A. R. LUSCHKA.

SPARK COIL.

APPLICATION FILED DEC. 11, 1907.

968,173. Patented Aug. 23, 1910.

4 SHEETS—SHEET 1.

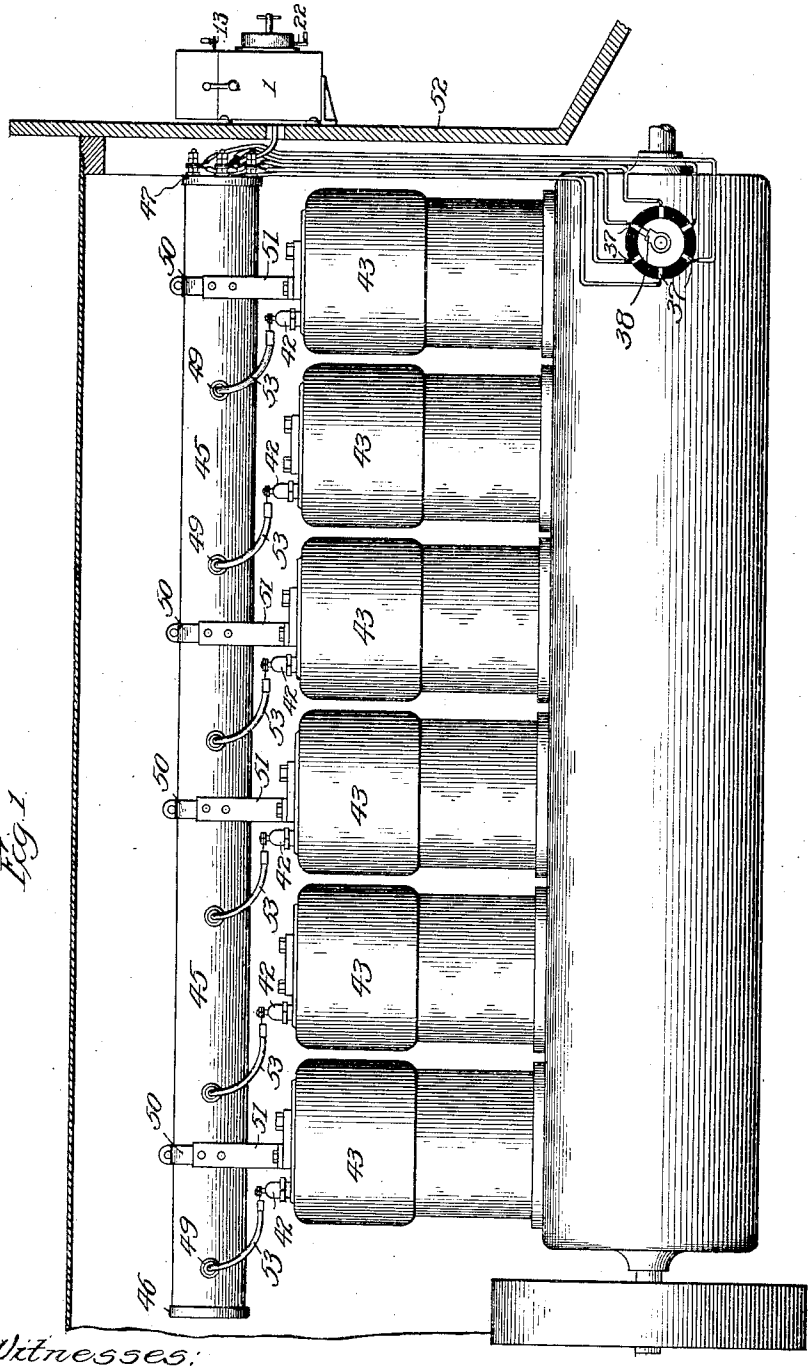

Fig. 1.

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Irving Mac Donald

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4 SHEETS—SHEET 2.

