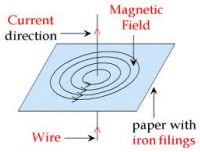
Chapter 37

The relationship between

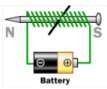
Apr 28-8:30 AM

An electrical current produces a magnetic field.



This is a "relativistic effect" if you were moving along with the current carriers you would not observe any magnetic field.

Electromagnet:



May 19-7:13 PM

Conversely: A moving (or changing)magnetic field can cause a current in a circuit.

More voltage with more turns, stronger magnet, or faster movement.
No movement = No voltage

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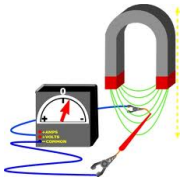

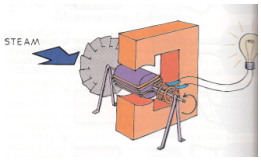

Apr 28-1:03 PM

Remember:

1. An alternating current causes an alternating magnetic field.
2. An alternating magnetic field causes an alternating voltage in a circuit.

Putting those facts together gives us...

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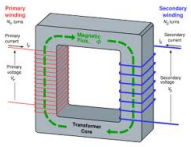
The Transformer:



The transformer changes AC at one voltage to AC at another voltage.

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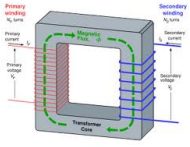
The Transformer:

Primary =>Input Secondary =>Output



$P = VI$

Power in = Power out

$V_{in} I_{in} = V_{out} I_{out}$

n= number of turns of wire

$N_p/N_s = V_p/V_s$

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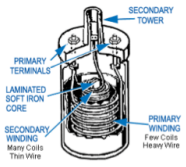
An induction coil in a car is a step-up transformer.
The "points" turn the DC on and off very quickly producing a varying current in the primary coil. High voltage comes out of the secondary. The high voltage is used to fire the spark plugs!



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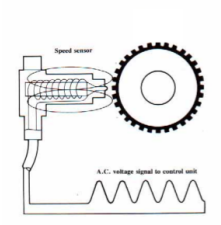

Electromagnetic induction can be used to monitor the speed of a moving gear.

The same principle was used in the Hammond electrical organ. Many spinning gears produced the various notes. This had the advantage of never needing tuning!

Apr 28-1:11 PM