five times as much per lineal foot laid, as a twelve inch pipe.

There are also other points to be taken into consideration. London at the City Hall has an elevation of 251 feet above Lake Erie, and at a point 7½ miles south of the city, the summit level with an elevation of 347 feet above Lake Erie is crossed.

The cost of this conduit line with lake intake and pumping machinery would exceed one million dollars, and the operating expenses would be heavy owing to the high head to be pumped against. This scheme is altogether too expensive.

(H) RIVER THAMES.

In 1898 the late Professor Harrison analyzed samples of water taken from both branches of the Thames River immediately above London, from a point near Byron, at Delaware and immediately above Chatham.

The results of these analyses demonstrates that there was no appreciable deterioration in the river water in flowing from above London to Delaware, although the crude sewage of the City of London was being discharged directly into the river. These analyses were, however, chemical, and it is probable that a bacteriological examination would have shown a great difference.

Sedimentation in the ponds of still water formed by the dams at Springbank and Byron contribute materially to the purification of the water, and aeration is effected by the flow over the numerous rapids.

Although water inferior to the river water at Springbank is now used as a public supply by many cities in the civilized world, after purification, and although the chemical analyses show so little difference, in the samples, I would prefer to take water from above the city, at such a distance as would render it comparatively free from direct pollution from sewage, and the drainage from slaughter houses, packing houses, garbage fields, nuisance grounds, and other sources of contamination that are generally found in the suburbs of a city.

There is but little difference in quality between the water of the north branch of the river and that of the south branch. On the south branch are the Towns of Ingersoll and Woodstock, and on the north branch St. Marys and Stratford.

Although the average daily flow in the north branch may be larger than that of the south branch, the dry weather flow is probably more in the latter.

By acquiring the Meadow Lily Mill site on Lot 8, Con. A, on the south branch, about two miles above the city a sedimentation basin could be made by cleaning up the pond above the dam, and the water carried to the vicinity of Rectory street, the pumping station, filters, etc., to be located between Trafalgar street and the river.

In the vicinity of the pumping station a second sedimentation basin would be advisable, the water to be pumped from it after filtration into the city distribution system. This would give an ample supply for all future requirements.

I believe that mechanical filters of the gravity type would prove more satisfactory than pressure filters, or the slow sand filtration process for several reasons, not necessary to be stated here.

On the north branch a short distance above Hellmuth College, a mill dam forms a pond from which a head race has been constructed westerly and across Richmond street to a small mill, the tail race from which enters the river below Hellmuth College. The available is about seven feet.

At the point where Adelaide street produced northerly intersects the north branch, there is another available site for a dam for sedimentation purposes, from which the water might be conveyed westerly to some point nearer the city.

No doubt satisfactory arrangements could be made with the street railway company to lay tracks to the pump house wherever located and to haul the coal in car lots.

The choice between the north branch and the south branch would depend principally upon the results of a series of chemical analyses and bacteriological examinations, extending over some time.

The following are the results of Chemical Analyses of Thames River water in 1898 by the late Prof. F. T. Harrison:

In parts per million.

Samples.	Date.	Free ammonia.	Albumenoid, ammonia and nitrates.	Nitrogen as nitrates.	Chlorine.	Solids, ash.
1	June 30	.016	.955	.867	8.00	160
2	"	.016	.445	.313	1.00	130
3	"	.066	1.103	.922	7.00	160
4	"	.016	1.156	.975	7.00	170
5	"	.041	.976	.782	8.00	160
6	"	.016	.857	.725	11.00	180

First sample was taken above Vauxhall Bridge.

Second sample was taken above Hellmuth College.

Third sample was taken just below G. T. R. Bridge.

Fourth sample was taken just below Byron Mills.

Fifth sample was taken at Delaware.

Sixth sample was taken at Chatham.

Compare these with those made at Chatham by the Provincial Board of Health.

This method of increasing the supply is simple, and the cost easily estimated. The only obection is the quality of the water. It is certain, however, that filtration and sedimentation will remove all deleterious matter and all disease germs, and it may also be added that from experience gained during the last few years in designing and operating filtration works in America that it may be confidently asserted that the water from the Thames can be so purified so as to be a safe, wholesome water at all times, and at a moderate cost.

