No. 732,364. PATENTED JUNE 30, 1903.

# H. G. MEARS & H. W. AYLWARD.

## ELECTRIC IGNITER.

APPLICATION FILED NOV. 19, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

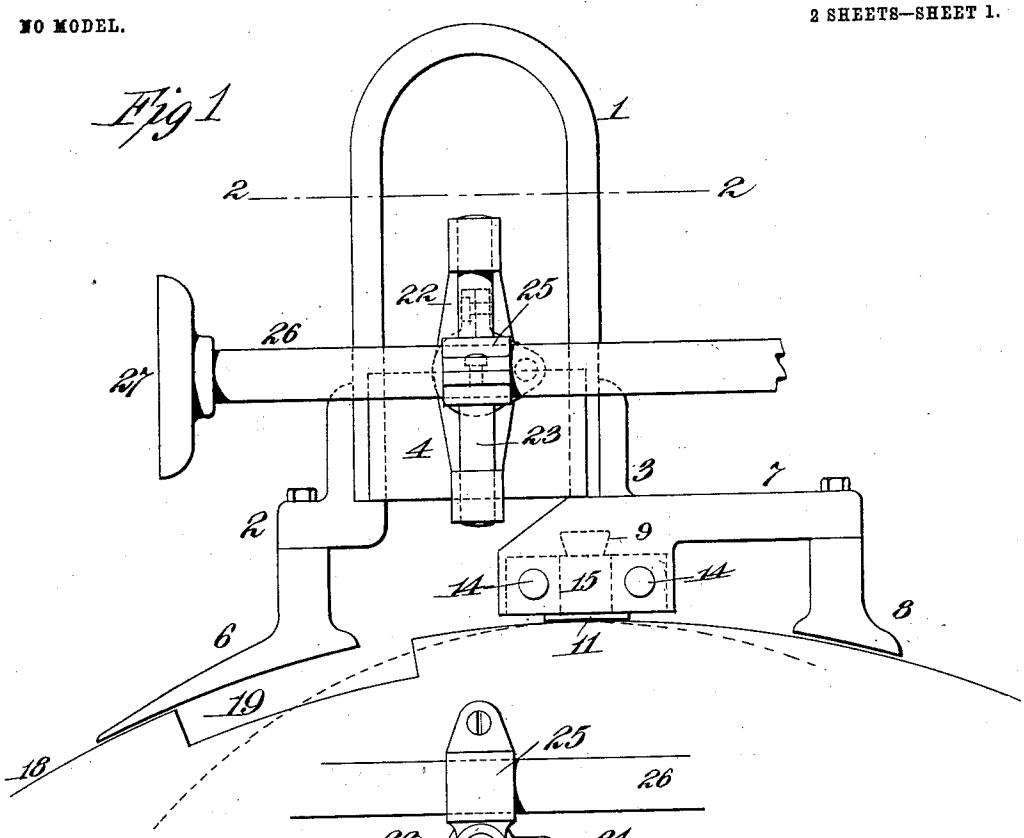
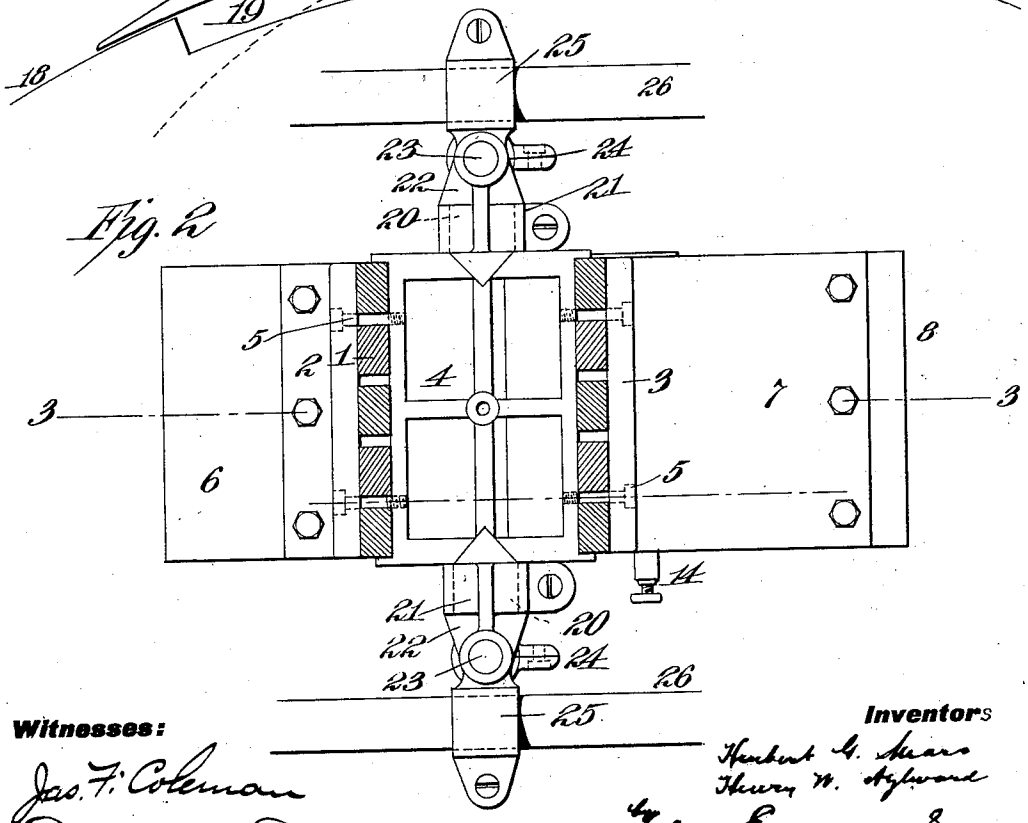



