

## CLIMBING ARC CATALOG # GS-411

**WARNING:** The experiments or demonstrations described in these instructions may involve hazards from careless handling or incorrect procedures. This equipment should be used only under the guidance and supervision of a qualified and certified science teacher.

This design of Climbing Arc, often called a Jacob's Ladder, incorporates the necessary high-voltage, high-frequency power supply. It is ready to operate, as received, from the 115 volt 60 Hz wall outlet.

When power is first applied, there will be a stationary arc between the electrodes, down low where the gap is smallest. In ten to twenty seconds, heat will build up in the arc horns and cause a rising air current. **BE SURE TO REMOVE THE CORK FROM THE UPPER COVER PLATE.** The arc will then begin to rise up between the electrodes, following the rising heated, ionized air. It will extinguish itself near the top where the arc length becomes longer than can be supported by the available voltage. As soon as an arc is interrupted at the top, a new one strikes at the bottom and the cycle repeats. The arc is essentially a short circuit across the power supply, so there can never be more than one active arc.

During operation a small amount of nitrogen and oxygen will combine in the direct path of the arc to form one or more of the many oxides of nitrogen. If the gas in the column is aspirated through some distilled water, the water will then test out as a weak acid. Nitrogen is returned to the earth when lightning creates these oxides on a much grander scale and they are brought down with the rain. A section of glass tubing for this purpose, bent to shape and fitted with a cork, is included.

The arc horns are made of stainless steel. After many hours of operation it may be desirable to remove some of the oxides which have formed on the surface of the rods. Light rubbing with 400 grit sandpaper or a Scotchbrite pad will do the job.



Be careful not to dislodge the arc horns from their factory pre-set positions. Some permanent discoloration of the horns may occur due to the heat, but this will not be detrimental to their operation.

Whenever necessary, the protective tube may be cleaned with soap and water. Unplug the unit from the wall outlet and then remove the tube by loosening the three holding screws in the cast aluminum collar. Do not use any type of abrasive cleaner as the plastic will be scratched.

Should it ever become necessary to re-adjust the arc horns, careful positioning is required. The gap at the bottom should be set to 2.5 mm while the spread at the top must be at least 35 mm and less than 50 mm. The top spread must not be so large that the arc horns touch the inside wall of the plastic column. The minimum spread is to assure that the arc will extinguish itself at the top.