December, 1915) this plant (1915) is a success both technically and economically, and between 800 and 1,000 tons of alum are manufactured per year. The cost of manufacture in 1915 was about $10.50 per ton. For this process sulphuric acid of not less than 92 per cent. is used and a bauxite containing not less than 52 per cent. Al_2O_3, and not more than 3 per cent. Fe_2O_3. Bauxite can readily be secured, containing from 58 to 60 per cent. Al_2O_3. The filter alum should contain at least 17 per cent. Al_2O_3, and one ton of bauxite will serve for at least three tons of alum, $Al_2(SO_4)_3$ 14 H_2O. The manufacture of alum in Ontario at the point where it is to be used would be of great economic advantage, especially in that it increases our local market for sulphuric acid wherever large quantities of filter alum are required, and this coincides very well with the points of manufacture of sulphuric acid; also there is a decided advantage in hauling less than one-third the tonnage over railways now known to have very congested traffic conditions. Alum made at some central water purification plant can readily be shipped to adjacent municipalities in a solid form.

The importation of bauxite would probably be from the Southern States of America where it is mined quite extensively. There is no record of any bauxite in Canada. The shales and clays of Ontario seldom give as high as 20 or 21 per cent. Al_2O_3 and except the ordinary process is to be changed, are not suitable for the manufacture of alum.

WATER CONSUMPTION STATISTICS OF SEVERAL CITIES

The following table showing the estimated population, the daily per capita consumption and the percentage of services metered will be of interest. These figures were obtained from the officials of the various cities and are taken from the report of the Chicago Bureau of Public Efficiency.

City.	Estimated Population.	Average daily consumption per capita (gallons).	Per-centage of services metered.
Des Moines, Iowa ...	105,000	60	98.5
Providence, R.I.	284,400	66	93
Oak Park, Ill.	33,000	70.6	100
New Orleans, La. ...	378,000	75	100
Madison, Wis.	32,050	77.4	99.8
Atlanta, Ga.	200,000	89	100
Kansas City, Mo. ...	380,000	89.5	80
Columbus, Ohio	216,687	90.5	96.1
Omaha, Neb.	180,000	95	87.6
New York, N.Y.	5,602,000	101	26.8
Boston, Mass.	762,700	105	66
Springfield, Mass. ...	106,280	106	97.7
Cleveland, Ohio	845,000	113.2	98.4
Milwaukee, Wis. ...	440,000	118	99
Cincinnati, Ohio	415,000	126.3	69
St. Louis, Mo.	755,000	130	7.1
Washington, D.C. ..	364,088	136.5	77
Los Angeles, Cal. ...	533,535	140	88
Detroit, Mich.	781,133	168.5	36
Philadelphia, Pa.	1,700,000	176	15
Chicago, Ill.	2,491,933	258.9	6.9
Buffalo, N.Y.	486,000	329	5

The following have been nominated as officers of the American Water Works Association for the year 1918-1919:—For president, Chas. R. Henderson; vice-president, Carleton E. Davis; treasurer, James M. Caird; trustees, Allan W. Cuddeback and John J. Hinman, Jr.

SEWAGE TREATMENT AND DISPOSAL*

By G. Bertram Kershaw, M.Inst.C.E., M.Am.Soc.C.E.
President of the Institute of Sanitary Engineers.

THE first point requiring consideration in sewage treatment is the nature of the sewage to be treated. Sewages differ very widely as regards strength and composition, scarcely two being alike, and it is of vital importance to obtain a thorough knowledge on these points. Sometimes this knowledge can only be tentatively arrived at; usually, however, samples can be taken and analyzed. These samples should be what are known as average samples, or samples drawn according to the rate of flow; otherwise very misleading results may be obtained. A very rough idea of the strength of a domestic sewage may doubtless be obtained by a knowledge of the sewage flow per head of the population sewered; but I would utter a word of caution against placing too much reliance upon this. It by no means follows that a 30-gallons-per-head sewage is necessarily twice the strength of a 60-gallon sewage, even when two domestic sewages are compared. Sewages often differ very considerably as regards oxidizability, even when the water supply per head is similar, and when trade wastes are present the flow of sewage per head may be comparatively little value as an index of strength. The proper way to determine the strength of a sewage is by a series of analyses, and the use of the proper formula for strength.

On the nature of the sewage as shown by the figures of analysis will depend in great measure the nature of the treatment to be adopted; generally speaking, the constructional cost and working charges will vary directly as the strength of the sewage. Even when the treatment works are in active operation, samples should be taken and examined, especially when trade wastes are present; the strength and character of a sewage does not, as a rule, remain constant year after year, and it is well to ascertain from time to time how far and in what way it has altered. One factor alone, *viz.*, the setting up of new manufactories in a town, may entirely alter the composition of the sewage. During the past three years large munition works and huge extensions of existing factories have not only modified but absolutely changed the character of many sewages.

With respect to analyses of sewage liquors (the term "sewage liquors" including effluents), it has always seemed to me that figures taken to four places of decimals are utterly out of place, and tend to give a fictitious appearance of great accuracy, which is seldom justifiable. Again, figures of analysis regarding the water supply itself should, whenever practicable, be given, together with the figures for the sewage. The water forms the bulk of the liquid portion of the sewage; chemically it varies very considerably, and it is often important that its chemical characteristics should be known.

Conjoining with the sampling of sewage liquors, and equally important, is the gauging of sewage flows, and it is often convenient to carry out both operations at the same time. It would be of great assistance in many ways to sewage engineers if greater facilities for gauging were provided at all sewage works, no matter how small, yet it is rarely the case to find such provision. It is no answer to point out that gaugings have been taken for years in the case of a few large works; it is the average works that needs improvement in this respect. Gauging records, when worked up, would give much valuable information.

*Abstracted from Presidential Address.