Jan. 12, 1926. 1,569,756

A. A. KENT

IGNITION COIL

Filed May 3, 1922

Fig. 1.

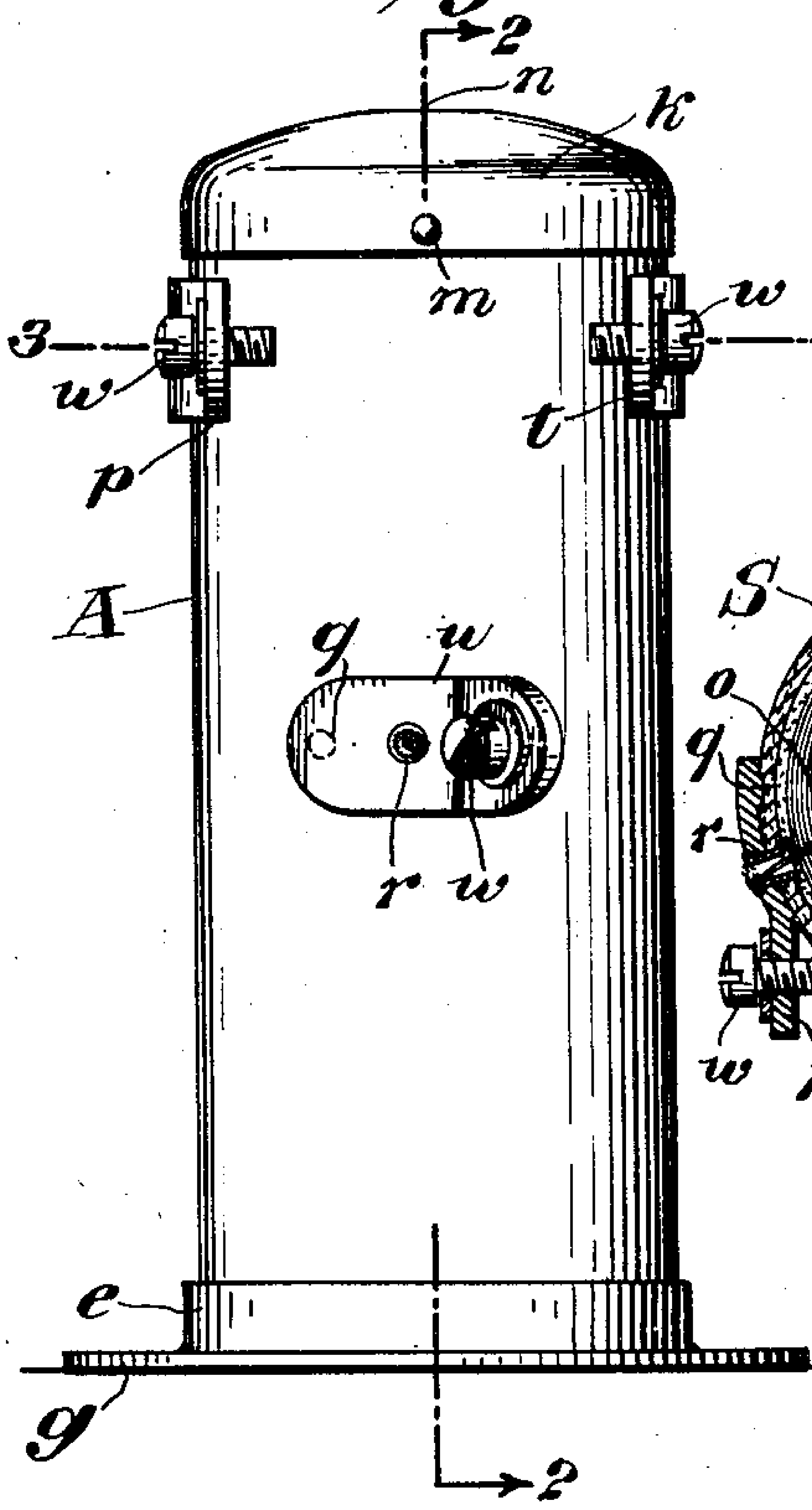


Fig. 2.

