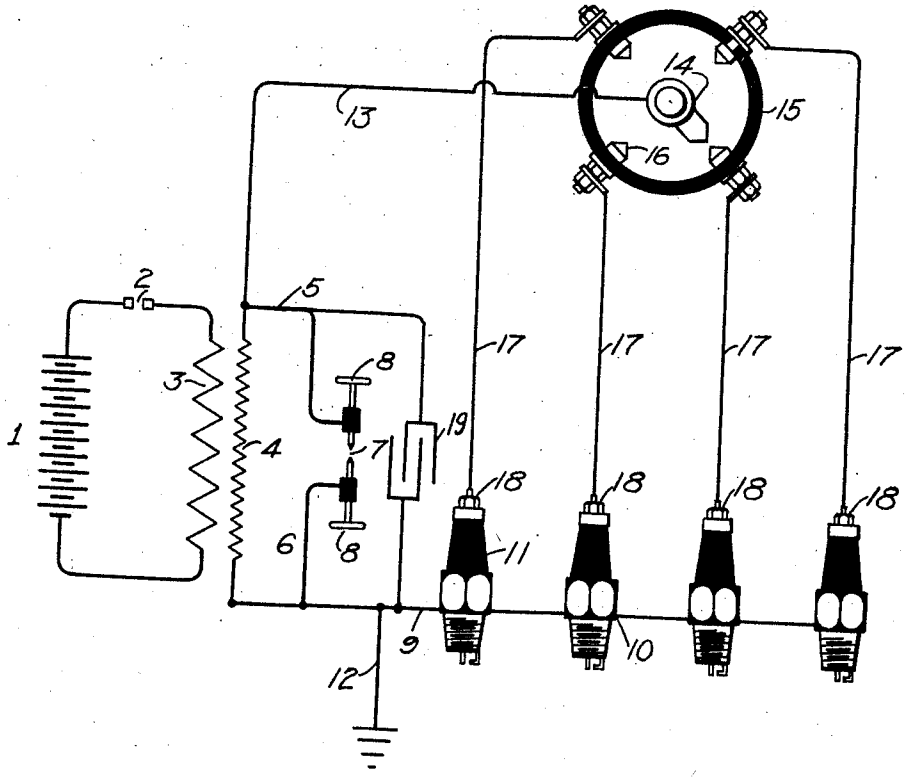
Aug. 28, 1923.

1,466,209

H. W. EICHBAUM

IGNITION SYSTEM

Original Filed Sept. 15, 1919



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UNITED STATES PATENT OFFICE.

HERMAN W. EICHBAUM, OF VENICE, CALIFORNIA.

IGNITION SYSTEM.

Continuation of application Serial No. 323,979, filed September 15, 1919. This application filed September 18, 1920. Serial No. 411,237.

To all whom it may concern:

Be it known that I, HERMAN W. EICHBAUM, a citizen of the United States, residing at Venice, county of Los Angeles, and State of California, have invented a new and useful Improvement in Ignition Systems, of which the following is a specification.

My invention relates to ignition systems used with internal combustion engines and the principal object of the invention is to provide a system which will be much simpler and surer in operation than any of the present forms.

A further object of the invention is to provide a system in which the engine will operate in case there are foul or defective spark plugs.

A further object of the invention is to provide a device in which the intensity of the spark will be greatly increased over the present forms.

A still further object of the invention is to utilize oscillating discharges.

Referring to the drawing which is a diagrammatic representation of the system, I provide a battery 1, a vibrator 2, a transformer having a primary winding 3, and a secondary winding 4. Connected across the winding 4 by means of wires 5 and 6 is an adjustable fixed gap 7 which may be varied by adjusting one of the screws 8 thereof. One terminal of the secondary wire 4 is connected through a wire 9 with the grounded shells 10 of a series of spark plugs having insulation 11, the wire 9 being connected to the ground through a wire 12.

When used on an automobile, the secondary winding 4 is grounded directly to the frame of the engine, the spark plugs being so constructed that one side thereof is grounded on the engine. The other terminal of the secondary wire 4 is connected through a wire 13 to a central moving contact 14 of a distributor 15. This central moving contact 14 is insulated from and rotated by the engine inside fixed contacts 16 which are connected respectively through wires 17 with the live side 18 of the spark plugs. The moving contact 14 is so constructed that there is a small gap between this moving contact and the stationary contacts 16 even when they are closest together. This gap, of course, is a minimum when the two contacts are exactly in line and increases and diminishes from this minimum as the contact rotates.

It is sometimes necessary to provide a condenser 19 connected directly across the fixed gap 7, but when installed on an automobile, the insulated wiring in combination with the metal parts of the automobile which form a part of the circuit provide considerable capacitance which assists in producing the oscillating discharge hereinafter referred to.

As used on a standard automobile, the parts are of such size that the distance between the contacts 14 and 16 is somewhat less than one-half the sparking distance on the plugs 18 and the gap 7 is about five times this sparking distance.

