C. F. KETTERING.

IGNITION SYSTEM.

APPLICATION FILED NOV. 2, 1910.

1,037,492. Patented Sept. 3, 1912.

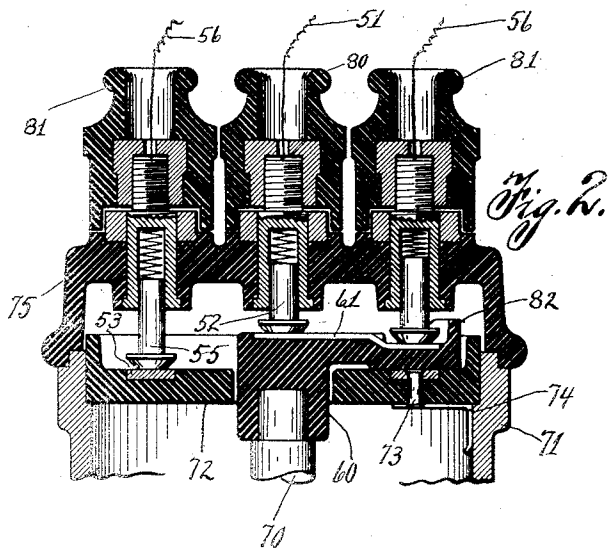

Fig. 2.

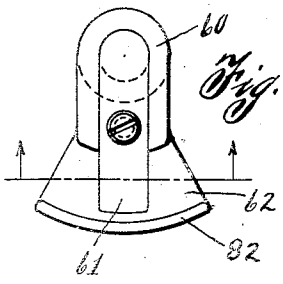

Fig. 3.

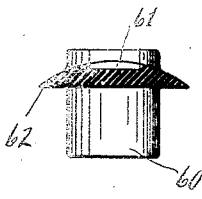

Fig. 4.

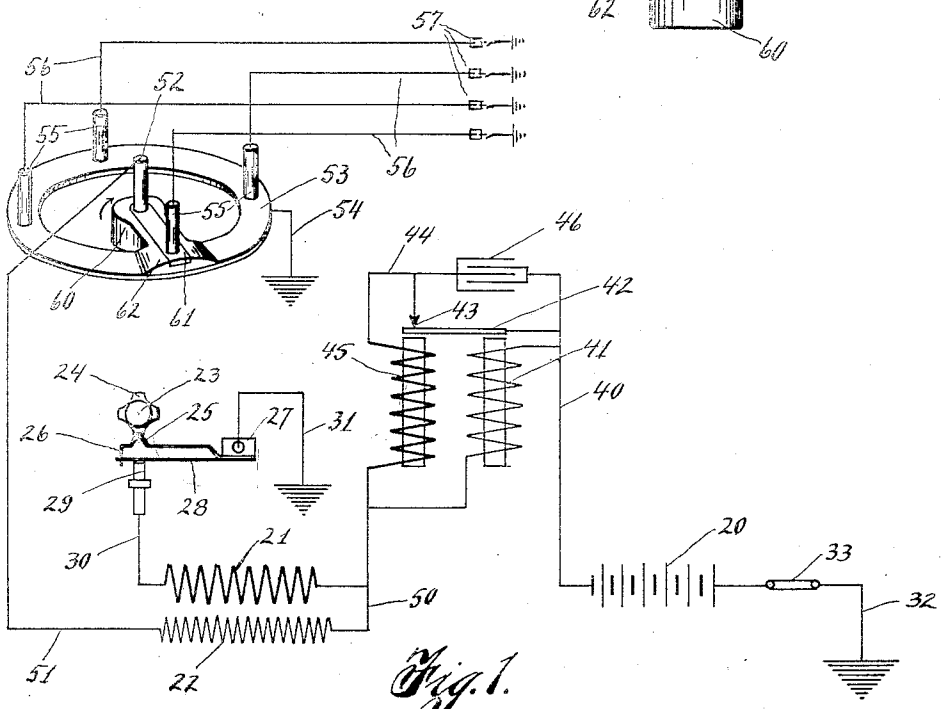

Fig. 1.

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IGNITION SYSTEM.

1,037,492. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed November 2, 1910. Serial No. 590,406.

To all whom it may concern:

Be it known that I, CHARLES F. KETTERING, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Ignition Systems, of which the following is a full, clear, and exact description.

This invention relates to improvements in ignition systems and has among its objects to provide an improved form of device more particularly as a distributer for systems where the secondary impulses are distributed in turn through the successive secondary circuits, one of the general purposes of this improvement being to provide means for dissipating the inductive currents which may arise in the secondary circuit adjacent to the circuit of the cylinder ready to fire, thereby preventing premature firing or sparking in the cylinders.

The general form of distributer apparatus to which I have applied the present improvements, is shown in my co-pending application for an ignition system, Serial No. 548,921, filed Mar. 12, 1910, in which a distributer is used and in which another form of means is provided for dissipating the inductive currents in the secondary circuits as just referred to.

With these and incidental objects in view, the invention consists in certain novel constructions and arrangements, a preferred form of embodiment of which is shown in the accompanying drawings and described in the specification which follows.