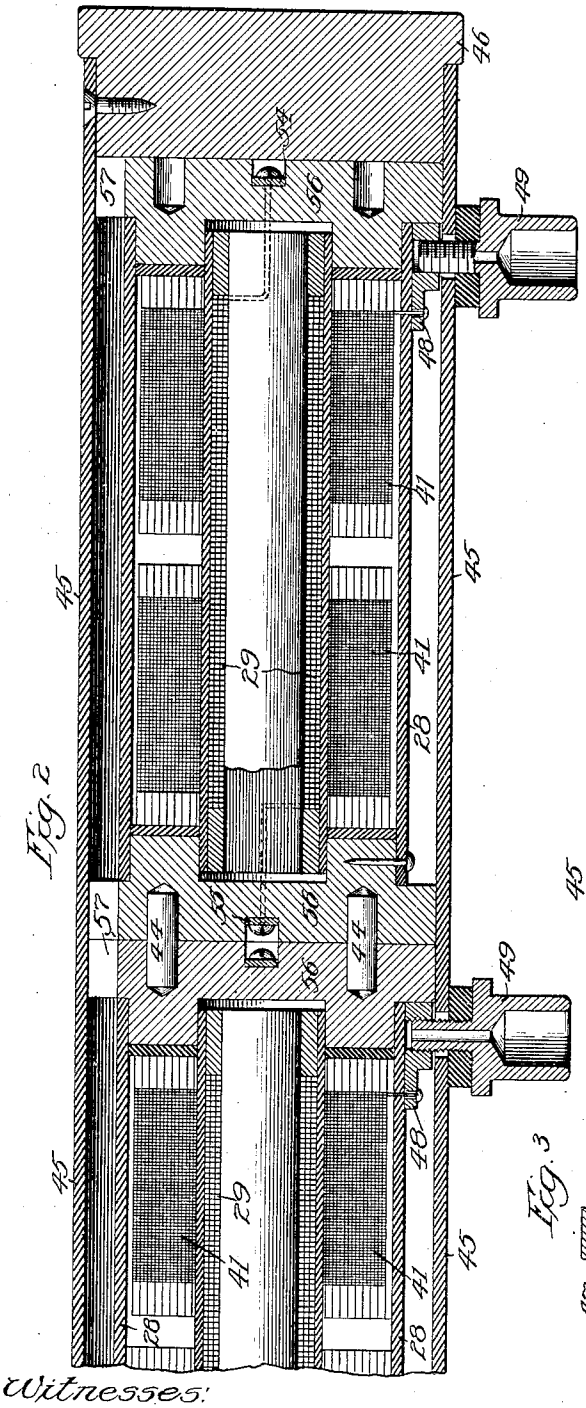

Fig. 2.

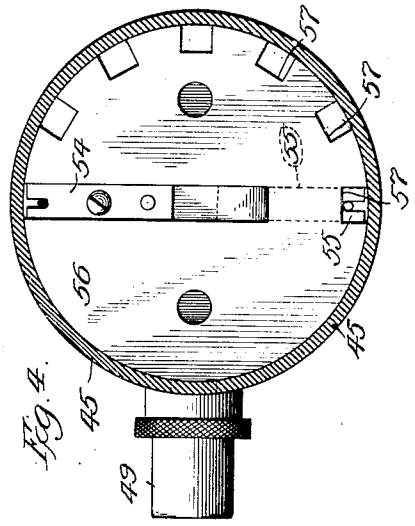

Fig. 4.

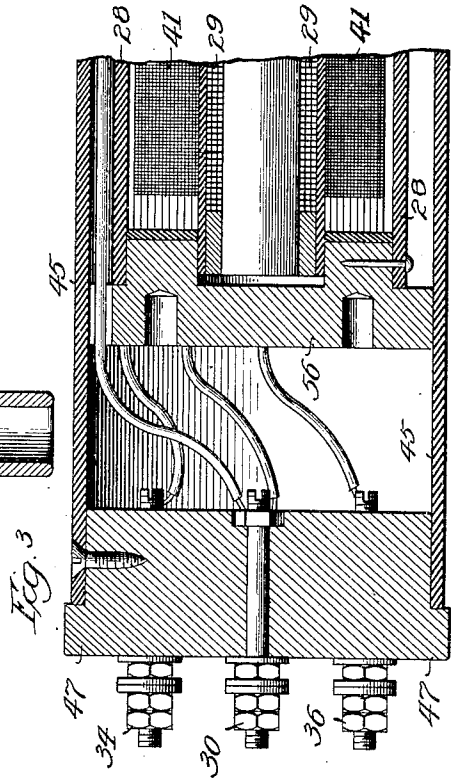

Fig. 3.

