causes. The slow sand type may give poor filter efficiency when sufficient extra units are lacking, necessitating excessive rates and placing of "green" filters in service. Excessive rates, too little coagulant, insufficient sedimentation capacity, and insufficient storage are common operating and structural faults of the mechanical type. Sometimes a properly constructed plant is struggling with a raw water which has a high bacterial content, and even with fair filter efficiency yields an unsafe effluent. Probably the greatest single cause of a poor effluent from filter plants is inefficient operation by unskilled men. It is absolutely essential for good results that bacteriologic examination, including B. coli estimation, be made at least once daily, and in slow sand plants from each unit separately.

The man in charge must be able to do this. In mechanical filter plants, or with hypochlorite plants, he must also have the necessary skill to adjust his chemicals with a nicety according to the changes in the raw water. With such a man in charge of a properly constructed plant a safe effluent is assured at all times. When struggling with a bad raw water, he will use hypochlorite as an adjuvant with good results. He will study the peculiarities and fluctuations of the constituents of the raw water and adjust his treatment accordingly.

In showing the relation between water and the prevalence of typhoid fever it is essential to have accurate vital statistics. Too often we find in making an investigation that no accurate statistics are available. Happily the registration area is growing larger each year, but the enormous territory still outside the pale, which furnishes no statistics, is a disgrace to our civilization and our much vaunted progressiveness.

The Federal Government can only request such statistics as a courtesy, but surely in this day and generation no authority should be necessary to compel the furnishing of statistics to the General Government for the general welfare.

Failure to Supply the Purified Water to All Parts of the City.—To secure the desired result, elimination of waterborne typhoid, it is essential to supply the safe water to all parts of the city. The high typhoid rate in Toledo, in spite of a safe public supply, was due to the fact that more than half the population depended upon shallow wells which were known to be contaminated in many instances. In Pittsburg during 1910 wards 1 to 20 were supplied with filtered water. The aggregate population of these 20 wards was 401,622. The typhoid-fever death rate per 100,000 in 1910 was 13.4. Wards 21 to 27 comprise the old city of Allegheny, and have a total population of 132,283. This section received unfiltered water. The typhoid-fever death rate per 100,000 in this section in 1910 was 46.9.

To summarize, the following facts are pertinent:

One.—In the prevention of typhoid fever there is a necessity for safe water supplies for 365 days in the year.

Two.—Unfiltered surface supplies may be exposed to a dangerous pollution for a few days or even for a few hours only.

Three.—Supplies derived by impounding surface waters, and which depend upon storage alone to nullify the pollution of an inhabited watershed may be very dangerous in periods of drought and low water. The proportion of pollution is relatively greater at such times and the time of storage is greatly reduced.

Four.—Purification, whether by storage, filtration, or chemical treatment, must be efficient at all times, and this cannot be assured without bacteriologic control.

Five.—It is essential that a daily quantitative estimation of B. coli be made, as a low bacterial count does not necessarily mean a safe water without absence of B Coli. Six.—There is a necessity for close supervision of muni cipal plants by the State to correct structural and operative defects and insure a safe water at all times.

Seven.—Bacteriologic control and State supervision would insure cleaning when necessary, and should prevent the putting in service of slow sand filters before the "schmutzdecke" is ripe.

Eight.—In order to control typhoid fever and eliminate water-borne typhoid it is not sufficient alone to have a purification plant. In addition the purification must be efficient and the purified water must be available in all parts of the city.

It has been said that every death from typhoid fever was either a case of murder or suicide. An even stronger statement has been made that for every death from typhoid fever somebody should be hanged. These statements have a strong basis of truth, but exceed the truth somewhat. A more conservative statement, and one which is unassailable, is that every case of typhoid fever is due to somebody's ignorance or carelessness.

Now, in regard to carelessness or criminal negligence, the punishment should fit the crime, but for ignorance the remedy is not punishment but education.

It is precisely in this matter of education that this powerful and intelligent association can achieve the greatest good. The educational campaign must be directed against improper disposal of human excreta, impure milk supplies, flies, uncontrolled cases of typhoid, filthy personal habits of individuals, and, above all, against contaminated public water supplies. This paper is limited to water-borne typhoid, and therefore the other very important factors are not discussed. In the campaign for better water supplies we must direct our efforts toward securing the co-operation of the municipal authorities and the individual citizen.

Municipal authorities must be impressed that it is their plain duty to furnish a public water supply which is safe 365 days in the year and not on which is safe "most of the time"; that the absence of large explosive epidemics is not proof that the water supply is safe; that dangerous pollution due to a combination of weather and other conditions may occur only one day in the year, as at Erie, Pa., and that such disasters must be prevented; that a dilute pollution may be responsible for cases of typhoid fever scattered throughout the year, without giving an abnormally high typhoid rate; that a public water supply cannot be assumed to be safe, unless it is shown to be safe by a daily bacteriological examination.

In regard to the individual citizen, he must be awakened to the seriousness of the excessive typhoid fever rate in this country. In so far as water-borne typhoid is concerned the citizen should be taught that municipalities have an obligation to furnish a public water supply which is safe 365 days in the year, and that it is his inalienable right to demand and receive such a supply. The standard which should be expected in order to indicate safe water should be, less than too bacteria per cubic centimeter and an absence of the Colon Bacillus or other bacteria of sewage origin in one cubic centimeter samples.

The following are the lines of the Canadian Northern Railway now under construction:---

Line	files.
Inte.	86
Sydennam-Ottawa	60
Montreal-Hawkesbury	30
(Dileas Instin) Capreel Junction	304
Ottawa (Rideau Junction)-Capieor Junction	543
Ruel-Port Arthur	
	1,023

856