Table of Charges—On Percentage Basis

	Less than $5,000.	$5,000 to $10,000.	$10,000 to $20 000.	$20,000 to $50,000.	$50,000 to $100,000	$100,000 to $200,000.	$200,000 to $500,000.	Over $500,000.
	%	%	%	%	%	%	%	%
Reconnaissance .	2.0	1.75	1.5	1.0	0.75	0.5	0.4	0.3
Preliminaries ..	1.5	1.0	0.8	0.6	0.5	0.4	0.3	0.2
Plans and specifications	4.0	3.5	3.0	2.5	2.0	1.5	1.3	1.2
*Supervision ...	2.0	1.8	1.5	1.3	1.1	1.0	0.8	0.6
*Superintendence	5.0	4.5	4.0	3.5	3.5	3.0	2.8	2.4
†Alterations	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5
Everything from beginning to completion of job	12.5	10.75	9.3	7.9	7.4	6.0	5.3	4.2

*Supervision not charged for when superintendence is.

†Alteration relates only to value of work involved in the alteration.

NOTE—Percentages are computed upon the entire cost of the completed work, exclusive of engineering, or upon the estimated cost pending execution or completion of same. "Cost" refers only to such part or parts of the whole work or project as the engineer may deal with.

Table of Charges—On Per Diem Basis

Chief engineer—$500 retaining fee, $100 a day while absent from office and expenses.

Assistant chief engineer—$50 a day while absent from office and expenses.

Topographers, assistant engineers and chiefs of parties—$15 to $25 a day while absent from office and expenses.

Designers—$12.50 a day while absent from office and expenses.

Instrumentmen, draftsmen, computers—$7.50 a day while absent from office and expenses.

Stenographers, chainmen, axmen—$3.50 a day.

NOTE—Attendance at court or expert testimony for any fraction of a day is considered as a full day.

Charges on Other Bases

A fixed fee for services rendered may be charged by agreement where a long engagement for professional services is contemplated, the engineer may accept such retainers on a yearly basis, at a compensation not less than that of the permanently employed engineer of the client. Except in cases where the compensation of the engineer is in the form of an annual retainer, the agreement between the engineer and his client should specify the period of time during which the compensation of the engineer, as determined by per diem charges, fixed fee, or agreed percentages, shall apply. If, through no fault of the engineer, the work should not be completed within the time so specified, an additional charge may be made, the basis for which, if practicable, should be agreed upon in advance.

Several prospectors have been at work in the Kingston, Ontario, district, and think they have discovered coal deposits, located within a dozen miles of the city. Samples have been submitted for analysis.

Hon. Howard Ferguson, Minister of Lands, Forests and Mines, Province of Ontario, stated at the Provincial Legislature last week, that the price of peat, as compared with coal, is as high as it has ever been, considering its relative fuel value. This is because the cost of manufacturing has advanced so much. The Ontario Government intends to endeavor to secure some labor-saving device for the production of peat in commercial quantities.

FILTER ALUMS USED IN ONTARIO*

By G. E. Gallinger, A. V. DeLaporte and F. A. Dallyn

THE development of water purification in the province, and more especially the introduction of rapid sand filter plants, has brought new and peculiar duties to the Board of Health. At present an important matter under consideration is the quality of alum or sulphate of alumina offered for sale for water purification purposes. It is extremely necessary that a proper or satisfactory aluminum sulphate should be used in connection with the operation of mechanical filters.

For the past ten years the smaller municipalities in Ontario have been purchasing alum to satisfy their local requirements—amounts ranging from two to twenty tons per annum—through local supply houses or druggists. The importance of the filter alum supply has recently been greatly enhanced through the completion at Toronto of a water purification plant requiring the purchase of from 700 to 900 tons of alum per annum.

The investigation of the various filter alums supplied through the local agencies was undertaken by the staff at the laboratory at the Board's Experimental Station. The return of inquiry sheets showed, with few exceptions, that the alum supplied to smaller municipalities had passed through four or five hands before reaching them, and that the price paid by adjoining municipalities for aluminium sulphate varied widely. During the last two years the prices have varied from 1.9 cents to as high as 7 cents per pound, depending on the amount purchased; the latter represents the prices when purchased in small quantities.

Apart from the economic question of added cost, there is grave danger, when the local agency is unaware of the source of supply, that alum furnished in this way may be found unsuitable for the purpose of water purification. Several striking incidents of this nature were discovered during the laboratory investigation.

The investigation also revealed the fact that the average municipality purchased its alum without a knowledge of what was required.

The analysis of the alums received by the Board appear in Table No. 1.

Lump alum or sulphate of alumina is a combination of bauxite—a southern clay containing 58 per cent. to 60 per cent. alumina, the aluminum being present as $Al_2O_3H_4$, with sulphuric acid.

The process most generally employed for manufacturing sulphate of alumina consists firstly in mixing bauxite with sulphuric acid in lead-lined tanks, then boiling for a period of from six to eight hours. The solution formed after the reaction between bauxite and acid has taken place, is a mixture of $Al_2(SO_4)_3$ and silica; and in order to obtain a clear solution it is necessary to filter the mixture. This filtering process is difficult, tedious and costly. The alum solution is next boiled to expel the excess water. After being concentrated from a density of 25° or 30° Baume to a density of 50° or 60° Baume, the solution is discharged into trays, and on cooling it crystallizes to alum cake. This cake is then crushed or pulverized and is shipped in bulk, barrels or sacks.

A good basic aluminium sulphate should be in lumps from one-half to two inches in diameter. It should contain not less than 17 per cent. of water soluble aluminium calculated as Al_2O_3, and should have a basicity ratio of 0.03 or, in other words, should contain one-half of one per cent. of Al_2O_3 more than is theoretically required to

*From the 1916-17 annual report of the Provincial Board of Health, issued February, 1918.