R. C. LANPHIER.
INDUCTOR MAGNETO.
APPLICATION FILED OCT. 9, 1909.

1,027,550.

Patented May 28, 1912.

2 SHEETS—SHEET 1.

Fig. 2.

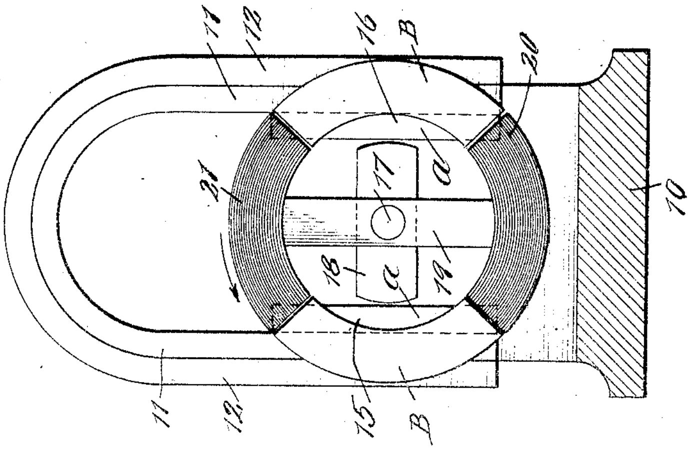
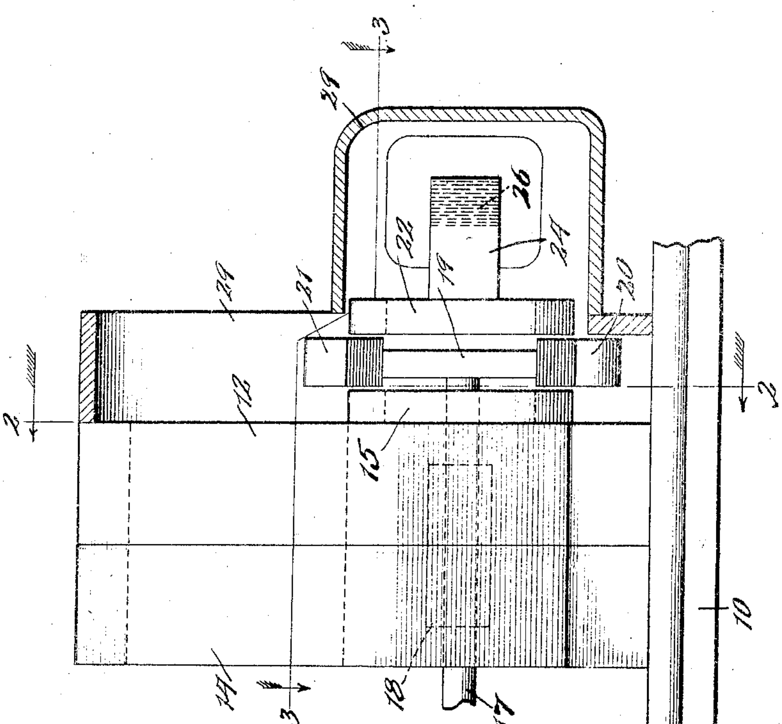


Fig. 1.



Witnesses:

[illegible]

[illegible]

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2 SHEETS—SHEET 2.

Fig. 3.

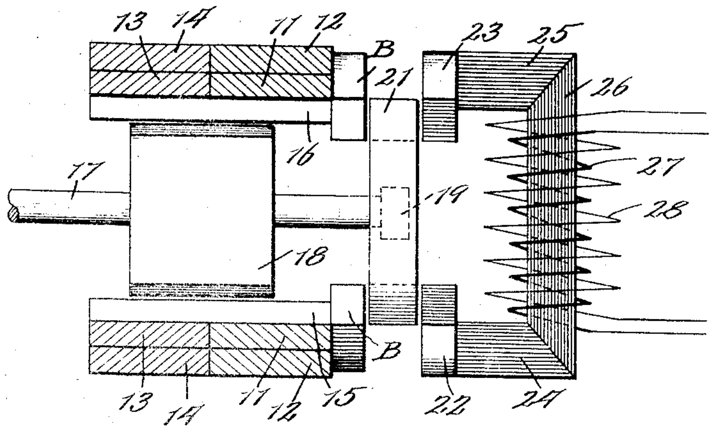


Fig. 4.

