A. C. KLECKNER.

OSCILLATING IGNITION MAGNETO.

APPLICATION FILED OCT. 20, 1919.

1,378,873.

Patented May 24, 1921.

3 SHEETS—SHEET 1.

Fig. 1

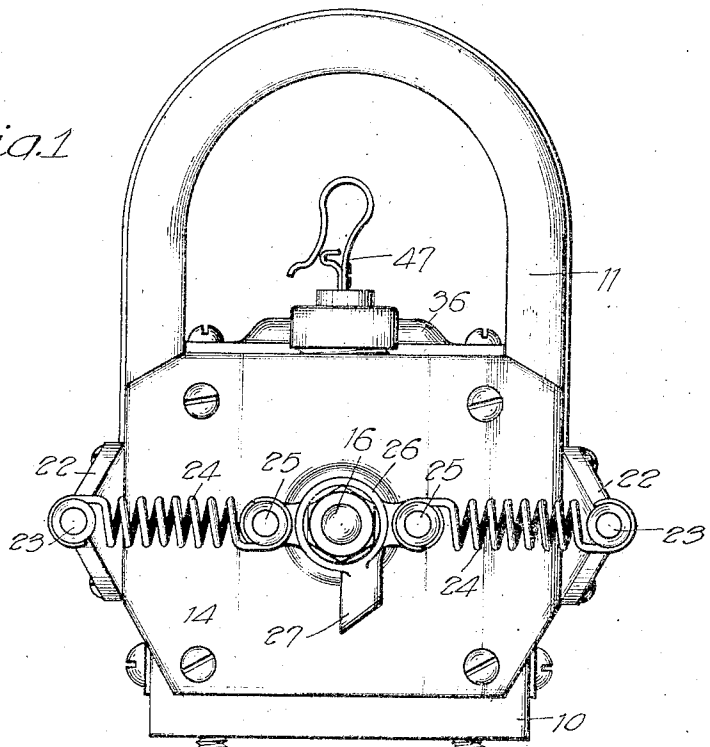
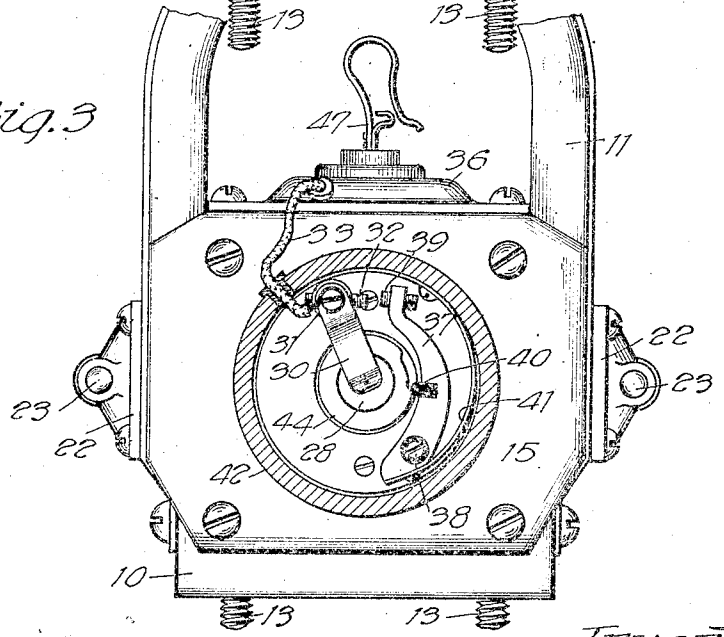


Fig. 3



Inventor
Arthur C. Kleckner
Williams Bradbury & Co
Attys.

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3 SHEETS—SHEET 2.

