DUAL SYSTEM RECOMMENDED

Continued from page one

ing engine should also be installed at Springbank.

2. Install a low-pressure fire service system in the congested district, using steam fire engines as before.

3. Install a high-pressure fire service system in the congested district, using steam fire engines as at present in the residential parts of the city.

A few large mains should also be laid in the two latter schemes, to give a better fire supply in the domestic service system:

The last-mentioned scheme will doubtless effect a greater reduction in fire premiums than either of the other two, but the first cost will be higher.

On the small plans which accompany this report I have shown two high-pressure systems:

1. Pumping station on North Branch near Wellington street.

2. Pumping station on South Branch near Rectory street.

The final decisions as to which of the foregoing should be adopted should depend upon the results of analyses and bacteriological examinations of the streams.

Should it ever become necessary to supplement the supply from Springbank, by filtering river water, the pumping plant for this domestic supply may be located at the high-pressure station, in which case a new main would be required to convey the filtered water to the city pipe system. Filtered water might eventually be used in the high-pressure system.

If the high-pressure system be adopted, one of the three proposed pumping units might be slowly operated for the constant demands, or two smaller auxiliary units installed for this service.

Owing to the length of the force mains from the pumping stations to Dundas street, the friction in a 16-inch pipe conveying 5,000 gallons per minute would amount to 100 pounds; that is, it would be necessary to maintain a pressure of 100 pounds higher on the machinery than at the hydrants at Dundas and Richmond streets. With a 20-inch main the loss in friction would be 40 pounds, and I therefore recommend a 20-inch main.

Cost of High-Pressure System.

I estimate the cost of either of the two mentioned schemes as follows:

Sedimentation basin or reservoir from which to pump ..	$ 25,000
Pumphouse	20,000
Four boilers, 250-horsepower each	20,000
Four pumping units, 2,000,000 gallons each	55,000
	$120,000

Pipe System.

11,000 feet of 20-inch pipe at 340 pounds to the foot.	
1,200 feet of 16-inch pipe at 230 pounds to the foot.	
7,800 feet of 12-inch pipe at 135 pounds to the foot.	
10,000 feet of 10-inch pipe at 100 pounds to the foot.	
10,000 feet of 8-inch pipe at 65 pounds to the foot.	
40,000 feet—3,340 tons at $35—$116,900	
150 special hydrants at $100 each	15,000
Special castings and gate valves	7,100
Trenching, pipe-laying, etc ...	35,000
Extra for replacing pavements	6,000
Cost of mains and hydrants...	$180,000
Pumping station	120,000
Total	$300,000

Extensions to the system on unpaved streets will cost from $3 to $4 per lineal foot, and on paved streets from $4 to $5 per lineal foot.

The foregoing estimate is based upon the assumption that a pressure of 250 pounds is to be carried at the pumphouse.

With lower pressures the estimates would be reduced approximately as follows:

With 250 pounds' pressure at pumphouse	$300,000
With 200 pounds' pressure at pumphouse	265,000
With 150 pounds' pressure at pumphouse	230,000

At the fire hydrants the pressure will be about 50 pounds less than at the pumping station.

In my opinion a larger percentage of the cost of the high-pressure system should be borne by the owners of properties benefited than by the districts.

Although I have estimated upon a steam plant, electric motors would be much cheaper, if approved of by the underwriters. Their sanction would doubtless depend largely upon the location of the power lines from the source of electric energy to the pumphouse. In my opinion, however, one of the pumping units should be steam driven.

Standpipe.

A water tower, standpipe, or elevated tank would equalize the ordinary daily pressure in the high-pressure fire system, but it would introduce an element of weakness, owing to the fact that it would be necessary to cut it off during fires, either by hand power or electric power. A tower 100 feet in height would give a pressure of 43 pounds only at the base, and this height is now seldom exceeded. Furthermore, I believe a pressure of 100 pounds desirable for hoists, manufacturing purposes, etc.

I doubt if the underwriters would permit a standpipe in connection with the fire service system, and I cannot recommend it.

River Water.

Although the quality of the river water is such that it cannot be used for domestic purposes without filtration following sedimentation, it may be used for fire service, street sprinkling, washing pavements, hoists, liveries, sewer flushings, certain factories, railway locomotives, and many other purposes.

Raw water, far more impure than the River Thames, is in use in many places for street sprinkling and other purposes. It is odorless, and the proposed settling basin will remove the greater part of the coarser suspended matter. You need not anticipate foul odors or other dangers arising from the distribution of microbes, as none will exist. I would suggest that the streets in the vicinity of the river on either branch, be sprinkled this season by raw river water, as an object lesson to the citizens.

The results of a few analyses of the river water will be found in my 1903 report.

I then recommended that a series of chemical analyses and of bacteriological examinations be made to extend over some time, to determine the relative purity of the two branches of the river. If this recommendation had been carried out, the results would now have been of the greatest value and assistance.

Ordinary Fire Supply.

Outside the high-pressure fire system area the domestic pipe system must be depended upon for fire protection.

The water supplied daily from the high-pressure system would increase the pressure in the domestic system a few pounds, and the amount saved by meters would effect a greater increase, but it must be borne in mind that the city will increase in population, thus increasing the draught from this system.

