June 19, 1923. 1,459,252

G. PLUMM

IGNITION SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed July 22, 1920 2 Sheets-Sheet 1

Fig. 1.

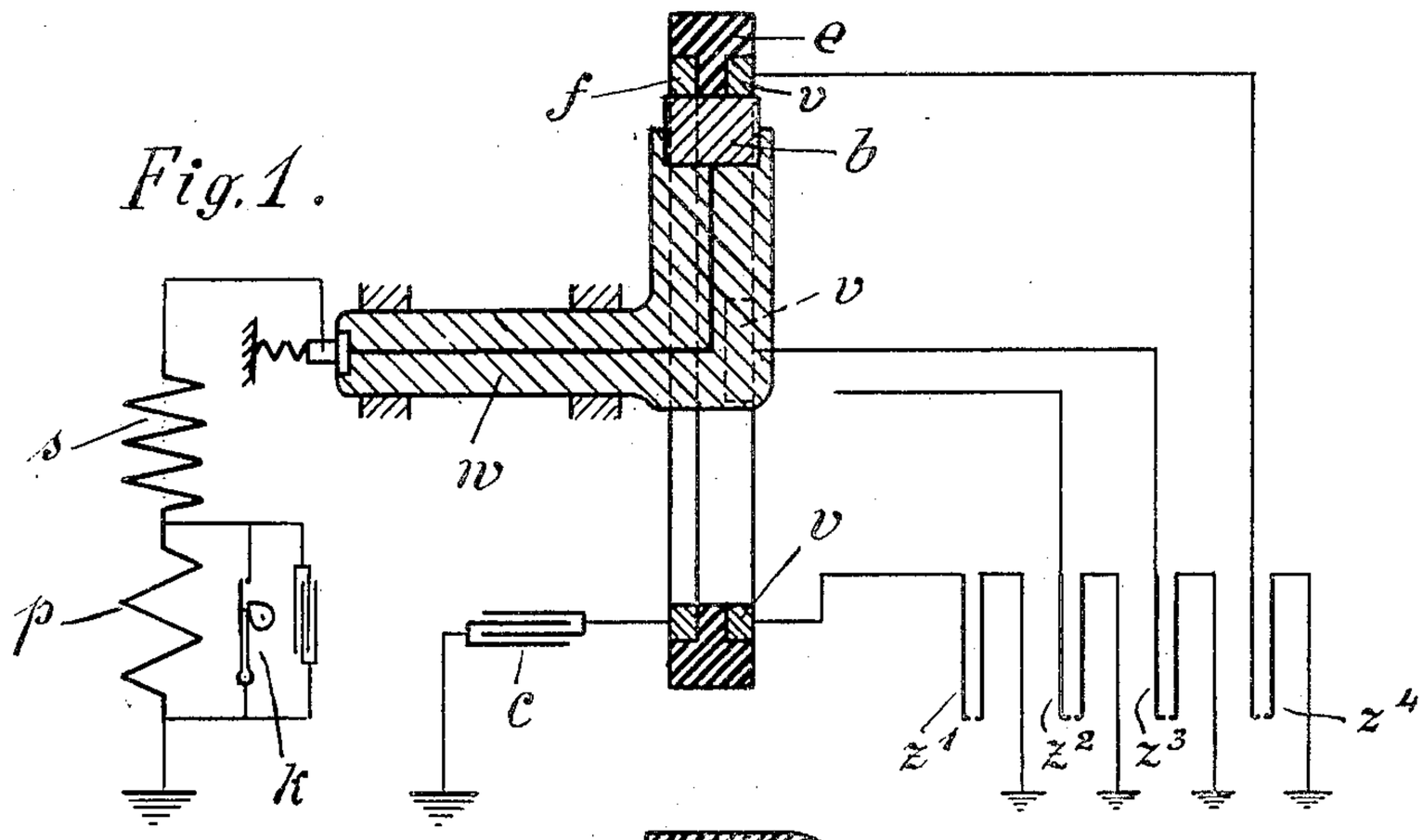

Fig. 2.