The citizens of London have been supplied with a pure spring water for so many years that they are doubtless prejudiced against river water, however purified. The results attained at Chatham, St. Thomas and other places should be studied carefully, before condemning filtration.

REDMOND POND

About a mile north of Springbank on the north side of the river, there is a small body of water known as Redmond Pond, that has from time to time been suggested as a possible source of an increased supply. This pond is situated on Lot 25 in the first Concession of London Township, and contains about 40 acres of water, surrounded by a peat bog.

There is no permanent inlet or outlet visible, and the surface area draining to it is probably less than 500 acres. The surface of the water in the pond is about 10½ feet above the river.

Soundings made in March, 1896, gave an average of 24 feet of water and 20 feet of muck, the bottom being white sand.

In February and March, 1897, a test was made by pumping from the pond by a centrifugal pump with a nominal capacity, when running, of one million gallons per 24 hours.

This test was commenced on February 24th and completed on March 24th, the water being discharged to the northward.

For nineteen days out of twenty-five, the pump ran 24 hours each day. The pond was lowered at the rate of about two inches per day when it was not raining or thawing, the water standing about three feet lower at the end of the test than at the commencement.

The water rose eight inches in 43 hours after closing down on March 20th. The pump was then run for 24 hours, lowering the pond 10½ inches in this time.

After closing down the water rose as follows:

First 24 hours, 8 inches.

Second 24 hours, 5½ inches (snowed and thawed).

Third 24 hours, 2 inches.

Fourth 24 hours, 1 inch.

In my opinion the greater part of the water in this pond is surface water, and it is quite probable that the springs along the north bank of the river opposite Springbank may be supplied from it.

It is possible that one-half million of gallons of water per day might be obtained from this pond, but the quality of the water would, in my opinion, be injuriously affected by the surrounding bog land.

I would recommend that several examinations and analyses of this water be made at different times during next year, and that the elevation of water be observed weekly.

By constructing filter beds on the north side of the river, the water from Redmond Pond might be clarified and discharged into the existing conduit pipe by which the north side springs are conveyed to the pump house.

If the meter system be adopted there will be ample time to further investigate this proposed source, which, with the springs below Byron, would increase the supply by at least one million gallons per day.

FILTRATION.

The objectionable impurities in the river water consist principally of matters in suspension, indicated in the chemical analyses by the solids, the oxygen consumed and the albumenoids.

In all surface waters low vegetable organisms and minute plants grow luxuriously, multiply and at certain seasons die, often causing "fishy" tastes and odors.

These generally flourish more particularly during the warmer months, but I have known of instances where water became offensive in winter, beneath the ice.

During freshets and high water, the river carried immense quantities of sand, clay, silt, peaty matters, etc., a heavy shower producing turbidity.

By sedimentation in a series of basins, the greater part of the suspended matter will sink to the bottom, that is, sedimentation will clarify the water.

By passing the clarified water through sand filters, practically all of the impurities can be removed, including the bacteria which are to be found at all times in all surface waters.

There are two distinct systems of filtration, the Bed System and the Mechanical System.

In the former the water is passed slowly downward through beds of sand underlaid by drains that carry away the purified water. The beds require scraping, and the upper layer of sand must be renewed periodically. This system gives excellent results, but it is only after they have been in continuous use some weeks that they give the best results.

Albany, N. Y., a city with a population of 110,000, constructed filter beds in 1899 for purifying the Hudson River water, after receiving the sewage from half a dozen cities and towns on its banks, within a radius of ten miles, the population of these places aggregating 130,000.

The plant was constructed at a cost of about $500,000, including a pumping station and intake pipe.

The results at Albany have been most satisfactory.

The death rate from typhoid was reduced from an average of 85 per annum in 1899, to 35 in 1900, and to 27 in 1901.

The filters remove about 99 per cent of the bacteria and practically all of the matters in suspension.

The cost of operating and maintaining the plant is given as $25,000 per annum, the cost per million gallons being about $2 for filtration, and about $2 65 for pumping.

At Lawrence, Mass., the annual cost of filtration is given as $9,930. The deaths from typhoid in 1902 were 12, or one in 5,700, an exceptionally low rate.

The Hudson and the Merrimac are two filthy streams, as compared with the Thames, and I have given the results, to show what can be done by filtration and the cost of doing it.

