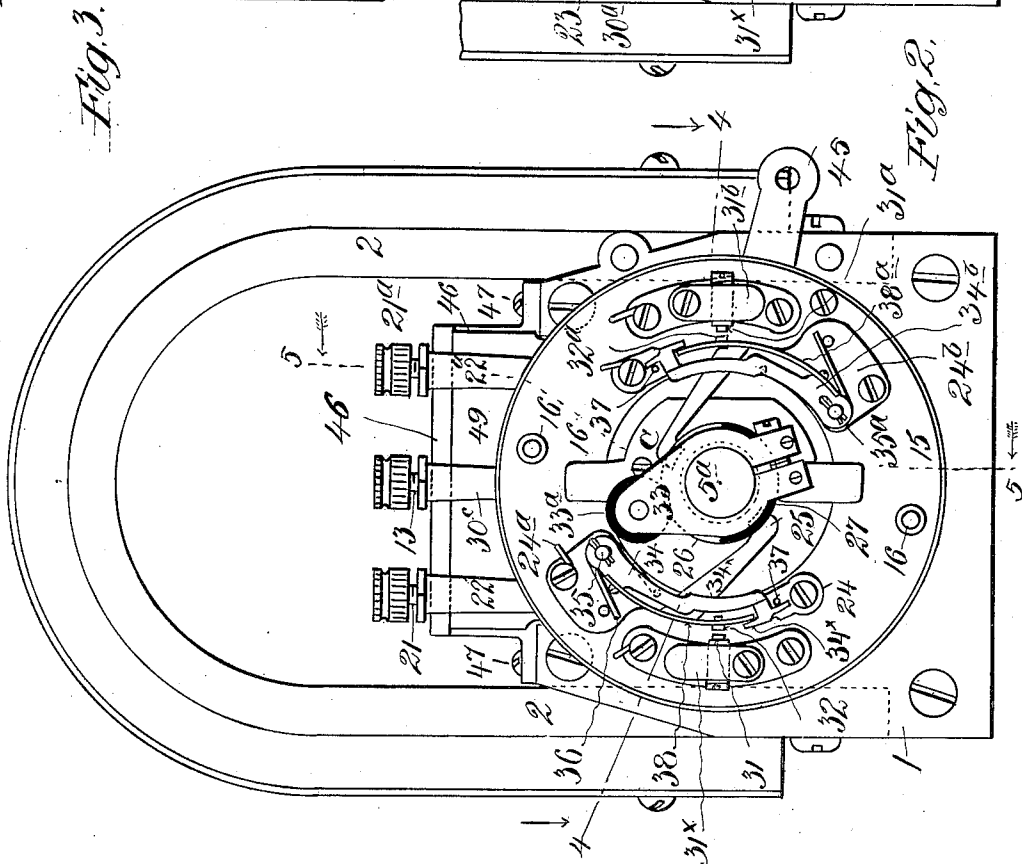
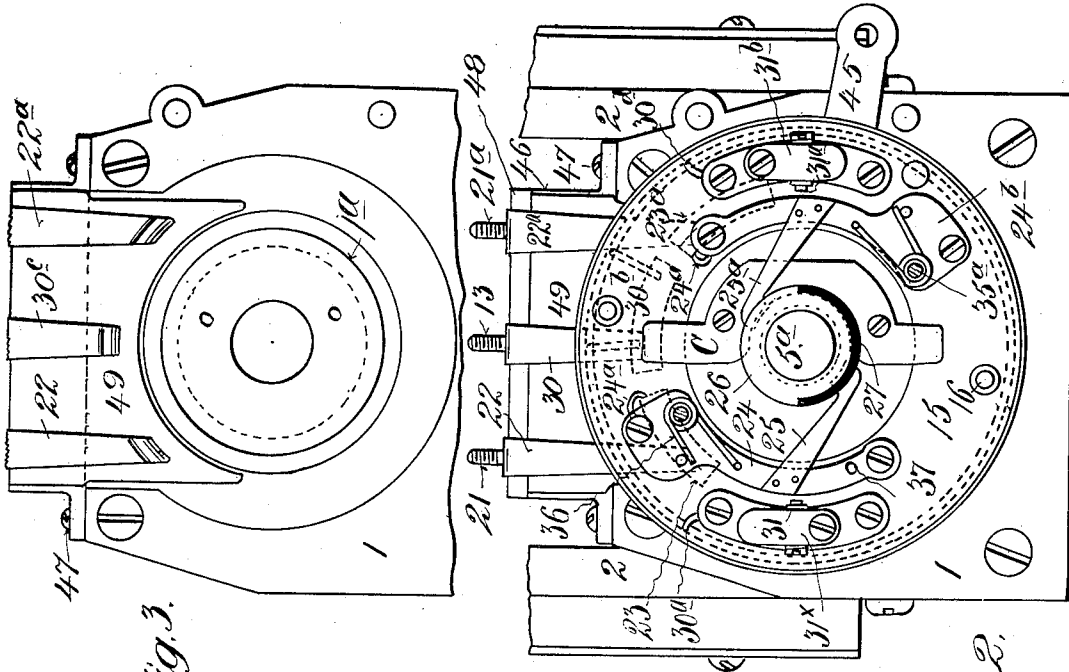