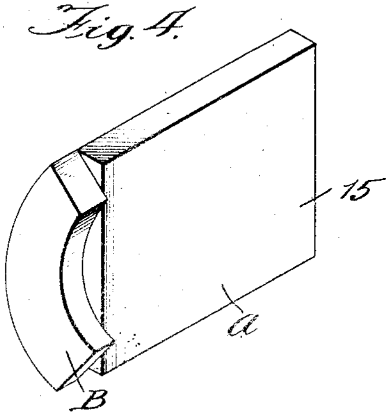
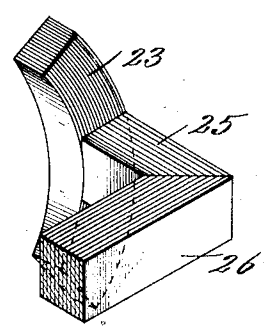


Fig. 5.



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UNITED STATES PATENT OFFICE.

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INDUCTOR-MAGNETO.

1,027,550. Specification of Letters Patent. Patented May 28, 1912.

Application filed October 9, 1909. Serial No. 521,947.

To all whom it may concern:

Be it known that I, ROBERT C. LANPHIER, a citizen of the United States, residing at Springfield, in the county of Sangamon, State of Illinois, have invented certain new and useful Improvements in Inductor-Magnetos, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to inductor magnetos of the type which have no moving wires or contacts, and its object is to provide a new and improved arrangement and operation by which the magnetic lines of force through the stationary core about which the coil is wound may be cut as suddenly as possible, producing a correspondingly sudden increase in potential in the coil and maximum sparking efficiency.

To this end, it is one of the objects of my invention to arrange the construction in such a way that the soft-iron parts of the path which the magnetic lines of force are caused to take, including the core upon which the primary and secondary coils of my improved high-tension machine are mounted, can be made in laminated form with the separate plates of such soft-iron parts all extending in the direction which the lines of force would naturally travel, thus avoiding eddy currents almost entirely and securing maximum efficiency. I accomplish this object by separating the stationary core about which the coils are wound by a wide air gap from the magnets and by rotating between the pole pieces of the magnet and the ends of the core about which the coils are wound laminated soft-iron parts of a size to readily pass between them and to practically close the air gap.

My arrangement of devices attains the further object of minimizing the demagnetizing effect upon the permanent magnets which I use, this being accomplished by reason of the fact that the magnetic lines of force have at all times a practically continuous soft-iron circuit from pole to pole, the lines of force passing either through the laminated soft-iron rotating parts directly from pole to pole or from pole to pole through said rotating parts and through the laminated soft-iron stationary core.

Another object of my invention is to provide an additional soft-iron path for the magnetic lines of force directly from pole to pole which shall be effective for a very short time just when the soft-iron rotating parts begin their passage alongside of the pole pieces. This expedient prevents the heavy end thrust to a very great extent which would otherwise be exerted upon the axle of the rotating parts at the commencement of the passage of such parts alongside of the pole pieces and thus prevents any appreciable tendency of the rotating parts to impinge upon the pole pieces.

It is the further object of my invention to improve in sundry details of construction magnetos of the type named.

I accomplish these objects by the means illustrated in the drawings and hereinafter specifically described.

That which I believe to be new will be set forth in the claims.

In the drawings:—Figure 1 is a side elevation, partly in section, of my improved magneto. Fig. 2 is a cross section on line 2—2 of Fig. 1. Fig. 3 is a cross section on line 3—3 of Fig. 1, with the inclosing casing omitted. Fig. 4 is a perspective view of one of the pole pieces of my improved magneto. Fig. 5 is an enlarged detail, being a perspective view of one of the arc-shaped end pieces of the stationary core about which the coils are wound.

Referring to the drawings:—10 indicates a base, upon which are secured in any suitable manner so as to coöperate to produce a magnetic field between the pole pieces hereinafter described the magnets 11, 12, 13 and 14. At their ends, the magnets have secured to them soft-iron pole pieces 15—16, each of which is made up of a plate A and an arc-shaped piece B, preferably formed integral with each other.

17 indicates a shaft, preferably formed of non-magnetic material, adapted to be mounted in any suitable bearings (not shown) and adapted to be driven in any appropriate manner.

18 indicates a plate, perferably formed of soft-iron, fixedly secured on the shaft 17, with its ends formed in arcs of a circle about the shaft 17 and of a length to extend from one pole piece to the other with a very slight air gap intervening at each end.

19 indicates a bar of non-magnetic material fixedly secured on the shaft 17, bearing

at its ends laminated soft-iron arc-shaped pieces 20—21. These parts 20—21 are of substantially the same shape as the parts B of the pole pieces 15—16, the four parts when in the position shown in the drawings giving the appearance of a complete ring, as shown in Fig. 2. As seen also in Figs. 1 and 3, the parts 20—21 are adapted to rotate opposite the parts B at a very short distance therefrom, such distance being as small as mechanical considerations will permit.

