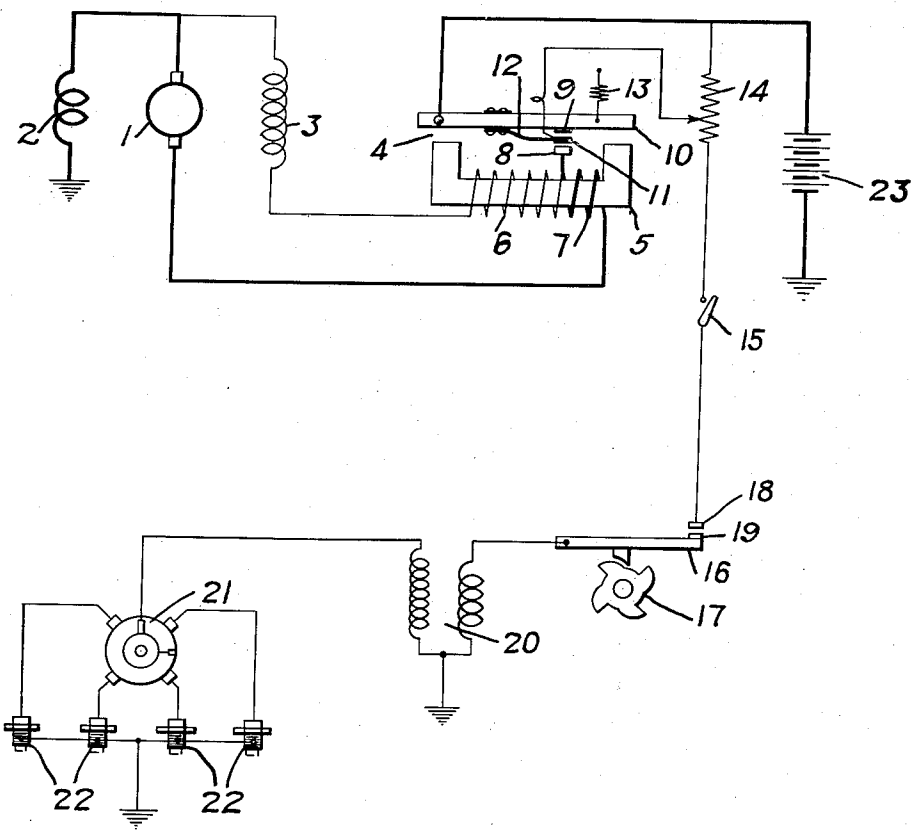
C. R. ALDEN.

ELECTRICAL SYSTEM.

APPLICATION FILED FEB. 4, 1916.

1,266,898. Patented May 21, 1918.



WITNESSES:

R. J. Cadyt.

J. R. Langley

INVENTOR

Carroll R. Alden

BY

Wesley G. Carr

ATTORNEY

UNITED STATES PATENT OFFICE.

CARROLL R. ALDEN, OF DETROIT, MICHIGAN, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

ELECTRICAL SYSTEM.

1,266,898. Specification of Letters Patent. Patented May 21, 1918.

Application filed February 4, 1916. Serial No. 76,162.

To all whom it may concern:

Be it known that I, CARROLL R. ALDEN, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Electrical Systems, of which the following is a specification.

My invention relates to electrical systems for automobiles, and it has for its object to provide a simple and efficient means for controlling the resistance of ignition circuits in accordance with operating conditions.

In the operation of ignition systems of automobiles, or other motor vehicles, which embody batteries as sources of energy, it is usually necessary to provide ballast resistors in circuit with the primary windings of the usual induction coils in order that the batteries may not be discharged when the ignition mechanisms come to rest in such positions that the circuits are closed at the contact members of the usual interrupters. It is desirable, also, that the resistances of the primary circuits of the ignition systems be higher when the vehicle engines are operating at relatively low speeds, as, for example, in starting, than when the engines are operating at their normal running speeds, in order that the interrupter contact members may not be damaged by the flow of currents of excessive values under the former conditions.

I provide an arrangement whereby the cutout that is usually employed to control the charging circuit of an electric generator that is driven at varying speeds by the vehicle engine, operates to control a shunt circuit for a portion or all of the ballast resistor, as may be desired. The cutout operates at a predetermined voltage of the generator to connect the generator in series with a storage battery in order to charge the latter and, at the same time, closes a shunt circuit for at least a portion of the ballast resistor. The advantage of such an arrangement resides in the fact that the ignition mechanism is protected from currents of excessive value during such time as the ignition mechanism may be at rest or operating at relatively low speeds and that the resistor is removed from the circuit when its presence is no longer necessary.

In the accompanying drawing, the single figure is a diagrammatic view of circuits and apparatus embodying my invention.

An electric generator 1, which may be operatively connected to an internal-combustion engine (not shown), has a series field-magnet winding 2 and a shunt field-magnet winding 3. A cutout 4, which controls the main or charging circuit of the generator, comprises a core member 5 of magnetic material, a magnetizing coil 6 that is in series with the shunt field-magnet winding 3 and a series magnetizing winding 7 that is in series with the generator armature when the cutout is in its closed position.

