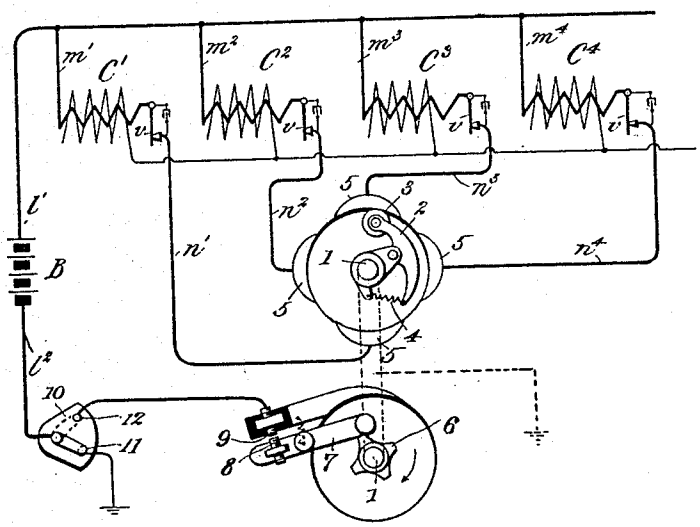
R. VARLEY.

IGNITION SYSTEM FOR EXPLOSION ENGINES.

APPLICATION FILED DEC. 1, 1906.

915,389. Patented Mar. 16, 1909.




Witnesses
Frank C. Ober
Waldo M. Chapin

Inventor
Richard Varley.
By his Attorneys
Rosenbaum & Stockbridge.

THE NORRIS PETERS CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

RICHARD VARLEY, OF ENGLEWOOD, NEW JERSEY, ASSIGNOR TO THE AUTOCOIL COMPANY, A CORPORATION OF NEW JERSEY.

## IGNITION SYSTEM FOR EXPLOSION-ENGINES.

No. 915,389. Specification of Letters Patent. Patented March 16, 1909.

Application filed December 1, 1906. Serial No. 345,864.

*To all whom it may concern:*

Be it known that I, RICHARD VARLEY, a citizen of the United States, residing at Englewood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Ignition Systems for Explosion-Engines, of which the following is a full, clear, and exact description.

My invention relates to ignition systems for explosion engines, particularly of that type having a plurality of induction coils with their secondaries connected with the spark plugs of a multiple cylinder engine, and having circuit controlling devices in their primary circuits by which their operation is controlled to properly time the explosions. The ordinary circuit controlling device for this purpose effects the closure of the circuits of different coils successively, each for a definite period, which, however, varies with the speed of the engine. The longer the period of circuit closure or dwell, the more effective the ignition becomes, but, on the other hand, a long circuit closure consumes a great deal of battery current, and, in many cases, uselessly, since the engine ordinarily operates properly with a very short current duration. This difficulty is increased by the fact that the ordinary circuit controlling device is operated from the engine, so that the primary dwell is less at high speeds than at low speeds.

It is the principal object of my present invention to have the primary circuit closure or dwell controllable so as to be suited to the conditions.

With this principal object in view the invention consists in the arrangement of circuits and parts by which the primary circuit closure or dwell is varied by merely making or breaking an electrical connection or circuit. This action may be under the control of the driver, or it may be done automatically as desired.

The invention further consists in the features of construction and combination as hereinafter set forth, and finally pointed out in the claim.

The drawing shows a partly diagrammatic view illustrating one embodiment of the invention.

In operating a motor car it is desirable to use as little battery current as possible, not only for the purpose of saving the battery, but also to avoid overworking the coils, overworking the vibrators, and overheating the spark plugs. If, however, the circuit controlling devices are adjusted to suit the ordinary normal conditions when the vehicle is running at slow speeds, the circuit closure will not be long enough when the vehicle is traveling at high speeds, or, in some cases where increased power is desired, or where the mixture in the cylinders is not quite right, so that the engine does not ignite properly. Accordingly it is extremely desirable to have the circuit closure or primary dwell adjustable, and many plans have been proposed for accomplishing this. By the present invention I secure such control wholly by making and breaking an electric circuit, which can be accomplished by a simple switch located at any point on the car, and convenient to the driver if desired. Such control may also be effected automatically by a governor, as will be later pointed out.

