



SLINKY® EXPERIMENT #167:

# ELECTRIC BELL KIT

Make a Working  
ELECTRIC BELL, BUZZER  
and TELEGRAPH!

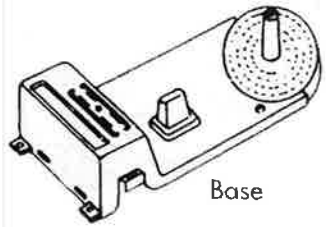


AGES  
**8**  
AND UP

fun & fact manual

**WARNING:**  
CHOKING HAZARD - Small Parts.  
Not for Children under 3 years.

## WHAT'S IN YOUR KIT



Base



Bobbin



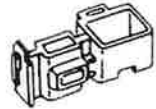
U-Bracket



Plastic Support



2 Plastic Battery Straps



Magnet Holder



Contact Adjusting Screw



4 Battery Terminals



Magnet Wire



Sandpaper



Bell



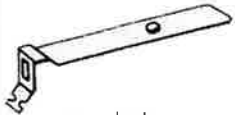
Screw



Screwdriver



Compass Needle



Metal Flipper



Bell Hammer



Paper Clip

### Pushbutton Parts



Pushbutton



Cover



Spring



Contact



2 Contact Terminals

## BEFORE YOU BEGIN

With this Minilab, you can make all of the following things:

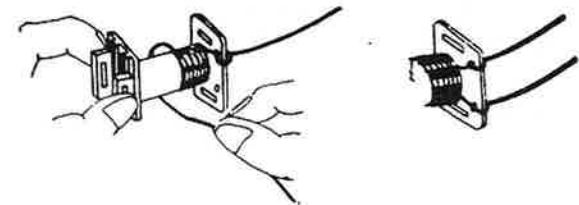
*an electromagnet*  
*a telegraph key*  
*a buzzer*  
*a bell*

You should build and test all these things in the order they are given in the instructions:

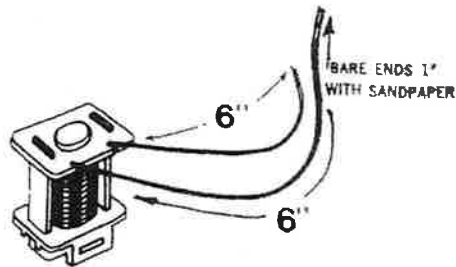
Before you begin, you should have on hand a new D-cell battery, either an ordinary flashlight battery or the longer-lasting (but more expensive) alkaline power cell.

## MAKING AN ELECTROMAGNET

1. Unwrap the end of the magnet wire from the coil. Cut off ONE 8-inch piece to be used later.
2. Remove the metal U-bracket from the plastic bobbin.
3. Take the coil of wire. Loop one end TWICE through one of the small round holes in the bobbin and pull it tight, leaving 6 inches sticking out. Wrap the rest of the wire tightly and evenly around the bobbin as in the drawings below. When you come to the end of the wire, leave another 6 inches. Loop the end through the other small hole twice and pull tight.
4. Bare the ends of the magnet wire for about 1-inch with the sandpaper. (Fold the sandpaper in half around the wire, and pull the wire through several times.) This scrapes off the plastic film that covers the wire, and leaves bright shiny copper.



5. Replace the metal U-bracket from underneath the bobbin, so that the whole thing looks like the drawing below. Your electromagnet is now complete.



### TESTING THE ELECTROMAGNET

Hold the two bare ends of the electromagnet wires firmly against the two ends of your battery. Your electromagnet is now working. You should be able to pick up small pieces of metal parts of this kit.

(If your electromagnet doesn't work, check for each of the following: both wire ends scraped clean; U-bracket properly inserted; using correct end of magnet to pick things up; and, most importantly, wires held firmly against ends of battery).

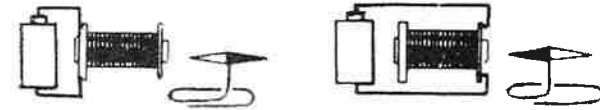
The electromagnet works for a very simple reason. Whenever electricity flows through a coil, the coil becomes a magnet. The metal U-bracket and the metal plug at the center of the bobbin just concentrate the coil's magnetism and make it stronger.

What happens when electricity stops flowing through the coil? Try this experiment. Use your electromagnet to pick up the bell hammer. Then take one wire away from a battery end. Electricity is no longer flowing through the coil. What happens?

Now do this experiment. Remove the U-bracket from the bobbin. Bend out the inside end of the paper clip so that this end points straight up when the clip is placed on a table.

Balance the compass needle on the end of the paper clip. Hold the wires against the battery and slowly bring one end of the bobbin close to the compass needle. Either the painted or bare end of the

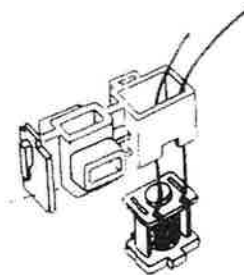
needle will point to the metal end of the bobbin. Now do the same, bringing the opposite end of the bobbin toward the magnet. Notice one side of the bobbin attracts the painted needle; the other side attracts the bare needle. If you switch the battery around, you will be able to change which side attracts the painted needle.



