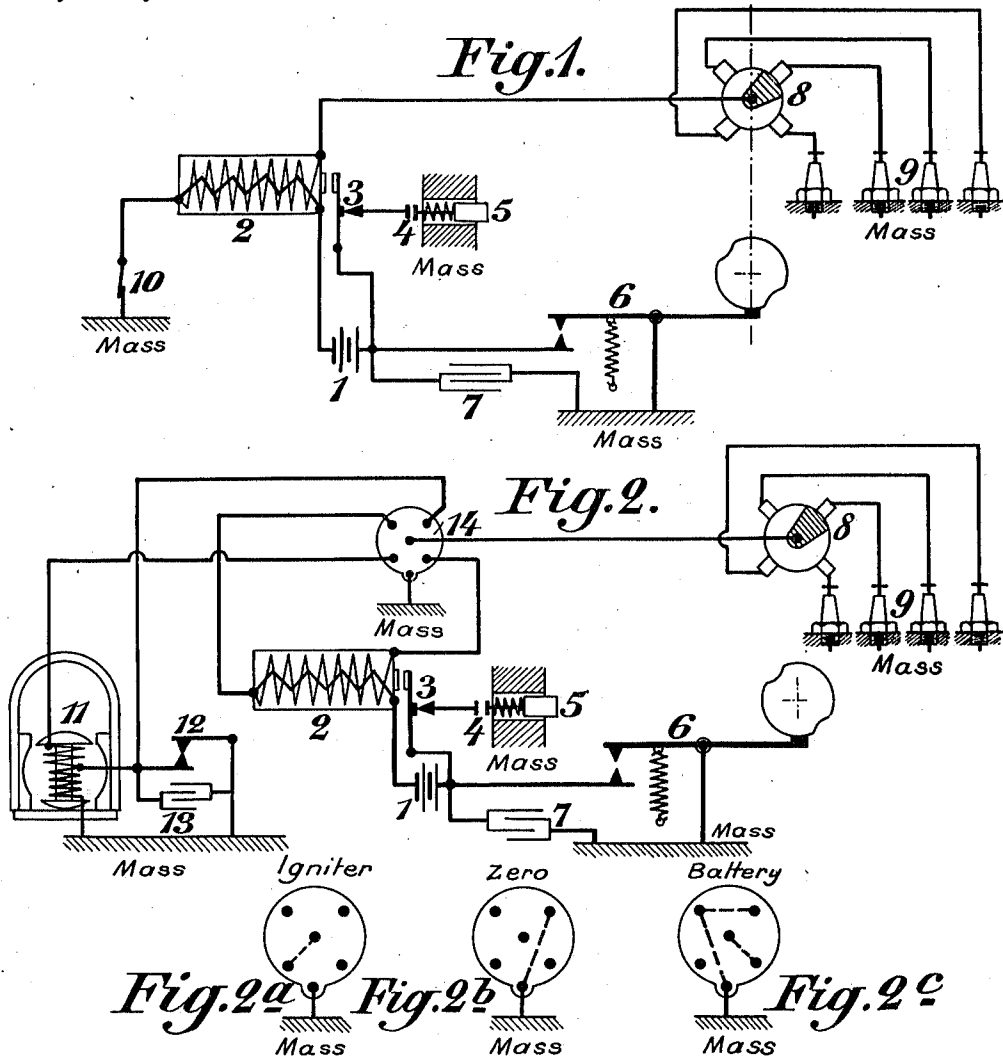


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 MEANS FOR STARTING INTERNAL COMBUSTION ENGINES.
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1,003,743.

Patented Sept. 19, 1911.



WITNESSES

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MEANS FOR STARTING INTERNAL-COMBUSTION ENGINES.

1,003,743.

Specification of Letters Patent. Patented Sept. 19, 1911.

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To all whom it may concern:

Be it known that I, GOTTLÖB HONOLD, engineer, a subject of the German Emperor, residing at 11 Hoppenlaustasse, Stuttgart, Germany, have invented certain new and useful Improvements in Means for Starting Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In starting multi-cylinder internal combustion engines which after an interruption are set in motion again merely by igniting the charge in one of the cylinders there exist two cylinders wherein at this moment there is a compression equal to half the normal compression, and the cylinder in which ignition ought to occur is that one the ignition plug of which is put into circuit by the distributor. The common experience is, however, that the spark produced by the battery and the coil does not suffice to ignite a mixture the compression of which is low, unless the sparks follow each other repeatedly and rapidly, whereas a single spark suffices to ignite the mixture when the motor has once been started. It is therefore necessary, in starting the engine, to use a trembler such as is commonly employed when the ignition is by means of a battery or accumulator; whereas as soon as the engine is started the trembler may be dispensed with.

The present invention relates to the starting of multi-cylinder internal combustion engines by means of an ignition apparatus supplied with current from a battery or accumulator in which single sparks suffice for the ignition, and consists essentially in effecting the ignition in the first instance with aid of a trembler in a known manner, and then effecting the ignition by single sparks when the engine has been started, the trembler being no longer in action. This method, compared with those commonly used for starting the engine, in which the trembler is in action while the engine is running, presents the advantage that since single sparks are used during the running, the demand on the battery is considerably less and the electrodes of the ignition plug are less used. Moreover, all the defects of the trembler which unfavorably affect the quality of the ignition spark, do not come

into play during running, so that the disadvantage inherent in the trembler, namely that it always requires a certain interval of time before it starts vibrating, which delay may retard the ignition at high speeds to an extent close upon an angle of 25° and gives rise to irregular working, is avoided.

