PHYSICS

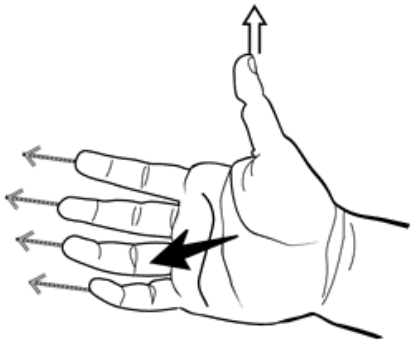
ELECTROMAGNETISM - PART II

The Motor Principle

We have seen that when a current moves through a conductor a magnetic field is established. This magnetic field can be influenced my other surrounding magnetic fields. The motor principal uses this interaction to create motion using electricity.

RIGHT-HAND RULE #3

Using your ***RIGHT HAND*** point your thumb in the direction of the curre and your fingers in the direction of the magnetic field (From North to South) Your palm will indicate the direction of the ***FORCE***.



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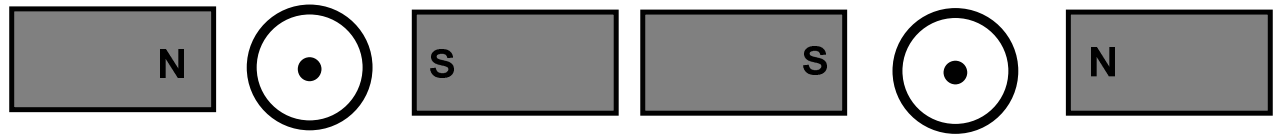
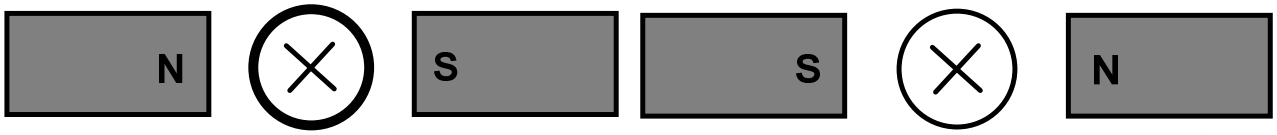
A Simple Motor

What happens when you place a live wire in between two bar magnets??





Recall:

Direct Current (***DC***) -

Alternating Current (AC) -

Thus, a simple motor can be made by using ***DC*** and alternating the magnets, or, keeping the magnets stationary and using ***AC***.

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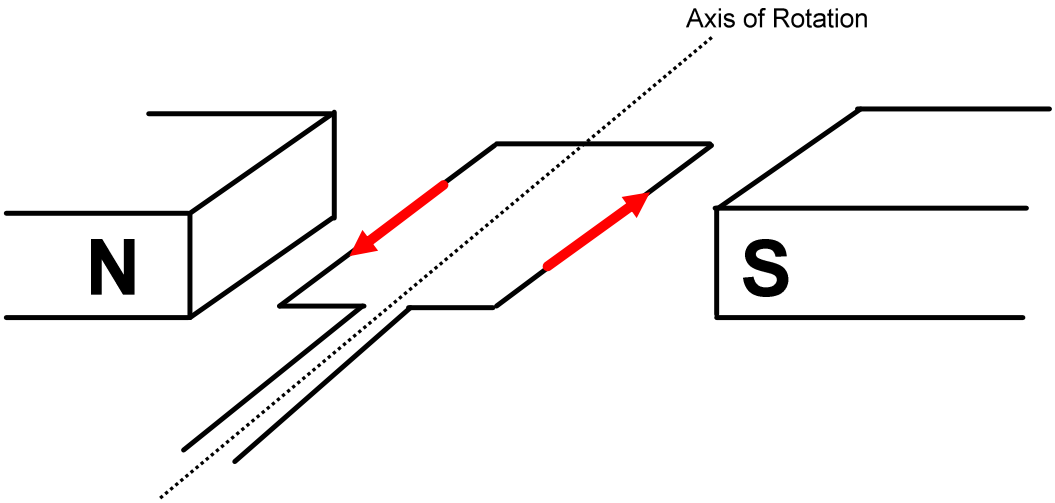
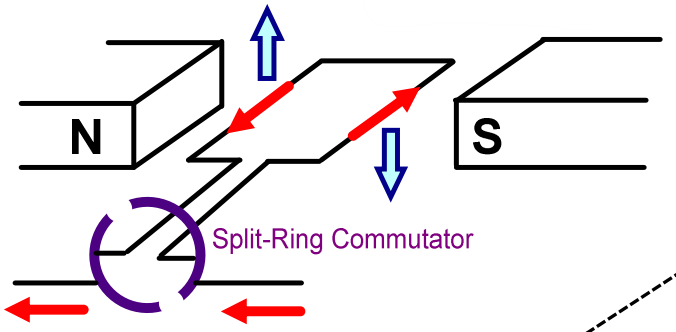
A Simple Motor (continued)

