R. VARLEY.

IGNITION SYSTEM FOR EXPLOSION ENGINES.

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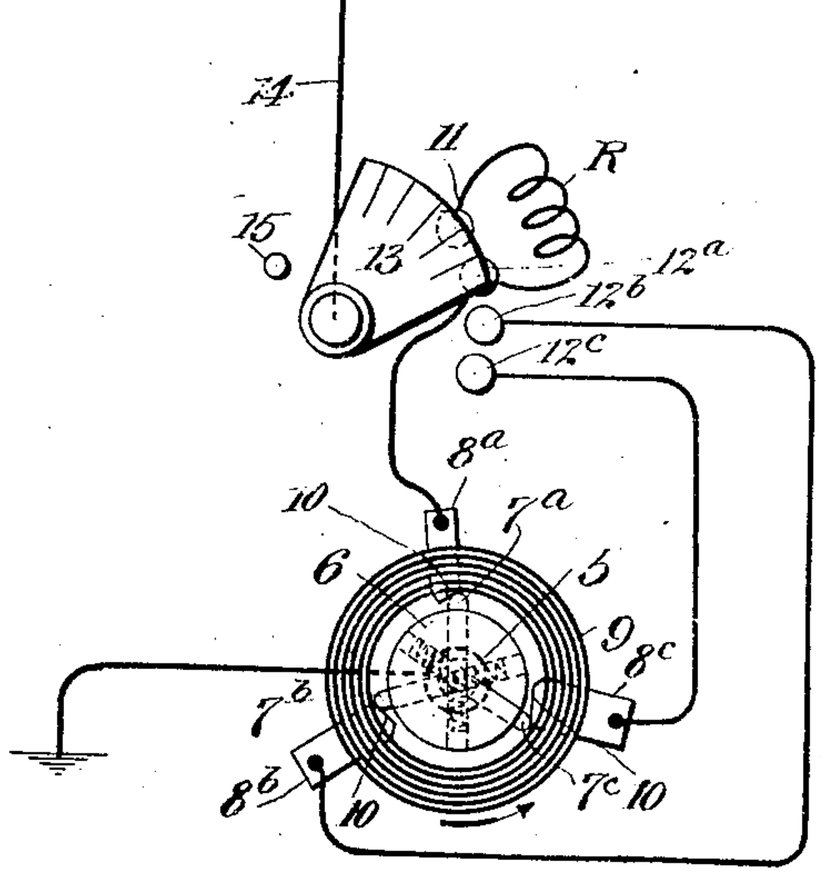
899,770.

Patented Sept. 29, 1908.

Fig. 1.



