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NON-VIBRATOR IGNITION APPARATUS FOR INTERNAL COMBUSTION ENGINES.

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1,037,732. Patented Sept. 3, 1912.

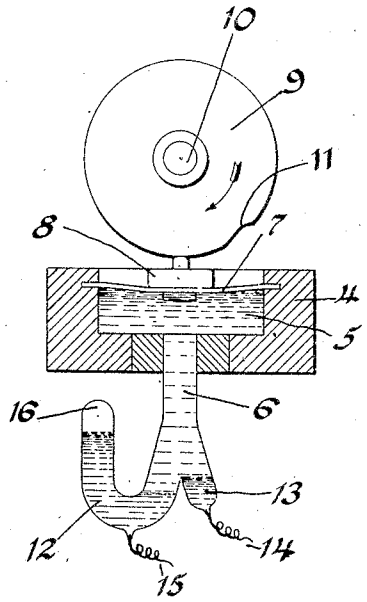

Fig. 2.

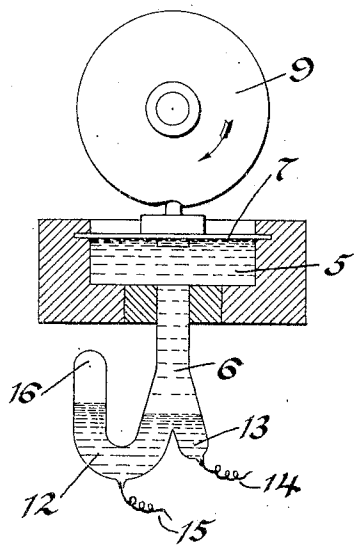

Fig. 3.

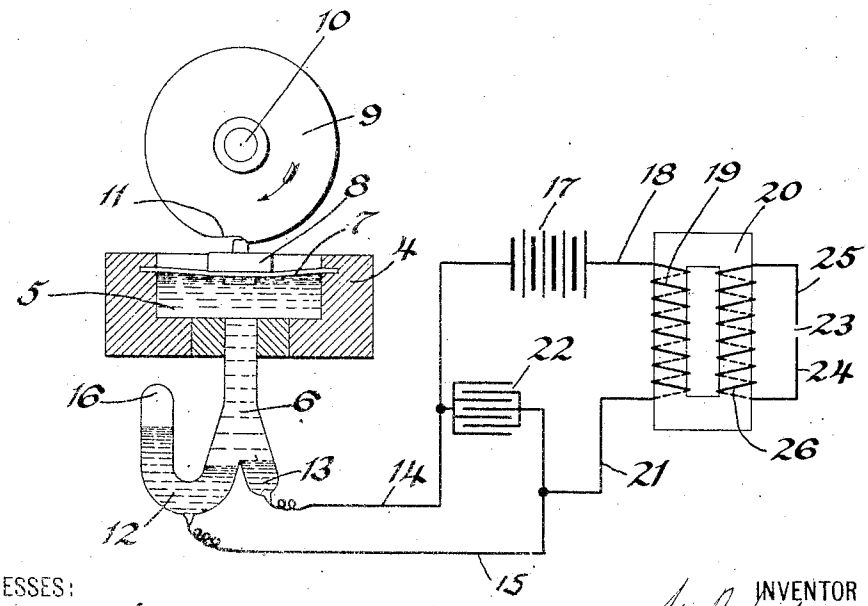

Fig. 1.

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NON-VIBRATOR IGNITION APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,037,732. Specification of Letters Patent. **Patented Sept. 3, 1912.**

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To all whom it may concern:

Be it known that we, MARK B. CRIST and MERRITT R. WELLS, citizens of the United States, and residents, respectively, of Pittsburgh and Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Non-Vibrator Ignition Apparatus for Internal-Combustion Engines, of which the following is a specification.

This invention relates to non-vibrator ignition apparatus for internal combustion engines.

In non-vibrator ignition systems for internal combustion engines the spark plug is connected to the terminal of the secondary coil of a transformer, the primary coil of which is connected to a battery, or some other source of direct current and the primary circuit of the system is provided with a circuit breaker across the terminals of which a condenser is connected.

The high voltage spark across the terminals of the secondary coil; that is in the spark plug of the engine, jumps at the time of breaking the primary circuit and is rendered more effective by the condenser which at the time of breaking the circuit sends an accumulated charge through the primary circuit.

Considerable difficulty has been encountered with the circuit breakers of such apparatus because of the oxidation and burning away of the contact points which thereby render the circuit breaker ineffective in operation.

The object of this invention has been the production of a simple and effective circuit breaker in which effective means are utilized for overcoming the tendency of the contact points to oxidize. This and other objects we attain in an apparatus described and illustrated in the accompanying drawings, throughout the several views of which like parts are denoted by corresponding numerals.

