Electricity

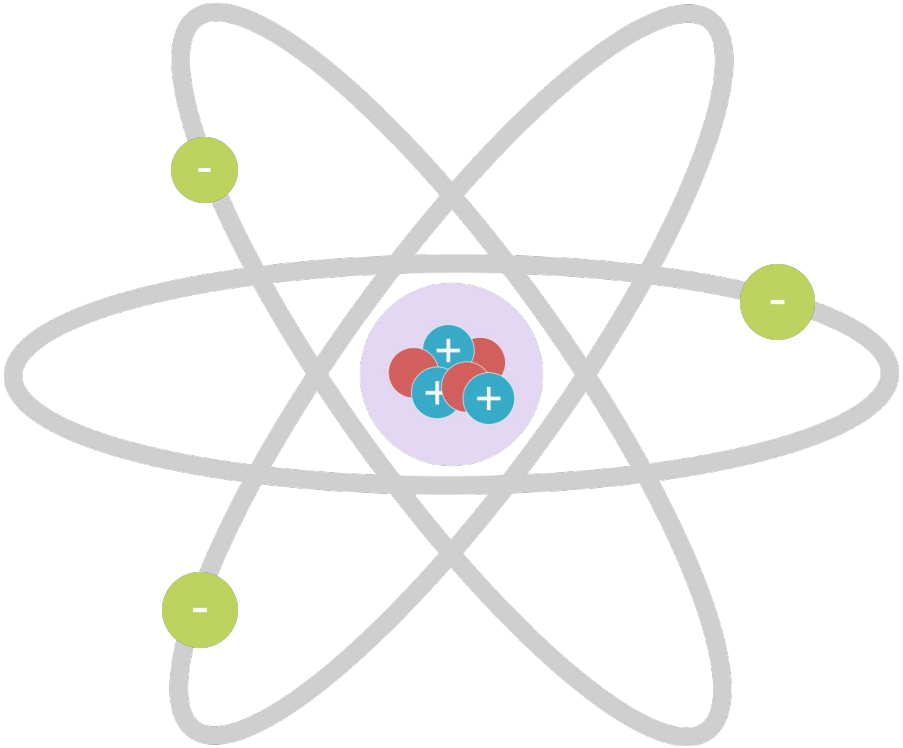
Electricity: What is it?

A form of energy resulting from charged particles.

+ Protons

Neutrons

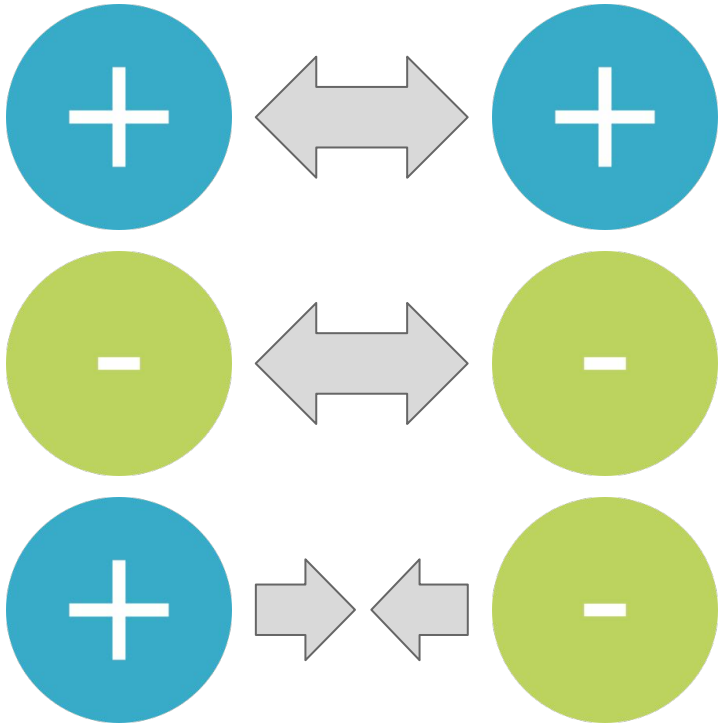
- Electrons



Electricity: Likes repel?

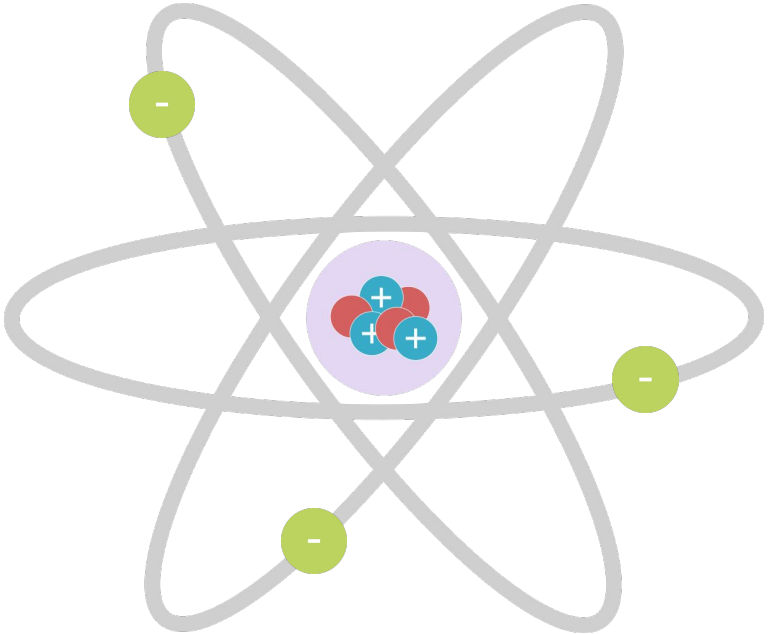
In the world of atoms like charged particles repel from one another while opposite charged particles attract one another.

The negatively charged atoms have extra electrons, while the positively charged atoms have less electrons. The electrons then jump from one atom to another.

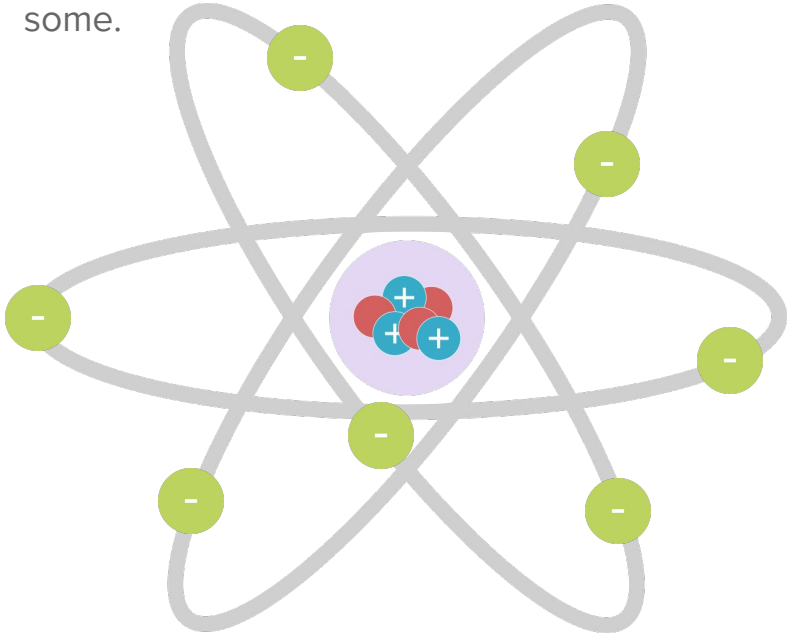


Electricity: Insulator or Conductor

Insulators are materials composed of atoms that hold onto their electrons tightly.



Conductors are materials composed of atoms that hold more electrons and can afford to lose some.



Electricity: Voltage & Current

Voltage

Voltage is the difference in charge between two points.

Voltage is measured in volts.

Current

Current is the rate at which charge is flowing.

Current is measured in amps.

Electricity: Static Charge vs Current

Static Charge
When two materials are in contact, electrons may move from one material to the other, which leaves an excess of positive charge on one material, and an equal negative charge on the other. When the materials are separated they retain this charge imbalance.

Current is the exchange of electrons in a conductive material such as a copper wire.

Direct current is the unidirectional flow of electric charge.

Alternating current is the bidirectional flow of electrons. The rate at which the direction of the electrons changes is the frequency which is measured in hertz.

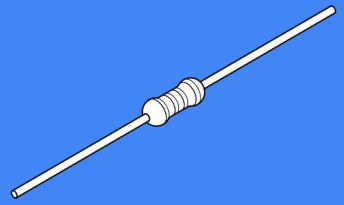

+
-
DC
AC
Direct Current
Alternating Current

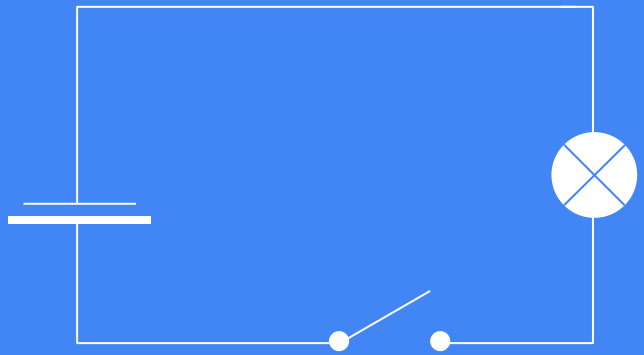
Fun Fact

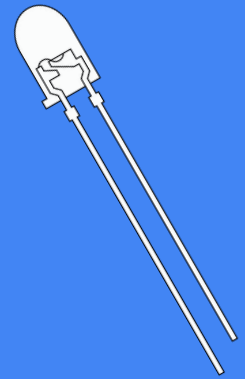
Static charge builds up when air moves across the surface of the wing of an airplane. As air passes over the surface electrons are stripped away from the atoms in the air and collected on the wings surface causing a static charge.

This static charge can interfere with radio communications on the aircraft when this static is discharged on aircraft extremities such as antennas.

Static discharge wicks are placed on the trailing edge of the wing to give the built up static a path to appropriately discharge back into the atmosphere.



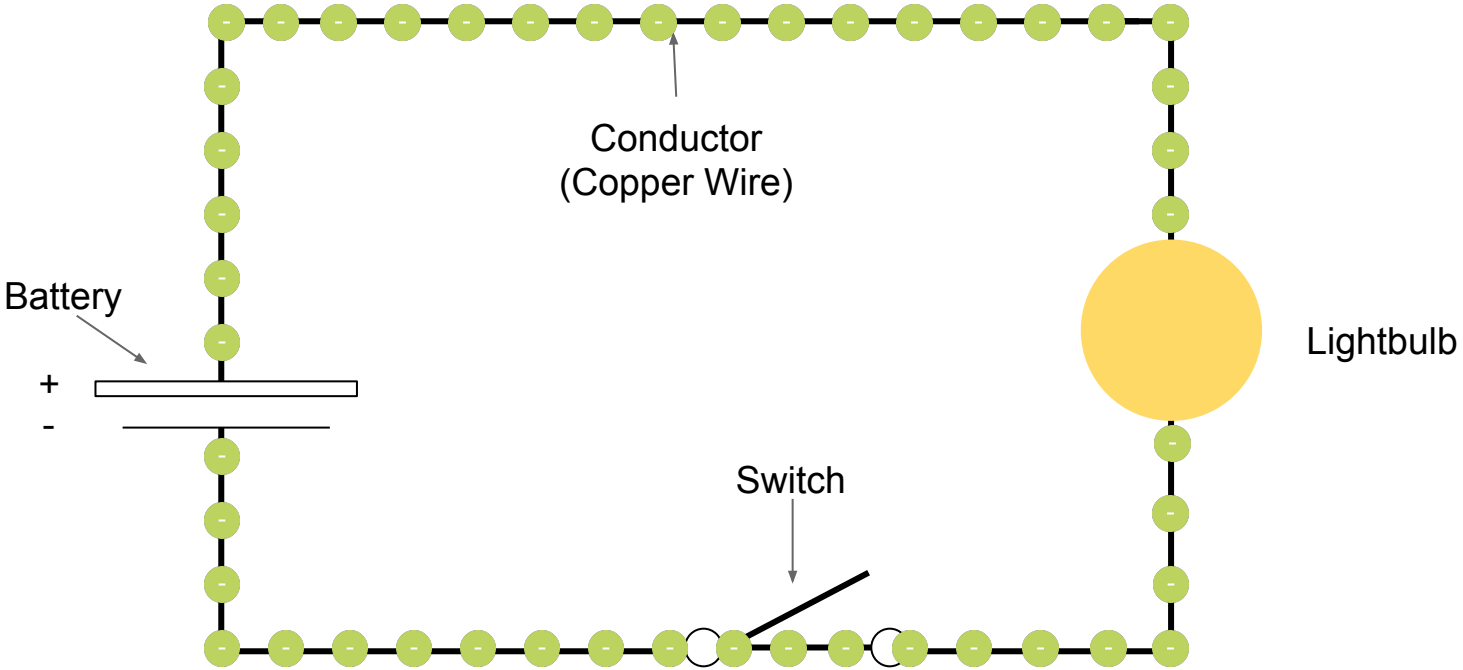




Circuits

Circuits: What is a circuit?

