No. 758,236. PATENTED APR. 26, 1904.

H. W. CHAMBERLAIN.

ELECTROMAGNET.

APPLICATION FILED AUG. 27, 1903.

NO MODEL.

Fig. 1.

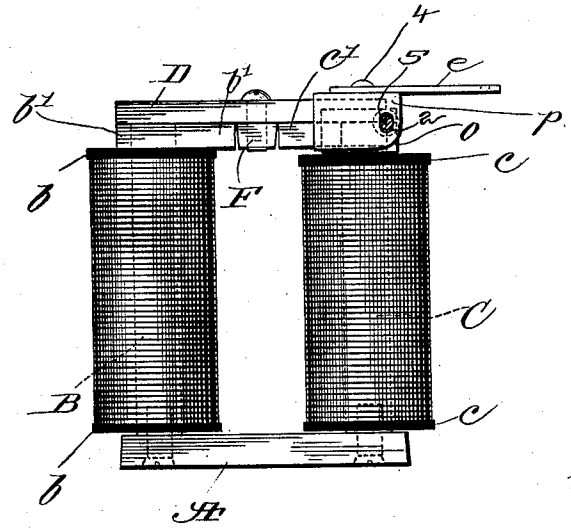


Fig. 4

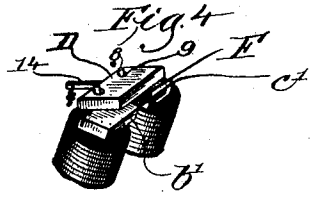


Fig. 3.

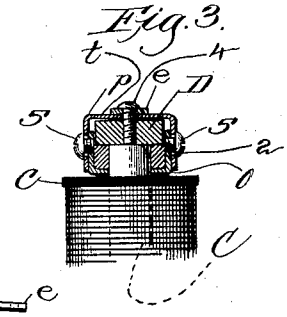


Fig. 2.

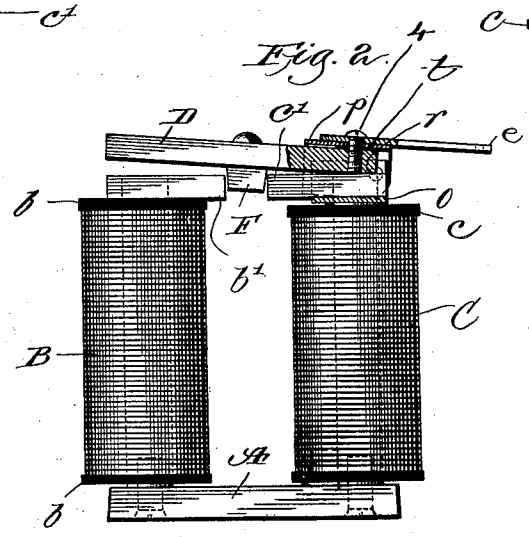
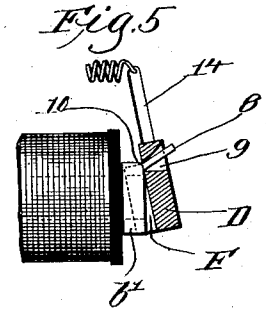


Fig. 5



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No. 758,236. Patented April 26, 1904.

UNITED STATES PATENT OFFICE.

HAROLD W. CHAMBERLAIN, OF BRUNSWICK, MAINE.

ELECTROMAGNET.

SPECIFICATION forming part of Letters Patent No. 758,236, dated April 26, 1904.

Application filed August 27, 1903. Serial No. 170,898. (No model.)

To all whom it may concern:

Be it known that I, HAROLD W. CHAMBERLAIN, a citizen of the United States, residing at Brunswick, county of Cumberland, State of Maine, have invented an Improvement in Electromagnets, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to improvements in electromagnets; and the object is to provide a magnet having great efficiency. The particular features wherein my invention resides are pointed out in the claims.

Figure 1 is a side elevation of an electromagnet and its armature, illustrating one form of my invention, the armature being shown closed upon the magnet. Fig. 2 is a view similar to Fig. 1, but showing the armature opened from the magnet, portions of the construction being broken away. Fig. 3 is an end view of the portion of the magnet and armature. Figs. 4 and 5 illustrate a different form of the invention.

The construction of the main portion of the electromagnet is illustrated as of a simple and usual form.

A is the yoke-piece, of soft iron, and B and C indicate the cores, which may be of soft iron in solid, hollow, or laminated form or may consist of a bundle of iron wires or have any usual construction. The cores are each wound in the usual manner with insulated copper wire between the heads *b b c c*.

It is to be understood that the dimensions, proportions, and form of the various parts of the magnet, its materials, winding, &c., may be modified in various ways suited to the purposes and power for which the magnet is designed without departing from my invention.

It has been found that by constructing the ends of the cores with extended pole-pieces, such as shown at *b' c'*, the efficiency of a two-limbed magnet is greatly increased, and in carrying out my invention I make use of such pole-pieces. I have herein shown two such pole-pieces of substantially equal extent, though my invention would not be departed from if instead of actually extending the ends of both cores to form pole-pieces the end of one core was maintained unchanged in size and the end of the opposite core extended.