Several large mains should be laid, principally upon east and west streets, to improve the distribution system, as the proportion of four-inch and six-inch pipes is now altogether too high.

For fire protection to isolated factories and large buildings scattered through the city at points not to be reached by the high-pressure system, you must rely upon steam fire engines taking water from fire hydrants on the domestic system.

It may be desirable to lay a second main from the reservoir to the city, but this is not now necessary. This duplicate main would increase the pressure, give a greater volume for fires, and permit repairs to be made in the existing main when necessary. It would cost from $80,000 to $100,000, according to its size.

The additions to the domestic system now required would cost approximately $50,000, but it is not necessary to lay all these mains in one season.

Saving in Water.

The quantity of water that may be supplied by the high-pressure system for municipal, commercial and manufacturing purposes can only be estimated.

In 1903, from data given me by the superintendent and the city engineer, I estimated the maximum daily summer consumption as follows:

	Gallons.
Dwellings, offices, shops, stores, factories, hoists, etc..	2,000,000
Lawns (summer only)	750,000
Street sprinkling (summer only)	350,000
City and public buildings	100,000
Railways	500,000
Leakage from mains and services	300,000
Total	4,000,000

Since 1903 the number of services has increased nearly 20 per cent, but the supply to the railways has been cut off.

Part of the water supplied for street washing and sprinkling, factories, hoists, lawns, city buildings, etc., may be taken from the fire supply system.

The superintendent of the waterworks system can, no doubt, closely estimate the amount, but in my opinion, it will be found to be not less than 500,000 gallons per day during the summer months, and about half this in the winter.

The pumping records for 1906 show that 3,800,000 imperial gallons was the daily yield of the Springbank supply in the driest part of the season.

About 42,000 people now take water from the waterworks system, which represents a consumption of about 90 gallons per consumer, for all purposes.

It has been proven beyond question that in residences of the better class, fitted with all modern plumbing fixtures, the average daily consumption in Canadian and United States cities does not exceed 30 gallons per capita. I have proven it to my own satisfaction, not only in my own residence, but in hundreds of others during the last two years. This would give 1,300,000 as the maximum London supply to householders, to which must be added the supply necessary for offices, shops, stores, factories, hoists, etc., probably amounting to 500,000 gallons, making a total of 1,800,000 gallons used by the citizens. Probably 500,000 gallons would now represent the water used by the city, which gives a total actually used of about 2,300,000 gallons per day. This leaves 1,500,000 gallons unaccounted for.

In 1903 I allowed 300,000 gallons as the daily leakage from mains, but to be absolutely safe, I will now take it as 700,000 gallons, which would leave 800,000 gallons per day as the amount of water wasted daily through the carelessness of householders, and through leaky plumbing fixtures. If this could be prevented, the consumption per consumer would be reduced from 90 gallons to about 71 gallons for all purposes, city uses included. The present supply would then be ample for 53,000 people. If 50 per cent of the services be metered, the saving would probably be about 600,000 gallons, in which case the supply would be ample for 50,000 population.

During recent years the landlords in the larger cities, where the water waste was excessive, have discovered that it is much cheaper to check the unnecessary extravagant, useless waste of water than to expend large sums in laying larger mains, in erecting additional machinery, and in increasing the supply.

Meters.

There is only one practicable way of stopping the unnecessary waste of water, and that is by the adoption of meters. If every service pipe in London were metered, the consumption would be decreased by about 800,000 gallons per day. At first all the large consumers should be metered, then services to the small factories, hotels and livery stables. In the second season dwellings with lawns should be metered, office buildings, shops, stores, etc. By the end of the third year about 6,000 meters should be set. With 50 per cent of the services metered probably three-fourths of the controllable and preventable waste would be checked.

The cost of meters set will now average $15 per service, and the annual charges, repairs, interest, depreciation and cost of reading meters will be less than $2 per service. The water saved if sold at 6 cents per thousand gallons would pay the annual charges for the entire meter system, and you now have a market ready to take all that you can thus save.

Prejudice and ignorance should no longer be permitted to delay the general adoption of the meter system in the city of London. If there be any place in Canada where meters should be adopted, that place is London.

Your supply is limited, and therefore valuable; it is insufficient for the present maximum daily demand in the summer season, yet a large percentage is now allowed to run to waste after being pumped into the reservoir.

Meters will effectually stop waste, if a reasonable tariff be adopted, but in London it might be advisable for the first year or so to collect the revenue on the flat-rate basis, if a certain specified amount of water were not exceeded by each consumer, the meters acting only as silent inspectors to detect waste and warn innocent offenders.

Spring Water.

The quantity of water yielded by the springs at Springbank was estimated as 4,338,000 imperial gallons per day in 1903 by the waterworks superintendent, and in my report of that year I stated that in a dry season the minimum yield might not exceed 4,000,000 gallons. This included all the water now collected at Springbank. I am now informed, however, that the minimum is 3,800,000 gallons.