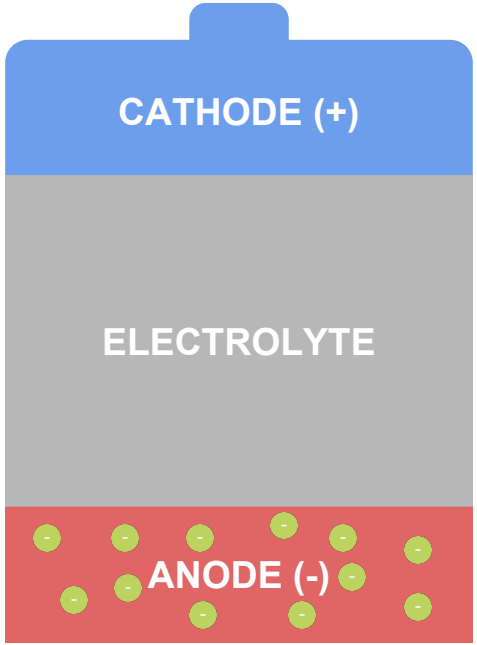
A circuit is a path which allows electric current to flow.



Circuits: Batteries

Batteries create an electrical current using chemical reactions.

A traditional battery consists for 3 parts. The Cathode, Electrolyte, and Anode. Using a chemical reaction electrons build up at the Anode.



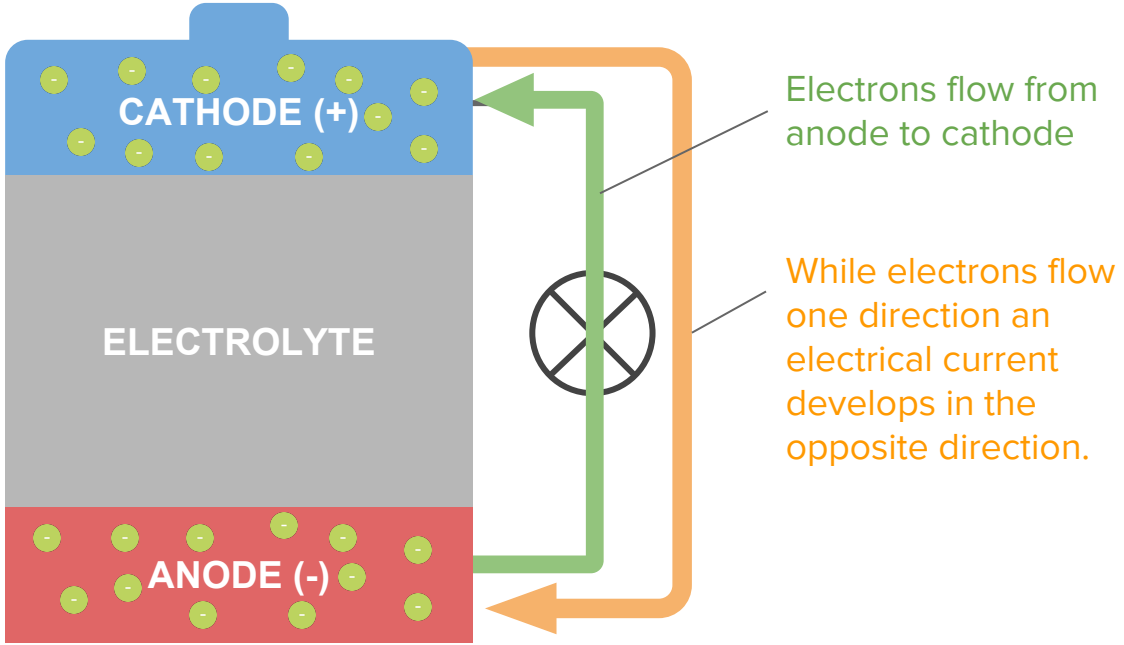
The Cathode has fewer electrons.

Electrons want to flow from the Anode to the Cathode but the Electrolyte prevents the electrons from passing directly to the Cathode

Electrons repel from one another and want to go to a place with fewer electrons.

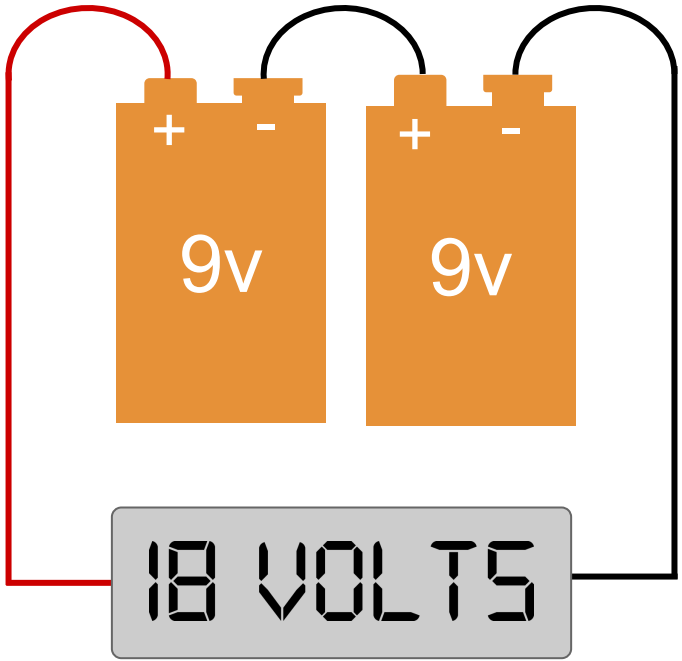
Circuits: Batteries

Electrons move from the anode to the cathode causing a current to flow from the cathode to the anode.

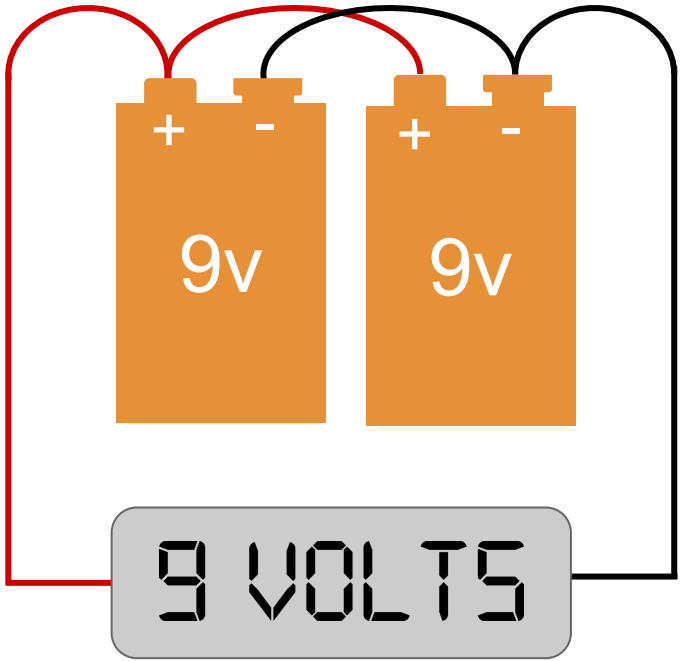


Circuits: Series vs Parallel

Series

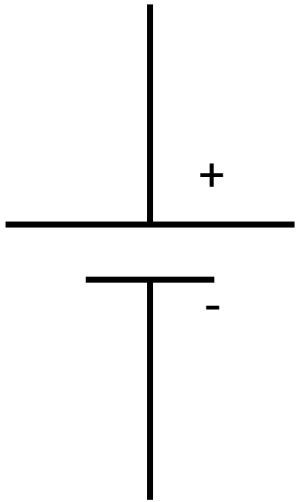


Parallel

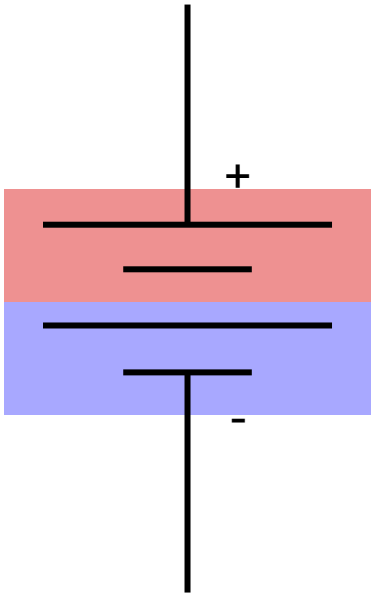


Circuits: Batteries

Single Cell Battery



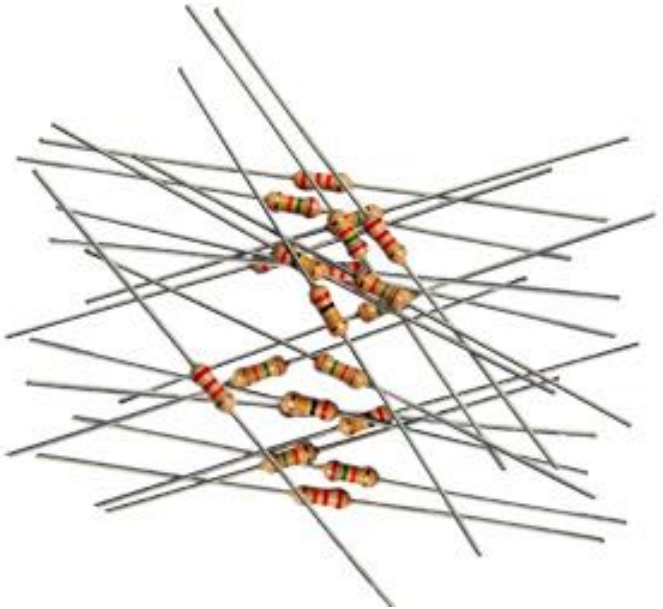
Two Cell Battery



Circuits: Resistors

A resistor limits or regulates the amount of electrical current. They do this by converting energy into heat.

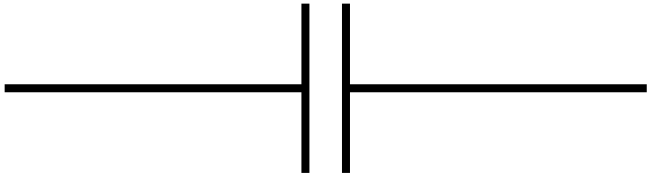
Resistors can be used to provide a specific voltage to a device on the circuit.



Circuits: Capacitors

Capacitors store electrical charge and are like batteries however they work in completely different ways.

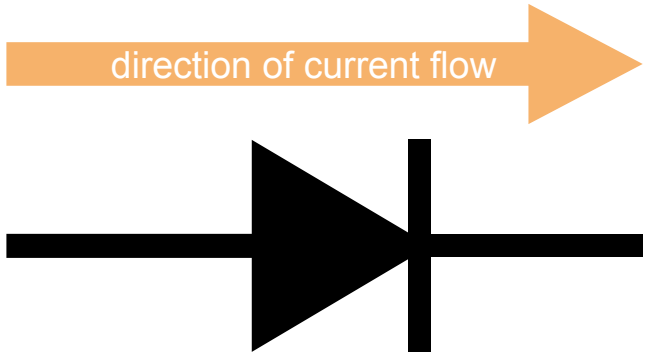
Unlike a battery, which produces electrons, a capacitor simply stores electrons.

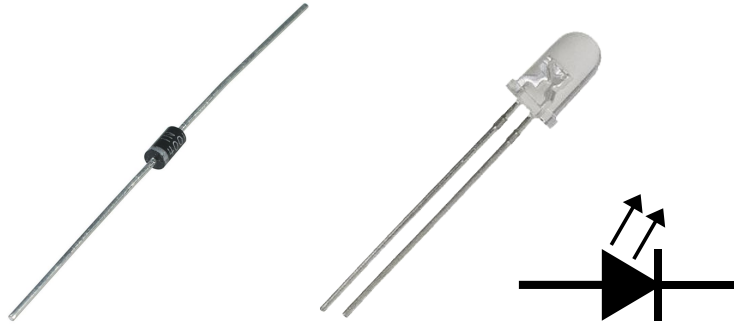


Circuits: Diodes

Diodes allow current to flow in one direction.

LED stands for **L**ight **E**mitting **D**iode.





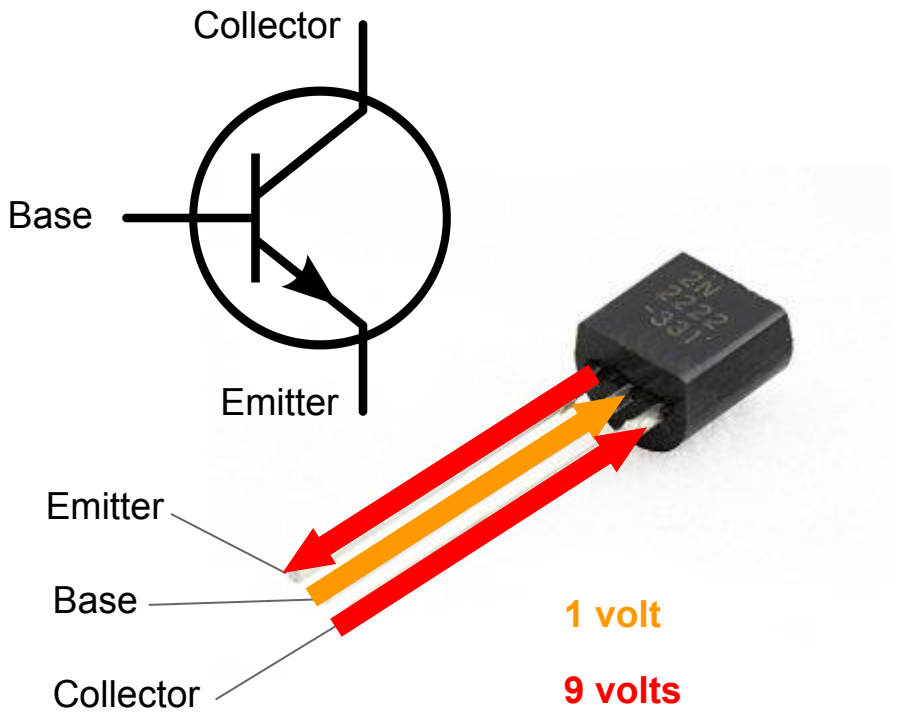
Circuits: Transistors

A transistor is a semiconductor that amplifies or switches electrical signals.

