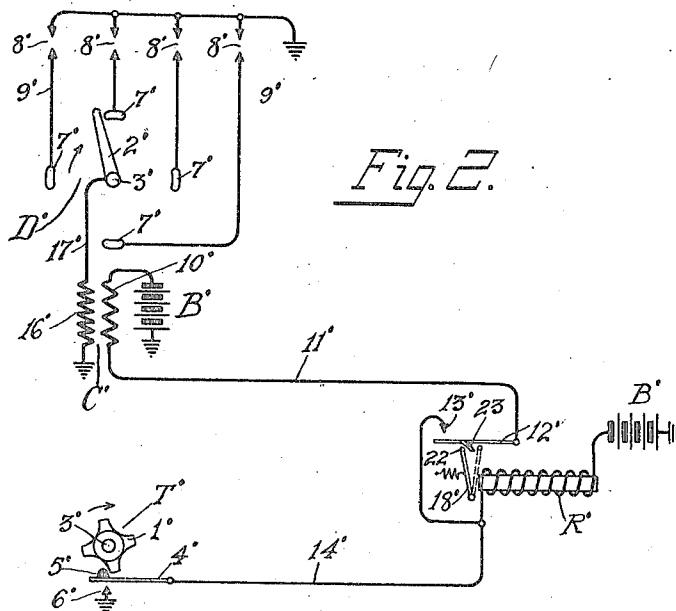


1,157,696.

Fig. 2.



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IGNITION SYSTEM.

1,157,696.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LEROY D. KELLOGG, a citizen of the United States, residing in Chicago, county of Cook and State of Illinois, have invented certain new and useful Improvements in Ignition Systems, of which the following is a specification.

My invention relates to ignition systems for explosive engines and is directed more particularly to uni-spark systems, that is to systems in which but a single spark is made for each cylinder explosion, an object being to provide a system of the above character having simplified circuit arrangements which are positive and efficient in operation.

Referring to the accompanying drawing in which like reference characters indicate like parts, Figure 1 illustrates one embodiment of my invention, and Fig. 2 illustrates another embodiment thereof.

Referring now in detail to the system of Fig. 1, which is illustrated diagrammatically, it comprises in general a timer T, a distributor D, an induction coil C, a relay R and vibrator key VK. The toothed cam 1 of timer T and the contact maker 2 of distributor D are preferably mounted upon the same shaft 3 so as to positively travel together. A timer contact spring 4 is provided having an insulating buffer 5 attached thereto and adapted to be engaged by a tooth of the timer cam 1 and thus moved to engage its alternate contact 6 which is connected to one terminal of battery B.

The distributor D has a number of contacts 7 corresponding to the spark plugs 8, there being a connection 9 between each distributor contact 7 and a corresponding spark plug 8. An induction coil C is also provided having a primary winding 10 connected to one terminal of the battery B, preferably the ground terminal, and also by conductor 11 to the normal contact 12 of relay R. The connection is then extended through contact 13 and conductor 14 to the timer contact 4.

A condenser 15 is connected in multiple with the contacts 12, 13 and tends to eliminate the sparking of these contacts. The secondary winding 16 of the induction coil is connected at one terminal to the conductor 17 which extends to the contact maker 2, the other terminal of the secondary winding 16 being connected so as to complete a circuit for the spark plugs 8 when a sparking im-

pulse is induced in said winding 16. The winding 10 is preferably so related to winding 16 as to step up the voltage in secondary winding 16 over that of the primary winding 10 each time an impulse of current is transmitted through said primary winding 10.

Relay R has its winding connected in circuit with the timer contact 4, so that it will be energized and held energized during each closure of the timer contacts 4, 6. Relay R is preferably of high resistance so as to operate with the least consumption of current and is preferably so arranged that each time the timer contacts are closed sufficient time is allowed for primary winding 10 to be fully charged before the contacts 12, 13 of relay R are interrupted. Each time the armature 18 of relay R is attracted the contacts 12, 13 are interrupted thereby breaking the circuit of primary winding 10 to induce a flow of current through the secondary winding 16 and cause a spark at the plug 8 which at the time is connected in circuit by the distributor arm 2.

Distributor D and timer T are preferably so related that for each spark impulse, contact maker 2 and a contact 7 are first closed followed by the closure of timer contacts 4, 6, said contacts 4, 6 then interrupting followed by the interruption of contact maker 2 and a contact 7. With this arrangement of the contact makers of the distributor and timer, sparking at the distributor contacts is eliminated.