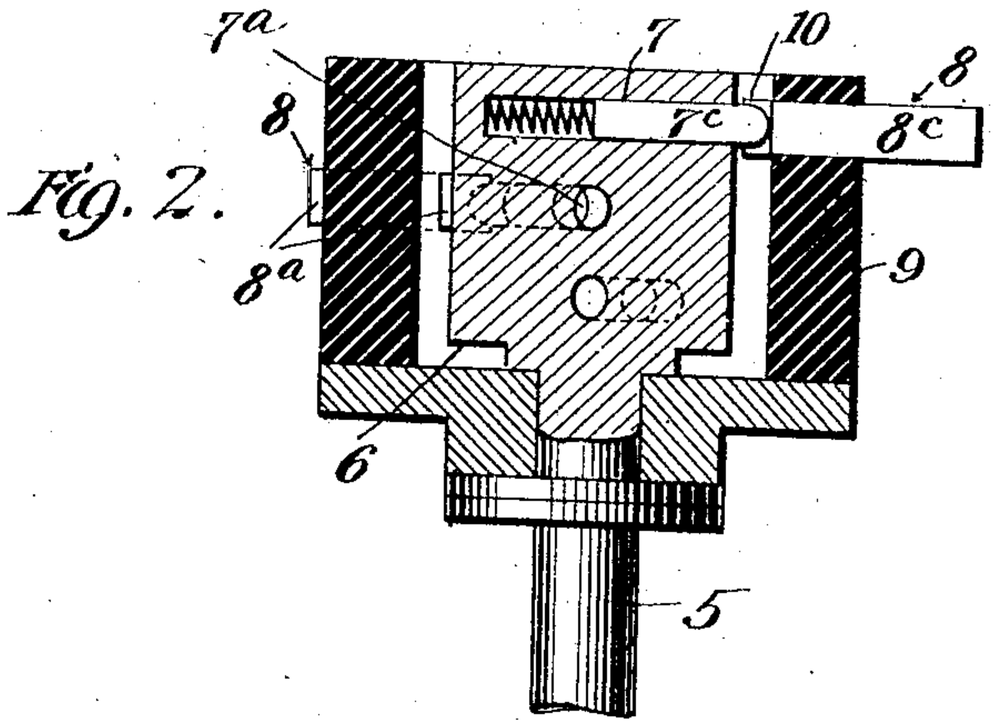


Fig. 2.

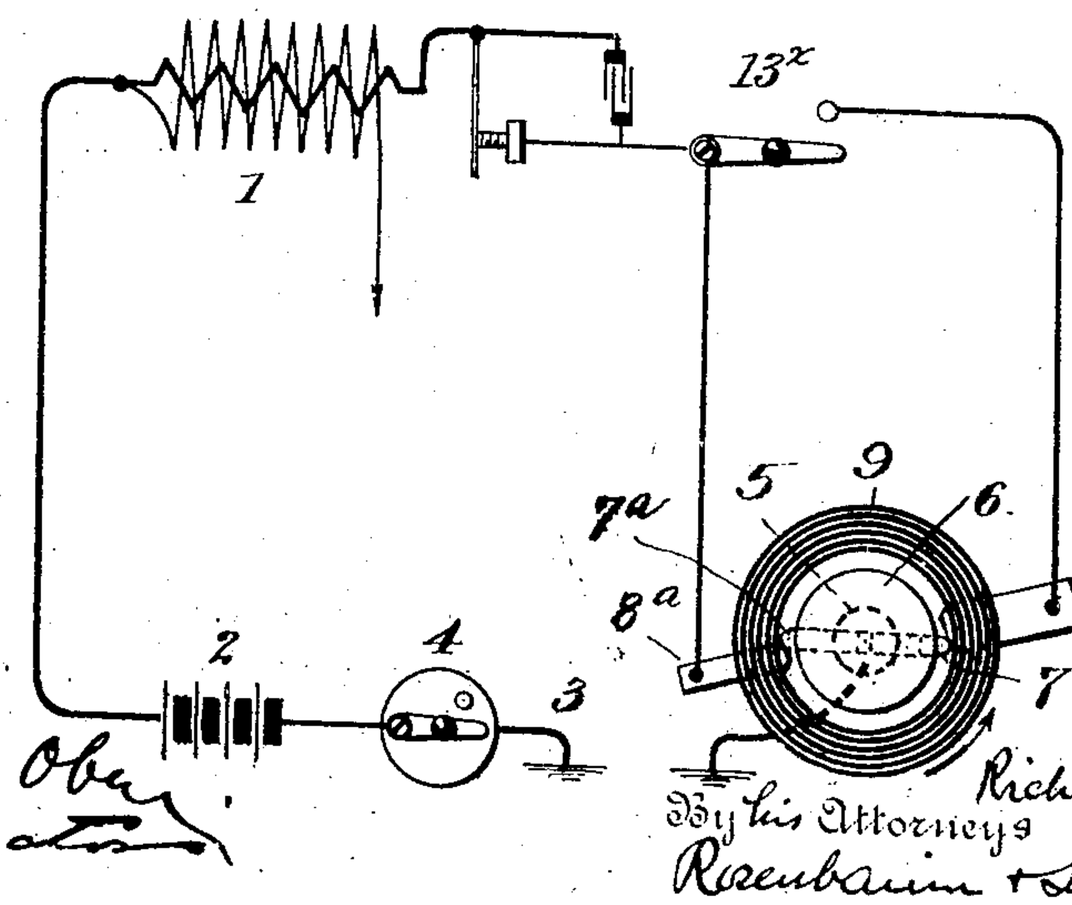


Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

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IGNITION SYSTEM FOR EXPLOSION-ENGINES.

No. 899,770. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed November 8, 1907. Serial No. 401,191.