Transistors have 3 legs:

1. Emitter
2. Base
3. Collector

A small amount of power in the base means a larger current is permitted through the collector to the emitter



Ohm's Law

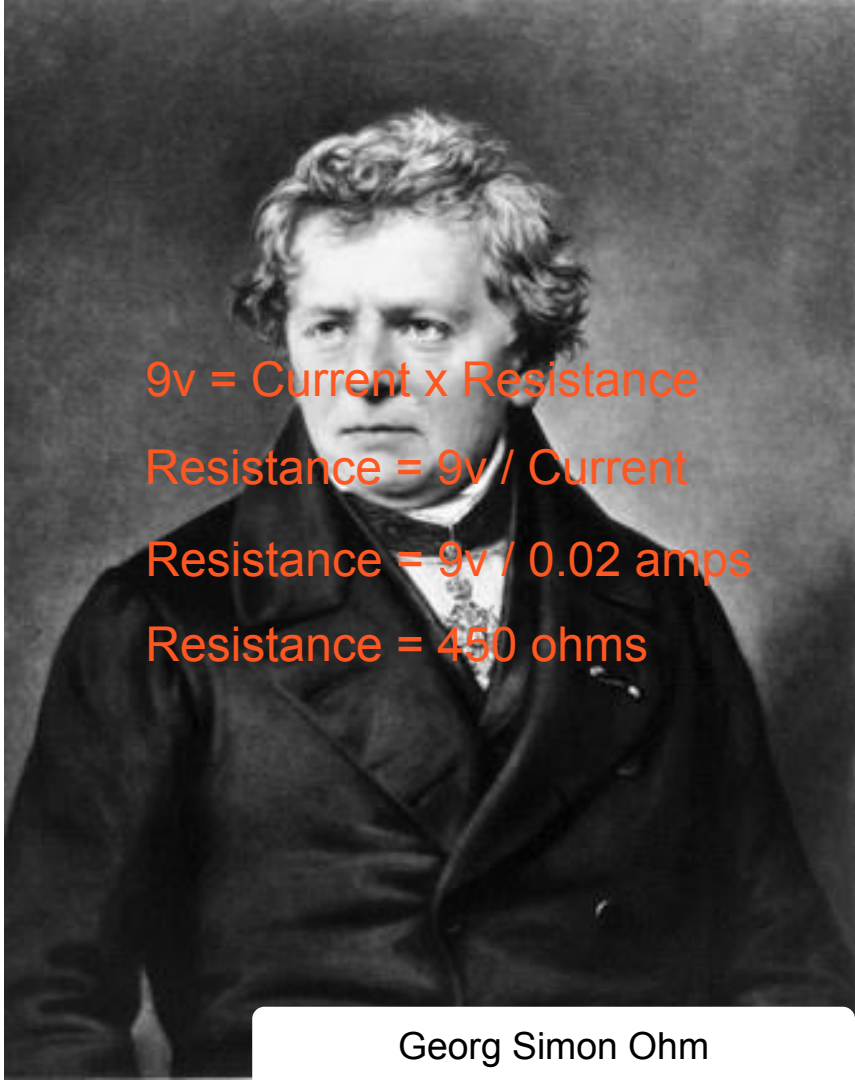
$$V = I \cdot R$$

Voltage = Current x Resistance

3v 20mA LED

9v Battery

500 ohm



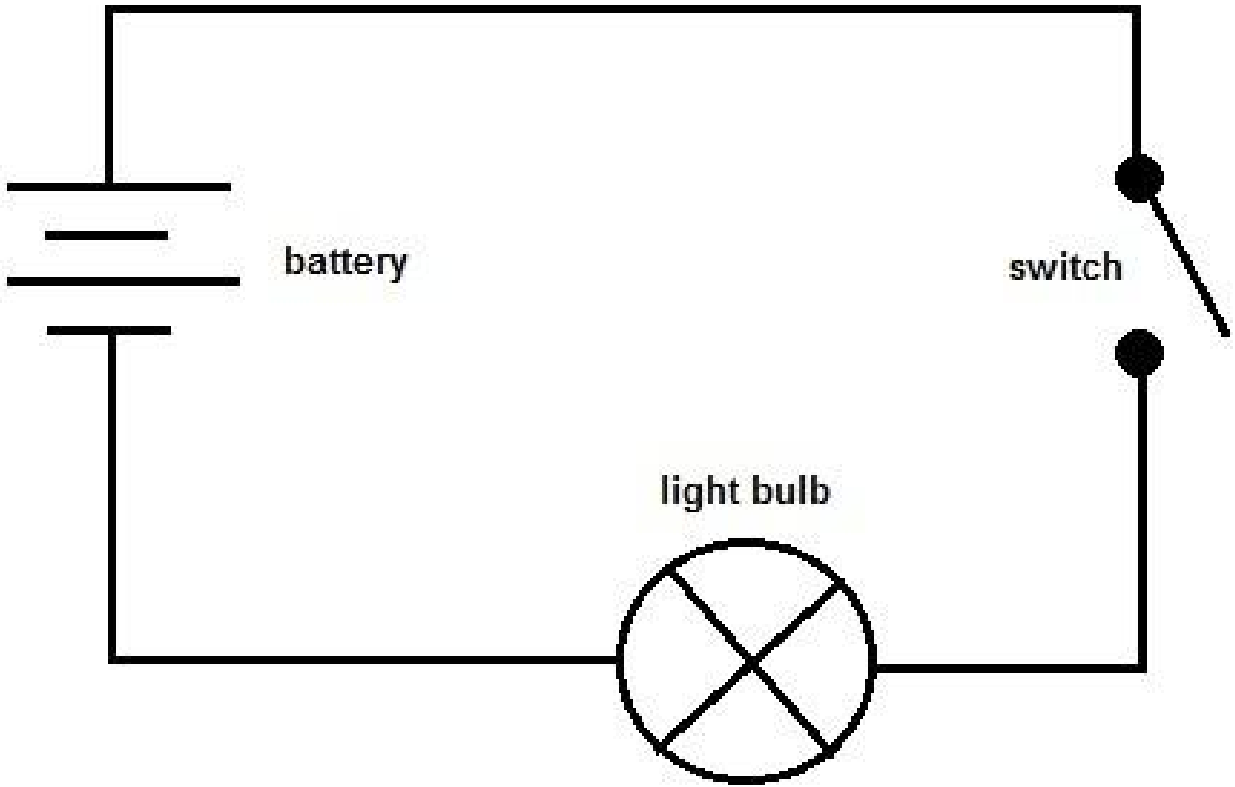
9v = Current x Resistance

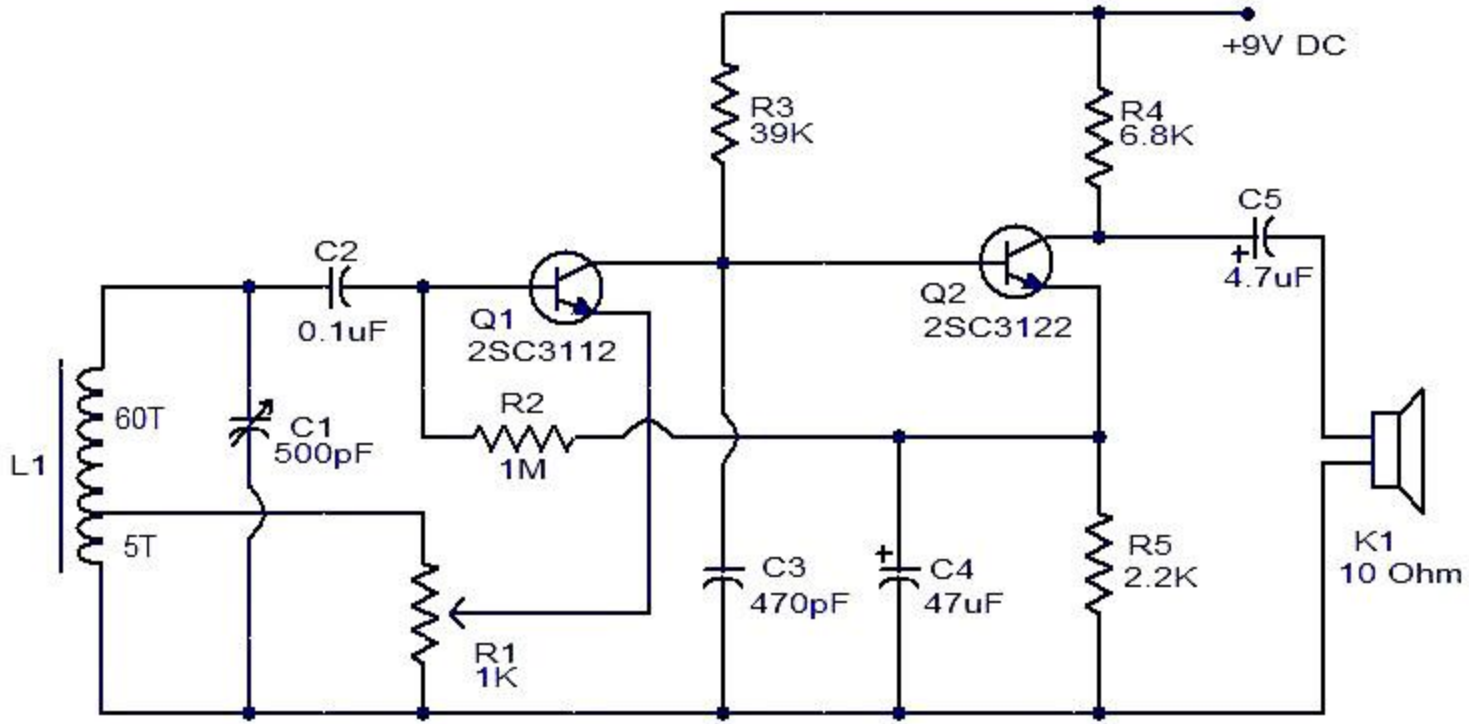
Resistance = 9v / Current

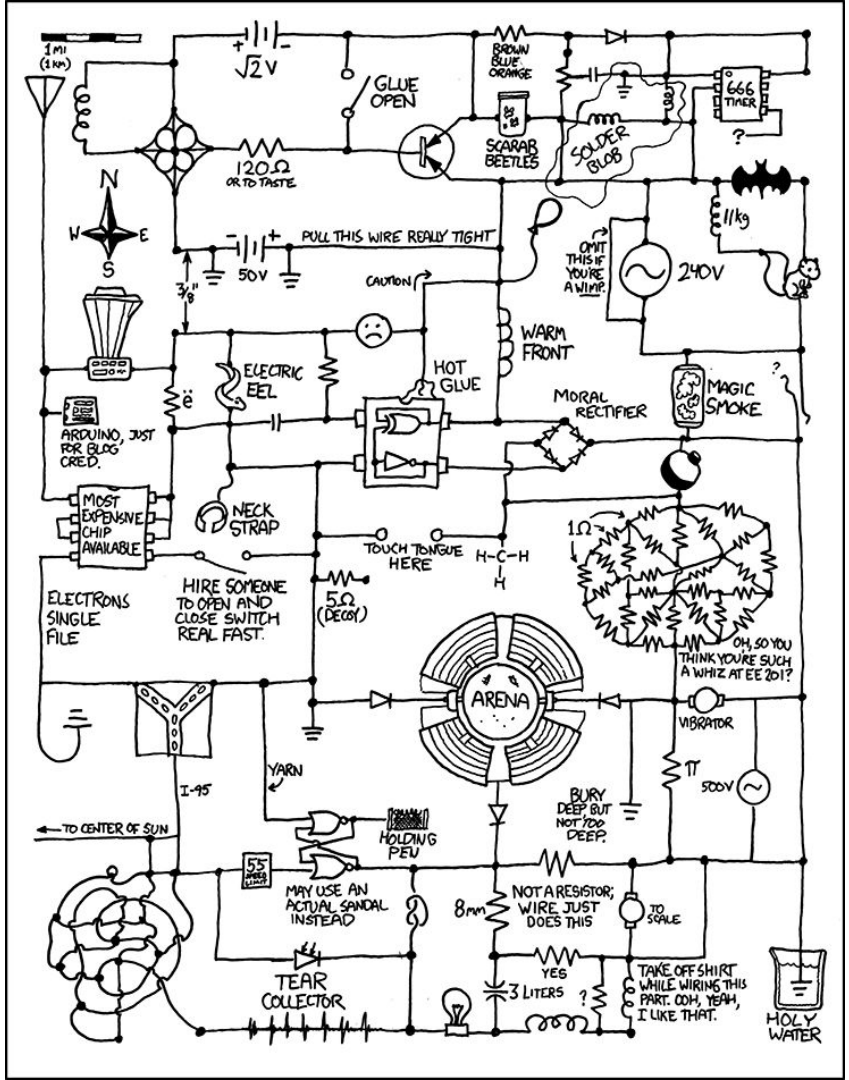
Resistance = 9v / 0.02 amps

Resistance = 450 ohms

Georg Simon Ohm

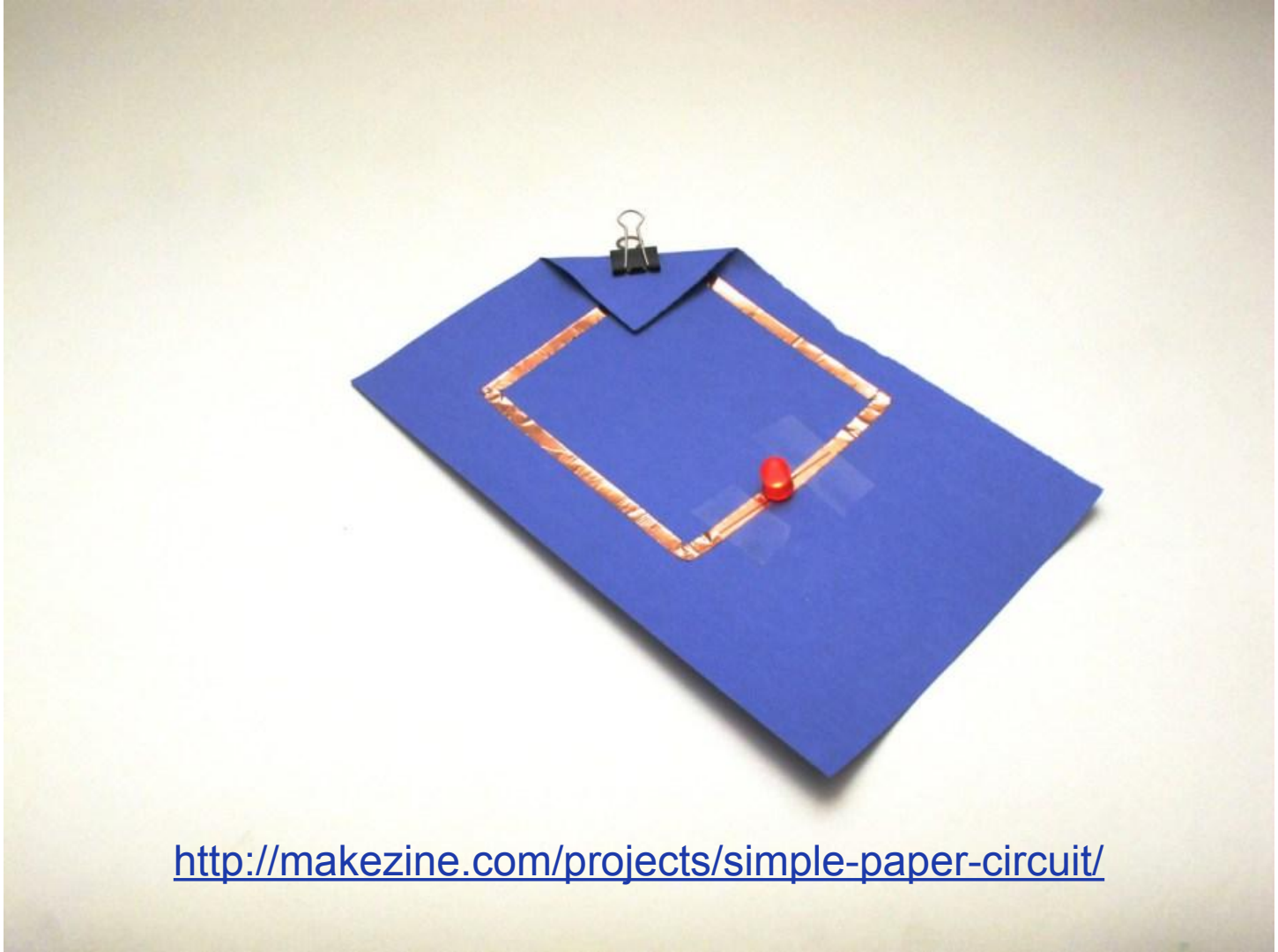

battery
switch
light bulb


+9V DC
R3
39K
R4
6.8K
C5
4.7uF
C2
0.1uF
Q1
2SC3112
Q2
2SC3122
L1
60T
5T
C1
500pF
R2
1M
R1
1K
C3
470pF
C4
47uF
R5
2.2K
K1
10 Ohm
Simple AM radio
www.circuitstoday.com


