H. RUTHARDT.

MAGNET.

APPLICATION FILED APR. 3, 1908.

925,951. **Patented June 22, 1909.**

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Fig. 1.

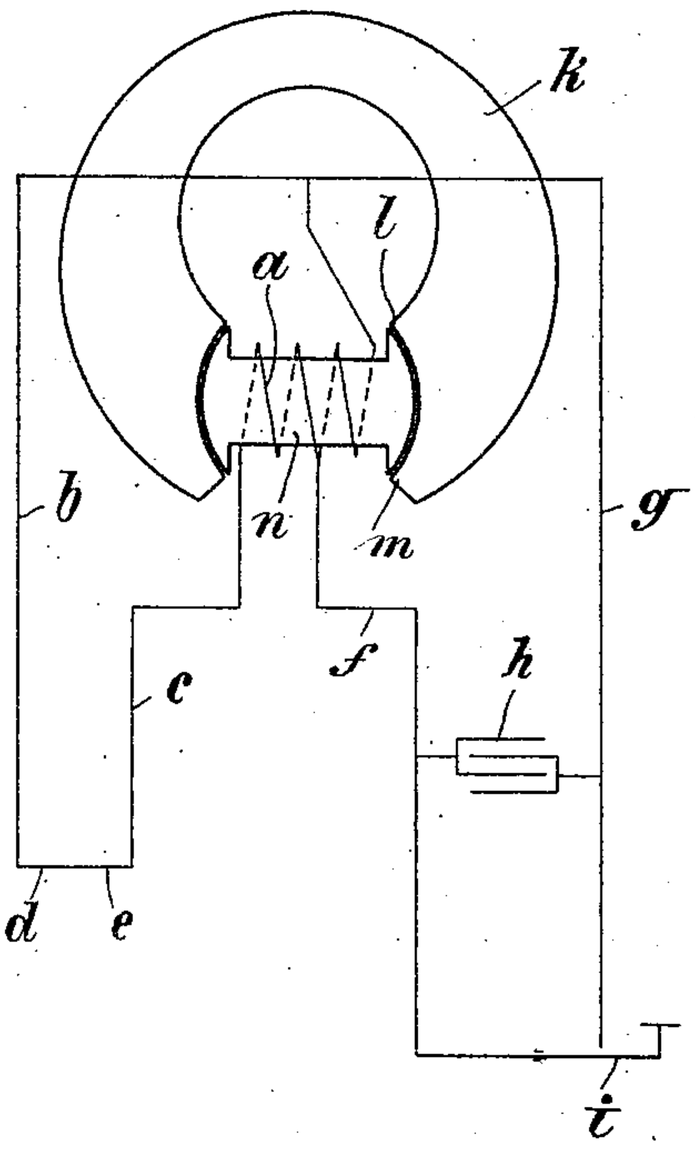
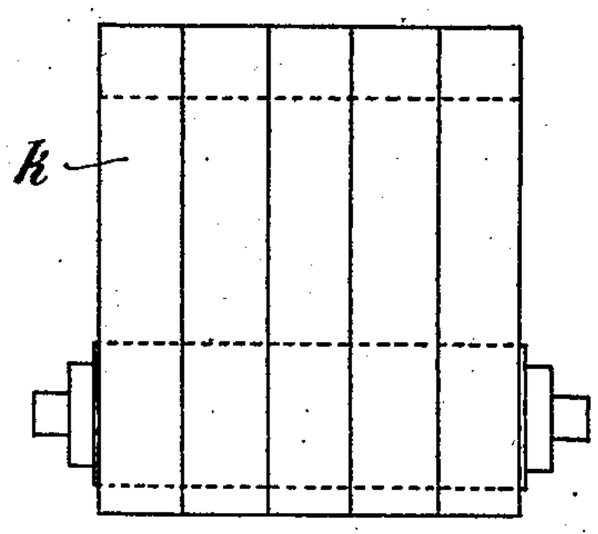


Fig. 2.



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UNITED STATES PATENT OFFICE.

HERMANN RUTHARDT, OF STUTTGART, GERMANY.

MAGNET.

No. 925,951. Specification of Letters Patent. Patented June 22, 1909.

Application filed April 3, 1908. Serial No. 425,025.

To all whom it may concern:

Be it known that I, HERMANN RUTHARDT, a subject of the German Emperor, residing at Stuttgart, in the German Empire, have invented a new and useful Improvement in Magnets, of which the following is a specification.

The invention relates to a field magnet for magnetic inductors, and more particularly adapted for magneto-electric igniters for internal combustion motors, though it can also be used for telephone calls and the like. In the case of magneto electric igniters it is highly important that minimum weight should be combined with a sufficiently powerful magnetic field, and furthermore that the electromotive force or the current flowing through the short-circuited winding should be as powerful as possible, because the tension of auto-induction is thereby increased, and with it the certainty of the sparking. Another point to be borne in mind is that the induced electromotive force in the armature coil must be strong and continue for a sufficient time after the bridging of the spark gap. These requirements are fulfilled in the present invention by the special form of the field magnets, this at the same time affording the additional advantage that the laminæ composing the field magnets are easily made and can be accurately worked, without difficulty in such a manner as to secure a further increase in magnetic power by reducing the air space between the magnet and armature.

The field magnets in use in an igniter are shown in the accompanying drawings, in which:—

Figure 1 is a front elevation and Fig. 2 a side elevation of the igniter, both of them diagrammatical.

