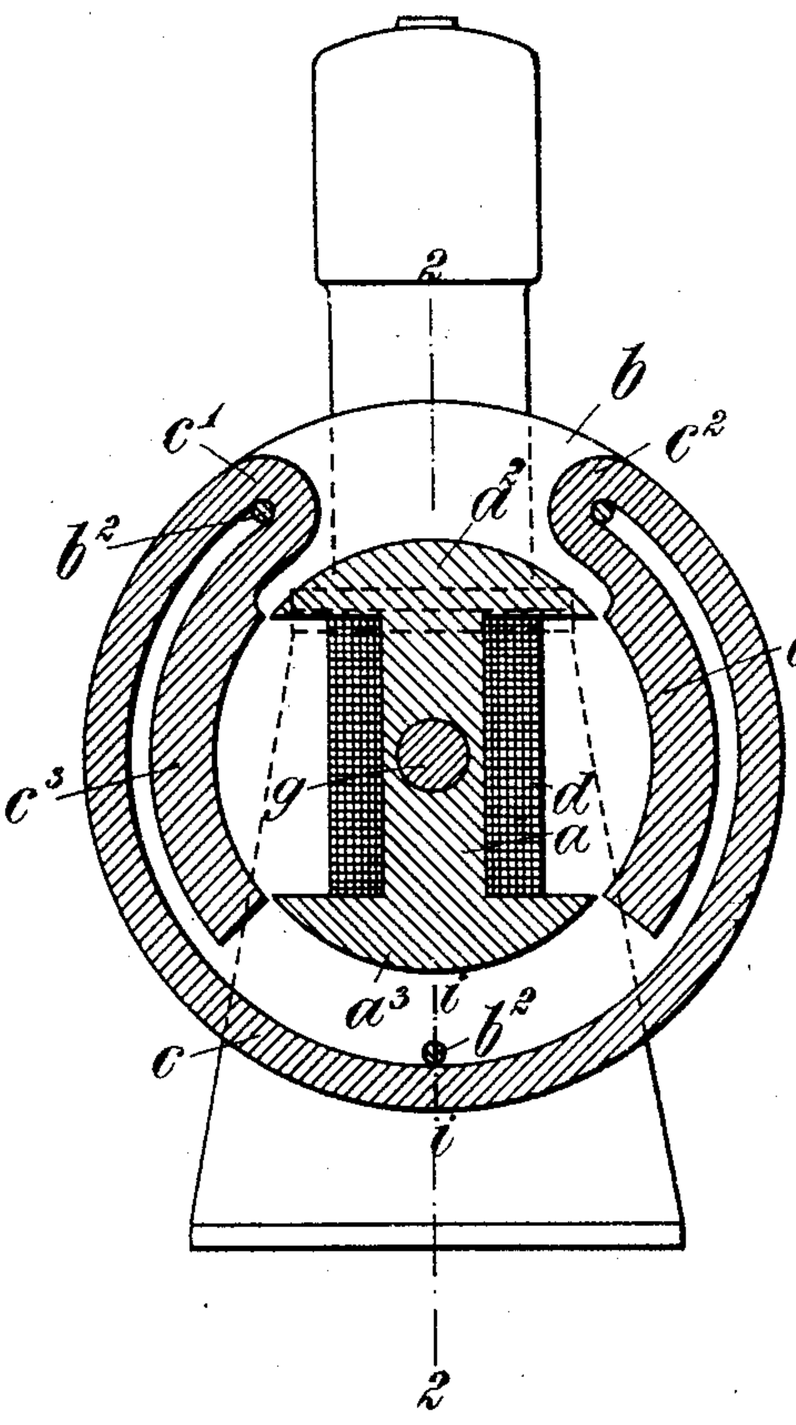

Fig. 2

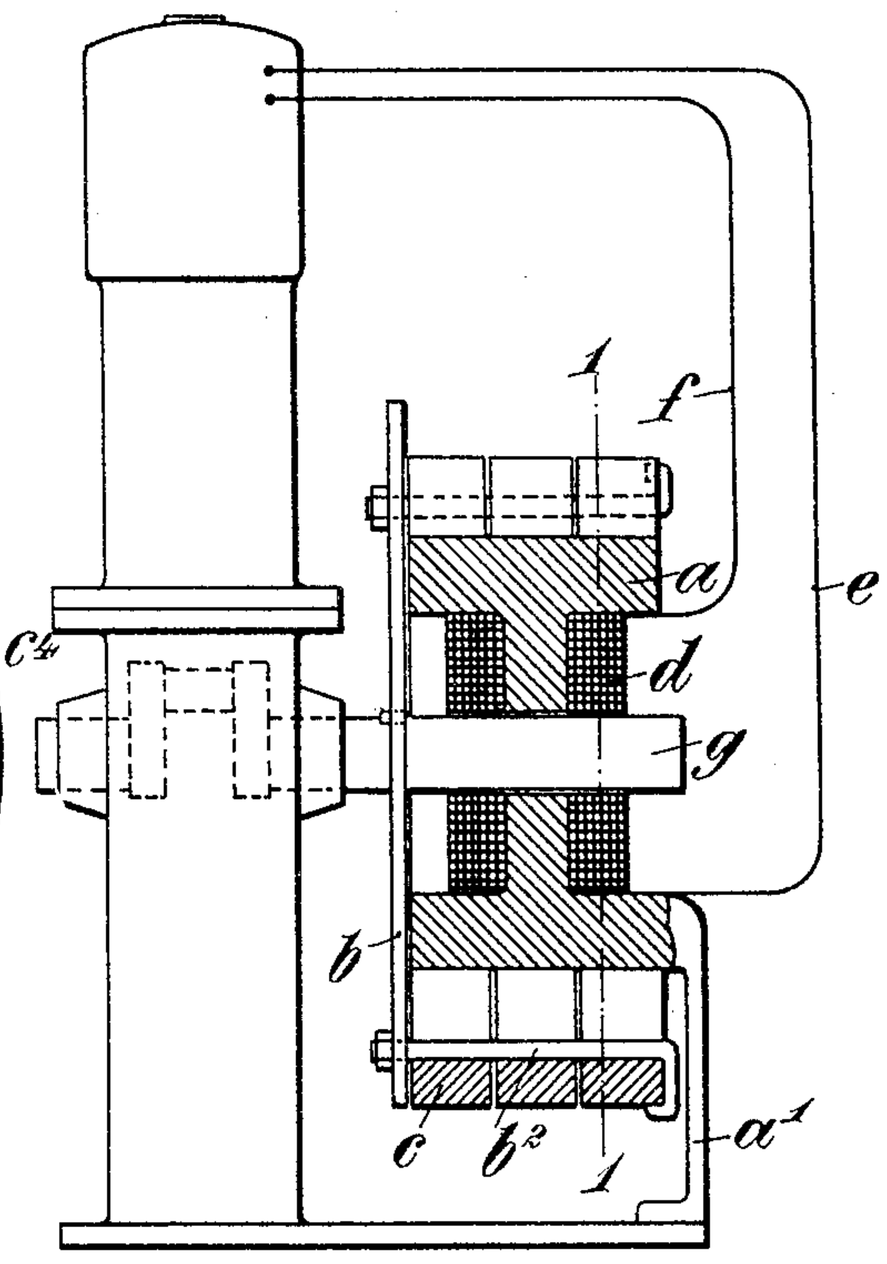

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Fig. 3

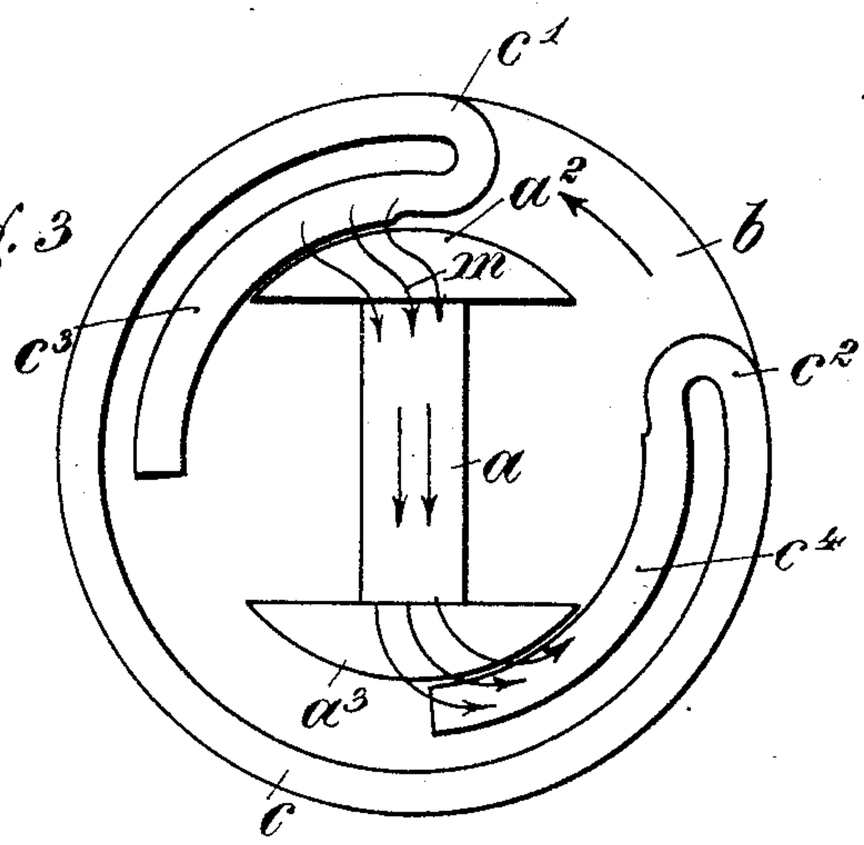


Fig. 4

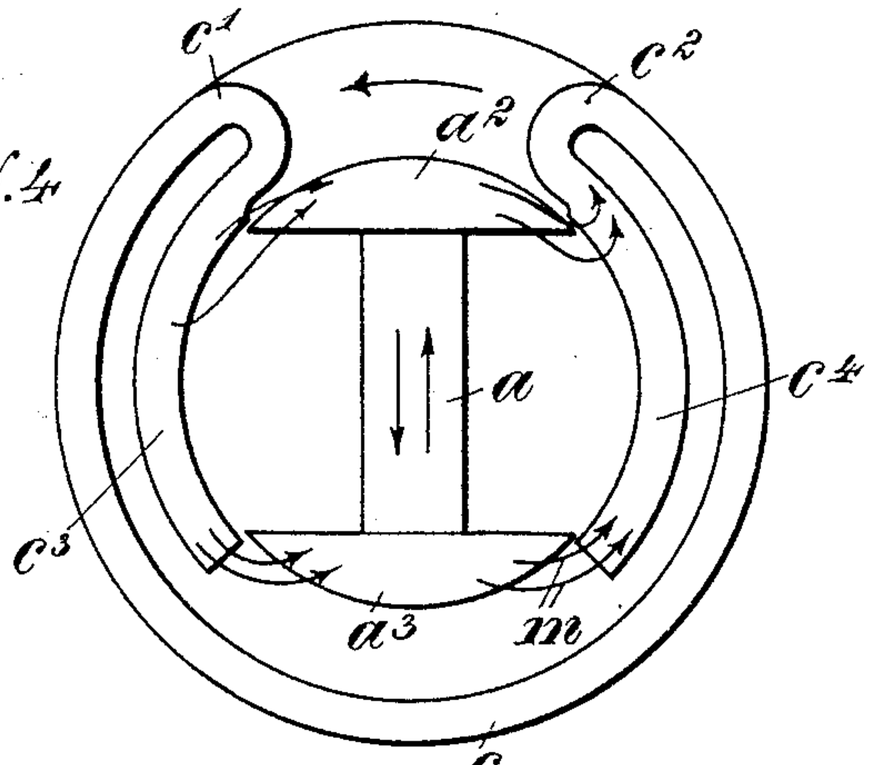
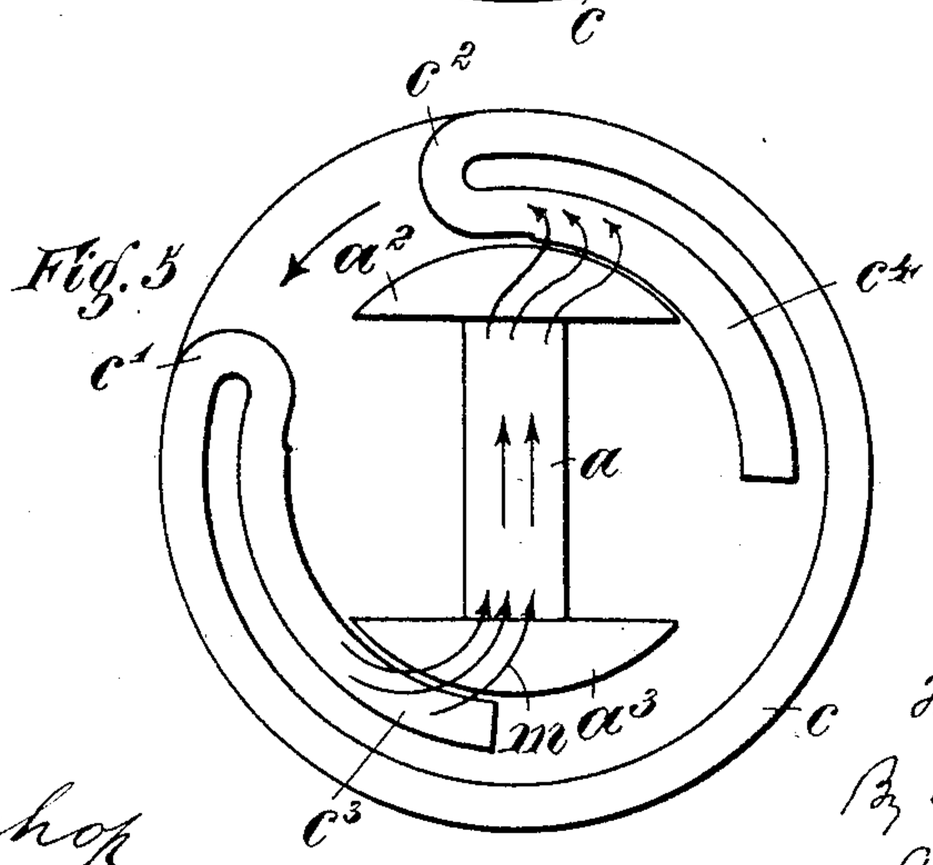


Fig. 5



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UNITED STATES PATENT OFFICE.

FRITZ REICHENBACH, OF CHARLOTTENBURG, GERMANY.

IGNITING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 778,707, dated December 27, 1904.

Application filed February 26, 1904. Serial No. 195,414.

To all whom it may concern:

Be it known that I, FRITZ REICHENBACH, civil engineer, a subject of the King of Prussia, German Emperor, residing at No. 14 Bismarck-strasse, Charlottenburg, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Igniting Devices for Internal-Combustion Engines, of which the following is a specification.

This invention relates in general to igniting devices for internal-combustion engines in which the charge is ignited by electric sparks, and in particular to a combination of the means for producing the sparks with the fly-wheel of the engine or, more precisely, to the combination of the latter with the magnet and the armature of the electric inductor, the object being to reduce the weight of the engine and to make the latter cheaper and its erecting lighter and to prevent air-gaps occurring between the ends of the pole-pieces of the magnets and the end pieces of the armature of the bobbin, whereby the power exerted by the magnet on said armature will not be interrupted or diminished in any position of the magnet, and particularly during the change of the direction of the magnetic power-lines.

A preferred form of construction of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional view taken on the line 1 1 of the Fig. 2. Fig. 2 is a vertical sectional view taken on the line 2 2 of Fig 1, the engine being shown in side elevation; and Figs. 3 to 5 show diagrammatically three different positions of the fly-wheel of the engine in relation to the stationary armature of the inductor.

