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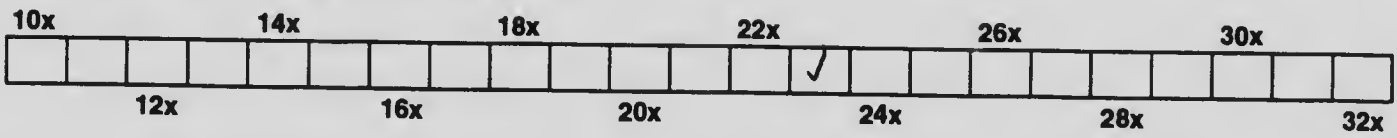

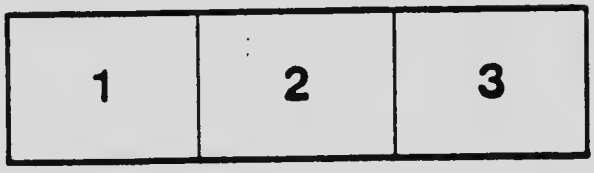

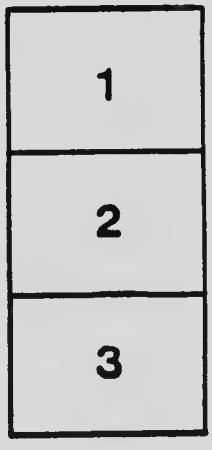

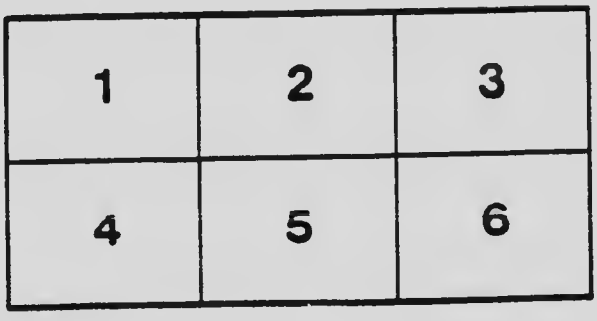

COMMISSION OF CONSERVATION

COMMITTEE ON PUBLIC HEALTH

REPORT

on the

EPIDEMIC OF TYPHOID FEVER

occurring in

THE CITY OF OTTAWA

January 1st to March 19th, 1911

Ottawa : The Rolla L. Crain Company, Limited : 1911

REPORT

ON THE

Epidemic of Typhoid Fever

OCCURRING IN

The City of Ottawa

January 1st to March 19th, 1911

FOREWORD

Early in March of the present year, at the instance of the Hon. Clifford Sifton, Chairman of the Commission of Conservation, an investigation into the causes of the epidemic of typhoid fever at Ottawa was undertaken. The co-operation of the Provincial Board of Health of Ontario was sought, and this was most cordially given by Dr. J. W. S. McCullough, Chief Health Officer of the Province, who subsequently detailed Dr. R. W. Bell, Medical Inspector of the Board of Health, for this special work. By permission of the Honourable the Minister of Militia, the services of Colonel Jones, D.G.M.S., and Major Drum, D.P.H., P.A.M.C., were loaned to the Commission of Conservation to co-operate in the work of investigation.

Thanks are due to several gentlemen for assistance given. Mr. Newton J. Ker, City Engineer, kindly furnished from his office much important information, maps, and drawings; while from Dr. Law, Medical Health Officer, was obtained the register of typhoid fever cases which formed the groundwork of enquiry. The mortality data were kindly furnished by Mr. John Henderson, City Clerk, and the meteorological data by Mr. J. H. Grisdale, Director of Experimental Farms. The work necessary in the [illegible] out of Cave creek district in Mechanicsville and Hintonburg was kindly done by Mr. W. J. Dick, [illegible]ing Engineer of the Commission of Conservation

LETTER OF TRANSMISSION

Sir:

Ottawa, April 13, 1911.

I have the honour to submit herewith the report on the Epidemic of Typhoid Fever which occurred in the city of Ottawa, beginning January 1st, 1911.

