Curie Effect
Magnetic Heat Engine
Kit

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How it Works

The heat engine uses a principle of magnetism discovered by Pierre Curie. He studied the effects of temperature on magnetism. Ferromagnetism covers the field of normal magnetism that people typically associate with magnets. All normal magnets and the material that are attracted to magnets are ferromagnetic materials. Pierre Curie discovered that ferromagnetic materials have a critical temperature at which the material loses their ferromagnetic behavior. This is known as its Curie Point.

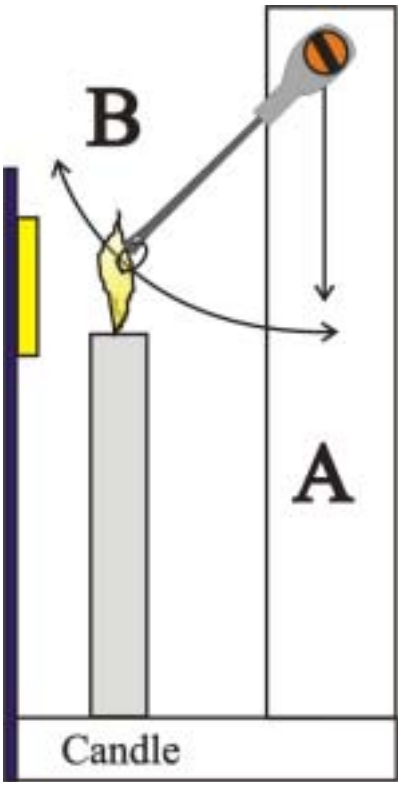


Figure 1

As an example, a piece of iron (Fe) at room temperature is strongly attracted to a magnet. Heat the iron to a temperature of 770 C, which is its Curie Point, it loses its ferromagnetism behavior and it is no longer be attracted to a magnet. If we let the iron cool, it regains its ferromagnetic behavior and is attracted to the magnet again.

We can use this property to construct a small swinger type heat engine. The heat engine uses a nickel alloy wire that has a low Curie Point, see drawing to right. When the wire is at room temperature it is attracted to the magnet, and swings close to the magnet. In this position, labeled B

in the drawing, it is heated by the flame of a small birthday cake candle. When the material temperature reaches its Curie Point, it loses it ferromagnetism and falls away from the magnet, to position A, and out of the candle flame. As the wire cools it regains its ferromagnetism and is attracted to the magnet again, where it swings back up toward the magnet to position B and back into the candle flame. This process repeats, swinging the nickel allow wire back and forth.

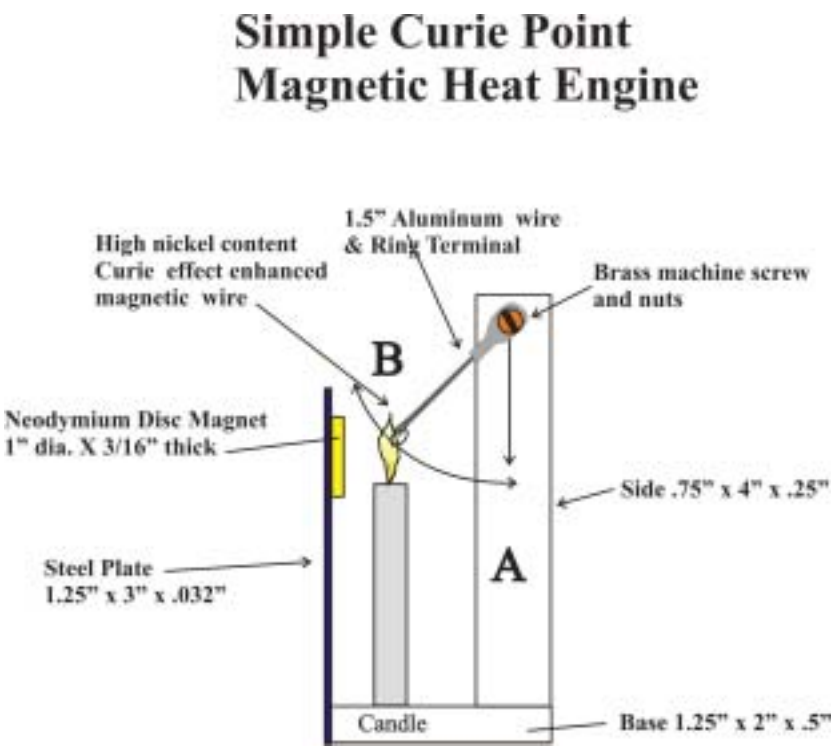
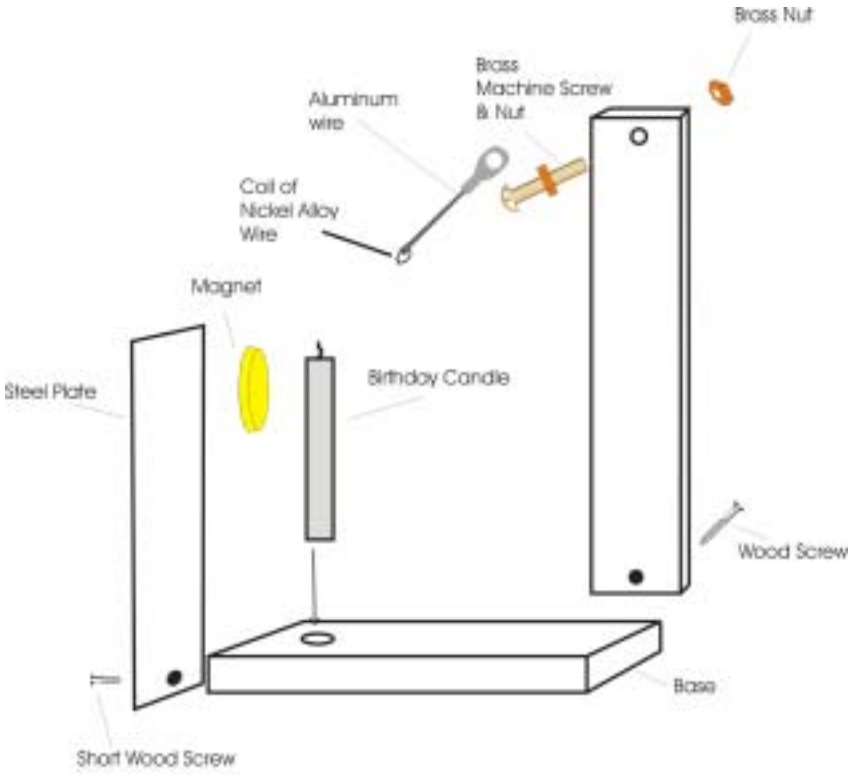


