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SELF RESTORING SWITCH FOR IGNITION SYSTEMS OF INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JAN. 29, 1915.

1,168,637.

Patented Jan. 18, 1916.

2 SHEETS—SHEET 1.

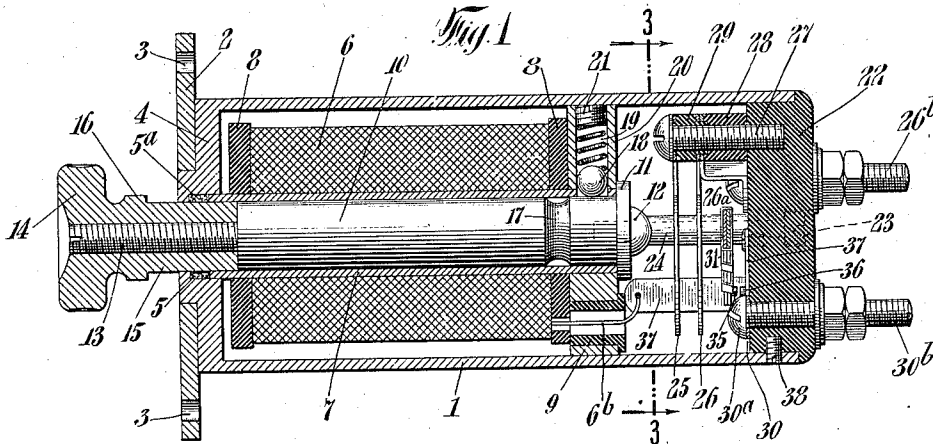


Fig. 2

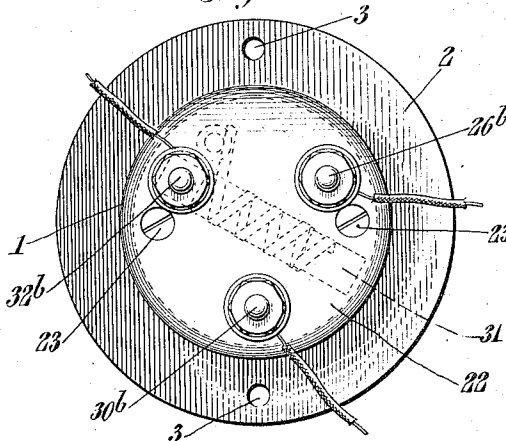


Fig. 4

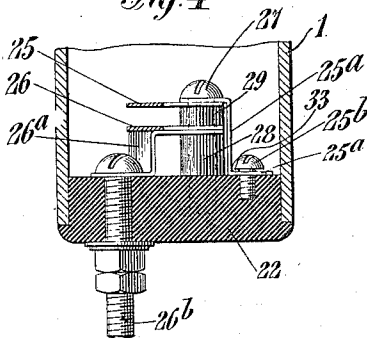


Fig. 3

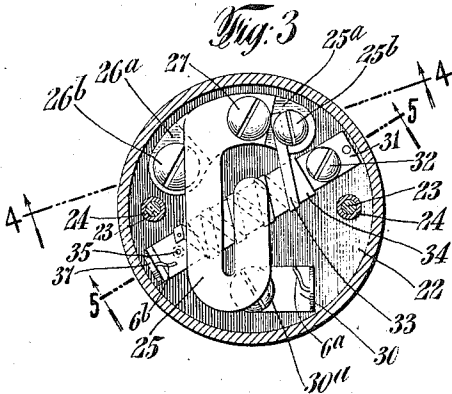
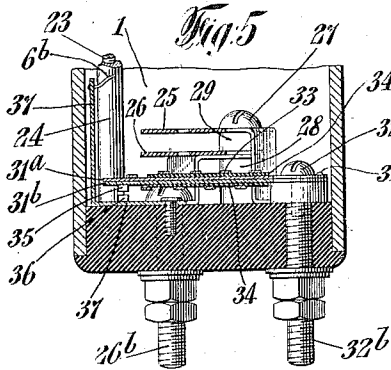