In said drawings: Figure 1 is a diagrammatic view of the circuits, showing the distributer mechanism diagrammatically in perspective. Fig. 2 is a vertical cross section through the distributer head containing the improvements referred to. Figs. 3 and 4 are detail views of the rotary distributer plate.

In the diagrammatic view, Fig. 1, the battery 20 supplies the current for the induction coil comprising the primary coil 21 and the secondary coil 22. This battery circuit includes what may be termed a locking-relay, the characteristics of which are set forth in my co-pending application Serial No. 548,921, filed Mar. 12, 1910, and which will presently be explained. The effect of this locking-relay is to produce a single spark impulse in the secondary for each closing of the contact in the primary circuit by means of the timer. This timer 23 is shown having cam projections 24 adapted to strike the nose 25 of a contact strip 26 which is carried upon a pivotal block 27. This block also carries a contact strip 28 adapted to make contact with the contact point 29 when the cam projection 24 strikes the strip 26, in the manner described in my co-pending application first referred to. The contact point 29 is connected by a wire 30 with the primary 21 of the induction coil and the block 27 is grounded by the wire 31, thereby grounding the contact strip 28, and completing the battery circuit through the primary, the timer contact point, and the locking-relay. The other side of the battery is grounded by the wire 32 through an ordinary switch key 33.

The construction of the locking-relay is as follows: The wire 40 from the battery divides to connect in one branch with a high resistance or locking coil 41 and in the other branch with a movable contact strip 42 which is adapted to make and break the contact at the contact point 43. This contact point 43 is connected by a wire 44 with a low resistance coil 45. A condenser 46 is shunted around the contact points of this make and break device. The two coils 41 and 45 are wound around suitable cores operating upon the armature contact strip 42. In the operation of this locking-relay, the current flows through the wire 40, contact strip 42, contact point 43, low resistance coil 45, to the primary coil 21 of the induction coil. Thus when the timer makes contact with the point 29, this completes the battery circuit through the primary of the induction coil and through the low resistance coil 45, but immediately the magnetic influence draws down on the armature strip 42, breaking the contact at point 43 and thus sending the necesssary breaking impulse through the primary coil 21 to induce a sparking impulse in the secondary coil 22. The armature 42 is held down in this contact breaking position by the high resistance or locking coil 41, operating in shunt circuit for this purpose; and remains so held down until the timer breaks the contact at the point 29. This produces a single spark impulse for each closing of the contact by the timer at the point 29.

The distributing of the secondary impulse to the various secondaries will now be described.

The secondary coil 22 is grounded by the wire 50 to the primary circuit which latter is grounded as previously explained; and the other end of the secondary 22 is connected by a wire 51 to the central binding post 52 of the distributer. A grounded ring 53 (grounded by the wire 54) surrounds this central binding post 52 and has normally bearing upon its plungers 55. These plungers are connected by wires 56 to the respective spark plugs 57, which are suitably grounded in a well known manner. Rotating in the secondary of this grounded ring 53, is a distributer vane 60 which is of insulating material, while the ring 53 is of conducting material. Embedded in said vane 60 is a conducting strip 61, and the outer end 62 of the vane is beveled or curved as also shown in Fig. 4. This conducting strip 61 is connected to the central binding post 52. The timer 23 and the distributer vane 60 are geared together so that when the timer causes contact to be made in the primary of the induction coil through the contact point 29, the distributer vane lies with its conducting strip 61 under some one or the other of the secondary plungers 55. It results from this construction that when the current is broken in the primary, as already described, and thereby a secondary impulse is caused in the secondary 22 of the induction coil, this secondary impulse goes through the secondary circuit including the wire 51, central binding post 52, contact strip 61, plunger 55, and wire 56 to the spark plug 57. In this manner as the distributer vane rotates, the secondary circuits are established in turn by means of the contact strip 61 thereby causing a spark in turn in each of the four spark plugs for the four cylinders of the engine, the timer making contact correspondingly to produce the breaking of the primary current at the proper time.

It will be seen that at the time the contact is being made for one of the secondary circuits, to permit the spark impulse to be sent therethrough, all of the other secondary circuits are grounded by reason of the fact that their plungers 55 rest upon the grounded plate 53. For this reason, if any inductive effect is established, either by static or magnetic influence, in any one of the adjacent secondary circuits, such effect would be immediately dissipated by reason of the fact that these adjacent secondary circuits are grounded. By this means therefore I provide secondary circuits which normally all stand grounded, but when the distributer 60 slides under one of the plungers 55, this insulates this plunger and cuts it off from the grounded ring 53, and at the same time establishes that secondary circuit through the contact strip 61, connected to the central binding post 52. This same operation occurs in turn for each one of the secondary circuits.