1 MI (1 KM)
√2V
GLUE OPEN
BROWN BLUE ORANGE
666 TIMER
120Ω OR TO TASTE
SCARAB BEETLES
SOLDER BLOB
?
N
W
E
S
PULL THIS WIRE REALLY TIGHT
50V
1/kg
OMIT THIS IF YOU'RE A WIMP.
240V
3⅜"
CAUTION
WARM FRONT
ELECTRIC EEL
HOT GLUE
MAGIC SMOKE
MORAL RECTIFIER
ARDUINO, JUST FOR BLOG CRED.
MOST EXPENSIVE CHIP AVAILABLE
NECK STRAP
TOUCH TONGUE HERE
H-C-H
H
1Ω
5Ω (DECOY)
ELECTRONS SINGLE FILE
HIRE SOMEONE TO OPEN AND CLOSE SWITCH REAL FAST.
OH, SO YOU THINK YOU'RE SUCH A WHIZ AT EE 201?
ARENA
VIBRATOR
1T
500V
YARN
I-95
BURY DEEP BUT NOT TOO DEEP.
TO CENTER OF SUN
HOLDING PEN
55 MPH SPEED LIMIT
MAY USE AN ACTUAL SANDAL INSTEAD
8mm
NOT A RESISTOR; WIRE JUST DOES THIS
TO SCALE
YES
3 LITERS
TAKE OFF SHIRT WHILE WIRING THIS PART. OOH, YEAH, I LIKE THAT.
TEAR COLLECTOR
HOLY WATER