Figure 1 is a sectional elevation of a circuit breaker embodying this invention in combination with a wiring diagram in which the electrical connections utilized are diagrammatically illustrated. Figs. 2 and 3 are sectional elevations of the circuit breaker and with Fig. 1 illustrate a complete cycle of making and breaking the circuit.

A casing 4 incloses a chamber 5, the lower portion of which connects with a Y tube 6. A diaphragm 7, mounted on the casing 4 closes and hermetically seals the chamber 5 and is provided with a centrally-located finger 8 which contacts with a cam 9, mounted on a shaft 10, which is driven by the engine. The cam 9 is provided with a cut-away portion 11 which causes the finger 8 to reciprocate and thereby vibrates the diaphragm 7. The downwardly-extending nonconductor Y tube 6 is provided with a U-shaped arm 12 which extends upwardly; the top portion being sealed. The other arm 13 extends downwardly and is sealed at the bottom and is provided with a terminal wire 14 which extends through the walls of the tube. The arm 12 is provided with a terminal wire 15 and is adapted to be partially filled with mercury. A space 16 at the top of the arm 12, and over the mercury, contains air or some other gas. The arm 13 is filled with mercury and the chamber 8 and a portion of the tube 6 are filled with suitable oil which floats on the mercury contained in the arms 12 and 13.

The air or gas pressure in the portion 16, above the mercury in the arm 12, varies as the pressure in the chamber 5 varies. The vibrations of the diaphragm 7 which, as before mentioned, are caused by the cam 9, cause the pressure in the chamber 5 to vary and the mercury in the arm 12 and the oil in the tube 6 to fluctuate.

Since the cross-sectional area of the diaphragm is much greater than the sectional area of the tube 6, a small motion of the diaphragm will cause a comparatively large motion of the oil in the tube.

Fig. 2 shows the cam 9 in such a position that the diaphragm 7 is forced by the finger 8 to its lowest position and the column of oil in the tube 6 causes the mercury of the arm 12 to recede from the tube 6 against the air pressure in the top portion 16.

In Fig. 3 the cam 9 is in such position that the diaphragm 7 occupies its highest

position and the mercury in the arm 12, because of the air pressure in the top portion 16 forces the displaced oil back into the chamber 5 and enters the tube 6. The mercury from the arm 12 rises to a sufficient height in the tube 6 to come in contact with the mercury contained in the arm 13, thereby completing a metallic circuit between the wires 14 and 15.

In Fig. 1 the cam 9 is in such position that the diaphragm 7 has just started on its downward motion and the oil expelled from the chamber 5 into the tube 6 against the pressure of the air in the top portion 16 forces the mercury of the arm 12 to recede from the tube 6 and break the contact between it and the mercury contained in the arm 13. The wire 14 connects with a battery 17 which is connected to a lead 18 of a primary coil 19 of a transformer 20. The wire 15 is connected to a lead 21 of the primary coil 19 and completes the primary circuit. A condenser 22 is connected between the wires 14 and 15 in parallel with the contacts of the circuit breaker. A spark gap 23 is maintained between the high voltage terminals 24 and 25 of a secondary coil 26, forming a portion of the induction coil 20.

Upon breaking the primary circuit by forcing the oil down the tube 6, and causing the mercury to recede into the arm 12, an induced current is generated in the secondary coil of the induction coil and a high voltage spark is caused to jump across the gap 23. Since the contact between the arms 12 and 13 is broken by the interposition of suitable oil, the tendency for the primary circuit to arc is practically overcome and since the suitable oil does not char or carbonize, no difficulties are encountered with the terminals and the make and break device is practically indestructible. The high terminal leads 24 and 25 of the secondary coil may be connected to a spark plug of the engine, which is not shown.

Having now described our invention, what we claim as new and useful is:

1. In an electric circuit, a circuit breaker comprising a closed chamber containing a fluid nonconductor, a dielectric tube communicating therewith and provided with communicating arms joined to the tube at a common point, a body of mercury contained in each arm and each forming a terminal in said circuit, a body of air between one body of mercury and the end of the arm in which it is contained and adapted to exert pressure on the mercury, a flexible wall for said chamber and means for imparting movement to said wall to cause the fluid nonconductor to oscillate the mercury contained in said tube to cause the two bodies of mercury to come together and separate and thereby make and break said circuit.

2. In an electric circuit, a circuit breaker comprising a closed chamber containing a fluid nonconductor, a tube communicating with said chamber and provided with communicating arms joined to the tube at a common point, a body of mercury maintained in each arm, a body of air between one body of mercury and the end of the arm in which it is contained and adapted to exert pressure upon the mercury, a flexible wall for the chamber whereby the mercury contained in one arm is capable of fluctuating in response to variations of pressure created in said chamber to move into and out of contact to the body of mercury in the other arm to make and break said circuit and means for actuating said flexible walls.

In testimony whereof, we have hereunto subscribed our names this 13th day of February, 1906.

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MERRITT R. WELLS.

Witnesses:
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