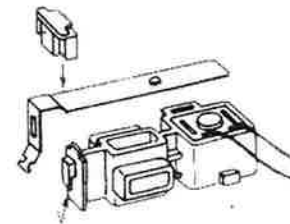
Replace the U-bracket in the bobbin. Remember, the end of the bobbin out of which the wires comes is the OPEN end of the U-bracket.

### MAKING A TELEGRAPH KEY

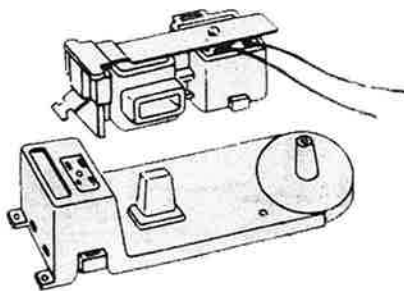
1. Insert the electromagnet assembly into the magnet holder as in the drawing below. If it does not fit in the notches, turn the bobbin around.



2. Put the metal flipper onto the magnet holder. Hook the plastic pimple on the end of the magnet holder into the hole. Slip the blue plastic support over the metal flipper to hold it in place.



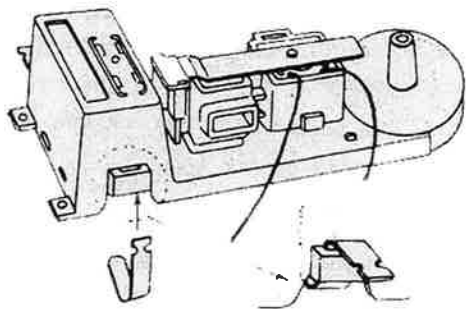
3. Mount the magnet holder assembly onto the base as shown in the drawing.



Now test your partly assembled telegraph key by touching the electromagnet wires to the ends of the battery. When you make contact with both ends of the wire, the metal flipper should be pulled down. You should be able to make the flipper click on and off by holding one wire against one end of the battery and tapping the other end of the battery with the other wire.

### ASSEMBLING THE BATTERY

1. Place the battery terminals into the slots at each end of the battery holder, as in the drawing below. Bend the outside tabs out as shown. (Your kit comes with 4 battery terminals. Put the other two aside for use later.)

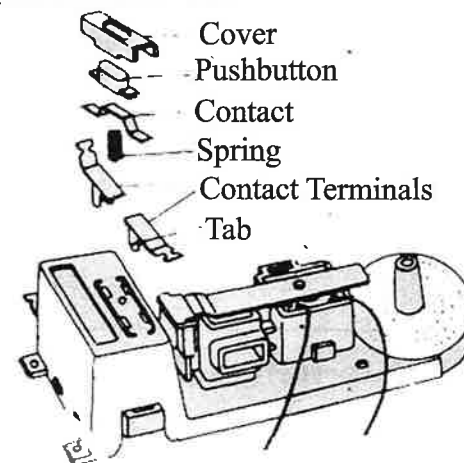


2. Now, turn the base over and drop the battery into the battery holder. Make sure the battery terminals press firmly against both ends of the battery. If they don't, bend the terminals out until they do. Then slide in the battery straps into four slots under the holder.

3. Turn the base right side up. Test by touching the two terminals with the two wires. You should be able to make the flipper click just as you did before. If not, check your battery terminals. They may not be tight against the battery.

### ASSEMBLING THE SWITCH

Look at the drawing below. Then follow the step-by-step directions to assemble the pushbutton switch.

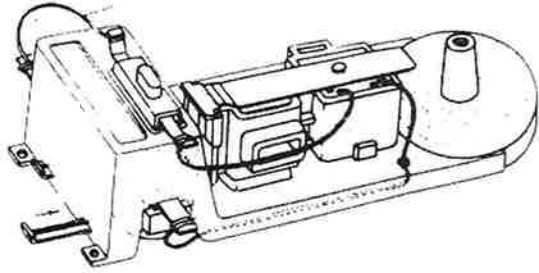


1. Put the contact terminals on top of the battery holder. Be sure they face in the correct direction, as in the drawing. Use the eraser end of a pencil to bend the metal tabs underneath the plastic battery holder to secure the terminals.

2. Place spring on the plastic pimple. Take pushbutton cover, pushbutton and contact and mount onto plastic battery holder. The sides of the cover fit into the holes on the battery case. Bend the end tabs of the contact terminals up and over the top of pushbutton cover. Press the pushbutton a few times to see that metal contact touches the bottom contact terminals and that the spring returns the pushbutton.

3. Connect the two bared wire ends as follows. The wire FARTHER from the pushbutton is connected to the BATTERY terminal located on the CLOSER to the pushbutton. Connect the other wire from the bobbin to the PUSHBUTTON terminal as in the drawing below.