Projects

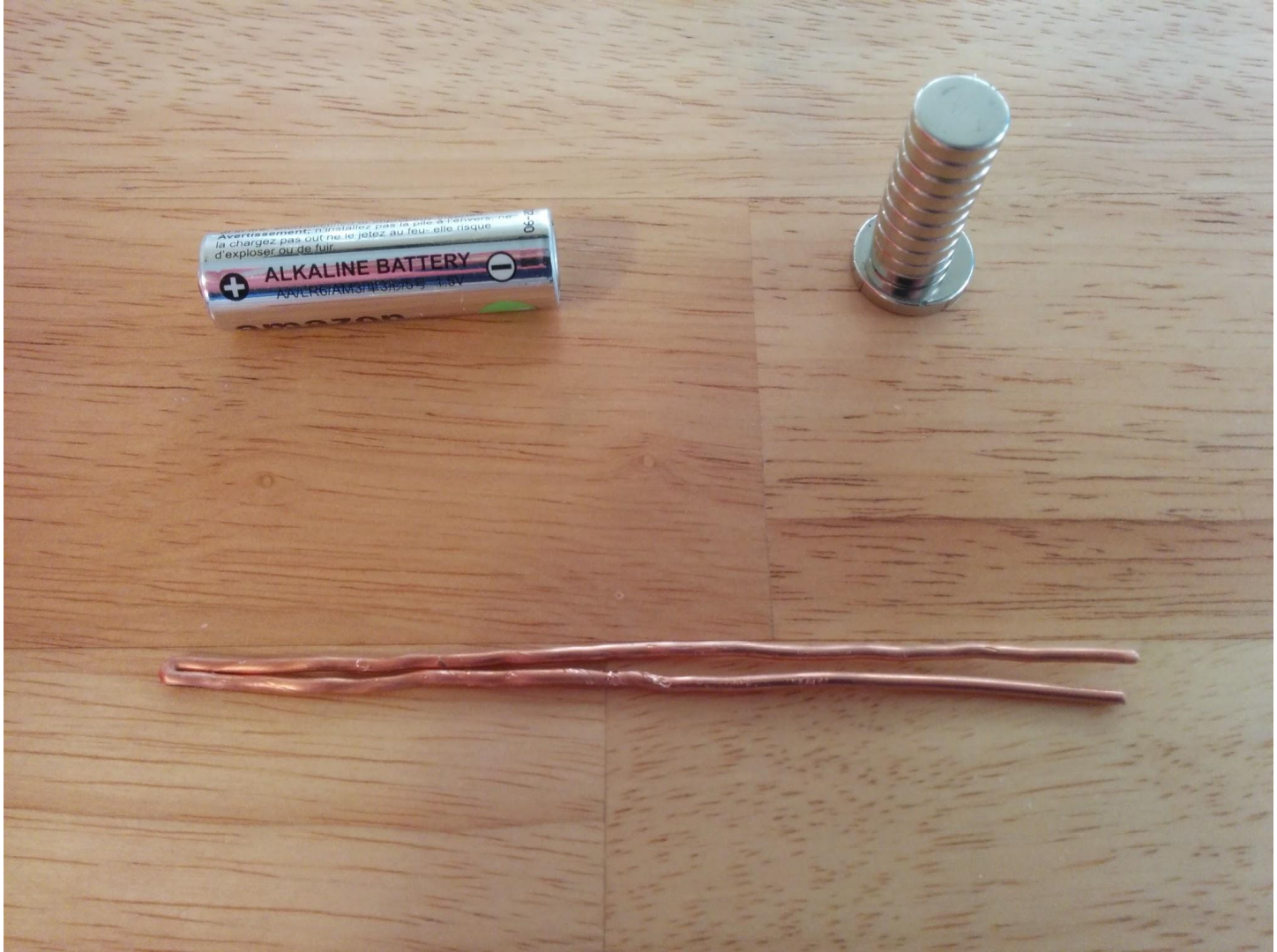
Simple Circuit

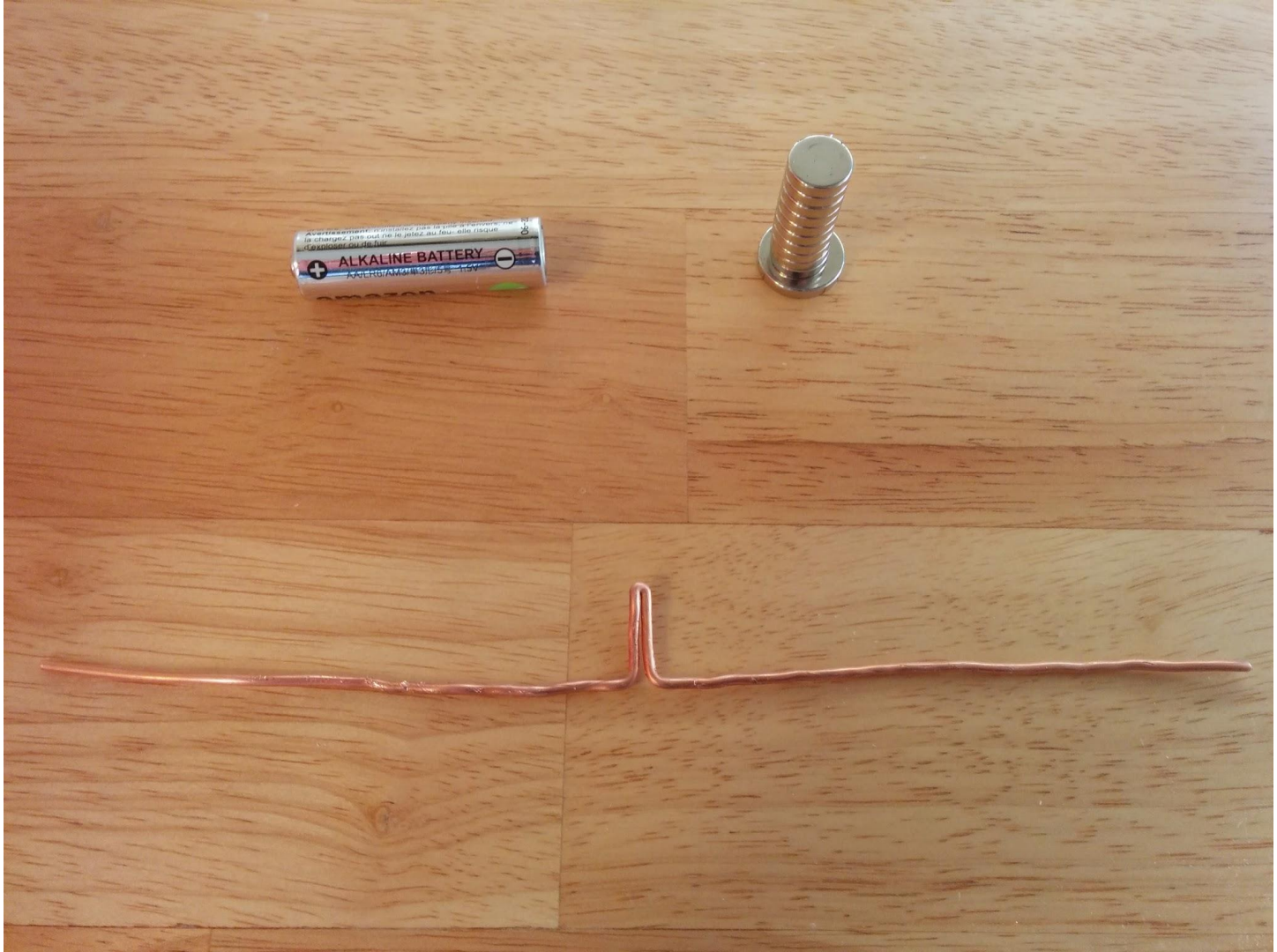


http://makezine.com/projects/simple-paper-circuit/

Homopolar Motor


ALKALINE BATTERY


ALKALINE BATTERY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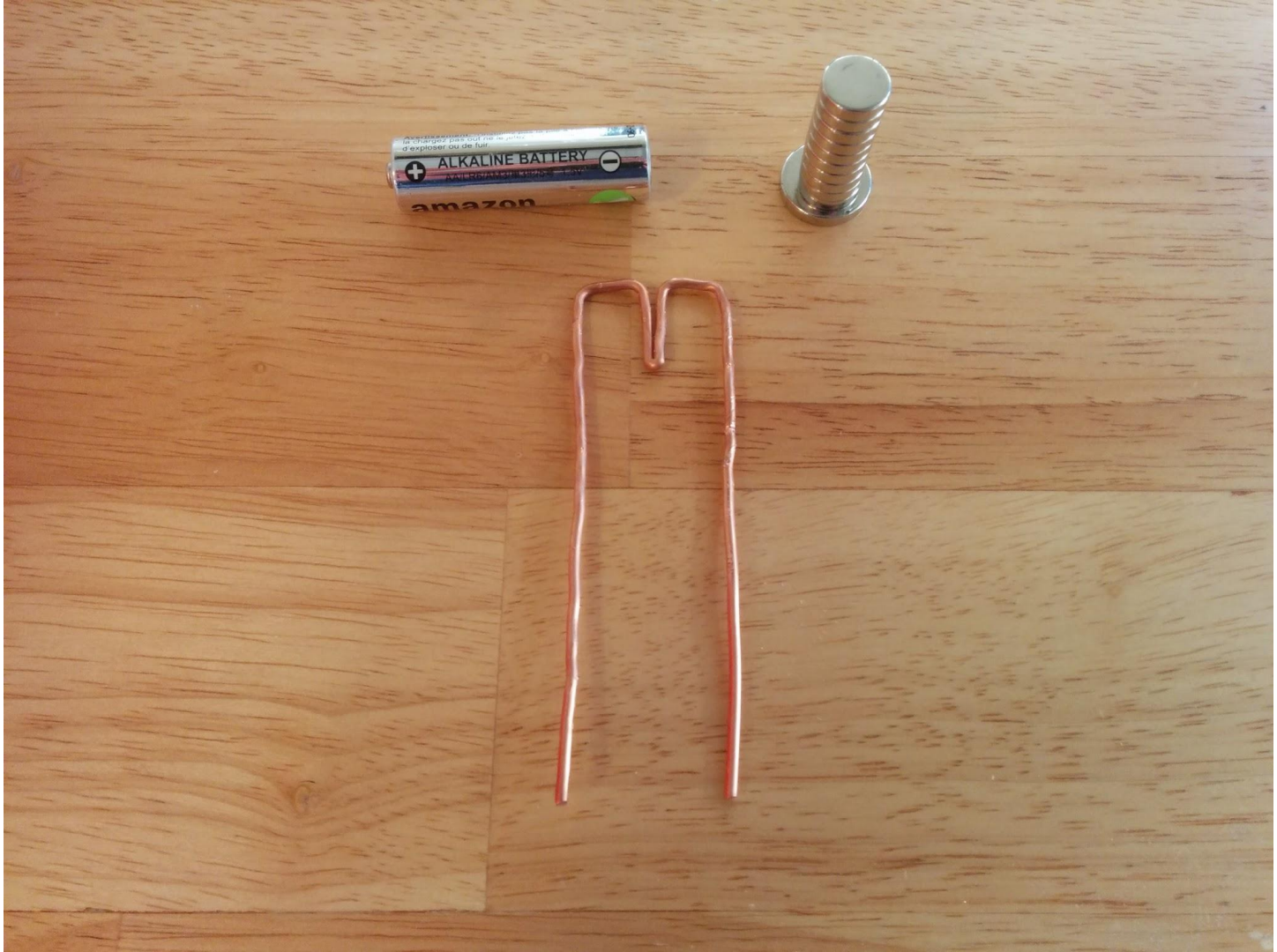
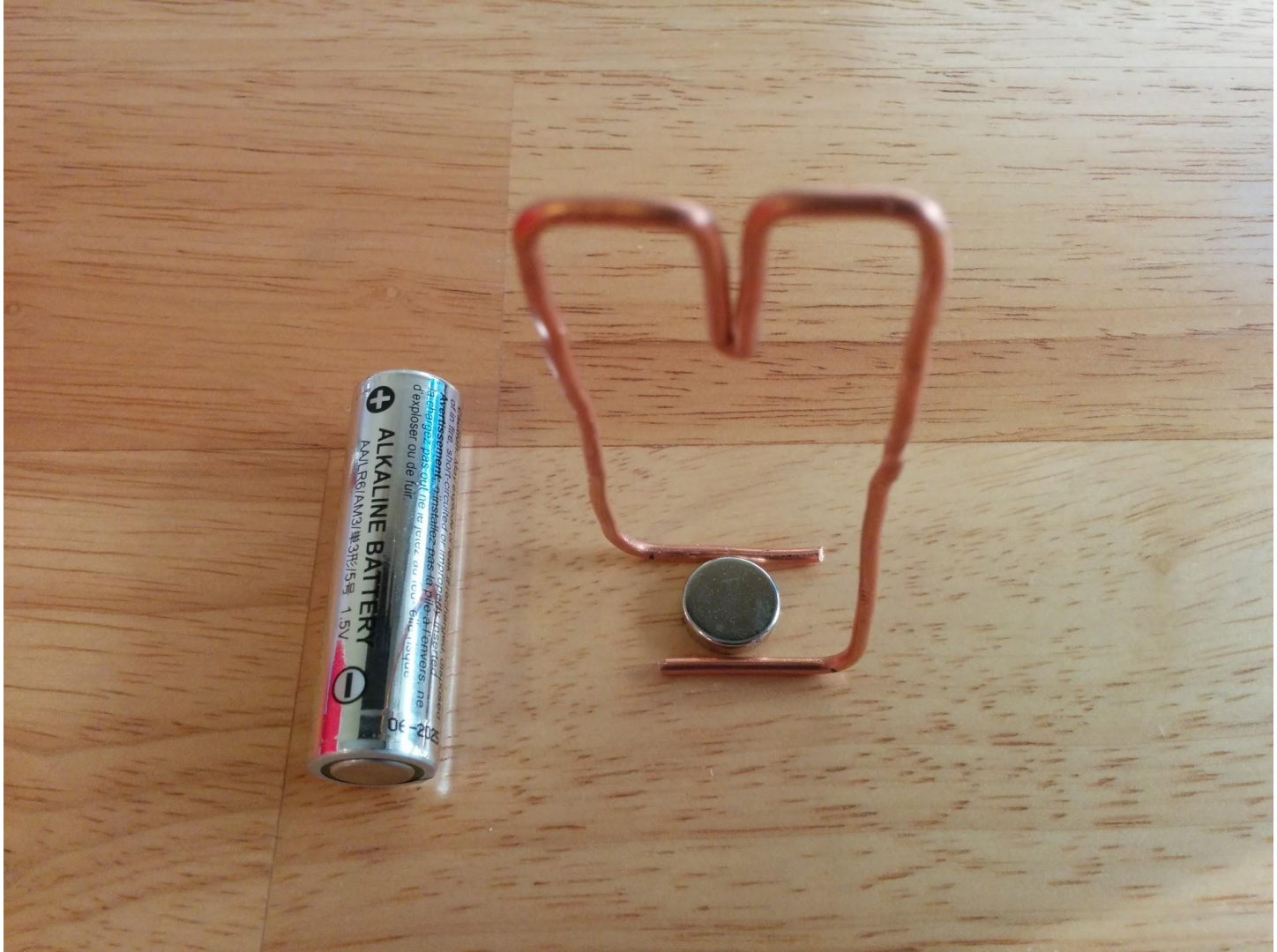

ALKALINE BATTERY
amazon

ALKALINE BATTERY
AA/LR6/AM3/単3形/5号 1.5V

ALKALINE BATTERY
Avertissement: n'installez pas la pile à l'envers
la chargez pas, ou ne la jetez au feu- elle risque
d'exploser ou de fuir.