Fig. 2

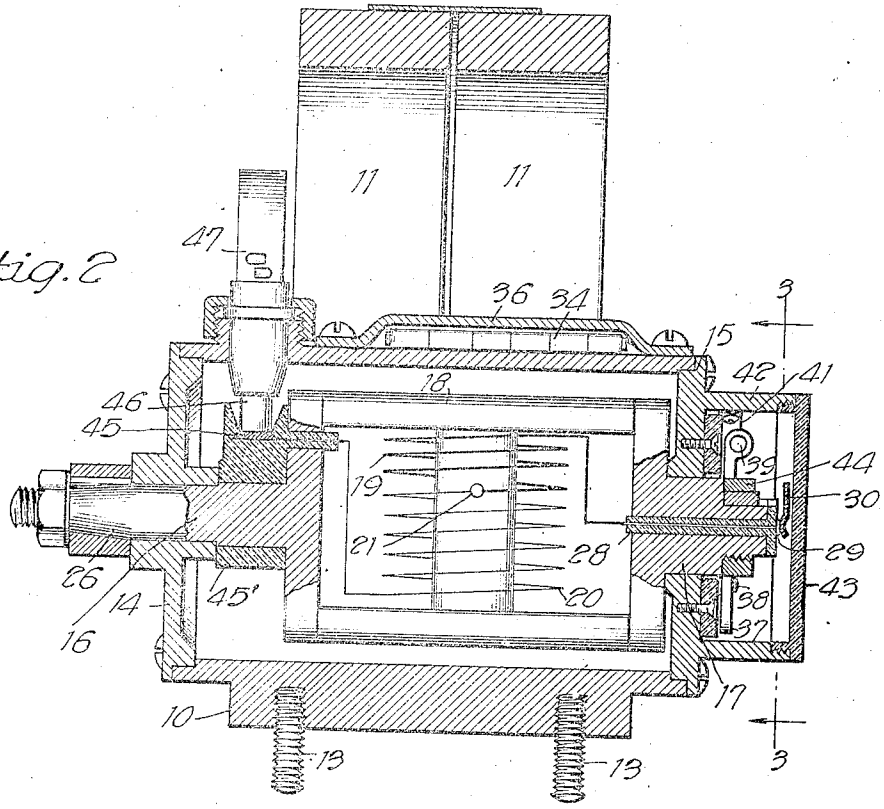


Fig. 4

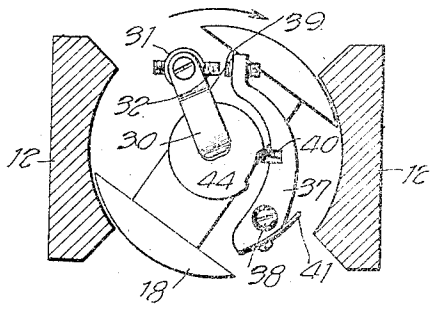
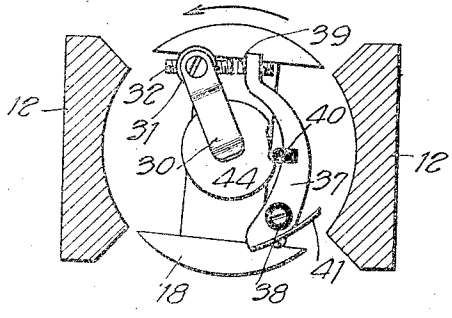


Fig. 5



Inventor
Arthur C. Kleckner
Williamson Bradbury & Lee
Attys.

A. C. KLECKNER.

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3 SHEETS—SHEET 3.