To add to the motor, and make it more effective, one needs to coil the wire:



When the coil gets vertical, one needs to switch the direction of the current to keep the motor rotating. This is the job of the ***SPLIT RING COMMUTATOR***.



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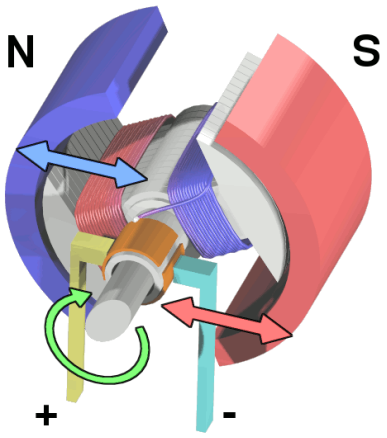
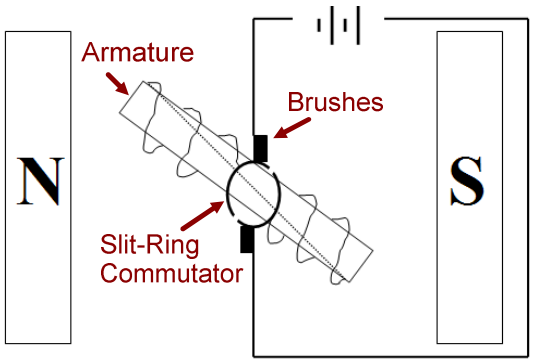
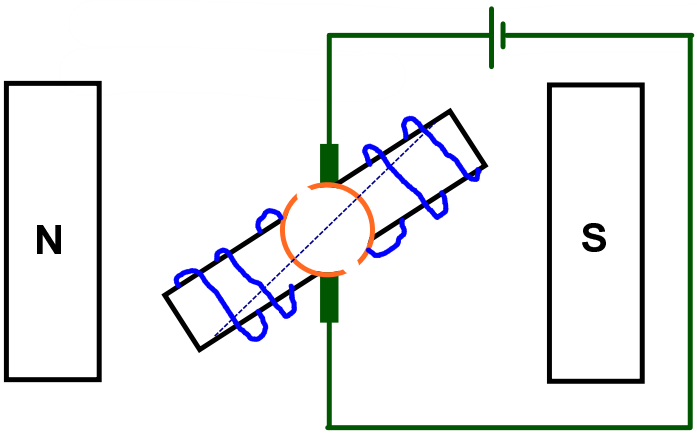
ELECTROMAGNETISM - PART II

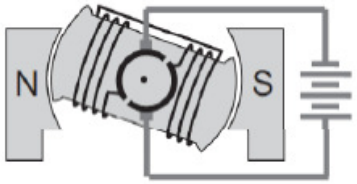
A Complex Motor

A more complex motor uses a coil of wires to create its magnetic field. A ***DC*** circuit is used to flow electricity through the brushes and into the coils. What perpetuates the motion is the role of the Split-Ring Commutator.