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4 SHEETS—SHEET 3.

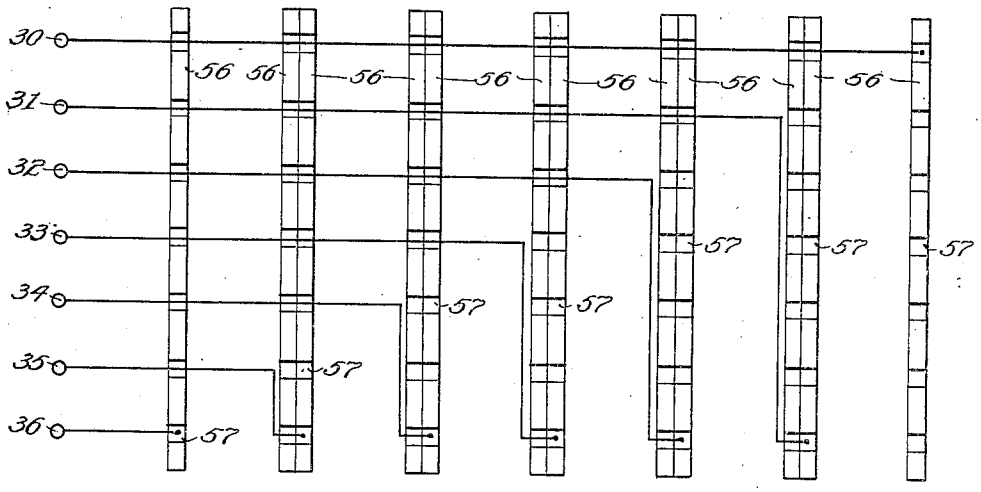
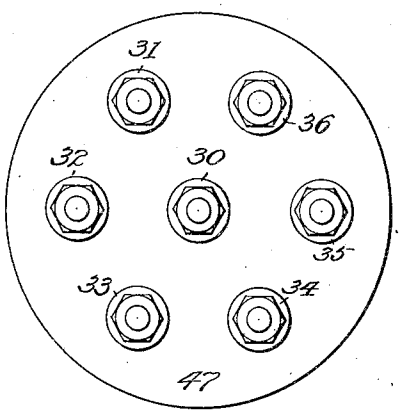


Fig. 5.

Fig. 6.