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 the construction and arrangement or use of a form of circuit controller or timer for explosion engines, and particularly systems in which a trembler coil or coils are used.

The principal object of the invention is to provide a thoroughly practical arrangement for varying the duration of the primary circuit closure or, as it is commonly called, "the primary dwell."

In all ignition systems the primary circuit of the induction coil or coils must be completed and broken at certain intervals of the engine rotation. It is necessary to have the moment of circuit closure varied with relation to the engine stroke, and it is desirable to have the length of duration of the circuit closure also variable. It is, of course, absolutely necessary to have the circuit closure and the circuit rupture made with the highest conducting and insulating efficiency respectively. Obtaining these various functions in a simple practical mechanism has proved very difficult in practice, notwithstanding their apparent simplicity.

By the present invention I have devised a system and arrangement by which very good practical results are obtained, and which is quite simple, both from the standpoint of the mechanical construction and the electrical circuits.

In the drawings: Figure 1 is a complete diagrammatic view showing the circuits and arrangement of the parts; Fig. 2 is a sectional view of the circuit controller or timer; Fig. 3 is a diagrammatic view showing a slight modification.

Referring to the drawings in which like parts are designated by the same reference sign, 1 indicates a trembler induction coil, the secondary circuit of which may include the spark plug of an engine (or a plurality of spark plugs if a distributer is used).

2 designates the battery, having one terminal grounded at 3, 4 being a circuit opening switch which is normally closed, and which takes no particular part in the normal working of the apparatus. The other terminal of the battery 2 is connected to the primary of coil 1, and through said coil is intermittently grounded to complete the circuit by a system of arrangement embodying the principles of my invention.

The essential characteristic of this circuit closing apparatus lies in the provision of a single constantly rotating shaft, carrying a plurality of circuit closing fingers, all grounded on the shaft, and simultaneously engaging segments or contact plates, one or more of which can be connected in a single circuit from the primary of coil 1. The continuously rotating shaft, which is ordinarily the half-time shaft of the engine, is indicated at 5, and carries a cylindrical block 6, with spring pressed plungers 7, movable radially outward therefrom. For convenience in construction, balance and arrangement, the plungers 7 project in equal angularly spaced-apart relations from one another about the cylindrical block 6. The different plungers are, however, quite widely out of the plane of one another, so that each may project entirely through the cylindrical block 6, without interference from the rest. This arrangement in separate planes is also important in the functions of the apparatus.

8 designates the segments or contact plates disposed within a cylindrical hollow insulating casing 9 and out of the plane of one another corresponding to the disposition of the plungers 7. These contact plates have inclined faces 10, in the path of the plungers 7, which are accordingly pressed inward in passing by an engagement so powerful as to get a very good electrical contact. The relative disposition of the various segments or contact plates 8 to the respective plungers is such that all make contact or initially complete the circuit at precisely the same instant, but the contact plates are of different sizes, so that the duration of the circuit closure or dwell is different in the different cases. The contact plate 8^a is the smallest or shortest, and corresponds to a minimum circuit closure or primary dwell. Contact plate 8^b is slightly longer, whereas contact plate 8^c is longest of all, and corresponds to a maximum circuit closure or primary dwell. 11, 12^a, 12^b, 12^c designate contact studs of a switch, with a pivoted slotted blade 13, long enough to simultaneously make contact with

all of the studs or any less number down to a point where it engages the stud 11 alone. Studs 12^a, 12^b and 12^c, are respectively connected to segments or contact plates 8^a, 8^b and 8^c; the stud 11 is connected with the stud 12^a by a resistance R, and the switch blade 13 is connected to the primary of coil 1 by wire 14.