22—23 indicate arc-shaped laminated soft-iron pieces connected to laminated soft-iron bars 24—25, respectively, which are connected at their opposite ends to a laminated soft-iron bar 26. These parts 22—23—24—25—26 constitute a core upon which the primary coil 27 and the secondary coil 28 are mounted, said coils 27 and 28 being illustrated conventionally in Fig. 3. It will be understood that if so desired, the parts 22—23—24—25—26 may be made integral. The parts 22—23 also are of substantially the same shape as the parts B of the pole pieces 15—16, and are located directly opposite such parts B at practically the same distance beyond the rotating parts 20—21 as that between the parts B and such rotating parts.

29 indicates a casing formed of non-magnetic material which incloses more or less completely the coils and rotating parts.

With the rotating parts 20—21 in the position shown in Fig. 2, it will be understood that almost all of the magnetic lines of force will be passing from one pole piece to the other directly through the parts 20—21 and the part 18, practically none of them being diverted through the core about which the coils are wound, on account of the fact that, for a flow directly from pole to pole through the parts 20—21 or the part 18, only two small air gaps must be jumped, while, for a flow through the stationary core, two large air gaps would have to be jumped. When the rotating parts have been moved very slightly in advance, however, in the direction indicated by the arrow in Fig. 2, for example, the effectiveness of the parts 20—21 and the part 18 as a return path for the lines of magnetic force directly from one pole piece to the other is quite suddenly diminished and cut off. At the same time, the parts 20—21 are brought into position to bridge between the pole pieces and the parts 22—23 of the core, the small air gaps intervening between the parts 20—21 and the pole pieces on one side and the parts 22—23 on the other being so small as to afford very little resistance, a very effective magnetic circuit being thus completed through the laminated core and a flow of the magnetic lines of force through said core being accordingly set up. As rotation proceeds, the effectiveness of the parts 20—21 in bridging the large air gaps between the pole pieces 15—16 and the arc-shaped pieces 22—23 of the core gradually increases until the bar 19 is at right angles to the position shown in Fig. 2 and the parts 20—21 are standing directly between the pole pieces and the parts 22—23 of the core, the magnetism in the core also gradually building up. Inasmuch as the lines of force as rotation proceeds from the position just described are crowded toward the tips of the pole pieces that are in advance in the direction of rotation, probably the maximum number of lines of force pass through the core just before the parts 20—21 bridge directly between the pole pieces 15—16 in the position shown in the figures, and therefore just immediately in advance of the sudden breaking of the lines of force and their diversion through the parts 20—21 and the part 18 directly from pole to pole as above described. The reluctance of the soft-iron core to be demagnetized delays the abrupt change in magnetic conditions in the core until a slightly later moment, at which later time it will be understood the circuit of the primary coil is to be broken by any suitable circuit breaker (not shown), producing a maximum spark in the secondary circuit.

It will be understood that any suitable type of distributer may be used with my improved magneto, and that such a device would be included ordinarily in a commercial embodiment of my machine, but inasmuch as the distributer does not affect the operation of the magneto I have not shown or described it.

I have shown my magneto equipped with the bar 18 especially for the purpose, as described above, of taking away the end thrust from the axle of the rotating parts at the time that the parts 20—21 begin their passage alongside of the pole pieces, and this is the construction I prefer to use. In case the part 18 is employed, the lines of force travel directly from pole to pole through both the parts 20—21 and the part 18 when producing a sudden change in magnetic conditions in the stationary core as above described, but this same change in magnetic conditions in the core would result—either from the use of the bar 18 alone as a return path provided the parts 20—21 were not made long enough to bridge between the pole pieces, for example,—or from the use of the parts 20—21 as shown with the part 18 omitted entirely. I therefore do not limit myself to the use of the bar 18 or of the parts 20—21 of such length as to bridge directly between the pole pieces except as hereinafter claimed.

I have described my magneto as of the high-tension type, but it will be understood that I do not limit myself to this construction and that only a single coil may be mounted on the stationary core if desired.

By my invention I provide a construction by which the flux of magnetism through the core on which the coils are mounted does not change in direction but remains always in the same direction, varying only in intensity, such variation being practically from zero to the maximum at each half revolution of the rotating parts. This construction also makes possible the winding and finishing of the coil or coils independently of the core upon which they are to be mounted, being slid into place in completed condition on one section of the core, the parts of the core being thereafter united with magnetically tight joints.

By the term "horseshoe magnet" as used in the claims, I mean a magnet having its poles arranged opposite each other after the fashion of the ordinary horseshoe magnet but do not wish to have any other restrictions upon the term, either as to its structure or its energization.