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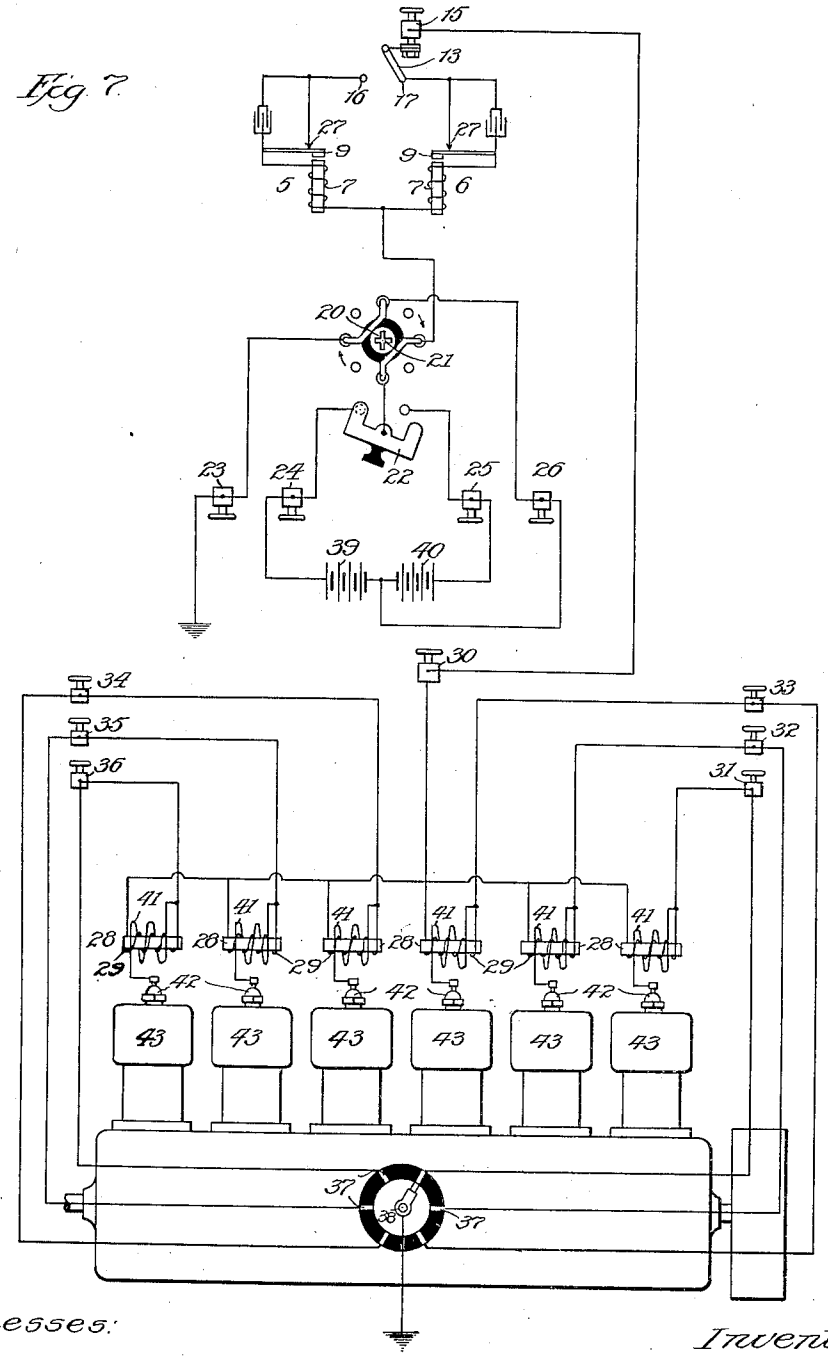
4 SHEETS—SHEET 4.

Fig. 7.



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UNITED STATES PATENT OFFICE.

AUGUST R. LUSCHKA, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SPARK-COIL.

968,173. Specification of Letters Patent. **Patented Aug. 23, 1910.**

Application filed December 11, 1907. Serial No. 406,001.

To all whom it may concern:

Be it known that I, AUGUST R. LUSCHKA, citizen of Switzerland, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Spark-Coils, of which the following is a full, clear, concise, and exact description.

My invention relates to induction coils, and more particularly to the construction and arrangement of spark coils designed for use in connection with an electric ignition system for automobile gas engines.

The object of my invention is to provide a structure consisting of a plurality of spark coil units assembled as a whole and adapted to be mounted directly over the engine cylinders.

My invention in its preferred form contemplates a plurality of spark coil units, as, for example, one for each engine cylinder, arranged end to end and inclosed in a cylindrical case of such construction as will permit the same to be mounted directly above the engine cylinders. Two heads, one of which is equipped with binding posts for the primary coils, close up the ends of the cylindrical mounting tube, while the secondary terminals are arranged along the side of the tube, as, for example, in the form of small removable sockets into which the high tension leads to the spark plugs are soldered or otherwise secured.