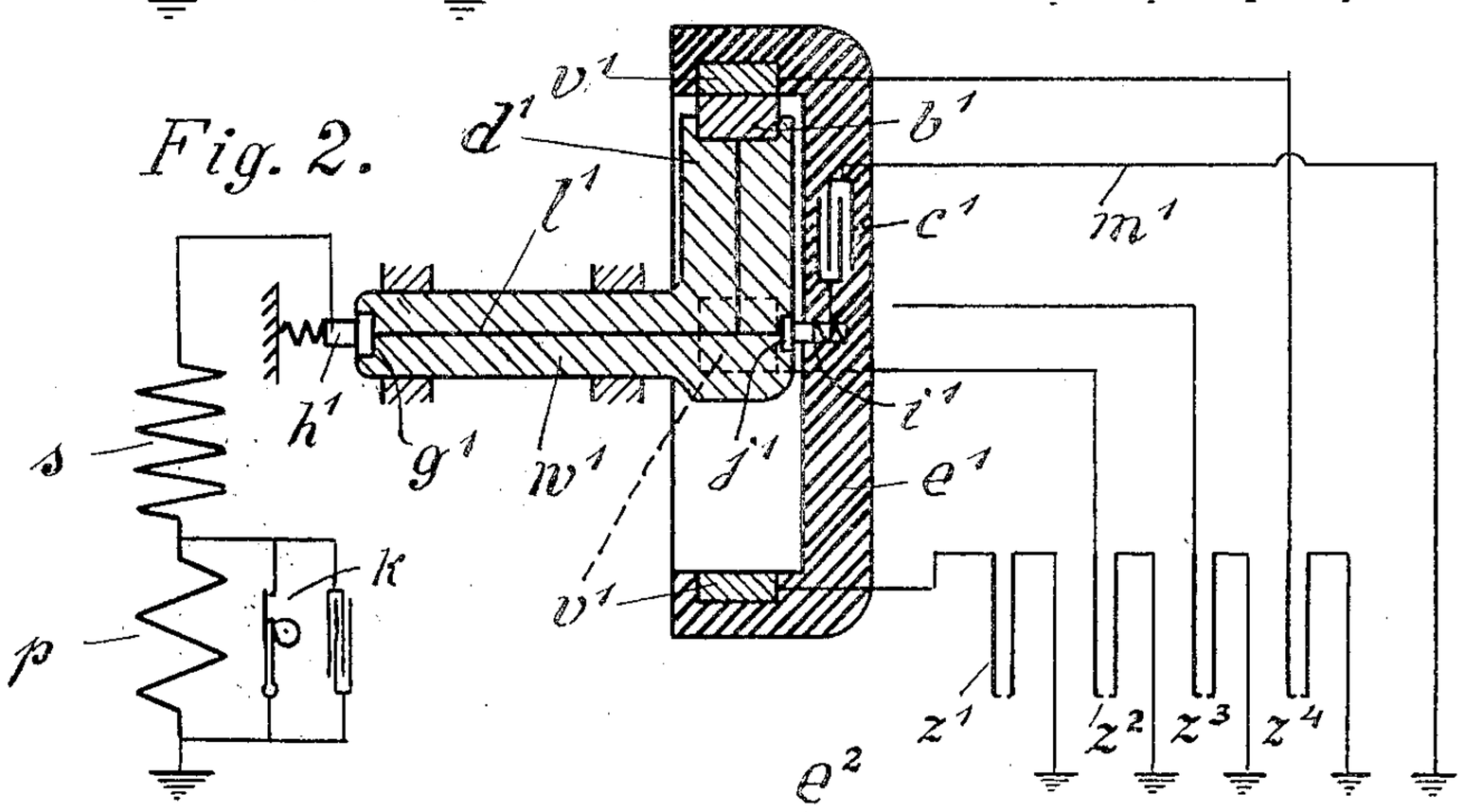

Fig. 3.