The ends of the armature winding *a* are connected with the sparking plugs *d e* by means of the conductors *b*, *c*, and a portion of the armature winding *a* is connected through the conductors *f g* with a condenser *h* and a contact breaker *i*. By the rotation of the armature an induction current is excited in the short-circuited part of the armature winding, and when this current is interrupted by the contact breaker *i*, a current is produced, by auto-induction, in the whole of the armature winding, of such high tension that a spark passes between the ends of the sparking plug *d e*, and ignites the gaseous mixture. In the circuit thus completed by this spark gap, the rotation of the armature in the magnetic field immediately excites an induction current supporting the ignition, which current unites with the discharge current of the condenser, which, as is well known, lessens the sparking at the contact breaker.

The essential feature of the invention consists in the laminæ composing the field magnets being made in the shape of disks *k* which may be rounded or polyangular on the outside but are cut out in a circular or nearly circular form inside, a circular gap for the armature *n* being then cut out of the resulting ring. This method of manufacture in addition to reduced cost in comparison with the production of magnets by bending steel plates, presents the advantage that the precise shape desired is imparted to the magnet disks, and that distortion of the disks during the hardening of the steel is almost impossible, on the one hand because the homogeneity of the steel is completely retained during the previous working, and in the other because a bridge can be left between the ends of the magnet, which bridge is not broken down until after the hardening process. This greatly facilitates the subsequent grinding, and the free air space between the magnet and the armature can be greatly lessened. At the same time the dispersion between the limbs of the magnet is also lessened because owing to the circular, or nearly circular shape of the internal gap, the path for the lines of dispersion is considerably longer than in the case of the horse shoe form of magnet.

The dispersion is particularly small when the limbs of the magnet increase in width at the points nearest to the armature. The most favorable shape for this purpose is that shown in Fig. 1 in which the outer and inner contours of the magnet take the form of mutually eccentric circles, and the circular gap for the armature is provided at the wider part of the resulting ring. In this form of magnet the chief dispersion is chiefly confined to the thin portion vertically above the armature, and is very slight even there. On the other hand dispersion is almost entirely obviated at the entry of the lines of force into the armature where they exert an inductive action, because the lines of force are distributed uniformly over the armature, in consequence of the gradual broadening of the ends of the magnet, and

the change of direction of the lines of force proceeds gradually. At the same time the shape of the magnet limb enables the flow of the lines of force to follow the rotating armature without restriction from the one corner *l* of the pole to the other corner *m*, so that on passing the corner *l* a sudden change can take place in the number of the lines of force, and consequently a powerful induction effect occurs in the armature winding.

What I claim is:—

1. As an article of manufacture a disk or plate adapted to form an element of a field magnet, said disk having a substantially circular inner periphery and having a circular armature gap of a less curvature than said inner periphery, but of sufficient diameter to cut both the inner and outer peripheries of the disk, the distance between said inner and outer peripheries gradually increasing toward said gap on each side of the same.

2. As an article of manufacture a substantially C-shaped disk or plate adapted to form an element of a field magnet, and having a circular armature gap in the field between its poles, said disk gradually increasing in width toward said gap on both sides of same from a part intermediate the aforesaid ends.

3. As an article of manufacture a disk or plate adapted to form an element of a field magnet, said disk having a substantially circular inner periphery and having a circular armature gap between its poles, the distance between the inner and outer peripheries of said disk gradually increasing toward said poles, from approximately the middle or neutral point in the length of the body of the disk or plate.

4. As an article of manufacture a disk or plate adapted to form an element of a field magnet, and having its outer periphery in the form of a broken circle and its inner periphery also in the form of a broken circle but eccentric to the outer periphery, the gap in both of said peripheries being at the part where the disk is broadest, said part being the part containing the poles.

5. As an article of manufacture, a disk adapted to form an element of a field magnet, and having its inner and outer peripheries substantially circular but eccentric to each other, so as to have one part of the disk broad relatively to the diametrically opposite part of same, said disk integrally comprising both poles and having said poles and an intervening armature gap located in said broad part.

6. A field magnet comprising a plurality of disks each of which contains both poles and has substantially circular but mutually eccentric inner and outer peripheries and an armature gap extending across from one periphery to the other at the part where they are farthest apart.

7. In a magnetic inductor the combination of a field magnet comprising a plurality of disks each of which has substantially circular but mutually eccentric inner and outer peripheries, the magnet-body or assemblage of disks as a whole being of a shape the outer and inner peripheries of which are substantially circular but mutually eccentric and having a gap which forms substantially a third circle separate from both circular peripheries and extends across from one periphery of said magnet body or assemblage of disks to the other periphery thereof at the part where said last named peripheries are farthest apart, and an armature in said gap.

8. As an article of manufacture a field magnet comprising a plurality of disks each of which contains both poles and has an outer periphery in the form of a broken circle and an inner periphery also in the form of a broken circle, but eccentric to the outer periphery, the gap in both of said peripheries being at the part where the disk is broadest such part being the part where the poles are located.

9. As an article of manufacture a field magnet comprising a plurality of disks each of which has substantially circular but mutually eccentric inner and outer peripheries and is broad at one part relatively to the diametrically opposite part of the same, said broad part containing both the poles and being provided with an armature gap.

10. A laminated magnet having an outer periphery in the form of a broken circle and an inner periphery also in the form of a broken circle but eccentric to the outer periphery, and having both the poles integral and located between the aforesaid broken circles and on opposite sides of the gaps therein, said gaps being at the part where the magnet is of greatest radial thickness.

11. In a magnetic inductor the combination of a field magnet having its outer and inner peripheries substantially in the form of circles eccentric to each other and having a gap extending across from one periphery to the other at the part where they are farthest apart, and an armature in said gap.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses this 20th day of March 1908.

HERMANN RUTHARDT.

Witnesses:
WILHELM RUTHARDT,
HUGO SCHUMP.