Fig. 5



WITNESSES

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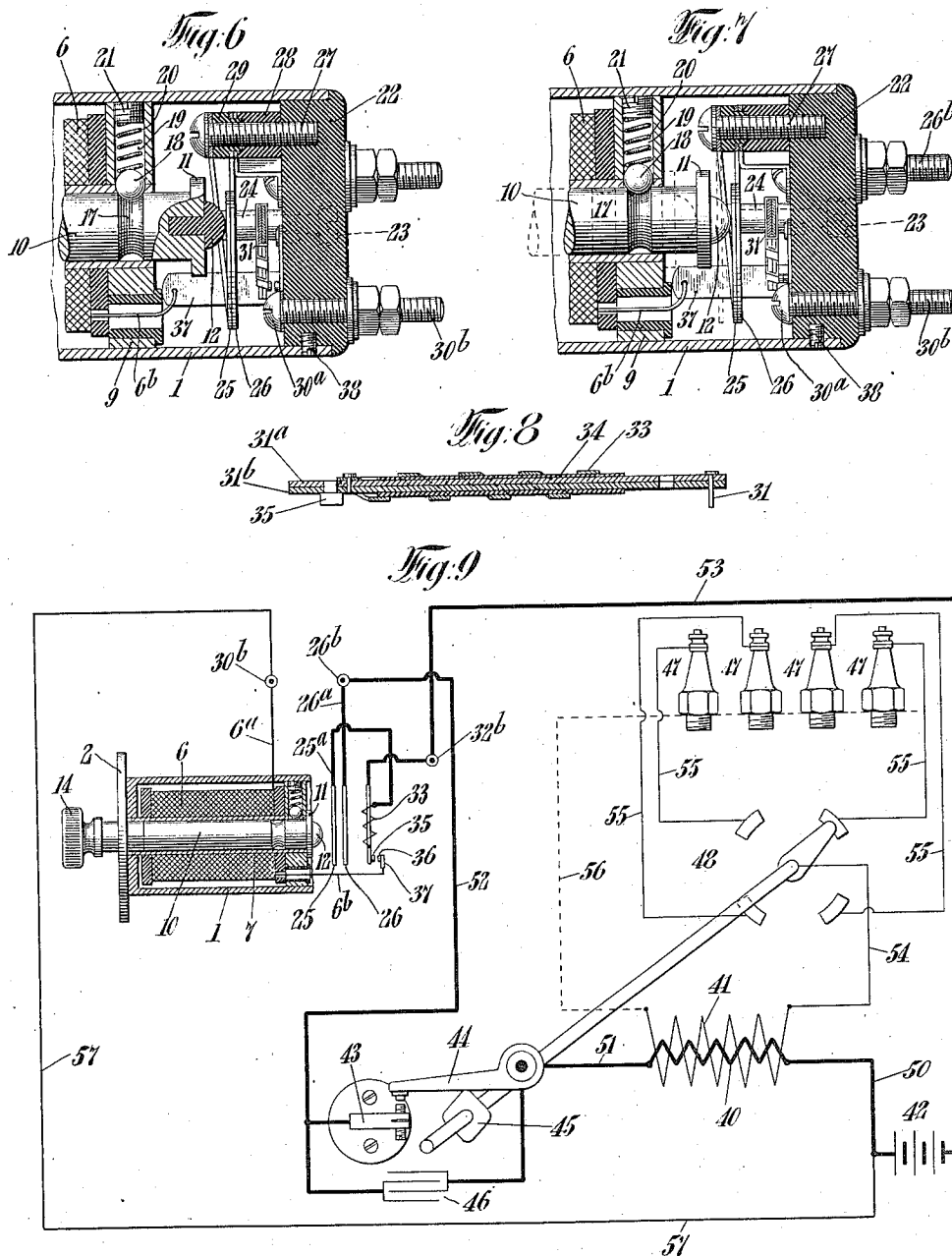
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WITNESSES

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SELF-RESTORING SWITCH FOR IGNITION SYSTEMS OF INTERNAL-COMBUSTION ENGINES.

