paratus because they worked entirely with stronger solutions and only two measurements are recorded for any one concentration. Their most dilute solution gave $\frac{p_0 - p}{p_0} = 0.032$, the two determinations differing by only 0.2%. Similarly for stronger solutions, the differences between the two determinations were for $\frac{p_0 - p}{p_0} = 0.054$, d = 0.1%; for $\frac{p_0 - p}{p_0} = 0.065$, d = 0.03%; for $\frac{p_0 - p}{p_0} = 0.084$, d = 1.0%. The *percentage* accuracy should, of course, increase rapidly with increase in the relative lowering measured and although we have as yet made no careful measurements with solutions in which $\frac{p_0 - p}{p_0}$ exceeded 0.02, the results obtained by Berkeley, Hartley and Burton as far as a comparison is justified seem to show in general a degree of concordance of the same order as that given by our apparatus. Their experiments were made at 0°, and the duration of a run was about *three days.*

In the static method for measuring vapor pressure lowering as perfected by Frazer and Lovelace an accuracy of 0.001 mm. is claimed. This would correspond to an accuracy of 0.2% on the value of $\frac{p_0 - p}{p_0}$ for a weight molal solution at 25° and is, therefore greater than that obtained in our experiments with the cane sugar solutions, but of the same order of accuracy as that indicated by the data recorded in Table I. By extending the time of run over several days instead of one, more complete equilibrium could perhaps be obtained with our apparatus but the possible increase in accuracy which might thus be secured has not in most cases seemed worth the additional expenditure of time.

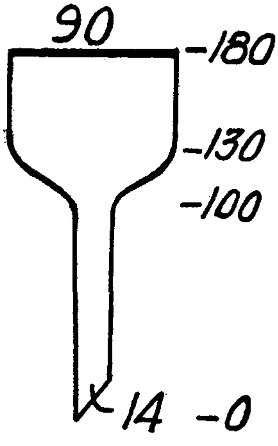
In Frazer and Lovelace's apparatus a minimum of about eight days seems to be required for the attainment of equilibrium and its final measurement, but their results at the end of that period appear to be very accurate, which is more than can be said of any previous attempts to use the static method, and they are to be congratulated upon their success where so many others have failed. We are at present engaged in measuring solutions of mannite at 25° and 35° and as these authors appear to be working with the same solutions we may hope to obtain a direct comparison of results by the two methods for the same solutions.

URBANA, ILLINOIS.

NOTE.

Nichrome Gauze.—Many questions have been asked concerning this gauze, designed in 1911 at Amherst College and since distributed to many of the New England laboratories. It had been the custom to supply students with "Foudrinier gauze" obtained from one of the near-by paper mills, but on the introduction of water-gas, the brass wire deteriorated rapidly over the Bunsen flame. The nichrome wire was supplied by the Driver Harris Company, of Harrison, New Jersey, to the weavers, Messrs. Howard and Morse, 45 Fulton Street, New York, and proved all that was desired. In fact, the raw edge of the gauze may be held for a long time in the flame of a blast lamp without any evidence of deterioration of the fine wire; and in the past three years no single gauze has been returned as damaged at the end of a year's service in the laboratories.

The first cost of these gauzes, compared with that of brass wire, is quite high. The standard gauze (5″ × 5″) in the first experimental order cost 55 cents each. Later, a larger order was sent amounting to nearly $400 and the cost of each gauze was reduced to about 25 cents each. As the nichrome seems to last indefinitely, the first cost is gradually eliminated and in the end this gauze becomes cheaper than brass; and at the same time the need of sending a new order each year is eliminated.



The specifications as finally drawn were determined by the following considerations. The British Commission on the Davy Lamp determined that, in order to permit flame to pass, spaces should be at least 0.025″ on a side. The following space equivalents are given for various sizes of wire and mesh per inch.

B and S gauze.	30 mesh.	28 mesh.
26	0.0175	0.0198
27	0.0191	0.0215
28	0.0207	0.0231
29	0.0220	0.0244
30	0.0233	0.0257

The choice of No. 30 wire was made because this gives a particularly smooth and flexible gauze; and this was combined with No. 30 mesh as the space equivalent for this combination is nearest to the danger line. With thicker wire or smaller mesh the price advances about 10% for each step. The best gauze is one which is sufficiently open to allow the passage of the maximum heat without allowing flame to pass. The gauze produced proved very satisfactory, allowing—to be exact—a very slight flickering flame about $^1/_8$″ above the gauze (probably due to the difference in heat conductivity between copper and nichrome) but not enough to damage a glass beaker placed above; and allowing, at the same time, nearly all the heat of the lamp to pass.

The large order of nearly 1600 gauzes was quickly subscribed and no more now remains than sufficient to supply this laboratory; but if a few laboratories care to club together, the same or better terms could doubtless be secured from the weavers, who have kindly assisted us with advice and coöperation in the production of this new article. When one considers the possibility of damage by students' use, the subjection of the red-hot gauze to accidental flooding with concentrated acids or alkalies, the record of not a single damaged gauze in three years is quite remarkable. Satisfaction with this innovation increases with the lapse of time.

ARTHUR JOHN HOPKINS.

AMHERST COLLEGE,
Dec. 7, 1914.

CHLOROPHYLL.

BY RICHARD WILLSTÄTTER.

Received December 23, 1914.

The Method of Investigation.[1]

Some years ago, chlorophyll was unknown as a substance in a chemical respect. It was doubtful whether there was one chlorophyll or several pigments related to each other, or a great number of green leaf dyestuffs. The first questions of the analysis were unsolved; it was yet undecided which elements belonged to the chlorophyll molecule. Through the investigations of F. Hoppe-Seyler,[2] E. Schunck and L. Marchlewski,[3] and M. Nencki,[4] the chief fact found was that the decomposition of chlorophyll leads to pyrrol derivatives which are related to the derivatives from blood pigment.

After some investigations of Hoppe-Seyler[5] and A. Gautier[6] (1879) chemists no longer attempted to isolate chlorophyll, for this appeared impossible principally on account of the changeability, the chemical indifference and the easy solubility of the dyestuff diluted, as it was, with so many colorless and yellow accompanying substances. But it was possible, without investigating chlorophyll itself, to deduce the peculiarities of its constitution from the consideration of the derivatives which are obtained by the reactions with acid and alkali.

[1] A more detailed report is given by R. Willstätter and A. Stoll, "Untersuchungen über Chlorophyll," from the Kaiser Wilhelm-Institut für Chemie, Berlin, 1913 (J. Springer).

[2] *Z. physiol. Chem.*, **3**, 339 (1897); **4**, 193 (1880); **5**, 75 (1881).

[3] Complete abstracts of the numerous researches performed by E. Schunck and L. Marchlewski are published in three monographs of L. Marchlewski, "Die Chemie des Chlorophylls," Hamburg, 1895; chapter "Chlorophylle," in Roscoe-Schorlemmer-Brühl, Vol. VIII, 848 (1901); "Die Chemie der Chlorophylle," Braunschweig, 1909.

[4] *Ber.*, **29**, 2877 (1896); M. Nencki and J. Zaleski, *Ibid.*, **34**, 997 (1901); M. Mencki and L. Marchlewski, *Ibid.*, **34**, 1687 (1901).

[5] *Z. physiol. Chem.*, **3**, 339 (1879).

[6] *Compt. rend.*, **89**, 861 (1879).