

F. S. PERRIN.  
MAGNETIC SPARK PLUG.  
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989,924.

Patented Apr. 18, 1911.

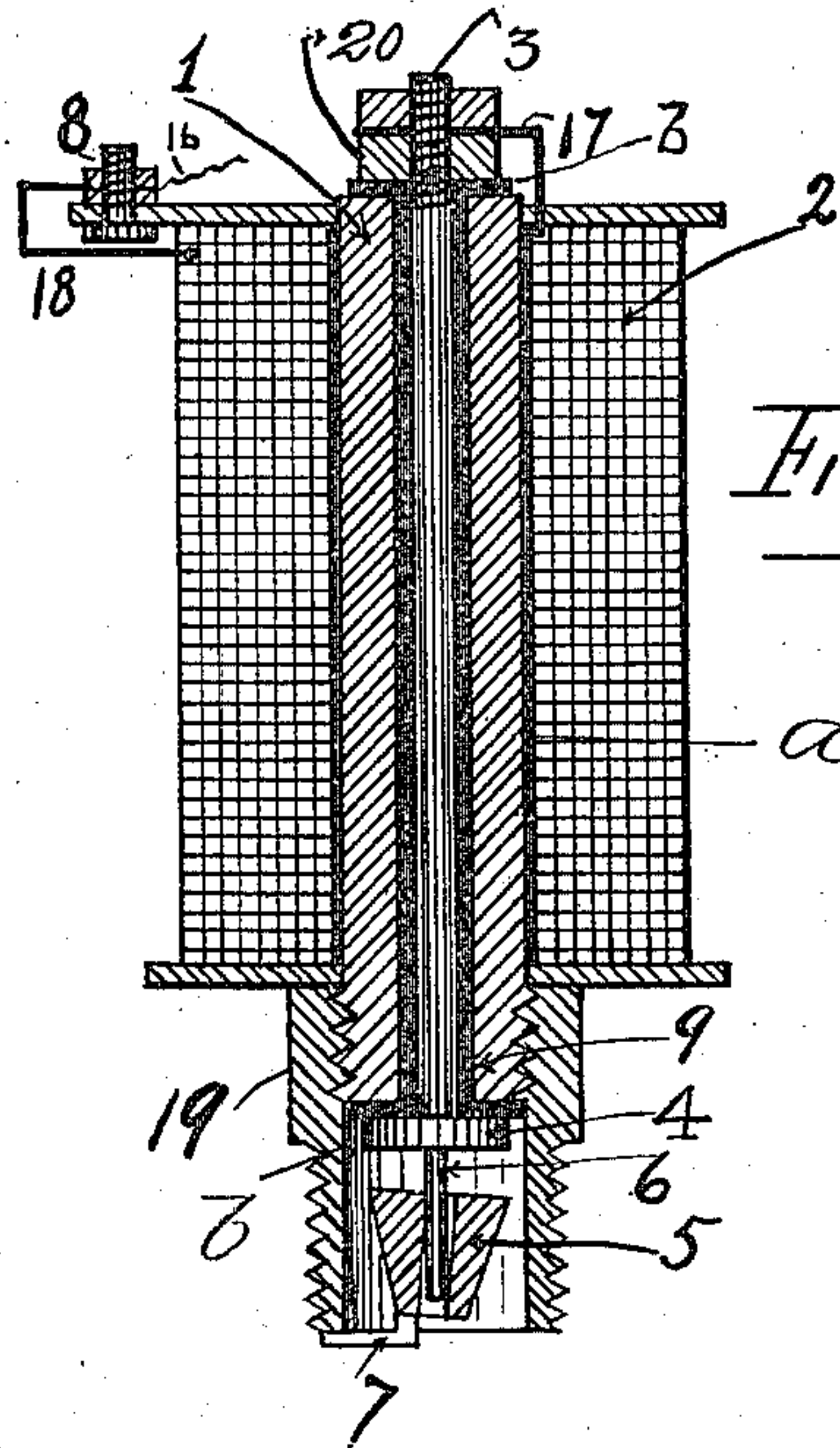


Fig. 1.