The several features of my invention may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the engine mechanism of an automobile and the spark coil tube mounted on the engine cylinders, parts being omitted and parts shown diagrammatically for sake of clearness; Fig. 2 is a fragmentary longitudinal section of one end of the cylindrical tube; Fig. 3 is a similar view of the other end of the tube; Fig. 4 is an end view of one of the spark coil units, showing the inclosing tube in cross section; Fig. 5 is a diagram of the connections of the terminals of the primaries to the binding posts on the end of the inclosing tube; Fig. 6 is a view of the end of the tube on which the binding posts are mounted; and Fig. 7 is a diagram of circuits and apparatus embodying my invention.

Similar letters of reference are used to designate similar parts in each of the figures of the drawings.

The spark coil units 28 are connected end to end by dowel pins 44, and the connected units are inclosed in a cylindrical tube 45 of insulating fiber or other suitable material. The ends of said tube are closed by heads 46, 47. The head 47 is equipped with binding post 30 common to one terminal of each of the primary windings 29 of the induction coil 28, and also with individual binding posts 31, 32, 33, 34, 35 and 36, to which the other ends of said primary windings are connected.

It will be understood that in accordance with the usual practice one terminal of each of the secondary windings 41 is connected to a terminal of the primary, as indicated diagrammatically in Fig. 7, and the other terminal of each secondary is connected to a terminal plate 48 mounted on one end of each of the units 28. The secondary terminals may thus be arranged, as indicated in Figs. 1, 2 and 4, along the sides of the tube 45 in the form of removable sockets 49, the stems of which pass through holes in the tube 45 and are threaded in the terminal plates 48.

As shown in Fig. 1, the tube 45 is supported directly above the engine cylinders, being held by hoop clamps 50 supported on the ends of the angle pieces or brackets 51, which may in turn be mounted on the cylinders 43. The head 47 carrying the binding posts is adjacent the dash board 52 of the automobile on which the box 1 carrying the vibrating or interrupting mechanism is mounted. The commutating mechanism comprising, as usual, fixed segments 37, and a rotating switch arm 38 is thus located below the head 47, necessitating the use of short leads only to connect the binding posts carried by the head 47 with the segments 37 of the commutator. An especially desirable feature of this method of mounting the coils in proximity to the engine cylinder is that the high tension leads 53 extending from the secondary coils to the spark plugs 42 are very short, thus resulting in a considerable saving in installation, while leakages from the high tension cables of the secondaries to the engine frame are entirely

avoided. The tube 45 protects the inclosed spark coils from the heat and oil of the engine, and moisture, and said coils are not in the least injuriously affected thereby.

The units 28 are identical in structure and are thus interchangeable. The structure of these units is shown in Figs. 2, 3 and 4. The primary winding 29 is brought out at its opposite ends to clips 54, 55, secured in radial channels upon the spool ends 56. The clips 54 and 55 preferably extend in diametrically opposite directions, as indicated in full and dotted lines, respectively, in Fig. 4. Each spool end 56 is provided with a plurality of channels 57 in its periphery, for the purpose of receiving the lead wires of the primaries. For sake of uniformity and in order than the units may be interchangeable, the same number of channels, similarly arranged, are provided in each spool end of each of the units. For example, in case the assembled units are to be used in connection with a six cylinder engine, and where six spark coils are therefore preferably employed, seven of said channels 57 are provided, one for receiving the common lead to which one end of each of the primaries is connected, and the other six corresponding to the other ends of said six primaries.

By referring to Fig. 5, it will be observed that one lead common to one terminal of all the primaries extends through the alined channels 57 to the common binding post 30. The other end of the primary of each induction coil extends through the intermediate alined channels 57 to its respective binding post. While all of the channels 57 of all the units are not thus actually necessary, for the sake of uniformity, as before stated, the units are made identical in structure.

Referring more particularly to Fig. 7, which shows diagrammatically a circuit arrangement for a six cylinder engine, one terminal of each of the primary windings 29 of the induction coil 28 is connected by a common wire to the binding post 30, which is electrically connected to the post 15. The other terminal of each of said primary windings is connected to its corresponding binding post 31, 32, 33, 34, 35 or 36. From said posts the primary windings are led to corresponding segments 37 of the timing device, which may be of the usual construction, the circuit from any one of said segments being completed to ground through the rotatably-mounted switch arm 38 of said timing device. Said timing device, it will be understood, is operated in the usual way from the driving shaft of the engine. By thus suitably constructing said timing device, the circuits of the primaries of the induction coil may be closed in sequence or as otherwise desired.

