ing-point, but it is not permissible to use one appreciably narrower than this.

V. The Influence of the Length of the Thermometer.—In order to demonstrate and also to estimate the error (a too low result) caused by an incomplete immersion of the thermometer in the liquid, thus allowing a portion of the column of mercury to project above its surface, the shortened thermometer recommended above, and a long (normal) one were first tested by a complete immersion in a water-bath, when each registered exactly the same temperature (43°); after which they were simultaneously placed in the test-tube containing water at 43°. The shortened thermometer was immersed to the 35° mark, leaving but 8° of mercury above the surface of the water, while the long thermometer could be immersed to only its zero mark, leaving fully 43° of mercury exposed. The whole was then placed in an air-bath, kept at a temperature of 20° in order to avoid the error of radiation. The reading of the long thermometer was about 0.13° below that of the shorter one.

This error was now calculated for each thermometer, giving, theoretically, for the long

thermometer	0.15°
while for the shorter one, only	0.03°
the difference of	0.12°

being the theoretical error introduced by using a long (normal) thermometer, and agreeing closely with the experimental determination of the error (0.13°).

Though, of course, this error is not completely eliminated by using a shortened thermometer, still it is so reduced as to be of no practical importance.

RECENT WORK ON THE SUGARS.

By B. B. Ross.

(*Continued from page 553.*)

Received May 14, 1894.

DETERMINATION OF WATER IN SUGARS.

Herzfeld (*Ztschr. des Ver. f Rübenzucker*, **43**, 130, *Bull. Assoc. Chim. Belg.*, **6**, 267) reports the results of a large number of experiments in the determination of the amount of water in

syrups and sugars, the drying being effected both in air and in vacuo.

The drying in contact with air was conducted at a temperature of about 105° C., the samples under examination being contained in nickel dishes about eight cm. in diameter and two cm. deep.

For syrups, three grams of material were employed, along with thirty grams of well-purified quartz sand.

In the water determinations in vacuo, a temperature of about 107° C. was employed, while in the experiments with Soxhlet's drying apparatus, the operation was conducted at about 103°–104° C.

A syrup prepared by dissolving a definite weight of sugar in a known weight of water was used in a large number of the tests made.

After three hours drying in vacuo, the results secured closely approximated the theoretical figures, and at the end of five hours' drying the correspondence was almost exact.

In drying in air, eight hours were required to obtain results agreeing with the theoretical water content, and the loss in weight still continued, even after fifty-six hours' drying.

In the estimation of water in syrups, to which alkaline salts had been added, it was likewise found that concordant results could be most quickly secured in vacuo.

With raw sugars, as well as with syrups, the results by drying in air were quite appreciably higher than those secured in vacuo, especially where the drying was at all protracted.

For maintaining a temperature of approximately 105° C., the author employs toluene between the walls of the drying apparatus.

Josse (*Bull. Assoc. Chim. France*, **10**, 656) proposes to employ in the determination of water in syrups and masse cuite, a dried and weighed spiral of filter paper which is to be saturated with the sample under examination.

A strip of filter paper, one to two cm. wide and about three meters in length, is coiled into a spiral form, placed in a capsule about seven cm. wide and two cm. deep, dried and weighed.

Two grams of syrup or masse cuite is next brought into the dish, about six to eight cc. of water added, and after the mixture has been warmed slightly the paper spiral is inserted.

The liquid is readily absorbed by the filter paper, and the drying is conducted at 100°–110° C., until a constant weight is secured, about two hours being ordinarily required to complete the operation.

It is claimed that the method is accurate as well as rapid.

DETERMINATION OF ASH IN SUGARS.

Courtonne (*Bull. Assoc. Chim. France*, **10,** 223) describes in detail the method proposed by him for the determination of ash in sugars by ignition of the sample in the presence of ferric oxide. The process is conducted as follows:

Place in a platinum capsule two grams of freshly calcined ferric oxide, which should also have been thoroughly washed to insure freedom from sulphuric acid. Into the same vessel weigh five grams of sugar, or about two grams of molasses. After addition of a little water to the mass, the mixture is evaporated rapidly upon a sand-bath or a metallic plate and heated over a Bunsen burner until frothing takes place. The capsule is now placed in a muffle heated scarcely to dull redness; the combustion is found to take place quite rapidly, and the incineration is sometimes completed in a quarter of an hour—always within half an hour.

Among the advantages presented by this process, it is claimed that, as in the Alberti and Hempel method, where quartz sand is employed, the mass is well divided by the admixture with the ferric oxide, and the points of contact of the material with the air are thus multiplied. The formation of carbonates is also prevented and the ferric oxide facilitates oxidation by acting as a carrier of oxygen from the air to the sample; further, the low temperature employed prevents the loss of volatile salts, such as chlorides, while the rapidity of execution of the incineration is an important advantage.

This method should also have the preference over the quartz sand process for the reason that the platinum vessels used are much less readily attacked where ferric oxide is employed.

Vivien (*Bull. Assoc. Chim.*, **10,** 225) reports the result of experiments with Courtonne's method, employing different temperatures and different periods of time for the ignitions.

The results were found to be always lower than those secured

by the sulphuric acid method and the direct ignition process, the figures for the same sample not being at all concordant.

A constant weight was not obtainable by this process and the composition of the ash varied considerably with the length of time of the incineration and the temperature employed.

At somewhat elevated temperatures it was found that chlorides were more or less attacked and, possibly, partly volatilized.

ALBERTI AND HEMPEL'S METHOD FOR ASH DETERMINATIONS.

Stift (*Oest. Ztschr. Zucker*, **22**, 22; *Chem. Ztg. Rep.*, **17**, 102), as the result of a large number of experiments with different sugar products, concludes that this method, by proper and careful execution, and with previous thorough testing of the quartz sand employed, is to be most highly commended, yielding, as it does, concordant results and, in contrast to other methods, furnishing more correct and uniform figures for the content of inorganic substances.

A point of great importance in the performance of the incineration is the necessity of the employment of quartz sand of absolute and known purity.

With sugars containing considerable proportions of nitrates (which are decomposed in this process), it is necessary to make a separate estimation of nitric acid.

THE DETERMINATION OF VOLATILE AND INSOLUBLE FATTY ACIDS IN BUTTER FAT.

BY W. H. BEAL.

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A FEW years ago when called upon to make examinations of the fat in a number of samples of cream the author attempted to use for that purpose the then recently proposed method of Waller as modified by Moore[1] which is briefly as follows: Two and five-tenths grams of fat are placed in a weighed Erlenmeyer flask and saponified with one gram of potassium hydroxide dissolved in fifty cc. of seventy per cent. alcohol. After heating until saponification is complete the alcohol is driven off in a boiling water-bath. The resulting soap is dissolved in fifty cc.

[1] See *J. Am. Chem. Soc.*, 11, 144, *1889*.