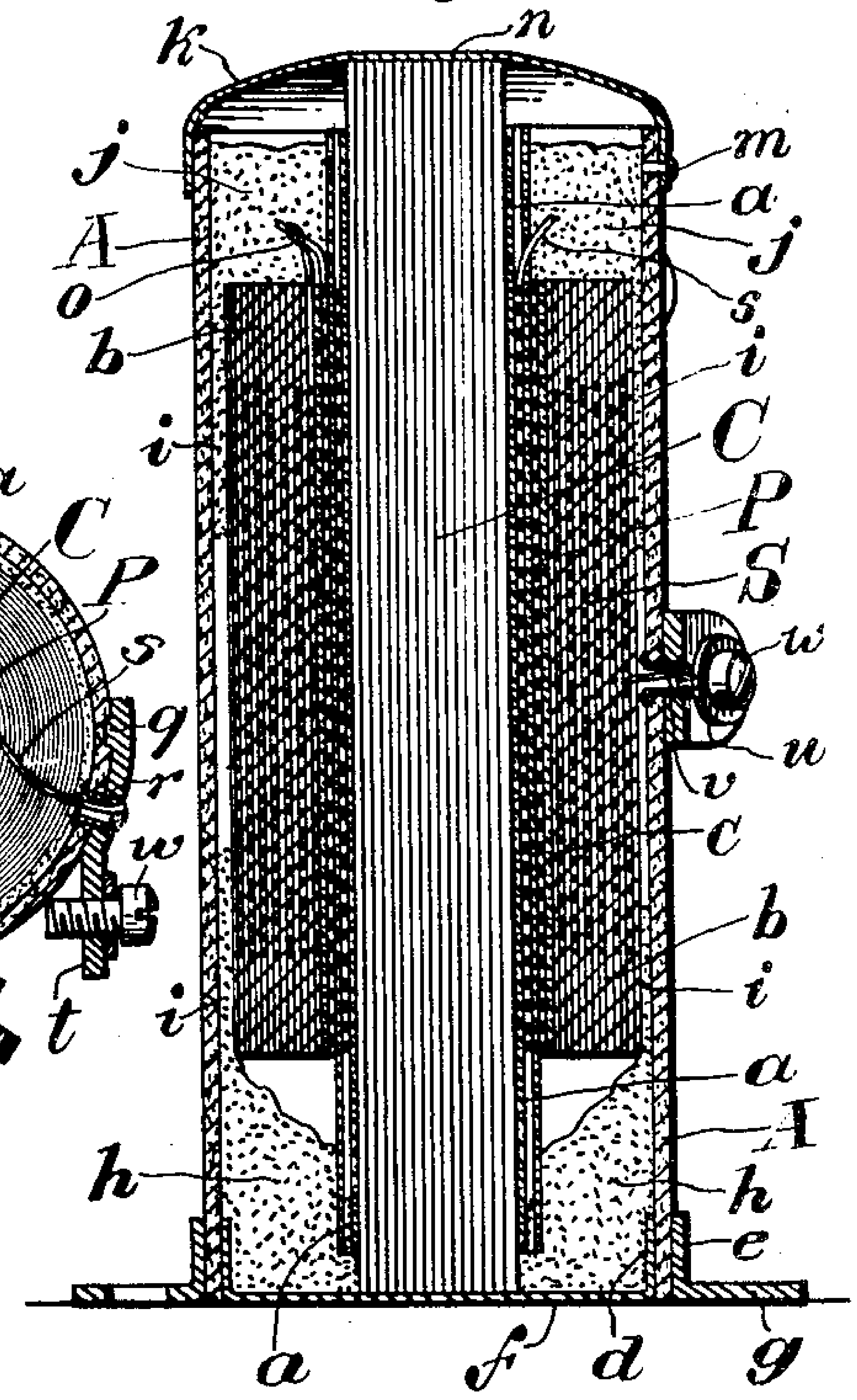


Fig. 3.

