maximum of forty-eight million gallons per day. However, it is necessary to have at all times at least two filters out of operation for cleaning purposes, making the average output of the plant forty million gallons per day. As a matter of fact, we have, for a considerable time, been operating at the rate of forty-three to forty-eight million gallons per day—considerably in excess of its designed rating.

To make provision for a maximum daily capacity of one hundred million gallons, Mr. Allen Hazen, the expert retained by the city, advises an addition of thirteen slow sand beds, each having an area of .8 acres, which would guarantee an average daily output of sixty-seven million gallons, after making allowance for the beds inoperative because of cleaning operations. For short periods this output could be increased to ninety million gallons per day.

This addition, together with the necessary pumping plant and appurtenances, would cost approximately one million dollars. The cost of operation per million gallons, excluding pumping and capital charges, is estimated by Mr. Hazen at $1.83. This seems to be a fair figure.

A mechanical filtration plant, capable of delivering a maximum of sixty million gallons per day, would cost approximately one million dollars—equal in amount to the slow sand addition.

While we have hereinbefore stated that the first cost of a mechanical filtration plant is considerably less than that of a slow sand, it does not hold good under local conditions, where very expensive foundation work must be provided owing to the sand formation of the Island.

The first cost of each type of plant being practically identical, the annual charges on capital account are not included in the comparisons following.

In mechanical filtration, an additional head is required to operate the filters, over and above that requisite in the slow sand method. Making provision for this additional lift, Mr. Hazen estimates the cost of operation per million gallons, exclusive of capital charges, to be $4.80, which, having regard for our investigation, appears a reasonable figure.

For the purpose of illustration, assuming the average daily pumpage for the year 1914 to be fifty-five million gallons, handled exclusively by slow sand filters, the approximate cost, excluding pumping and permanent charges, would be $36,737. If thirty-two million gallons were filtered through the present slow sand beds (their average normal rating), and twenty-three millions through mechanical filters, the annual cost would approximate $61,670, showing a difference of $24,933 in favor of slow sand. In later years, if the proportion of the total supply through mechanical filters largely increased, as it naturally would, the cost difference in favor of slow sand would be greater.

From the foregoing, you will observe that, from point of operating cost, the slow sand process is very much cheaper than the mechanical.

We have found in the operation of the Island plant that, at times of easterly storm, the suspended matter carried from Scarboro', and particularly the fine sand carried in the water, has rendered the filters almost inoperative. Our experience in 1912 showed this condition to obtain for four periods, and while by dint of great effort, we have never come to the point where actual cessation of filtering operations was necessary, we feel that a long continued easterly storm would probably so clog the filters as to render the use of raw water necessary.

Again, from the inset of frost in the fall until the advent of warm weather in the spring, it is not possible to wash the sand scraped from the filter beds, by the methods provided, inasmuch as the pipe lines, etc., would freeze and burst, and the sand and water would be frozen during the washing process. To overcome this, it was found necessary last summer to build a storage sand bin in each filter, wherein the sand scrapings for the winter were held. We have been working night and day since spring to wash this accumulation, plus the sand from the beds in operation, and the quantity necessary for resanding.

The complete construction of a slow sand filtration plant would take approximately three years, while a mechanical unit should be installed and in operation within eighteen months.

We deem it unfortunate that the filtration plant should have been erected at Toronto Island. The ideal place for such installation would have been on Garrison Common, which is within a convenient distance of the main pumping station, and would have been the strategic point at which, if necessary, other than lake water could have been filtered.

However, the fact that upwards of $800,000 has been invested in the Island plant compels the retention of the Island as a filtration site, unless the present plant be abandoned, which we, of course, cannot advise.

The formation of the Island is such as to render it an undesirable location for permanent construction of this nature, and the very extensive dredging operations which the Harbor Commissioners purpose undertaking, may cause such changes as to imperil the present or any future installation which may be built thereat. This possibility may be remote, but is of sufficient moment to justify us directing your attention thereto.

The continuity of a filtered water supply for 365 days per year, is in our opinion the dominant factor in the consideration of this proposition. A shut-down during a storm period would entail the use of raw water by the citizens, at a time when it is usually most dangerous, least amenable to chlorine treatment, and liable to produce epidemic.

While the slow sand method shows, on a pumpage basis of fifty-five million gallons per day, a saving of $24,933 per year over the mechanical system, we, your officials charged with the duty of providing an absolutely continuous and safe supply of water, are, irrespective of cost considerations, forced to recommend the adoption of the mechanical system of filtration.

The report was signed by R. C. Harris, Commissioner of Works; Geo. G. Nasmith, Director of Laboratories, Department of Health, and Chas. J. Hastings, Medical Officer of Health, and was adopted by the Works Committee.

The International Congress of Mining, Metallurgy, Applied Mechanics and Practical Geology is to be held in London in 1915. Several preliminary meetings of the Organization Committee have already been held, and a decision arrived at that the sections of the Congress be divided into four groups as follows:—Group 1, mining; section A, coal mining; section B, metal mining; Group 2, metallurgy; section C, ferrous metals; section D, non-ferrous metals; Group 3, applied mechanics; section E, mechanical engineering; section F, chemical engineering; section G, electrical engineering; Group 4, geology.