... piece of enamel wire from the 8-inch piece we've been saving from before. Bare both ends one inch with sandpaper. Connect one end to the unused pushbutton terminal in the back. Connect the other end to the free battery terminal. Be sure that no tab has more than one wire attached to it.



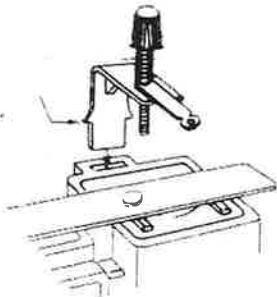
Now, tap on your pushbutton. The metal flipper should tap as before. If it doesn't, check all your connections. One is probably loose.

### International Code

A... B... C... D... E... F... G... H... I... J...  
 K... L... M... N... O... P... Q... R...  
 S... T... U... V... W... X... Y... Z...

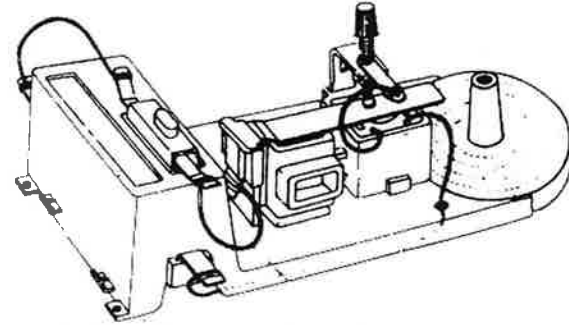
### MAKING A BUZZER

1. Place the contact adjusting screw onto the magnet holder.



2. Disconnect the wire from the bobbin to the pushbutton terminal and reconnect to the metal terminal of the adjusting screw.

3. Take the other 4-inch piece of wire. Sandpaper the ends as before. Connect one end to the tab at the end of the metal flipper. (You will probably have to remove the magnet holder to get at this last connection.) Connect the other end to the pushbutton terminal.



4. Press the pushbutton down and keep it down. With your other hand, turn the contact adjusting screw until it makes contact with the pimple on top of the metal flipper. Keep turning. You will soon hear a buzzing. Adjust the screw until you get the desired loudness position.

You may have to make small adjustments in different parts of your buzzer to get the best possible sound. Make sure all wire connections and battery connections are tight. You may want to change the fit of the electromagnet in the magnet holder and the U-bracket in the bobbin. All these parts can be delicately adjusted up or down to give the best sound.

### MAKING A BELL

1. Remove the magnet holder from the base and disconnect the wire at the end of the metal flipper.

2. Remove the contact adjusting screw (but don't disconnect it) and remove the metal flipper.

3. Replace the metal flipper with the bell hammer. Hook the hole in the hammer over the hook on the magnet holder, and then hold the

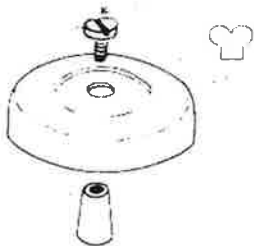
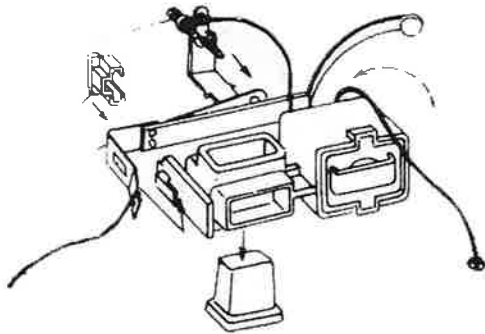
hammer in place with the plastic support. Be careful not to bend any part of the hammer as you put it on.

4. Connect the loose wire from the pushbutton terminal to the terminal at the end of the bell hammer. Make sure the connection is firm and tight.

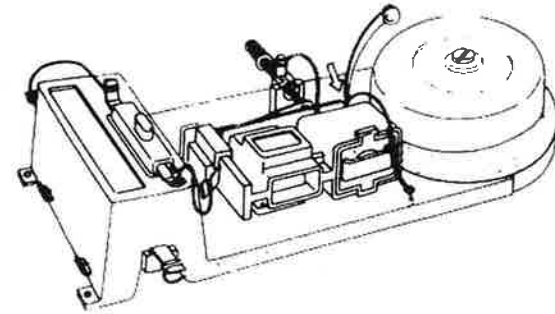
5. Replace the contact adjusting screw on the magnet holder. Unscrew the screw so that it does not touch the small metal pimple on the bell hammer.

6. Replace the magnet holder on its side onto the base, as shown in the drawing.

7. Place the metal bell on the plastic post on the base. Screw in the metal screw with the screwdriver.



8. Push the pushbutton down and hold it down. Now adjust the contact adjusting screw as you did before until your bell rings.



You should make a few small adjustments to get the best sound out of your bell. Squeezing down firmly on the blue plastic support that holds the hammer to the magnet holder sometimes improves the sound. You can also adjust the fit of the contact adjusting screw in the magnet holder. Play around with these adjustments. Don't bend anything except as a last resort. If nothing seems to work, the problem is probably a loose connection. Even holding the bell in different positions can change its sound.