1,168,637.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANCIS R. HOYT, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Self-Restoring Switches for Ignition Systems of Internal-Combustion Engines; 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.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings which show one form or embodiment of my invention selected by me for purposes of illustrating the same, and the said invention is fully disclosed in the following specification and claims.

Referring to the said drawings, Figure 1 represents a longitudinal sectional view of my improved self restoring switch, the same being an embodiment of my present invention selected by me for the purpose of illustrating the same. Fig. 2 is a rear view of the switch. Fig. 3 represents a transverse sectional view of the apparatus on line 3—3 of Fig. 1, looking in the direction of the arrows. Fig. 4 is a sectional view on line 4—4 of Fig. 3. Fig. 5 is a section taken on line 5—5 of Fig. 3, looking in the direction of the arrows. Fig. 6 is a partial longitudinal sectional view of the apparatus showing the position of the parts when the switch is thrown in for the purpose of connecting the battery in circuit with the primary winding of the induction coil and the periodic interrupter or circuit breaker operated by the rotation of the engine shaft, for the purpose of producing ignition sparks at the spark plugs in the several cylinders of the engine under the control of a distributor in the secondary circuit of said coil. Fig. 7 is a similar view illustrating the action of the thermostat in closing the battery circuit through the solenoid for automatically restoring the manually operated portion of the switch and breaking the battery circuit through the contact breaker and primary coil, and restoring the parts to their original positions, as indicated in dotted lines, the breaking of the battery circuit through the

contacts controlled by the manually operated switch member permitting the thermostatic element to return to normal position. Fig. 8 is a detail sectional view of the thermostatic element and heating coil. Fig. 9 represents a diagram of the circuits.

The object of my invention is to provide a self restoring master switch especially adapted for controlling a battery ignition system such as is used for ignition purposes in connection with internal combustion engines on automobiles, and for other uses. In such ignition systems as ordinarily constructed and used prior to my invention, it has been customary to provide a switch for the purpose of cutting the battery into and out of the primary circuit, which usually includes the primary winding of an induction coil or its equivalent and the periodic interrupter or circuit breaker operated by the rotation of the engine crank shaft or cam shaft for the purpose of breaking the primary circuit and inducing a high tension current in the secondary circuit, of the induction coil, which extends to a spark plug in a cylinder of the engine, and in the case of multi cylinder engines, to a spark plug in each cylinder, in such case a distributor, also operatively connected with the engine crank shaft or cam shaft, being employed to direct the secondary current successively to the spark plugs of the several cylinders for producing an ignition spark therein at the proper point in the cycle of the engine for each cylinder. In apparatus of this character it frequently happens that the operator neglects to throw out the switch when the engine is stopped and in case the engine stops in such a position as to leave the contacts of the automatic circuit breaker closed, the battery current continues to flow and exhaust the battery.

One of the objects of my invention is to provide such a switch with means for automatically restoring the manually operated part of the switch, and the parts controlled thereby, to their initial or normal positions, thus breaking the primary circuit and preventing the waste of electrical energy from the battery or accumulators. In the embodiment of my invention herein shown and described, I accomplish this purpose by means of a thermostatic device comprising a heating coil inserted in the primary cir-

cuit and associated with the thermostatic element which closes a shunt circuit around the primary coil and automatic circuit breaker and through an electromagnetic device operatively associated with the manually operated part of the switch for restoring the latter to normal position, together with the parts operated thereby, the contacts controlled by the thermostatic element being thereafter separate¹ by the return movement of the thermostatic element as soon as the primary circuit through the heating coil is broken.