Fig. 6

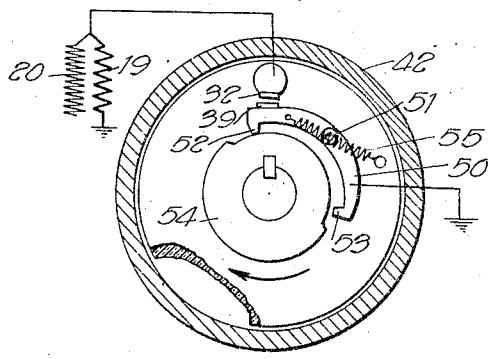


Fig. 7

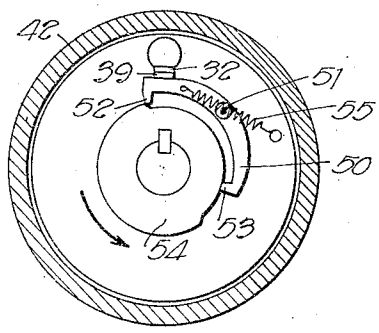


Fig. 8

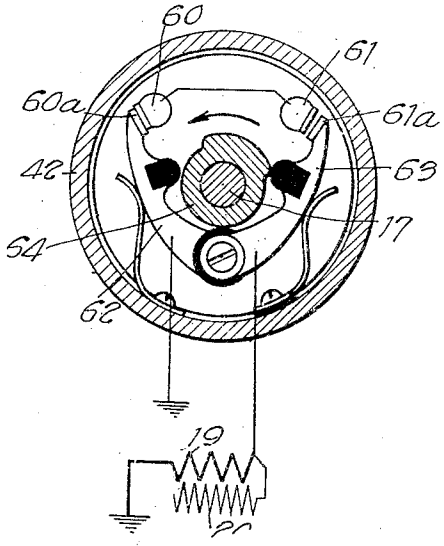
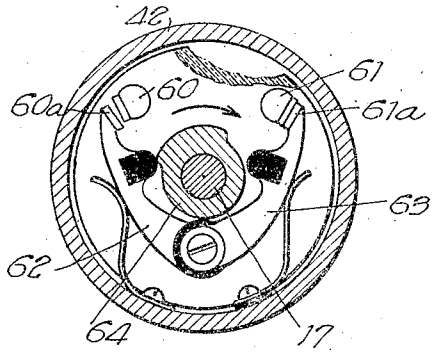


Fig. 9



Inventor
Arthur C. Kleckner
William Bradbury Lee
Attys.

UNITED STATES PATENT OFFICE.

ARTHUR C. KLECKNER, OF RACINE, WISCONSIN, ASSIGNOR TO WEBSTER ELECTRIC COMPANY, OF RACINE, WISCONSIN, A CORPORATION OF WISCONSIN.

OSCILLATING IGNITION-MAGNETO.

1,378,873. Specification of Letters Patent. **Patented May 24, 1921.**

Application filed October 20, 1919. Serial No. 332,092.

To all whom it may concern:

Be it known that I, ARTHUR C. KLECKNER, a citizen of the United States, residing at Racine, in the county of Racine and State of Wisconsin, have invented a certain new and useful Improvement in Oscillating Ignition-Magnetos, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in ignition magnetos, and is more particularly concerned with the provision of certain improvements applicable to that class of ignition magneto equipments generally known in the trade as oscillators.

Generally speaking, oscillating magneto ignition equipments, as now commonly used, comprise an ignition magneto, the rotor element of which is normally held in a certain position with respect to the magneto stator by resilient means, preferably in the nature of a pair of comparatively heavy springs. In the operation of the equipment, the rotor is periodically moved against the tension of these springs to "cocked" position and released, whereupon the said springs rapidly move the rotor toward the position in which it is normally held by the springs.

I have found that in oscillating magneto equipments, there is a current created in the generating winding of the magneto on the cocking stroke, due to the fact that the rotor is being rotated at some definite speed by the mechanism which periodically cocks and trips the same as hereinbefore explained, since the circuit including the generating winding, or primary winding in the case of a high tension machine, is closed during the cocking stroke. If, after the rotor is fully cocked, it is allowed to remain in this position for a significant period of time, say for instance a second or two, before it is released, the current generated on the cocking stroke will die out, so that when the rotor is released and recoiled back to normal position, a substantial current for ignition purposes is created in the generating or primary winding. However, when such an oscillating magneto is used on a high speed engine and is cocked and tripped by a mechanism operating at high speed, so that the rotor has virtually no period of rest before returning on its recoil movement, the current wave created in the generating or primary winding during the cocking movement of the rotor does not die out to a zero value, wherefore the current wave created on the recoil movement does not build up from zero value, but to the contrary, commences to build up from a point considerably below zero value. The result is that when such a magneto is operated at high speed, the current available for ignition purposes is not sufficient, or at any rate, is not of as great a value as it would be were the current created on the cocking movement of the rotor permitted to die out entirely before the commencement of the recoil of the rotor.

The principal object of my present invention is to provide means for insuring that the current wave created on the recoil of the rotor shall always be permitted to build up from a zero value, rather than from a point below the zero value, regardless of the speed at which the equipment is operated.

In the accompanying drawings I have illustrated my invention applied to a high tension oscillating magneto ignition equipment, wherein the several parts of the equipment with the details of which my invention is not particularly concerned are shown in what may be considered conventional form. While the magneto illustrated is of the wound armature type, carrying primary and secondary windings, it will be understood that the improvements of my invention are applicable to any suitable form of magneto, whether it be of the wound armature type, inductor, or any other type suitable for use in an oscillating magneto equipment.

In the drawings,—

Figure 1 is an elevational view of that end of the magneto equipment which carries the trip finger and rotor operating springs.

Fig. 2 is a vertical sectional view taken along the rotor axis.

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2 and looking in the direction indicated by the arrows.

Fig. 4 is a diagram illustrating the oper-

ation of the interrupter cam and coöperating devices when the rotor approaches the end of its movement toward cocked position.

Fig. 5 is a similar diagram illustrating the operation of interrupter elements, at, or substantially at the time the peak of the current wave is attained in the primary winding on the recoil of the rotor or armature.

