Dec. 2, 1924. 1,517,997

T. G. LOUIS

MAGNETO

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Fig. 1.

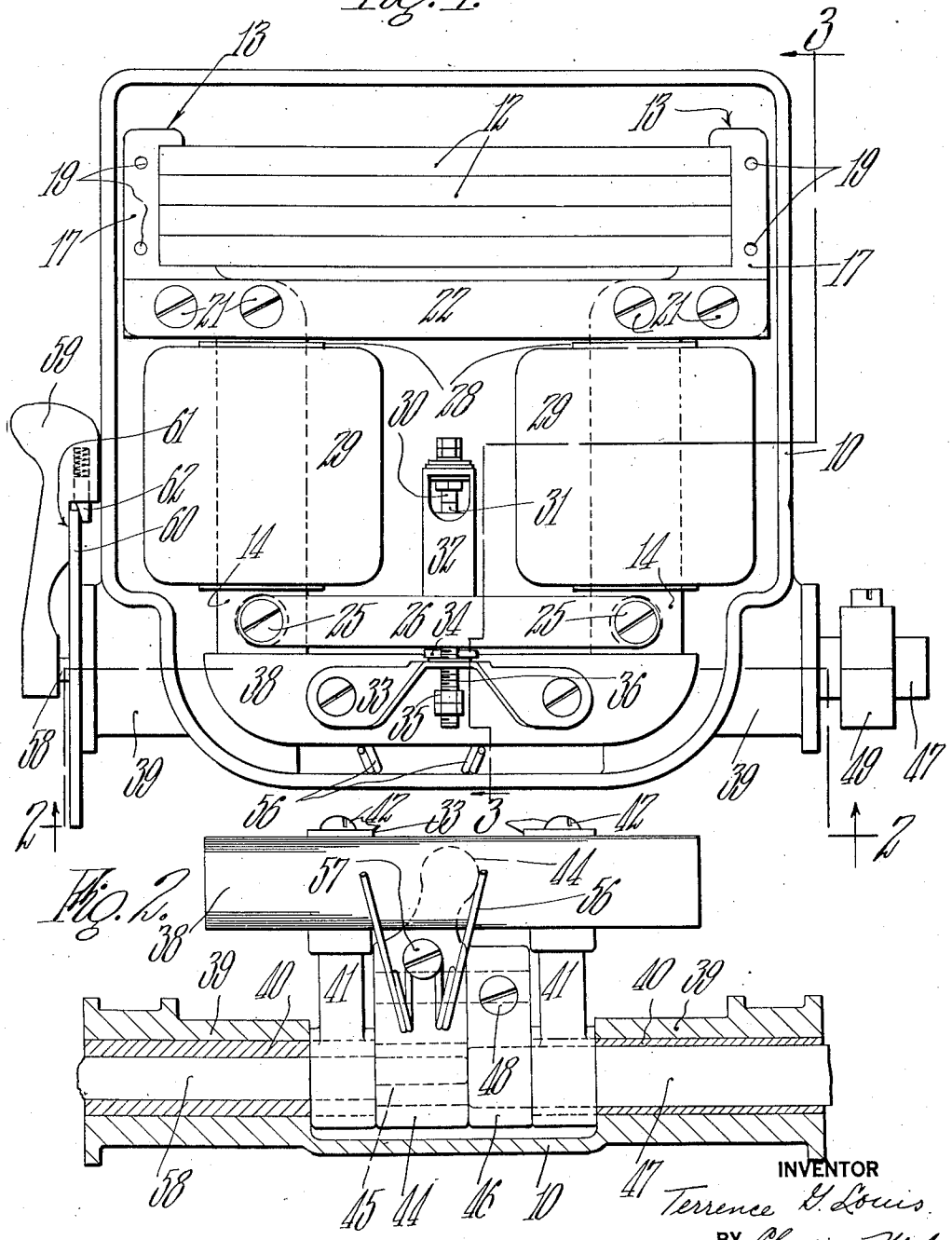

Fig. 2.

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Fig. 3.

