INTRODUCTION.

SINCE so many questions, relating more or less directly to the main one, are involved in the progress of the proper discussion of the chief subject, and since the field is so very broad, it became necessary to select from the very large number of experiments involved, those which seemed to tend more directly towards a full development of the subject. As the main question is an investigation into the effect of certain solutions of inorganic salts upon foliage leaves, and, as the intelligent answer to this question depends so largely upon the capability of leaves to absorb water and the more dilute solutions, *e.g.*, rain water, soil water and spring water, it was found necessary to investigate the matter of the absorption of water and aqueous vapour by leaves. This naturally led to a consideration of the atmospheric conditions which might, through time, give rise by adaptation to certain qualities which leaves may have acquired through ages past. Enquiry was made at the Weather Bureau at Washington, to learn to what extent inorganic salts were known to pervade the atmosphere, either in the neighbourhood of the sea or inland, but it was found that, so far as America was concerned, no work of any importance had up to the present been done. The investigations made in Europe were too general in character to apply directly to the subject under discussion. This made it necessary to investigate the matter experimentally, and a series of experiments was performed to ascertain if the salts of the sea did permeate the atmosphere without the aid of spray or winds. These experiments are described in detail further on.

Investigation was also made into the question suggested by a statement of Sachs, that distilled water which remains upon a leaf of a plant becomes alkaline.

Plants adapted to a moist climate were selected and arranged as shown in Fig. 7, the roots being supplied with nothing but distilled sterilized water and air, while the leaves were fed with a nutrient solution furnished by means of an intermittent spray. Composition of the nutrient solution:—H_2O, 1000.0 grams; KNO_3 1.0 grams; $MgSO_4$ .5 grams; $CaSO_4$ .5 grams; K_3PO_4 .5 grams; $FeSO_4$ .01 grams. The object of this experiment was to determine whether a plant could *use* a nutrient solution so applied. On account of the long