ALKALINE BATTERY


ALKALINE BATTERY
AA/LR6/AM3/単3形/5号 1.5V

ALKALINE BATTERY

ALKALINE BATTERY
AA/LR6/AM3/単3形/5号 1.5V

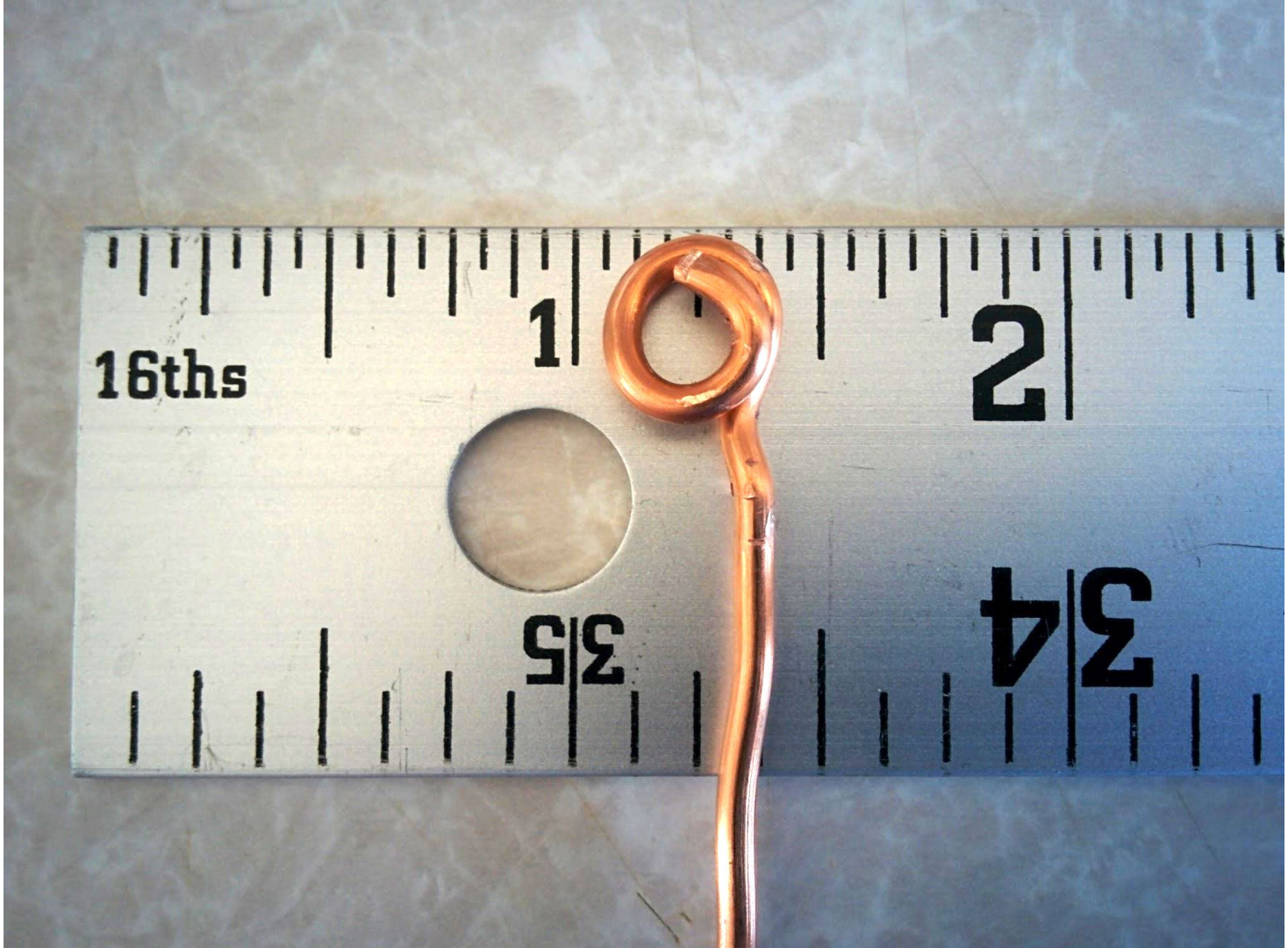

amazon
basics


amazon basics

Homopolar Motor #2

#1

#2



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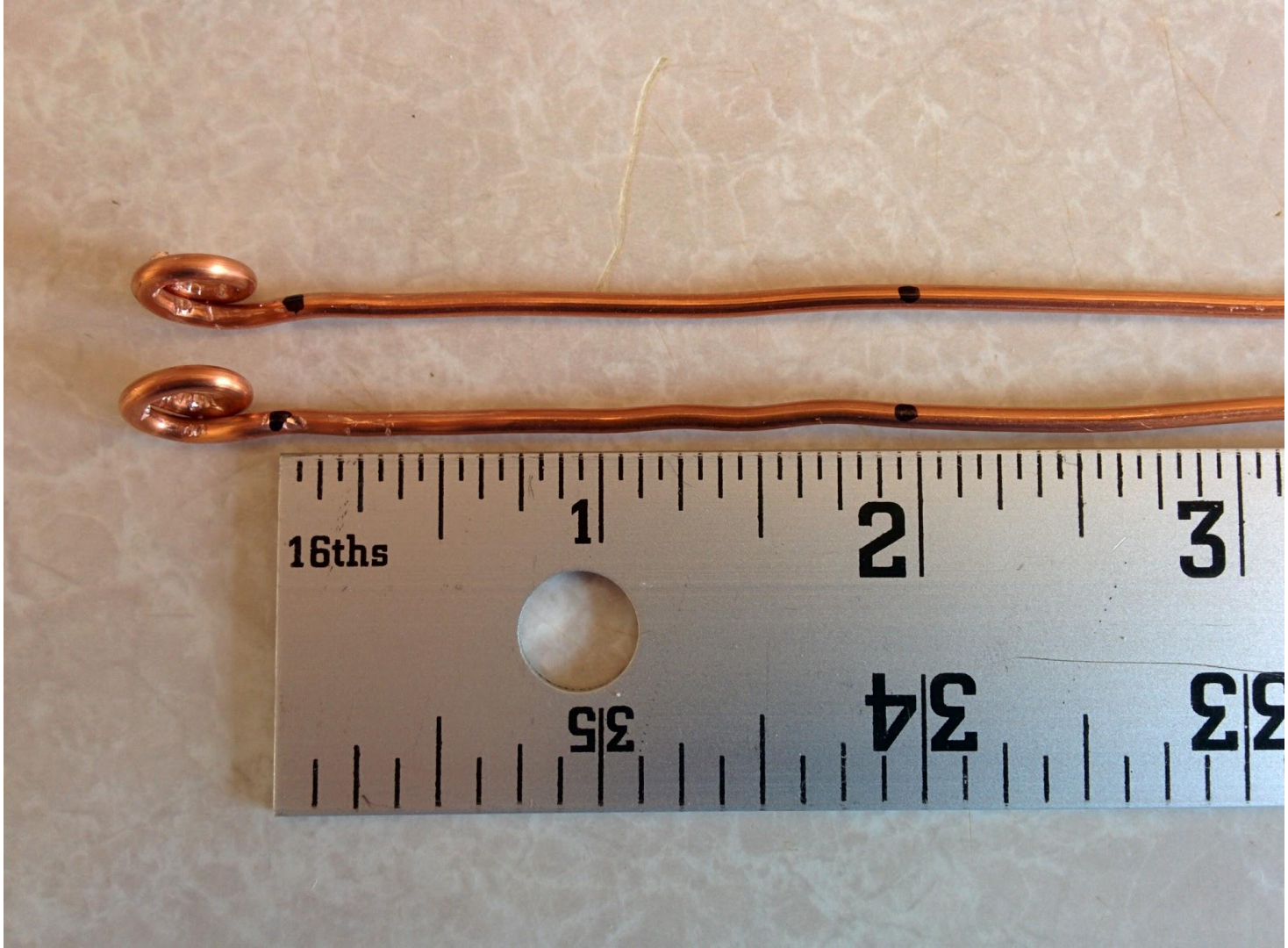

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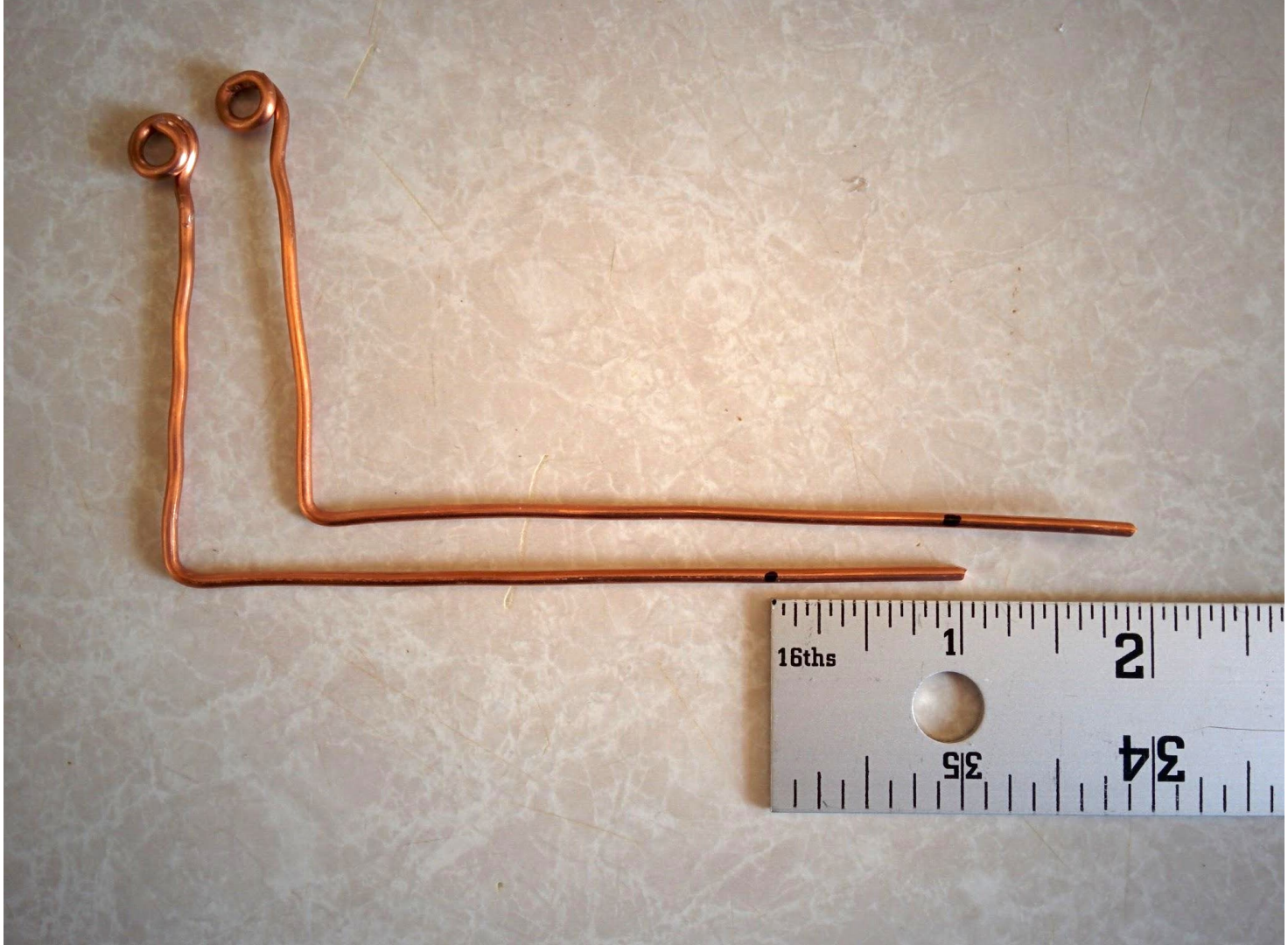

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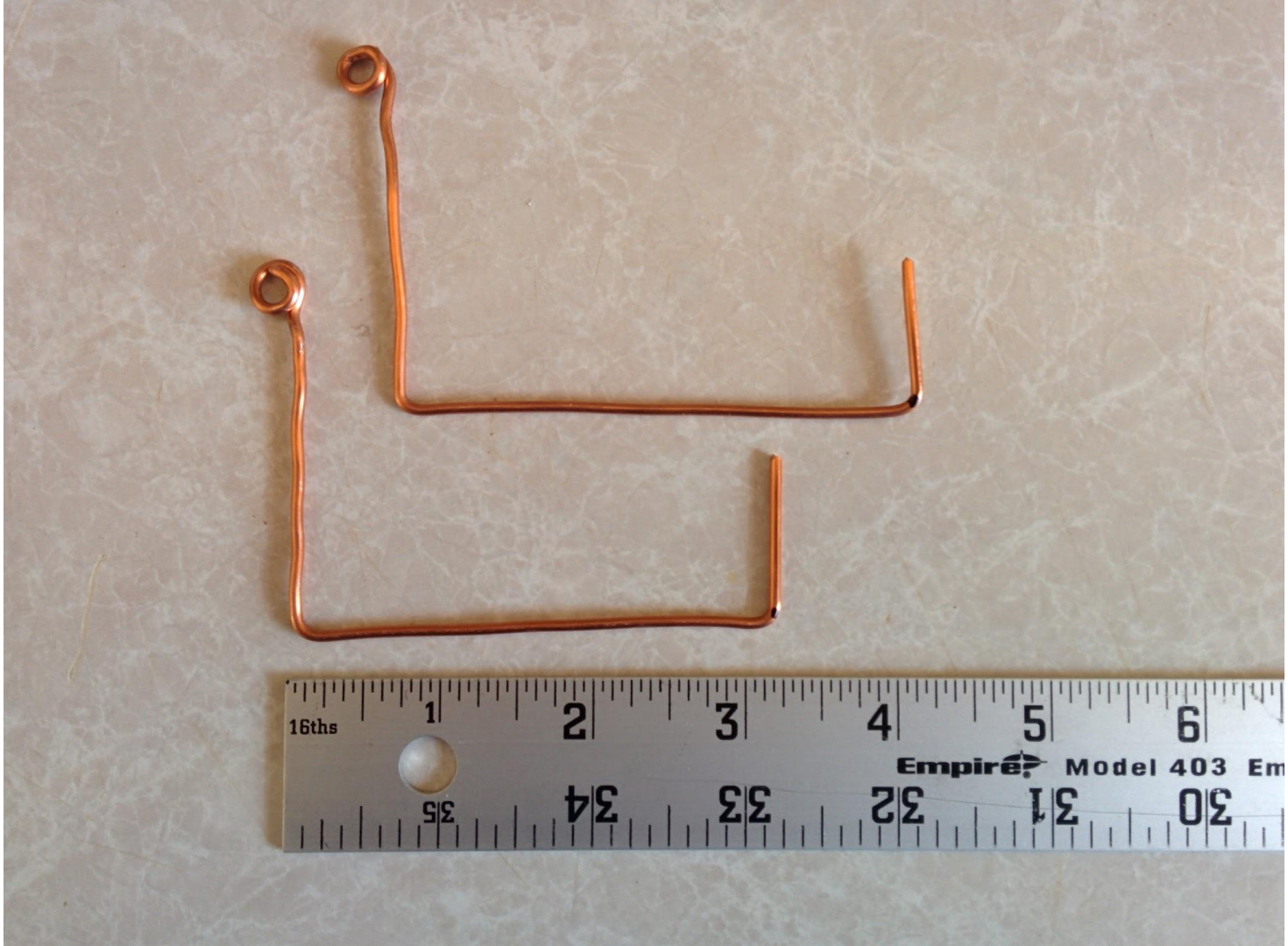

