

The only experiments which have been made hitherto on the mobilities of ions in air at high pressures appear to be the ones made by Dempster¹ and those made by Kovarik².

In his work Dempster used pressures to as high as 100 atmospheres and he found that over the range from one atmosphere to this limit the mobility of the positive ion made in air by alpha rays varied inversely as the pressure. He found, however, that the mobility of the negative ion at the higher part of the range did not appear to vary inversely as the pressure; but it decreased less rapidly with the pressure than it should have done if the inverse pressure law had been valid. Kovarik in his experiments, on the other hand, worked with pressures from 13.3 to 74.6 atmospheres and over the whole of this range he found that the mobilities of both positive and negative ions made in air by alpha rays followed the inverse pressure law.

In the present investigation the mobilities of the two kinds of ions were measured in air over a range of pressures commencing at 66.86 atmospheres and extending to 181.5 atmospheres. At the lower pressures of this range the mobilities obtained agreed with the results of Kovarik; but at the higher pressures it was found that the mobilities of the two kinds of ions began to approach each other in value and both decreased less rapidly with increases in pressure than they should according to the inverse pressure law.

II. APPARATUS.

In making the measurements the apparatus shown in Fig. 1. was used. AB was a thick circular plate of brass about 8 cms. in diameter, into which a polonium-coated copper plate CD was inserted. GH was a circular plate of brass 2 cm. in diameter and EFKL was a circular guard plate surrounding GH. The plate GH was held firmly in position with ebonite supports, with its lower face flush with that of the guard plate EL. The upper face of CD, which was the one coated with polonium, was also flush with the upper face of the plate AB, into which it was inserted. The plate CD was square and has an area of 16 sq. cm. The plates GH and EL were kept at a distance of 1 cm. from the upper face of AB by means of ebonite supports. The clearance between GH and the guard plate EL was less than one-half a millimetre.

When this ionisation chamber was in use, it was placed in a strong steel cylinder which had a capacity of about 1.5 litres. The guard plate was electrically connected to the steel chamber, which was itself kept joined to earth. One terminal of a battery of small cells

¹Dempster. *Phys. Review*, Vol. XXIV. No. 1. Jan. 1912, p. 53.

²Kovarik. *Proc. Roy. Soc. A.* Vol. 86, 1912, p. 154.