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(B) LIST OF SCIENTIFIC PAPERS ISSUED BY THE BUREAU OF STANDARDS

206. High-Frequency Ammeters (pp. 91–159) ..... *J. H. Dellinger*
207. A Comparative Study of American Direct Current Watt-hour Meters (pp. 161–190) ..... *T. T. Fitch and C. J. Huber*
208. Windage Resistance of Steam-Turbine Wheels (pp. 191–234) ..... *Edgar Buckingham*
209. Latent Heat of Fusion of Ice (pp. 235–266) ..... *H. C. Dickinson, D. R. Harper 3d, and N. S. Osborne*
210. Observations on Ocean Temperatures in the Vicinity of Ice Bergs and in Other Parts of the Ocean (pp. 267–278) ..... *C. W. Waidner, H. C. Dickinson, and J. J. Crowe*
211. Accuracy of the Formulas for the Ratio, Regulation, and Phase Angle of Transformers (pp. 279–293) ..... *P. G. Agnew and F. B. Silsbee*
212. Melting Points of Some Refractory Oxides (pp. 295–313) ..... *C. W. Kanolt*
213. Critical Ranges A2 and A3 of Pure Iron (pp. 315–370) ..... *G. K. Burgess and J. J. Crowe*
214. Note on the Setting of a Mercury Surface to a Required Height (pp. 371–374) ..... *M. H. Stillman*
215. Micrometer Microscopes (pp. 375–390) ..... *A. W. Gray*
216. The Pentane Lamp as a Working Standard (pp. 391–417) ..... *E. C. Crittenden and A. H. Taylor*

31022°—14

(D) DESCRIPTIVE LIST OF SCIENTIFIC PAPERS

I. ELECTRICITY

206. High-Frequency Ammeters.....*J. H. Dellinger*

For the measurement of current in the range of radiotelegraphic frequencies, 50 000 to 2 000 000 cycles per second, it is general practice to use the hot-wire ammeter or a modification of it. Its superiority is due to the simplicity of form which the portion of the circuit within the instrument may have, permitting a minimum of self-inductance and capacity. When the instrument is required to carry relatively large currents, a simple single wire is not sufficient, and more than one elementary path must be provided for the current. Then the current distribution, and consequently the indicated current, change as the frequency is varied. All types of ammeters in use for the measurement of large high-frequency currents are found to be subject to serious errors at radiotelegraphic frequencies. Mutual inductance between parts is in some cases the determining factor in the change of current distribution. Capacity of parts is found to cause no error for frequencies below 1 000 000; although above that, it may, so that two instruments in series may be carrying different amounts of current. Inductive action of the instrument leads in some cases causes appreciable errors. The various types of instrument are investigated both experimentally and theoretically, and ways of overcoming the various errors are devised.

207. A Comparative Study of American Direct-Current Watt-hour Meters.....*T. T. Fitch and C. J. Huber*

A large amount of numerical data is given, in regard to the performance and construction, of six types of American meters. The total friction torque is separated into four parts—brush, gearing, bearing, and windage friction—and curves are plotted of these components of torque against speed. Also a description is given of the method used in obtaining these curves. The load curve is analyzed and its shape is shown to depend upon the heating of the series element, the variation in the friction torque, and the back electromotive force.

211. Accuracy of the Formulas for the Ratio, Regulation, and Phase Angle of Transformers.....*P. G. Agnew and F. B. Silsbee*

A derivation of the formulas for ratio, regulation, and phase angle is given, showing by numerical example the magnitude of the approximations involved. Values computed for two types of lighting transformers from short-circuit data are compared with values obtained from direct measurement, and the results found to agree within the experimental error.

Ia. PHOTOMETRY

216. The Pentane Lamp as a Working Standard.....
.....*E. C. Crittenden and A. H. Taylor*

This paper recommends the use of tested pentane lamps as secondary standards of candlepower when electric standards are not available, and gives a detailed statement of the method of testing followed at the Bureau, with general directions for the use of the lamps. The effects of variation in pentane and in atmospheric conditions are discussed, a correction for the former is proposed, new determinations of the humidity correction factor are given, and a chart is provided to facilitate the reduction of observations to normal candlepower.

