

1. PRELIMINARY EXPERIMENTS.

In these experiments an effort was made to work under precisely the same conditions as those selected by Professor Thomson.

The form of tube used, as already mentioned, was that shown in Fig. 1. The Faraday cylinder *D* which served as a screen for the electrode *U*, was kept connected to earth by means of a fine platinum wire passing through the tube at *E*. The plate which closed the upper end of this cylinder was made of aluminium about .04 mm. in thickness.

As glass, even for low voltages, is not a good insulator, care was taken to prevent any leak from the electrode over its surface by melting wax on the tube at *a* and *a'*. Tests made from time to time throughout the experiments showed that this insulation sufficed to maintain any charge given to the electrode when the tube was not excited.

The tube was kept connected to a mercury pump throughout the investigation and was excited by an eight inch spark length induction coil running under a tension of eight volts. The exploring electrode was joined to a quadrant electrometer and this instrument together with the connecting wire was surrounded by an earth connected conductor in order to screen off electrostatic action.

Under these conditions, it was found that on passing a discharge through the tube the electrometer indicated no action until a pressure of about one millimetre of mercury was reached. At this pressure, with the coil joined to any two of the three terminals *A*, *B* and *D*, positive or negative charges given to the protected electrode gradually leaked away. At lower pressures the electrode *C* slowly acquired a negative charge. This charge, however, did not go on increasing when the discharge was passing, but after a time reached a limiting value and then remained stationary.

With still lower pressures the same effect was observed but the value of the limiting charge increased and was more quickly reached.

With pressures so low that cathode rays could traverse the bulb of the tube, a momentary discharge sufficed, when *A* acted as a cathode, to give a deflection beyond the range of the electrometer, a value which indicated a charge of at least five or six volts.

Although this statement represents in a general way the results obtained, it was exceedingly difficult to trace uniformity in the effects. It frequently happened that the electrode *C*, instead of receiving a negative charge, received a positive one, this being especially the case when *A* and *B* were the terminals and neither connected to earth.