My invention also comprises certain novel features of construction and combination of parts hereinafter fully set forth and particularly ascertained in the claims forming part of this specification.

Referring to the accompanying drawings, 1 represents a cylindrical casing preferably of steel or other magnetic metal, and of comparatively small diameter, which incloses the entire apparatus of the switch and is provided with a projecting plate or flange 2 having means for securing it to the dashboard of an automobile, as for example, the screw holes 3 or other suitable support. The front end of the casing 1 is closed preferably by an integral wall 4 of magnetic material which is provided with a central opening and with an interior annular recess 5 which does not extend to the front face. Within the casing are the various parts of the switch mechanism which are preferably connected together and form, with the exception of the push button hereinafter referred to, a unitary structure which can be assembled in its entirety outside of the casing and inserted and secured therein for convenience of manufacture. This mechanism comprises the following parts:—

6 represents a solenoid the coils of which are wound about a sleeve 7 of non-magnetic material preferably brass, and between insulating heads or washers 8—8 of fiber, hard rubber, or other suitable material, secured to said sleeve. The said sleeve 7 has its internal diameter corresponding with the internal diameter of the aperture in the front end or head 4 of the casing and a portion of this sleeve extends beyond the forward head of the solenoid and is adapted to fit in the annular recess 5 in the head 4, a felt washer or other packing 5^a being provided in said recess to prevent moisture or any foreign substance from gaining access to the apparatus within the casing.

The rear end of the sleeve 7 is secured to a guiding disk 9 which is preferably of steel or other magnetic material and constructed to fit in the casing 1. This disk may be conveniently secured to the sleeve 7 by providing it with a central aperture and pressing the sleeve into the disk, as shown. It will thus be seen by reference to Fig. 1 in which

the parts are shown assembled within the casing, that the solenoid is surrounded by, but insulated from, the magnetic material, to wit, the wall of the casing 1, the head 4, and the disk 9, so that a closed magnetic circuit is formed which enables the solenoid to exert its maximum force upon the core hereinafter described.

10 represents the core of the solenoid which is movable longitudinally through the non-magnetic sleeve 7 and constitutes, in conjunction with the push button hereinafter referred to, the manually operated member of the switch, the said core being moved inwardly by hand (or may be by the foot) and said core being retracted or restored to normal position by the solenoid 6, the magnetic mass of the core being so arranged as to enable this result to be advantageously effected. I prefer to provide the core 10 with a stop to limit its outward movement, and in this instance said stop is provided by a radial flange 11 at the inner end of the core, and the said core is also provided with a non-conducting portion at its inner end indicated at 12, which in this instance consists of a mushroom shaped button of fiber or other insulating material having a stem which is pressed into a suitable aperture in the inner end of the core, or otherwise secured thereto. For convenience of assembling, I also prefer to provide the outer end of the core with a reduced threaded shank indicated at 13 to receive the push button 14, which is preferably formed of brass and provided with a sleeve portion 15 of the same material, the push button and sleeve being internally screwthreaded to engage the shank 13 and the said sleeve is also provided with a flange 16 for engaging the outer end of the casing and positively limiting the inward movement of the push button and core. The sleeve 15 extends through the felt washer 5^a before referred to, and also provides a non-magnetic continuation of the core 10.

It is desirable to provide means for locking the movable switch member or core in its innermost position against the resiliency of the contacts and against the danger of its being moved outwardly by jar or vibration, while at the same time, this locking device must not be so rigid as to prevent the return movement of the core 10 under the action of the solenoid 6. To this end I find it advantageous to provide some part connected with the core, and preferably the core itself, with an annular, shallow groove indicated at 17, which coöperates with a spring pressed locking device having a rounded or spherical surface preferably in the form of a ball 18 located in a radially disposed recess 19 in the guiding disk 9, which communicates with a corresponding aperture in the sleeve 7, said ball being held in place by a spring 20.