In the accompanying drawings Figure 1 is a diagram illustrating the invention when the battery and coil are alone used for the ignition. Fig. 2 shows a modification of the invention when both a battery and coil ignition and a magneto-electric ignition is provided. Figs. 2^a, 2^b and 2^c are diagrams representing different positions of the controlling switch. Fig. 3 is a transverse section through the circuit interrupter.

Referring to Fig. 1, 1 is the battery, 2 the coil, 3 the trembler electrically connected on the one hand with the battery and on the other through contact 4, which is normally, open with the body of the engine; this contact 4 can be closed by a push button 5. It is a matter of indifference which part of the trembler is connected with the battery and which with the mass of the engine through the contact 4. A mechanically-driven interrupter 6 and a condenser 7 are in parallel with the trembler. 8 is the distributing switch, 9 is the series of ignition plugs, and 10 is the switch for cutting off the ignition. The diagram represents the parts in the position ready for starting. The contact 4 and the interrupter 6 are open, while the switch 10 is closed, and the ignition plug of that cylinder which is ready for ignition is in electrical connection with the distributing switch 8. As soon as the contact 4 is closed by pushing the button 5, current flows through the trembler and the engine is started. The engine being set in motion, the interrupter 6 will be closed thereby and the current will then flow through the interrupter and will not pass to the trembler which will remain inactive.

In Fig. 2, there is illustrated an arrangement in which, in addition to the parts described with reference to Fig. 1, there is used an electromagnetic machine 11 provided with an interrupter 12 and a condenser 13 so that it can be brought into service when required. A controlling switch 14 is provided for the purpose of putting in or out of circuit either the battery system or the magneto system. The different

positions of the switch for this purpose are shown in Figs. 2^a, 2^b, 2^c. The first of these is the position for connecting the magneto-system with the ignition; the second is the position for cutting out both systems; and the third is the position for connecting the battery system with the ignition. It will be observed that no cut-out switch is here necessary, as one of the positions of the switch cuts out both systems. The common distributor 8 forms a part of the magneto. The interrupter 6 may also be connected with the magneto in such a manner that apart from the magneto-electric machine no separate piece of apparatus need be driven by the motor.

In Fig. 3, I have illustrated an interrupter which may be used and in which the circuit is closed by a spring and is positively opened by mechanical means. This interrupter is open when the motor is at rest so that the connection of one pole of the battery with earth or the mass of the engine is broken by the interrupter, and that in consequence the circuit of the trembler may be closed.

In Fig. 3, 15 is the lever of the interrupter, 16 a spring which urges this lever upward, and 17 the platinum contacts brought together by action of this spring. The piece 18 is insulated from the mass of the engine and carries the terminal of the branch to the circuit. On the lever there is a boss 19 which, as the magneto rotates, enters and leaves notches 20 in the rotating disk, breaking the circuit, and thus causing a spark to pass at the moment that the boss leaves the notch. The notched rotating disk preferably is directly on the shaft of the magneto, but it may be driven by gearing from the engine.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In an ignition system for multi-cylinder engines, the combination, with a plurality of igniters, and a source of electrical energy arranged to supply current to the igniters, of a positively actuated circuit interrupter arranged to interrupt the supply of current to the igniters, a normally inoperative trembler circuit breaker arranged in parallel with the positively actuated circuit

breaker and manually controlled means for rendering the trembler operative.

2. In an igniter system for multi-cylinder engines, the combination, with a plurality of igniters, a spark-coil, a magneto, electrical connections between the spark-coil and the igniters, electrical connections between the magneto and the igniters, a trembler circuit breaker, and means for causing said trembler circuit breaker to interrupt the circuit from the spark-coil to the igniters, of a positively actuated circuit interrupter also arranged to interrupt the circuit from the spark-coil to the igniters, said positively actuated circuit interrupter being in parallel with the trembler circuit breaker, and a controlling switch arranged to switch the igniters into circuit with either the spark-coil or the magneto, or to cut them out from both.

3. In an ignition system for multi-cylinder engines, the combination, with a plurality of igniters, a spark-coil, circuits including the spark-coil and the igniters, and a positively actuated circuit interrupter arranged to control the said circuits, of a trembler circuit breaker, a normally open branch circuit in shunt around the positively actuated circuit interrupter, and means for closing said normally open circuit temporarily.

4. In an ignition system for multi-cylinder engines, the combination, with an igniter for each cylinder, a distributor and a positively actuated interrupter, of a circuit in which the distributor and said interrupter are included, said circuit comprising branches leading from the distributor to the respective igniters, of a source of electricity for energizing said circuit, a normally open shunt circuit around the positively actuated interrupter, an electro-magnetically operated circuit interrupter in said shunt circuit, and manually operated means for closing said shunt circuit.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

GOTTLOB HONOLD.

Witnesses:

REINHOLD ELWERT,
ERNST ULMER.