5. With your eye close to the grating, observe the first-order spectra. Move the grating forward or backward as required so that the entire spectrum appears on each side of the scale. Place a bent paper-clip rider on the scale at the point in each first-order spectrum where the yellow light is the purest. Adjust the grating and slit scale by rotating the grating around its vertical axis so that the two yellow points end up equidistant from the source slit. Reposition the riders if necessary.

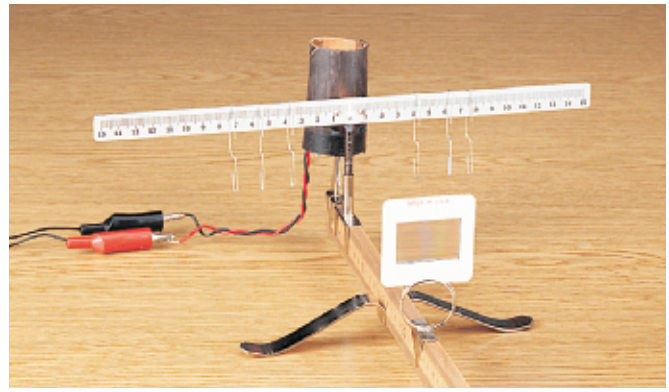

Figure 1

Step 3: Use the cardboard to make a shield around the light source. Make sure the light is directed through the slit.

Step 4: From above, the slit scale should form right angles with the meterstick. Measurements can be strongly affected if the equipment is moved even slightly during the procedure.

Step 5: Place a bent paper-clip rider to mark the position of the images on the scale.

6. Use the scale to measure the distance from the slit to each rider to the nearest millimeter. Record these distances in your data table as *Image 1* and *Image 2*. Also measure the distance from the slit to the grating. Record this distance in your data table as the *Slit (m)*. Record the order number and the image color.

7. Next, adjust the grating and slit to find the clearest first-order continuous spectrum. Measure and record the distance from the slit to the grating. Place a rider on the scale at the point in each first-order spectrum where you see the extreme end of the violet spectrum. Measure and record the distance from the slit to each rider.

8. Repeat step 7 for the extreme red end of the spectrum. Record all data.

9. Clean up your work area. Put equipment away safely so that it is ready to be used again. Recycle or dispose of used materials as directed by your teacher.

ANALYSIS

1. **Organizing Data** Use your data for each trial.
   - a. For each trial, find the average image position.
   - b. Use the average image position and the distance from the slit to the grating to find the distance from the grating to the image for each trial. (Hint: Use the Pythagorean theorem.)
   - c. To find sin θ for each trial, divide the average image position by the distance found in (b).

CONCLUSIONS

2. **Drawing Conclusions** For each trial, find the wavelength of the light using the equation $\lambda = \frac{d\,(\sin\theta)}{m}$, where λ is the wavelength of light (in meters, m), d is the diffraction-grating spacing (1/[number of lines/m]), and m is the order number of the spectrum containing the image.