Figs. 6 and 7 are diagrams illustrating a modified arrangement that may be employed with the objects of my invention in view, and

Figs. 8 and 9 are diagrams illustrating a further modification of the mechanism that may be provided to accomplish the objects of my invention.

Similar characters of reference refer to similar parts throughout the several views.

In the drawings, I have illustrated one form of high tension oscillating magneto equipment provided with the improvements of my invention. The equipment shown comprises the magnetic framework 10 and permanent horse-shoe magnets 11—11 provided with the usual pole pieces 12—12. The framework 10 shown is provided with a plurality of stud bolts 13—13 whereby the magneto frame may be mounted upon any suitable support, as for instance, a shelf or bracket carried upon the framework of the engine with which the ignition equipment is employed. The magneto framework as here illustrated is provided with end plates 14 and 15, which serve to journal the trunnions 16 and 17 of the rotor 18, which I have illustrated as being of the wound armature type provided with primary winding 19 and secondary winding 20. Each of said windings have one end thereof grounded to the armature core at 21.

I have shown the magneto as provided with side plates 22—22, each of which comprises a post 23 provided with a suitable roller around which is secured the outer end of one of the comparatively heavy rotor operating springs 24—24. The inner ends of the springs 24—24 are secured around rollers carried by pins 25—25 which project laterally from and preferably are formed integral with the yoke member 26, which is keyed or otherwise fixed upon the armature trunnion 16. Conveniently formed integral with the yoke 26 is a trip finger 27, which it will be understood is periodically engaged in any suitable and well known manner by an engine driven device and moved in a contra-clockwise direction (Fig. 1), and then released. This movement of the trip finger and rotor by the engine driven operating mechanism is of course accomplished against the tension of the springs 24—24, so that when the trip finger is released the springs 24—24 serve quickly to return the armature toward normal position. While any suitable engine driven apparatus may be used to periodically engage, move and release the trip finger, I prefer to employ the type of operating mechanism shown and described in the co-pending application of John A. E. Carlson, Serial No. 346,728, filed December 22nd, 1919. Anyone skilled in the art to which this invention relates will of course understand that when the rotor is cocked, it is moved a substantial distance against the tension of the springs 24—24,—say for instance through an angle of approximately 30°, the normal position of the rotor being such that after being cocked and released it is carried to or past its generating position under the influence of the springs connected therewith.

The insulated lead of the primary winding is here shown as passing through an insulating bushing 28 extending through the armature trunnion 17, and terminating in an insulated button 29 as shown. Having one end thereof bearing against the button 29 is a brush 30, the other end of which leads to the insulated interrupter element 31 provided with the usual contact 32. The insulated interrupter element 31 may be connected by conductor 33 with one terminal of the condenser 34 inclosed by condenser housing 36, the other terminal of the condenser being grounded to the magneto frame in the usual manner. The movable or grounded element of the interrupter is here shown in the form of an arm 37 pivoted at 38 and provided with the contact 39 arranged to coöperate with the stationary interrupter contact 32. The arm 37 is provided with cam follower 40 and spring 41, which normally tends to keep the contact 39 in engagement with its coöperating contact 32. The interrupter elements are conveniently inclosed in a housing 42, which for convenience in illustration has been shown as formed integral with the magneto endplate 15 and provided with a removable cap or closure 43.

Fixed upon the armature trunnion 17 is the cam 44 which is so conformed that when the rotor or armature, during the cocking movement thereof has reached the position shown in Fig. 4, or in other words, is approaching the end of its cocking movement, the interrupter contacts are separated to open the circuit including the primary winding. The herein shown conformation of the cam 44 likewise insures that when on its recoil movement the armature has reached the position shown in Fig. 5, or in other words, has reached the position where the peak of the current wave of the primary winding is attained, the interrupter contacts are again opened to cause a high tension current to be induced in the secondary winding 20 in the usual manner. During the recoil of the armature from the point at which

it is released to the point at which the peak of the current wave in the primary winding is attained, the cam follower rides on the depressed portion of the cam, allowing the interrupter contacts to remain closed.

Suitable means may be employed for carrying the high tension current from the insulated lead of the secondary winding 20 to the spark plug of the engine with which the apparatus is employed. I have shown the insulated lead of the secondary winding extended to a segmental conductor plate 45, carried by a segmental spool 45′ mounted on the armature trunnion 16. Coöperating with the plate 45 is a brush 46 operating in a combined brush holder and terminal 47, which I have here illustrated as being of the type shown and described in the patent to Walter Brown, #1,314,182, dated August 26th, 1919.