The report is concurred in by Dr. R. W. Bell, Medical Inspector of the Provincial Board of Health of Ontario, Colonel Carlton Jones, Director General of Medical Services, and Major Lorne Drum, D.P.H., P.A.M.C., to whom my personal thanks are due for their valuable professional assistance in carrying on the enquiry.

I have the honour to be, Sir,

Your obedient servant,

(Signed) Chas. A. Hodgetts,

Medical Adviser.

Hon. Clifford Sifton,
Chairman of the Commission of Conservation.
Ottawa, Ont.

LETTER OF APPROVAL

Sir:

Ottawa, April 11, 1911.

We have the honour to submit herewith the report on the Epidemic of Typhoid Fever which occurred in the city of Ottawa, beginning January 1st, 1911.

The same receives our unanimous endorsation.

We have the honour to be, Sir,

Your obedient servants,

(Signed) Chas. A. Hodgetts, M.D.
" R. W. Bell, M.D.
" G. C. Jones, Colonel, D.G.M.S.
" Lorne Drum, Major, P.A.M.C.

Hon. Clifford Sifton,
Chairman of the Commission of Conservation,
Ottawa, Ont.

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II. Letters of March 11th, 1911, to His Worship the Mayor and the Medical Officer of Health *re* privy pits.

III. Letter of March 13th to His Worship the Mayor and the Medical Officer of Health *re* Cave creek.

IV. (a) Letter of Newton J. Ker, City Engineer, concerning Water Supply; (b) Letter of Newton J. Ker, City Engineer, with instructions to valve men.

V. Map showing area drained by Cave creek and location of privies.

VI. Report of plumbing inspector.

VII. Map of City showing cases in first week.

VIII. Dates of fire alarms when valve was open, Oct. 7th, 1910 to Jan. 13th, 1911.

IX. Laboratory reports showing examination of Ottawa River water as made by Major Lorne Drum.

X. Letter to His Worship the Mayor, April 4th, 1911 *re* closing of emergency valve.

XI. Form of inspector's report used in the investigation.

Cave creek looking north, showing location of privies.

Ottawa Typhoid Fever Epidemic

SUMMARY STATEMENT OF THE CAUSE OF THE EPIDEMIC.

The immediate cause of the typhoid epidemic which began in the city of Ottawa, January 1st, 1911, was the infection of the water supply by polluting matter coming mainly from the south shore of the river, in the vicinity of Lazy and Nepean bays. The infection found entrance through the emergency valve at Pier No. 1 whenever opened, and, possibly, was sucked through joints in the intake, the old aqueduct having very improperly been used as a sewer from September, 1910, to the middle of January, 1911.

The pollution of the water supply began about the middle of December and was mainly due to the unusual lowness of the river and the freezing of the shallow places to the bottom, thus diverting the currents of polluting matter directly towards the main south current which passes Pier No. 1.

The pollution of Lazy bay and Nepean bay could, and should, have been prevented.

The old aqueduct should not have been converted into a sewer.

The outbreak would have been obviated had the hypochlorite treatment been installed forthwith after its recommendation by Mr. Hazen, on October fifth, 1910.

The continuance of the epidemic after the first week was due:

Cave creek looking north, showing location of privies.

(1 To the subsequent opening of the emergency valve (it was finally closed on January 13th), which renewed the infection.

(2) The inefficiency of the hypochlorite to effectually sterilize the water supply until on or about February 22nd.

(3) To contact with persons ill of the disease.

(4) To preventable unsanitary conditions.

(5) To defective plumbing.

As soon as the causes of the outbreak became apparent, a letter was sent to His Worship the Mayor, on April 4th, advising that the emergency valve should be kept closed. (See Appendix X)

INTRODUCTORY REMARKS

The city of Ottawa, the seat of the Federal Government of the Dominion of Canada, is situated on the south shore of the Ottawa river at the junction of the Rideau river, and is wholly situated in the province of Ontario. The estimated population is between 85,000 and 90,000.

The water supply is obtained from the Ottawa river, the intake being placed well in the stream at a point above the Canadian Pacific railway bridge (see Appendix I). The present consumption is 16,000,000 gallons daily.

