consistently lower. With careful operation, any one of the five forms of apparatus tested would ordinarily give results that are well within the limits of accuracy required for this determination, either for commercial control work or for the purpose of gas inspection.

ABSTRACT OF THE INFLUENCE OF ATMOSPHERIC CONDITIONS IN THE TESTING OF SUGARS.

By F. J. Bates and F. P. Phelps.

A SIMPLIFIED form of Marvin's evaporation equation has been applied to the evaporation of raw sugar solution during filtration. Marvin's formula reduces to

$$\frac{dq}{dt} = C(P_s - P_a)$$

or $Q = C(P_s - P_a)T$, which, it is shown, fits the observations satisfactorily. Q = the change due to evaporation in the time T ; P_s = the vapor pressure of the sugar solution; P_a = the saturation vapor pressure in the air at the temperature of the dewpoint.

The constant, C , has been determined for a number of different cases: First, when the solution is poured back upon the filter after all has run through; second, when it is poured back after about half has run through; third, when it is not poured back at all. Observations were made by two methods: First, by weighing the solution at intervals during the filtration; second, by observing the change in polarization. In the polarization method one tube was filled, as a reference tube, with solution that had been covered during filtration, since filtration could not be avoided. It is shown, however, by weighing, that the evaporation in this case is quite negligible. Other tubes were filled with solution which had not been covered during filtration. The difference in polarization between these tubes and the reference tube is the change due to evaporation. This was done under various atmospheric conditions.

The observations were made in a thermostated room where the amount of moisture present in the air, as well as the temperature, could be varied at will, the range of adjustment being

$(P_s - P_a) = 4$ mm. of Hg. to $(P_s - P_a) = 41$ mm. of Hg. In practice $P_s - P_a$ rarely exceeds 22 mm.

It was found that in the case where the solution was not poured back upon the filter the change in polarization due to evaporation is so small as to be quite negligible in ordinary sugar testing. The change is represented by $Q = 0.00017(P_s - P_a)T$. However, in case that even a portion of the solution is poured back the change due to evaporation is not negligible in ordinary testing but must either be prevented or corrected for.

It may be prevented by covering the funnel, or corrected for by the equation $Q = 0.0006(P_s - P_a)T$.

INDUSTRIAL GAS CALORIMETRY.

FOR many years all laws and regulations relating to manufactured gas were based on candle-power requirements, *i.e.*, the gas burned in a definite burner at the rate of 5 cubic feet per hour was required to give a specified illumination of so many candle-power. This specification furnished a perfectly satisfactory control of the quality of gas delivered so long as the gas was chiefly used for illuminating purposes with the old style of open-flame gas burner. At the present time, however, this inefficient type of burner has been very largely displaced by burners of the Welsbach mantle type. Furthermore, a large amount of the gas sold to-day is used for cooking purposes and to some extent for operating small gas engines for power purposes. In these applications of gas it is the heating value that is of first importance and not the candle-power. It has been estimated that less than 20 per cent. of the gas manufactured and sold to-day, indeed in many of our cities and towns less than 10 per cent., is used in the old type of open-flame gas burners. Notwithstanding this fact we still find in most of our cities and towns ordinances on the statute books requiring that the gas meet a definite candle-power test, while no attention has been given to the question of heating value, which is the important factor for over 80 per cent. of the gas sold. Many of the candle-power requirements fixed by law are quite high, often requiring the manufacture of an expensive oil-enriched gas, which may not be the most economical gas to the public. The importance of the heating value of the gas is now being quite generally recognized, and where new legislation

has been adopted recently and where public-service commissions have considered the question of gas regulation and have gotten to the point of issuing regulations, the heating value standard is being generally adopted, supplemented in some cases by a moderate candle-power standard, the latter with a view to affording the necessary protection to those who still use the open-flame burner.

In view of the growing importance of the question of heating values of gases from the manufacturing, the legislative, the inspecting, and the economic sides, the Bureau of Standards, of the Department of Commerce, started several years ago an exhaustive investigation of the instruments widely used in this country and abroad to measure the heating values of gases, with a view to determining the sources of error to which the instruments are liable, the important precautions to be observed in their use, and the accuracy attainable with them. This investigation has now been completed, and the results will be published in a forthcoming technologic paper, reprints of which may be obtained by those interested in the subject by addressing a written request to that bureau. It is expected that the paper will come from the press about June 1.

Experiments on the Efficiency of Rope Driving. H. BONTE. (*Zeitschr. Ver. Deutsch. Ing.*, lvii, 1711.)—Recently many firms have transformed rope-driving into belt-driving systems, largely on account of the insufficiently criticised results of Kammerer. Experiments on a 200 horse-power plant are described. The ropes used for driving purposes are especially flexible. The efficiency of transmission has a mean value of 97.3 per cent. and increases with the load. The author thinks that few ropes are sufficiently stressed in practice. Rope driving properly applied is quite as efficient as leather belting, and probably more efficient than double or triple belts. It occupies less space and the initial cost is less.

Crystallization through Fatigue of Iron and Steel. F. ROGERS. (*Iron and Steel Inst.*, Sept., 1913.)—The crystalline structure frequently shown by wrought iron or steel which has given way through repeated stress does not appear to be the result of fatigue, since in every case of such failure coming under the author's notice, a fracture of similar appearance could be obtained in an unfatigued part of the metal. Examples of the failure of wrought iron are given in which such crystalline structures, in both the new and the fatigued metal, were due to the presence of low-grade iron or steel scrap.