The upper end of the cylinder was again made air-tight in the manner already described and was closed by a thin disc of aluminium. A platinum wire attached to the cylinder made electrical connection with the mercury and an iron wire dipping into the mercury in the receiver R connected the whole to earth.

As before, the electrode C was carefully insulated by melting sealing wax on the tube at a and a^1. To prevent conduction along the surface of the glass the part of the tube below the bulb was tightly bound with tin foil connected to earth.

The highest vacua could be obtained with this tube and the use of the ground joint gave easy access to the interior without causing any derangement of the apparatus.

When ready for use, the tube was placed in position with its lower end extending into the earth-connected metal box that contained the electrometer. The air was then exhausted through the tube F until any desired pressure was reached and the mercury raised until it made contact with the steel cylinder.

By this arrangement the Faraday cylinder consisted of the steel tube D, the mercury, and the metal box containing the electrometer, the whole practically constituting a single earth connected metallic conductor.

In the first experiments with this tube aluminium ·04 millimetres was used for the plate d. The air was then exhausted until the cathode dark space extended completely across the bulb of the tube and its walls were covered with a green phosphorescence.

With these conditions A, B and D, were in turn selected as the negative terminal of the tube, but in no case was there obtained any evidence of electrical action within the cylinder. Charges, either positive or negative, given independently to the exploring electrode were maintained without loss when the tube was excited.

The aluminium plate d was then replaced by one ·004 millimetres in thickness and the tube re-exhausted.

With B or D now acting as a cathode there was again no indication of electrical action within the cylinder, even with the lowest pressures obtainable. But, when A was taken as the negative terminal, it was found that just as soon as the walls of the tube in the neighbourhood of d began to phosphoresce, the electrode C slowly acquired a negative charge. With still lower pressures this charging became more rapid until finally with very high exhaustions a momentary discharge in the tube sufficed to charge the electrode beyond the range of the electrometer.