The river, at different points above the intake, receives the untreated sewage from several municipalities, all of which are situated in the province of Ontario, with the exception of the town of Aylmer, which is in the province of Quebec.

LIST OF TOWNS SHOWING POPULATION AND DISTANCE FROM OTTAWA

	Estimated Population	Distance from Ottawa
Mattawa	2,000	195 miles
Pembroke	5,000	108 "
Renfrew*	4,000	58 "
Carleton Place†	4,000	63 "
Almonte‡	3,000	55 "
Arnprior	3,500	39 "
Aylmer	2,300	9 "

*On the Bonnechere river, eight miles from its junction with the Ottawa.

†On the Mississippi river, twenty-six miles from its junction with the Ottawa.

‡On the Mississippi river, eighteen miles from its junction with the Ottawa.

Some of these towns are a considerable distance from Ottawa, and the natural conditions of lake and rapids are particularly favourable for the destruction of much of the polluting matter before the waters of the river reach lake Deschènes, which is some twenty-seven miles long, and of an average depth of twenty-five or thirty feet.

In addition to the above-mentioned sources of sewage pollution, there is a considerable and growing population on both shores of the Ottawa river, for a distance of five or six miles above the intake. This population must be considered being a menace to the purity of the waters of the Ottawa river, particularly at the time of the spring freshets and after each heavy rainfall, when pollution of both animal and human origin is washed into it.

THE REPORT

CHARACTER AND SCOPE OF THE INVESTIGATION

The immediate objeet of the investigation was to determine the eause of the outbreak of typhoid fever which began in the mouth of January, 1911, and eontinued with a varying daily case incidenee until Mareh 18th, when the work of enquiry ceased.

The investigation began on March 8th and was completed on March 24th. It included a study of all the possible factors whieh eould reasonably be considered to have been operative in causing the epidemic. The work included:

(a) An epidemiologic study of all cases oeeurring between January 1st and March 18th, 1911, as per the table on page 5.

b) A sanitary survey of the premises where cases had been reported.

(c) A sanitary survey of the north shore of the Ottawa river above the intake to, and including, the town of Aylmer.

d) A sanitary survey of the south shore, above Pier No. 1, ineluding Britannia-on-the-Bay.

(e) A study of the milk supply.

(f) An enquiry into the sewerage system.

(g) An enquiry into the water works system, including the pump house intake at Pier No. 1, and the operation of the "emergeney valve," situated at the latter point, as well as of the old aqueduet.

(h) An examination of the plumbing in some of the infeeted houses.

Corner of a shed, on St. Patrick St., Ottawa, used as a privy by several families, in one of which was a typhoid fever patient.

(i) A study of meteorological and other climatic conditions, as well as other minor matters which will receive notice in the report.

INCIDENCE OF CASES OF TYPHOID

ARRANGED BY DAYS, WEEKS AND MONTHS, FROM JANUARY 1ST TO MARCH, 18TH, 1911, BOTH DATES INCLUSIVE

DECEMBER, 1910

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1		1												2	1						1	2	1				1			

2 3 4 1

DECEMBER TOTAL, 10

JANUARY, 1911

1ST WEEK							2ND WEEK							3RD WEEK							4TH WEEK						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
2	2	3	4	5	5	10	11	2	9	9	13	10	10	34	21	17	16	14	25	9	14	13	12	29	10	17	16	

31 70 136 111

JANUARY TOTAL, 382

FEBRUARY, 1911

5TH WEEK							6TH WEEK							7TH WEEK							8TH WEEK						
29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
7	18	9	34	17	17	17	10	21	6	16	18	25	12	14	15	14	20	12	13	26	13	19	16	10	13	13	10	

119 118 114 94

FEBRUARY TOTAL, 454

MARCH, 1911

9TH WEEK							10TH WEEK							11TH WEEK						
26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
15	16	12	15	11	5	5	3	2	8	7	2	2	1	1	2	1				

79 25 4

MARCH TOTAL, 65

TOTAL NUMBER OF CASES JANUARY 1ST TO MARCH 18TH, 901.