What I claim as my invention and desire to secure by Letters Patent is—

1. In a magneto, the combination of a magnet, a stationary soft-iron core magnetically separated therefrom by wide air gaps, a coil mounted on said stationary core, and a rotary device comprising a soft-iron part adapted to be rotated between said magnet and said core and adapted during a portion of the time only to effectually bridge said air gaps, and comprising also a soft-iron part located directly between the poles of said magnet and adapted, during the time that said first-mentioned soft-iron part is not serving to bridge between said magnet and said core, to complete the magnetic circuit directly from pole to pole.

2. In a magneto, the combination of a magnet, a stationary soft-iron core magnetically separated therefrom by wide air gaps, a coil mounted on said stationary core, and a rotary device comprising an axle journaled midway between the poles of said magnet, a soft-iron part mounted on said axle and adapted to be rotated between the poles of said magnet and said core and adapted during a portion of the time only to effectually bridge said air gaps, and a soft-iron bar fixedly secured on said axle between the poles of said magnet and adapted to reach substantially from one pole to the other and adapted, during the time that said first-mentioned soft-iron part is not serving to bridge between said magnet and said core, to complete the magnetic circuit directly from pole to pole.

3. In a magneto, the combination of a magnet, soft-iron pole pieces therefor each comprising an arc-shaped part located alongside of one pole of said magnet, a stationary soft-iron core magnetically separated therefrom at its ends by wide air gaps, said core comprising arc-shaped end pieces corresponding to the shape of the arc-shaped parts of the pole pieces and located opposite the same, a coil mounted on said core, and a rotary device adapted to be rotated between said pole pieces and said core and adapted during a portion of each rotation to effectually bridge said air gaps.

4. In a magneto, the combination of a magnet, soft-iron pole pieces therefor each comprising an arc-shaped part located alongside of one pole of said magnet, a stationary soft-iron core magnetically separated therefrom at its ends by wide air gaps, said core comprising arc-shaped end pieces corresponding to the shape of the arc-shaped parts of the pole pieces and located opposite the same, a coil mounted on said core, and a rotary device comprising an axle, a bar of non-magnetic material fixedly secured thereon, and arc-shaped soft-iron parts corresponding in shape to that of the end pieces of said core and fixedly secured on the ends of said bar, the arc-shaped parts of said rotary device being adapted to effectually bridge said air gaps during a portion of each rotation of said rotary device.

5. In a magneto, the combination of a magnet, soft-iron pole pieces therefor each comprising an arc-shaped part located alongside of one of said magnet poles, a stationary soft-iron core magnetically separated therefrom at its ends by wide air gaps, said core comprising laminated soft-iron arc-shaped end pieces corresponding in shape to that of the arc-shaped parts of the pole pieces and located opposite the same, and laminated soft-iron bars connecting said end pieces, a coil mounted on said core, and a rotary device comprising an axle, a bar of non-magnetic material fixedly secured thereon, and laminated soft-iron arc-shaped parts corresponding in shape to that of the end pieces of said core fixedly secured on the ends of said bar, each of said arc-shaped parts of said rotary device being adapted to afford a path for the magnetic lines of force directly from one pole piece to the other of said magnet with only two small intervening air gaps at two phases of its rotation and being adapted during the remainder of each rotation to afford a path for the magnetic lines of force from said pole pieces to the ends of said core only, with four small intervening air gaps.

6. In a magneto, the combination of a horseshoe magnet, a return plate arranged opposite the poles of said magnet, a rotary armature positioned opposite the poles of said magnet and adapted during a portion only of each rotation to complete the magnetic circuit from one pole to the other through said return plate, and a rotary armature positioned directly between the

poles of said magnet and adapted to complete the magnetic circuit directly from pole to pole during the time when said first mentioned armature is not completing the circuit through said return plate.

7. In a magneto, the combination of a horseshoe magnet, a return plate arranged opposite the poles of said magnet, a rotary armature positioned opposite the poles of said magnet and adapted during a portion only of each rotation to complete the magnetic circuit from one pole to the other through said return plate, and a rotary armature positioned directly between the poles of said magnet and adapted to complete the magnetic circuit directly from pole to pole in each instance before said first-mentioned armature passes out of the return path through said return plate.

8. In a magneto, the combination of a horseshoe magnet, a return plate arranged opposite the poles of said magnet, a rotary armature positioned opposite the poles of said magnet and adapted during a portion only of each rotation to complete the magnetic circuit from one pole to the other through said return plate, and a rotary armature positioned directly between the poles of said magnet and adapted to complete the magnetic circuit directly from pole to pole in each instance before said first-mentioned armature passes out of the return path through said return plate and adapted to continue to so serve until the first-mentioned armature again completes the circuit through said return plate.

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