A third or vibratory contact 19 is provided for the relay R, being connected through a protective resistance 20 to key VK. This arrangement is provided so as to permit a vibratory operation of the relay R and thus secure a number of sparks for each closure of the timer contact instead of a single spark. That is when the key VK is closed, each time the timer contacts 4, 6 are closed relay R attracts its armature closing contacts 13, 19 whereby the path through low resistance 20 and key VK to ground shunts the winding of relay R and causes the armature to retract whereupon contacts 13, 19 being interrupted and the shunt removed, the relay immediately attracts its armature again. This vibratory operation continues during the closure of timer contacts 4, 6 so that a plurality of impulses are transmitted through primary winding 10 instead of the

single impulse. This arrangement is desirable in starting an engine.

Referring now to the operation of the system of Fig. 1, upon rotating the shaft 3, the distributor contact maker 2 first engages a contact 7 and thereafter a timer tooth 1 engages the insulating buffer 5 to effect the closure of timer contacts 4, 6. A circuit for the primary winding 10 is thus closed, traced from battery B through contacts 6, 4, conductor 14, normal contacts 13, 12, conductor 11, primary winding 10 of the induction coil to the other terminal of battery B. The closure of contacts 4, 6 also produces an energizing circuit for relay R traced from battery through said contacts 6, 4, conductor 14 and the winding of relay R to the other terminal of battery B. Relay R therefore attracts its armature 18 interrupting the contacts 12, 13 and thereby interrupting the circuit for the primary winding 10 and thereby creating a potential across the spark plug contacts 8 connected in circuit with the secondary winding, and effecting a spark thereat. Relay R remains energized until contacts 4, 6 are interrupted whereby it restores followed by the interruption of the engaged contacts 2, 7. This sparking operation is of course repeated each time the timer contacts 4, 6 are closed.

Assuming now that the operator has closed the vibrating key VK, relay R will vibrate and operate its contacts a number of times for each closure of timer contacts 4, 6 thereby producing a corresponding number of sparks at the spark plugs 8.

Fig. 2.—In Fig. 2, I have illustrated another form of my invention, differing from the first form more particularly in the relay construction. That is the relay R¹ of Fig. 2 when energized, attracts its armature to close a passing contact to effect a momentary closure of the primary circuit. Relay R¹ is so constructed that when its armature 18¹ is attracted contacts 12¹, 13¹ are closed and then interrupted, but upon a retraction of the armature said contacts are not closed. I have illustrated diagrammatically a construction which will effect such a result said construction comprising an armature 18¹ carrying a laterally extending pin 22 which is adapted when armature 18¹ is attracted to engage the under side of the angular laterally extending piece 23 carried by spring 12¹ thereby pressing spring 12¹ upwardly to engage its alternate contact 13¹. As the armature 18¹ completes its attraction, pin 22 passes beyond and frees itself of the piece 23 allowing spring 12¹ to again move downwardly so that contacts 12¹, 13¹ interrupt. Upon armature 18¹ retracting, its pin 22 engages the upper surface of the angular piece 23 thereby pressing spring 12¹ downwardly and thus farther away from its alternate contact 13¹ but

upon full retraction of the armature, pin 22 again passes off of piece 23 to allow spring 12¹ to move upwardly to assume its normal position as shown in Fig. 2. This momentary closure of contacts 12¹, 13¹ establishes a momentary flow of current through the primary circuit which produces a spark at the plug 8¹ then connected in circuit. Relay R¹ is preferably of a high resistance so as to consume the least amount of current.

In the operation of the system of Fig. 2, upon rotating shaft 3¹, the distributor brush 2¹ first engages a contact 7¹ and thereafter a tooth 1¹ of the timer cam engages the rubber buffer 5¹ closing the contacts 4¹, 6¹. An energizing circuit for relay R¹ is thus closed whereby the armature 18¹ is attracted to cause a momentary closure of contacts 12¹, 13¹. This closure produces a momentary circuit in the primary winding 10¹ of the induction coil traced from battery B¹, winding 10¹, conductor 11¹, contacts 12¹, 13¹, conductors 14¹, contacts 4¹, 6¹ to ground or the other terminal of the battery. This impulse of current through the primary winding 10¹ induces a current flow in the secondary circuit and causes a spark across the spark plug terminals 8¹ which are then connected in circuit. Thereafter the timer contacts 4¹, 6¹ are interrupted deenergizing relay R¹ and causing a retraction of its armature 18¹ without closing contacts 12¹, 13¹.

