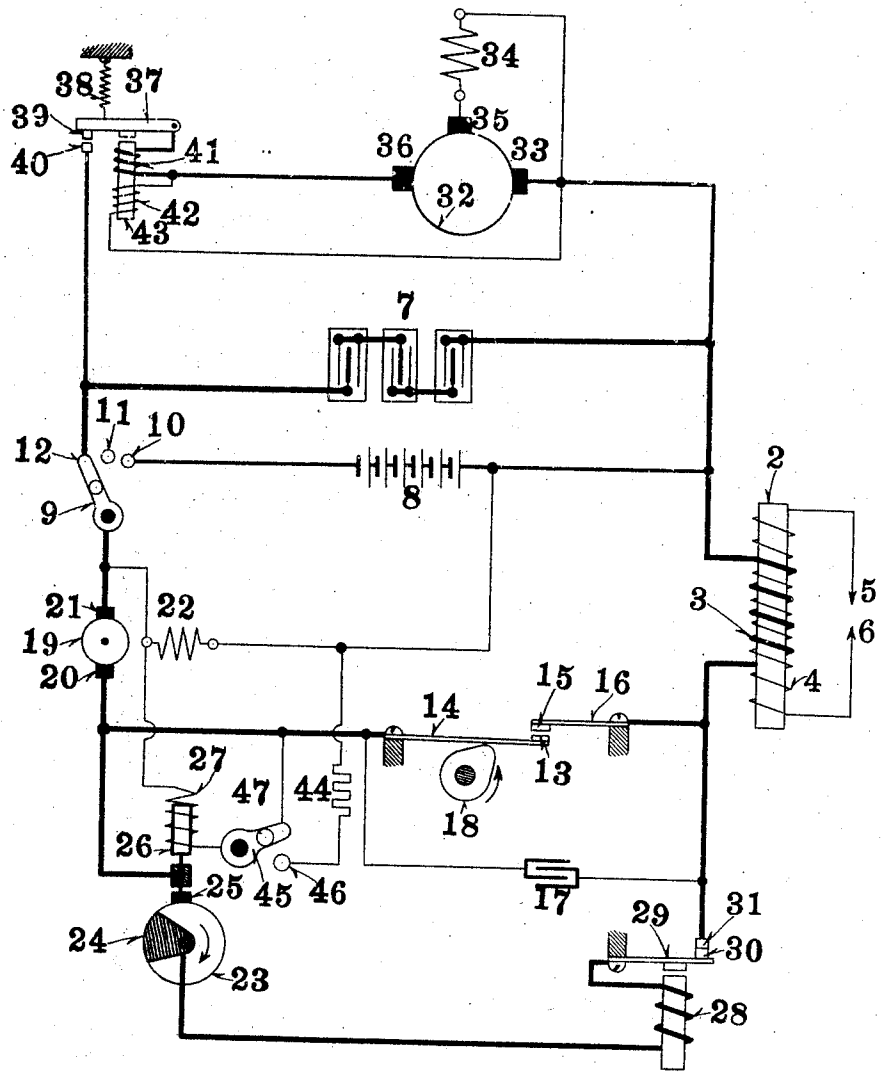
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IGNITION SYSTEM.

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WITNESSES:

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IGNITION SYSTEM.

1,248,840. Specification of Letters Patent. Patented Dec. 4, 1917.

Application filed April 13, 1914. Serial No. 831,454.

To all whom it may concern:

Be it known that I, VALÈRE ALFRED FYNN, a subject of the King of England, residing at the city of St. Louis, State of Missouri, United States of America, have invented certain new and useful Ignition Systems, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an ignition system for internal combustion engines, and more particularly to what is known as a battery ignition system.

One of my objects is to provide a system by means of which either vibrator or single sparks may be produced, it being possible to interrupt the production of the vibrator sparks either automatically or by hand and at any desired instant, irrespective of the position of the engine piston.

Another of my objects is to reduce the possible drain on the battery to a minimum in case the ignition switch is not opened after the engine has come to rest.

A further object is to provide means whereby the ignition voltage will rise with increasing engine speed. Other objects and advantages of my invention will appear from the following more detailed description thereof.

The accompanying drawing diagrammatically illustrates one embodiment of my invention in combination with a generator preferably driven by the explosion engine and adapted to charge the storage battery.