The outer portion of the recess 19 is preferably threaded to receive an adjusting screw 21 which can be screwed in more or less to accurately adjust the tension of the spring 20 so that when the push button and core are pressed inwardly the ball 18 will seat itself in the groove 17 in the core and hold the core sufficiently to prevent its accidental displacement, while at the same time, permitting the restoration of the core and push button to normal position by the solenoid.

The contacts in the primary circuit controlled by the movable switch member as well as the thermostatic device, and the contacts controlled thereby, are preferably mounted on a disk 22 of a fiber, hard rubber, or other non-conducting material, which is provided with a portion fitting in the rear end of the casing 1, and with a flanged portion engaging the end of said casing, so that the said disk 22 also effectually closes the rear end of the casing and prevents moisture or dirt from entering the casing from the rear end. For convenience in assembling, the disk 22 is preferably rigidly secured to the steel disk 9, in this instance by means of two screws 23—23 extending through spacing sleeves 24—24, as shown. Adjacent to the inner end of the core 10 are a pair of normally separated contacts 25—26 which are preferably supported upon the disk 22, but are insulated from each other. In order to prevent injury to the contacts, they are preferably made substantially C-shaped, as shown in Fig. 3, the said contacts being held in position by screw 27 extending through insulating sleeve 28 and insulating sleeve 29, and into the disk 22, the latter sleeve 29 being inserted between the two contacts 25 and 26. These contacts are preferably of substantially the same shape and are so arranged that the screw 27 passes through one end, while the other end is held substantially in axial alinement with the core 10, so that there is danger of the contacts being permanently bent by the continuous use of the device, and moreover a slight rubbing contact occurs between the two C-shaped strips when the core is pushed in to its innermost position, while at the same time a contact surface of large area is provided, which insures good contact. The contact 26 is connected preferably by means of a metallic strip 26^a, with a binding post 26^b. The contact 25 is provided with a metallic strip 25^a secured to the disk 22 by a screw 25^b on the inner face of the same. The disk 22 is also provided with a binding post 30^b to which one end 6^a of the solenoid coil 6 is connected, preferably by soldering it to a metallic strip 30 which is held in place by the screw 30^a of the binding post 30^b. The disk 22 also carries, in this instance, a thermostatic element 31 comprising, for example, a composite

strip of brass 31^a and nickel steel 31^b, secured to the disk by the screw 32, of a third binding post 32^b, said strips being brazed together in the usual manner. This composite strip is provided with a coil or winding 33 of a metal having a high melting point, said coil or winding being insulated from the composite strip by mica or other suitable non-conducting material, indicated at 34 in Figs. 3, 5, and 8. This coil is conveniently formed of a ribbon of suitable material and will hereinafter be referred to as the heating coil. One end of the coil is electrically connected with the strip 25^a, as shown in Fig. 3, and the other end is electrically connected with the thermostatic element, which carries a contact 35. A fixed contact 36 is carried by a metallic strip 37 secured to the disk 22, and this strip is electrically connected with the other end of the coil 6 of the solenoid, the end 6^b being preferably soldered to the strip 37, as indicated in Figs. 1 and 5. The contacts 35 and 36 are normally separated so that the circuit through the coil 6 is normally broken and the thermostatic element is so arranged that as its temperature rises, the distortion of the thermostatic element will bring the contacts 35 and 36 together.

As before stated, the various parts of the internal mechanism of the switch can be assembled outside of the casing, as will be readily understood, the parts carried by the disk 22 being rigidly held in proper relation to the movable core 10 by the screws 23 and sleeves 24. The assembled unit is then pressed into the casing 1 in the manner shown in Fig. 1, until the outer projecting end of the sleeve 7 enters the recess 5, and presses against the felt washer 5^a at which time the disk 22 will have entered and closed the rear end of the casing. The push button 14 and sleeve 15 are then screwed on the projecting shank 13 of the core and the parts may be permanently united in any desired way so as to prevent their accidental displacement. For example, I have shown radially disposed screws 38 extending through the casing into the disk 22 for securing the parts permanently to the casing, and the push button 14 and sleeve 15 may be locked upon the threaded shank 13 in any desired manner, for example, by slotting the outer end of the shank 13, as indicated in Fig. 1 of the drawings and spreading the same.