Although I have illustrated several embodiments of my invention I do not desire to be limited to the exact structures as shown and described as many changes and modifications thereof may be made, and I aim to cover all that which comes within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent is:

1. An ignition system comprising normally open timer contacts, a relay winding and source of current in circuit therewith, a primary circuit independent of the relay winding and including said source of current a primary induction coil winding and contacts of said relay, closed responsive to the closure of said timer contacts, said relay being energized responsive to said timer contacts to thereafter interrupt said primary circuit and hold it interrupted during closure of the timer contacts, and a manually controlled circuit including an alternate contact of the relay for rendering the holding circuit ineffective and to cause a vibratory operation of the relay during closure of the timer contacts.

2. An ignition system comprising timer contacts, a relay winding and source of current included in circuit therewith, and a primary circuit independent of the relay winding and including said source of current a primary winding and contacts of said relay, said relay being adapted to be held

energized responsive to each closing operation of the timer contacts to permit but a momentary closure of said primary circuit, and a manually controlled circuit including an alternate contact of the relay for rendering the holding circuit ineffective and to cause a vibratory operation of the relay during each closing operation of the timer contacts.

3. An ignition system comprising timer contacts, a relay winding and source of current connected in circuit therewith whereby said relay is operated each time said timer contacts are operated, a primary circuit including a branch circuit extending from said timer contact and contacts of said relay a primary induction coil winding and said source of current, and a shunting circuit for said relay including an alternate contact thereof and a manually controlled switch.

4. An ignition system comprising timer contacts, a relay winding and source of current in permanent circuit therewith, a primary circuit independent of said relay winding and including contacts of said relay and said timer contacts, said timer contacts being adapted when operated to simultaneously close said primary and relay circuits; said relay being thereby operated to again interrupt said primary circuit and hold it interrupted during the operation of the timer contacts, and means including an alternate contact and a manually controlled switch for rendering said holding circuit ineffective and causing a vibratory operation of the relay during closure of the timer contacts.

5. An ignition system comprising normally open timer contacts, an interrupter relay, an induction coil and a manually operated switch, means for closing said timer contacts to thereby operate the said relay to cause a single impulse to be transmitted through the primary winding of the said induction coil, and means including said manual switch whereby the said interrupter relay may be operated to transmit a plurality of impulses through the said primary winding when the said timer contacts are closed.

6. An ignition system comprising normally open timer contacts, an interrupter relay, an induction coil and a manual switch, means for closing said timer contacts to op-

erate said interrupter relay to transmit a single impulse to the primary winding of said induction coil, and means including said manual switch whereby the said interrupter relay may be operated to transmit a plurality of impulses to the said primary winding when the said timer contacts are closed.

7. An ignition system comprising normally open timer contacts, a relay included in circuit with a source of current and said timer contacts, a primary circuit independent of the said relay and including the primary winding of an induction coil and contacts of said relay, means for closing said timer contacts to energize said relay whereby the circuit of the said primary winding is opened, and means including a second circuit closer for causing the said relay to be deenergized and the circuit of said primary winding to again be closed.

8. An ignition system comprising an induction coil, normally open timer contacts and a relay for controlling the circuit of the primary winding of said induction coil, means for closing said timer contacts whereby only one impulse is transmitted to the said primary winding, and independent means comprising a second circuit closer whereby when the said timer contacts are closed the said relay will operate as a buzzer to transmit a plurality of impulses through the said primary winding.

9. An ignition system comprising normally open timer contacts, a relay and a source of current in circuit therewith, a primary circuit independent of the said relay and including the primary winding of an induction coil and contacts controlled by said relay, means for closing said timer contacts to thereby close a circuit through the said relay whereby the contacts controlled by said relay are opened thus interrupting the circuit of said primary winding, and means including a second circuit closer whereby the winding of said relay may be shunted to cause the same to deenergize to again close the said primary circuit.

Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.

LEROY D. KELLOGG.

Witnesses:

GEORGE E. MUELLER,
BESSIE O'BRIEN.