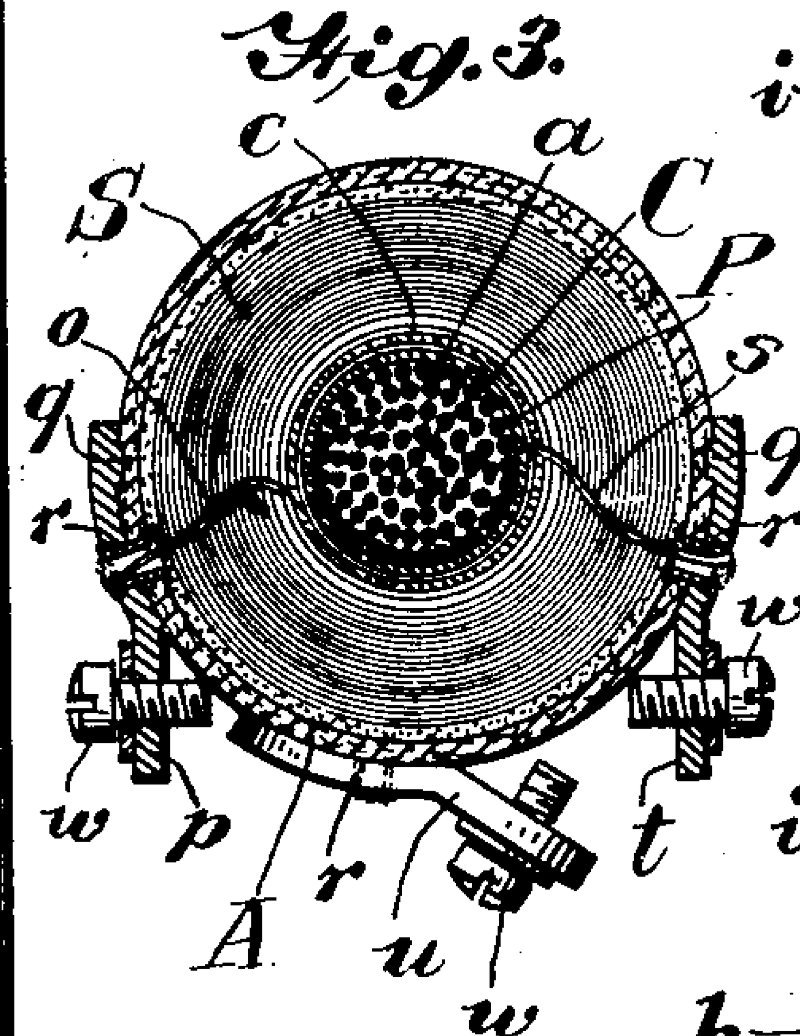
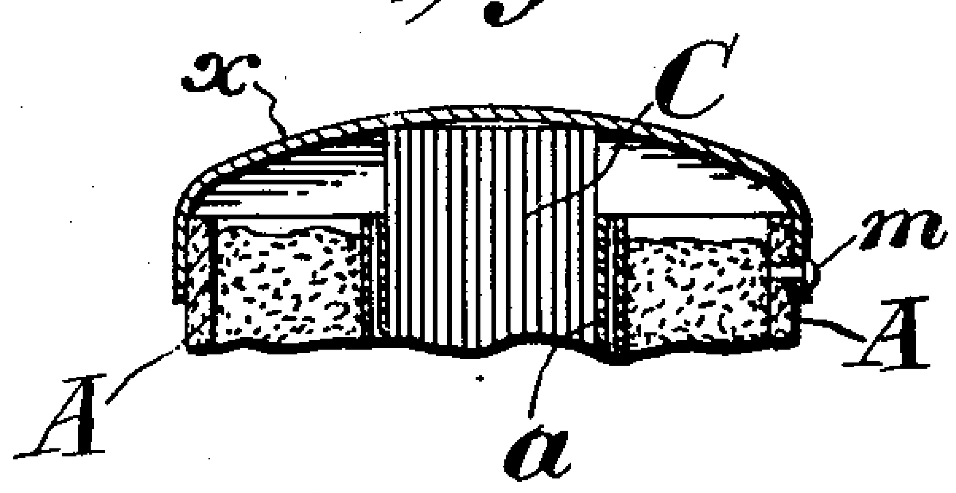
