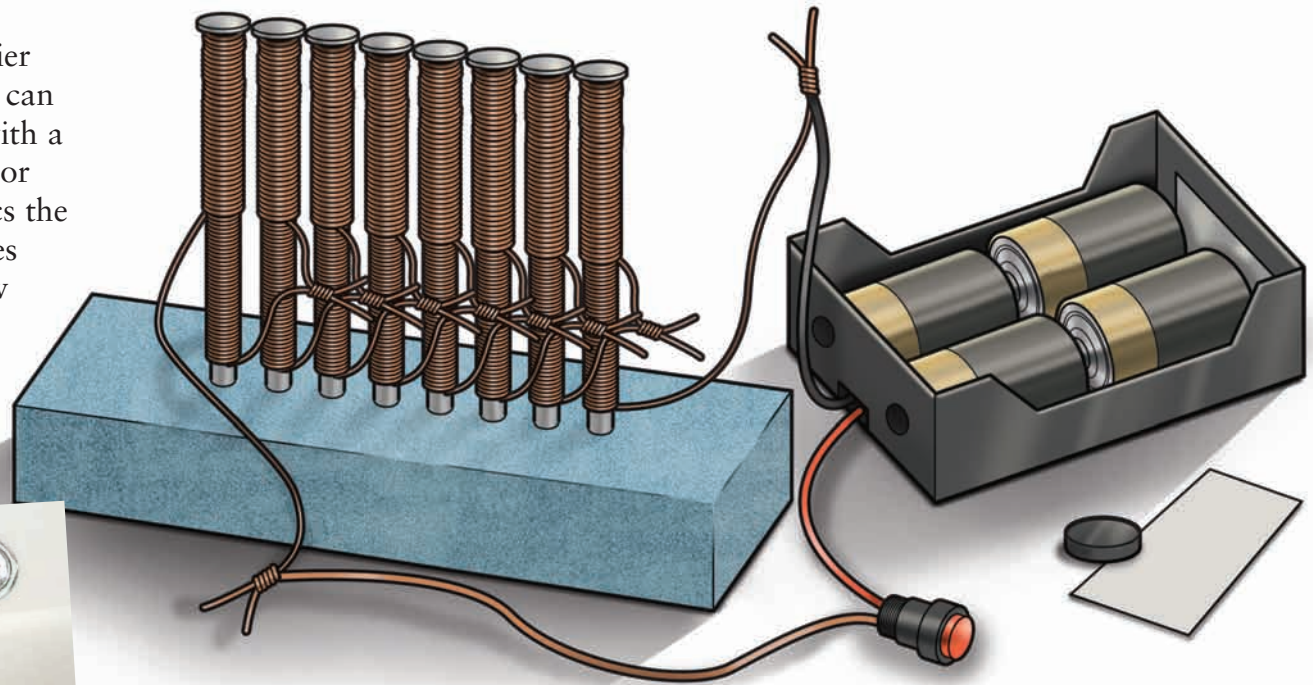


Project #4: MAKE A MAGLEV TEST TRACK

By repeating the build of the magnetic field experiment earlier in the book (see page 25), you can create a model maglev track with a miniature “train.” This setup, or array, of electromagnets mimics the effect of the real coils and wires found along a full-scale maglev track.



YOU WILL NEED

- a small disk magnet
- white glue
- 10 cm (4 in.) strip of paper
- electrical tape
- 8 or more iron nails
- 50 m (164 ft.) varnish-insulated wire, 22- or 24-gauge
- sandpaper
- an electric drill (optional; see train-building tip on page 32)
- a block of Styrofoam
- 4 D-cell batteries
- a battery holder to accommodate 4 D-cell batteries
- a simple push-button on/off switch

Expert interview

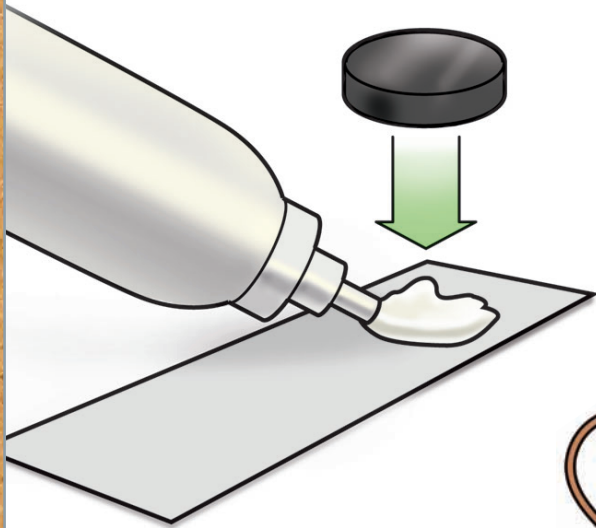
“Watch how softly your magnet hovers over your homemade ‘track.’ I’m always amazed at how smooth the ride is when I step on a maglev train. Generally, the force you feel when the train gets moving is gradual, about 0.1 G. Because of this, riding on a maglev like the one in Shanghai feels less like a train and more like being on a passenger jet at cruising altitude.”