Fig. 2




**Witnesses:**

Jas. F. Coleman

Jno. Robt. Taylor

**Inventors**

Herbert G. Mears

Hiram W. Aylward

by Byrn Edmonds & Byrn

*Attorneys*

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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ELECTRIC IGNITER.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3

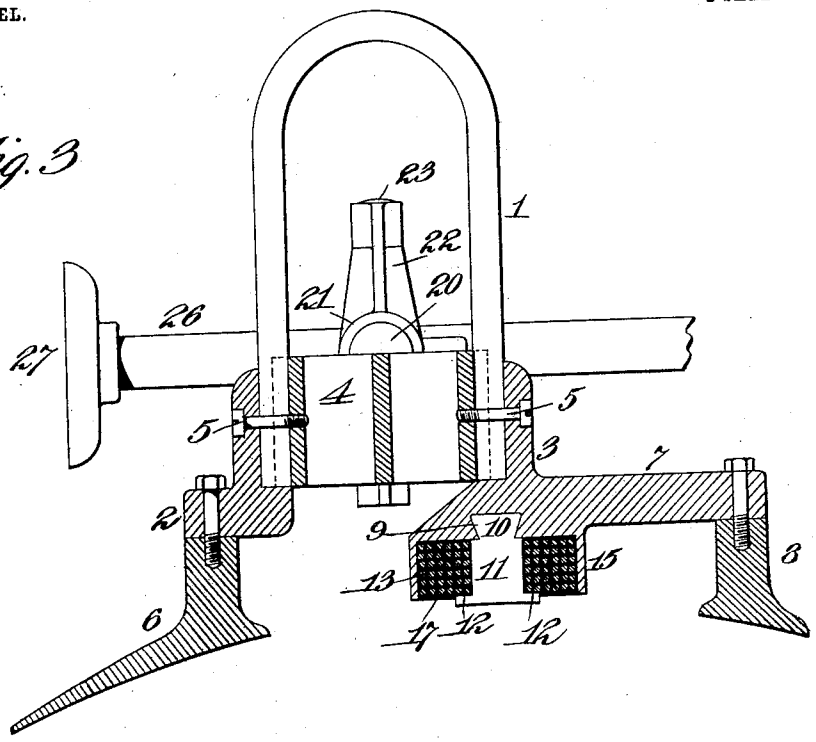
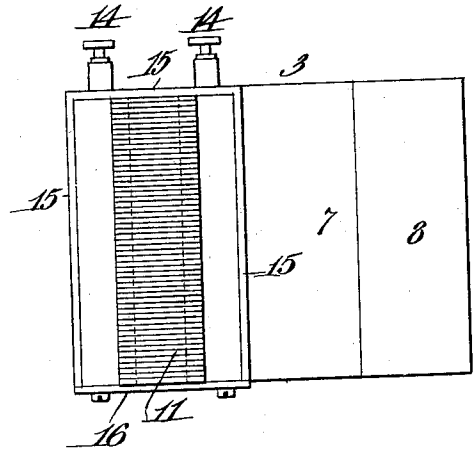



Fig. 4




Witnesses:

Jas. F. Coleman

Jno. Robt. Taylor

Inventors

Herbert G. Mears

Henry W. Aylward

by Byer Edmonds & Byer

Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 732,364. Patented June 30, 1903.