On March the 11th, shortly after the enquiry began, it was found that certain unsanitary conditions existed in respect to the disposal of typhoid excreta in some of the homes, which were a direct menace to the other inmates as well as to residents in the immediate neigh-

bourhood. A letter was sent by the Medical Adviser of the Commission of Conservation to the Medical Health Officer of the city, and a duplicate to His Worship, Mayor Hopewell (See Appendix II.), directing the attention of the authorities to the urgent necessity for precautionary measures being adopted in this respect. Similarly on March 13th, their attention was dr. n to the conditions in and around Cave creek. (See Appendix III).

The list of cases as contained in the Register of Communicable Diseases of the Health Officer, kindly loaned by Dr. R. Law, furnished the data as to cases. Additions were made to this list from the registers of the Emergency and the General Hospitals and from the daily reports of the inspectors making the domiciliary enquiry. The total number of cases thus obtained was 1,196. Of this number, 901 were reported upon, the remainder, 295, it was impossible to trace, owing to removal, death, or other causes. This report, therefore, is based upon an enquiry into seventy-five per cent. of the actual number of cases, and upon this number, 901, all the calculations contained in the report are based.

Owing to the incompleteness of the morbidity returns of typhoid fever, it is impossible to present a reliable statistical table which would indicate the actual number of cases happening in the city from year to year, for any lengthy period. Those recorded in the Register of the Medical Health Officer for the years 1909 and 1910, are as follows—For 1909: May, 1; July, 8; August, 5; September, 20; October, 7; November, 7; December, 10; total, 58. For 1910: January, 5;

February, 9; March, 14; April, 1; May, 1; June, 1; July, 1; August, 13; September, 7; October, 5; November, 18; December, 5; total, 80.

It is quite evident that these figures are not as complete as the mortality returns by months for the decade 1901 to 1910 inclusive, reported by the Registrar General of Ontario, which are herewith submitted. They show that the disease has been almost a constant factor in the mortality returns of the city. It is probable some of the deaths registered with the City Clerk were those of non-residents who may have sought the nursing advantages afforded by one or other of the three general hosiptals; and again, residents of the city may have died after contracting the disease elsewhere than in Ottawa. These are contingencies which happen in every large city, and Ottawa is no exception.

TYPHOID FEVER MORTALITY IN OTTAWA FOR THE DECADE 1901 TO 1910

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1901	1	..	..	..	..	1	..	1	4	1	4	1	13
1902	1	2	1	2	..	4	1	1	4	1	2	..	19
1903	..	1	..	1	..	..	..	1	2	..	1	..	
1904	..	..	..	1	..	..	..	1	3	4	2	2	1
1905	1	2	1	..	2	2	1	1	1	1	..	2	14
1906	1	..	2	1	1	1	1	4	2	5	4	3	25
1907	7	3	3	3	2	1	..	3	1	4	2	6	38
1908	..	..	..	..	1	1	2	1	1	7	8	4	25
1909	2	2	1	1	..	1	1	..	5	6	1	3	23
1910	1	3	2	1	..	1	1	2	3	6	3	1	24
Total	14	13	10	10	6	12	7	15	29	35	27	22	200

The maximum number of deaths occurred in the year 1907, the minimum in 1903, while the average for the decade was 20.

TYPHOID FEVER MORTALITY IN HULL FOR THE DECADE 1901 TO 1910

Year	Deaths	Population
1901	1	13,933
1902	2	14,377
1903	2	14,517
1904	7	15,033
1905	6	15,529
1906	9	15,654
1907	8	16,020
1908*	5	16,349
1909*	1	16,200
1910*		16,805

*The Recorder of Vital Statistics for the Province of Quebec states that the statistics for these years are incomplete.