In the Mechanical System the water is passed rapidly through beds of sand after adding a coagulant to the raw water, which appears to act as a net to intercept all suspended matter. After a few hours the valves to and from the filter are closed, and a reverse current forced upward through the sand, thus washing out the collected impurities.

As these filters are comparatively small, they may be placed within a building generally adjoining the pumping station.

A mechanical filter plant costs slightly less than filter beds, and the operating expenses are probably less.

Mechanical filters have been in operation at Chatham and at St. Thomas, as well as other places in Canada and at many places in the United States, for a number of years.

The results at the two first mentioned places are of particular interest to London.

At Chatham the water supply of the city is taken directly from the River Thames, pumped to a sedimentation basin and clarified by mechanical filters.

Analyses made in 1895 by the Provincial Board of Health (see fourtheenth Annual Report of the Provincial Board of Health of Ontario page 69) gave the following as the results of the purification effected by the filtration process.

RESULTS OF FILTRATION AT CHATHAM BY BACTERIOLOGICAL EXAMINATIONS AND TESTS IN 1895.—

No.	Date.	Hour.	Bacteria per c.c. before filtration.	Bacteria per c.c. after filtration.	Per cent of reduction.	Cleaning of filter.
1.	May 22	11:00 a.m.	2,385	....	....	May 21, 10 a.m.
2.	May 22	11:00 a.m.	....	479	80	
3.	May 22	11:30 a.m.	....	1,567	34.3	Between 11 and 11:30
4.	May 22	12:00 a.m.	....	890	62.7	
5.	May 22	12:00 a.m.	....	630	73.6	
6.	May 22	1:00 p.m.	....	550	77.8	
11.	May 23	3:00 p.m.	1,200	....	....	
10.	May 23	3:00 p.m.	....	188	84.4	
12.	May 23	3:30 p.m.	....	900	25	Between 3 and 3:30
13.	May 23	4:00 p.m.	....	260	78.4	
14.	May 23	4:30 p.m.	....	176	85.4	
16.	May 24	2:30 p.m.	950	....	....	
17.	May 24	2:35 p.m.	....	164	828	
18.	May 24	4:20 p.m.	....	475	55.8	About 3 p.m.
19.	May 25	9:45 a.m.	1,100	....	....	
20.	May 25	9:45 a.m.	....	160	85.5	
21.	May 25	12:25 p.m.	....	250	77.3	About 10 a.m.

The rate of pumping for tests 1 to 11 inclusive was 432,000 gallons per day, for tests 12 to 17 inclusive 822,000 gallons per day, and for tests 18 to 21 inclusive 400,000 gallons per day.

In tests No. 1 to 11 inclusive 0.72 grains of alum per gallon were used; for tests 12 to 17 inclusive 1.18 grains; for test 18 none, and for tests 19 to 21 inclusive two grains.

Sand resistance was determined for tests 1 to 18 inclusive and was found to be five pounds.

At St. Thomas mechanical filtration, following sedimentation, has been in use for several years, with satisfactory results.

The water of Kettle Creek is fully as impure as that of the Thames, as shown by the following analyses made by the Provincial Board of Health in Fourteenth Annual Report of the Provincial Board of Health of Ontario, page 70:

RESULTS OF FILTRATION AT ST. THOMAS BY BACTERIOLOGICAL EXAMINATIONS AND TESTS IN 1891:

Date.	Bacteria per c.c. before filtration.	Bacteria per c.c. after filtration.	Per cent of reduction.	Cleaning of filter.
Oct. 23	1,240	44	96	No. 1 filter, 10 hours before No. 2, 6 hours before
Oct. 24	1,380	No. 1 filter 50	96	10 hours before
		No. 2 filter 270	80	Just before taking sample
		Both filters 70		
Oct. 26	1,545	50	97	Cleaned as in first case

The monthly averages of weekly examination of Toronto Water are here given for comparison:

Month.	Bacteria per c.c.	Remarks.
March, 1894	5,172	From city tap
April, 1894	2,353	Analysis of Mr. Shuttleworth.
May, 1894	1,172	

The cost of filtering at St. Thomas is given as about $2 per million gallons.