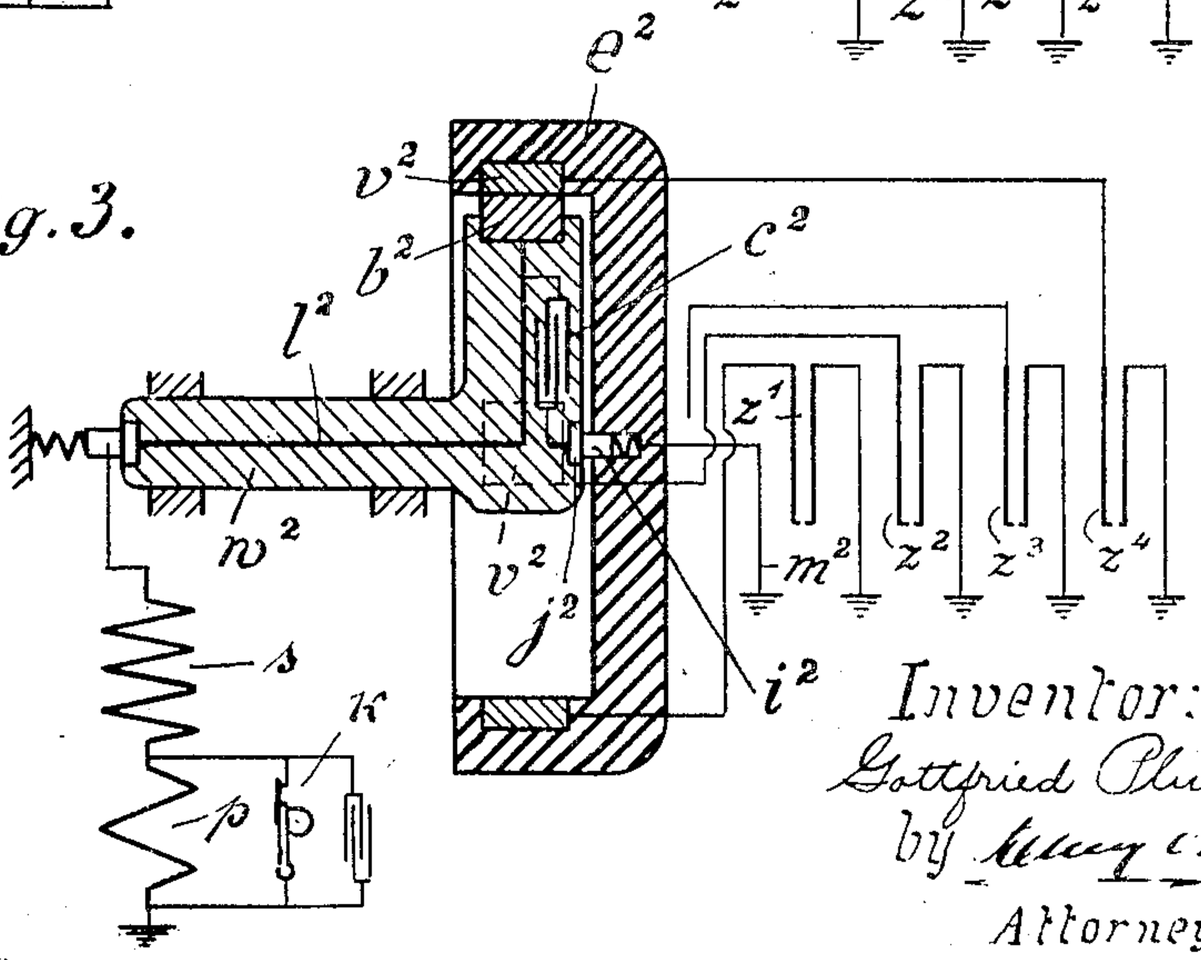

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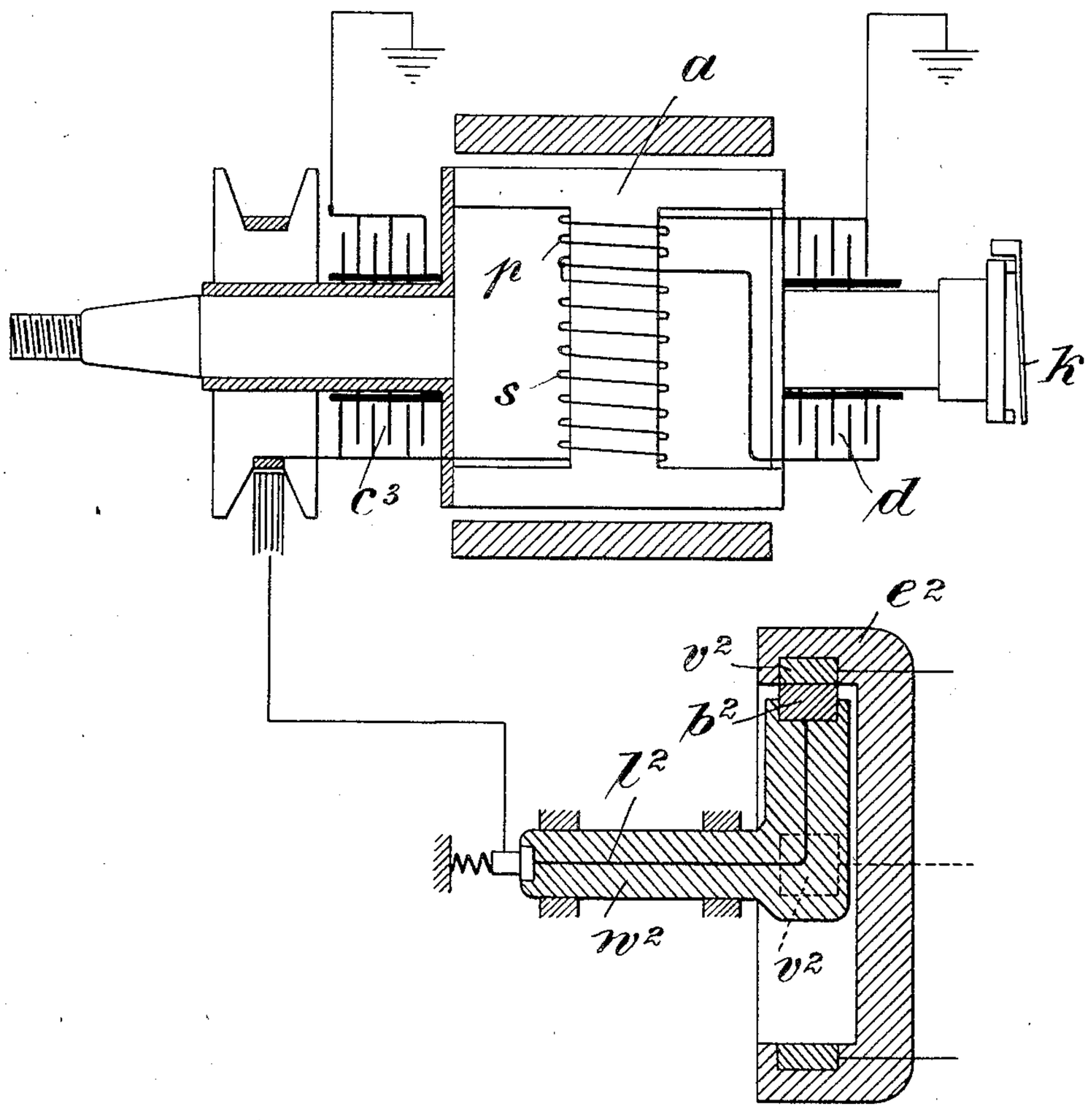
Fig. 4.



Inventor:
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by
Attorney.

Patented June 19, 1923. 1,459,252

UNITED STATES PATENT OFFICE.

GOTTFRIED PLUMM, OF BERLIN-LICHTERFELDE, GERMANY, ASSIGNOR TO MORITZ POLAK, OF GRONINGEN, NETHERLANDS.

IGNITION SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 22, 1920. Serial No. 398,305.