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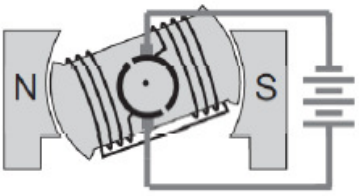
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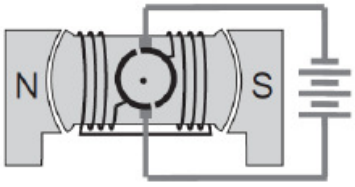
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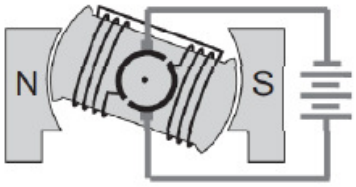
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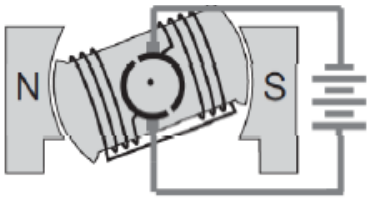
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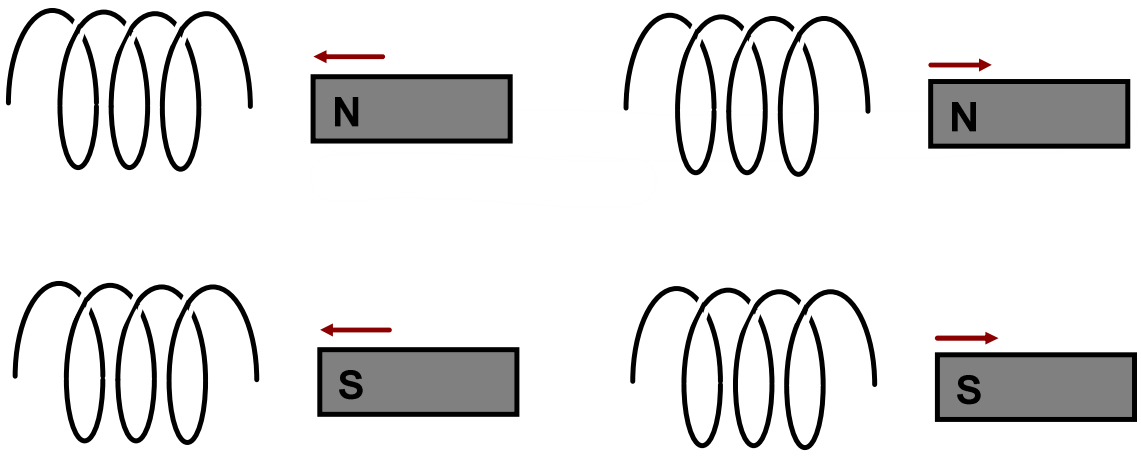
ELECTROMAGNETISM - PART II

Lenz's Law of Electromagnetic Induction

We have seen that electricity can create a magnetic field. It tuns out that the opposite is also true:

Lenz's Law:

When a conductor interacts with a magnetic field, there must be an induced current that opposes the interaction, because of the law of conservation of energy. An example of this is pushing a bar magnet into a coil of wires:



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Lenz's Law of Electromagnetic Induction

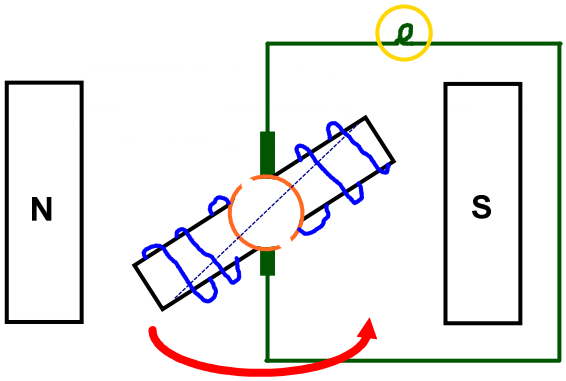
Factors Influencing the Magnitude of the Current

1.

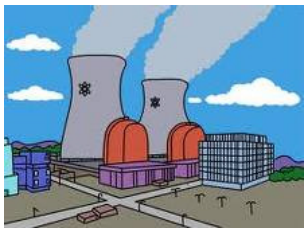
2.

3.

This is the basic principle behind the generation of electricity in power plants. Steam (or wind or a waterfall) is used to turn a turbine that is basically a giant armature with coils of wire around it. The turbine is spun in the presence of permanent magnets. Ultimately, it is the same process as the electric motor, but in reverse ...



By manually moving the armature, a magnetic pole is set up in the coils of the armature that adheres to Lenz's Law. This induces a current in the coils that moves out to a circuit as the armature keeps spinning.



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ELECTROMAGNETISM - PART II

Coal Power

Gas Power

Water Power

Nuclear Power