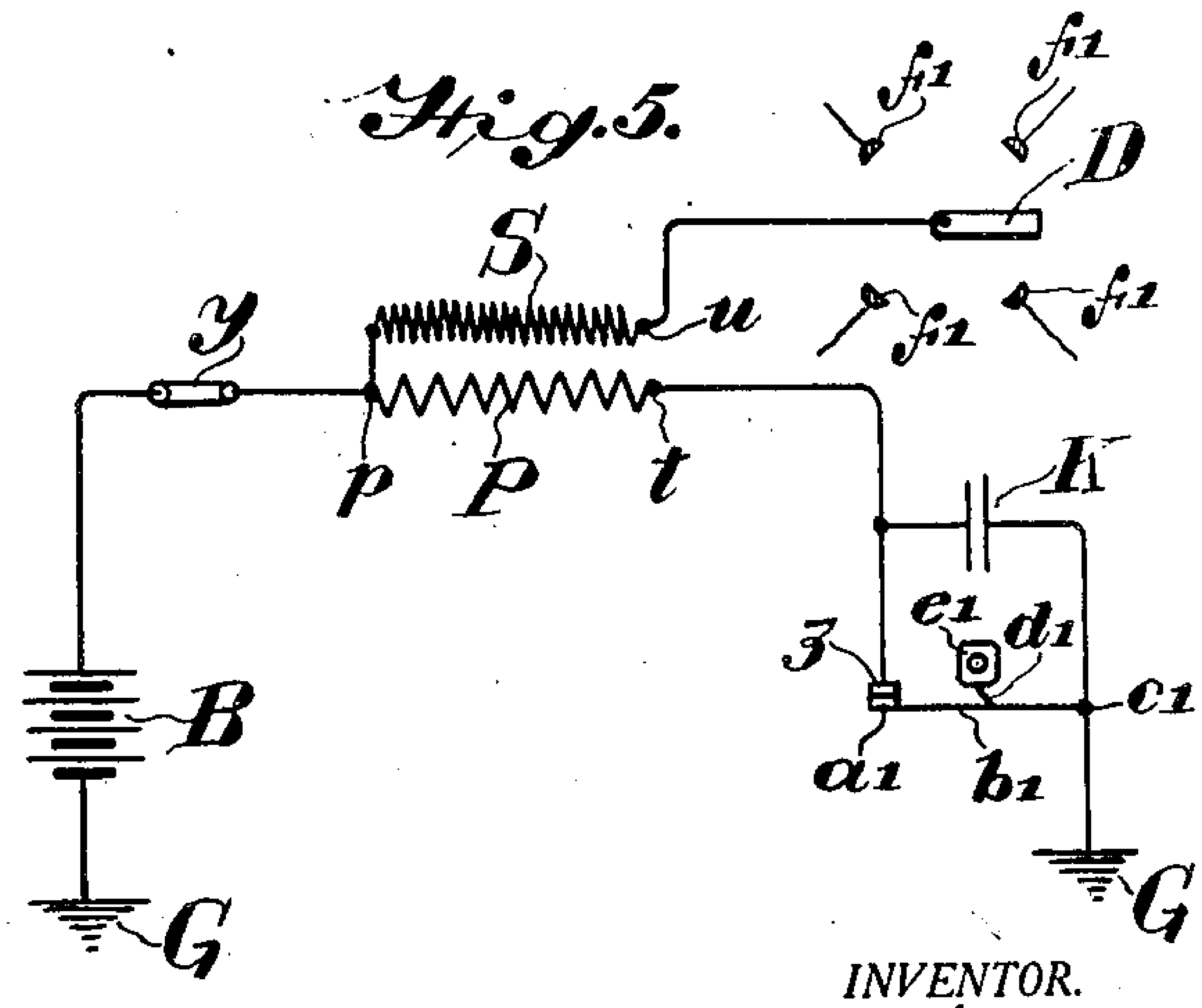