— Laurence Blow, President, MaglevTransport, Inc.

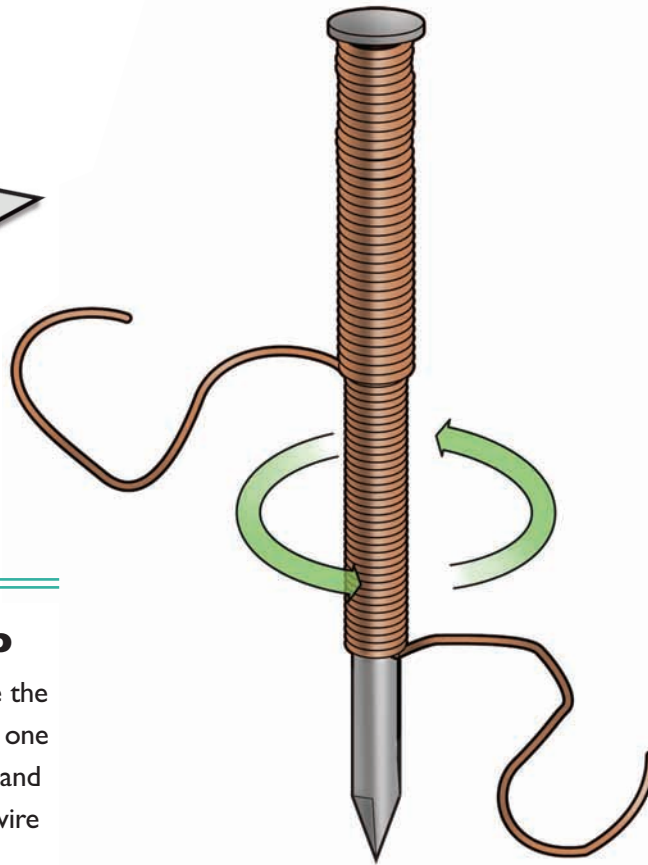


INSTRUCTIONS

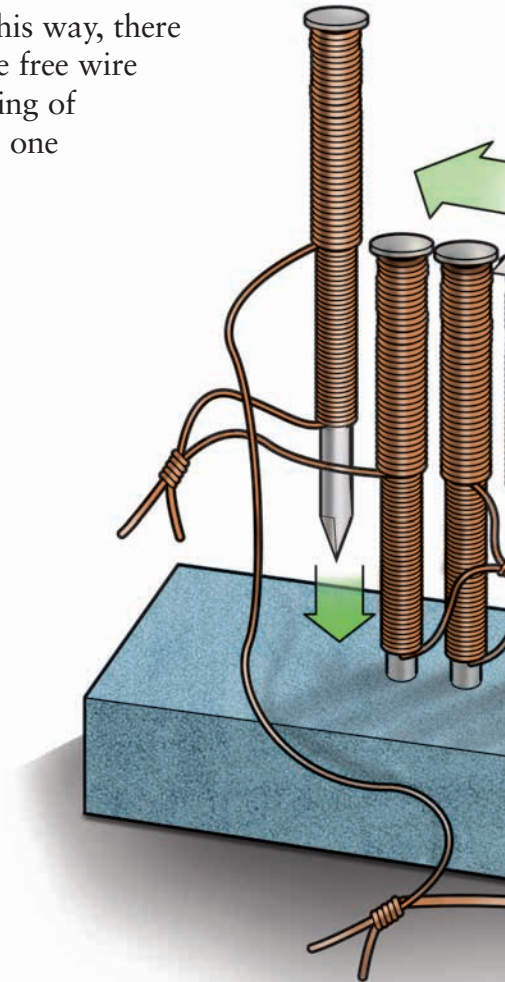
1 Glue the magnet to the paper and set aside to dry. (The strip of paper is used to guide the magnet over the “track.”)



2 Assemble eight electromagnets (like the one created in project #3) by tightly coiling wire up each nail and halfway back down. Leave 2.5 cm (1 in.) at the point of the nail bare, and leave at least 5 cm (2 in.) of wire free at each end. Sand the varnish off each wire end.