OCCURRENCE AND EXTENT OF THE OUTBREAK

It must be noted that this was a winter epidemic pure and simple, happening during the coldest months of a Canadian winter. In the month of December, 1910, there were five cases reported to the Medical Health Officer, but the enquiry shows that there were ten, viz., one on the first, one on the third, two on the fifteenth, one on the sixteenth, one on the twenty-second, two on the twenty-third, and one each on the twenty-fourth and twenty-eighth. This would indicate that there was nothing abnormal in the last month of the year 1910. But beginning with January, there was an immediate increase in cases. The epidemic proper therefore, began on January 1st, 1911, the cases by calendar weeks being as follows :

CASES OF TYPHOID

Date	Week	No. of Cases Reported
January 1 to 7	First	31
" 8 " 14	Second	70
" 15 " 21	Third	136
" 2 " 28	Fourth	111
" 29 " Feb. 4	Fifth	119
February 5 " 11	Sixth	118
" 12 " 18	Seventh	114
" 19 " 25	Eighth	94
" 26 " Mar. 4	Ninth	79
March 5 " 11	Tenth	25
" 12 " 18	Eleventh	4

There was thus a total of 901 cases. The incidence of these cases by days is shown in the table on page 5 and their geographical distribution is shown on the spot map, Appendix I.

Classifying the cases by sex, there were 422 males and 479 females, the ages ranging from 3 to 75 years. (See diagram facing page 14.) In this age group, persons showing the greatest susceptibility to typhoid infection, viz., those from 15 to 30 years, furnished 47 per cent. of the cases. The percentage of cases among persons under 15 years of age was 33.4 per cent.

Grouping the cases by places of birth, they were divided as follows: Canadian, 554; English, 211; Irish, 35; Scotch, 24; German, 24; United States of America, 17; Italy, 15; Sweden, 4; Poland, 3; Denmark, 2; Russia, 1; and Hebrews (place of birth unnoted), 11.

By occupation, they were grouped as follows: students, 361; domestics, 129; skilled labour, 112; civil servants and clerks, 61; labourers, 52; factory hands, 20; children under school age, 19; housewives and others, 147.

As to place of treatment, 472 received hospital attention, while 429 were treated at home.

In twenty-three houses two cases were reported in each; in one house, three cases; and in one institution there were thirty-five cases.

Of the 901 cases investigated, 52 died before March 18th, when the enquiries ceased. This made a death rate of 5.7 per 100. But, as many of the cases were still under treatment and several deaths have been reported since, the actual mortality was somewhat higher. Eight deaths occurred in January; twenty-nine deaths in February; and fifteen in March.

In addition during the same period, there were sixteen patients from outside municipalities under treatment for typhoid, viz., Mechanicsville, 8; Westboro, 2; Gatineau Point, 5; and one from each of the following municipalities: Pembroke, Hammond, North Wakefield, and St. Joseph d'Orleans.

DIAGNOSES OF CASES

In every instance the diagnosis as made by the attending physician was accepted. Under the Public Health Act the responsibility for diagnosis as well as notification is placed upon the medical practitioner and it is presumed the medical men have availed themselves of the many opportunities offered, to verify the diagnoses by blood or other cultures.