A contact member 8 is connected to the windings 6 and 7 at a common point. A contact member 9, which is carried by and connected to a pivotally mounted armature member 10, coacts with the contact member 8 to complete the charging circuit of the generator. An auxiliary contact member 11, which occupies a position between the contact members 8 and 9, is carried by a spring 12 that is connected to, and insulated from, the armature member 10.

A spring 13 normally retains the armature member 10 in its uppermost position, with the contact members 8, 9 and 11 out of engagement. The contact member 11 is connected to any desired point of a ballast resistor 14 that is in circuit with an ignition system.

The ignition system comprises a manually operable switch 15 which may be, for example, the usual switch that is mounted on the dashboard of an automobile. The primary circuit of the ignition system comprises an interrupter lever 16 that is actuated by a cam member 17 to effect the engagement and disengagement of contact members 18 and 19 and the primary winding of an induction coil 20. The secondary circuit of the ignition system comprises the secondary winding of the induction coil 20, a distributer 21 and the usual spark plugs 22.

It may be assumed that the several parts are in their illustrated or inoperative positions and that the internal-combustion engine to which the generator 1 is operatively connected is operating at a gradually increasing speed. The ignition system is supplied with energy from a storage battery 23. When the interrupter contact members 18 and 19 are engaged, current traverses a circuit which extends from one terminal of the storage battery through ballast resistor 14, switch 15, contact members 18 and 19, interrupter lever 16 and the primary wind-

ing of the induction coil to ground and thence to the grounded terminal of the storage battery 23.

When the interrupter lever operates to permit the disengagement of the contact members 18 and 19, an electromotive force of high value is generated in the secondary winding of the induction coil 20, and a spark is produced across the terminals of that spark plug to which the distributer 21 is at that time connected. When the voltage of the generator increases to a predetermined value, the coils 6 and 7 of the cutout 4 are sufficiently energized to draw the armature member 10 downwardly to effect the engagement of contact members 8, 9 and 11.

The engagement of contact members 9 and 11 establishes a shunt circuit for a portion of the ballast resistor 14. The electrical connection of contact members 8 and 9 completes the charging circuit of the generator which extends from one terminal of the latter through the coil 7, contact members 8, 11 and 9, armature member 10 and battery 23 to ground, and thence through the series field-magnet winding 2, one terminal of which is grounded, to the other terminal of the generator. The storage battery 23 receives current from the generator 1 during such time as the voltage of the latter exceeds that of the battery. During the operation of the ignition mechanism at relatively high speed, the current traversing the primary circuit will not exceed a safe value because of the relatively high inductance of the circuit. Such protection as is necessary under normal running conditions will be afforded by the section of the ballast resistor remaining in circuit.

When the voltage of the generator falls to a value below that of the battery 23, current tends to flow in a reverse direction through the charging circuit above traced. The series coil 7 of the cutout, which operates as a holding coil during the normal operation of the system and assists the shunt coil 6, now opposes the latter, and the spring 13 operates to draw the armature member 10 upwardly and thereby effect the disengagement of the contact members 8, 9 and 11. The opening of the cutout operates to break the charging circuit and thus prevent the discharge of the battery through the generator when the voltage of the latter is less than that of the battery and, also, to insert the resistor 14 in circuit with the ignition system in order that the latter may not receive current of excessive value when the engine and ignition mechanism are at rest or are operating at relatively low speeds.

The arrangement above described operates to automatically remove unnecessary resistance from the primary circuit of the ignition system when the ignition mechanism operates above a predetermined speed. This result is effected by the use of substantially the same mechanism that is ordinarily employed in systems of this character. The ignition mechanism is afforded such protection as is usual and necessary when the conditions render it desirable, but unnecessary waste of energy is prevented. The ignition system is made more efficient by the removal of the ballast resistor when the protection afforded by it is no longer necessary. It will be understood that the portion of the resistor that may be shunted by the cutout is more or less dependent upon the engine speed at which the cutout is adjusted to operate. If the predetermined speed is sufficiently high, all of the resistor may be removed from circuit. As ordinarily arranged, however, it is advisable to allow at least a portion of the resistor to be in circuit during the normal operation of the system.

I claim as my invention:

1. In an electrical system, the combination with an ignition circuit comprising a resistor and a generator, of means for simultaneously closing and also simultaneously opening the circuit of said generator and a shunt circuit for said resistor.

2. In an electrical system, the combination with an ignition circuit comprising a resistor and a generator, of means operable at a predetermined voltage of said generator for simultaneously closing the circuit of said generator and a shunt circuit for said resistor.

3. In an electrical system, the combination with an ignition circuit comprising a resistor and a generator, of a cutout for simultaneously closing or opening the circuit of said generator and a shunt circuit for said resistor.

4. In an electrical system, the combination with an ignition circuit comprising a generator, a battery and a ballast resistor between said generator and battery, of a cutout for controlling the circuit of said generator, said cutout having an auxiliary contact member for controlling a shunt circuit for said resistor.

5. In an electrical system, the combination with an ignition circuit comprising a ballast resistor and a generator, of a cutout having a plurality of contact members for controlling the main circuit of said generator and for completing a shunt circuit for a portion of said resistor.

In testimony whereof, I have hereunto subscribed my name this 21st day of January 1916.

CARROLL R. ALDEN.