Figure 2

Figure 2 illustrates the components and alignment of the magnet in relationship to the candle wick (shown as flame) and 1.5″ aluminum wire and ring terminal.

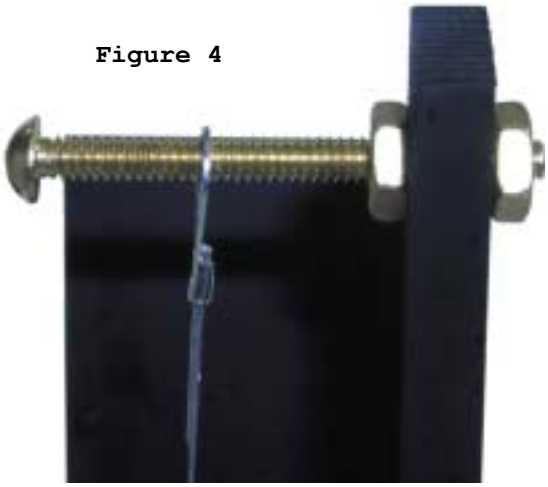


Assembly Diagram

Figure 3

Assembly the heat engine components as shown in figure 3 above. See details on pages 5 and 6 of this booklet.

Figure 4



Insert the ring terminal of the aluminum wire and curie point wire loop on to the brass machine screw. Secure the brass machine screw to the wood side using the two brass nuts as show in figure 4 . The two brass nuts should be tighten down firmly so that the brass machine screw can not wiggle.

Place the magnet on the back metal plate. Align it center to the candle. The aluminum wire should be position in line with the center of the candle.

Figure 5

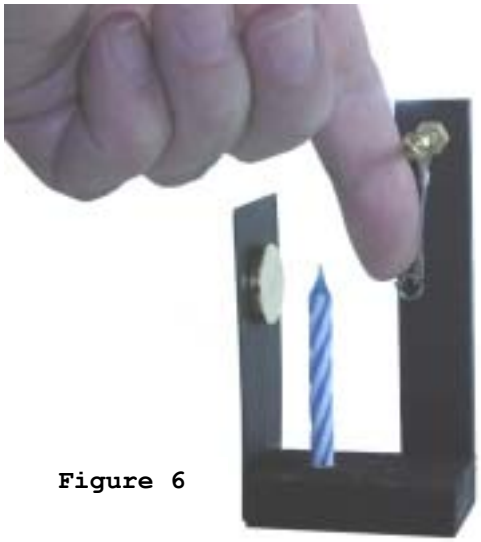


Figure 6

Testing

Test the heat engine before starting it. Place the birthday candle into the 1/4″ hole in the base. Make sure the candle is press down as far as it can go into the 1/4″ hole.

Push back on the Curie point wire until it is pointing straight down. When you remove your finger it should swing right back up toward the magnet.

Make sure the wire when it swings back up, is position above the candle.

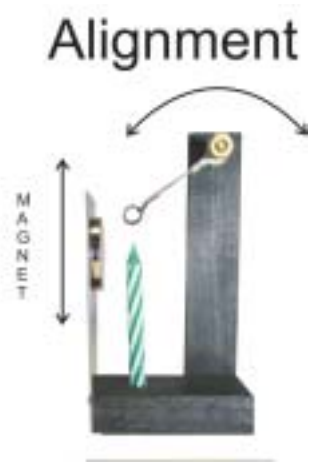
Operating Your Heat Engine

Use a match to light the birthday candle. The flame of the candle should encompass the nickel alloy wire. When the wire temperature reaches its Curie Point, it loses it ferromagnetism and falls away from the magnet, and out of the candle flame. As the wire cools it regains its ferromagnetism and is attracted to the magnet again, where it swings back up toward the magnet and back into the candle flame. This process repeats, swinging the nickel allow wire back and forth.

Online videos of the heat engine operating are available for viewing.

www.imagesco.com/articles/heatengine/HeatEngine.html

Troubleshooting



It’s important that the assembled heat engine has its main components aligned for proper operation. This troubleshooting section should help keep your Curie Effect Magnetic Heat engine functioning properly. The alignment photograph to the left shows how the heat engine should be aligned. The back support may be pivoted to keep the nickel wire directly above the top of the candle. The two photographs to the bottom show the nickel wire too close and too far away from the candle top. Similarly the magnet may be moved up and down to position the nickel wire. Usually proper positioning requires adjustments in both magnet and back support.