# UNITED STATES PATENT OFFICE.

HERBERT G. MEARS, OF NEW YORK, AND HENRY W. AYLWARD, OF BROOKLYN, NEW YORK, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE AUTO-IGNITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

## ELECTRIC IGNITER.

SPECIFICATION forming part of Letters Patent No. 732,364, dated June 30, 1903.

Application filed November 19, 1902. Serial No. 131,971. (No model.)

*To all whom it may concern:*

Be it known that we, HERBERT G. MEARS, residing in the borough of Manhattan, and HENRY W. AYLWARD, residing in the borough of Brooklyn, city of New York, State of New York, both citizens of the United States, have invented a certain new and useful Improvement in Electric Igniters, of which the following is a description.

Our invention relates generally to apparatus for generating an intermittent or alternating electric current and specifically to electric igniters for use with internal-combustion engines, blasting apparatus, and analogous devices.

The type of igniter to which the invention specifically relates is that invented by Leon J. Le Pontois, wherein a permanent magnet is employed having one of its poles surrounded by a coil and employing an inductor arranged to be relatively moved with respect to the magnet to thereby generate an electric impulse in the coil. When the device is employed in connection with internal-combustion engines, the fly-wheel may be conveniently used as the inductor, and the relative movement of the inductor and magnet can be effected by cutting a notch in the fly-wheel, which notch can be either left as an air-gap or be filled with non-magnetic material, like bronze, for example.

The object of our present invention is generally to improve and simplify the construction of an igniter of this type, to more conveniently adapt it for use, and to increase its efficiency and general utility.

In order that our invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side view of the improved apparatus, illustrating the same in use with a disk-like inductor, such as a fly-wheel; Fig. 2, a cross-section on the line 2 2 of Fig. 1; Fig. 3, a vertical section on the line 3 3 of Fig. 2, and Fig. 4 a bottom view of one of the poles and laminated core.

In all of the above views corresponding parts are represented by the same numerals of reference.

The magnet 1 is formed, preferably, of a series of ordinary horseshoe-magnets connected together at their poles or elsewhere in any suitable way. Coöperating with these magnets are two magnetic soft-iron pole-pieces 2 3. Mounted on the inside of the magnets is a frame 4, preferably open, so as to be as light as possible. Screws 5 extend from the pole-pieces 2 3 and engage the frame 4 between the several magnets, whereby the pole-pieces in said frame will be clamped firmly and rigidly in position to the magnets, while at the same time the latter may be removed when necessary. The soft-iron pole-piece 2 carries a soft-iron removable polar extension 6 of any desired form and shape. When a fly-wheel or other disk-like inductor is employed, the inner face of this polar extension will be curved to correspond with that of the inductor. The soft-iron pole-piece 3 is provided with an extension 7, and removably secured thereto is a second soft-iron polar extension 8, which is likewise of any desired form and shape. By employing the removable polar extensions 6 and 8, as explained, it will be evident that the apparatus can be readily adapted for use in connection with fly-wheels of any desired diameter merely by employing extensions of the desired shape without necessitating any other change in the device. Thus in Fig. 1 we illustrate in dotted lines a very much smaller fly-wheel, with which the apparatus can be used merely by employing polar extensions 6 and 8 somewhat longer and with curved faces closely coöperating therewith. The pole-piece 3 is formed with a dovetailed groove 9, preferably in line with one leg of the magnet 1, which groove is adapted to receive the tenons 10 on the laminæ 11, constituting a core. These laminæ are punched out of soft sheet iron in the usual way and are formed with shoulders 12, between which and the inner face of the pole-piece 3 is located the coil 13 of any desired capacity. The terminals of this coil lead to binding-posts 14, from which connections may be made to any desired translating device. The pole-piece 3 may be cast with depending flanges 15, which surround the coil 13 on