Fig. 4.





INVENTOR.
Arthur Atwater Kent
BY Cornelius D. Ehret
his ATTORNEY.

Patented Jan. 12, 1926. **1,569,756**

UNITED STATES PATENT OFFICE.

ARTHUR ATWATER KENT, OF ARDMORE, PENNSYLVANIA.

IGNITION COIL.

Application filed May 3, 1922. Serial No. 558,239.

To all whom it may concern:

Be it known that I, ARTHUR ATWATER KENT, a citizen of the United States, residing in Ardmore, county of Montgomery, and State of Pennsylvania, have invented certain new and useful Improvements in Ignition Coils, of which the following is a specification.

My invention relates to induction coils, and particularly those utilizable for producing sparks for igniting combustible charges in the cylinders or combustion chambers of internal combustion engines.

My invention resides in an induction coil of the straight core or open magnetic circuit type disposed within a tubular or other casing having one or more end closures or caps of metal against which directly abut some or all of the iron or other wires of the core to effect high heat conductivity.

More particularly, my invention resides in an induction coil of the character above referred to utilizable in an ignition circuit of the normally closed type, whereby, without the employment of external resistance, should the ignition circuit be left closed, the resultant heat generated within the induction coil structure will be conducted away and radiated with sufficient ease and rapidity to prevent abnormal rise in temperature within the structure.

More particularly, my invention resides in an induction coil of the characters above referred to in which the primary winding is inside of the secondary winding.

More particularly, my invention resides in an induction coil of the characters above referred to in which the core and windings are positioned or held in place without recourse to tie rods, bolts or the like extending to the exterior of the end closures or caps.

My invention resides in induction or ignition coil structure of the character hereinafter described and claimed.

For an illustration of some of the forms my invention may take, reference is to be had to the accompanying drawing, in which:

Fig. 1 is an elevational view of an induction coil embodying my invention.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a fragmentary vertical sectional view showing a modified structure.

Fig. 5 is a diagrammatic view of a circuit arrangement to which my induction coil is adapted.

Referring to Figs. 1, 2 and 3, C is a simple straight core consisting of a bundle of iron wires, as well understood in the art. The core wires are held in a bundle by the surrounding paper or fibre tube *a* upon which is wound, in one or more layers, the primary coil or winding P, of relatively few turns of large diameter copper wire. The secondary S, consisting of numerous layers of numerous turns of fine wire, with the different layers separated from each other by sheets of insulating material *b*, is wound upon a paper or fibre tube *c*, which is then slipped over the primary P, the core C, and primary and secondary windings P and S, forming preferably a substantially rigid unit in that the primary P is in fixed position upon the core C and the secondary S is in fixed position upon the primary P.

A casing A, as a tube of fibre or other non-metallic or insulating material, has its lower end disposed between the upstanding flanges *d* and *e* on the metal cap or end closure *f* and base plate or member *g*, respectively. The tube A may be forced between the flanges *d* and *e* and fit with sufficient friction or snugness to require no additional fastening means.

There is preferably poured in fluid state into the bottom of the casing A a suitable amount of insulating material *h*, preferably cementitious, as asphalt, bituminous cement or equivalent, which upon cooling solidifies, hardens or sets. While the material *h* is still in fluid state, an induction coil unit, comprising the aforesaid assembly of core C and primary and secondary windings P and S, is introduced through the upper open end of the casing A, and the lower ends of the wires of the core C are caused to penetrate the fluid *h* into direct or substantially direct contact with the inner side of the metal cap *f*, the contact affording good heat conductivity from some or all wires of the core C to the cap *f*. The amount of material *h* employed may be sufficient to cause some of it to rise into the space *i* between the outside of the secondary S and the inside of the casing A. When the material *h* hardens or solidifies, it serves to hold the induction coil unit in place and prevent its rattling or moving, under the continuous succession of jars of a motor vehicle.

With the induction coil unit so positioned within the casing A, asphalt or equivalent material j, similar to the material h, may be poured in fluid condition into the upper end of the casing A on top of and around portions of the induction coil unit, the same hardening or solidifying to further support and hold the unit in fixed position with relation to the casing A. The upper end closure or cap k is then placed in the position indicated and secured by any suitable means, as pins m, to the casing A. As indicated, the cap k may have a flat or substantially flat portion n against which directly or substantially directly abut some or all of the wires of the core C, whereby there is effected a contact of good heat conductivity, whereby additional heat is conducted to the cap k and radiated thereby.

The inner end of the secondary winding S is connected to the outer end of the primary winding P at o, and a connection is made from o to the metallic terminal p having a boss or projection q forced into the wall of the casing A or projecting into a depression in such wall. An eyelet or hollow rivet r secures the terminal p to the casing A, and connection from o is extended through the eyelet r and soldered or otherwise connected thereto. The other terminal of the primary P connects by wire s to a similar metallic terminal t similarly secured by eyelet to the casing A, the connection s being soldered or otherwise connected to the eyelet or terminal t.

There is similarly secured to the casing A, at any suitable position, as substantially mid-way of its length, as indicated, a third metallic terminal u secured by eyelet, to which is soldered the conductor v connecting with the outer terminal of the secondary winding S. Each of the terminals is provided with any suitable means, as a screw w, for binding thereto a lead or conductor of the external circuit.

