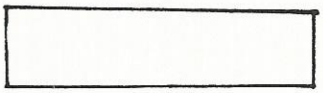
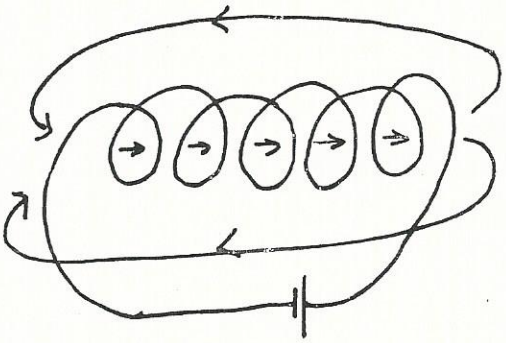
Electromagnets, Electric Motors, and Electric Generators

A coil of a conductor (e.g. a Cu wire, coiled) with a current flowing through it forms an "electric magnet" with a N-pole and an S-pole. It is called an electromagnet.

Large electromagnets often are made of two coils facing each other. See FIG C for pictures.





Given that the bar magnet and electromagnet above attract each other, label the polarities.

Electric Motors

They convert electric energy into rotational energy. e.g. a fan uses electricity to turn a blade

Motors operate on DC or AC.

See picture FIG D.

There is a coil placed in a magnetic field that produces rotational movement when an electric field is passed through it.

The mobile part of an electric motor is called the rotor.

The stationary part of an electric motor is called the stator.

Two ways to increase the power of a motor:

1. Increase the voltage of the power supply.
2. Add extra turns to the coil of the electromagnet.

Electric Generators - See Fig F

They convert rotary or rotational mechanical energy into electricity (electrical energy).

The mechanical rotation of a conductor coil in a magnetic field produces an electromotive force (emf) in the coil.

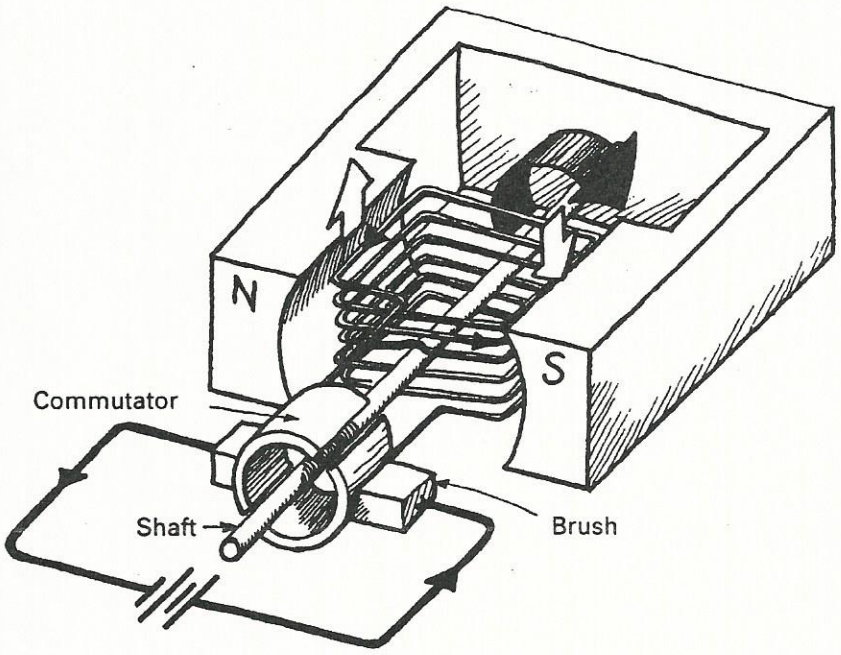
The mobile part of a generator is called the rotor.

The stationary part of a generator is called the stator.

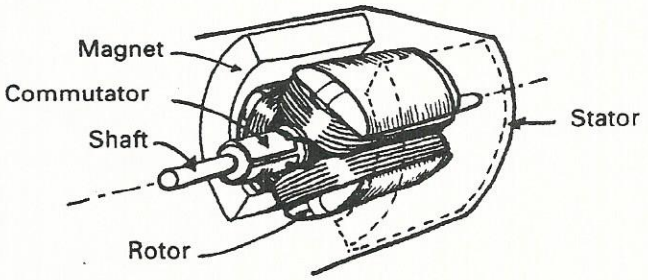
To increase the power of a generator: increase the number of turns of the electromagnet.

FIG D

Direct-current motor

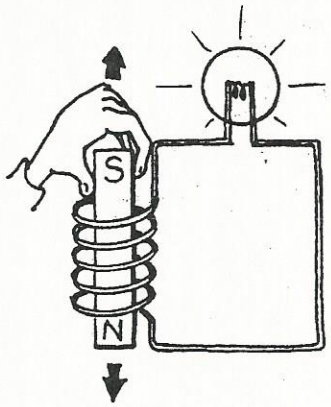


a) A coil with current flowing through it turns under the action of the magnetic field. The motor shaft is mechanically connected to the coil. Thus, the coil's rotation causes the motor shaft to turn.

