

XX.—*On the Electrolysis of Sugar Solutions.* (Preliminary Notice.)

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I HAVE in my last paper shown it to be highly probable that water is decomposed during fermentation. Bearing this in mind, it was thought desirable to subject water to the decomposing action of the electric current in the presence of glucose.

For this purpose a strong solution of invert sugar was prepared. This was acidified slightly with sulphuric acid, and the current from two Bunsen's cells passed through the liquid between platinum terminals.

After the lapse of two hours, the presence of carbonic anhydride could readily be detected in the gas evolved. Twenty-four hours after the commencement of the experiment the electrolytic gas on analysis was found to have the following percentage composition:—

CO ₂	14·15
CO	3·34
H.....	72·80
O	9·71
	100·00

The liquid was neutralised with soda, and distilled. The perfectly neutral distillate, possessing a slight ethereal odour, produced, on treatment with oxide of silver, a fine mirror of metallic silver, and yielded acetic acid on oxidation. These reactions leave no doubt of the presence in the liquid of considerable quantities of *acetic aldehyde*.

The residue in the retort, redistilled with a little sulphuric acid, gave a strongly acid distillate containing abundance of acetic acid and a little formic acid. It was hoped that alcohol might be produced in this experiment; but although the first distillate gave with iodine and potash the characteristic crystals of iodoform, yet this did not necessarily indicate the presence of alcohol, since Lieben (*Ann. Chem. Pharm.*, vii, Supplement 6, 2 Heft., 226) has shown that the reaction takes place very readily with aldehyde.

Although I have at present no direct experimental proof of the production of alcohol during the electrolysis of glucose solutions, yet I think the composition of the electrolytic gas rather indicates the previous formation of this body, although it probably undergoes immediate oxidation.

I was not aware when I recently commenced the investigation, of which I now present a preliminary notice, that any work had been

done in this direction. I find, however, that Brester (*Archives Néerlandaises des Sciences exactes et naturelles*, 1866, i, 296; *Jahresb. f. Chem.*, 1866, p. 87) in 1866 subjected solutions of cane-sugar, amongst many other substances, to the action of the electric current. He observed the evolution of carbonic anhydride, and also that the electrolysed solution, heated in the water-bath, gave an acid distillate, having reducing properties, but not containing, according to him, formic or acetic acid.