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IGNITION DEVICE.
APPLICATION FILED MAR. 23, 1909.

1,064,329.

Patented June 10, 1913.

3 SHEETS-SHEET 1.



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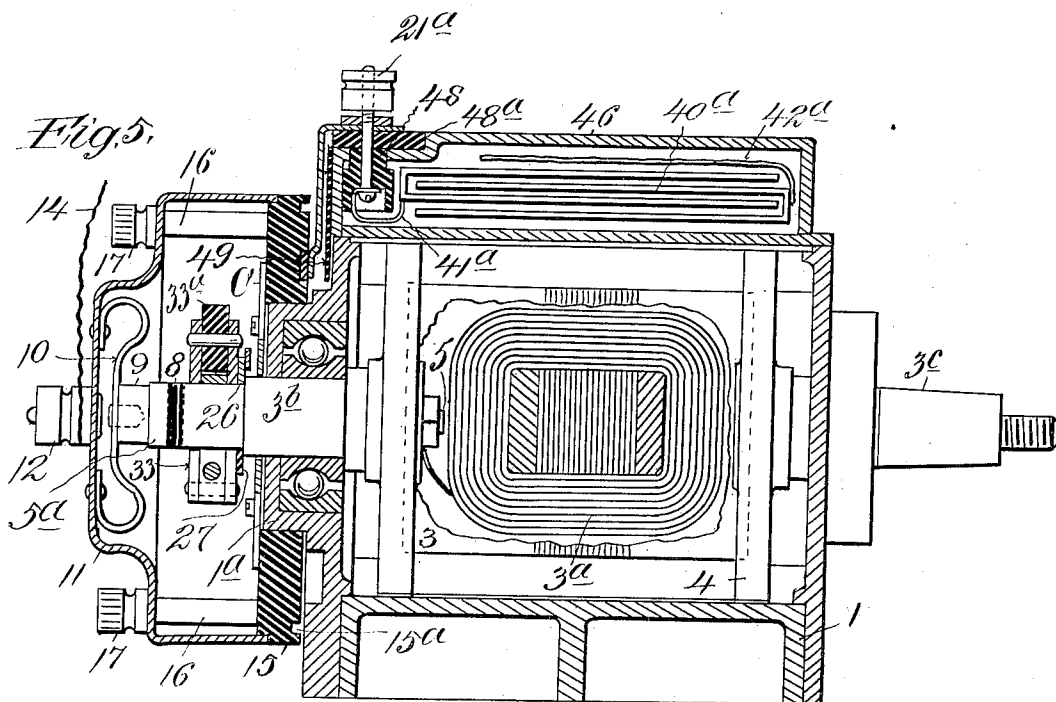
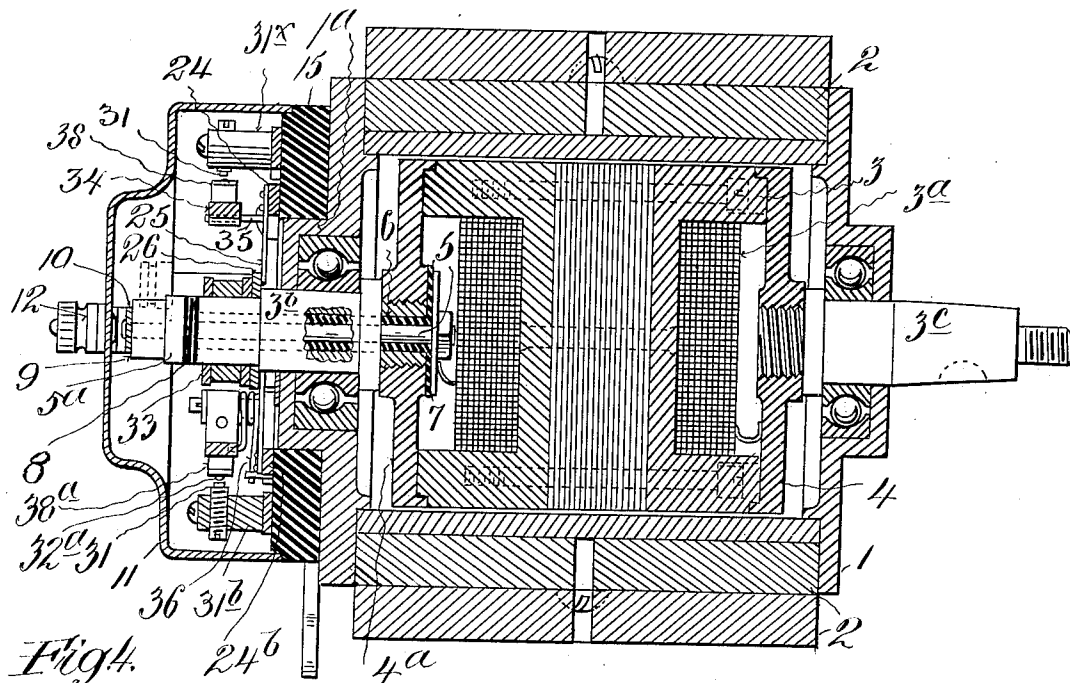
Fig. 1.