Results of bacteriological analyses of Thames River water at Chatham, 1895 (unfiltered):

Date.	No.	Bacteria per c.c.
March 29	3	9,635
March 29	4	10,570
April 16	7	9,163
April 16	8	9,720
April 23	10	137,175
April 23	11	4,550
May 2	13	2,340
May 2	14	2,625
May 20	17	1,284
May 20	18	1,680

RESULTS OF CHEMICAL ANALYSES OF THAMES RIVER WATER AT CHATHAM:

In parts per million.

Date.	Appearance Before P'tion.	After	Free ammonia.	Albumenoid, ammonia and nitrates.	Nitrogen as nitrates.	Chlorine.	Solid ash.
Mar. 30	Muddy	Clear	0.28	0.44 After p'tion, 0.132	0.266	2.0	5,960
Mar. 30	Muddy	Clear	0.295	0.438 After p'tion, 0.130	0.286	2.0	....
April 5	Muddy	Clear	0.1564	0.340 After p'tion, 0.135	1.02	2.0	....
April 5	Muddy	Clear	0.16	0.139 After p'tion, 0.140	1.00	2.0	470
April 17	Very turbid	Clear	0.118	0.3906 After p'tion, 0.140	1.344	3.0	367
April 23	Slight turbidity		0.028	0.22	1.58	4.0	310
May 1	Slight turbidity		0.014	0.34	0.227	4.0	....
May 28	Clear		0.023	0.24	....	5.0	Filtered water

EXISTING CONDITIONS.

The present conditions may be summarized as follows:

1. The supply is unexcelled in quality.
2. The quantity is sufficient for the maximum domestic consumption, but no more.
3. About one-fourth of the water pumped is wasted, which waste can be stopped.
4. The pumping machinery is of ample capacity, but in case of a failure of the water power and a mishap to the large steam pumping engine, the small engine could not maintain the supply.
5. The reservoir holding about two days' supply, is in first class condition, but the elevation is not sufficient to give the required fire service in town.
6. The supply main from the reservoir to the city is ample for the domestic demand, but inadequate for the fire supply.
7. The distribution system within the city contains too great a proportion of small pipes, and the fire service is insufficient in all parts of the city.
8. The tariff now in force is on the flat rate principle, depending on the number of rooms, the number of fixtures, etc. The meter rate requires revision.
9. The revenue now exceeds the operating expenses, maintenance charges, interest and sinking fund on debentures, by $27,000 per annum.

If the rates charged for fire hydrants and other municipal purposes be excluded from the revenue, the surplus becomes $11,850.

10. There are no proper records and plans of the existing works.

SCHEMES FOR IMPROVEMENTS.

Of the several suggested methods of increasing the supply, there remain three to be further considered:

1. Increasing the supply by one-fourth, by placing meters on 75 per cent of the services.
2. Construct an independent system for fire service, for hoists, railway uses, etc., in the business districts, the water to be pumped directly from the river.
3. Construct a pumping plant immediately above the city on either branch of the Thames, install filters, and pump filtered water into the present distribution system.

In each of those three schemes, additional distribution mains will be necessary in the city.

In scheme No. 1 another supply main will also be required from the reservoir.

METER SCHEME.

By the adoption of meters, the present supply should be sufficient for all purposes for a population of 55,000. By adding the spring between Byron and Kilworth, the supply would be sufficient for over 60,000 people.

To give a fire supply in the city, a duplicate supply main must be laid from the reservoir to the city, passing south of the Cove to Tecumseh street, thence along Tecumseh to Wellington, and along Wellington to Queen's avenue. This supply would of course connect with all the existing mains.

Additional distributing mains to the extent of about six miles will also be required.

As stated under another heading, the fire pressure is to be given by portable steam fire engines.

I estimate that this scheme will cost approximately as follows:

(a) Duplicate supply main from reservoir to city, 18 inches diameter $110,000
(b) Additional distribution mains in city 50,000
(c) Installing 7,000 meters 90,000

Total $250,000
Fixed annual charges $15,000
Depreciation of meters 3,500
Reading meters 2,000

Total annual cost $20,500

If the supply main be increased to twenty inches in diameter to Wharncliffe road, the extra cost will be $7,000.

