



The spontaneous thinning of liquid films

J. Plateau

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the Seine valley comes next (pp. 16-25); then London and the Thames (pp. 25-32); Brussels and the Senne (pp. 32-41); Berlin and the Spree (pp. 42-53); St. Petersburg and the Neva (pp. 53-59); lastly, Rome and the Tiber (pp. 59-68). Transverse geological sections of these valleys, and vertical sections of the deepest wells and borings in the said cities, illustrate this admirably concise and well-considered little book; and the general remarks on these interesting localities, and the special notes on their water-supply and sanitary conditions, still further enhance the value of M. Karrer's admirable work. We must add that the author supplies copious references to authors and observers, and carefully acknowledges the original sections and notes communicated by his many helpful friends.

XLVIII. *Intelligence and Miscellaneous Articles.*

THE SPONTANEOUS THINNING OF LIQUID FILMS. BY J. PLATEAU.

IN my memoirs 'On the Figures of Equilibrium of a Liquid Mass without Weight,' and in my 'Statics of Liquids submitted to Molecular Forces only,' I have from time to time insisted that the gradual thinning of liquid films is due, entirely in certain cases, and in great part in the rest, to the suction exerted by the small surfaces with strongly concave transverse curvatures which line the margins of those films. Now, on considering the capillary pressures in themselves, and starting from the principle that the pressure of a plane or relatively but little curved excels that of a strongly concave surface, one may ask if the gradual thinning does not consist in this—that the two superficial layers of the film, by their excess of pressure, press out from between them the interposed layer, driving it towards the very concave portions,—or if the superficial layers participate in this motion. To solve this question I have had recourse to the following experiment. A plane film of glycerine liquid was formed in a ring of iron wire of 7 centim. diameter, supported by three feet, and quite horizontal. While it was still colourless it was sprinkled with a light coat of lycopodium powder; it was then covered over with a glass bell, and was observed while it was gradually being attenuated, which was ascertained by the appearance and succession of the colours. Now, the lycopodium was seen little by little to gain the margin; about half an hour after, it had accumulated along the ring, and the film was clear of it.

Thus, in the act of thinning, the superficial layers travel towards the margins of the films; but as these necessarily adhere to the interposed layer, they could not move without dragging the latter. It must, then, be admitted that the whole of the film partakes of this motion, whether the action be exerted directly upon the superficial layers only, or is exerted directly upon the interposed layer also, or, lastly, only upon the latter.

When the apparatus is not covered with a bell, the slight agitations of the ambient air determine extensive irregular movements in the film, which are manifested by the lycopodium. Let us say further that, to distribute the lycopodium powder properly over the film, a little of it is introduced into a small paper tube, and blown into the air at a certain distance from the apparatus: the powder then descends and deposits itself upon the film in a state

of sufficient dissemination.—*Bull. de l'Acad. Roy. de Belgique*, sér. 3, tome ii. no. 7 (1881).

ON SECONDARY BATTERIES. BY J. ROUSSE.

In order to accumulate electricity so as to produce electric light or motive force, I have arranged several secondary batteries which differ notably from that of M. G. Planté.

(1) At the negative pole of the secondary battery I employ a palladium plate, which, during the electrolysis, absorbs more than 900 times its volume of hydrogen. At the positive pole I employ a plate of lead. The liquid electrolyzed is sulphuric acid diluted to 10 per cent. This element is very powerful, even when of small dimensions.

(2) Another secondary element, which has also given good results, is formed, at the negative pole, of a thin plate of sheet-iron: this absorbs more than 200 times its volume of hydrogen when it is electrolyzed in a solution of ammonium sulphate. The positive pole consists of a plate of pure lead coated with litharge, or with pure oxide, or white-lead, or with a mixture of all these substances. These metallic plates dip into a 50-per-cent. solution of sulphate of ammonia.

I have also employed, with some success, other similar combinations. For example:—

At the negative pole a plate of sheet-iron; at the positive pole a cylinder of ferromanganese. The liquid electrolyzed is sulphate of ammonia at 40 per cent.

I have remarked that, in general, for composing a secondary battery it is sufficient to place at the negative pole of the voltameter a metal which possesses the property of absorbing hydrogen when it is placed in a suitable solution. On the other hand, it is necessary to place at the positive pole a metal which absorbs oxygen and becomes peroxidized.—*Comptes Rendus*, Oct. 3, 1881, t. xciii. p. 545.

ELECTRICAL TESTING.

To the Editors of the Philosophical Magazine and Journal.

Electrician's Department, General
Post Office, Oct. 4, 1881.

GENTLEMEN,

In your issue for October last (no. 75, vol. xii.) I notice an article by Mr. Thomas Gray, "On the best Arrangement of the Wheatstone's Bridge for the Measurement of a particular Resistance," in which he says, "so far as I am aware, no one has considered in detail all the different cases." I would beg to point out that, in the second edition of my 'Handbook of Electrical Testing',*, published in the month of June of the present year, I have fully worked out the whole question (including the particular cases referred to by Mr. Gray), and I have done this without the use of the calculus; moreover I draw attention to the fact that, although the calculus method shows the conditions for obtaining an absolute maximum of sensitiveness, yet it does not show (as I have done) that this absolute condition may be very widely departed from without *practically* affecting the sensitiveness of the arrangement.

Yours faithfully, H. R. KEMPE.

* Published by Messrs. E. and F. N. Spon, Charing Cross.