The operation of the mechanism illustrated in Figs. 1 to 5 is as follows:

When the trip finger 27 is engaged by the engine driven actuating mechanism, the armature is cocked in the direction indicated by the arrow in Fig. 4 until it reaches the position illustrated in this figure. During the major portion of the cocking movement of the armature, a current is being created in the primary winding 19, but prior to the releasal of the trip finger from the engine driven actuating device, the cam 44 effects the separation of the interrupter contacts as shown in Fig. 4, and permits the current created in the primary winding during the cocking of the armature to die out.

Shortly after the releasal of the trip finger by the engine driven actuating mechanism, and when the armature is recoiled in the direction indicated by the arrow in Fig. 5, under the tension of the armature operating springs, the cam follower enters upon the depressed portion of the cam and permits the contacts to remain closed until the armature reaches substantially the point at which the peak of the current wave created in the primary winding during the recoil is attained, whereupon the interrupter contacts are again separated as shown in Fig. 5, with the result that the current created in the primary winding during the recoil of the armature dies rapidly away and induces a high tension current in the secondary winding in the usual manner. It will thus be seen that I have provided means for insuring that the circuit, including the primary winding, shall always be open for at least a significant interval prior to the commencement of the recoil of the armature, so that the current created in the primary winding during the cocking of the armature may be permitted to die away before the armature starts upon its recoil movement. Thus I am assured that the current wave created in the primary winding during the recoil of the armature may start from a zero value, and not from a point below a zero value, regardless of the speed at which the mechanism may be operated.

Referring now to the diagrams of Figs. 6 and 7, wherein I have shown a modified form of interrupter mechanism, it will be noted that to those parts which correspond in all material respects to corresponding parts of Figs. 1 to 5, I have applied the corresponding reference characters. The interrupter contact 39 of Figs. 6 and 7 is mounted upon an arcuate lever 50 pivoted at 51, the said lever being provided with two cam followers 52 and 53 arranged to cooperate with the cam 54, which it will be noted is provided with two points and a comparatively long depressed surface between said points. Acting between the lever 50 and the interrupter housing is a spring 55 which operates to hold the contacts closed after they have been closed, and to hold the same open after they have been separated. In Fig. 6 the cam follower 52 is shown in engagement with the cam and the spring 55 is shown maintaining the interrupter contacts separated.

Fig. 6 illustrates the positions assumed by the several parts of the interrupter at the beginning of the cocking movement of the rotor. The rotor is cocked in the direction indicated by the arrow. In this figure, it will be noted that the contacts remain separated during practically all of the cocking movement of the rotor, with the result that the circuit, including the primary winding, is open, and no current wave is created in the primary winding. At the end of the cocking movement, one of the points of the cam engages the cam follower 52 and effects the closing of the interrupter contacts. The spring 55 now functions to keep the contacts closed. The cam follower 53 is now in engagement with the cam and remains in engagement with the cam until, near the end of the recoil, one of the points of the cam engages the cam follower 53 and again effects the separation of the contacts.

Fig. 7 illustrates the positions assumed by the several elements of this interrupter mechanism at the beginning of the recoil movement.

It will be noted that the arrangement illustrated in Figs. 6 and 7 differs somewhat from the arrangement shown in the preceding figures, in that the circuit including the generating winding, is maintained open during practically all of the cocking movement of the rotor, instead of for just a brief interval at the end of the cocking movement, as is the case with the mechanism shown in Figs. 1 to 5 inclusive.

In Figs. 8 and 9 I have illustrated an arrangement wherein two sets of interrupter contacts in series controlled by a single cam