To collect the water from the springs between Byron and Kilworth and convey it to Springbank, will cost about $50,000, and the cost of pumping about $1,000 per year.

The advantages of this scheme are:

First. The citizens will continue to be supplied with pure spring water only.

Secondly. The revenue tariff will be established on a common sense basis.

Thirdly. Either of the other two schemes may be added at any time in the future, but in my opinion not until the present population has increased fifty per cent.

If the dam should be washed away or some accident occur to the hydraulic plant, and if at the same time the Blake-Yates pump were disabled, the city could not be supplied by the small steam pumping engine. Another steam pumping engine of 4,000,000 gallons daily capacity is desirable, if scheme No. 1 be adopted, and the estimated cost increased by about $25,000.

INDEPENDENT FIRE SERVICE.

Although the mercantile district is now practically inclosed in the area west of Wellington, north of G. T. R., east of Ridout and south of Queen's avenue, there are other important points in the city that require an ample supply of water for fire protection, such as the G. T. R. shops and the Exhibition Buildings in the east end, the factories and yards along the G. T. R. line from Thames street to William street; Richmond between Queen's avenue and the C. P. R., Carling's Brewery, Hyman's Tannery and C. P. R. freight shed.

To give a proper independent fire supply about nine miles of pipes would be required, and 150 fire hydrants of the latest improved type, with an independent valve to each hose nozzle, and large steamer nozzle also.

In my opinion the most suitable site for the pumping station would be near Rectory street, between Trafalgar and the south branch of the river, the supply to be drawn directly from the river.

The steam pumping plant should be in duplicate, each pumping engine to have a capacity of four million gallons per day, or 2,800 gallons per minute.

It would probably be cheaper to install two large pumping engines of comparatively low duty for the fire service, and one smaller high duty pumping engine for the daily supply. Quick firing boilers of ample capacity would be required.

From the pumping station a force main would have to be laid along the Hamilton road to Bathurst street.

By adopting this scheme or the filtration scheme, the present Springbank supply would be sufficient for the domestic uses of 60,000 people, without the general adoption of meters, but in my opinion probably 2,000 meters should be installed.

I estimate that this system will cost as follows:

(a) Additional distribution mains in city for domestic supply .. $50,000
(b) Independent fire mains and hydrants 90,000
(c) Force main 20,000
(d) Pumping station and machinery 60,000

Total first cost $220,000
Fixed annual charges .. $13,200
Operating expenses .... 4,800 to $7,800

$18,000 to $21,000

Average, $19,500 per year.

I would also recommend 2,000 meters at an additional cost of $25,000 in order to check to some degree the useless waste.

It is probable that over one million gallons per day would be drawn from this source of supply for the railways, manufactories, hoists, street sprinkling, parks, etc.

Steam fire engines would be necessary for fire duty, but probably not so many as in the first scheme.

The advantages of this system are:

First. An abundant supply of water at a high head for fire service.

Second. It will permit the continued waste of Springbank water.

The disadvantages are as follows:

First. The possibility of using raw river water for culinary and dietetic purposes at any time, in the business and manufacturing districts.

Second. If a break should occur in the supply main from the present reservoir to the city the distribution system might be filled with raw river water.

I believe either the first scheme or the third scheme preferable to this.

FILTRATION SCHEME.

It has been conclusively shown that the river water can be so purified as to be a perfectly safe water for drinking and culinary purposes.

Although my estimate of cost is for a system taking the supply from the south branch, it may be decided after further investigations that the water in the north branch is better and safer, in which case the system may be changed, but the difference in the first cost or in the operating expenses would be trifling.

In this scheme, I propose taking the water from the pond above the old dam at the Meadow Lily Mills, which were destroyed by fire a few years ago, and have not been rebuilt.

The banks of the pond would require to be thoroughly cleaned, all vegetable matter, sunken logs, etc., removed, the dam repaired, roadways and embankments built, etc.

From the pond the water should be conveyed in a closed conduit of wood, concrete, tile or iron (or a part of each), to the pumping station, to be erected near the north bank of the river opposite Rectory street.

At the pumping station four large basins should be constructed, two for the crude water from Meadow Lily Mills, and two for the pure filtered water. By building the basins in duplicate, one of each pair may be emptied for cleaning and for repairs, while the other is in service.