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3 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

THEODORE HUBERT, OF CRANFORD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AMERICAN CIRCULAR LOOM COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

IGNITION DEVICE.

1,064,329.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed March 23, 1909. Serial No. 435,252.

To all whom it may concern:

Be it known that I, THEODORE HUBERT, a citizen of the United States, and resident of Cranford, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Ignition Devices, of which the following is a specification.

My invention has particular reference to improvements in means for producing sparks for internal combustion engines, and relates to improvements in magnetos or generators of the low tension type used in connection with one or more transformers or induction coils to produce the jump spark at the ignition plugs, whereby the usual or well-known distributors may be dispensed with, the effects of such devices being produced by means of my improved magneto.

My invention comprises the novel details of improvement and combinations of parts, designed to carry out the above named and other objects, that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1 is a front view of a magneto or generator embodying my improvements, Fig. 2 is a similar view of part thereof, parts being removed, Fig. 3 is a front view corresponding to Figs. 1 and 2, parts being removed to illustrate the arrangement of contacts shown partly in said figures, Fig. 4 is a cross section taken substantially on the plane of the line 4, 4, in Fig. 1, Fig. 5 is a partly vertical section substantially on the plane of the irregular line 5, 5, in Fig. 1, parts being in elevation and parts being broken away, Fig. 6 is an inside face view of the insulating plate 15, and Fig. 7 is a diagrammatic view illustrating circuits and devices employed in an ignition system embodying my improvements.

Similar numerals of reference indicate corresponding parts in the several views.

The numeral 1 indicates, generally, a suitable frame of the magneto or generator provided with any suitable or usual magnets 2, and at 3 is a suitable armature whose primary winding 3^a is shown connected at one end with a head 4 of the armature, and at the opposite end with a conductor 5