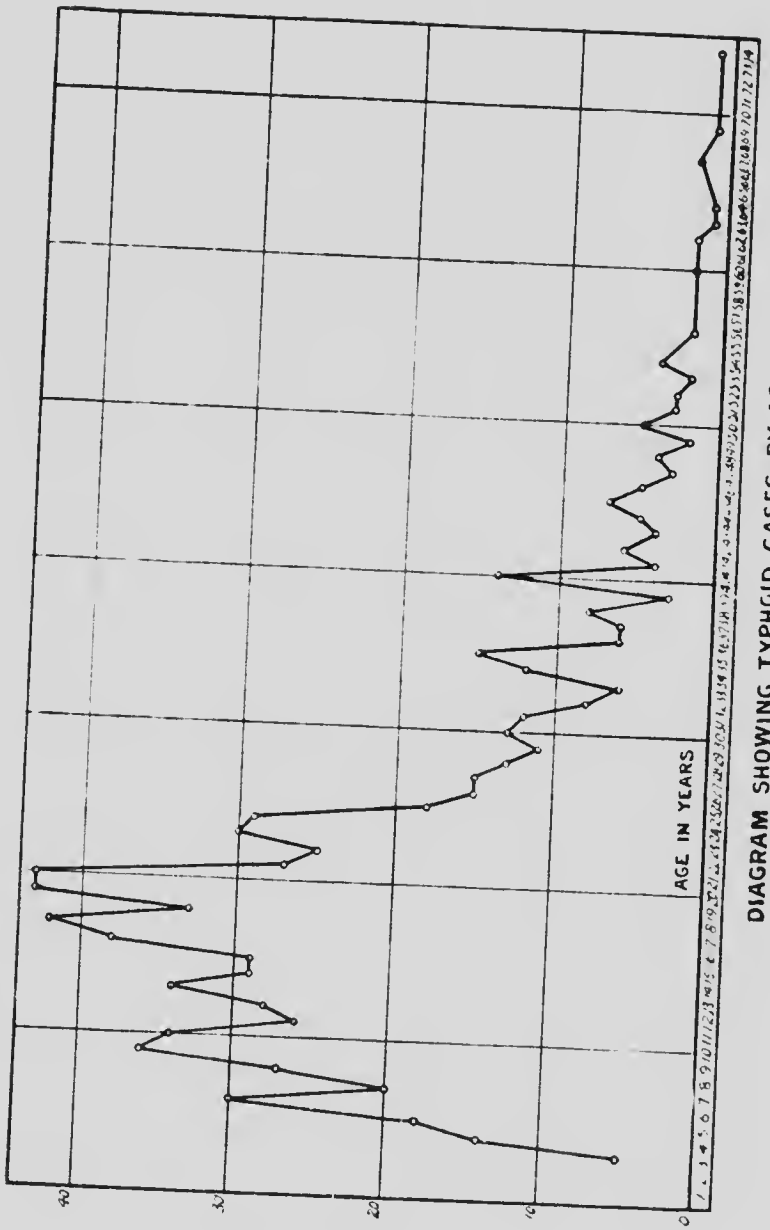

DIAGRAM SHOWING TYPHOID CASES BY AGES

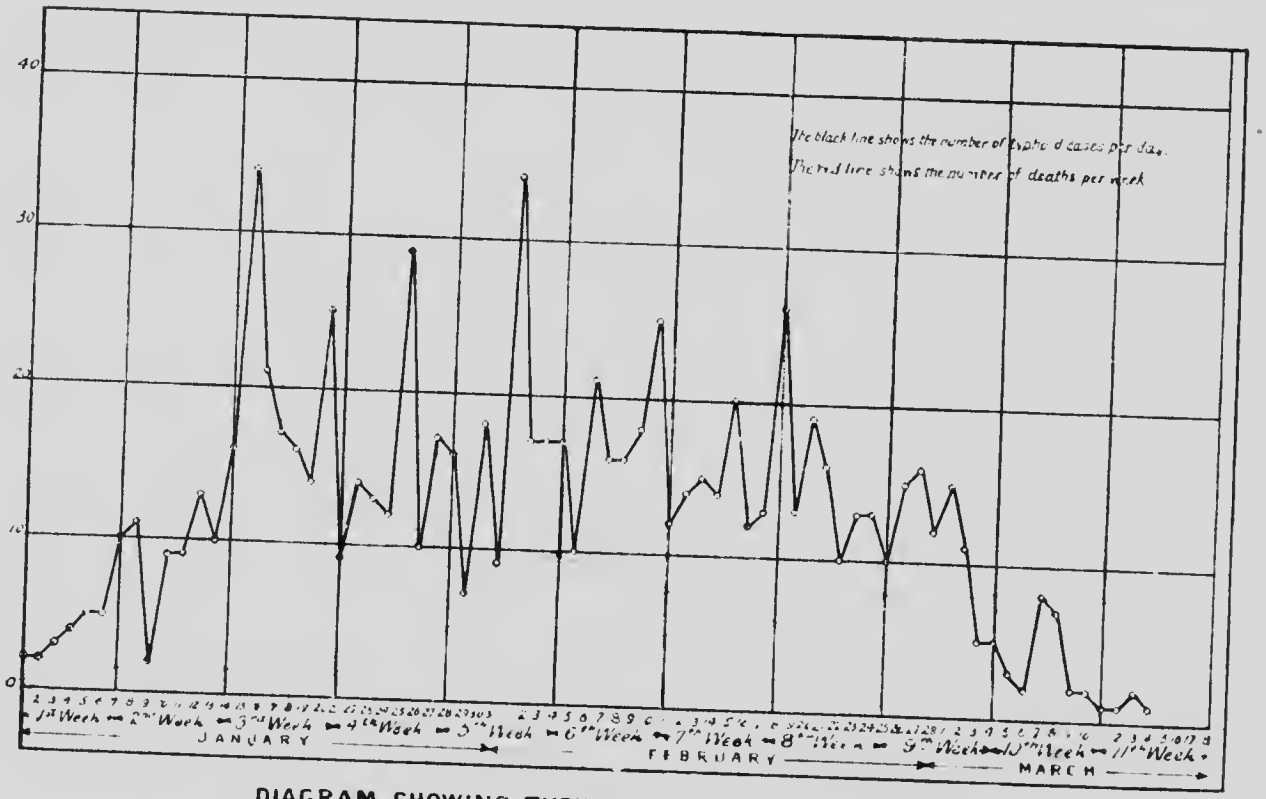

DIAGRAM SHOWING TYPHOID CASES BY DAYS AND WEEKS

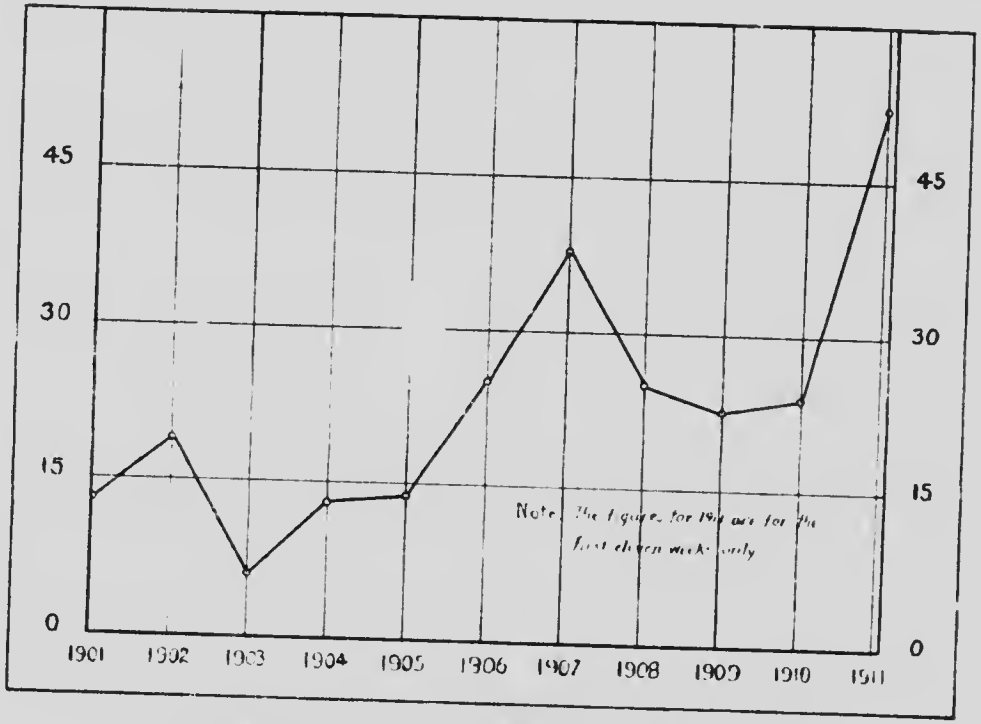

DIAGRAM SHOWING THE NUMBER OF DEATHS FROM TYPHOID FEVER, CITY OF OTTAWA, 1901 - 1911

WATER SUPPLIES OF OTTAWA AND HULL

OTTAWA RIVER WATER

The source of water supply for the cities of Ottawa, Ontario, and Hull, Quebec, is the Ottawa river. The points from which water s taken are shown in Appendix I. The intakes of Ottawa and Hull are both situated on the Quebec side in the main current of the Ottawa river, and therefore are alike exposed to any contamination which might be carried down from the Aylmer sewer outfall. The Hull intake is more exposed to contamination from surface drainage from the Quebec side of the river.