The combined yield of the five or six springs between Byron and Kilworth has been variously estimated from 500,000 gallons per day to 1,000,000 gallons per day. To collect this water, erect the necessary pumping station or stations, and construct a force main to Springbank would cost from $50,000 to $85,000 without any allowance for land and water taken. A gravity main would cost materially more, but the operating expenses would be less.

The dry weather yield of the springs on the north branch at Cronyn's and White's has been estimated as 750,000 gallons per day. To collect this water and convey it to the city would cost about $50,000, and in addition a pumping station must be erected which would cost, with machinery, $20,000 additional, or a total of $70,000, exclusive of land and water rights.

From the foregoing it would appear that the cost of adding the springs below Byron and the springs on the north branch would be at the rate of over $100,000 per million gallons secured, and in addition all the water must be pumped.

By expending this sum on meters, the same results will be effected, at less cost, and your waterworks system will then be placed on a business basis.

The springs mentioned may be added as required, before your present supply is overdrawn.

Filtration.

Eventually it may be necessary to take water from the Thames to supplement the supply from springs. Water far more impure than the Thames above London is today being used for domestic purposes by several cities in the United Sates, without filtration, but until the population of the city approaches 70,000 the citizens may be supplied by spring water exclusively, if my recommendations be followed.

If river water be used, at any time, the Springbank supply should, of course, be retained, the proportion of river water increasing with the population year by year.

Surveys, Etc.

Before acquiring any of the springs below Byron, or those along the North branch, careful detailed surveys should be completed and thorough tests made to demonstrate beyond a doubt the exact quantity available from each source. This work should be proceeded with at as early a date as convenient.

Valuation should also be made on the lands and waters desired, or options obtained. At present there is no definite data to lay before a designing engineer, all estimates of cost being guesses, which is not a business way of solving a business problem. The board has a yearly surplus and can well afford to make all surveys and examinations required, etc.

With a substantial yearly surplus I can see no reason why all necessary surveys, investigations, valuations, etc., should not be completed, and a definite scheme with complete plans and estimates submitted for the approval of the ratepayers.

The meter system is definite, you know in advance what they will cost, and the water saved will insure a supply while the surveys, plans, etc., are under way for an additional supply from springs.

Population.

In 1883 the population of the city was given as 20,305, but this did not include the population of East London, South London and West London, which were annexed in 1885, 1890 and 1898 respectively.

Upon the assumption that the three suburbs annexed increased in population at the same rate as the city, the population of the area now included in the city was about 29,000 in 1883, instead of 20,305 as above given.

From 1883 to 1903 the population increased to 39,265, that is it increased by one-third in 20 years, or only about one and one-half per cent per annum.

Since 1903 the rate of increase slightly exceeds three per cent.

I am inclined to believe that the probable increase in the future will fall between 3 per cent and 4 per cent; if so, the population of the city would be 60,000 in nine years, and 70,000 in seventeen years.

Engineers as a rule allow five persons for each service pipe, but in London there are four people to each service or each building, a remarkably small number.

Conclusions.

1. The present supply is 3,800,000 gallons per day, and is barely sufficient for the city's requirements. Average daily consumption, 90 gallons per consumer.

2. The installation of 6,000 meters will effect a saving of about 600,000 gallons per day. The supply would then be sufficient for 50,000 people at 76 gallons per consumer. By metering all of the services the supply would be sufficient for 53,000 people.

3. About 500,000 gallons now supplied by the domestic service may be taken from the proposed independent fire pressure system. This would bring the necessary Springbank supply down to 65 gallons per consumer, and it would then be ample for 57,000 people.

4. The saving effected by the meters and by the high pressure system together will defer for eight or nine years the time for securing an additional supply.

5. The springs between Byron and Kilworth, and in this vicinity, will supply 8,000 people, and the Cronyn-White springs 10,000 people, if the services be metered.

6. A total population of 75,000 may therefore be supplied by spring water at a reasonable cost, if meters be adopted and river water used for certain purposes.

7. The filtration of the Thames water can only be postponed by the adoption of the scheme recommended, or by the discovery of some source of supply not as yet investigated.

8. Fire protection can be best given in the congested business district by an independent high pressure system.

Recommendations.

1. Gradually set meters until 50 per cent of the services are metered, at a first cost of about $90,000. The total annual expenditure will be less than $2 per meter, which will be entirely offset by the saving in the cost of pumping.

2. Install a high pressure fire protection system at a cost of $300,000, the annual charges being $25,000, this cost to be adjusted between the city and the parties directly benefited.

3. Lay additional distribution mains in the domestic system at a cost of about $50,000.

4. Survey and measure all available springs and determine the quality of the river water before deciding upon the source from which to draw an additional supply.

The interest on the estimated cost of the different schemes that have been presented to the citizens from time to time for increasing the supply would more than meet the expense of these surveys and investigations.

Respectfully submitted.

WILLIS CHIPMAN,
Civil and Sanitary Engineer.

The Asiatic ports of Russia are at the present time free from customs duties.

It is calculated that society women at Newport and other fashionable summer resorts in the east were robbed of over $300,000 worth of jewels in the cover their property.

season just coming to an end. Very few of them have been, like Mrs. Stuyvesant Fish, fortunate enough to re-