

## V.—On the Conductivity of Mixtures of Dilute Solutions.

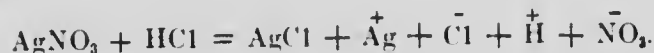
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## INTRODUCTION.

In a recent paper by Mr. E. F. Burton<sup>1</sup> some numbers are given which shew that, when dilute hydrochloric acid was added to a colloidal solution of silver, a drop in the conductivity of the solution occurred. During the course of that investigation Mr. Burton also observed a similar effect when dilute hydrochloric acid was added to a dilute solution of silver nitrate.

Now, according to the ionic theory of electrolysis, silver nitrate in dilute solution is completely dissociated into silver and nitrate ions, i.e.,  $\text{AgNO}_3$  becomes  $\text{Ag}^+ + \text{NO}_3^-$ . The same is true of hydrochloric acid in dilute solution,  $\text{HCl}$  decomposing into the ions  $\text{H}^+ + \text{Cl}^-$ . Also when we add dilute  $\text{HCl}$  to dilute  $\text{AgNO}_3$ , we should obtain the following:



Since the hydrogen ion possesses greater mobility than the silver ion which it displaces one would naturally expect the conductivity of the silver nitrate to increase on the addition of the hydrochloric acid. From the observation described above it seemed evident, however, that the conductivity under the circumstances stated, did not follow the ordinary laws of electrolysis, and in order to examine the effect more fully a series of experiments was made under a variety of conditions described below.

*Description of the apparatus.*—The resistance of the solution was measured by a method similar to that adopted by G. B. Bryan<sup>2</sup> in "The Conductivity of Liquids in Thin Layers." The arrangement is shewn in Fig. 1.

By means of the double commutator CC an alternating current was supplied to two corners of a Wheatstone Bridge, and since the connections to the galvanometer were reversed at the same time as the current, any current through the galvanometer was always in one direction. The commutator had two ebonite drums, each with two

<sup>1</sup> Phil. Mag., Nov. 1906, p. 472.

<sup>2</sup> Bryan, Phil. Mag. 45, pp. 253-270, 1906.