The fly-wheel consists in the example shown of a disk b, manufactured of non-magnetic material—such, for instance, as brass or bronze or the like—the tire of the wheel being formed by a permanent magnet c, the main part of which is circularly bent, so as to correspond to the circular shape of the disk b, whereas the ends c' c^2 are bent inward to form the concentric poles c^3 c^4, one pole being located diametrically opposite the other. The length of the legs of the magnet, measured from the neutral line i i to the commencement of the pole-pieces c^3 c^4, is obviously very great, which is highly favorable for the intensity and long effectiveness of the magnet, and thus of the whole inductor. The magnet is shown in the drawings as formed of three sections of corresponding shape, each section being an independent magnet. It is obvious, however, that it may be formed of only one section or magnet.

The disk b is rigidly secured to the drive-shaft g by any suitable means, a key being shown in the drawings for this purpose. The magnet may be secured to the disk in any suitable manner, preferably by clamping-bolts b^2, as shown in the drawings.

The armature a of the inductor is surrounded by a bobbin d, being in circuit with the poles of the igniter device by means of the wires e f. The said armature is stationarily supported concentric with the drive-shaft g and between the poles of the magnet by means of a post a', the shaft passing loosely through the center of the armature. This armature is I-shaped, and its flanges a^2 a^3 are very broad in such a manner that the magnetic power-lines passing from the north pole c^3 to the south pole c^4 of the magnet must go in each position of the latter not through the air, but always through the stationary armature a, as will be clearly seen from Figs. 3 to 5. In the one end position of the magnet (see Fig. 3) in which its north pole c^3 is in front of the above flange a^2 of the armature a all power-lines represented by the arrows m go from above to below through the armature a to the south pole c^4 of the magnet, while in the other end position, Fig. 5, in which the north pole is in front of the lower flange a^3 of the armature, they go from below to above.

In the middle position of the magnet, Fig. 4, the north pole is in front of the left portions of both flanges a^2 a^3 of the armature a, so that each flange forms a bridge for the magnetic lines between one end of the north pole to the corresponding end of the south pole. In this middle position, in which the change of the direction of the magnetic lines takes place, the electric current is generated, as is well known, by changing the excitation of the armature a by means of poles c^3 c^4 of the mag-

net. It may be seen that in all positions of the magnet the power-lines go through the iron core of the armature, but never through the air, the power of the magnet therefore being not diminished and very strong sparks during the change of the direction of the magnetic power-lines being obtained.

Having now described my invention, what I desire to secure by Letters Patent of the United States is—

1. In a quick-running internal-combustion engine, the combination with the engine-shaft and the means for rotating it, of a fly-wheel, a magnet fixed thereto, an I-shaped stationary armature, formed with end pieces which are as long as the spaces between the ends of the poles of the magnet and completely bridge said spaces during the rotation of the magnet, a bobbin surrounding said armature, whereby the rotation of the fly-wheel will generate an electric current in said bobbin and there will be no air-gap between the armature and magnet during the rotation of the magnet, and means for utilizing the currents thus generated for igniting the explosive mixture in the engine-cylinder.

2. In a quick-running internal-combustion engine the combination of a fly-wheel, a circular permanent magnet fixed thereto, an I-shaped stationary armature embraced by said magnet and formed with end pieces as long as the spaces between the ends of the poles of the magnet said end pieces completely bridging said spaces during the rotation of the magnet, and adapted to be excited by the poles of the same; a bobbin surrounding said armature, whereby the rotation of the magnet will generate an electric current in said bobbin and there will be no air-gap between the armature and magnet during the rotation of the magnet, and means for utilizing the currents thus generated for igniting the explosive mixture.

3. In a quick-running internal-combustion engine, the combination with a fly-wheel, a circular permanent magnet fixed thereto and adapted to form the tire of the same, an I-shaped stationary armature embraced by said magnet and formed with end pieces as long as the spaces between the ends of the pole-pieces of the magnet said end pieces completely bridging said spaces during the rotation of the magnet, and adapted to be excited by the poles of the same; a bobbin surrounding said armature and there will be no air-gap between the armature and magnet during the rotation of the magnet, and means for utilizing the currents generated in said bobbin for igniting the explosive mixture.

