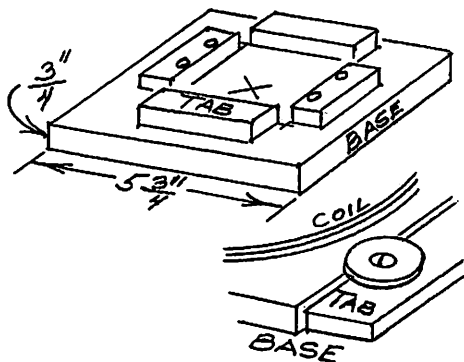


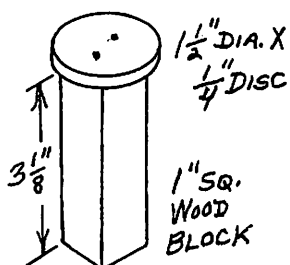
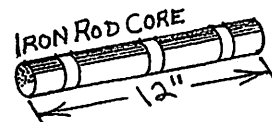
The Ring Flinger - The original Thomson (Dr. Elihu) apparatus provided a series of classic demonstrations in electromagnetism. This apparatus is a simplified version using today's available materials. The air core solenoid\* required may be used for a dozen other demonstrations. Be assured, this electromagnet is well worth constructing.

Materials: air core solenoid, welding wire (rod), shop wood, hardware, transparent plastic tubing, masking tape, AC switch box with circuit breaker, patch cord, Johnston alum. ring\*\*

Construction: (a) Base - Cut  $\frac{3}{4}$ " plywood or pine  $5\frac{3}{4}$ " square and 4 tabs,  $2\frac{3}{4}$ " x  $\frac{3}{4}$ " x  $\frac{3}{16}$ ". Place solenoid on end in center of base; mark position of tabs along the edges, apply glue (Elmer's?), and nail down with brads. With 4 washers and #8 x  $\frac{3}{4}$ " woodscrews, position washers so they overlap the edge of the solenoid's base. Mark and drill screw holes. Screw down the solenoid in place; everything should fit tight.



(b) Core - Buy "mild & low alloy steel welding wire (rod), 3 ft. long, cut to 1 ft. lengths. If  $\frac{5}{32}$ " dia. is used, core requires 74 rods or 25 - 3 ft. rods. Bundle the 74 rods together with masking tape.



(c) Spacer - Make a wooden spacer  $3\frac{3}{8}$ " long that will just fit inside the solenoid core. Glue and nail a masonite top (disc) to the wood block (round its corners to fit?).

(d) Insert the bundle of rods in the core. Place an 8" long piece of thin transparent plastic tubing (a sheath) over the iron core. Place the Johnston ring over the sheath and iron core. Connect the patch cord to the solenoid's terminals. With the AC switch box unplugged from the AC source and its switch in the "off" position, plug the patch cord into the switch box. Now everything is ready for 120 V.

Warning! This is a 120 V system. Observe all safety precautions. Keep unplugged until all adjustments are made; unplug when not in use. Tape over exposed terminals. This apparatus was designed for experienced teachers. You must add safety features for student use, and you must supervise them.

Presentation: (a) Plug into the AC source. Turn the switch "on"; the ring will pop up and "float" in the electromagnetic field and obey Lenz's Law. Don't leave the switch on long because of overheating the coil's insulation (damage!).

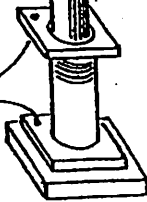
(b) Pull the sheath off and the iron core out of the coil. Insert the spacer, and reinsert the iron core without the sheath. Replace the ring over the iron core. This time when you throw the switch "on", the ring will "explode" upward, high into the air; be ready to catch it! Immediately turn off the switch or the coil will overheat and be badly damaged (ruined?!). Do not repeat many times in a row; the coil must have time to cool off. For more fun, tip the apparatus to a  $45^\circ$  angle and "shoot" the E-M "cannon"; prepare to catch the ring in a cardboard box, etc. to prevent damage to it. A review of 2-D motion? Obviously, this demo is a student favorite.

\* air core solenoid #14825 - Science First (207) 701 - 8111 [www.sciencefirst.com](http://www.sciencefirst.com)

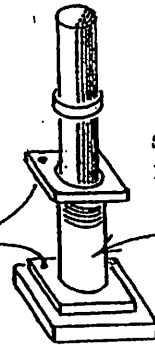
\*\* Contact The Faraday Center.

(motor effect)  
all  
550  
turns

transparent sheath  
over core



Extend  
core.



spacer  
inside

3 3/8"  
long

the E-M "cannon"