shown extending centrally through the shaft 3^b of the armature and insulated therefrom 55 by insulation 6 (see Fig. 4), conductor 5 being shown insulated from the armature head 4^a by the insulation 7. The conductor rod 5 at the outer end is provided with a metallic head 5^a insulated from shaft 3^b 60 by insulation 8. The shaft part 3^c of the armature is adapted for connection with a drive shaft, as with the crank shaft of an internal combustion engine. The rotary contact 5^a is maintained properly in the primary 65 circuit, as by means of a contact 9 shown carried by a spring 10 supported by a cap 11 in circuit with a post 12 which is in connection with a post 13 by a conductor as 14, in the circuit of which conductor is a 70 suitable switch 15' (Fig. 7) for controlling the primary magneto circuit. The cap 11 may be of metal, or if of insulation then post 12 may be directly connected to spring 10. By the arrangement shown contacts 5 75 and 9 are held in permanent engagement so that contact 5^a may rotate in circuit with contact 9. Cap 11 is shown carried by an insulating disk 15, being detachably held thereon by posts 16 extending from said 80 disk through cap 11 and provided with retaining nuts 17. Insulating disk 15 is shown journaled centrally to rock upon a hub 1^a projecting from frame 1, and held in rotative position upon hub 1^a by a suitable 85 spring C shown secured by screws to hub 1^a, the outer ends of said spring bearing against the outer face of disk 15. From post 13 a conductor 18 leads to a terminal of the primary winding 19 of a transformer or 90 induction coil A, whose opposite terminal connects by wire 20 with a post 21 from which a conductor or spring 22 leads to a plate 23 shown secured to the inner surface of insulating disk 15, plate 23 thus being 95 in permanent but adjustable or shifting contact with conductor or spring 22. On the opposite face of disk 15 is a base or plate 24 in circuit with plate 23, as by connecting wire 24^a passing through disk 15, 100 base 24 being secured in position as by screws near its ends. Secured to and extending from base 24 is a spring or contact 25 adapted to engage a rotary contact 26 secured on and in circuit with shaft 3^b of 105 the armature. Contact 26 is not completely

circular, at least for its operative part, but is divided or broken for a portion of its area so as to make and break circuit at the proper time with spring or contact 25, and by preference I provide a suitable piece of insulation 27 to fill the open space of contact 26, against which insulation the spring or contact 25 may bear. The surface of parts 26 and 27 against which spring 25 bears is made flush, so that when the primary magneto circuit is broken spring 25 may ride on insulation 27 to preserve its proper position with respect to rotary contact 26. It will thus be seen that the primary circuit is from the armature winding through parts 5, 5^a and 9, spring 10, cap 11, post 12, conductor 14, switch 15⁷, conductor 18, primary 19, conductors 20 and 22, to plate 23, thence through base 24, spring or contact 25, rotary contact 26, shaft 3^b, and the armature metal through head 4 to the opposite terminal of the armature winding. In order that the discharge of the magneto circuit through the primary coil 19 shall occur only at the desired time, as for instance, after the peak of the current wave of the primary circuit has been reached and passed and before such wave has terminated, I provide a short circuit for the armature winding and the transformer primary 19 which is arranged as follows: From post 13 a conductor, such as 30, is in circuit with a contact 31 carried by disk 15 adapted to make and break circuit with a movable contact 32 operated by the armature shaft, the contact 32 being in circuit with contact or spring 25. I have shown an arm 33 secured upon shaft 3^b adapted during rotation to intermittently operate contact 32. To these ends I have shown a rock arm 34, pivotally supported upon a post 35 secured to base 24, a spring 36 normally tending to push arm 34 toward and against a stop 37. Contact 32 is carried by a spring 38 secured at one end to arm 34, and at its opposite end said spring works against a stop 34^x on said arm to limit the outward movement of the spring and permit its inward movement toward arm 34 when engagement is made between contacts 32 and 31.

In the construction shown in Figs. 1 to 6, in order to provide in the short circuit for the shifting of disk 15, the following arrangement is shown:—The contact 31 is carried by a metal support or post 31^x secured on disk 15, and a conductor 30^a leads through a hole in disk 15 (being shown located in a groove 15^a in said disk, Fig. 6), and is connected to a metal plate 30^b secured on the inner face of disk 15 (see Fig. 6), said plate being in shifting contact with conductor 30 made in the form of a spring. In the arrangement shown the short circuit is completed through contacts 25, 26, shaft 3^b, the armature metal, winding 3^a, con-

ductor 5, head 5^a, parts 9, 10, 11, 12, 14, 13, spring 30, plate 30^b, wire 30^a, and base 31^x, 31, 32, 38, 34, and base 24 back to spring 25, and the transformer 19 is short circuited as follows:—from post 13 through 18, 19, 20, 21, 22, 23, 24, 34, 38, 32, 31, 31^x, and 30^a, 30^b and 30 back to 13.

