sidered a luxury, must, of necessity, from the amount of expense and attention given to the production, always command the highest price of any of the general farm crops.

In conclusion, the writers desire to express their appreciation to Dr. Joseph H. Kastle for suggesting this line of work and for assistance rendered during its preparation.

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NOTE.[1]

The Use of Benzoic Acid as a Standard Material.—The extended use of benzoic acid as a calorimetric standard, and its value as an acidimetric standard, makes it appear desirable to call attention to the fact that the substance is slightly hygroscopic. This was partially recognized by Morey[2] in speaking of the advantage of fusion as preventing "large surface effects."

Definit data on this point were first obtained when comparing, by means of titration with a standard alkali, the samples B and C described below. The following samples were then examined: Sample A was especially prepared to be used as a standard for comparison by starting with the purest material obtainable commercially, and successively crystallizing from alcohol and from water, subliming *in vacuo*, again crystallizing from water and again subliming twice *in vacuo* over fused calcium chloride. The object of the double sublimation at the end was the removal of the last trace of water. Sample B was some of the material purified by Morey[3] and kept for more than a year in a glass-stoppered bottle. Sample C was a commercial product of good quality, but shown to contain a small amount of impurity by the ash left upon ignition.

The acidity of the samples having been determined, a portion of each was carefully fused and the acidity again determined. The average results follow, taking the average value obtained for A, as 100%.

Sample.	Number of determinations.	Average. Per cent.
A	7	100.00
A fused	5	100.00
B	6	99.93
B fused	9	100.01
C	6	99.95
C fused	5	99.96

The results obtained with each sample were very concordant. One series, the results obtained upon sample A before fusion, gave 100.01, 100.02, 99.98, 100.00, 100.00, 99.98, 99.99. This fairly represents the agreement between results from any one sample.

[1] Published by permission of the Director, Bureau of Standards.

[2] THIS JOURNAL, **34**, 1027 (1912).

[3] *Loc. cit.*

While these titrations indicated that sample B had taken up during the year about 0.07% of moisture, it seemed desirable to prove the presence of water in the sample in a more direct manner. This was done by dissolving a little of each of the samples in ethyl acetate, which was shown by a blank test, made in the same way as the final test, to be nearly anhydrous; shaking with calcium carbide; and decanting the liquid into an ammoniacal solution of cuprous chloride. This test, which is being investigated as a general method for the detection of traces of water, depends upon the formation of acetylene, which dissolves in the organic solvent used, in this case ethyl acetate, and is precipitated upon adding to cuprous chloride solution. The test was repeated several times, using ethyl acetate and other organic solvents, and showed clearly the presence of water in sample B and of a smaller amount in sample C. Several other old samples of benzoic acid showed the presence of a little water when subjected to the same test. That moisture is not taken up rapidly by the acid is shown by the fact that no change could be noted in sample A after it had been freely exposed to the air of the room at intervals, during compression into pellets and handling in other ways. The benzoic acid sent out by the Bureau of Standards as a standard sample is, when first prepared, free from any amount of moisture that can be detected by the methods used in this investigation; but it is, of course, impossible to know certainly that a sample which has been bottled for a long time has been so protected from the air that it has had no chance to take up moisture. Numerous calorimetric tests on different samples made from time to time in the heat laboratories of the Bureau have shown no systematic differences exceeding 1 part in 2000, which could be attributed to moisture variations.

Fortunately, in order to remove the absorbed moisture from benzoic acid, it is only necessary to fuse it; but this must be done with great care or else a change takes place with the formation of a brown, resinous substance. The fusion may be made in a loosely stoppered Erlenmeyer flask in an air bath. The fused mass may usually be broken up easily without breaking the flask. A temperature higher than 130° should be avoided.

No effort was made to learn the exact nature of the change which takes place upon heating. It goes on quite rapidly when the temperature is raised to more than 150°. A portion of sample A, which had been heated at 150°–160° for half an hour, showed an acid value of only 99.93% as compared with the standard. It has not been found practicable to sublime the acid without the formation of a little of the brown compound. A small amount of residue was left in the platinum dish after each of the sublimations carried out in the preparation of sample A, and as this residue is volatil only at a much higher temperature than that occurring during sublimation, and was found to be present in about as large quantity after the third sublimation as after the first, some of it must have been formed during sublimation. In the sublimation apparatus used for the preparation of standard benzoic acid on the large scale,[1] a small amount of the acid condenses upon the inside of the glass cylinder supporting the electric hot plate. It remains here day after day at a temperature somewhat elevated but lower than the melting point. Under this condition it gradually turns yellow, showing that the resinous compound is slowly formed at a temperature even below the melting point. When the acid is fused to remove moisture, it should, therefore, be kept at as low a temperature as possible and not allowed to remain any longer than is absolutely necessary. It should remain perfectly colorless after fusion. Any amount of decomposition which can be detected chemically imparts a distinct yellow color to the fused mass. E. R. WEAVER.

BUREAU OF STANDARDS.
WASHINGTON, D. C.

NEW BOOKS.

Annual Tables of Constants and Numerical Data, Chemical, Physical and Technological. Published under the auspices of the International Association of Academies and under the direction of an international commission appointed by the VII International Congress of Applied Chemistry. Volume II, for the year 1911, xl + 759 pp. Chicago: University of Chicago Press, 1913. Price, paper, $6.40 net, $6.94 postpaid; cloth bound, $7.20 net, $7.76 postpaid.

The second volume of this important work will be eagerly welcomed by every chemist and physicist. The subject matter and arrangement are very much the same as in Volume I. The index for Volumes I and II which was announced to appear in the present volume is lacking. It will not be greatly missed, however, as the system of classification makes it very easy to find any desired datum. E. W. WASHBURN.

Chemistry and its Relations to Daily Life. By LOUIS KAHLENBERG AND EDWIN B. HART, Professors in the University of Wisconsin. 393 pp., illustrated. New York: The Macmillan Company, 1913. Price, $1.25.

This is an elementary book, as far as chemical theory is concerned, and is intended primarily for students of agriculture and home economics in secondary schools. It contains a great deal of very useful information on a wide variety of topics, information which the boy or girl going out into the practical world will find helpful and worth holding. The presentation is clear, as it should be for young poeple.

The reviewer ventures the suggestion that if most of our *college* instruction in chemistry were concerned more with such topics as are handled in this book, and less with certain "modern" theories, the average student might be able to carry a little of it home with him, to last a month into the

[1] Morey, THIS JOURNAL, 34, 550–52.