three of its sides, the fourth side being inclosed by a movable shutter 16, held in position by screws. By reason of this construction it will be apparent that the coil which surrounds the laminated core will be practically inclosed in an open-bottomed box, so as to be effectively protected from injury in use. Preferably this box is filled up around the coil with an insulating material 17, like rosin and paraffin, which is introduced in a molten condition and allowed to cool and set. This insulating material not only serves to assist in the effective insulation of the coil, but also protects the same mechanically. In order to generate a current in the coil, it is obvious that it is only necessary to effect a relative movement between the core 11 and the inductor 18, which in the present instance is the fly-wheel of an internal-combustion engine. This may be effected by providing the fly-wheel with a gap 19 therein, which may be either left open or be filled up with a non-magnetic material, like bronze. The best effect is obviously secured when the inductor coöperates as closely as practicable not only with the core 11, but also with the polar extensions 6 and 8; but it will be understood, of course, that one or both of the latter extensions may be omitted, at a sacrifice, however, of the highest utility. We find in practice that by locating the polar extension 8 a relatively considerable distance from the core 11 and by proportioning the gap 19 so as to substantially bridge the space between said core and extension the generating effect is not confined to so narrow a limit in the rotation of the fly-wheel as would be the case if the gap between said extension and core were shortened. This feature of our invention, by which we are enabled to increase the length of duration of the current, is of importance in an igniting device, since in order to obtain the best results in the ignition of an explosive gaseous mixture the igniting-current should be relatively prolonged as distinguished from a single sharp spark. It will be observed that by employing the polar extensions 6 and 8, which are considerably farther apart than the width of the gap 19, by making the polar extension 6 longer than said gap, and by arranging the polar extension 8 relatively to the core 11, so as to bridge the gap, the magnetic circuit is never broken and the magnets are therefore not weakened even if the inductor comes to rest with any part of the gap within the extreme dimensions inclosed by the ends of the polar extensions.

It will of course be understood that if the parts were so proportioned that a complete breaking of the magnetic circuit could be effected at the gap there would be danger of the magnets being weakened by the inductor remaining in position to hold the gap at the critical point.

It is desirable in practice that means should be provided for effecting an adjustment of the igniting device with respect to the fly-wheel or other inductor not only to compensate for possible wear, but more particularly to permit of an adjustment in the "timing" of the spark to accord with the mechanically-operated elements of the engine—such as its piston, valves, and contact devices—if a wipe or make-and-break spark is employed.

Our present apparatus provides for effective adjustment devices by means of which the igniter is not only capable of adjustment toward and away from the inductor, but also in a line perpendicular to that adjustment, while at the same time provision is made for a radial adjustment of the igniter to always maintain it in diametrical alinement with the fly-wheel, assuming the use of the latter. To this end we make the frame 4 with pintles 20, which are engaged by split collars 21, so that said collars may be rigidly clamped in place. The collars 21 are cast integrally with arms 22, the ends of which carry the short adjusting-rods 23. Mounted on these adjusting-rods 23 are split collars 24, with which are cast split collars 25, slidably mounted on adjusting-rods 26, arranged perpendicular to the adjusting-rods 23. The adjusting-rods 26 are secured in any suitable foundations 27, so as to be rigidly supported therein. It will be observed that by loosening the split collars 24 the device as a whole may be adjusted toward and away from the fly-wheel 18 or other inductor and that by loosening the split collars 25 the device as a whole may be adjusted in a direction perpendicular to the first adjustment. By loosening the split collars 21 the device may be adjusted radially, so as to be always maintained in diametrical alinement with the fly-wheel. By reason of these three separate adjustments it therefore becomes possible to adjust the igniter circumferentially with respect to the fly-wheel and to always maintain it in any position of this adjustment in proper relation to said fly-wheel.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. In an igniting device of the character described, the combination of a magnet, a coil surrounding one of the poles thereof, a separate removable polar extension carried by the other magnetic pole, and an inductor movable with respect to the coil, substantially as and for the purposes set forth.

2. In an igniting device of the character described, the combination of a magnet, a coil surrounding one of the poles thereof, a polar extension connected to the same pole, with a gap between said polar extension and coil, and an inductor movable with respect to the coil, substantially as and for the purposes set forth.

