

contacts with each other. If any even number of coils, say as many as can be placed in the circle, and each insulated from the other and their ends connected to commutator segments as described, and rotated at a constant required speed, the pulsations would be so rapid in the external circuit that the E. M. F. would be almost always at the maximum and the current would have a steady flow in the external circuit. It will be seen that each coil has its own commutator segments and that through them it comes in direct contact with the external circuit for an instant twice in each revolution, coiled conductors arranged and connected as above is known as open coil drum winding. A cylindrical iron drum can be used on which to wind or place the coils, the drum, or core, as it is called, is supported on a shaft extending from the core at both ends. On one end is also placed the commutator. The whole thing revolves with the shaft, which is held in position by two bearings, one at each end. The presence of the iron core has a tendency to greatly increase the number of lines of force in the magnetic field, which makes it possible to get a greater E. M. F. with the same speed. The coils should be insulated from the core. The commutator segments or bars should also be insulated from the shaft, in order that the current will flow in the external circuit when closed.

The core can also be made in ring form, very much like the rim of a fly-wheel, a cross section of which would be rectangular in shape. The ring would be supported by a spider fastened to the shaft. These cores should not be made of a solid piece of iron, because when rotated in the magnetic field it acts as a closed conductor, their sides cutting the lines of force at right angles, thus inducing an E. M. F. that cause what are called local or eddy currents to flow in the core itself. These eddy currents will cause the core to heat up uselessly, and also to consume a considerable amount of energy. To overcome this difficulty the core is built up with a large number of round, thin iron plates, or discs, each being insulated from the other by some non-conducting material, such as insulating japan, varnish, or very thin paper. The whole thing should be bolted together in such a manner that their flat surfaces are parallel to the direction of the lines of force, also to the direction of rotation. The building of the core in this manner does not diminish the magnetic permeability of the iron, but almost prevents eddy currents from flowing in the core. Another good point about the core is that it will attract nearly all stray lines of force from the surrounding air, because the lines of force will complete their circuit more readily through the core than through the air or some other non-magnetic substance.