searches may continue. There remains much to be done and a part of this collection of exhibits has very nearly attained the object proposed."

Among the specific conclusions are these:

Smoke cannot be suppressed without considerable excess of cost.

Special fuels, as anthracite, coke, fuel-gas and mineral oils, may be resorted to, and with success, where cost is not objectionable.

The chimney-top should be visible to the man at the furnace.

Prolonged trials should supplement such investigations as those prosecuted by this Commission, to ascertain the durability of the apparatus and of its efficiency.

Existing legislation, well enforced, is advised, rather than any specific new legislation.

The appendix to the report is an elaborate presentation of the logs, tables and drawings of the apparatus of the trials described in the text. The whole constitutes a very valuable contribution to the literature of the subject, in the department of applied science, and deserves to be permanently preserved in every library of applied science, beside the reports of the Franklin Institute discussion.

R. H. THURSTON.

AMERICAN MATHEMATICAL SOCIETY.

THE fifth annual meeting of the American Mathematical Society was held in Fayerweather Hall of Columbia University, on Wednesday, December 28, 1898. On the two following days the Chicago Section of the Society held its fourth regular meeting in the Ryerson Physical Labratory of the University of Chicago. At the election held at the annual meeting the following officers and members of the Council were chosen: President, R. S. Woodward; First Vice-President, E. H. Moore; Second Vice-President, T. S. Fiske; Secretary, F. N. Cole; Treasurer, Harold Jacoby; Librarian, Pomeroy Ladue; Committee of Publication, T. S. Fiske, F. N. Cole, Alexander Ziwet; members of the Council to serve for three years, Maxime Bôcher, James Pierpont, Charlotte Angas Scott.

The Society has now completed its tenth year of continuous existence, having been organized as the New York Mathematical Society in November, 1888, and reorganized under its present title in July, 1894. The *Bulletin* is now in its eighth annual volume; the first number appeared in October, 1891. The present membership of the Society is 315. About ninety papers have been presented at its meetings during the past year. The Chicago Section was organized in April, 1897, and has proved from the beginning a valued addition to the Society's strength.

At the annual meeting the following papers were read:

(1) PROFESSOR M. I. PUPIN: 'On multiple resonance.'

(2) DR. A. S. CHESSIN: 'On the development of the perturbative function in terms of the eccentric anomalies.'

(3) DR. A. S. CHESSIN: 'On some points of the theory of functions.'

(4) PROFESSOR E. O. LOVETT: 'On the transformation of straight lines into spheres.'

(5) DR. E. J. WILCZYNSKI: 'A generalization of Appell's factorial functions.'

(6) PROFESSOR ORMOND STONE: 'On the solution of Delaunay's canonical system of equations.'

(7) DR. VIRGIL SNYDER: 'Asymptotic lines on ruled surfaces having two rectilinear generators.'

(8) DR. G. A. MILLER: 'On a memoir on the substitution groups whose degree is less than nine.'

(9) DR. W. SCHULZ: 'On the partial differential equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = ke^u$$

and its connection with Dirichlet's principle.'

The following is a list of the papers read before the Chicago Section:

(1) DR. L. E. DICKSON: 'The determination of the structure of all linear homogeneous groups in a Galois field which possess a quadratic invariant, with the announcement of two new systems of simple groups.'

(2) MR. CARL C. ENGBERG: 'The Cartesian oval and the auxiliary parabola.'

(3) Professor Arthur S. Hathaway: 'A new way of presenting the principles of the calculus.'
(4) Professor H. Maschke: 'Some general theorems concerning linear substitution-groups of finite order.'
(5) Professor E. H. Moore: 'Concerning Klein's groups of n! (n—1)-ary collineations.'
(6) Professor E. H. Moore: 'The decomposition of a modular system connected with the doubly generalized Fermat theorem.'
(7) Professor H. B. Newson: 'Normal forms of projective transformation (second communication).'
(8) Professor H. B. Newson: 'A new solution of the Riemann-Helmholtz problem.'
(9) Professor H. B. Newson: 'What constitutes a continuous group?'
(10) Professor James B. Shaw: 'Some quaternion integrals and their related classes of functions.'
(11) Dr. H. F. Stecker: 'Non-Euclidean images of plane cubics on rotation surfaces of constant negative curvature.'
(12) Professor Henry S. White: 'Note on certain relations among fundamental covariants of a ternary cubic.'
(13) Professor J. W. A. Young: 'The teaching of mathematics in the higher schools of Prussia.'

F. N. Cole,
Secretary.

Columbia University.

GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY.

The eighteenth general meeting of the American Chemical Society was held in New York on the 27th and 28th of December, and was in every respect a most successful and notable gathering.

The opening session was held at the rooms of the Chemists' Club, 108 West 55th Street, with an attendance of about one hundred and fifty members and visitors.

Dr. McMurtrie welcomed the visitors and then introduced Mr. Randolph Guggenheimer, President of the Council, who welcomed the Society to the city. Professor Alexander S. Webb, of the College of the City of New York, welcomed the Society to the educational and scientific institutions of the city. President C. E. Munroe responded in behalf of the Society, after which the following papers were read:

'A New Method for the Separation of Arsenic, Antimony, Selenium and Tellurium from one another and from other Metals,' A. E. Knorr; 'Separation of Impurities in the Electrolytic Refining of Copper,' by P. de P. Ricketts; 'The Preparation of Metallic Tellurium,' Victor Lehner.

The meeting was then adjourned to take a special train to the New Jersey Zinc and Iron Company's works at Newark, N. J., where a luncheon was served, and the process of manufacture of zinc oxide was shown. Parties were also made up to visit the Wetherill Concentrator Works, Murphy Varnish Company, Lister's Agricultural Chemical Works and others.

In the evening a business session was held at the club rooms, at which reports were received from standing committees and the retiring President made his address. M. Raoul Pictet gave an interesting discourse on the 'Retardation of Chemical Activities at Low Temperatures.' His subject was illustrated by a lantern projection showing a piece of metallic sodium held on a steel needle and both immersed in hydrochloric acid which had been cooled to the lowest temperature obtainable by means of solidified carbon dioxide. There was no reaction between acid and sodium or the iron until a considerable rise of temperature had taken place.

The second day's session was held at Havemeyer Hall, Columbia University, at which the following papers were read:

'Measurement of Turbidity in Water,' W. P. Mason; 'The Assay of Nux Vomica,' E. R. Squibb; 'The Potato and Cassava Starch Industries in the United States,' H. W. Wiley; 'Notes on the Estimation of Carbohydrates,' Traphagen and Cobleigh; 'The Action of Iodine on the Fatty Amines,' J. F. Norris; 'On the Constitution of Some Canadian Baryto-Celestites, C. W. Volney;