The sedimentation effected in the pond above the dam, and in the basins at the pump house would remove a large part of the suspended matters.

After settling in these basins, the water would be pumped to the filters, from which it would flow to the clear water basins.

The pumping machinery in this scheme should be in duplicate, of the high duty type, similar to your Blake-Yates pumping engine, each to have a capacity of four million gallons per day.

From the pure water basins the water is to be pumped directly into the present distribution system, through a 16-inch main laid from the pump house along Hamilton road, with a branch force main on Adelaide or on Rectory to Dundas street for the eastern part of the city.

The cost of this scheme I estimate as follows:

(a) Additional distribution mains in city for domestic supply .. $50,000
(b) Conduit from Meadow Lily Mills to pump house, 10,000 feet, cleaning pond, roads, etc. 40,000
(c) Sedimentation and clear water basins 8,000
(d) Pumping station and machinery and buildings 60,000
(e) Filtration plant 35,000
(f) Force mains to city 35,000

Total first cost $228,000
Fixed annual charges ..$13,680
Operating expenses pumping ...... 4,320 to $7,320
Filtration ...... 1,000 to 2,000

$19,000 to $22,000

Average $20,500 per year.

This system has this great advantage over the independent fire supply system, that it gives an independent domestic supply.

If the Springbank pumping station, or the reservoir, or the supply main were destroyed, the new plant would be of sufficient capacity to supply all demands.

The only objection to this scheme is the prejudice of the citizens against river water.

The pressure throughout the city, particularly in the residential districts, would be higher in this scheme, than in the independent fire system, but by the latter a higher pressure could be given in the business districts.

If this scheme be adopted, the additional pumping plant at Springbank may not be required.

CONCLUSION.

There is not sufficient difference in the estimated first costs of the three schemes as outlined, or in the yearly expenses, to effect the decision as to which should be selected.

I am, however, in favor of adopting the meter system, which will so reduce the waste, that the present supply will be sufficient for over 50,000 people.

To give a fire supply, another supply main must be laid from the reservoir, and additional distribution mains laid throughout the city.

It will probably be found more convenient to set the 6,500 meters in four or five seasons, commencing with the largest consumers.

The amount saved in pump house expenses will, in my opinion, nearly meet the extra annual expenditure incurred.

If the springs should in the future become inadequate, the river supply may then be added.

It will be observed that I have made no estimate for land damages, riparian rights, etc., for which something should be allowed in each of the three schemes.

Respectfully submitted,

WILLIS CHIPMAN,
Civil and Sanitary Engineer.

SCHEDULE A.

CONSUMPTION OF WATER IN A NUMBER OF CITIES IN CANADA AND THE UNITED STATES.

Place.	Population.	Number of services.	Number of meters.	Gals. per capita per day.
Toronto, Ont	236,000	45,607	1,830	88
Hamilton, Ont	56,000	14,300	165	89
London, Ont	39,500	9,500	226	90
Berlin, Ont	10,500	1,390	631	48
Brockville, Ont	9,600	1,765	6	182
Brantford, Ont	18,000	3,240	141	85
Windsor, Ont	14,000	2,912	40	192
Sarnia, Ont	9,000	2,031	9	156
Atlanta, Ga	89,872	9,275	8,500	67
Bayonne, N. J	32,722	3,000	3,000	75
Binghamton, N. Y.	39,647	7,000	523	125
Buffalo, N. Y	352,400	64,638	1,049	187
Covington, Ky	42,938	5,300	4,150	46
Detroit, Mich	285,700	55,340	5,555	117
Duluth, Minn	52,969	2,795	1,261	218
Erie, Pa	52,733	11,163	266	114
Evansville, Ind	59,007	5,637	12	109
Fort Wayne, Ind	45,112	7,894	1,400	62
Lawrence, Mass	62,559	5,926	4,386	45
Lincoln, Neb	40,169	3,550	2,900	64
Madison, Wis	20,000	3,132	2,983	53
Manchester, N. H.	56,987	5,500	3,769	49
McKeesport, Pa	34,227	3,833	754	58
Milwaukee, Wis	285,300	41,485	28,039	64
Norfolk, Va	46,624	8,500	178	105
Peoria, Ill	56,100	6,058	418	50
Quincy, Ill	36,252	2,700	1,300	37
Racine, Wis	29,102	4,916	1,200	38
Saginaw, Mich	42,345	3,500	300	214
Savannah, Ga	54,244	8,000	45	87
Springfield, O	38,253	4,200	200	73
Terre Haute, Ind	36,673	4,265	285	76
Utica, N. Y	56,383	7,064	6,838	42
Waterbury, Conn	45,859	4,899	486	105
Yonkers, N. Y	47,931	4,968	4,852	65
York, Pa	33,708	8,300	275	63

SCHEDULE B.