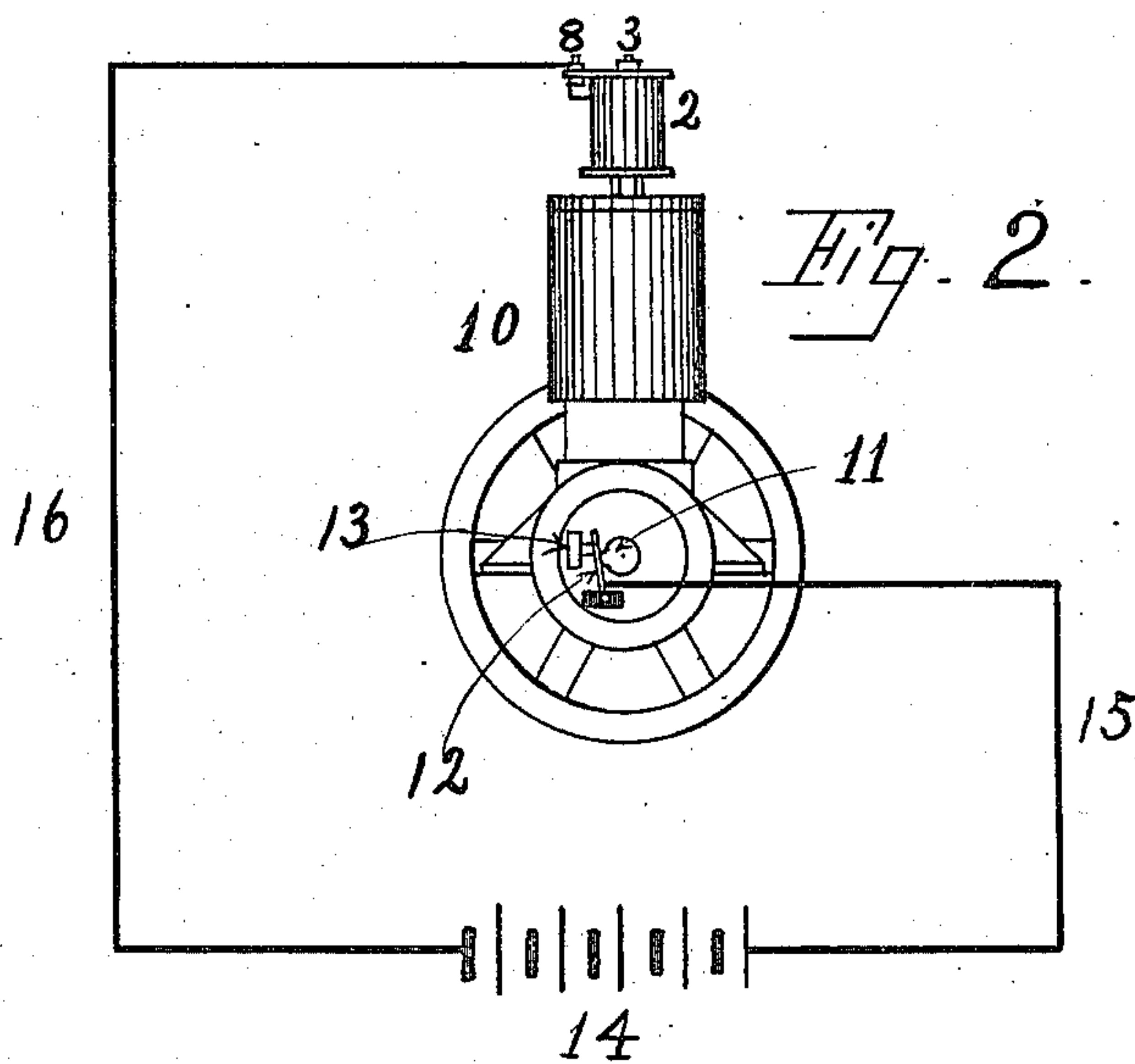


Fig. 2.

WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## MAGNETIC SPARK-PLUG.

989,924.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed November 3, 1910. Serial No. 590,450.

*To all whom it may concern:*

Be it known that I, FREDERIC S. PERRIN, a citizen of the United States, and resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Magnetic Spark-Plugs, of which the following is a specification.

My invention relates to improvements in magnetic spark-plugs for electrically igniting the gases in the cylinder of an internal combustion engine; and the object of my improvement is to provide such a plug that will produce an electric arc from the self-induced current of an electro-magnetic coil in its circuit.

I attain my object by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a vertical section of the plug; and Fig. 2 is a view of an internal combustion engine equipped with my plug; and showing the electrical circuits and connections adapted to its operation.

Similar numerals refer to similar parts throughout the views.

The numeral 1 indicates a soft iron tube shown threaded at its lower end and screwed securely into a non-magnetic metal shell 19; said tube having a central bore extending throughout its length; 2 indicates a coil of insulated wire wound upon the tube 1, with insulation *a* between the tube and coil.

3 indicates a metal rod, threaded at the upper end for nuts 20, and provided at its lower end with a shoulder or head 4 and a projection or pin 6.

9 indicates an insulating tube or winding as of mica, extending through the bore of the tube or core 1 and inclosing the rod 3, to insulate one from the other.

5 indicates a conically shaped soft iron armature having a central bore receiving projection or pin 6, the diameter of which bore is greater than the diameter of the pin 6.

7 indicates a metallic prolongation or terminal on shell 19 upon which rests the armature 5.

8 indicates a binding post for one terminal of the coil 2; and at *b* are incombustible insulating washers, such as mica or asbestos, between core 3, thread 4 and nut 20.

In Fig. 2, 10 indicates an internal combustion engine provided with my improved spark-plug 2 fitted to the cylinder; 11 indi-

cates a cam on the shaft of the engine, which cam operates a suitably insulated lever or contact 12, against a stationary contact 13 to make and break the circuit of a generator 14 through the coil 2 of the plug, the wires 15 and 16, and the frame of the engine.

As shown in Fig. 1 the head 4 is drawn by the nuts 20 against the insulating washer *b* with sufficient force to close the bore in tube or core 1 and make an air-tight joint, and prevent electrical contact between the tube 1 and the rod 3. The coil 2 is wound upon the tube 1 with sufficient convolutions of wire to form an electro-magnet having considerable self-induction, and this self-induction of the coil I utilize for making the arc in the plug to ignite the gases in the engine.

One terminal of the coil is attached to the rod 3 by means of the wire 17 and nuts 20, and the other terminal is brought out by the wire 18 to binding post 8; by this means the rod 3 and the metallic projection or pin 6 are in circuit with coil 2.

The armature 5 is held in an inclined position with its lower edge resting upon the terminal 7, at a point outside of its center of gravity, by means of the pin 6 passing through the bore of the armature, said bore having a diameter larger than that of pin 6 to allow the conical armature 5 to incline to one side in such a manner that the pin 6 will make contact with the armature, within its bore, near or at the top on one side and near or at the bottom upon the other side; and allow the armature 5 to move freely up and down upon pin 6, from its support 7 to the rod head 4.

