FIELD MAGNETS.

THE field magnets of a dynamo electric machine, says the *Electrical Age*, constitute one of the two of its most essential parts. The other part is the armature.

The field magnets are constructed of several parts, namely, the magnet cores (of which there are usually two), the yoke piece, the pole pieces and the wire with which the magnets are wound.

The accompanying illustration shows these various parts and the manner of assembling them to make the field magnets complete.

There are many forms of dynamos in use, but the one illustrated in the diagram is in no essential respect different to all the others.

The function of the field magnets is to create and maintain a magnetic field in which the armature may revolve. As a rule, dynamos are so built that the field magnets are stationary while the armature revolves. Some machines are made, however, with stationary armature and revolving magnets. One part *must* move, this is manifest when we think for a moment that in order to create a difference of potential in the wire of the armature, or, in other words, generate a current, that wire must cut through the magnetic lines of force in the magnetic field. This implies motion.

The material used for the different parts of field magnets is the softest iron procurable, except in the case of the wire, which

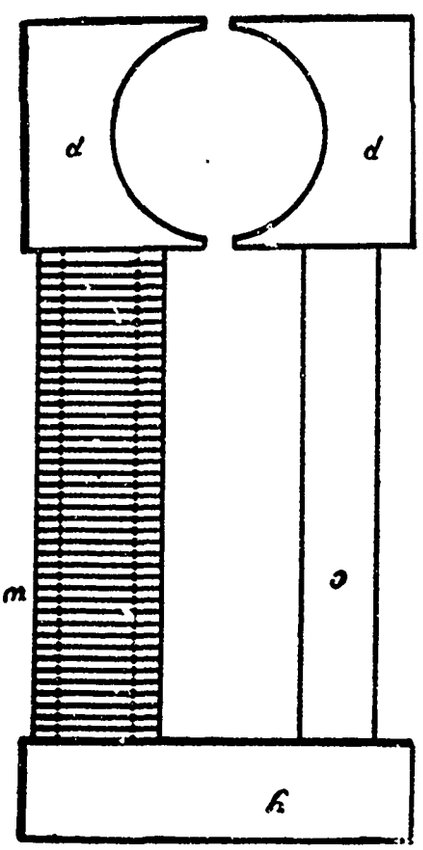

DIAGRAM OF FIELD MAGNETS
Y, Yoke. *C*, Magnet core. *W*, Magnet windings.
P, *P*, Pole pieces.

is of copper. Soft iron is used, because with it, it is possible to produce a much more powerful magnetic field than if any other quality were used. Iron is the essential metal to use always for magnets in all cases of electrical instruments on account of its high magnetic properties; that is to say, it is the best conductor of magnetism. Metals are divided into two classes with reference to their magnetic behavior, viz: magnetic and non-magnetic. Copper is classed as a non magnetic metal, while iron is the most magnetic, hence the importance of iron in the construction of magnets will be readily understood.

There are as many different forms of dynamos as there are makers—no two being alike. As the field magnets usually constitute the most prominent part of dynamos, the difference in form of machines relates wholly to the shape of the field magnets, although there are structural differences in different makes of armatures as well. These, however, are not readily noticeable to the observer.

The form of dynamo illustrated in our figure requires a yoke, the function of which is to effect continuity in the magnetic circuit. Without the yoke the magnetic field surrounding the armature would be infinitely weaker, and the machine would be practically valueless. All dynamos do not possess a yoke piece, indeed, some dynamo field magnets are constructed on the typical horseshoe form, and consequently require no yoke. The form shown in the figure is a modification of the horseshoe, instead of the curve it has corners.

The pole pieces are really enlargements of the core, so as to increase the surface of magnetic action, and are constructed with curves on their inner surfaces, so as to cover the surface of the armature as completely as possible, and yet have a break in the continuity of the magnetic circuit.

These pole pieces are really the "poles" of the electromagnet. We all know that a horseshoe (permanent) magnet is strongest at its poles; so in the case of a dynamo, the magnetism is strongest at the pole pieces, and as the lines flow from one pole to the other, according to the direction of the current flowing in the magnet wire, they must necessarily flow or act through the space between the pole pieces. As this place is filled with the magnetic lines of force, and as the wire on the armature must cut lines of force in order to effect a difference of potential, and consequently generate a current, the armature is placed in this space, or magnetic field, as it is usually called.

Concerning the magnetic field we will say more later on.

The core of the field magnets are generally made round. Some, however, are elliptical in shape. They are never made square or in any other form possessing points or corners, because such projections became "poles" themselves, and as it is essential to have all the magnetic influence concentrated at two points, namely, the pole pieces, the importance of adopting every means possible to convey the magnetic lines to these points is manifest; hence the round form is adopted for magnet cores. In the case of the yoke piece the magnetism is very weak, or practically *nil* at that part of the magnetic circuit, hence the existence of the corners makes no material difference in practical results.

The magnetism is strongest between the pole pieces and weakest at the yoke.

As to the winding of the magnets, of course, that involves many factors in its calculation, and as it is not within the scope of these articles to consider indefinite problems of this nature, we refer those of our readers who desire to go into the subject further to any one of the text-books which are now published, giving all such information. An excellent book of this class is "Principles of Dynamo-Electric Machines," by Carl Hering.

Copper wire, of course, is always used for magnet windings, It is covered with some insulating material in order to keep the windings from touching one another. The copper must be of the purest quality obtainable in order to keep the resistance down to a minimum. The size of the wire is determined by calculations based on the work that will be required of the machine.

Some dynamo field magnets are wound with two coils. Such machines are known as compound-wound dynamos.

It is important to have all joints between the parts of a field magnet very secure and reliable, so as to interpose no resistance in the magnetic circuit.

TRADE NOTES.

We have received from the Ball Electric Light Co., a tastefully printed book of testimonials from users of the Ball apparatus in Canada during the last ten years, certifying in flattering terms to its efficiency.

The Royal Electric Company, of Montreal, report the following sales during the month of July: Hamilton Electric Light and Power Company; Hamilton, Ont., one 50 light 2000 candle power arc dynamo and lamps, John Starr, Son & Co., Halifax, N. S., one 50 light 1200 candle power arc dynamo and lamps, W. S. Shaw, Huntsville, Ont., one 500 light alternating dynamo, The T. Eaton Company, Toronto, Ont., one 7½ horse power motor and 42 arc lamps. Hunt Bros., London, Ont., one 65 horse power generator and three tons of wire; The Wingham Electric Light Company, Wingham, Ont., one 500 light alternating dynamo with 300 lamps and fixtures; The Dominion Electric Company, Montreal, Que., one 7½ horse power motor, F. X. Charbonneau, Montreal, Que., one 1½ horse power motor, Messrs. Conlan & Levell, Montreal, Que., one 1½ horse power motor.

At the first annual meeting of the Ottawa Electric Street Railway a dividend of seven per cent. was declared.