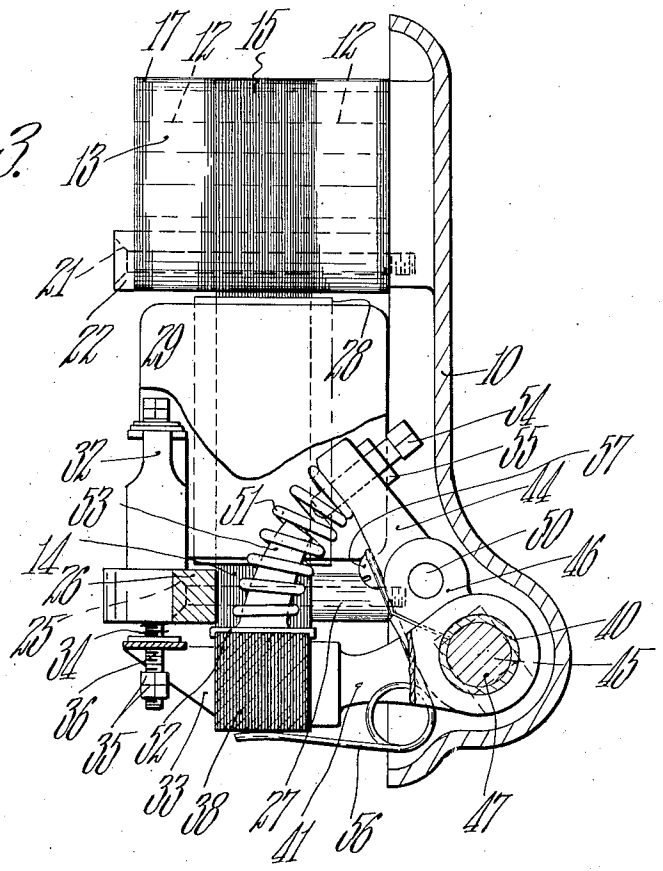

Fig. 4.

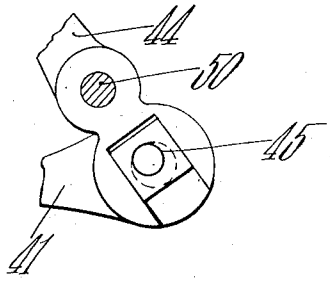

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Fig. 5.

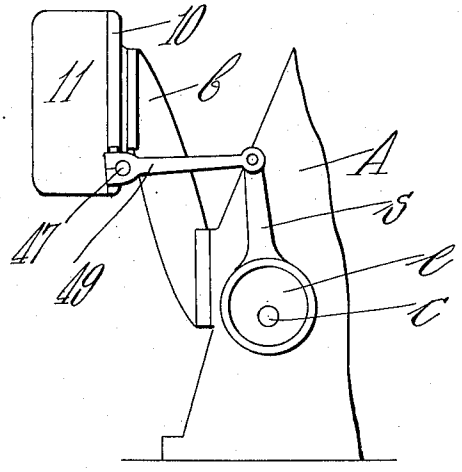


Fig. 6.

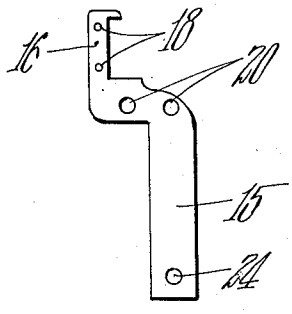
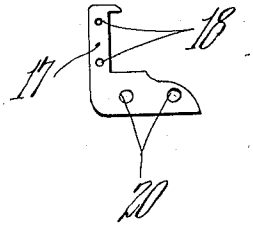


Fig. 7.



INVENTOR

Terrence G. Louis

BY Chapin & Neal

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Patented Dec. 2, 1924. 1,517,997

UNITED STATES PATENT OFFICE.

TERRENCE G. LOUIS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO WICO ELECTRIC COMPANY, A CORPORATION OF MASSACHUSETTS.

MAGNETO.

Application filed May 26, 1922. Serial No. 563,911.

To all whom it may concern:

Be it known that I, TERRENCE G. LOUIS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Magnetos, of which the following is a specification.

This invention relates to magnetos and more particularly to improvements in magnetos of the type wherein the armature moves into and out of contact with magnetic poles.

The invention has for one object to provide, in a magneto of the general type described, an improved means for operating the armature.

The invention has for another object to provide in a magneto, armature operating means including an oscillatory lever, the movement of which controls the time of generation of current, and means for varying the time of current generation by varying the distance between the fulcrum of said lever and the point of application of power thereto.

Another object of the invention is to provide in a magneto of the class described, an armature which is mounted for rocking movement toward and away from its poles, and means for operating it independently of engine speeds.

Another object of the invention is to provide in a magneto having a pivoted armature movable into and out of contact with magnetic poles, means automatically operable when released for moving the armature through one complete cycle of movement, and means adapted for operation from an engine for releasing the first named means at properly timed intervals.

