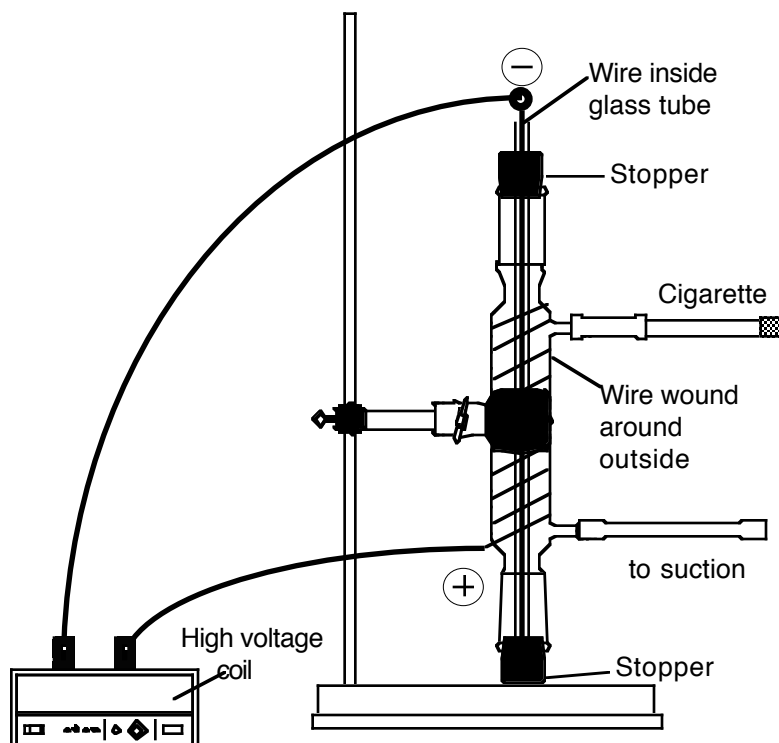


## 6. Electrostatic Precipitation of Smoke Particulates

The electrostatic precipitator (Cottrell Precipitator) is a highly efficient method for removing particulate matter from the air. Colloidally dispersed smoke particles carry a static electrical charge which causes them to repel one another thereby preventing them from coagulating and settling from the air.

The electrostatic precipitator uses high-voltage direct current to attract charged colloidal particles to a surface of opposite charge. Particles are removed rapidly and with efficiencies of greater than 99%.



**Apparatus and Procedure:** The electrostatic precipitator is constructed from the outer jacket of a 2-piece condenser. Note: The inner glass tube must be made from ordinary laboratory soft-glass or borosilicate tubing (sealed at the bottom end) and must be held in place with a 1-hole rubber stopper at each end of the condenser jacket. It is a good idea to insert the bottom (closed) end of the tube just enough into the lower stopper so that it seals the hole but so that it can be easily disconnected later. Wrap 1 to 2 meters of copper wire around the outside of the condenser jacket and fasten at the top and bottom with tape or adhesive. Leave a little wire extending away from the condenser so that an alligator clip can be attached to it. Run a

heavier gauge wire (14 or 16 gauge) through the center tube and make a loop at the top so that an alligator clip can be attached to it. Connect the negative lead from a high-voltage (10,000 volts) DC coil to the wire running down the center of the unit. Connect the positive lead from the coil to the wire wrapped around the outside of the jacket.

Use a vacuum source (this may be as simple as a squeeze bulb or a syringe) to draw smoke from the lighted cigarette into the unit. Turn on the high voltage coil. The cloudiness should disappear immediately. Be careful to avoid being zapped by a spark from the coil! While the coil is operating, more smoke may be drawn into the apparatus. It will “disappear” as fast as it enters the system. After the particulate matter from half a cigarette or so has been precipitated, the unit may be disconnected from the electricity source and the center glass tube removed. Because cigarette smoke particles or oil droplets tend to be positively charge, most of the brown “tar” will have precipitated on the negatively charged center rod. Wiping it with a tissue or paper towel will demonstrate the oily nature of this particulate matter.