II. WEIGHTS AND MEASURES

214. Note on the Setting of a Mercury Surface to a Required Height.....*M. H. Stillman*

The paper describes an improvement in the method of setting a mercury surface to a given height by bringing it just into contact with a downward projecting pointer. The improvement consists in placing a parallel-ruled scale back of the pointer so that its image will appear in the mercury serface at the end of the pointer. Distortion of the lines of this image indicates contact. Results of experiments showing the accuracy of this method are given.

215. Micrometer Microscopes.....*Arthur W. Gray*

The first section points out numerous sources of error generally overlooked in using micrometer microscopes, and gives examples to illustrate the magnitude of the corrections needed for a few microscopes that have been investigated. The second section describes a simple and rapid method of applying the proper corrections when making length measurements of precision. The third section explains an accurate means of measuring screw errors and a graphical procedure for computing convenient correction tables.

III. THERMOMETRY, PYROMETRY, AND HEAT MEASUREMENTS

208. Windage Resistance of Steam-Turbine Wheels.....*Edgar Buckingham*

A general equation deduced from the theory of dimensions is shown to agree with such experimental data on windage as have been published, but these data are not adequate as a basis for the computation of windage corrections, except in a few simple cases. The data are analyzed and suggestions offered as to practical computation. By applying the principle of dynamical similarity it is shown that model experiments may be utilized and the practicability of such experiments is discussed.

209. Latent Heat of Fusion of Ice.....
.....*H. C. Dickinson, D. R. Harper 3d, and N. S. Osborne*

Measurements by two independent methods in a precision calorimeter are described in the paper. Samples of ice containing from 100 to 500 grams each were cooled to fixed known temperatures, weighed, and introduced into the water of the calorimeter. In one method the heat to meet the ice was supplied electrically, the temperature of the calorimeter remaining nearly constant; in the other, the method of mixtures, the heat was supplied by the cooling of the calorimeter. The first gives the result primarily in joules based on the electric units; the second gives it in calories. The apparatus, the procedure, and the results obtained are fully discussed.

210. Observations on Ocean Temperatures in the Vicinity of Ice Bergs and in Other Parts of the Ocean.....
.....*C. W. Waidner, H. C. Dickinson, and J. J. Crowe*

The paper discusses the records of ocean temperatures obtained in the vicinity of icebergs and in other parts of the ocean by the Bureau party on board the U. S. S. Chester and U. S. S. Birmingham in June and July, 1912. The records show that in parts of the ocean where some of these records were taken the temperature variations due to mixing currents is so large that no certain conclusion can be drawn from temperature records as to the proximity of ice bergs. The results of other experiments, such as variation in salinity, the detection of echoes both aerial and submarine, temperature records in approaching icebergs along different courses, vertical temperature distribution near ice bergs, etc., are briefly considered.

212. Melting Points of Some Refractory Oxides.....*C. W. Kanolt*

The materials were heated in a graphite resistance furnace and heating curves were plotted. The temperatures were measured with an optical pyrometer. CaO and MgO could not be melted in a vacuum on account of vaporization, but were heated at atmospheric pressure. In this case special precautions were necessary to avoid smoke, which causes low pyrometer readings. One method consisted of inserting into the material to be melted a tube of tungsten or graphite, removing smoke from the tube by a current of gas, and sighting the pyrometer into the tube. A method applied to lime consisted of making the lime into a tube, supporting the tube by its open upper end, which was at a low temperature, and sighting the pyrometer into the lower end, which was heated, smoke being removed by a current of hydrogen.

Oxide	Melting Point	Supporting Material
Cr_2O_3	1990°	Tungsten, graphite
Al_2O_3	2050°	Tungsten, graphite
CaO	2572°	Tungsten, CaO
MgO	2800°	Graphite