LONDON WATERWORKS — POPULATION AND WATER CONSUMPTION.

Year.	Population.	Yearly consumption in millions of gallons.	Maximum daily consumption in gallons.	Day.
1881	19,725	354	1,500,000	
*1885	(21,697	557	2,500,000	
	(26,254			
†1890	(27,236			
	(30,705			
1897	34,855	917	2,809,492	Aug. 5
‡1898	36,224	937	3,803,076	Aug. 26
1899	38,575	974	3,542,000	July
1900	38,909	994	3,303,600	June 21
1901	39,059	1,081	3,830,880	June 14
1902	39,183	1,266	3,983,840	July 26
1903	39,500		3,688,800	

*London East annexed in 1885.
†London South annexed in 1890.
‡London West annexed in 1898.

Year.	Estimated population supplied.	Average daily consumption in gallons.	Consumption per capita. Pop., total.	Pop. s'plied.	Number of services.	Consumption per service.
1881	9,000	971,168	49	108	1,772	548
1885	17,000	1,526,491	58	90	3,454	442
1890	25,000	......	..	..	5,436	...
1897	32,000	2,513,585	72	79	7,862	320
1898	33,000	2,568,337	71	78	8,140	316
1899	34,000	2,668,735	69	78	8,484	315
1900	35,000	2,722,769	70	78	8,753	311
1901	36,000	2,960,376	76	82	9,047	327
1902	37,000	3,468,488	89	94	9,336	372
1903	38,000	......	90	92	9,500	...

SCHEDULE C.

LONDON WATERWORKS—METERS AND REGISTERS.

Sizes set and in use.

Kind.	½-inch.	¾-inch.	1-inch.	1½-inch.	2-inch.	3-inch.	4-inch.	Totals.
Crown	19	14	3	4	9			49
Gem						1	1	2
Empire			2					2
Hersey	42	11	3		9		1	66
Thomson	11	8	4		1	1		25
Lambert	23	5	3					31
Trident	22				5			27
	117	38	15	4	24	2	2	202
Hoist registers								24

SCHEDULE D.

LONDON WATERWORKS — FIRE SUPPLY.

	1893.	1898.	1903.
Miles mains	70	80	90
Fire hydrants (public)	364	410	429
Fire hydrants (private)	21	23	23
Number hydrants provided with steamer connections	None	None	None
Fire streams demanded by underwriters	6	6	16
Approximate average pressure at city hall	70	65	60

SCHEDULE E.

LONDON WATERWORKS — REVENUE AND EXPENSES.

	1893.	1898.	1902.
Total capital expenditure	[illegible]	$759,183	$898,136
Revenue.			
Municipal purposes—			
Fire hydrants, 426 at $25	8,525	10,250	10,650
Street sprinkling	2,500	2,500	3,500
Other purposes	1,605	650	1,100
	$12,620	$13,400	$15,250
Domestic consumers			73,786
Railways	55,116	68,240	6,000
	$67,736	$81,640	$95,036
Expenses.			
Operating expenses, maintenance and repairs	$19,581	$21,932	$26,336
Interest and sinking fund	30,043	36,497	41,601
	$49,624	$58,429	$67,937
Surplus	$18,112	$23,211	$27,099
Amount charged for municipal purposes	12,620	13,400	15,250
Net surplus	$5,492	$9,811	$11,849

LONDON WATERWORKS — TABLE OF ELEVATIONS.