To all whom it may concern:

Be it known that I, GOTTFRIED PLUMM, a citizen of Germany, residing at Berlin-Lichterfelde, Germany, have invented certain new and useful Improvements in Ignition Systems for Internal-Combustion Engines (for which I have filed an application in Germany Dec. 2, 1918); 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.

My invention relates to improvements in ignition systems for internal combustion engines, and more particularly in systems of that class in which a source of electric energy such as a magneto or an alternator cooperates with a suitable circuit make-and-break device such as a distributer for successively supplying current impulses to the spark plug or plugs of the cylinder or cylinders of the combustion engine. I have found that in ignition systems such as are now in use the power of the source of electric energy is made use of only in part, and that therefore the sparks produced at the poles of the spark plugs are weak as compared to the size of the source of electric energy, the reason being that the source of electric energy is connected with the spark plug or plugs only during a fraction of the rotation of the vane or brush of the distributer, while the said source is idle during the major part of the rotation of the vane or brush. The object of the improvements is to provide an ignition system which is adapted to produce strong sparks at the poles of the spark plugs. With this object in view my invention consists in providing means in connection with the source of electric energy for storing the energy while the source is disconnected from the plugs and supplying the same to the spark plugs when the plugs are connected with the source. In the practice of the invention I provide a condenser between the source of electric energy and the distributer and connect the same in shunt around the terminals of the said source and with one of its terminals directly to the distributer and source of electric energy.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings, in which the same letters of reference have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1, is a diagrammatical view showing a system in which the condenser is connected to a ring embedded in the stationary part of the distributer and in constant contact with the distributer brush,

Fig. 2, is a similar view showing a modification in which the condenser is embedded within the stationary part of the distributer and connected with the brush by a spring contact,

Fig. 3, shows a modification in which the condenser is embedded within the body of the brush of the distributer, and

Fig. 4, shows a modification in which the condenser is mounted on the magneto and disposed between the armature winding and the collector brush.

In the example shown in Fig. 1 the source of electric energy consists of a magneto comprising a primary p having a make-and-break device k for short circuiting the same, and a secondary s. One of the terminals of the primary is grounded, and the opposite one is connected to one of the terminals of the secondary, the other terminal of the secondary being connected to the revolving brush b of a distributer e having four distributer terminals v connected with spark plugs z^1, z^2, z^3 and z^4. The parts so far described are known in the art and therefore need no detailed description.

In addition to the terminals v the distributer is provided with a contact ring f which is located in position for being in engagement with the brush b during the whole revolution thereof. The said ring is connected with one terminal of a condenser c the opposite terminal of which is grounded. It will therefore be understood that the condenser is connected in shunt around the terminals of the source of electric energy during the whole of the revolution of the brush b and that it is connected with one of the spark plugs only while the brush is moving in contact with the terminals v thereof.

From the foregoing description of the parts the operation of the apparatus will readily be understood: While the brush b is moving between successive terminals v the electric energy from the magneto is supplied through the brush b and ring f to the condenser c and stored therein, and

when the brush makes contact with one of the terminals v the current impulse from the magneto and in addition the energy stored in the condenser are supplied through the said terminal to the spark plug connected therewith. I have found that thereby a very strong spark is produced at the plug which is particularly adapted to assure ignition of the combustible charge of the cylinder. In addition I have found that the strong sparks have the function to burn any foreign matter such as oil and soot which might be deposited on the spark plugs, whereby the plugs are automatically held in proper igniting condition even in case of incomplete combustion and poor fuel being supplied to the engine.

By providing the condenser in the manner shown in the figure the self-induction of the armature of the magneto is dissipated. Therefore, as the inductive resistance of the armature is reduced to zero the voltage and the intensity of the current are increased.

An important feature of the invention resides in the fact that the condenser is disposed between the magneto and the distributer and in such a way that it is always connected with the magneto, while it is only temporarily connected with the spark plugs. In such cases in which the armature of the magneto and the primary and secondary windings are stationary and the field magnets rotatable the condenser is preferably directly connected to the pole of the secondary winding s, so that the subsidiary contact ring f may be dispensed with.