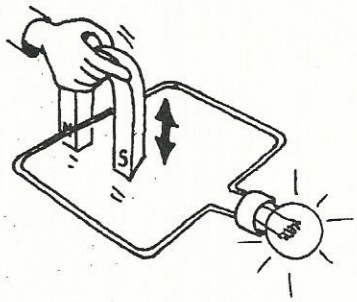


b) The rotor comprises several coils at different angles to ensure the regular rotation of the shaft. The stator is the fixed part of the motor.

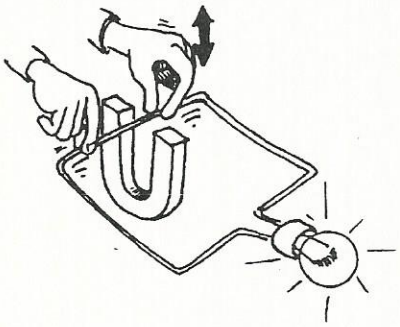
FIG E **Electromagnetic induction**

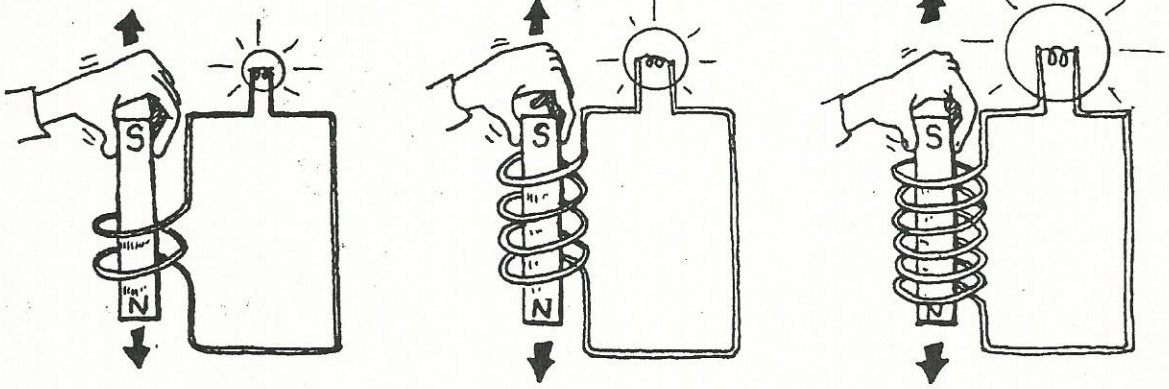


a) The movement of a magnet induces an emf in a coil.



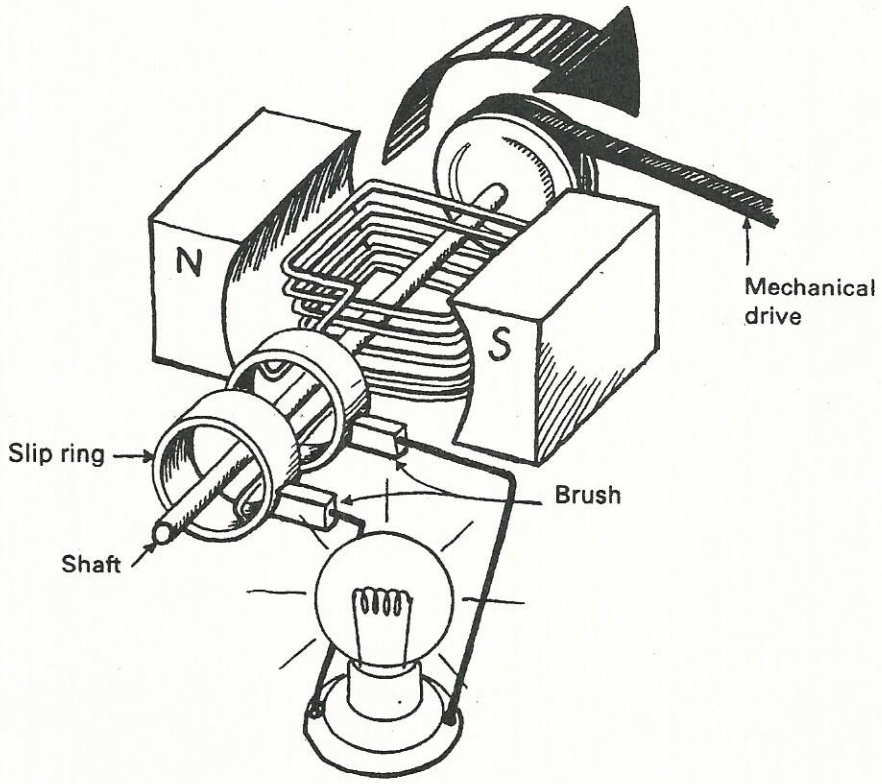
b) The relative motion of the magnet and the conductor induces a current in the circuit.





c) The induced emf is proportional to the number of turns in the coil.

FIG F **Alternating-current generator or alternator**



The mechanical rotation of the coil induces an AC voltage, which powers the bulb.