3 Plunge each nail–wire assembly into the Styrofoam. The nails should stand in a straight line, close enough so that their heads almost touch. Twist together the top wire on the first nail and the bottom wire of the nail next door. Apart from their wires, the nails should not touch. Once you have connected each nail with its neighbor in this way, there should be one free wire at the beginning of the track and one at the end.

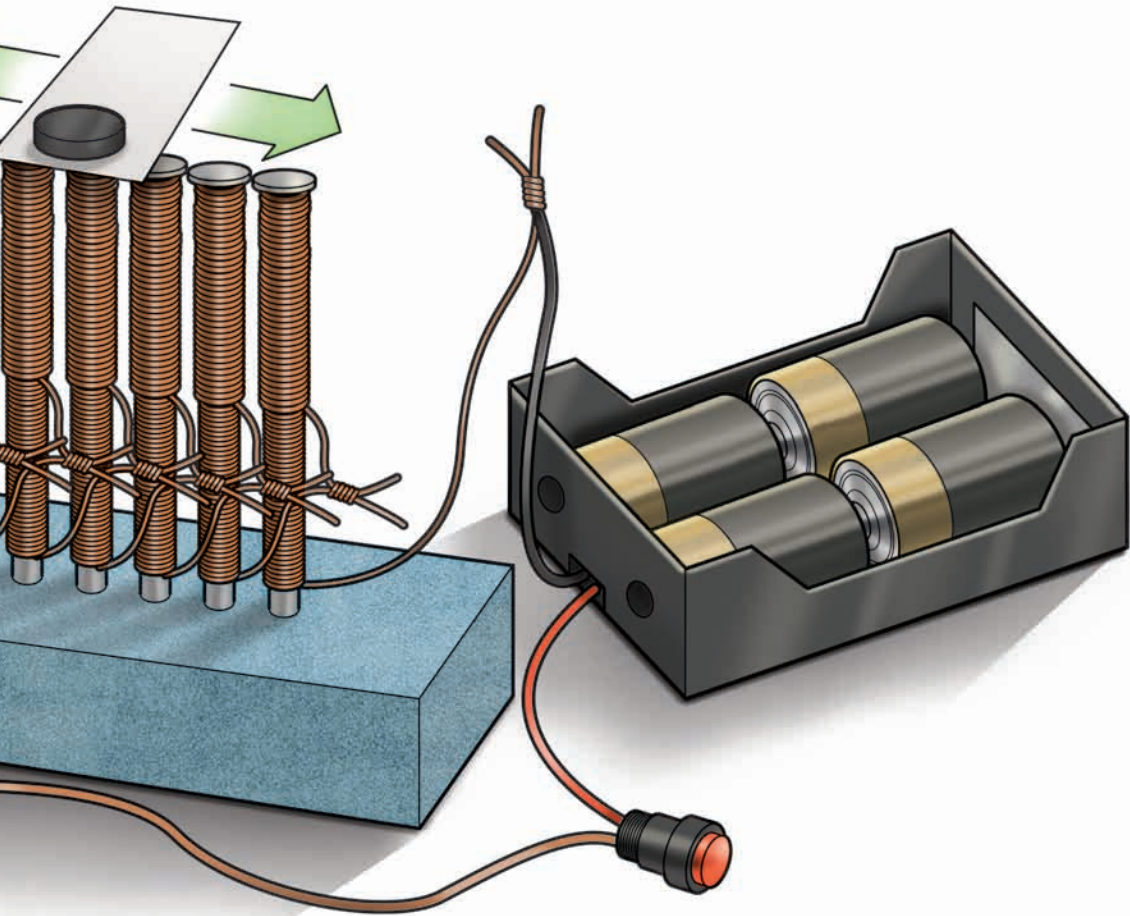


Train-building tip

To quickly wind wire around a nail, place the nail in the chuck of an electric drill. Tape one end of the wire near the tip of the nail, and with an adult’s help, carefully wind the wire up the whole nail, then back halfway, guiding it with your hand.

4 Twist the free wire at the beginning of the track with one of the two battery-holder wires. Connect the other battery-holder wire to one of the push-button prongs. Then connect the free wire at the other end of the track to the other push-button prong.

5 Fit four D-cell batteries together in the battery holder. Switch on the power and hold the magnet above the track, using the paper to guide the magnet back and forth as it floats. Be careful not to let your magnet slip off the track. A derailment here is a constant possibility. No pressure! Just imagine the challenges of keeping a real train on track ...



In this basic model, a simple push-button switch controls when your track is turned on to levitate. In a full-scale electromagnetic track, computers control when a train levitates and by how much. They also keep the train balanced as it glides over the electromagnets. Think of how many calculations per second a real maglev rail system must have to make in order to give passengers a fast, safe ride!