Arm 33 may be insulated from shaft 3^b, or its roller 33^a may be of insulating material, so that the circuit will always be through contacts 25 and 26 during rotation of arm 33. Arm 34 is so arranged and in such relation to the co-acting part of arm 33, such as the roller 33^a, that the circuit will be closed at contacts 31, 32 during a definite portion of the rotation of arm 33 while contacts 25 and 26 of the circuit of primary 19 are in engagement, the arrangement being such that contacts 25 and 26 are in engagement preferably just before, during and after contacts 31 and 32 are in engagement, so that circuit through 25, 26 for primary 19 will be maintained to receive the primary discharge from the armature after arm 33 releases arm 34 and the short circuit is thus broken at contacts 31, 32. To this end I have shown arm 34 provided with a bearing surface 34^x of suitable length concentric with the axis of shaft 3^b, whereby roller 33^a will engage the surface 34^x at the appropriate time to close the short circuit through contacts 31, 32, hold the short circuit closed for a definite period, and then break the short circuit as roller 33^a leaves surface 34^x while contacts 25 and 26 remain in engagement.

To destroy the sparks that may be produced in the short circuit at the break of contacts 31, 32 I provide a condenser 40, which may be relatively small, bridged across contacts 31, 32, which may be arranged as follows: One terminal of the condenser is shown in circuit with post 21 and contact 22, as by being connected with conductor 20 by a spur 41, and the opposite terminal of the condenser is shown connected with post 13 by wire 42 (see Fig. 7), the circuit for the condenser thus being from post 21 through 41, 40, 42, 13, 30, 30^b, 30^a, 31^x, 31, 32, 38, 34, 35^a, 24^a, 23 and contact 22 to post 21.

The secondary winding 19^a of the transformer connects with one or more spark plugs or the like *a a'* of an internal combustion engine. The arrangement so far described is such that two plugs *a, a'* may be operated directly and at the proper time (without any separate timer or distributor) for two cylinders of an engine by connecting the conductors *b, b'* of the terminals of the secondary winding 19^a with the plugs *a a'* respectively. In such case the circuit will be completed through the engine frame and sparks will jump simultaneously in both plugs when transformer winding 19 is ener-

gized, the sparks in one cylinder serving to explode a compressed charge therein, while sparks simultaneously passing in the other cylinder will not be necessary at that moment but will serve to aid in keeping the spark points clean, and then when the charge is compressed in the last named cylinder the sparks at its plug will ignite the charge while the sparks simultaneously made in the exhausted cylinder will be negative as before stated. As the armature, in the example described, is connected directly to the crank shaft of the engine it will be understood that each revolution of arm 33 and contact 26 will produce sparks at the plugs. If the magneto were to be used in a single cylinder engine then one of the conductors b or b' would lead to a spark plug and the other corresponding conductor would lead to ground at the engine.

In the diagram illustrated in Fig. 7 I have provided for supplying four cylinders of an engine with current for two revolutions of the armature, the arrangements before described being substantially the same on opposite sides of the armature axis, that is to say, from post 21^a conductor 22^a leads to plate 23^a , secured on disk 15, on the side opposite plate 23, connected by a wire 24^a with base 24^b on disk 15, said base carrying spring 38^a and contact 32^a , spring 25^a secured to base 24^b engaging contact 26 as required. The conductor 18 leading from post 13 also connects with one terminal of the primary winding 19^b of a second transformer or induction coil B, (Fig. 7) the opposite terminal of which connects by wire 20^a with post 21^a , the primary circuit thus being arranged similar to that previously described, but including the primary winding 19^b . The spark plugs a^2 , a^3 are connected with the secondary winding 19^c of primary winding 19^b by the conductors b^2 , b^3 . The short circuit for primary winding 19^b is established from post 13 through conductor 30 (shown diagrammatically in Fig. 7 as wire 30^a leading to post 31^b) to plate 30^b , thence by wire 30^a through a hole in disk 15, to post 31^b , thence from contact 31^a on said post to contact 32^a on spring 38^a , carried by arm 34^b , thence by base 24^b , spring 25^a , contact 26, shaft 3^b , the metal of the armature, winding 3^a , conductor 5, 5^a , 9, 10, 11, 12 and 14 back to post 13.

A separate condenser 40^a may also be used to destroy the sparks at contacts 31, 32^a . Said condenser is shown connected by wire 41^a with post 21^a and by wire 42^a with post 13. The condenser circuit around contacts 31^a , 32^a is as follows:—from post 21^a , through 41^a , 40, 42^a , 13, 30, (being 30^a in Fig. 7), 30^b , 30^a , 31^b , 31^a , 32^a , 38^a , 34^b , 35^a , base 24^b , plate 23^a and contact 22^a to post 21^a .