are provided for the purpose of accomplishing the objects of my present invention. It will be noted that in this arrangement the stationary contacts indicated at 60 and 61 are connected together. The movable contact 60^a, which coöperates with the stationary contact 60, is mounted on the grounded interrupter arm 62, while the movable contact 61^a is mounted upon the insulated contact arm 63. Each of the contact arms is provided with a follower arranged to cooperate with the cam 64 and a spring which normally tends to move the interrupter arm toward the cam. The circuit arrangement has been diagrammatically illustrated. Fig. 8 shows the several parts of the interrupter mechanism in the positions which they assume at the beginning of the cocking movement of the rotor, whereas Fig. 9 illustrates said parts in the positions assumed by them just prior to the recoil of the rotor under the tension of the heavy springs connected therewith. Assuming that the rotor is cocked in a contra-clockwise direction, as indicated by the arrow in Fig. 8. It will be noted that shortly after the cocking movement of the rotor commences, the follower of interrupter arm 63 rides upon the depressed portion of the cam, with the result that both sets of interrupter contacts remain closed during the major portion of the cocking movement of the rotor. Near the end of the cocking movement one of the points of the cam engages the cam follower of interrupter arm 62 and separates the contacts 60 and 60^a, with the result that any current created in the generating winding during the cocking of the rotor has time to die out before the recoil commences. As soon as the rotor recoils in a clockwise direction, as indicated by the arrow in Fig. 9, the contacts 60 and 60^a are permitted to engage each other, with the result that the circuit, including the primary winding, is closed until, when at a point near the end of the recoil movement, the cam follower of interrupter arm 63 is engaged by one of the points of the cam to interrupt the primary circuit to cause a high tension circuit to be induced in the secondary winding in the usual manner.

From the foregoing description it will be seen that the instrumentalities for accomplishing the objects of my invention may be varied within wide limits, wherefore, I do not limit myself to the specific constructions herein shown and described, but desire to claim broadly all equivalent constructions embodying the invention defined by the appended claims. Furthermore, while I have illustrated my invention as applied to a magneto of the wound armature type, it will be understood that the invention is by no means so limited, but may be applied to any satisfactory form of oscillating magneto.

When in the appended claims I refer to an oscillating magneto, I refer to a magneto of the general class wherein the rotor is cocked against the tension of resilient means and released, whereupon the rotor is recoiled by the resilient means connected therewith rapidly to move the rotor to cause the generation of the current employed for useful work.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An oscillating ignition equipment consisting in combination with a magneto comprising a rotor, stator, and primary and secondary windings, spring means normally holding the rotor in a certain position with respect to the stator, a trip device connected with the rotor adapted to be engaged by an engine driven actuator, moved against the tension of said spring means and released, together with interrupter contacts in circuit with said primary winding, means coöperating with said interrupter contacts arranged to insure that the circuit including the primary winding is open for at least a significant period of time before the trip device is released by the engine driven actuator as aforesaid, and means for actuating the interrupter contacts to open the circuit including the primary winding when on its recoil movement the rotor is at substantially the position where the peak of the current wave created in said primary winding is attained.

2. In combination with a high tension ignition magneto of the oscillating type, of interrupter mechanism controlling the circuit of the primary winding of the magneto, said interrupter mechanism arranged to insure that the circuit of the primary winding is open for at least a significant period of time prior to the recoil of the rotor, closed during the recoil of the rotor, and opened near the end of the recoil of the rotor, *seriatim*.

3. In combination with an ignition magneto of the oscillating type, a pair of coöperating interrupter contacts controlling the circuit of the generating winding of the magneto, spring means associated with the interrupter contacts, said spring means tending to maintain the existing closed, or separated, relation to the interrupter contacts, and cam mechanism adapted to close the interrupter contacts, in opposition to said spring means, immediately prior to the recoil of the rotor, and adapted to separate the contacts, in opposition to said spring means, near the end of the recoil of the rotor.

4. In combination with an ignition magneto of the oscillating type, interrupter mechanism controlling the generating winding of the magneto, said interrupter mecha-

nism comprising stationary and movable contacts, a pivoted arm carrying the movable contact, spring means connected with said arm at one side of its pivot, said spring means tending to maintain the existing closed or open relation of the contacts, said arm having two cam followers, one on each side of its pivotal point, and a peripheral cam coacting with said followers, said cam arranged to coöperate with one follower to effect the engagement of the contacts immediately prior to the recoil of the rotor and arranged to coöperate with the other follower to effect the separation of the contacts near the end of the recoil of the rotor.

5. In combination with an ignition magneto of the oscillating type, interrupter mechanism comprising coöperating contacts, an arm carrying the movable contact, said arm being pivoted intermediate its ends and provided at each end with a cam follower, a spring connected with said arm at one side of the pivot thereof, said spring adapted to oppose the separation of the contacts when the latter are in engagement and to oppose the closing of the contacts when they are separated, and a peripheral cam associated with said arm, said cam adapted to coöperate with one follower to effect the separation of the contacts near the end of the recoil of the rotor and to coöperate with the other follower to close the contacts immediately prior to the next recoil of the rotor, the contacts being separated during the cocking movement of the rotor.

In witness whereof, I hereunto subscribe my name this 19th day of September, 1919.

A. C. KLECKNER.

Witnesses:
J. G. Crewe,
B. E. Nelson.