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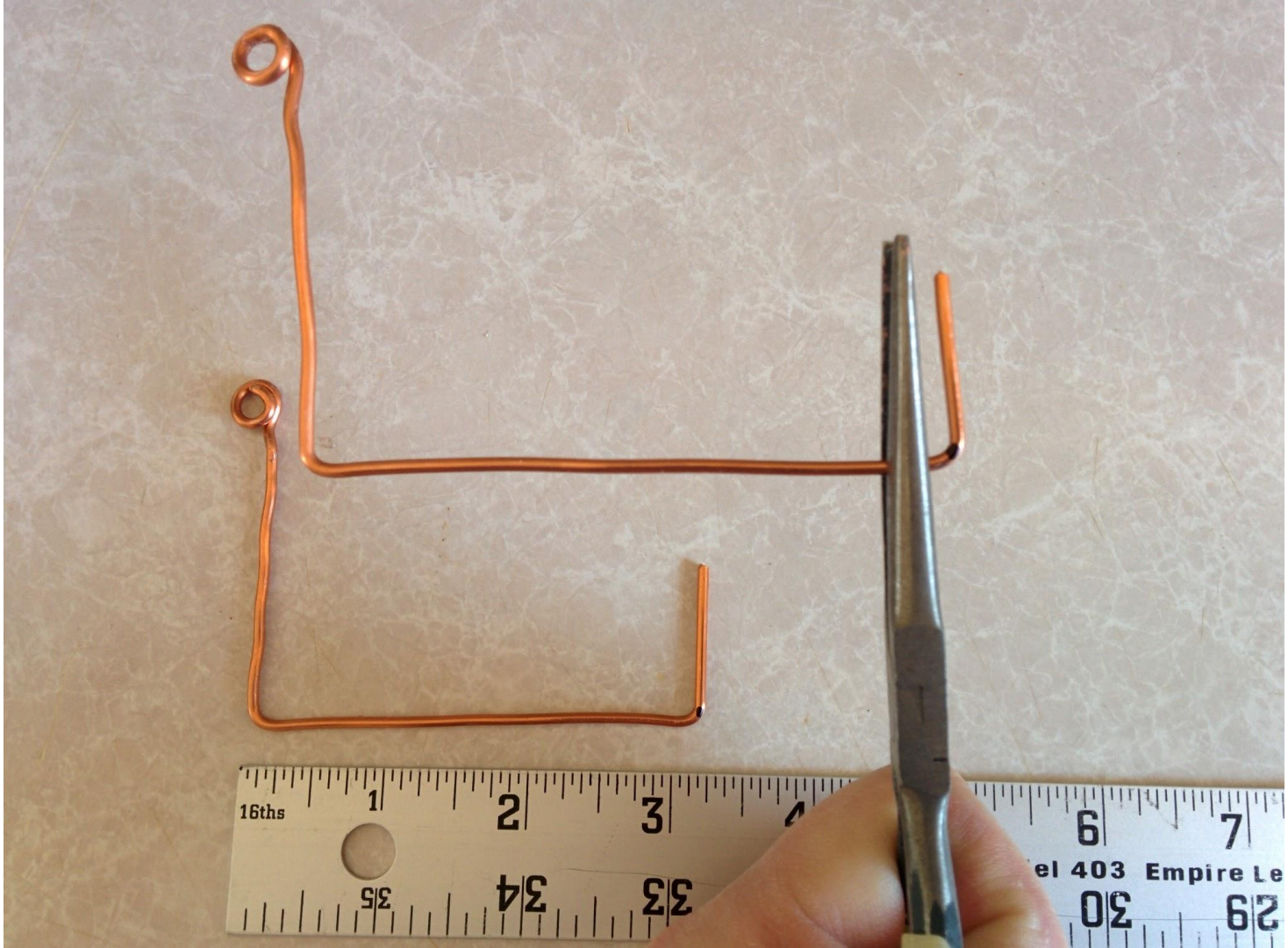

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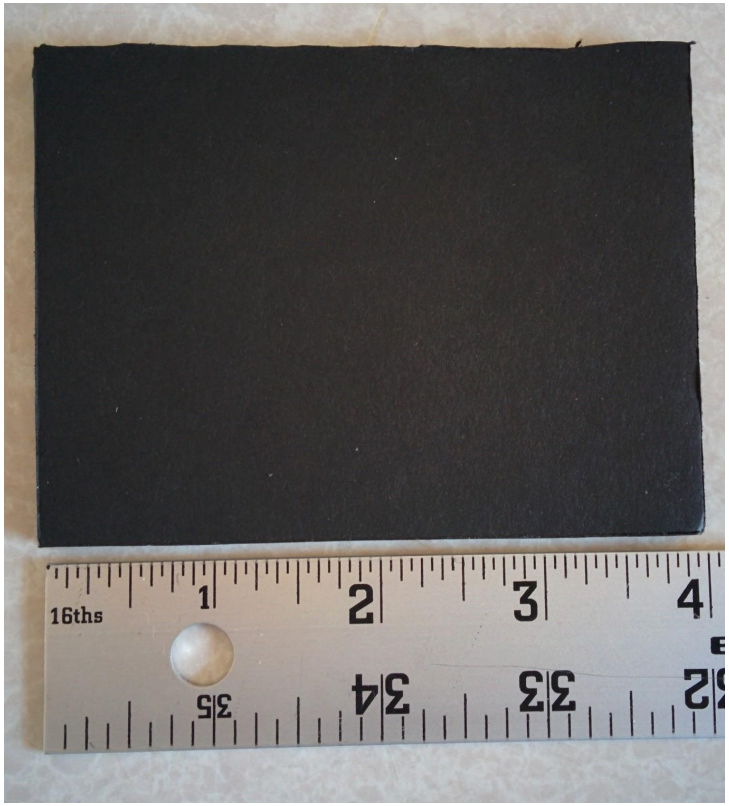

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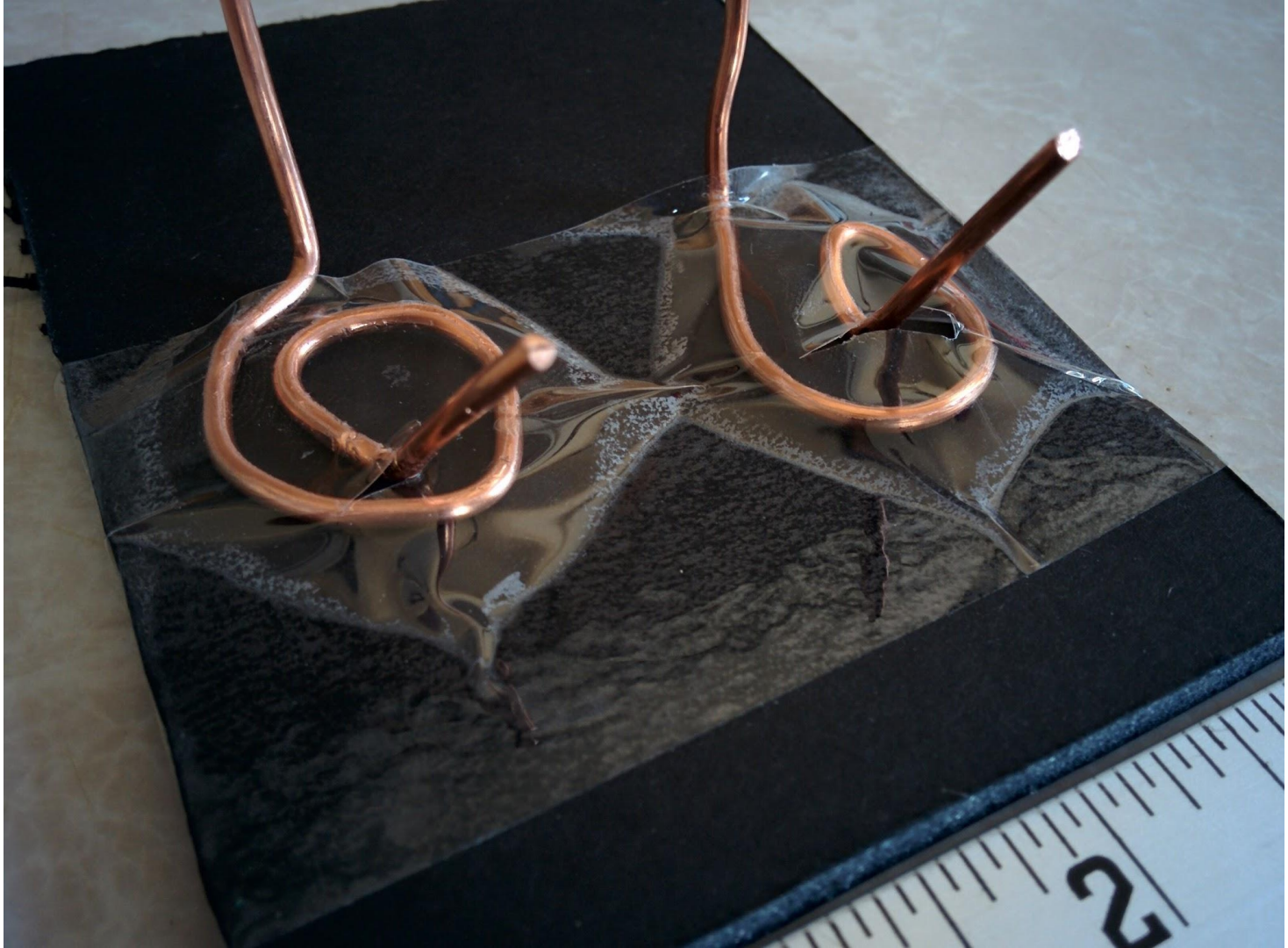

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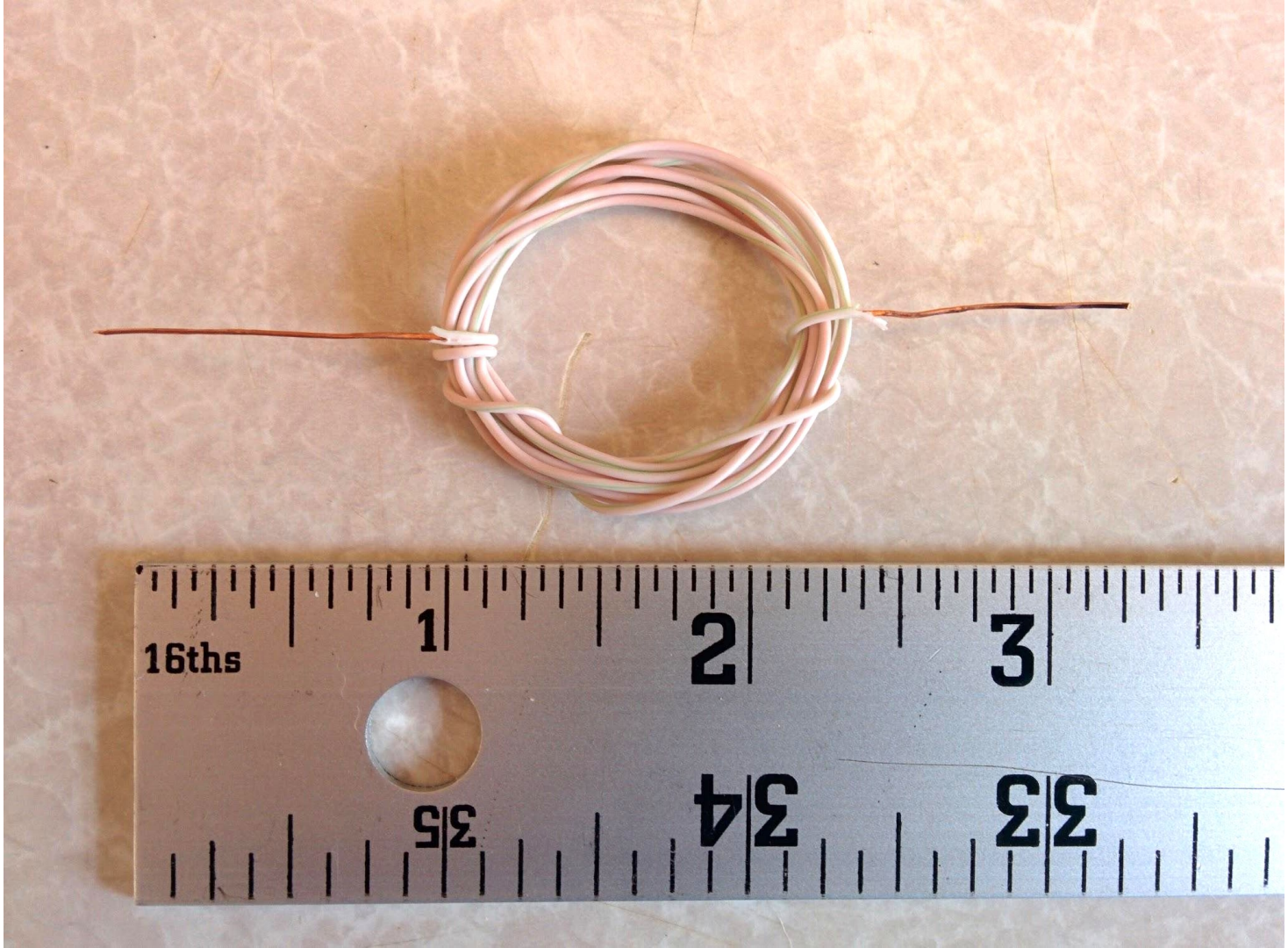

