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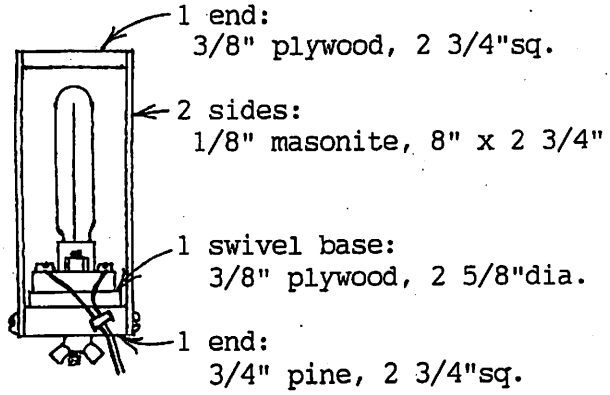
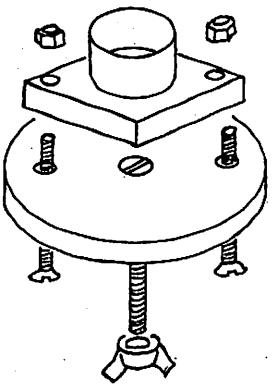
Sunspots or relative temperatures and colors on the sun's surface.

When high energy flares occur on the sun's surface, they carry away large amounts of energy from that location, leaving the area much cooler or at a lower temperature. With the lower temperature, the color of the location usually goes from white hot to red hot. The cooler, "darker" location is called a sunspot. In modern telescopes with special solar filters, the spot appears dark gray against the light background of the sun's surface. With a simple piece of apparatus, we can simulate these dark gray sunspots using similar temperature differences like those on the sun. An overhead projector (OHP) provides the white light of the normal sun's surface. A clear, straight-filament, incandescent bulb with a dimmer switch provides the cooler, red light of the sunspot. The diagrams below illustrate the apparatus design; alter the design as you see fit. Of course, the apparatus has two open sides.

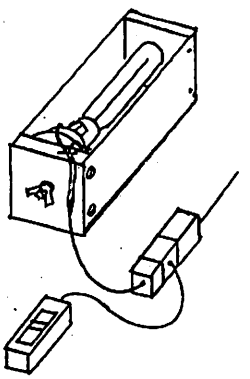
Warning! This is a 120 V system. Observe all safety precautions. Keep unplugged until all adjustments are made; unplug when not in use. Tape over exposed terminals. This apparatus was designed for experienced teachers. Only a 25 W bulb is necessary.

Diagram:





#6 x 32 lock nut
socket
2 5/8" dia., 3/8" plywood
#6 x 1" FH bolt
#8 x 1½" FH bolt
#8 x 32 wing nut



Materials: 1 med. base #9063 Leviton pony cleat lampholder, 1 #TBI03 Leviton plug-in lamp dimmer switch, 30" #18 lamp cord wire, 1 male plug, 3 FH bolts, 2 lock nuts, 1 wing nut, 4 #6 x 5/8" PH screws, 3/4" pine board or plywood, 3/8" plywood, wire restraint (staple?)

Assembly of bulb holder: (a) Cut out the two side pieces and two end pieces.
(b) Mark the center and cut out the 2 5/8"dia. x 3/8" plywood socket base. Drill and countersink an 11/64" hole in the center for the 1½" x #8 FH bolt.
(c) Center the socket on the plywood base and mark and drill (countersink) the two 9/64" holes for the two 1" x #6 FH bolts.
(d) Center the plywood base on the pine end, mark and drill the 11/64" hole for the #8 FH bolt.

Explanation: Why the extra work to make a swivel socket base? You want the straight filament in profile for best viewing; this rarely happens when one of these bulbs is screwed into its socket. Thus, you must swivel the bulb and socket for proper alignment. Remember to leave enough slack in the wire leads for the swivel action.
(e) Final assembly. Glue and nail (brads) the two masonite side pieces to the 3/8" plywood end piece. Pre-drill and screw (no glue!) the masonite side pieces to the 3/4" pine end with four #6 x 5/8" PH screws.
(f) Wire the socket with the #18 lamp cord and apply the staple or strain release. Attach the male plug.

Presentation: With the OHP turned on, center the apparatus on the OHP stage; bring the filament into sharp focus. Remove the apparatus and turn the filament on fully via the dimmer switch; show it to the students. Place it back on the stage. Does the filament blend in (become invisible)? Now slowly dim down the filament until it appears as a dark gray line. Turn off the OHP. Is the filament still on, glowing with a dim red color? It should be, or you have dimmed it too much. Practice. Remember that solar filters generally reduce sunlight to 1/10,000 ; thus, the red sunspot is reduced to almost black by these filters. This demonstration is yet another comparison of relative temperatures and colors. This observation by Galileo some 400 years ago led to more knowledge about our sun.