The apparatus illustrated comprises a storage battery 7; a spark coil provided with a core 2, a primary winding and a secondary winding 4, adapted to feed one or more spark gaps such as 5, 6; a contact maker, diagrammatically represented by two spring-mounted contacts 15, 13; a revolving cam 18 driven by the engine and adapted to bring contacts 13 and 15 together and hold them in contact with each other for a short interval of time during each revolution of the cam; a normally closed vibrator, with a spring-mounted armature 29, carrying a contact 30 coöperating with the stationary contact 31 and acted upon by a core energized by the coil 28; and a timer 23 controlling the circuit of the vibrator and comprising a drum of insulated material driven by the engine and carrying a conducting plate 24 coöperating with a brush 25. This brush is under the control of the plunger 26 located in inductive relation to the coil 27 and adapted to be lifted by the latter, thus withdrawing the brush from contact with the timer 23. An auxiliary dynamo or "booster" driven by the engine and having a commuted winding 19, brushes 20, 21, cooperating with same, and an exciting winding 22, is included in circuit with the primary or exciting winding of the spark coil. The dry cells 8 are to be used as the source of ignition current when the storage battery 7 is damaged. The dynamo electric generator driven by the engine, is provided with a commuted winding 32, main brushes 33, 36, an auxiliary brush 35, and an exciting winding 34. This generator can be connected to the storage battery to charge the same by means of an automatic switch of known construction after the voltage of the generator has reached a value approximately equal to the average terminal voltage of the battery. The automatic switch comprises an armature 37 carrying a contact 39 coöperating with a stationary contact 40 and normally held away from the latter by means of the spring 38. This armature is also controlled by the core 43 carrying the shunt winding 42 and the series winding 41, the latter being connected between the contact 39 carried by the movable armature of the automatic switch and the brush 36 of the generator, while the shunt winding 42 is connected between this same brush and the other main brush of the generator.

These various elements of the system above enumerated are correlated as follows:

The secondary ignition circuit, connected to the secondary 4 of the spark coil, is merely indicated. It is well understood that this circuit will, as a rule, lead to a number of spark gaps, the circuits of which will be controlled by a distributer. This portion of an ignition system forms no part of this invention and need, therefore, not be described in more detail. The primary ignition circuit, including the primary winding 3 of the spark coil can be fed either from the storage battery and the booster, or from the dry cells and the booster. When the dynamo 32 is running at a sufficiently high speed and the automatic battery switch 37

is closed, switch 9 standing on point 12, then the primary ignition circuit will be fed from the booster and the dynamo, the latter also charging the storage battery. The primary ignition circuit has two branches; the one adapted to produce single sparks, the other vibrator sparks. The primary single-spark circuit comprises the booster 19, the storage battery 7 or the dynamo 32 or the dry cells 8, the primary 3 of the spark coil, and the contact maker controlled by the cam 18. The vibrator circuit comprises all the elements of the single spark circuit except the contact maker and, in addition thereto, the vibrator 29 and the timer 23 which are connected in parallel across the contacts of the contact maker. The exciting winding 22 of the booster is fed from the storage battery 7 or the dynamo 32, when switch 9 stands on point 12. When the ignition switch is open, lever 9 contacting with the point 11, this exciting circuit is interrupted. When switch 9 stands on point 10, it is fed from the dry cells 8. The coil 27 coöperating with the plunger 26 controlling the timer brush 25, is connected across the brushes 20, 21 of the booster 19, when the switch 45 stands on point 47. The circuit of 27 may be opened by means of this switch 45 or it can be fed from the storage battery 7, the dynamo 32, or the dry cells 8, by placing switch 45 on point 46. A condenser 17 is connected across the contacts 13, 15 of the contact maker.

The operation of this system is somewhat as follows: Assuming the ignition switch to be standing on point 12, and switch 45 to be in contact with point 47, while the engine is at rest, then it will be seen that the field winding 22 of the booster is excited from the storage battery, for with the engine at rest, the automatic switch 37 will necessarily be open. Since the booster armature is then stationary, no voltage will be produced at the brushes 20, 21, the coil 27 will not be energized, and the plunger 26 will allow the brush 25 to rest on the timer. If the position in which the engine has stopped corresponds to the positions of the timer 23 and the cam 18, shown in the figure, both single and vibrator spark circuits will be interrupted, and the drain on the storage battery will be limited to the very small current required to energize the winding 22 of the booster. But the engine may stop in a position in which the brush 25 is in contact with the conducting plate 24 of the timer. Should this be the case, then the vibrator will vibrate, and increase the drain on the battery, generally to about one ampere. Under these conditions, the buzzing of this vibrator should be a warning to the driver that he has omitted to open the ignition switch. Although with the type of contact maker diagrammatically illustrated in the figure, it would be possible for the engine to stop in such a position that contacts 13 and 15 would remain closed, thus draining the battery to the extent of three or four amperes, but any of the known forms of contact makers which make such an accident impossible may be used, the time during which the cam-controlled contacts remain in touch with each other being quite independent of the speed of the engine. The cam 18 can be so set with relation to the timer 23 that contact between 24 and 25 is made immediately after contact between 13 and 15 has been broken. When the engine is first cranked, the cam 18 revolves in a clockwise direction, makes contact between the points 13, 15, thus closing the single spark circuit and energizing the spark coil. As the rotation continues, contact between 13 and 15 is maintained long enough to allow the current in the primary of the spark coil to rise to a sufficient value, and the primary circuit is then interrupted, contact 13 being released by the cam 18. This interruption produces a single spark in the secondary winding 4. Immediately thereafter, the vibrator circuit is closed at 24, 25, and a series of vibrator sparks are produced, ceasing when contact between 24 and 25 is interrupted. After these sparks have ignited the mixture in the cylinders and the engine operates under its own power, its speed may be increased in the usual manner, the voltage at the booster terminal 20, 21 rising in direct proportion with said speed and gradually energizing the coil 27. After the booster has reached a certain voltage, in other words, after the engine has attained a certain speed, the plunger 26 is lifted and the vibrator circuit is interrupted, thus preventing the further production of vibrator sparks. By this means, the wear on the timer brush is materially reduced and additional contacts in the vibrator circuit are rendered unnecessary. The booster is so connected that its voltage is added to that of the storage battery 7 whereby the total ignition voltage increases with increasing engine speed. After the engine has reached a speed at which the dynamo 32 has become self-excited, and reached a voltage approximately equal to that of the storage battery, the automatic switch 37 closes under the influence of the shunt winding 42, and a further slight increase in voltage at the terminals of the dynamo will cause the latter to send a charging current into the storage battery and to relieve the latter of the necessity of feeding the primary ignition circuit. It will be noted that the operation of the ignition system *per se* cannot be affected by the failure of the dynamo or of the automatic switch to operate; said dynamo is merely used for recharging the battery.