The method of operation of my invention is as follows:

The potential induced in the secondary 4 charges the condenser 19. The gap 7 is so set that before this potential reaches the highest value which it would attain were the gap 7 not present, the air in the gap 7 breaks down and a discharge takes place thereacross. The condenser discharges and an oscillating discharge takes place. This discharge is first across the gap 7. As the gap between the moving contact 14 and any stationary contact 16 diminishes, the resistance of this variable gap plus the gap between the sparking points of the spark plug connected to that stationary contact also diminishes until it is approximately the same as the resistance of the gap 7. Whenever this occurs, an oscillating discharge takes place from the contact 14 to the contact 16 and between the sparking points of the spark plug connected to said contact 16. As the contact 14 closely approaches the contact 16, the oscillating discharge at the gap 7 will entirely stop for an instant. The sparking at spark plugs 18 continues until the contact 14 passes the contact 16 and increases to a value such that the resistance of the gap between the contacts 14 and 16 plus the resistance across the sparking terminals of the plug 18 is greater than the resistance of the gap 7, when the spark at the spark plug 18 ceases.

As above described, the firing of the spark plugs is regulated by the moving contact of the distributor 14, discharges taking place from this moving contact to each of the fixed contacts in regular sequence. The time of this discharge is determined by the

fixed gap 7. In practice, the fixed gap 7 is set so that it will discharge during the time that the contact 14 is passing between the contacts 16 and until the contact 14 is very nearly on the same radial line as the contact 16, or may be made to operate continuously by enlarging the minimum distance between points 14 and 16. By introducing the fixed gap 7 and the condenser 19, I am able to produce a highly efficient oscillating discharge. By the use of the variable moving gap between the contacts 14 and the contact 16, I am able to introduce an auxiliary gap in series with the spark plug. In the event that the spark plug becomes fouled, or the insulation becomes defective, the oscillating discharge owing to its peculiar action will jump at the points in preference to shunting through the carbon and oil of the fouled plug.

This application is a continuation of my application No. 323,979 filed September 15, 1919.

I claim as my invention:

1. An ignition system for internal combustion engines comprising an induction coil; means for inducing a high potential in the secondary of said coil; a series of points each point connected to one of the spark plugs of the engine; a rotating shaft insulated from the frame of the engine having projections so placed as to come successively within sparking distance of said points; means for driving said rotating shaft in synchronism with the engine; a fixed gap having its terminals connected to the said shaft and the frame of the engine, said fixed gap being so set that an oscillating discharge takes place across said fixed gap in the normal operation of the engine, during the entire time the engine is running except for very short intervals during which said projections are within sparking distance of said points; and means for connecting one side of said secondary to the frame of the engine and the other side to said shaft.

2. An ignition system for internal combustion engines comprising an induction coil; means for inducing a high potential in the secondary of said coil; a series of points each point connected to one of the spark plugs of the engine; a rotating shaft insulated from the frame of the engine having projections so placed as to come successively within sparking distance of said points; means for driving said rotating shaft in synchronism with the engine; means for shifting said points about said shaft to vary the timing of said engine; a fixed gap having its terminals connected to the said shaft and the frame of the engine, said fixed gap being so set that an oscillating discharge takes place across said fixed gap in the normal operation of the engine, during the entire time the engine is running except for very short intervals during which said projections are within sparking distance of said points; and means for connecting one side of said secondary to the frame of the engine and the other side to said shaft.

3. An ignition system for internal combustion engines comprising an induction coil; a battery; means for intermittently impressing the voltage of said battery on the primary winding of said induction coil to produce a high potential in the secondary of said coil; a series of points each point connected to one of the spark plugs of the engine; a rotating shaft insulated from the frame of the engine having projections so placed as to come successively within sparking distance of said points; means for driving said rotating shaft in synchronism with the engine; a fixed gap having its terminals connected to the said shaft and the frame of the engine, said fixed gap being so set that an oscillating discharge takes place across said fixed gap in the normal operation of the engine, during the entire time the engine is running except for very short intervals during which said projections are within sparking distance of said points; and means for connecting one side of said secondary to the frame of the engine and the other side to said shaft.

4. An ignition system for internal combustion engines comprising an induction coil; means for inducing a high potential in the secondry of said coil; a series of points each point connected to one of the spark plugs of the engine; a rotating shaft insulated from the frame of the engine having projections so placed as to come successively within sparking distance of said points; means for driving said rotating shaft in synchronism with the engine; a fixed gap having its terminals connected to the said shaft and the frame of the engine, said fixed gap being so set that an oscillating discharge takes place across said fixed gap in the normal operation of the engine, during the entire time the engine is running except for very short intervals during which said projections are within sparking distance of said points; and means for connecting one side of said secondary to the frame of the engine and the other side to said shaft.

In testimony whereof. I have hereunto set my hand at Los Angeles, California, this 13th day of September, 1920.

HERMAN W. EICHBAUM.