By providing the subsidiary contact ring f within the distributer the axial dimension of the distributer is increased or the dimension of the ring f must be reduced. This is objectionable in some cases, because the proper transmission of the current to the spark plugs is interfered with. In such cases I prefer to mount the condenser within the distributer, and more particularly either within the rotary member w which carries the brush b or within the cap carrying the terminals v. Thereby the condenser is protected as against injury and no special room and supporting means need be provided therefor.

In Fig. 2 I have shown an example in which the condenser is disposed within the ring of the distributer. As shown the source of electric energy is the same as that shown in Fig. 1, and the same letters of reference have been used to indicate corresponding parts. The body of the distributer is in the form of a cap e^1, and in the said cap the terminals v^1 are embedded. The rotary member which carries the brush b' consists of a shaft w^1 of insulating material made integral with a vane d^1. Within the rotary member a conductor l^1 is embedded which connects the brush b^1 with a contact piece g^1 cooperating with a slide contact h^1 for transmitting the electric energy from the magneto to the brush. Within the cap e^1 the condenser c' is mounted one terminal of which is connected with a spring pressed contact i^1 engaging a metallic contact piece j^1 secured centrally on the rotary member and connected with the conductor l^1. The other terminal of the condenser is grounded over a conductor m^1.

The operation of the apparatus is as follows: While the brush b^1 is moving between the terminals v' no current impulses are transmitted to the spark plugs z^1, z^2, z^3, or z^4, and the energy supplied by the magneto is transmitted over the contact h^1, the conductor l^1, the contacts i^1 and j^1 to the condenser c^1. When the brush b^1 slides over one of the terminals v^1, the current flows from the magneto over the contacts h^1 and g^1, the conductor l^1, the brush b^1, the said terminal v^1, and to the spark plug, and in addition the condenser is discharged over the contacts i^1 and j^1, the conductor l^1, the brush b^1, and the spark plug.

The example shown in Fig. 3 is different from that shown in Fig. 2 in that the condenser c^2 is disposed within the rotary member w^2, one of its terminals being directly connected to the conductor l^2, while its other terminal is grounded over a metallic contact j^2 secured to the member w^2, a spring contact i^2, and the conductor m^2. The operation is the same as that of the example shown in Fig. 2.

In Fig. 4 I have shown an example in which the condenser for increasing the intensity of the discharge at the spark plugs is directly connected to the secondary, or more particularly to a point intermediate the secondary and the collector thereof. As shown the primary p and the secondary s are mounted in a manner known in the art on the rotary armature a of the magneto, and the secondary is equipped with the usual interrupter (not shown) and the condenser d thereof. In addition the condenser c^3 is mounted on the armature which is connected with one pole to the secondary s and the collector ring h, the opposite pole being grounded. The brush n of the said collector is connected to the distributer w^3.

From the foregoing description of the invention it will be apparent to those skilled in the art that it is important that the condenser has the proper dimensions in order to fulfill the object aimed at, and to increase the intensity of the sparks. As a matter of fact I have found that the intensity of the discharge at the plugs is not increased and in some cases even reduced if the capacity of the condenser is too large or too small. I am not able to give exact data as to the dimension required in each case. But it will readily be understood that such dimension

depends on numerous conditions, such for example as the type and the dimension of the magneto, and the construction of the spark plugs. The best way to find out the proper capacity of the condenser is by experiment. By testing the system I have always been able to find the dimension of the condenser which gives the best results.

I claim:

In an ignition apparatus for internal combustion engines, the combination, with a source of electric energy, the spark plugs, and a distributer having a body carrying terminals connected with the spark plug and a brush connected with the source of electric energy, of a condenser embedded within said body and connected in shunt around said source of electric energy and with one terminal to a part intermediate said source and distributer, the capacity of the condenser being such that it is adapted to increase the intensity of the discharge at the plugs.

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

GOTTFRIED PLUMM.

Witnesses:
FRANZ REINHOLD,
GERTRUD SCHWARZ.