Annexations of adjoining municipalities, and the large extension of the city's water distribution system, have been more rapid than was expected. The new plant was required to work to full capacity from the day it was put into service and is now inadequate. The need for immediate action to provide for a much greater daily capacity of filtered water is so apparent that the city will undoubtedly

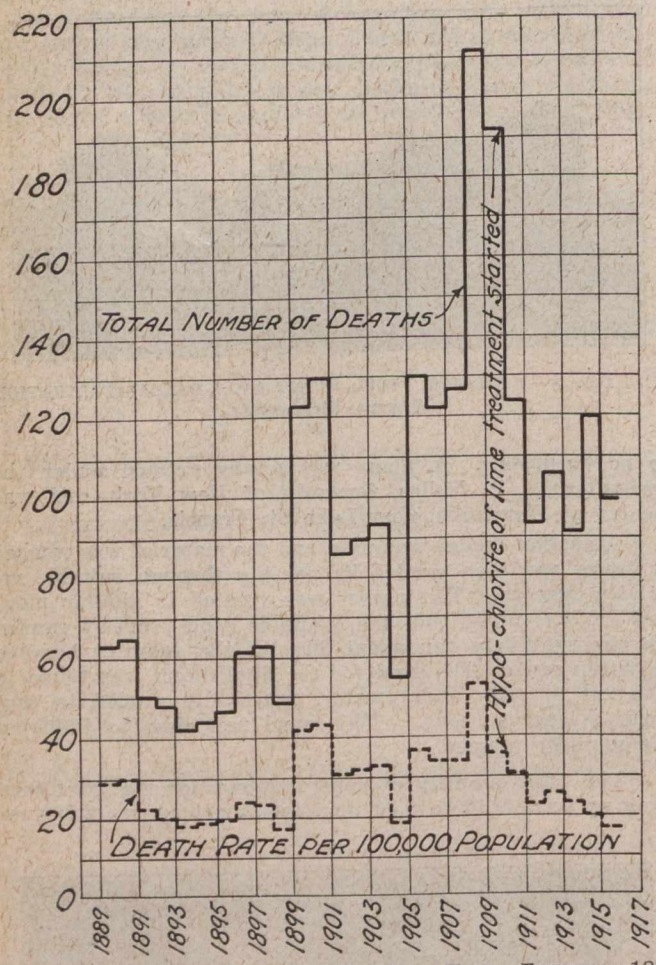

FIG. NO. 8—GRAPH SHOWING DEATHS FROM TYPHOID, 1889 TO 1917, CITY OF MONTREAL

in the near future let contracts for extension of the present works.

The original design contemplated the ultimate enlargement of the plant, it is said, along the following lines:—

Conversion of the final filters into slow sand beds,—capacity	30,000,000 gals.
Conversion of the pre-filters into mechanical filters,—capacity	40,000,000 gals.
Construction of two additional batteries of mechanical filters,—capacity	80,000,000 gals.
Total daily capacity	150,000,000 gals.

To carry out this scheme of extensions, it would be necessary to construct a new basin for coagulation, using alum as the coagulant, and also a new filtered water reservoir at a higher elevation than the present one, so that water could be delivered under greater head to the proposed new pumping station. The scheme contemplates the use of the existing reservoir as at present, but only to store filtered water from the proposed slow sand beds.

It is claimed that the proposed new pumping station could be built to advantage to the southeast of the site of the proposed power station, between Halmfield Street and the aqueduct excavation. This location would eliminate further congestion at the present low level pumping station and would allow for future extensions, it is said, to greater advantage than the present site.

The filtration works were constructed under the general supervision of Paul E. Mercier, engineer of public works, and T. W. Lesage, engineer-superintendent of water works. Frederick E. Field is the assistant superintendent of water works; A. B. Reid, electrical and mechanical engineer; Allan Kilpatrick, chief filter operator; and J. H. Harrington, chief chemist. To Messrs. Field, Kilpatrick, Reid and Harrington, *The Canadian Engineer* is indebted for all of the above information, drawings and photographs.

PREPARATION OF SPECIFICATIONS FOR CONCRETE

Practical and Advantageous to Specify Concrete According to Strength or Any Other Quality Desired—Some Specifications Result in Unknown Factors of Safety

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THE problem of proportioning concrete is the subject of extensive investigations in many laboratories at the present time, and several well-known investigators have arrived at reliable results which have quite well determined the sound principles to be followed in the making and mixing of concrete. In fact, sufficient data and information are already available to enable almost any contractor to make good concrete of a required strength in a certain time, and more is being rapidly added to the great mass already accumulated.

In the field these methods are being put into practice with success, resulting in a uniformity of product, a certainty of results, and consequent economy. In most offices, however, where designs are being carried out in both plain and reinforced concrete, this is not the case. The reason is this: Specifications for the quality of concrete are not kept up-to-date and many designers are still calling for 1:2½:5 mixes for 500 lbs. per sq. in. concrete; 1:2:4 mix for 650 lbs. per sq. in.; 1:1½:3 for 750 lbs. per sq. in., etc., these being the allowable stresses at, say, 28 days. The factor of safety is relied upon to cover the deficiencies.

Now a 1:2:4 mix may or may not make a concrete good for the usually assumed 2,000 lbs. per sq. in. at 28 days. That depends upon several factors, including the quality of cement, quality and grading of fine and coarse aggregates, quantity of water and methods of mixing and handling; and, to any engineer who may read this, upon several of his own pet ideas on the subject, even upon the effect of the change in declination of Polaris.

Nevertheless, the above-mentioned factors are the most important, and most contractors realize their importance. The control of the work on any large job now-a-days is such that attention is given to all of these matters.

The designer in the office, however, is still plodding along, calling for a 1:2:4 mix—which is so antiquated as to be almost meaningless—when he uses a stress of 650 lbs. per sq. in. in his design. The result is that one job, or a part of it, has a factor of safety of, say, about 2, and the next, or a part of the same one, has a factor of safety of about 6 or 7. This is certainly not economy; furthermore, if additions or extensions are to be made in the future, how is one to tell whether the original factor of safety was 2 or 7?

This article is essentially addressed to the designer and the one who writes specifications in the office. If they are to make use of the methods and valuable information already acquired for mixing good concrete which is suited to the purpose, they must co-operate with the engineer and contractor in the field. After plans and specifications leave the office, it is too late to change materially the entire design; the damage is already done. It may be possible for the field engineer to produce 2,000 lbs. per sq. in. concrete, but it may not be economical. On the other hand, a contractor would certainly be living up to the specifications if he put in 1:2:4 concrete, as called for, whether it gave 1,000 or 3,000 lbs. per sq. in. at 28 days.