These terminals are secured to the casing A in advance of introduction of the coil unit thereinto; and as the coil unit is introduced, as above described, the connecting wires o, s and v are passed through the eyelets in advance of fixing the coil unit within the casing A. Thereafter these connecting wires may be soldered to the eyelets or terminals.

While in Figs. 1 and 2 the cap k is shown as having a flat or substantially flat portion n, such cap may take the form indicated at x in Fig. 4, in which case the cap is bowed across the end of the core C, but nevertheless the core abuts directly or substantially directly against the cap x for heat conduction purposes.

Fig. 5 indicates an ignition circuit of the normally closed type, with which my induction coil is preferably, though not necessarily, employed. B is a battery or other source of current in series through the switch y with the primary P of the induction coil. In the primary circuit are the stationary and movable interrupter contacts z and a^1, shunted by the usual condenser K. The movable contact a^1 is carried upon an arm b^1, pivoted at c^1, having a cam follower or shoe d^1 engaged by the engine driven cam e^1. The primary circuit in this instance is indicated as grounded to the frame or metal work of the automobile or engine, the ground connections being indicated at G, G; it will be understood, however, that an insulated conductor return may be employed. The secondary terminal u connects to the rotary distributor D, which, as well understood in the art, rotates past the distributor terminals f^1 connected to the spark plugs of the different cylinders of the internal combustion engine.

Should the engine stop with the cam e^1 in such position that the contacts a^1 and z are in engagement with each other, the primary circuit remains closed, if the operator should overlook opening the switch y. Under such circumstances, current from the battery B will continue to pass through the primary P and cause evolution of heat therein. This heat is in part communicated to the core C, which in turn communicates it to the end closures f and k, which radiate it or conduct it off to neighboring or contacting heat-conducting parts.

The extent and degree of heat conduction is such that the temperature of the primary P will not attain an excessive value notwithstanding the fact that there is no resistance in the primary circuit external to the primary P.

While the caps or end closures f and k may be of steel or iron, it is preferred that they be of brass or other non-magnetic metal, since the employment of magnetic metal for the caps f and k, or either of them, increases the inductance or self-induction of the primary circuit and in some cases to extent undesirable as regards high speed operation of the interrupter mechanism comprising the contacts a^1, z, as at high engine speeds.

What I claim is:

1. An ignition induction coil utilized in a closed circuit ignition system comprising a casing of rigid insulating material, metallic end closures secured to said casing on opposite ends thereof, an induction coil unit in said casing held between said end closures and comprising a central straight core of wires abutting against and confined between said metallic end closures, a primary winding surrounding said core adjacent thereto, and a secondary winding, the contacts between the core wires and said end closures conducting away heat generated in said primary winding at a rate to prevent abnormal temperature rise of said primary winding.

2. An ignition induction coil utilized in a closed circuit ignition system comprising a casing of rigid insulating material, metallic end closures secured to said casing on opposite ends thereof, at least one of said end closures being non-magnetic, an induction coil unit in said casing held between said end closures and comprising a central straight core of wires abutting against and confined between said metallic end closures, a primary winding surrounding said core adjacent thereto, and a secondary winding, the contacts between the core wires and said end closures conducting away heat generated in said primary winding at a rate to prevent abnormal temperature rise of said primary winding.

3. An ignition induction coil utilized in a closed circuit ignition system comprising a casing of rigid insulating material, metallic end closures secured to said casing on opposite ends thereof, an induction coil unit in said casing held between said end closures and comprising a central straight core of wires abutting against and confined between said metallic end closures, a primary winding surrounding said core adjacent thereto, a secondary winding, and congealed insulating material in said casing and constituting with the engagement of said core with said end closures the sole means of holding said unit in fixed position with respect to said casing, the contacts between the core wires and said end closures conducting away heat generated in said primary winding at a rate to prevent abnormal temperature rise of said primary winding.

4. An ignition induction coil comprising a casing of rigid insulating material, a metallic end closure secured to one end of said casing on the exterior thereof, a second metallic end closure having a peripheral flange held to said casing by frictional engagement with the inner wall of said casing, and an induction coil unit in said casing comprising a central straight core of wires abutting at its opposite ends against said end closures in heat-transfer relation therewith, a primary winding surrounding said core adjacent thereto, and a secondary winding.

In testimony whereof I have hereunto affixed my signature this 27th day of April, 1922.

ARTHUR ATWATER KENT.