In Fig. 9 I have shown a diagrammatic plan of the circuits in connection with which my improved switch is employed and which will now be described. 40 represents the primary coil and 41 the secondary coil of an induction apparatus. 42 represents a battery which may be formed of dry cells or accumulators. 43, 44, represent respectively the separable contacts of an ordinary periodic interrupter or circuit breaker, 130

in this instance the contact 43 being fixed and the contact 44 being moved by a suitable cam 45 operatively connected with the engine shaft or crank shaft, a condenser 46 being provided to reduce the sparking. In this instance I have indicated four spark plugs 47, and the usual distributor 48 provided with rotating brush and contacts connected to the several spark plugs. The switch is also represented diagrammatically in the figure. The wiring for the primary circuit is as follows:—From the battery 42 the wire 50 extends to the primary coil 40, thence by wire 51 to the movable contact 44 of the contact breaker, thence by wire 52 from the other contact 43 to the binding post 26^b of the switch, which is connected by strip 26^a with the flexible contact 26. The opposing flexible contact 25 is connected by the strip 25^a with the heating coil 33 of the thermostatic element and the primary current passes through said coil and thence by the screw 32 to the binding post 32^b and thence by return wire 53 to the battery. The secondary circuit extends from the secondary coil 41 by wire 54 to the arm of the distributor and thence by wires 55 from each contact of the distributor to one of the spark plugs, the return circuit being by grounded through the engine structure, as indicated by the dotted line 56. The solenoid circuit extends from the binding post 30^b by wire 57 to the battery, the remainder of the circuit being formed by the return wire 53 of the primary circuit from the binding post 32^b to the battery; and this solenoid circuit is normally broken by the separated contacts 35 and 36.

The primary circuit is normally open at the separated contacts 25 and 26. In order to close this circuit to enable the engine to be started and operated, it is only necessary to press inward the push button 14 and core 10 when the insulated portion 12 on the inner end of the core 10 will engage the contact 25 and force it firmly into engagement with the contact 26, at the same time the ball 18 seats in the shallow groove 17 of the core and locks the manually movable member of the switch against accidental displacement without further interfering with the restoration of the said member, under the action of the solenoid. On closing the contacts 25 and 26 as above stated, the primary circuit through the primary coil, battery and automatic circuit breaker is made operative, but is continually interrupted by the operation of the automatic circuit breaker separating the contacts 43 and 44. It therefore follows that the heating coil 33 of the thermostatic device is not in circuit continuously for a sufficient time to heat up the thermostatic element to such an extent as to close the contacts 35 and 36, and this condition continues as long as the

engine is in operation. If the engine is stopped for any reason in such position that the contacts 43 and 44 of the automatic circuit breaker are closed, the waste of electrical energy would occur but for the automatic action of the thermostatic device. In such case the continuous flow of the battery current through the heating coil 33 raises the temperature of the thermostatic element and causes it to distort so as to close the contacts 35 and 36, or in other words, the solenoid circuit, including the wire 57, which thus makes a shunt circuit around the primary coil and the automatic circuit breaker. While I prefer this arrangement in that it permits the entire efficiency of the battery to be exerted in the solenoid by relieving the circuit of the resistance of the primary coil of the induction apparatus and permits me to use a smaller solenoid than would otherwise be necessary, I do not wish to absolutely limit myself to an arrangement in which the solenoid is in a shunt circuit around the primary coil. As soon as the contacts 35 and 36 touch, the action of the solenoid withdraws the core 10 and push button 14 and restores them to normal position, permitting the contacts 25 and 26 to separate, thus breaking the primary circuit through the heating coil 33. The cooling of the thermostatic element then causes it to return to its normal position and separate the contacts 35 and 36 when the entire system is completely restored to its initial condition.