4. In a quick-running internal-combustion engine, the combination of a fly-wheel consisting of non-magnetic material, a magnet fixed thereto and adapted to form the tire of the same, an I-shaped stationary armature adapted to be excited by the poles of said magnet, and formed with end pieces as long as the spaces between the ends of the pole-pieces of the magnet said end pieces completely bridging said spaces during the rotation of the magnet; a bobbin surrounding said armature, and means for utilizing the currents generated in said bobbin for igniting the explosive mixture required for driving the said fly-wheel with its magnet, as set forth.

5. In a quick-running internal-combustion engine, the combination of a fly-wheel consisting of non-magnetic material, a circular permanent magnet fixed thereto and adapted to form the tire of the same, an I-shaped stationary armature embraced by said magnet and adapted to be excited by the poles of the same, and formed with end pieces as long as the spaces between the ends of the pole-pieces of the magnet said end pieces completely bridging said spaces during the rotation of the magnet, a bobbin surrounding said armature, and means for utilizing the currents generated in said bobbin for igniting the explosive mixture.

6. In a quick-running internal-combustion engine, the combination of a fly-wheel consisting of non-magnetic material; a circular permanent magnet fixed to said fly-wheel and adapted to form the tire of the same and having its pole-pieces formed by bent-up portions embraced by its legs, said pole-pieces being at diametrically opposite points and concentric with the tire portion; an I-shaped stationary armature embraced by said magnet and adapted to be excited by the poles of the same, and formed with end pieces as long as the spaces between the ends of the pole-pieces and adapted to completely bridge said spaces during the rotation of the magnet; a bobbin surrounding said armature, and means for utilizing the currents generated in said bobbin for igniting the explosive mixture.

7. In a quick-running internal-combustion engine, the combination with the engine-shaft and the means for rotating it, of a fly-wheel, consisting of non-magnetic material, a circular permanent magnet fixed to said fly-wheel and adapted to form the tire of the same and having its pole-pieces formed by bent-up portions embraced by its legs, an I-shaped stationary armature embraced by said magnet and adapted to be excited by the poles of the same, the flanges of said armature forming a complete bridge between the poles of the magnet, a bobbin surrounding said armature, and means for utilizing the currents generated in said bobbin for igniting the explosive mixture.

8. In an internal-combustion engine the combination of a fly-wheel, a circular permanent magnet fixed thereto and having its poles arranged at diametrically opposite points and separated from each other, a stationary wound armature embraced by said magnet and adapted to be excited by the poles of the same, end

pieces formed on said armature, said pieces being long enough to completely bridge the spaces between the ends of the armature-poles during the rotation of the magnet, whereby no air-gap occurs during the rotation of the magnet.

9. The combination of a rotatable magnet having its poles arranged at diametrically opposite points and separated from each other, a stationary wound armature embraced by said magnet and adapted to be excited by the poles of the same, end pieces formed on said armature, said pieces being long enough to completely bridge the spaces between the ends of the armature-poles during the rotation of the magnet, whereby no air-gap occurs during the rotation of the magnet.

10. In an internal-combustion engine the combination of a fly-wheel formed of non-magnetic material, a series of circular permanent magnets fixed to said fly-wheel side by side and adapted to form the tire of the same and having their pole-pieces formed of bent-up portions, said bent portions lying within the tire portion and concentric therewith, said pole-pieces being diametrically opposite each other and separated from each other a suitable distance, an I-shaped stationary armature embraced by said magnet and adapted to be excited by the poles of the same, the heads of said armature being longer than the spaces between the ends of the pole-pieces of the magnet whereby the magnet will exert a uniform force on the armature during the rotation of the magnet and the current generated will not be diminished at the spark interval, a bobbin surrounding said armature, and means for utilizing the currents generated in said bobbin for producing a spark during the change of direction of the magnetic lines of force.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FRITZ REICHENBACH.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.