The operation of my improved spark-plug is as follows: when the fuel mixture is compressed in engine 10, the cam 11 moves the lever or contact 12 against the stationary contact 13 and closes the circuit from the generator 14 through wire 16 to the binding post 8, thence by the wire 18 through the coil 2 to the rod 3, by means of wire 17, thence through the pin 6 to the conical armature 5, and terminal or support 7 to shell 19, and from said shell through the engine cylinder to the contact 13, thence to contact 12 and through the wire 15 back to the generator 14. The instant this circuit is closed through the coil 2, the iron core or tube 1, rod 3 and head 4 become magnetized and attract the soft iron armature 5 toward said



head, thus raising the armature from its support 7 and breaking the electric circuit. When the circuit of the coil is broken an arc is formed at the break by the self-induced current set up in the convolutions of wire in the coil, and this arc provides the spark that ignites the mixture in the engine cylinder. As the engine continues to run the cam 11 breaks the circuit at 12, 13, the armature 5 will drop down along the pin 6 until its edge rests upon the support 7, and incline against the pin 6, ready to repeat the spark when the circuit is again closed, thus producing a continuous operation of the engine. It will thus be understood that the armature 5 normally maintains the circuit closed between the parts 6 and 7, and the break in the circuit between the parts 5 and 7 only occurs when the timer closes the circuit, the armature 5 falling back to the normal position by gravity upon the breaking of the circuit at the timer, so that when the circuit is open at the timer it is closed at 5, 6, 7, ready for the flow of current upon the closing of the circuit at the timer, whereupon the break in the circuit occurs at 5, 7 to ignite the engine charge, and so on.

What I claim as my invention, and desire to secure by Letters Patent, is:—

1. The combination, in a magnetic spark-plug, of a non-magnetic shell, a tubular soft-iron core attached to the shell, a coil of wire surrounding the core, a conductor in circuit with said coil, extending through and insulated from the core, and having an extension projecting into the cavity of the shell; a soft iron armature adapted to move upon the extension within the shell, an arm of the shell supporting the armature at a point outside of its center of gravity, the armature, when resting upon its support, being inclined against the projecting extension.

2. In a magnetic spark-plug, the combination of a non-magnetic shell, with an electro-magnet comprising a coil of wire wound upon a tubular soft-iron core, an insulated conductor, in circuit with the coil and extending through the core, an extension of the conductor projecting into the cavity of the shell, an armature having a bore adapted to move upon the extension within the shell, and an arm of the shell supporting the armature at a point outside of its center of gravity.

3. An electro-magnet 2, shell 19 having a tubular core 1, an insulated conductor 3 having a shoulder 4 and a projection 6, a perforated armature 5 resting upon an arm 7 of the shell at a point outside of its center of

gravity, and adapted to move upon the projection 6.

4. A magnetic spark plug comprising a non-magnetic threaded shell, an electro-magnet having a tubular core attached to the shell, an insulated conductor passing through the core and having a shoulder, and an extension projecting into the cavity of the shell, a soft-iron armature having an aperture greater in diameter than that of said extension, adapted to move upon the extension, the shell having an arm supporting the armature at a point outside its center of gravity, the armature, when at rest, being inclined against the extension of the conductor.

5. A magnetic spark plug provided with a magnet having a core containing an insulated conductor, a terminal, an armature adapted to rest upon the terminal and provided with an opening adapted to play freely upon and make contact with said conductor.

6. A magnetic spark plug provided with a magnet having a core containing an insulated conductor, a terminal, an armature adapted to rest upon the terminal and provided with an opening adapted to play freely upon and make contact with said conductor, said armature when it raises engaging said contact at two points.

7. A magnetic spark plug provided with a magnet having a core containing an insulated conductor, a terminal, an armature adapted to rest upon the terminal and provided with an opening adapted to play freely upon and make contact with said conductor, said terminal being out of line with the axis of the conductor, whereby the armature when resting upon said terminal will tilt into contact with the conductor.

8. A magnetic spark plug comprising a magnet having a soft iron core, and a non-magnetic shell connected therewith, said core containing an insulated conductor projecting from the core into a chamber in said shell, said shell being provided with a terminal spaced from the conductor, and an armature fitted to play freely upon said conductor and adapted to rest upon said terminal and thereby make contact with the conductor.

Signed at New York city, in the county of New York, and State of New York, this 18th day of Oct. A. D. 1910.

FREDERIC S. PERRIN.

Witnesses:

HERMAN HERST, Jr.,  
T. F. BOURNE.