Another object of the invention is to provide in a magneto of the type described, a casing within which all the working parts of the magneto are supported and contained, including its armature and operating and timing mechanism therefor.

Other objects and advantages will appear in the following description and in the illustrative embodiment of the invention in the accompanying drawings, in which—

Fig. 1 is a front elevational view of a magneto embodying the invention, the cover of the casing having been removed to reveal the interior;

Fig. 2 is a sectional plan view taken on the line 2—2 of Fig. 1;

Fig. 3 is an end elevation, with parts in section, of the magneto;

Fig. 4 is a fragmentary sectional elevation showing the adjustment for the armature operating lever;

Fig. 5 is a small scale elevational view illustrative of the manner of mounting the magneto on, and driving it from an engine; and

Figs. 6 and 7 are front elevational views of laminations employed in building up a part of the magnetic field structure.

Referring to these drawings, the magneto comprises a suitable frame or casing, a source of magnetic flux, cores or pole pieces for the source forming part of a magnetic circuit therefrom, a suitable generating winding or coils associated with one or both of the cores, an armature movable into and out of contact with the pole pieces to cooperate therewith in producing a magnetic circuit of alternately low and relatively high reluctance from the source, and operating mechanism for moving the armature preferably including timing means to vary the time at which the armature leaves the poles.

The frame of the magneto may be variously constructed, as desired, but preferably is in the form of a casing to enclose and protect the working parts of the magneto. The complete casing, comprising a back 10 and cover 11, is shown in Fig. 5 and the back 10, which supports all the working parts of the magneto is shown in full detail in Figs. 1 and 3. The back 10, as disclosed herein, is of non-magnetic material.

The source of magnetic flux, preferably although not necessarily, consists of one or more permanent magnets, and as disclosed herein, consists of two series of bar magnets 12 arranged side by side, the magnets of each series being preferably superposed one upon another in vertically stacked relation. The ends of like polarity of all the magnets, of the unit magnetic source thus afforded, are received within substantially U-shaped holding clips 13 and tightly fit or are caused to tightly fit between the upper and lower

surfaces of the U-shaped recess, so as to make not only a good magnetic connection between the magnets and clips but also an adequate mechanical connection to hold the magnets in place.

The magnetic circuit from the source includes two cores 14, or pole pieces, which are arranged in spaced parallel relation. Following preferred practice, these cores are made up of soft iron laminations, one of which is shown at 15 in Fig. 6. A feature of novelty, however, consists in the formation of the clips 13 as integral parts of the core laminations 15, the latter having upper extensions 16 for this purpose as shown in Fig. 6. The unit magnetic source is, however, wider than the cores and accordingly the holding clips 13, as afforded by the grouped extensions 16, should be broadened out and made coextensive in width with the source. This result is effected by supplementary laminations 17, of the form shown in Fig. 7, a plurality of which are placed on each side of each core, as shown in Fig. 3. The clip forming extensions 16 and the laminations 17 have holes 18 to receive rivets 19, by which the laminations, forming the clips 13, are held firmly together and are also provided with holes 20 to receive screws 21, whereby the clips are secured to back 10, as best shown in Fig. 3. Preferably, a bar 22 of non-magnetic material bridges across and mechanically connects the two clips 13 at their lower portions and the screws 21 are applied through this bar, which is clamped against the front face of the clips 13. The latter, being clamped to back 10, adequately support the upper ends of cores 14 and the laminations 15 are provided with holes 24 to receive screws 25 which clamp the laminations of the core together and hold it to back 10. These screws 25 pass through a bar 26 of non-magnetic material, which bridges across and mechanically connects the front faces of the cores 14 at their lower ends, and through a spacing sleeve 27 inserted between the core and back.

The generating winding is preferably applied to each of the cores 14 and between the bars 22 and 26. Preferably, this winding comprises two coils 28 and 29 on each core, the former being a primary and the latter a secondary winding. The electrical connections of the coils of the two windings have not been shown, as they are well understood in the art and are not essential to an understanding of the invention. A full disclosure of one suitable way in which the coils may be connected and the electrical circuits, of which they form a part, is given in U. S. Letters Patent No. 1,307,342 granted June 24, 1919 to Phelps Brown. For the present purposes, it will suffice to state that the coils 29 are the main generating winding and the coils 28 are provided for a choking function in resisting and retarding the diminution of flux in cores 14 so long as the circuit in which they are included is closed. The opening and closing of such circuit is controlled by an interrupter mechanism, which includes fixed and movable breaker points 30 and 31 respectively. The former is mounted in a casing 32 secured in bar 26 and the latter is slidable in this casing and moved upwardly by a member 33 through the intermediary of a spring 34 and downwardly by the engagement of this member with abutments 35 on a rod 36, which is fixed to the movable breaker point and slides in member 33.