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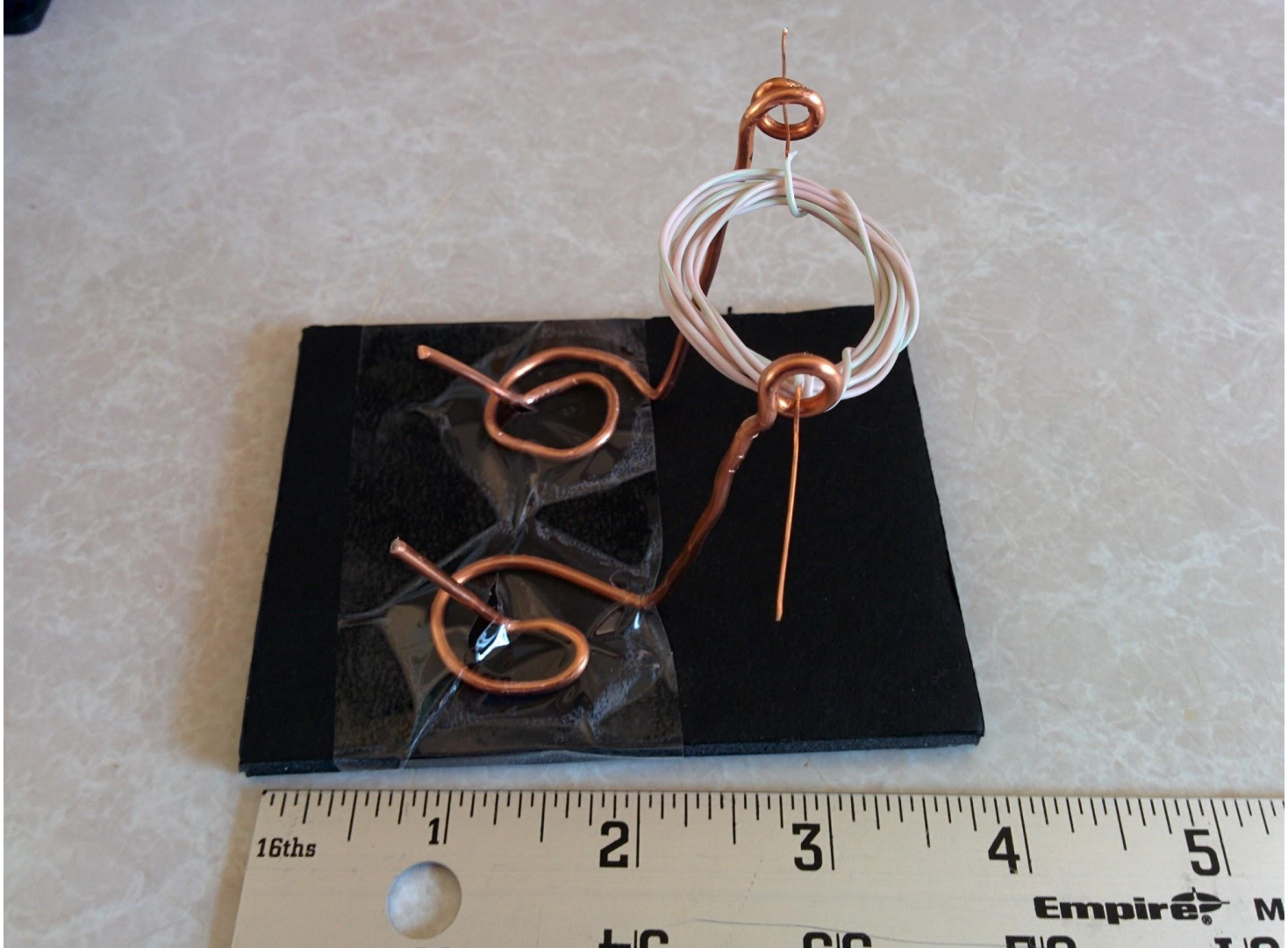

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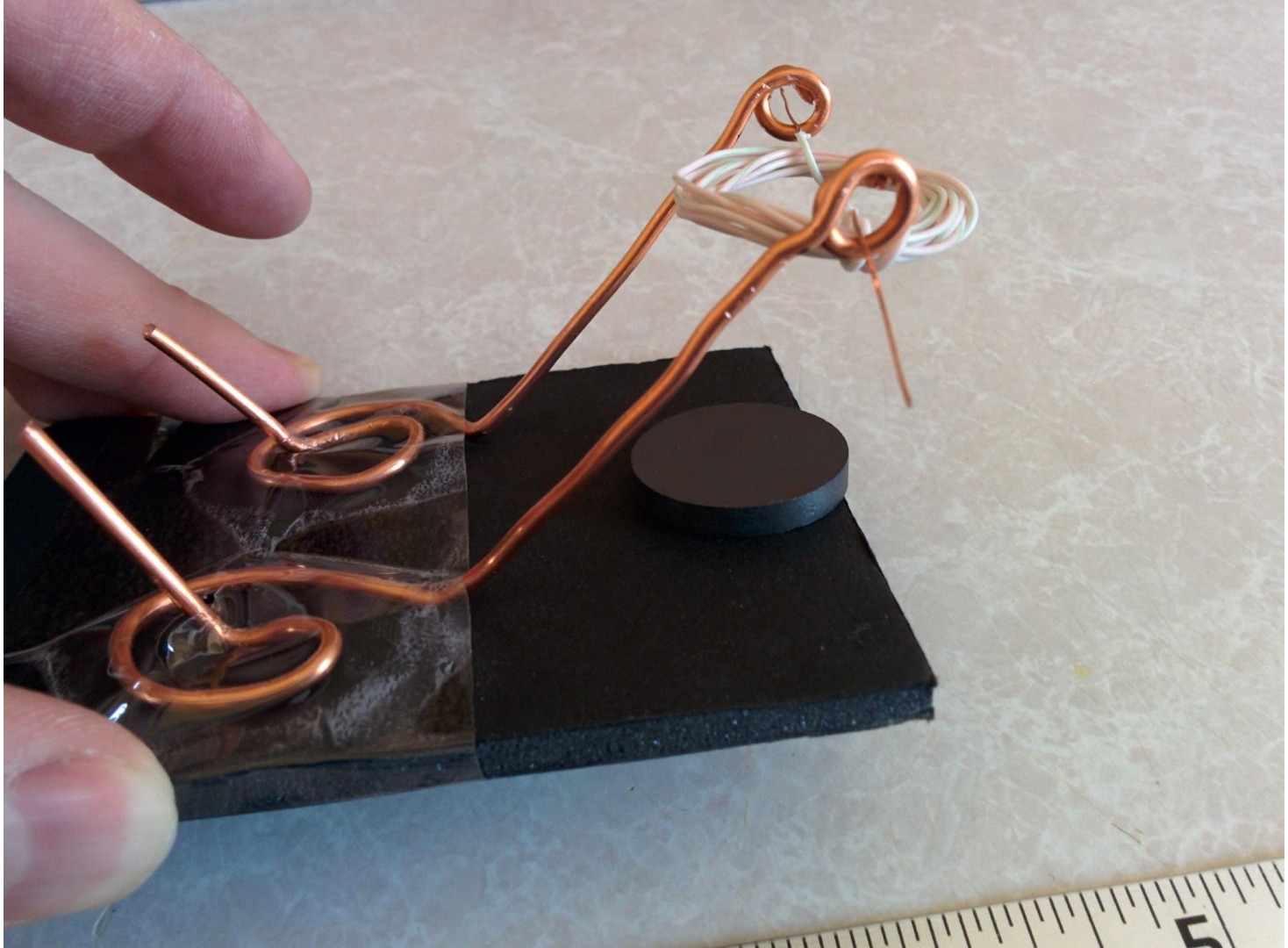

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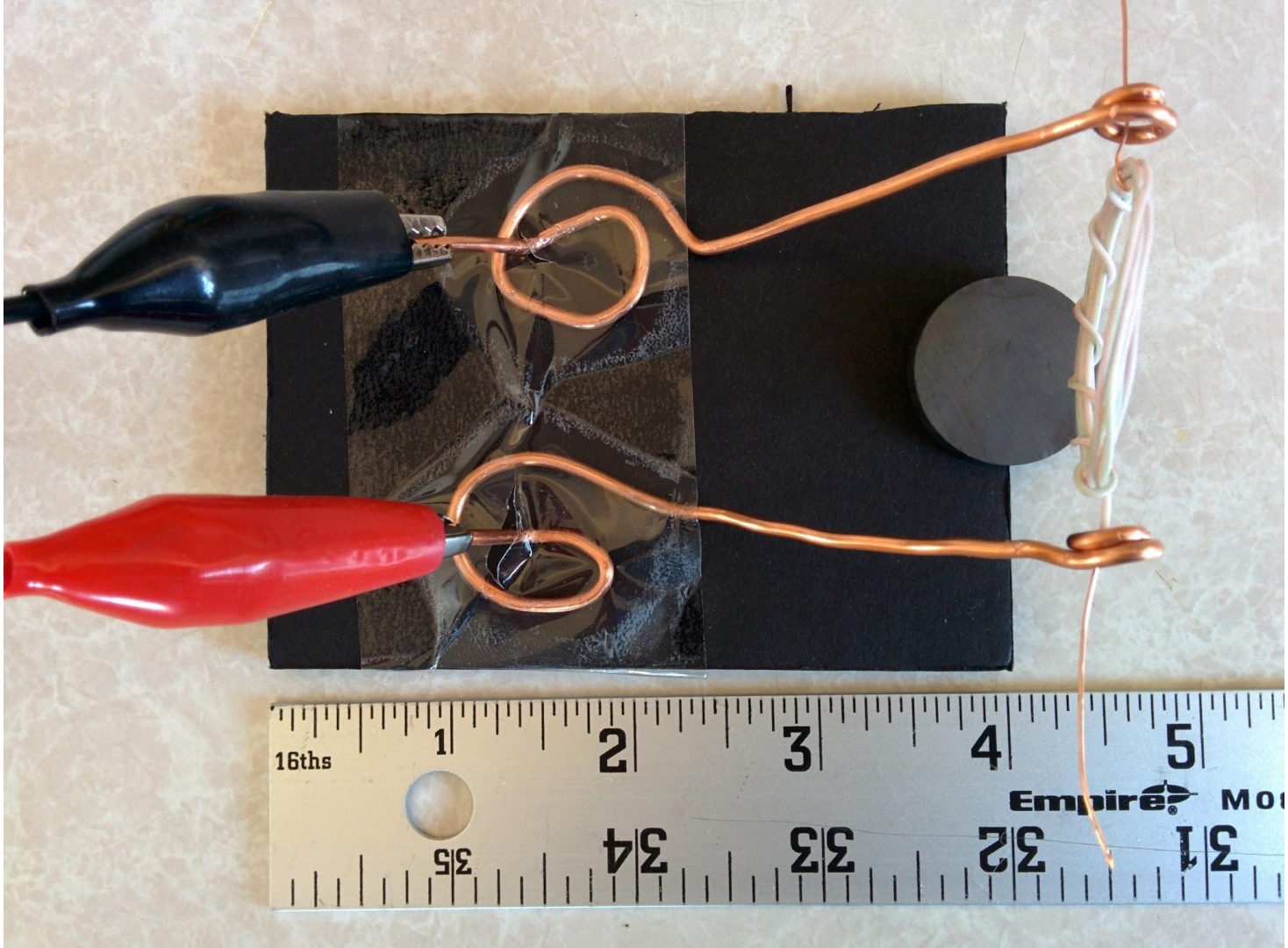


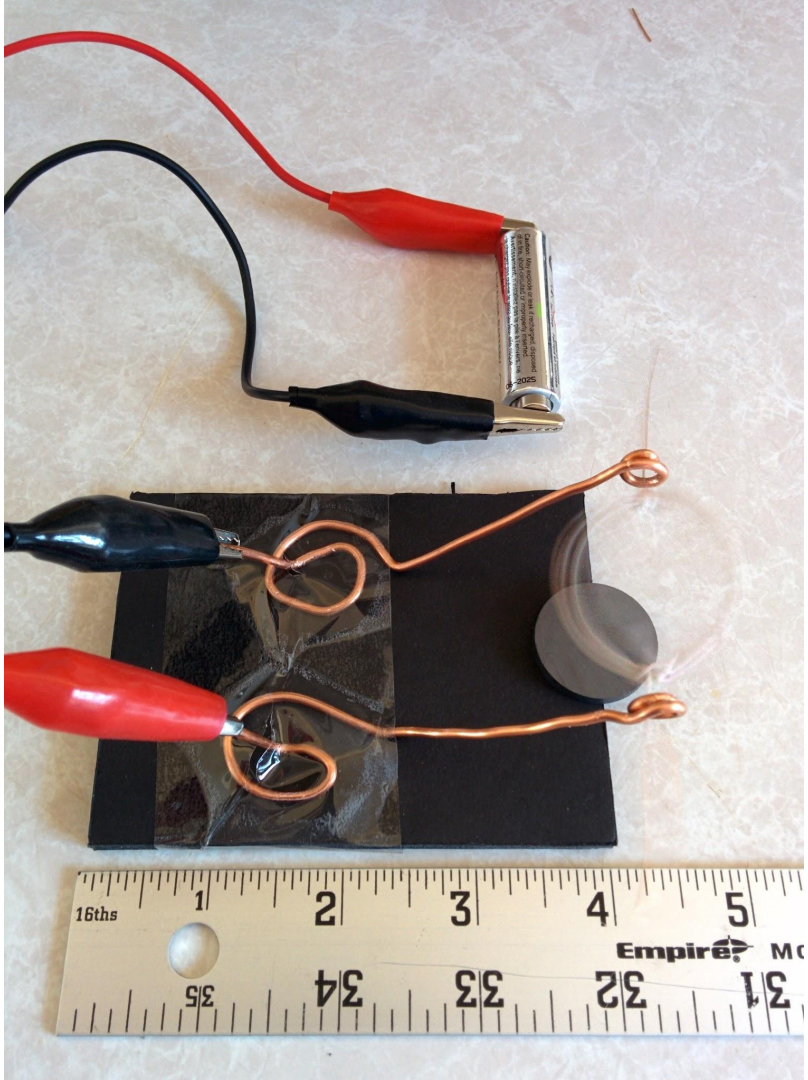
#16


EU
No mercury added
Caution: May explode or leak if recharged

#17

#18

#19



3
4
5
Empire
Mode
33
32
31

Wireless LED

Projects: Wireless LED

Light an LED using electromagnetic induction.

Materials

- 24 gauge insulated wire.
- 2n222 transistor
- Soldering Iron/Solder
- 3v LED
- 3v coin battery