Point.	Above mean sea level.
Railway track—	
G. T. R., London station	805
G. T. R., East London station	830
G. T. R., over Cove bridge	783
G. T. R., at Hyde Park station	883
G. T. R., at Komoka station	808
C. P. R., at London station	804
Intersection of streets—	
Dundas and Richmond, King and Richmond	802
Reservoir—	
Embankment of reservoir	1,002
Surface of water in reservoir	999
High ground about half a mile southwest of reservoir	1,016
Pump House—	
Floor of hydraulic pump house	761
Floor of steam pump house	757
Bottom of main pump well	735
River—	
Crest of concrete dam at Springbank	743
Crest of Byron dam	
Surface of water, north branch, at Cronyn's	789
Surface of water, north branch, at Wharncliffe	768
Surface of water, south branch, above Meadow Lily Mills	
Surface of water, south branch, at Adelaide street	
Surface of water at junction of branches	748
Surface of water at Kilworth	704
Surface of water at Komoka	681
Springs—	
Surface of water, Lower Strong's springs	
Surface of water, Hobbs' springs	744
Surface of water, Coombs' main springs, lower pond	760
Surface of water, Colville springs	745
Surface of water, Griffith's springs	772
Dignam Creek—	
Surface of water, near Strong's springs	779

A SOUND STOMACH MEANS A CLEAR HEAD.—The high pressure of a nervous life which business men of the present day are constrained to live makes draughts upon their vitality highly detrimental to their health. It is only by the most careful treatment that they are able to keep themselves alert and active in their various callings. Many of them know the value of Parmelee's Vegetable Pills in regulating the stomach and consequently keeping the head clear.

The first life insurance company was started in London in 1698 and another in 1700. Neither was successful.

ONE TRIAL of Mother Graves' Worm Exterminator will convince you that it has no equal as a worm medicine. Buy a bottle, and see if it does not please you.

In the wilds of Argyllshire air has been tested that contained 200 particles of dust per cubic centimeter; in London the particles have numbered 150,000, and in Paris 210,000. Dust, says Sir J. Crichton Browne, assists in the production of a low state of health.

YOU CANNOT be happy while you have corns. Then do not delay in getting a bottle of Holloway's Corn Cure. It removes all kinds of corns without pain. Failure with it is unknown.

Owes Health to Bu-Ju

A London Man's Sad Plight and Speedy Recovery

640 Park St.,
London, October 11, 1903.

The Claflin Chemical Co.,
Windsor, Ont.

Gentlemen:

I was for weeks unable to work and almost unable to dress myself, with kidney trouble, when I decided to try Bu-Ju and found relief in a few days, and now I am as well as ever, after doctors failing. I owe my present good health to Bu-Ju.

Yours truly,
W. E. BROWN.

Owes present good health to Bu-Ju. Thousands of others are saying the same thing. It is a boon to humanity. Positive cure for all kidney troubles, or ailments that result from kidney troubles. Sold everywhere by druggists. Do not accept substitutes.

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NEW YORK, N. Y., AND WINDSOR, ONT.

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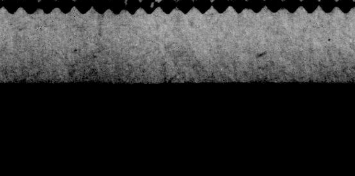

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Standard remedy for Gleet, Gonorrhœa and Runnings IN 48 HOURS. Cures Kidney and Bladder Troubles.
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NOTICE.

HOG CHOLERA.

DOMINION OF CANADA,
Department of Agriculture.

Whereas, by departmental order, bearing date the twenty-sixth day of October, 1903, the movement of live hogs into or out of the district composed of the Townships of Tilbury East, Raleigh, Dover East and West, Chatham, and Harwich, in the County of Kent, and the Island known as Walpole Island, in the County of Lambton, was strictly prohibited; and whereas, it has been deemed expedient to extend the said district so as to include the Townships of Tilbury West and Tilbury North, in the County of Essex.

Therefore, under the provisions of The Animal Contagious Disease Act, 1903, I hereby give notice that on and after the fifteenth day of December, 1903, all the provisions of the departmental order of the twenty-sixth day of October, 1903, shall apply to the said Townships of Tilbury West and Tilbury North, and the said order shall be read as if the said Townships of Tilbury West and Tilbury North had been originally mentioned therein.

Dated at Ottawa this first day of December, 1903.

GEO. F. O'HALLORAN,
Deputy Minister of Agriculture.
80c 70c-t

LeeHing Laundry

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