

the American Metrological Society; a corresponding member of the New York Medico-Legal Society; a Fellow of the College of Physicians, Philadelphia; a Fellow of the American Association for the Advancement of Science, and a Fellow of the Chemical Society of London.

In 1870 he received the honorary degree of Doctor of Philosophy from Dickinson College, and the same degree from Pennsylvania College in 1877, while Marietta College, Ohio, conferred upon him the degree of Doctor of Laws in 1870.

Personally Professor Wormley was a modest, unassuming man. Few knew him well. Those who were fortunate enough to brush aside the mantle of reserve which usually surrounded him, found a genial, kind, sympathetic companion, with a mind stored with the most varied knowledge and ready to unfold itself to those who had won his confidence. In his comments upon the work and writings of others he was extremely considerate. No bitter criticism was ever allowed to pass his lips, no matter how widely the views set forth by their authors may have differed from what he believed to be correct. True, upright and just in his dealings with all men, it is not surprising that he won the hearts of the great student body and of all with whom he came in contact. By them his memory will ever be cherished as one who loved and sought the truth alone, who was content in the quiet of his laboratory, away from the noise and bustle of the world, to work out the facts, which as we find them arrayed in his great work, will cause future students of chemistry to render to his name that homage which ever falls to the master in any great effort.

NOTES ON CAFFEIN.

BY G. L. SPENCER.

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SHORTLY after submitting the above title to the Secretary, the November, 1896, number of the Journal was received, which included a paper on the estimation of caffeine. This paper in many respects anticipated the notes I intended submitting to the Society.

It was my intention to discuss some of the statements of Gomberg¹ in his paper describing his volumetric method for caffeine,

¹ This Journal, 18, 331.

using Wagner's reagent. Gomberg cites certain experiments in which he secured but a small proportion of caffein present in a certain sulphuric acid solution of the alkaloid, even after shaking many times with chloroform. The experience of Allen,¹ or Puckner,² and my own work all demonstrate that the caffein may practically be entirely removed from water solution by shaking four or five times with chloroform. However in a number of instances I detected a trace of caffein by the "murexid test," and in later work by Wagner's reagent, as recommended by Gomberg, in the watery residue, left after five extractions with chloroform. In view of this fact and the frequent necessity of slight acidulation of the solutions with sulphuric acid to reduce the tendency to the formation of obstinate emulsions, the writer deemed it advisable, for precautionary reasons, to recommend seven extractions, in the publication of the gravimetric method³ from which Gomberg quotes in his paper. Unless great care is observed in the gravimetric method in the recovery of the chloroform by distillation, an error may result from the entrainment of caffein with the chloroform vapors. A safety bulb, such as is made for use in the Kjeldahl nitrogen process, effectively prevents loss of caffein in the distillation.

It is difficult in the gravimetric method to obtain an absolutely pure caffein, there being usually sufficient foreign matter present to give a slight coloration in the cold with concentrated sulphuric acid. This contamination with foreign matter is probably too slight to appreciably affect the accuracy of the results. The two methods give almost identical results as shown by the following examples. The same purified solution was used for each of the methods:

Description of samples.	Gravimetric method.	Gomberg's method.
1. Mixed tea.....	2.24	2.21
2. Japan tea dust	2.27	2.28
3. Japan tea dust	2.29	2.30

The following method of purifying the caffein was tried with Sample No. 3 with a promising degree of success: Five grams of the finely ground tea were boiled thirty minutes with approximately 400 cc. water; a considerable excess of recently prepared

¹ Commercial Organic Analysis, 3, Part II, 485.

² This Journal, 18, 978.

³ *J. Anal. Chem.*, 4, 390.

ferric hydroxide was added, and after digesting about one hour, the mixture was cooled and transferred to a graduated flask and diluted to 500 cc. An aliquot part of the solution was filtered off and treated by Gomberg's method. The difficulty experienced was in filtering off the periodide of caffein. The percentage of caffein obtained was 2.28, as compared with 2.29 and 2.30 by the other methods. The solution of caffein obtained by this method is not sufficiently pure for the extraction of the alkaloid by chloroform for analytical purposes.

In comparative experiments with a number of methods for the determination of caffein in teas, the Gomberg method has given the most satisfactory results and admits of wider application than the gravimetric methods.

SOME APPARATUS FOR THE TECHNICAL ANALYTICAL LABORATORY.

BY EDWARD S. JOHNSON.

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THOSE branches of chemical industry which are dependent in part for guidance upon an analytical laboratory are each year becoming more exacting in regard to their demands upon the laboratory for accurate, yet rapid, work in large quantity.

Besides stimulating research with a view to shortening established methods of analysis, or the invention of new ones requiring less time for their execution, this exaction has resulted further in the introduction of much special apparatus for expediting the routine operations of the laboratory. A visit to any of the well-conducted technical laboratories of the day will show that much work of this sort has been done, and the frequent contributions on the subject in the contemporaneous journals of chemistry give evidence that activity in this direction is not abating.

It is the purpose of the present communication to present a few forms of apparatus designed in the first instance to facilitate and hasten the work of the technical laboratory with which the writer is connected. The efficient service which these devices have rendered induces him to venture upon their description with the thought that it may prove of interest to others engaged in the same field of work—the analysis of iron and steel. Although more particularly adapted to the special work mentioned, the ap-