With the arrangements described in connection with the two transformers A and B

with reference to Fig. 7, when the arm 33 is in the position shown, the short circuit at the left for transformer A will be closed at contacts 31, 32, and when said arm releases rock arm 34 said short circuit will be broken, and a discharge will occur in the primary 19 for plugs a , a' , and then during the next half revolution of arm 33 arm 34^b will be operated to close the corresponding short circuit at 31^a , 32^a , of the primary of the transformer B, and when said short circuit is broken by arm 33 next releasing arm 34^b the discharge of the primary current from the armature will be through the primary transformer winding 19^b , for plugs a^2 , a^3 , and so on, each time arm 33 causes the make and break in one of the short circuits the discharge of primary current in the primary of the corresponding transformer will occur, there thus being a discharge in one of the primaries during each half revolution of the armature whereby current is furnished for four engine cylinders during two complete revolutions of the engine driving shaft. It will be understood that the magneto may be driven by the engine main shaft in any desired ratio of rotation according to the number of engine cylinders, but by the arrangements shown the magneto armature may be connected direct to the engine driving shaft as stated, and the two transformers will supply current for the four plugs at the times required in the manner described. To advance or retard the time of sparking, disk 15 may be operated by an extension 45 actuated in any well-known manner. The arrangement of the transformers shown is such that the current will flow through them always in the same direction thereby eliminating hysteresis.

The condensers may be supported upon frame 1 in any suitable manner, as within a cap or housing 46 secured thereon as by screws 47, and posts 13, 21 and 21^a , are secured in insulation 48, 48^a fitted upon cap 46, insulation 49 being interposed between contacts 22, 22^a and 30 and the frame 1, the condensers being connected by wires 41 and 41^a , with the corresponding posts 21, 21^a , the opposite terminals of the condensers being connected by wires 42, 42^a with post 13 in any suitable manner.

Having now described my invention what I claim is:—

1. Ignition devices comprising an armature, a transformer, a circuit from the armature to the transformer, and devices controlled by the armature to make and break said circuit during rotation of the armature, a short circuit for the transformer circuit and make and break devices for the short circuit arranged to be broken before the break in the transformer circuit.

2. Ignition devices comprising an armature, a transformer, a circuit from the arma-

ture to the transformer and devices controlled by the armature to make and break said circuit during rotation of the armature, a short circuit for the transformer circuit, and make and break devices for the short circuit arranged to be broken after the peak of the wave in the transformer circuit has been passed and before the break in the transformer circuit.

3. Ignition devices comprising an armature, a transformer, a circuit from the armature to the transformer, and devices controlled by the armature to make and break said circuit during rotation of the armature, a short circuit for the transformer circuit, and make and break devices for the short circuit arranged to be closed during the rise of the current in the armature and to be broken after the peak of the wave in the transformer circuit has been passed and before the break in the transformer circuit, and a condenser bridged across the make and break devices of the short circuit.

4. Ignition devices comprising an armature, a non-vibratory transformer circuit therefor from the armature, a plurality of spark plugs in the circuit of the secondary of the transformer, a short circuit for the transformer circuit, means to make and break the transformer circuit by and during rotation of the armature, and means to make and break the short circuit arranged to break the short circuit while the transformer circuit is closed.

5. Electric ignition devices comprising an armature, a plurality of transformers, separate circuits from the respective transformers to the armature, separate short circuits for the respective transformer circuits, and means to make and break said short circuits successively during different positions of the armature.

6. Electric ignition devices comprising an armature, a plurality of transformers, separate circuits from the respective transformers to the armature, short circuits for the transformer circuits, and means located on opposite sides of the axis of the armature for making and breaking the corresponding short circuit when the armature is in corresponding positions of rotation.

7. Electric ignition devices comprising an armature, a plurality of transformers, separate circuits from the respective transformers to the armature, short circuits for the transformer circuits, means located on opposite sides of the axis of the armature for making and breaking the corresponding short circuit when the armature is in corresponding positions of rotation, and condensers bridged across the make and break devices of said short circuits.

