

No. XIV.—*Polarization of the Plates of Condensers*; by A. S.
THAYER.

It is well known that in polarization batteries, of which Planté's battery is a type, a combination of the ions, resulting from electrolysis, takes place when the plates of the battery are connected, and a current results which slowly diminishes in

strength. In the case of condensers made with solid dielectrics the same diminishing current is observed, and the following experiments would seem to show that it might be due to an electrolysis or decomposition of the material separating the plates of tin-foil. The experiments consisted in placing condensers of various kinds in a circuit, through which a current was made to pass by two Bunsen's cells, and noting their changes. The plates of the condensers were of tin-foil and had an area of about fifteen square inches. The experiments were as follows:

(1.) The dielectric used was a sheet of dry glazed paper. The condenser could not be charged so as to give a perceptible discharge.

(2.) When a sheet of glazed paper, moistened with shellac, was substituted for the dry paper, the discharge was sufficient to send the light off the scale of the galvanometer, and continued for some minutes.

(3.) Dry goldbeaters' skin was used as a dielectric, and no deflection could be obtained.

(4.) The goldbeaters' skin, when moistened with shellac, gave a slowly diminishing deflection.

(5.) The dielectric was made by flowing the surfaces of the plates with a solution of wax and gasoline, and a slowly diminishing deflection was obtained.

(6.) The condenser used in (4) was tried again after the shellac had dried and again gave a diminished deflection less than the first deflection.

(7.) The condenser used in (5), when tried again after a day or two, did not again give a deflection.

(8.) Unglazed paper dry and oiled gave no deflection.

(9.) Glazed paper oiled gave a very slight deflection, and the galvanometer needle immediately returned to zero.

(10.) Glazed paper wet with water and covered with shellac gave the greatest deflection of all the dielectrics. The light was sent completely off the scale and was only brought back by shunting the galvanometer. The discharge also continued a long time.

(11.) The conducting power of some of the various dielectrics was tested. The goldbeaters' which had been covered with shellac transmitted no current after it had been allowed to stand for a week. Freshly oiled and dry oiled paper did not conduct at all. Glazed paper covered with shellac gave a deflection nearly off the scale. Glazed paper wet with water and covered with shellac transmitted a current sufficient to send the light entirely off the scale.

What these experiments directly go to show are, first, that condensers with moist dielectrics received a greater charge than

those made with dry, and second, that the better the dielectric conducted, the greater the charge the condenser was capable of receiving. From these facts it would seem that the slow discharge of these condensers was very probably due to polarization. The best condensers, as shown by the experiments, possessed dielectrics which were moist and possessed considerable conductivity. The dielectrics when dry scarcely conduct at all. Their conduction when moist must therefore have been mainly due to electrolysis, since liquids conduct electricity only in very small quantities without being decomposed. The electrolyte was therefore decomposed, and the re-combination of the products of decomposition caused the return current. An exact analogy is thus determined between the case of the lead plates and these condensers. Whether it is an analogy that would hold in the case of all condensers which slowly discharge themselves, is an interesting question.