I find that by providing the armature D (which is of any suitable construction) with an extension F, working in proximity to one or both pole-pieces, the efficiency of the magnet is still further increased, and also the range or the distance through which the effective pull of the magnet can be utilized may be augmented. In the illustrated forms of my invention this armature extension is arranged to enter between and in proxmity to both pole extensions *b' c'*, and means are provided whereby said armature extension shall always remain out of contact with the pole extensions at all positions of the armature.

The natural course sought by the magnetic flux is in a circle, and at a moderate density of magnetization most of the lines of force cluster at the inner edges of the core ends, between which there is the greatest leakage. With the pole-pieces in contact with this strongest magnetized part of the core end the path of the magnetic flux is across the space between said pole-pieces, and as the armature extension is arranged to enter said space it nearly completes the iron circuit. This very compact magnetic circuit I have found produces great power, while requiring but little current in the coils.

It has been found that the efficiency is much increased by fulcruming the armature in direct contact with one or both of the poles. In such a construction it is important and essential to economy that any magnetized parts shall not rub or drag against each other during the turning movement of the armature on its fulcrum. In my improved magnet I mount the armature to have contact with one or both of the pole-pieces in a line and to rock or fulcrum about said line of contact. Various ways of mounting and guiding the armature in its movement to secure this result may be employed, according to the location of the line of polar contact between the armature and magnet. In Figs. 1, 2, and 3 such line of con-

tact between the armature and pole-piece about which the armature fulcrums is the edge r of the armature.

As a means of guiding the armature in its movement I provide one of the pole-pieces with upturned cheek-pieces or ears o, as illustrated, and the armature with downturned cheek-pieces or ears p, one at least and preferably both of which should be of some non-magnetic metal, such as brass. Those shown on the armature have integral therewith a top side t, which is secured to said armature by means of a screw 4, said screw preferably extending through a slot in said member t to permit of adjustment. The cheeks overlap each other and are connected together by means of lugs or projections s, shown as screws, located in line with the line of contact r.

The cheeks fixed on the magnet have the guide-screws s fixed therein, while the unthreaded shanks of the said screws lie in and coöperate with enlarged holes, preferably shown as guide-slots 2, in the ears on the armature, said slots extending somewhat above the guide-screws and transversely to the armature. These means constitute the guides I illustrate as preferable and perform several important functions, viz:

First. The guide-slots in the armature-ears, extending above the guide-screws as they do, always prevent the latter from acting as the fulcrum, and thus let the armature down on the magnet, whereby it is always insured that the line of contact between magnet and armature shall be the fulcrum on which the latter bears when energized during its entire movement.

Second. My means of guiding prevents the armature extension from striking against the pole, for which it has a strong attraction, endwise. Enlarged holes may be used instead of slots; but such construction would require a wider gap between the armature extension and pole-pieces, thereby diminishing the magnetization and efficiency.

Third. The placing of the guide-screws concentrically with the fulcrum-line between the armature and magnet, which is rendered possible by the overlapping of the ears, prevents unsteady action and avoids scraping or rubbing, which is found to be so pronounced and wasteful of economy, especially between magnetized parts.

In the form of my invention above described the armature is fulcrumed at one end on one of the cores or pole-pieces of the magnet; but by means of a similar construction with obvious modifications the armature could be fulcrumed on both cores or pole-shoes of the magnet.

A simple and inexpensive form of my invention in which the armature is fulcrumed on both poles is illustrated in Figs. 4 and 5. The cores are provided with the pole-pieces b' c', as above described, and the armature D is hung on pins or projections 8, extending from the said pole-pieces. The apertures 9 in said armature through which the pins project are counterbored to permit a free swinging movement of the armature. In this form of the invention the line of contact between the armature and magnet extends longitudinally of said armature instead of transversely thereof. I have shown the upper edge of said pieces rounded, as at 10, in such a way that the armature will have the necessary rocking contact with pole-pieces. The pieces 8 serve to hold the armature properly positioned, so that the armature extension F will play properly between the pole-pieces without contacting with either, and pins and the rounded edge 10 furnish the means for guiding the armature and permitting it to rock freely in direct polar contact with the magnet without any rubbing or dragging of one part over the other.

Various other ways of securing the objects of my invention may be employed without departing from the invention expressed in the appended claims. It is also evident that the invention may be applied to magnets of different styles and forms.

In Figs. 1 to 3 the armature has attached thereto at one end a projection e, to which a spring or other similar device may be connected for holding the armature open, and in Figs. 4 and 5 the armature has a similar projection 14 for a similar purpose.

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

1. A two-limbed electromagnet having an armature fulcrumed thereon in direct polar and magnetic contact therewith, and guiding means for the armature permitting it to be so fulcrumed during its entire movement, said magnet having one pole extending inward toward the other pole and situated under the inner side of the armature.