Batteries 39 and 40 are connected in parallel, one pole of each of said batteries being connected to the common binding post 26 and the opposite poles of each being connected respectively to the posts 24 and 25. When the battery switch 22 is in one position, as shown in Fig. 7, the battery 39 only is in circuit, when in the opposite position the current is switched to battery 40, and when said switch is in its intermediate position said batteries are connected in multiple.

The operation of the system as a whole may now be understood. Assume that the vibrator switch lever 13, the battery switch 22 and the combined battery and pole changing switch 20 are in the positions shown in Fig. 7. A circuit is thus closed from one pole of the battery 39, through post 24, switch 22, one arm of the switch 20, the winding 7 of the vibrator 6, contacts 27 and 17, switch 13, posts 15 and 30, to the common lead of all the primaries of the spark coils 28, and from said primaries through the binding posts 31, 32, 33, 34, 35, 36, to the segments 37 of the commutator, the circuits through said segments and hence through the spark coils being closed successively to ground by the rotation of the switch arm 38 of the commutator or timing device. The opposite pole of the battery 39 is also grounded through post 26, the other arm of the switch 20 and the grounded post 23. The above-described circuit through the primaries of the coils 28 is interrupted in the usual manner by the vibration of the interrupter 9 of the vibrator 6, thus inducing current in the secondary of the spark coil whose circuit is closed by the timing device. It will be observed that the single vibrator 6 is used in connection with all the coils 28.

It will be observed that by merely moving the lever 13 to its opposite position, the vibrator 5 may be substituted for the vibrator 6. For instance, one of said vibrators, for example, the vibrator 6, may be adjusted to produce a heavy spark in the engine cylinder and the vibrator 5 to produce a light spark. Hence to start the engine the vibrator 6 would be used. However, after the engine is fully warmed up, heavy sparks are not needed to ignite the charge therein, as is well known. Therefore, a considerable saving of battery current results from switching the lever to the vibrator 5 without affecting the proper ignition of the charge in the engine. Or on the other hand, one of said vibrators may be used only for emergencies, being so adjusted that if the vibrator ordinarily used does not produce sufficient spark to ignite the charge, due, for example, to a weak battery, the trouble may be immediately overcome by switching to the alternative or emergency vibrator.

I claim:

1. An induction coil consisting of a spool provided with a primary and a secondary

winding, each end of said spool being provided with a plurality of channels in its periphery, each spool end being further provided with a radial channel communicating with one of said other channels, terminal clips for the primary connections arranged in said radial channels, and a secondary terminal plate carried by said spool.

2. An induction coil consisting of a spool provided with a primary and a secondary winding, each end of the spool being provided with one or more sockets for receiving dowel pins, whereby a plurality of such coils may be united end to end, each spool end being further provided with a plurality of channels in its periphery and with a radial channel communicating with one of said other channels, terminal clips for the primary connections arranged in said radial channels, and a terminal plate carried by said spool.

3. The combination with a cylindrical tube of insulating material, of a plurality of interchangeable spark coil units assembled end to end within said tube, each of said units consisting of a spool provided with a primary and a secondary winding, each end of the spool being provided with one or more sockets for receiving dowel pins, whereby a plurality of such coils may be united end to end, each spool end being further provided with a plurality of channels in its perpihery and with a radial channel, heads for closing the ends of said tube, binding posts for the primary leads mounted in one of said heads, and secondary terminals arranged longitudinally of said tube, said secondary terminals comprising socket pieces removably secured to the secondary terminal leads.

In witness whereof, I, hereunto subscribe my name this 7th day of December, A. D. 1907.

AUGUST R. LUSCHKA.

Witnesses:
RALPH G. JOHANSEN,
ROY T. ALLOWAY.