Cooperating with the lower ends of cores 14 is an armature 38, which is movable into and out of contact with, and serves to magnetically connect such ends, which form the poles of the magnetic source. When in contact with the poles, a magnetic circuit of very low reluctance is established through cores 14 from the magnetic source and, when moved away from this source, the reluctance of the circuit is very materially increased, thereby causing a change in flux through the generating winding and the production of a current therein. This armature is made up of laminations in the usual manner and the interrupter operating member 33 is fixed thereto. Since the abutment 35 is spaced below member 33, when armature 38 is in contact with its poles, the breaker points 30 and 31 will not be opened until the armature has moved some distance away from its poles and the choking function of the coils 28 is thus availed of to hold the flux in cores 14 until the armature has acquired considerable speed, at which time the breaker points open and a rapid rate of change of flux in cores 14 ensues to cause the production of a high voltage in coils 29.

The armature 38, according to this invention, is supported for swinging movement to and from its poles, and while this can be accomplished in various ways, it is preferred to accomplish it in the following manner. The back 10 is provided near its lower end with axially spaced and axially alined hubs 39, one on each side of the back, leaving a considerable space between them and behind the armature. Fixed in these hubs 39 are bearing bushings 40. These bushings extend beyond the inner ends of hubs 40 sufficiently to receive, and pivotally support on their exteriors, rocker arms 41 which are connected at their free ends in laterally spaced relation to armature 38 by screws 42, the latter also serving to clamp the member 33 to the armature.

The driving mechanism for moving the armature away from its poles will next be described. Such mechanism includes an oscillatable lever 44 which is pivoted at one end on a fulcrum 45 and is located at the

rear of the armature and substantially centrally thereof. Adjacent this lever is a driving arm 46 which is clamped to a driving shaft 47 by a screw 48 passing through the split hub thereof. The shaft 47 is rotatably mounted in one of the bushings 40 and extends beyond the latter outside the magneto casing to receive an operating lever 49. The arm 46 has fixed therein a crankpin 50 which projects laterally therefrom and is pivotally received in the lever 44 at a point intermediate the ends of the latter. Interposed between the lever 44 and the armature is a driving spring 51 which functions to drive the armature downwardly away from cores 14, after the magnetic hold between the latter and the armature has been broken—the force of spring 51 being in this instance insufficient to overpower the opposing force of magnetic attraction which is at its maximum value due to contact of the armature and poles. A suitable spring seat is formed on lever 44 to position spring 51 and a spring seat 52 is provided on the armature 38, which seat 52 has an upward extension 53 constituting an abutment and adapted to be engaged with an abutment on lever 44 after the latter has moved downwardly to a certain distance. To adjust for this distance and to vary it, as and when desired, the abutment on lever 44 takes the form of a set screw 54, which is threaded in the lever and held in adjusted position by a lock nut 55.

For restoring the armature and reseating it on its poles, or bringing it closely enough thereto to enable the magnetic attraction of the poles to effect the seating, suitable resilient means are provided having a tendency to lift the armature. As shown, such means comprise a double torsion spring 56, having one pair of its arms secured to the lever 44, as by the screw 57, and having its other pair of its arms bearing upwardly against the under face of armature 38.

For the purpose of conveniently varying the time at which the lever 44 will act to dislodge the armature by engagement of the abutments 53 and 54, means are provided for shifting the fulcrum 45 of lever 44 and thereby varying the throw of the latter or the location of the throw or both. To this end, the fulcrum 45 is fixed eccentrically to the end of a timing shaft 58 which is mounted in the other bushing 40 and extends outside the magneto casing to receive an operating lever 59 (Fig. 1). Adjacent lever 59 and fixed to the member 10 of the magnet casing is a quadrant plate 60 against one face of which a surface 61 of the lever engages. Slidably mounted in lever 59 is a spring pressed member 62 which has a wedge shaped end to bear against the other face of the quadrant 60 and thus bind the lever thereto and hold it in the various positions of adjustment which it may assume. By turning lever 59, the throw of lever 44 is varied by the movement of its fulcrum toward or away from the point of power application, being the crankpin 50. Also by moving lever 59, the location, in which the throw of lever 44 occurs, is varied, for the fulcrum not only has a component of movement toward and away from pin 50 along the center line of lever 49 but also a component of movement at right angles to such line, thereby moving abutment 54 toward or away from its cooperating abutment 53.