The operation is as follows: Supposing the parts are in the relation shown in Fig. 1, it is evident that the circuit of the battery is intermittently completed and opened through the primary of the coil 1 by the plunger 7^a which engages the segment or contact plate 8^a. Under these circumstances, the segments 8^b and 8^c, with their plungers, are wholly out of action and the operation is substantially identical with any ordinary circuit controller or timer. If the switch blade 13 is moved downward to a new position, the stud 12^b is engaged thereby in addition to the stud 12^a, by means of which both the segments or contact plates 8^a and 8^b are put equally and simultaneously into action. It is clear that a double circuit closing efficiency is now obtained and the primary dwell is increased to the extent of the greater length of the segment or contact plate 8^b. In similar manner when the switch blade 13 is moved downward to its extreme position where it engages all of its contact studs, the segment or contact plate 8^c coöperates in the circuit in addition to and equally with the other segments or contact plates. The primary circuit closure is therefore made still longer in proportion to the extra length of the third segment or contact plate 8^c. Thus the primary circuit closure or dwell is varied, and the efficiency of the circuit closure is increased by each successive addition.

The above constitutes a practical and operative arrangement, but in practice I prefer to make use of the additional contact 11 connected to the contact 12^a by the resistance R, which can therefore be cut into the circuit by moving switch blade 13 to its uppermost position against the stop 15. This condition is exceedingly economical of battery current, and is employed on level roads at moderate speeds, or wherever the engine is found to ignite properly by its use. No difficulty is found in practice, because if the engine will operate satisfactorily with the switch blade in its uppermost position, corresponding to the shortest primary dwell and resistance in the circuit, this condition is, of course, maintained, but if the engine does not operate satisfactorily, which it may not do for a variety of reasons, then the switch blade 15 is moved successively downward to its other positions, each of which gives increasingly better ignition conditions, although at the expense of a greater battery current. The first movement cuts out the primary resistance, and the next movement cuts in additional circuit closing devices in multiple with the one or ones already in circuit, thereby not only doubling or multiplying the efficiency of the circuit completion at the timer, but lengthening the duration as well. Under any normal circumstances, proper ignition will be attained by one or another of the switch positions. If it is not so attained, it is a certain indication that there is a radical fault which must be corrected.

The relation of the initial circuit closure in the engine stroke is of course variable at all times in the ordinary way, which forms no part of my invention, that is, by shifting the entire casing 9 around the half-time shaft 5 as an axis. I have illustrated four different circuit conditions, three of which are brought about by segments or contact plates of different lengths. This arrangement can, of course, be simplified by reducing the number of segments with their attendant circuits. In Fig. 3 I have illustrated an arrangement in which there are only two segments or contact plates coöperating with a pair of plungers 7^a, 7^b. In this case the resistance R is also omitted, so that the switch 13 becomes simply a one-point or single contact switch 13^a of the type ordinarily used to open and close a single circuit. In the drawings the parts corresponding to those of the already described modification are denominated by the same reference characters, and need not be again particularly referred to.

What I claim, is:—

1. In an ignition system having a primary circuit, a circuit controller having a plurality of contacts of different angular extent and located in different transverse planes, a continuously rotating shaft having metallic plungers in different planes corresponding to said contacts and equi-angularly spaced apart, said plungers being spring-pressed radially outward and all grounded on said shaft, and a switch for putting one or any number of said contacts simultaneously into said circuit, the initial engagement of said contacts and said plungers occurring simultaneously when more than one is in the circuit.

2. In an ignition system having a primary circuit, a circuit controller having a pair of contacts of different angular extent and located in different transverse planes, a continuously rotating shaft having metallic plungers in different planes corresponding to said contacts and diametrically opposite one another, said plungers being spring-pressed radially outward and grounded on said shaft, and a switch for putting one or both of said contacts simultaneously into said circuit, the initial engagement of said contacts and said plungers occurring simultaneously when both are in circuit.

3. In an ignition system having a primary

circuit, a circuit controller having a plurality of contacts of different angular extent located in different transverse planes, a continuously rotating shaft having metallic plungers in different planes corresponding to said contacts, said plungers being spring-pressed radially outward and all grounded on said shaft, and a switch for putting one or any number of said contacts simultaneously into said circuit, the initial engagement of said contacts and said plungers occurring simultaneously when more than one is in the circuit.

4. In an ignition system for explosion engines, a rotatable member having a plurality of contact arms in different planes of rotation, a plurality of contacts all of different angular extent from one another and all located in different planes corresponding to said contact arms, an induction coil having a primary circuit, and means for including one or any number of said contacts in multiple, in said primary circuit.

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

RICHARD VARLEY.

Witnesses:
WALDO M. CHAPIN,
JAMES DE ANTONIO.