2. An electromagnet having one pole extending inward toward the other pole, in combination with an armature having a transverse extension adjusted to play in proximity to but out of contact with one of the poles, said armature being fulcrumed upon the magnet in direct polar and magnetic contact therewith, and guiding means for the armature operating to permit it to fulcrum on the magnet when energized and to maintain the armature extension in proper position during the entire movement of the armature.

3. An electromagnet having an armature fulcrumed thereon in direct polar and magnetic contact therewith, and a transverse extension-piece on the armature adjusted to play in proximity to but out of contact with one of the poles.

4. An electromagnet having one pole extended inward toward the other, an armature having a transverse extension-piece on its in-

ner side which is adapted to play between the poles, and armature-guiding means acting during the entire movement of the armature to maintain it in such position that the armature extension will move in proximity to but out of contact with one of the poles.

5. An electromagnet having one pole extending toward the other, an armature provided with an extension on its under side adapted to play between the poles, said armature being fulcrumed on the magnet in direct polar contact therewith, armature-guiding means acting to hold the armature extension in proper adjustment, while permitting said armature to fulcrum on the magnet.

6. An electromagnet having an armature in direct polar contact therewith on a line extending transversely of the armature, said armature being mounted to turn about said line as a fulcrum, in combination with guiding means for the armature, said means comprising two pairs of ears, one pair fixed with relation to the armature and the other fixed with relation to the magnet, lugs connecting said ears, one pair of ears being slotted to allow the armature to rest directly on the magnet.

7. An electromagnet, an armature having polar contact with the magnet on a line, said armature being mounted to turn on said line as a fulcrum, armature-guiding means comprising two pairs of ears, one pair fixed with relation to the armature and the other pair fixed with relation to the magnet, and screws or pins uniting said ears, one pair of ears being slotted to allow the armature to rest directly on the magnet.

8. An electromagnet having one pole extending inward to form a pole-piece, an armature with its inner side resting in direct polar contact with and fulcrumed upon the magnet, and armature-guiding means comprising two pairs of ears, one pair fixed with relation to the armature and the other fixed with relation to the magnet, and screws or pins uniting said ears, one pair of ears being slotted to allow the armature to rest directly upon the magnet.

9. In an electromagnet, an armature with its inner side resting in direct polar contact with and fulcrumed upon the magnet, armature-guiding means comprising two pairs of ears fixed with relation to the magnet and armature respectively, one pair of ears being slotted transversely to the armature and the other pair having lugs extending through the slots, whereby the armature is held in adjustment but allowed to freely fulcrum on the magnet.

10. An electromagnet having one pole extending inward to form a pole-piece, an armature having its under side fulcrumed directly upon the magnet, an extension on the inner side of the armature, and guides to hold the armature in adjustment during its movement, whereby the extension is maintained in proximity to but out of contact with one of the poles, said guides comprising two pairs of ears fixed with relation to the magnet and armature respectively, one pair of ears being slotted transversely to the armature and the other pair having lugs passing through said slots.

11. An electromagnet having an armature fulcrumed in direct polar contact therewith, combined with armature-guiding means comprising two pairs of ears, one pair fixed with relation to the armature and the other with relation to the magnet, one pair having lugs situated concentrically with the fulcrum-line between the armature and magnet, and the other pair having slots extending transversely to the armature, and with which said lugs cooperate, whereby the armature is maintained in continuous non-rubbing contact with the magnet.

12. An electromagnet having an inwardly-extending pole, an armature fulcrumed upon the magnet in direct polar contact therewith, and guides to hold the armature in adjustment during its movement, said guides comprising two connecting parts, a screw adjustably securing one of said parts to the armature, said part having a pair of ears extending downward overlapping the fulcrum-line, the other part being fixed to the magnet and having a pair of ears extending upward, parallel and adjacent to the other ears, two lugs set in one pair of ears concentrically with the fulcrum-line and entering slots in the other pair of ears, said slots extending somewhat above and below the same transversely to the armature, whereby the latter is held in adjustment, and permitted to fulcrum directly upon the magnet, during the entire movement of the armature.

13. An electromagnet having an armature fulcrumed thereon in direct polar contact therewith, and armature-guiding means comprising two pairs of ears, one pair fixed with relation to the armature and the other with relation to the magnet, and lugs carried by one pair of ears and received in holes in the other pair of ears larger than the lugs.

14. An electromagnet having an armature fulcrumed thereon in direct polar contact therewith, and a transverse extension-piece on the inner side of the armature and adjusted to play in proximity to but out of contact with one of the poles.

15. An electromagnet having an armature fulcrumed on one of its poles in direct magnetic contact therewith, and a transverse extension-piece on the inner side of the armature, said extension-piece being adjusted to play in proximity to, but out of contact with one of the poles.

16. A two-limbed electromagnet having an

armature fulcrumed on one of its poles in direct polar and magnetic contact therewith, and guiding means for the armature permitting it to be so fulcrumed during its entire movement, one of the poles of the magnet extending inward toward the other pole.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HAROLD W. CHAMBERLAIN.

Witnesses:
LOUIS C. SMITH,
JOHN C. EDWARDS.