3. In an igniting device of the character described, the combination of a magnet, a coil surrounding one of the poles thereof, a polar extension connected to the same magnetic pole, with a gap between said polar extension

and coil, a polar extension connected to the other magnetic pole, and an inductor movable with respect to said polar extensions and coil, substantially as and for the purposes set forth.

4. In an igniting device of the character described, the combination of a magnet, a coil surrounding one of the poles thereof, a polar extension connected to the same magnetic pole, with a gap between said polar extension and coil, a polar extension connected to the other magnetic pole, and an inductor movable with respect to said polar extensions and coil and having a gap therein so proportioned as to keep the magnetic circuit always closed, substantially as and for the purposes set forth.

5. In an igniting device of the character described, the combination of a magnet, a removable pole-piece secured to one of the poles of said magnet, a laminated core in said pole-piece, a coil surrounding said core, and an inductor movable with respect to said core, substantially as and for the purposes set forth.

6. In an igniting device of the character described, the combination of a magnet, a removable pole-piece secured to one of the magnetic poles, a core on said pole-piece, a coil surrounding said core, a polar extension carried by said pole-piece, with a gap between said extension and the core, and an inductor movable with respect to the polar extension and core, substantially as and for the purposes set forth.

7. In an igniting device of the character described, the combination of a magnet, a pole-piece, a core removably carried by said pole-piece, a coil on said core, and an inductor movable with respect to the pole, substantially as and for the purposes set forth.

8. In an igniting device of the character described, the combination of a magnet, a pole-piece, a laminated core removably carried by said pole-piece, a coil on said core, and an inductor movable with respect to the coil, substantially as and for the purposes set forth.

9. In an igniting device of the character described, the combination of a magnet, a pole-piece, a core removably carried by said pole-piece, a coil surrounding the core, a box on the pole-piece inclosing said coil, and an inductor movable with respect to the core, substantially as and for the purposes set forth.

10. In an igniting device of the character described, the combination of a magnet, a pole-piece, a core removably carried by said pole-piece, a coil surrounding the core, a box carried by the pole-piece and surrounding said coil, a filling of insulating material around the coil, and an inductor movable with respect to the core, substantially as and for the purposes set forth.

11. In an igniting device of the character described, the combination of a magnet, a pole-piece having a dovetailed groove therein, a series of laminæ having tenons engaging said groove to form a laminated core, a coil surrounding said core, and an inductor movable with respect to the core, substantially as and for the purposes set forth.

12. In an igniting device of the character described, the combination of a magnet, a pole-piece having a dovetailed groove therein, a series of laminæ having tenons engaging said groove to form a laminated core, shoulders on said laminæ, a coil surrounding the core and supported by said shoulders, and an inductor movable with respect to the core, substantially as and for the purposes set forth.

13. In an igniting device of the character described, the combination with a disk-like inductor having a cut-away portion in its periphery, of a magnet, a coil surrounding one of the poles of said magnet, and means for adjusting the magnet toward and away from said inductor, substantially as and for the purposes set forth.

14. In an igniting device of the character described, the combination with a disk-like inductor having a cut-away portion in its periphery, of a magnet, a coil surrounding one of the poles of said magnet, and means for adjusting the magnet circumferentially with respect to said inductor, substantially as and for the purposes set forth.

15. In an igniting device of the character described, the combination with a disk-like inductor having a cut-away portion in its periphery, of a magnet, a coil surrounding one of the magnetic poles, means for adjusting the magnet toward and away from the said inductor, and means for independently adjusting the magnet perpendicularly to said first adjustment, substantially as and for the purposes set forth.

16. In an igniting device of the character described, the combination with a disk-like inductor having a cut-away portion in its periphery, of a magnet, a coil surrounding one of the magnetic poles, means for adjusting the magnet toward and away from said inductor, means for independently adjusting the magnet perpendicularly to said first adjustment, and means for radially adjusting said magnet, substantially as and for the purposes set forth.

This specification signed and witnessed this 1st day of November, 1902.

HERBERT G. MEARS.
HENRY W. AYLWARD.

Witnesses to signature of Herbert G. Mears:
J. BAILLIE ALLEN,
E. L. POWELL.

Witnesses to signature of Henry W. Aylward:
JNO. ROBT. TAYLOR,
JOHN LOUIS LOTSCH.