By the use of my invention it will thus be seen that should the operator of the engine or automobile at any time fail to pull out the push button and core 10 connected therewith on stopping the engine, they will be automatically withdrawn by the solenoid under the control of the thermostatic element before any appreciable waste of electrical energy can take place, while, when the manually movable parts are pushed in, they will be retained in operative position and locked against accidental displacement by the spring actuated ball so long as the engine is running and the primary circuit which passes through the heating coil is intermittently made and broken by the automatic circuit breaker.

What I claim and desire to secure by Letters Patent is:—

1. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a source of electricity, and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit provided with a manually operated member, an electromagnetic device for positively moving said manually operated switch member into open circuit

position, circuit controlling means in circuit with said electromagnetic device, normally held in open position, and thermostatically operated means having a part in the primary circuit for bringing the said circuit controlling means into closed position.

2. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary, and secondary coils, a source of electricity, and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit having a manually operated member freely movable into and out of operative position, and adapted to remain in any position to which it is moved, an electromagnetic device for positively moving said manually operated member into open circuit position, normally inoperative circuit controlling devices for said electromagnetic device, a thermostatic element for operating said circuit controlling devices and a heating coil for the thermostatic element in the primary circuit.

3. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit including a manually operated member, a solenoid, a movable core therefor operatively connected with the manually operated member of the switch, a normally open circuit from the battery to said solenoid, a thermostatic element for closing said circuit, and a heating coil in said primary circuit operatively associated with said thermostatic element.

4. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch provided with normally separated contacts electrically connected in the primary circuit, and a manually operated member for closing said contacts, a solenoid, a movable core therefor operatively connected with the manually operated member of the switch, a normally open circuit from the battery to the solenoid around the primary coil of the induction apparatus, normally separated contacts in said circuit, a thermostatic element for closing the circuit through said contact, and a heating coil surrounding said thermostatic element and located in the primary circuit.

5. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a source of electricity, and

an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit provided with a manually operated member freely movable in either direction into and out of operative position, and adapted to remain in any position to which it is moved, means for temporarily securing the manually operated switch member against accidental displacements when in circuit closed position, and an electromagnetic device brought into operation by the stopping of the engine and contact breaker for overcoming said securing means and positively restoring said manually operated switch member to open circuit position.

6. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a source of electricity, and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit provided with a manually operated member freely movable in either direction into and out of operative position, and adapted to remain in any position to which it is moved, means for temporarily securing the manually operated switch member against accidental displacement when in circuit closed position, an electromagnetic device for overcoming said securing means and positively moving said manually operated switch member into open circuit position, normally open circuit controlling devices for said electromagnetic device including a thermostatic element, and a heating coil for said thermostatic element located in the primary circuit.

7. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit including a manually operated member, a solenoid, a movable core therefor operatively connected with the manually operated member, a thermostatic element for closing the circuit through said solenoid, a heating coil in the primary circuit for said thermostatic member, means for locking the core against accidental displacement with respect to the solenoid when the switch is in operative position without interfering with the operation of said core by the solenoid when the latter is energized.

8. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit in-

- cluding a manually operated member, a solenoid, a movable core therefor operatively connected with the manually operated member, a thermostatic element for closing the circuit through said solenoid, a heating coil in the primary circuit for said thermostatic member, and a laterally yielding locking device having a curved surface, said core having a shallow recess for engaging said locking device to hold the core and the manually movable member in circuit closed position against accidental displacement without interfering with the movement of the core by the solenoid.
9. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a switch for closing the primary circuit including a manually operated member, a solenoid, a movable core therefor operatively connected with the manually operated member, a thermostatic element for closing the circuit through said solenoid, a heating coil in the primary circuit for said thermostatic member, said core being provided with a shallow annular groove, a radially movable ball adapted to engage said groove when the manually operated member is moved into operative position, a spring for holding the said ball in operative position and an adjusting screw engaging said spring.
10. In an ignition system for internal combustion engines, the combination with an induction apparatus having primary and secondary coils, a battery and an engine driven contact breaker in the primary circuit, and a spark plug in the secondary circuit, of a self restoring switch provided with normally separated contacts in said primary circuit, a solenoid, a movable core therefor, a manually operated member connected with said core for closing said contacts, a circuit connecting the battery with the solenoid, normally separated contacts in said circuit, a thermostatic element for closing the solenoid circuit through said contacts, a heating coil for the thermostatic element, located in the primary coil, a cylindrical casing of magnetic material surrounding said solenoid and provided with transversely disposed portions of magnetic material at each end of the solenoid for producing a closed magnetic circuit.
11. In a self restoring switch the combination with a manually movable member, and contacts operated thereby, of a solenoid, a core movable therethrough and operatively connected with said manually movable member, normally separated contacts for closing the circuit through said solenoid, a thermostatic element for closing the circuit through said contacts, and a heating coil for said thermostatic member.
12. In a self restoring switch, the combination with a manually movable member, and contacts operated thereby, of a solenoid, a core movable therethrough and operatively connected with said manually movable member, normally separated contacts for closing the circuit through said solenoid, a thermostatic element for closing the circuit through said contacts, and a heating coil for said thermostatic element, and means for connecting said heating coil in circuit with the contacts controlled by said manually movable member.
13. In a self restoring switch, the combination with a cylindrical casing, of a solenoid mounted therein, a core movable through the solenoid, a manually movable device connected with said core, contacts operated by the movement of said manually movable device and core, normally separated contacts for controlling the circuit through said solenoid, a thermostatic element for operating said contacts, a heating coil for said thermostatic element, said casing being provided with a transversely disposed portion having a radially disposed recess therein communicating at its inner end with the space occupied by the said core, a ball located in said recess, a coil spring engaging said ball, an adjusting screw in said recess engaging said spring, for regulating the tension thereof, said core being provided with a shallow annular recess for engaging said ball when the manually movable member and core are moved to operative position, for holding said parts against accidental displacement without interfering with the operation of said core by the solenoid.
14. In a self restoring switch, the combination with a casing, of a solenoid mounted therein, a core movable longitudinally through said solenoid and provided with a stem extending beyond the end of the casing, guiding portions adapted to fit the inside of the casing and secured to said solenoid, contacts carried by one of said guiding portions in position to be engaged and operated by the inward movement of the core, contacts for controlling the solenoid circuit, a thermostatic element secured to one of said guiding portions and operatively arranged to control said contacts, a heating coil for said thermostatic element, means for connecting said heating coil in circuit with the contacts operated by the movement of said core, whereby said parts may be assembled and placed in the casing, and a manually operated device engaging the stem of said core and extending outside of said casing.
15. In a self-restoring switch, the combination with a manually movable member

freely operable into and out of closed circuit position, and adapted to remain in any position in which it is placed, and contacts controlled by said movable switch member, 5 of an electromagnetic device for positively moving said manually operable switch member into open circuit position, normally separated contacts for closing a circuit through said electromagnetic device, and a thermostatic device for closing the circuit through 10 said contact.

16. In a self-restoring switch, the combination with a manually movable member freely operable into and out of closed circuit position, and adapted to remain in any 15 position in which it is placed, contacts controlled by said movable switch member, and

a retaining device for holding said manually movable member in circuit closed position against accidental displacement, of an electromagnetic device for overcoming said retaining device and positively moving said manually movable switch member into open circuit position, normally separated contacts in a circuit with said electromagnetic device, and a thermostatic device for closing 20 the circuit through said contacts. 25

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

FRANCIS R. HOYT.

Witnesses:

BERTHA B. ADELSON,
E. W. WYATT.