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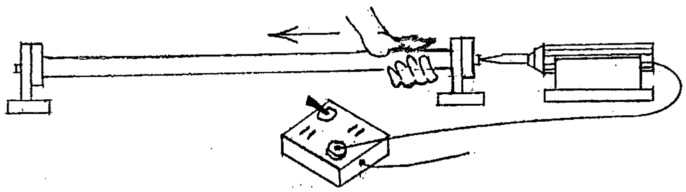
Elastic light - Is light really elastic? If you perform this demonstration properly, you can certainly make it appear that way. Although in the end, it is a trick, an important lesson in grounding will be learned, one that goes all the way back to 1750, to Ben Franklin and his early studies of lightning and electricity.

A hand-held Tesla coil, a 4 ft. fluorescent tube, an outlet box with an easy on-off switch, clamps, and holders for the tube and coil are required. Recommended first, see "The hand-held Tesla coil" elsewhere on this website. Because the tube must be "isolated" (insulated) from the ground, tube holders are required. Suggested holders will be explained.

Diagrams: The apparatus set-up.

1.



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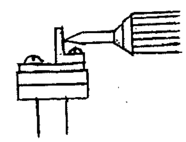
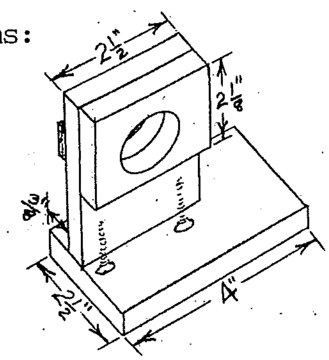


Notice that a long table space is required (1.). To shorten it, however, requires only a small piece of 1/16" angle alum. added to the "Tesla" holder so the coil can make contact at a right angle with the tube (2.). An outlet box with an easy on-off switch is required because the popular hand-held Tesla coil lacks such a switch. The holders are mostly made of 3/4" pine. They were made to dovetail with my Tesla coil holder (tower). Make any design changes to meet your specific needs.

Diagrams:

3.



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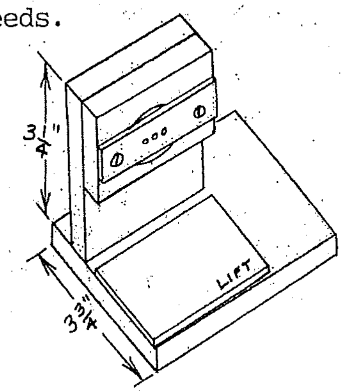

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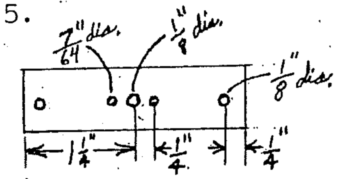
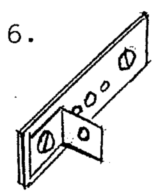


6.



Construction: The bases of the two tube holders are extended to accommodate clamps for fastening to a table top. The vertical parts are double thick, two pieces of pine glued together. Cut out all pine pieces, glue the vertical pieces together, and with a 1½" wood bit, bore through the double thick pieces on a drill press. Cut out a 1/8" x 1" x 2½" piece of masonite as a backstop and glue it on across one of the openings (3.). Cut out a 1/8" x 3/4" x 2½" piece of metal (Al, Fe, or brass) as an electrical contact plate that accepts the Tesla coil's tip and the tube's two prongs. Follow the diagram (5.) for hole sizes and spacing. Attach the plate with #4 x ½" PH screws (4.). With two #6 x 1 5/8" coarse thread drywall screws each, fasten the base and vertical pieces together. My "Tesla" holder required a ¼" lift (piece of ¼" masonite), 2" x 2½" for proper alignment. Add the 1/16" angle alum. as shown(6.).

Presentation: Carefully set up the apparatus. Exact timing is essential in performing this demo correctly; practice! With a large rubberband, illustrate the rubberband's elasticity by stretching it back and forth and asking what would happen if you stretched it too far. Is light able to show the same characteristics and/or behavior as the rubberband?

Stand behind the apparatus with one hand wrapped around the tube's "Tesla" end; keep that hand on the glass part only, not on any metal part. The other hand is on the switch and stays on the switch "unseen" (not obvious). Switch the coil on and slowly, steadily, move your hand down the tube; watch the light "stretch". Now "ease up", slowly moving (returning) your hand toward the "Tesla" end. Stop and "stretch" it out again; after a slow "back and forth" a time or two, stop and ask the question, "What if I try to stretch it too far?" Now "stretch" the light farther than ever before. All of a sudden, at the exact same time, remove your hand from the tube and switch off the coil. Like a flying rubberband, the light is gone. What just happened?

I seldom use "trick" demos, but if I do, I want some good physics to be learned in the process. In this case, it's all about grounding. An electric current is oscillating down the tube from the Tesla coil. It has to have somewhere to go or it stops. If stopped, energy is not delivered, and the tube stops operating (lighting). Your hand and you become the ground or an essential part of the circuit and the energy delivery system. Thus, the light was not "stretched". Instead, the conductivity of the tube was "stretched" so that more energy could be delivered, producing more light down the tube. Ben Franklin's kite and salt-soaked string were the ground in his famous experiment. The ion-ladened moisture in the atmosphere, like the mercury vapor ions in the tube,provided the necessary pathway of conductivity for the electron flow from the clouds. Contrary to popular belief, Ben performed his experiment <u>before</u> the lightning storm actually arrived; the air was charging up but not enough for a lightning strike, otherwise he could have been killed; others who followed him were killed. I think Ben would have loved this demo!

Addendum. Returning to the topic, "The hand-held Tesla coil" elsewhere on this website, there is an additional demonstration using the "tower" set-up with the bulb in place on top. With the coil turned on, bring a compact (twist) fluorescent bulb near the tower's bulb (7.) and watch the CF light up without a "hardwire" connection or thus, wireless!

It seems that the electric field around the tower bulb is so strong that it can convey energy through the space between the two bulbs causing the CF to light up.

Explanation. The Tesla coil is known for creating a very strong, high frequency, electric field around its tip, a field that oscillates and thus, can produce near-field radio waves. These waves accelerate the electrons and the mercury vapor ions in the bulb causing it to light up. It's similar to WiFi and cell phone transmissions.

7.