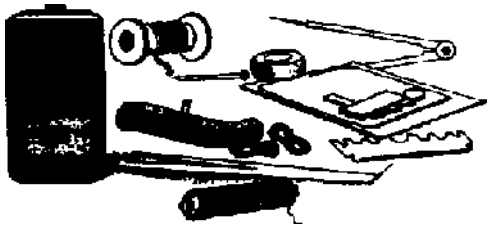
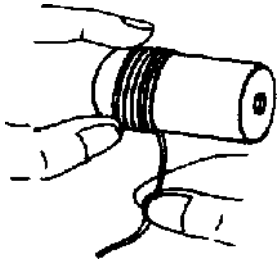
A REVOLUTIONARY MOTOR

A rotating electric motor is amazing fan. And this is, by far the simplest electric motor on earth!

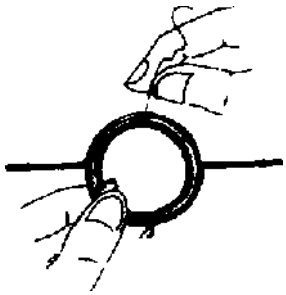
1. You will need a new, 1.5-volt normal torch battery, 1-metre of insulated Copper wire (about 20 gauge) used for motor rewinding, one magnet (one from an old radio speaker will be ideal), one old stove pin or metal file clip, two rubber bands 1-cm wide cut from an old bicycle rube, some thread and ordinary hand tools.



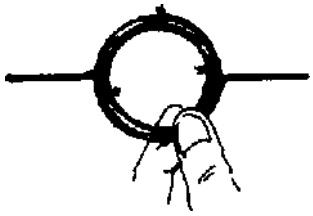


2. Take 1-metre of Copper wire (20 gauge). Straighten it by running it through a piece of cloth . Wind it tightly on a torch battery. The loops of the wire should be adjacent to one another. They should not overlap. The coil should have about 10 turns.

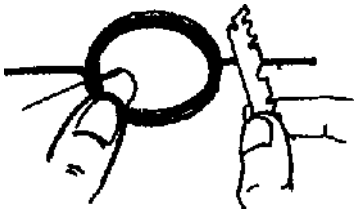
3. When the coil is removed from the battery it opens up like a spring.



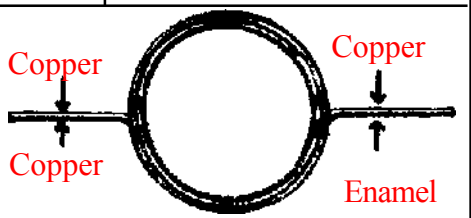
4. Tie the coil at several places with little bits of string. The string will keep the loops of the coil in place.



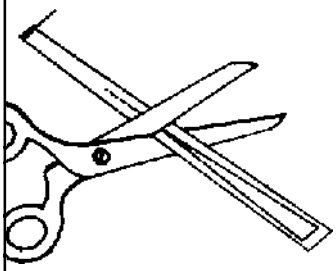
5. The two ends of the coil should jut diametrically outwards. The coil will rotate on these two ends. So, ensure symmetry and even distribution of the coil's weight.



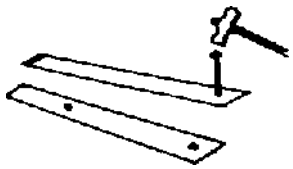
6. Now, scrape the enamel from three sides of the end leads using a blade. The enamel will remain only on the bottom of the end leads.



7. The copper / enamel sequence leads to make / break of the circuit. This BRUSH or COMMUTATOR is the heart of this simple motor. If all the enamel is removed from the end leads then the motor will not work. The coil is now ready.

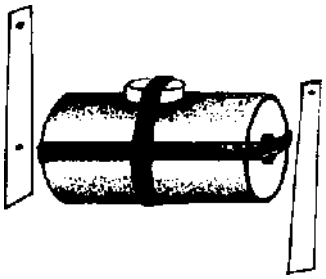


8. Cut an old stove pin into two or else take two metal file clips each 7-cm. long.

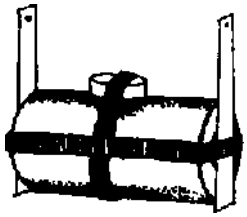


9. With a small nail, hammer a hole in each piece near one end. Hammer one more hole in one piece about 2.5-cm. from the other end.

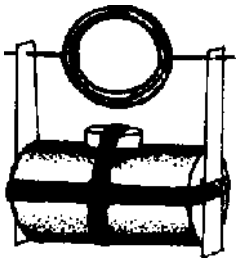
10. Salvage an old radio speaker magnet (standard laboratory magnets will do well) and place it on a new battery with the help of a cycle tube rubber band.



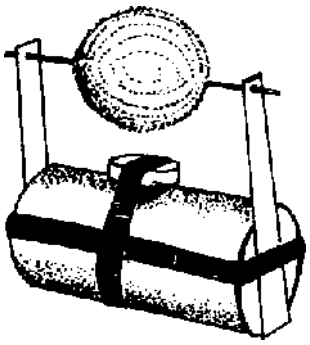
11. Stretch out another cycle tube rubber band (1-cm wide) along the length of the battery. Now insert the stove pins in the rubber band. The pin with two holes is placed next to the flat end of the battery. The second hole bites into the plane end of the battery and makes a good electrical contact.



12. The metal strips serve three purposes. They act as power leads, supplying current to the coil. They are also bearing supports for the coil. Finally, they also make a stand for the motor.



13. Now pull the metal strips a little apart and slip the motor coil in their holes.



14. Give the coil a gentle starting push and it will start rotating. However, if the push is in the wrong direction, then the coil will stop after a while, flip, and rotate in the right direction.

How does the motor work?

How does this D.C. motor work? When an electric current flows through a wire, it produces a magnetic field around it. Similarly, when current flows through the motor coil, then the coil becomes an electro-magnet with two poles - a North and a South pole.
According to the Law of Magnetism - like poles repel and unlike poles attract.
Following this law. the North pole of the electro-magnet is attracted to the South pole of the permanent magnet and is repulsed by its North pole. This mutual attraction - repulsion makes the motor coil turn. The coil will stop once its N and S poles align with the S and N poles of the permanent magnet. But just when this point reaches, something happens. Until now, the copper part of the coil ends were in contact with the metal strips. But now, the enamel part of the coil end comes in contact, and being an insulator, it switches off the current to the coil. The coil is no more a magnet, it becomes de-magnetised. Momentum propels the coil on until once again the copper on its leads touches the metal strips. Once again the coil becomes an electro-magnet. In this way the coil continues to revolve, round and round.

Experiments with the motor.

Several interesting experiments can be done with this simple electric motor. What happens if you reverse the permanent magnet? If the north and the south poles are interchanged then the direction of the motor also changes. What happens if another magnet is brought close by? If both magnets have opposite poles, then there is an increase in the magnetic field and a consequent spurt in the speed of the motor. The speed decreases, if the poles are similar.
You could experiment with different lengths and thickness of the copper wire. What happens if you take 2 metres of wire or half a metre of wire? What happens if you take thick wire or thin wire? What happens if there are fewer or greater number of turns in the motor coil? You can also make coils with different cross-sections like oval, square, rectangular etc. What happens if you add another battery? With these experiments you can learn a great deal about electric motors.