

other gases, a fact which certainly cannot be accounted for on the ground of its density. The present investigation was therefore undertaken to see whether this large ionization could be traced to either of the sources (1) or (3) above. As a result, it has been found that in acetylene made from calcium carbide there is present a slight trace of radium emanation, and this it has been shown accounts for the high residual ionization in the gas.

Experiments.—The gas used at first in the experiments with acetylene was taken from a commercial Prest-o-Lite tank. The ionization-chamber was made of zinc because it has been shown that this metal contains smaller traces of radioactive impurities than any other. The external dimensions of the chamber were:—diameter 11.6 cm., length 22.8 cm., and its volume was 2167 c.c. The thickness of the walls was about 3 mm. The chamber was carefully scoured with emery, and washed with dilute hydrochloric acid and water, to remove radioactive deposits. During all the course of the work the chamber was absolutely air-tight. It was provided with a zinc electrode which was connected to a sensitive electrometer in the usual manner. The wall of the chamber was kept at a potential of 240 volts, which ensured that all the currents measured were saturation currents.

The ionization-chamber was filled with acetylene which had been carefully dried and freed from dust, and the number of ions made per c.c. per second was found to be about 20. As this number was considerably less than that previously found by McLennan and Treleaven, the zinc Wolf electrometer (Pl. X. fig. 1) used by them was filled with acetylene from the Prest-o-Lite tank, and the number of ions made per c.c. per second was found to be only 12. The difference between this number and that found with the zinc ionization-chamber was probably due to a radioactive impurity in the walls of the latter. It was thought that the low value of the ionization was due to the commercial acetylene not being pure, and to test this some acetylene was made in the laboratory from calcium carbide, and both the Wolf electrometer and the zinc ionization-chamber were filled with it. The number of ions made per c.c. per second (n) was measured at intervals during a period of about 19 days. The following set of readings was obtained with the Wolf electrometer, and a similar set with the zinc ionization-chamber.