

He also reports progress on the *Index to the Mineral Waters of the World*, the printing of which has been delayed by mechanical difficulties.

Dr. Wilhelm P. Jorissen, of Rotterdam, has undertaken to bring down to date Professor Albert R. Leeds' *Indexes to Ozone and to Hydrogen Peroxide*, first issued in 1880, and long since out of print.

Monsieur Jules Garçon, chemical engineer (of 40 bis Rue Fabert, Paris), is about to publish an important contribution to the bibliography of technical chemistry, entitled: 'Répertoire universel de bibliographie des industries tinctoriales et des industries annexes.' It is expected to form three large volumes. In the preparation of this immense undertaking the author has examined 1,800 works and 111 sets of periodicals, the latter in 5,000 volumes, besides 7,000 other articles and documents. Subscriptions (100 francs) may be sent to the publishers, Gauthier-Villars et fils, Paris. M. Garçon is known as the author of the 'Bibliographie de la technologie chimique des fibres textiles,' Paris, 1893, noted in our Thirteenth Annual Report.

Two unfinished manuscript indexes are at the disposal of persons willing to undertake their completion: an *Index to the Literature of Carbonic Oxid*, begun by the late Professor William Ripley Nichols and continued by Professor Augustus H. Gill; and an *Index to the Literature of Milk*, begun by Professor Clement W. Andrews.

As stated in previous reports, this Committee does not attempt to prescribe a fixed plan for volunteer indexers, but leaves method and topic to be chosen by compilers; the Committee does not seek to control the productions further than to insure work of high merit and to guard the interests of the Smithsonian Institution, which has agreed to publish manuscripts endorsed by the Committee. Chemists willing to undertake the compilation of in-

dexes are requested to send their names and addresses with a memorandum of the subject chosen to the Chairman of the Committee (Cosmos Club, Washington, D. C.), who will furnish sample copies of indexes and other information.

H. CARRINGTON BOLTON, *Chairman*,  
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#### REPORT OF THE COMMITTEE ON STANDARDS OF MEASUREMENT.

The determination of the mechanical equivalent of heat by the electrical method, as reported by Griffiths (*Phil. Trans.*, A, 1893) and by Schuster and Gannon (*Proc. Roy. Soc.*, Nov., 1894) gave a larger value than Rowland's corrected result. This fact has created a demand for the redetermination of the ampere in terms of the electrochemical equivalent of silver. At the Toronto meeting of the British Association last year a grant was made to the B. A. Committee on Electrical Measurements for the purpose of carrying out this investigation.

At the Detroit meeting of this Association the grant of \$50 previously made for the use of this Committee was made available for the past year. Though this appropriation was clearly insufficient for the purpose, it was decided that the redetermination of the ampere should be undertaken for the committee of this Association in the physical laboratory at Ann Arbor. The work has been ably carried to completion by Professor Patterson and Dr. Guthe. The details of the method will be given in a paper by Dr. Guthe before Section B.\*

The discrepancy between Griffiths' results and those of Rowland is about one part in 400 at all temperatures between 15° and 25° on the nitrogen scale. Those of

\* This paper was duly presented.—ED. SCIENCE.

Schuster and Gannon exceed Rowland's at  $19.^{\circ}1$  on the same scale by about one part in 500 (Johns Hopkins University Circulars, June, 1898). These differences exist after the final elaborate comparison of thermometers and the reductions to the same absolute scale of temperature.

Since the electrical methods employed to determine the mechanical equivalent of heat involve either the current and the E. M. F. of the Clark cell or the square of this E. M. F., and since the E. M. F. of the Clark cell is determined by means of the silver voltameter it is evident that the current enters the final result as the square. If the discrepancy is due entirely to an error in the value of the ampere, assuming the ohm to be correct, then the ampere should be one part in 1,000 to one part in 800 larger than the present accepted value. That is, the electro-chemical equivalent of silver should be increased from Lord Rayleigh's value of 0.001118 to 0.0011191 or 0.0011194. Lord Rayleigh does not claim for his result an accuracy greater than one part in 1,000.

The method used by Patterson and Guthe was that of a specially constructed electro-dynamometer of large dimensions, and the employment of the torque of a phosphor-bronze wire to equilibrate the countertorque due to the effort between the magnetic fields of the stationary and movable coils. This method eliminates entirely the value of gravity  $g$ . The torque of the wire was measured by observing the period of vibration of a cylindrical brass weight of known mass and dimensions when suspended by the phosphorbronze wire. The entire success of this part of the investigation was due to the fact that the observations were made with the whole apparatus enclosed in a fairly good vacuum. Under these conditions the vibrations could be followed for hours at various intervals; the logarithmic decrement was almost entirely constant, and it was easy to obtain a curve connect-

ing temperatures and periods of vibration as a torsional pendulum. The wire was so connected to the support and to the brass cylinder that it could be transferred from the vacuum apparatus to the electro-dynamometer and back again without disconnecting it from the terminal pins. From personal inspection at the several stages of the investigation assurance can be given that the work has been most carefully executed at every point, and all known sources of error have been as completely eliminated as possible. The weights employed were compared with the standards at the U. S. Bureau of Weights and Measures in Washington; the standard of length was a half-meter bar of speculum metal made for the University of Michigan by the late Professor W. A. Rogers. The time was taken from a standard Riefler clock checked by comparison with the observatory time. The result of the investigation is that the electro-chemical equivalent of a used solution of neutral silver nitrate, fifteen parts by weight of the silver salt to eighty-five parts of distilled water, is 0.0011192 gm. per ampere per sec. This exceeds Lord Rayleigh's value by about  $\frac{1}{3}$  of one per cent. and causes the discrepancy in the mechanical equivalent of heat to disappear.

The corresponding change in the E. M. F. of the Clark cell will be from 1.4342 to 1.4327 at  $15^{\circ}$  C. A direct determination has not yet been made and this redetermination is reserved for the coming year.

Dr. Kahle has obtained for the electro-chemical equivalent of silver the value 0.0011182 (*Wied. Annal.*, Vol. 59, p. 532) by the use of an electro-dynamometer designed by von Helmholtz and a fresh solution of the salt. Pellat and Potier found the same value as that of Patterson and Guthe (*Journ. de Phys.* 9, p. 381, 1890).

HENRY S. CARHART,  
*Secretary of Committee.*

ANN ARBOR, MICH., July 25, 1898.