8. Ignition devices comprising an armature, a plurality of transformers having corresponding terminals connected to the same

terminal of the armature, a rotary contact in circuit with the opposite terminal of the armature, contacts to successively engage the armature contact in different positions of its rotation, said contacts being respectively connected with corresponding terminals of said transformers, opposite the first named terminals, said rotary contact being arranged to make engagement with the second named contacts successively whereby current will be discharged through said transformers successively and separately during a complete revolution of the armature, separate short circuits for said transformers, and means to make and break said short circuits successively and separately during a complete rotation of the armature before the breaks in the primary circuits.

9. Ignition devices comprising an armature, a plurality of transformers having corresponding terminals connected to the same terminal of the armature, a rotary contact in circuit with the opposite terminal of the armature, contacts to successively engage the armature contact in different positions of its rotation, said contacts being respectively connected with corresponding terminals of said transformers opposite the first named terminals, said rotary contact being arranged to make engagement with the second named contacts successively whereby current will be discharged through said transformers successively and separately during a complete revolution of the armature, separate short circuits for said transformers, means to make and break said short circuits successively and separately during a complete rotation of the armature before the breaks in the primary circuits, and condensers bridged across the make and break devices of said short circuits.

10. The combination of a magneto armature, a contact operated by and in circuit therewith, a second contact for engagement by the first named contact, a transformer having one terminal connected with the second named contact and having its other terminal permanently connected with the armature, a short circuit for said transformer circuit, operated by the armature, and means for breaking said short circuit while the transformer circuit is closed through said contacts.

11. The combination of a magneto armature, a contact operated by and in circuit therewith, a second contact for engagement by the first named contact, a transformer in a circuit having one terminal connected with the second named contact and having its other terminal permanently connected with the armature, a short circuit for said transformer circuit having make and break contacts, operated by the armature, and means

operated by the armature to control said make and break contacts arranged to close and break the short circuit at said contacts while the transformer circuit is closed through the first named contacts.

12. The combination of a magneto armature, a contact operated by and in circuit therewith, a second contact for engagement by the first named contact, a transformer in a circuit having one terminal connected with the second named contact and having its other terminal connected with the armature, a short circuit for said transformer circuit having make and break contacts, operated by the armature, means operated by the armature to control said make and break contacts arranged to break the short circuit at said contacts while the transformer circuit is closed through the first named contacts, and a condenser bridged across said make and break contacts.

13. The combination of a magneto armature, a contact operated by and in circuit therewith, a second contact for engagement by the first named contact, a transformer in the circuit of said contacts, an arm operated by said armature, a rock arm in circuit with said second contact, said rock arm having a third contact, a fourth contact for engagement with the third contact, a short circuit for the transformer circuit controlled by the third and fourth contacts, and an insulator supporting the second, third and fourth contacts and adjustable around the axis of the armature.

14. The combination of a magneto armature, a contact operated by and in circuit therewith, a second contact for engagement by the first named contact, an arm operated by said armature, a rock arm in circuit with said second contact, said rock arm having a third contact, a fourth contact for engagement with the third contact, and an insulator supporting the second, third and fourth contacts, said insulator having plates respectively connected with the second and fourth named contacts, said insulation being

movably supported and contacts engaging the contacts of said insulator.

15. The combination of a magneto armature, a contact operated by and in circuit therewith, contacts on opposite sides of the axis of the armature, insulation carrying said contacts, and adjustable around the axis of the armature, movable contacts respectively in circuit with the respective second named contacts, an arm operated by said armature to successively operate the movable contacts, and contacts respectively on opposite sides of the axis of the armature for engagement with the respective movable contacts, spaced contacts connected respectively with said last named contacts and carried by said insulation, a contact carried by said insulation common to all said contacts, and a spring to engage said common contact.

16. The combination of a magneto armature, a contact operated by and in circuit therewith, contacts on opposite sides of the axis of the armature, insulation carrying said contacts, movable contacts respectively in circuit with the respective second named contacts, an arm operated by said armature to successively operate the movable contacts, fourth contacts respectively on opposite sides of the axis of the armature for engagement with the respective movable contacts, an insulating disk carrying the contacts on opposite sides of the armature shaft, said disk having contact plates one of which is connected with the fourth contacts, other of which plates are connected with the movable contacts respectively on opposite sides of the armature axis, and separate springs engaging said plates.

Signed at New York city, in the county of New York, and State of New York, this 22nd day of March, A. D. 1909.

THEODORE HUBERT.

Witnesses:

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