Referring to the drawings in which like parts are designated by the same reference sign, 1 indicates a shaft, revolving commensurately with the engine, and usually denominated the half time shaft by reason of the speed relation most commonly used. For the purposes of illustration this shaft is shown in a conventional way, having two separate devices thereon at different points of its length. The two devices are separately illustrated, and are connected by dotted lines to represent the position of the shaft 1. The upper device constitutes a circuit controller, and has an arm 2 carried by the shaft 1, and having a roller 3, which is normally spring impelled outward by a spring 4. 5 indicates segments in the path of the roller 3, these segments being comparatively long so as to make electrical contact with the roller through a fairly large angle of rotation thereof. For example, the segments 5 may contact with the roller 3 through an angle of 50° of rotation thereof. The shaft 1 also has a cam 6, thereon, which acts upon a pivoted lever 7, having a contact 8, moved into and out of engagement with a fixed contact 9. The cam 6 is arranged to separate the contacts at the points 8 and 9 four times during the revolution of the shaft 1. These features thus far described are in their mechanical details not part of the present invention, but are claimed in my co-

pending case, Serial No. 343,833. The present case relates more particularly to the electrical circuits and connections which may be employed therewith.

The relation of the cam 6 to the roller 3 forms an important feature of the present invention. The adjustment is such that the cam 6 acts to separate the contacts 8 and 9 at just about the point when the roller 3 has passed half way across any one of the segments 5.

B denotes a battery, of which $l'$ and $l^2$ are the terminals. The terminal $l'$ has a connection with the primaries of each of the induction coils C', $C^2$, $C^3$ and $C^4$, through wires $m'$, $m^2$, $m^3$ and $m^4$. The other terminals of the coils are connected to the segments 5 through wires $n'$, $n^2$, $n^3$ and $n^4$. $v$ denote vibrators of the ordinary form and located in such connections. The roller 3 is permanently grounded by its connection with the shaft 1, thereby completing a circuit through one or another of the primaries in case the terminal $l^2$ of the battery happens to be simultaneously grounded.

The terminal $l^2$ is arranged to be grounded permanently or intermittently at different times. For this purpose a switch arm 10 moves between contact points 11 and 12, of which 11 is permanently grounded, while 12 is connected to the fixed contact 9 above described. When the lever 7 moves against the contact 9 a ground connection is made to the shaft 1, but when the cam 6 impels the lever away from contact 9, this ground connection is broken.

The operation is as follows: Supposing the roller 3 to have just moved into contact with segments 5, a current will pass from battery B, through wire $l'$, wire $m^3$, primary of coil $C^3$, vibrator $v$, wire $n^3$, segment 5, roller 3, arm 2, shaft 1, lever 7, contacts 8 and 9, switch arm 10, and wire $l^2$, back to battery. When the roller 3 is moved about half way across the segment 5, the cam 6 will impel the lever 7 to separate the contacts 8 and 9, so that this circuit is broken. It is evident that the primary circuit closure or dwell is about half the angular movement of the roller 3 on the segments 5 under these circumstances. In other words, the primary dwell would be about 25° of rotation of the half time shaft. This condition corresponds to normal running, and is sufficient in most cases for perfect ignition. Under some circumstances, however, as, for example, when high speed is to be attained, or in climbing hills, a longer circuit closure or dwell is required, and this may be at once obtained by moving the switch blade 10 over on to the contact 11. Under these circumstances, the terminal $l^2$ of the battery becomes permanently grounded so that the primary circuits of the induction coils are closed during the entire interval that the roller 3 is in contact with the segments 5. The primary circuits are therefore closed during about 50° of the half time shaft under these conditions. Thus the primary circuit closure or dwell is regulated by the movement of a simple switch at any point of the car, and without any change in the standard mechanism such as described in my above mentioned application, but merely in the electrical circuits thereof.

What I claim, is:—

In an ignition system for explosion engines, a single revoluble member having a circuit controller and a cam, said circuit controller having segments separated by spaces of appreciable width, and said cam having projecting portions of less angular extent than that of said segments, an induction coil, a current source having a terminal connected thereto, a contact connected to the other terminal of said current source, a vibrating part positively impelled by said cam to break the circuit at said contact, and means for permanently grounding said last mentioned terminal, whereby the primary dwell is increased to a value adapted to ordinary high speed running conditions.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

RICHARD VARLEY.

Witnesses:

FRANK S. OBER,

WALDO M. CHAPIN.