The magneto is operated by oscillating shaft 47 through a suitable arc of travel and this oscillation may be accomplished in any suitable way, even manually by swinging the lever 49. The shaft 47 may be automatically oscillated from an internal combustion engine in various ways which will readily occur to those skilled in the art. As an example of one of many suitable ways, reference is made to Fig. 5, wherein the magneto casing is shown as supported from the frame A of an engine through the intermediary of a bracket *b* and the free end of lever 49 is pivotally connected to an eccentric strap *s*, operated by an eccentric *e*, which has a suitable throw and is fixed to the engine cam shaft *c*.

Assuming that engine A is of the four cycle type, shaft 47 makes one complete oscillation for each cycle of operation of the engine and starts to move in a counter-clockwise direction (as viewed in Figs. 3 and 5) as the piston of the engine moves into position for the charge to be fired. Such movement of shaft 47 causes lever 44 to swing downwardly and the first result of such movement is to compress the driving spring 51 and place it under the proper stress for the armature driving function. In this particular case, the driving spring 51, even when fully stressed, has not sufficient force to dislodge the armature, which remains held to its poles by magnetic attraction until the abutments 53 and 54 engage, at which time the armature is pushed from its poles by a force acting through rigid and non-elastic means. On a very slight separation of the armature and poles, the opposing force due to magnetic attraction is very greatly diminished and continues to diminish with extreme rapidity as the armature moves still farther away. Consequently, the driving spring 51 very soon exerts a force superior to that due to magnetic attraction and the armature soon acquires considerable speed. When the desired speed is attained, the breaker points 30 and 31 are opened to release the flux in the magnetic circuit and cause the desired rapid change of flux for the generation of the ignition current. Thereafter, the lever 44 starts its return or upward travel and

spring 56 lifts the armature toward its poles, either in itself effecting the reseating of the armature or moving the latter sufficiently into the magnetic field to accomplish this purpose.

It is to be noted that on a downward movement of lever 44, such as causes the stressing of the drive spring 51, the opposing force of the restoring spring 56 is materially diminished and, on an upward movement of the lever, the restoring spring is tensioned while the lever moves back to prevent any considerable opposition by the driving spring to the armature lifting operation.

The time, when the ignition spark is produced, is controlled by the time at which the abutments 53 and 54 engage and by manipulation of lever 59, the spark may be retarded or advanced within a fairly wide range of limits as desired. It is also possible by movement of lever 59 to adjust the apparatus so that the abutments 53 and 54 will not engage so that, when desired, the magneto may be cut out of operation in a very simple manner without disturbing its driving connections with the engine.

The invention has been disclosed herein, in an embodiment at present preferred, for illustrative purposes, but the scope of the invention is defined by the appended claims rather than by the foregoing description.

What I claim is:

1. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, means for seating the armature on its poles, driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken, and an oscillatory lever movable relatively to the armature and operable periodically to break the magnetic hold on the armature.

2. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, means for seating the armature on its poles, driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken, an oscillatory lever movable relatively to the armature and operable periodically to break the magnetic hold on the armature, and means for varying the throw of said lever to vary the time at which the driving means is allowed to act.

3. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, means for seating the armature on its poles, driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken, and mechanism operable periodically to break the magnetic hold on the armature and allow the driving means to act, said mechanism comprising a driving arm having a fixed degree of oscillation about a fixed axis, a lever having a fulcrum and a pivotal driving connection with said arm, and means for moving the fulcrum toward or away from said pivotal connection to vary the throw of said lever.

4. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, resilient means for seating the armature on its poles, driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken, and an oscillatory lever operable periodically to break the magnetic hold on the armature and at the same time diminish the force exerted by said resilient means on the armature.

5. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, means for seating the armature on its poles, resilient driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken and an oscillatory lever movable relatively to the armature and operable on one stroke to first increase the force of said driving means on the armature and then to break the magnetic hold on the armature.

6. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, means for seating the armature on its poles, resilient driving means for moving the armature away from its poles after the magnetic hold on the latter has been broken, and an oscillatory lever movable relatively to the armature and operable on one stroke to break the magnetic hold on the armature and on the other stroke to diminish the tension of said driving means.

7. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, a frame, means pivotally supporting the armature therein for swinging movement to and from its poles, a lever mounted in said frame for oscillation toward and away from the armature, means for oscillating the lever, a driving spring interposed between the lever and the armature, and means interposed between the lever and armature to provide a rigid non-elastic connection therebetween after the lever has moved toward the armature a predetermined degree.

8. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, a frame, means pivotally supporting the armature therein for swinging movement to and from its poles, a lever mounted in said frame for oscillation toward and away from the armature, means for oscillating the lever, a spring interposed between the lever and the armature, and non-elastic means interposed be-

tween the lever and armature and adapted to be engaged with each on one stroke of said lever to permit the latter to move the armature away from its poles.

9. In a magneto, of the type wherein an armature moves into and out of engagement with magnetic poles, a frame, means pivotally supporting the armature therein for swinging movement to and from its poles, an oscillatable driving shaft mounted in one side of said frame, a timing shaft mounted in the other side of said frame in substantial alinement with the driving shaft and having an eccentric portion, a driving arm fixed to the driving shaft and carrying a crank pin, a lever pivotally connected intermediate its ends to the crank pin and fulcrumed on said eccentric portion at one end, the other end of said lever adapted when moved in one direction to cause the armature to leave its poles and when moved in the other direction to permit the armature to be reseated on its poles, and means for effecting the reseating of the armature.

10. In a magneto, having an armature movable into and out of contact with magnetic poles, operating mechanism therefor comprising, an oscillating drive shaft mounted adjacent and parallel with the armature, a lever pivoted at one end and oscillatable by said shaft, and resilient means interposed between the other end of said lever and the armature.

11. In a magneto, having an armature movable into and out of contact with magnetic poles, operating mechanism therefor comprising, an oscillating drive shaft mounted adjacent and parallel with the armature, a lever pivoted at one end and oscillatable by said shaft, resilient means interposed between the other end of said lever and the armature, and means for varying the throw of said lever.

12. In a magneto, having an armature movable into and out of contact with magnetic poles, operating mechanism therefor comprising, an oscillating drive shaft mounted adjacent and parallel with the armature, a driving arm on said shaft having a crank pin, a lever pivotally connected intermediate its ends to said crank pin, an adjustable fulcrum on which said lever is pivoted at one end, and resilient means interposed between the other end of said lever and the armature.

13. In a magneto, a frame, a source of magnetic flux and magnetic pole pieces therefor mounted on said frame, a generating winding provided on the pole pieces, an armature pivotally mounted on said frame and adapted to periodically swing into contact with and connect said pole pieces, a drive shaft supported by the frame and disposed on one side of the latter and between the frame and the armature in parallel relation with the latter, driving mechanism located between the armature and frame and operable from said shaft to move the armature, a timing shaft mounted in alinement with the drive shaft and disposed on the opposite side of the frame, and means operably connecting the timing shaft and said mechanism to control the time at which the latter is effective to move the armature.

14. In a magneto, a casing including a back and a cover therefor cooperating therewith to afford a substantially closed housing, a source of magnetic flux and magnetic poles therefor mounted on the inner face of said back, an armature to connect and disconnect said pole pieces, means rigidly connected to the armature and extending rearwardly to and pivoted on said back, a drive shaft mounted on the latter in the rear of the armature and extending through one wall of the casing, a timing shaft similarly mounted and in alinement with the driving shaft and extending through the opposite side of the casing, means associated with the timing shaft and located outside the casing for moving it to and holding it in various positions of regular adjustment, means on the drive shaft and located outside the casing for operating the latter, mechanism located between said shafts and inside the casing for operating the armature from the drive shaft, and means similarly located and operated from the timing shaft for varying the time of operation of said armature from said last named mechanism.

15. In a magneto, a frame, a source of magnetic flux and magnetic pole pieces therefor mounted on said frame, a generating winding provided on the pole pieces, an armature adapted to periodically connect said pole pieces, alined bearings provided on opposite sides of said frame and in back of said armature, a rocker arm fulcrumed on the exterior portion of each bearing, both of said arms being fixed to said armature, whereby the latter is supported for swinging movement, a drive shaft mounted in one bearing and a timing shaft mounted in the other bearing, both shafts projecting beyond both ends of their bearings and each having a part projecting outside the casing, mechanism located between the bearings and behind the armature for operating the latter from the drive shaft, and means similarly located and operated from the timing shaft for varying the time of operation of the armature by said mechanism.

In testimony whereof I have affixed my signature.

TERRENCE G. LOUIS.