Should an accident happen to the booster,

or should it be desired to interrupt the vibrator circuit by hand, it is only necessary to remove switch 45 from the contact 47 and place it on contact 46, whenever it is desired to eliminate vibrator sparks. It will be seen that it is quite impossible for the operator to produce sparks at an inopportune or dangerous instant by manipulating this switch 45. It is also seen that with a certain setting of the timer 23 with relation to the cam 18, a single spark is followed by a shower of vibrator sparks until a certain speed has been reached, when the vibrator sparks are automatically cut out and nothing but single sparks are produced. But a slight change in the setting of the cam 18 with relation to the timer 23 will suppress the single sparks at the lower speeds. It is only necessary to arrange for the brush 25 to make contact with the conducting segment 24 before the cam 18 has released the contact 13 of the contact maker, in which case, vibrator sparks only will be produced at the lower speeds and single sparks only at the higher speeds, the change from the one to the other occurring whenever the latter is energized automatically or by hand. It is, therefore, possible, by changing the relative setting of the cam 18 and the brush 25, not only to control the timing between the single spark and the first vibrator spark, but to entirely suppress the single sparks as long as the vibrator circuit is not interrupted.

Having fully described my invention, what I claim as new and desire to secure by Letters-Patent of the United States is:

1. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, and an engine controlled switch in said shunt circuit.

2. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, and means for rendering the shunt circuit inoperative.

3. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, an engine controlled switch in said shunt circuit, and means governed by the speed of the engine for rendering the shunt circuit inoperative.

4. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, means for varying the voltage impressed on the exciting coil, means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, and an engine controlled switch in said shunt circuit.

5. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, a booster driven by the engine and in circuit with the exciting coil, means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, and an engine controlled switch in said shunt circuit.

6. In an ignition system for combustion engines, a secondary ignition circuit, and a primary ignition circuit comprising an exciting coil, a source of unidirectional E. M. F. and electromagnetic means independent of the unidirectional source and governed by the speed of the engine for varying the voltage impressed on the exciting coil.

7. In an ignition system for combustion engines, a secondary ignition circuit, and a primary ignition circuit comprising an exciting coil, a source of unidirectional E. M. F. and an auxiliary dynamo for varying the voltage impressed on the exciting coil

8. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, means for making and breaking the circuit through the exciting coil, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, an engine controlled switch in said shunt circuit, and means governed by the engine for oper-

ating the first mentioned circuit interrupting means.

9. In an ignition system for combustion engines, a secondary ignition circuit and a primary ignition circuit comprising an exciting coil, a source of unidirectional E. M. F. and a booster for varying the voltage impressed on the exciting coil, said booster being excited from the source of unidirectional E. M. F.

10. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, mechanically actuated means for making and breaking the circuit through the exciting coil, said means being normally in the position occupied when the circuit is interrupted thereby, an electromagnetically operated circuit interrupter in shunt circuit with the first mentioned interrupter, a timer switch in said shunt circuit, said timer switch and said mechanically actuated circuit interrupter being operated by the engine.

11. In an ignition system for combustion engines, a secondary ignition circuit, a primary ignition circuit comprising an exciting coil, a battery and a booster driven by the engine, means for making and breaking the circuit through the exciting coil, other means for making and breaking the circuit through the exciting coil, said means being connected in shunt circuit with the first mentioned circuit interrupting means, an engine controlled switch in said shunt circuit, and a dynamo connected to the primary ignition circuit in shunt with the battery.

In testimony whereof, I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

VALÈRE ALFRED FYNN. [L. S.]

Witnesses:

W. A. ALEXANDER,

G. M. SHORE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."