The exact construction adopted as a preferred form for a distributer head, is shown in Fig. 2. In this case the shaft 70, which may be connected to the timer 23, as shown in my copending application first referred to, carries the insulated distributer vane 60, which therefore rotates with said shaft. The outer metal casing 71 of the distributer head, has seated within it an insulated disk 72 through which the distributer vane 60 projects, and this disk 72 has embedded in it the grounded ring 53. This ring is grounded by means of a conducting pin 73 connected at its upper end to said conducting plate and at its lower end to another plate 74 which projects from the metal casing 71. This casing 71 is grounded to the engine framework, thus grounding the metal ring 53. The strip 61 is shown embedded in the rotary distributer vane. The central binding post 52 is in the shape of a plunger having a beveled or rounded lower end bearing on the strip 61. This plunger 52 is suitably spring seated in its socket in the insulated distributer cap 75. The other plungers 55 are similarly formed and have beveled or rounded ends bearing upon the conductor ring 53 so that as the curved or beveled end 62 of the distributer vane moves around under these different plungers 55, said plungers will be elevated against their spring tension, and thereby the corresponding secondary circuit established as heretofore explained. The terminal cap 80 protects the lead-wire 51 attached to the binding post 52, and outside terminal caps 81 protect the secondary lead-wires 56, connected to their respective plungers 75 in similar manner. Thus the only rotary portion is the distributer vane 60, which distributes the secondary impulses to the various secondary circuits in the manner described. The outer end of said distributer vane carries an upwardly extending flange 82 adapted to minimize leakage.

While the form of mechanism herein described constitutes a preferred form of embodiment of the invention, it is to be understood that other forms may be adopted all coming within the scope of the claims which follow.

What is claimed is as follows:—

1. In an ignition distributer system, the combination with the engine and cylinders, sparking devices in the cylinders, and means for producing a sparking impulse; of normally grounded sparking circuits for said several cylinders; and means for successively insulating each grounded sparking

circuit from its ground and at the same time connecting said circuit with the circuit for said spark producing means.

2. In an ignition distributer system, the combination with the engine and cylinders, sparking devices in the cylinders, and means for producing a sparking impulse; of a permanently grounded member; sparking circuits for the several cylinders having terminals normally contacting with said grounded member; a rotary distributer electrically connected with said spark producing means; comprising means for successively connecting each of said spark circuit terminals with the spark producing means; and means for insulating said terminals from the grounded member concomitantly with the connecting of such terminal with the sparking circuit.

3. In an ignition distributer system, the combination with the engine and cylinders, sparking devices in the cylinders, and means for producing a sparking impulse; of a permanently grounded contact plate; sparking circuits for the various cylinders having contact terminals normally spring-pressed into engagement with said grounded plate; a rotary distributer electrically connected with the spark producing means comprising a contact arm located to engage said terminals in turn to connect the same with the sparking circuit; and an insulating plate intervening between the grounded plate and said contact arm to insulate the live terminal from the grounded plate when said terminal is engaged by the contact plate to connect up the sparking circuit for that terminal.

4. In an ignition distributer system, the combination with the engine and cylinders, and means for producing sparking impulses therein; of normally grounded spark circuits for said several cylinders; and means for successively breaking each grounded spark circuit and concomitantly connecting that circuit thus broken with the circuit for said spark producing means.

5. In an ignition system, the combination with an engine and cylinders, and means for producing sparking impulses therein; of a distributer for making the successive sparking circuits, said distributer including an arm of insulating material having embedded therein a conductor plate connected with the sparking circuit.

6. In an ignition distributer system, the combination with an engine and cylinders, and means for producing sparking impulses therein; of a distributer for making the successive sparking circuits, said distributer including a plate having embedded therein an annular ring permanently grounded electrically, with separate contact plungers connected with the secondary circuits and normally impinging upon said ring.

7. In an ignition distributer system, the combination with an engine and cylinders, and means for producing sparking impulses therein; of a distributer for making the successive sparking circuits, said distributer including a plate having embedded therein an annular ring permanently grounded electrically with separate contact plungers connected with the secondary circuits and normally impinging upon said ring; and a distributer arm including an insulated portion for rotating over the said ring, with a conducting portion embedded in said insulated arm and connected with the common circuit of the secondary circuit.

8. In an ignition system, the combination with an engine and cylinders, and means for producing sparking impulses therein; of a distributer for making the successive sparking circuits, said distributer including a plate having embedded therein an annular ring permanently grounded electrically with separate spring pressed plungers connected with the respective secondary circuits and normally impinging upon said ring; and a distributer arm including an insulated portion for rotating over the said ring, with a conducting plate embedded in said insulated arm and connected with the common circuit of the secondary circuit, said insulated portion having a beveled approach to the conductor plate to facilitate the displacement of the plungers from their normal position.

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

CHARLES F. KETTERING.

Witnesses:
J. B. HAYWARD,
CHAS. R. GILLIES.

Correction in Letters Patent No. 1,037,492

It is hereby certified that in Letters Patent No. 1,037,492, granted September 3, 1912, upon the application of Charles F. Kettering, of Dayton, Ohio, for an improvement in "Ignition Systems," an error appears in the printed specification requiring correction as follows: Page 1, lines 25–26, for the number and date "Serial No. 548,921, filed Mar. 12, 1910," read *Serial No. 564,737, filed June 3, 1910;* and that the proper corrections have been made in the files and records of the Patent Office and are hereby made in said Letters Patent.

Signed and sealed this 28th day of January, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.