Having in mind the relative position of the water intakes of the cities of Ottawa and Hull, what were the prominent points for consideration? Here were two municipalities taking water from the same river, at different points in the same current. The w ter intakes were about 3,000 feet apart, and the possib. ities of surface contamination were greater in the case of Hull than in that of Ottawa. Both sources were possible of contamination from the sewage of Aylmer, and yet enquiries made in Hull educed the fact that that city was not suffering from an epidemic of typhoid fever,—indeed it was comparatively free from the disease.

Had there been typhoid contamination of the waters of the Ottawa in the main north current, it was only to be supposed that its effects would have been shown in the morbidity of both cities, but this was found not to be the case. Hull was practically free from typhoid fever while it was epidemic in Ottawa. Some years ago when the water supply of Hull became contaminated through a break in the water intake lying in the sewage

polluted Brewery creek, there was an epidemic in H
while Ottawa was free.

Another point in regard to the two water syste
is of interest: the method of pumping is similar, in t
the water was drawn in (sucked in), not forced in, a
therefore the pressure on the intake pipe was fr
without inward; a fact which allows of the possibil
of contaminated liquid matter being sucked in at a
joint in the intake, even in minute quantities, sufficie
however, to pollute a water supply. Again, both pip
for a considerable distance are unfortunately, and i
properly, placed in running water, which either is,
may be, contaminated. That of Hull lies in Brewe
creek, while the Ottawa pipe is on the bottom of the o
aqueduct.

Appendix I indicates the point where sewage di
charges into Brewery creek in the case of Hull; and M
N. J. Ker, City Engineer, stated in his letter of Marc
17th, 1911 (Appendix IVa), that from September 29t
1910, to January 15th, 1911, sewage was pumped int
the aqueduct, thus converting it into a temporary sewe

OTTAWA EAST SUPPLY

This system was formerly used by th
village of Ottawa East; but was abandone
some four years ago and was not again put into opera
tion until the latter part of January, 1911. The wate
is collected from the gravel beds on the bank of the
Rideau river into a well some thirty feet deep and
twelve feet in diameter and pumped therefrom into the
general system. (See Appendix I). The quantity thus
obtained was about half a million gallons per day. This
water was reported to the Engineer as being perf etly
pure, and therefore it was not treated with hypo-

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Typhoid excreta as seen at the back of a Creighton St. house.

Where typhoid excreta was found in the rear of a Creighton St. house.

chlorite. However an inspection was made on March 31st by Dr. Hodgetts, Col. C. Jones, and Major L. Drum. Samples were taken and the laboratory findings indicated that there was contamination. A communication was then sent to Mr. Ker, City Engineer, recommending that the water be treated, and, on April 5th, this plant was shut down by his order.

It is possible that for some weeks past a partial sterilization of water from this source has been secured, by reason of the excess of hypochlorite which has been p esent in the general city supply.

BACTERIOLOGICAL ANALYSES OF SAMPLES OF WATER TAKEN FROM TAP AT OTTAWA EAST PUMP HOUSE

Date	Result of Analysis	Remarks
March 31..	Bacillus colon found in 10 c.c...	Water contaminated with intestinal organisms.
April 4....	Bacillus colon found in 20 c.c...	Water contaminated with intestinal organisms.

SEWAGE DISPOSAL OF OTTAWA AND HULL

The sewage of the city of Ottawa is discharged either into the Ottawa or the Rideau rivers at eleven different outlets. That discharged into the Rideau river at the point indicated in Appendix I undergoes but partial treatment by being passed through a septic tank. The remaining ten outlets discharge their sewage in a crude or untreated state at points where there is no possibility of the same polluting the water supply.

The sewage of the city of Hull is also discharged into

the Ottawa river at Brewery creek at points remot
from the water intake of either city. (See Appendix I)

LOCAL POLLUTION OF OTTAWA RIVER

NORTH SHORE

The sanitary survey of the north shore mad
by Dr. R. W. Bell and Major L. Drum re
vealed but little danger, apart from the pollution arisin
from the Aylmer sewerage system which will be an eve
increasing menace to both Ottawa and Hull, with th
intakes situated as they are at present.

The fact that little pollution of any kind finds it
way into the river in the district between Hull and
Aylmer, is largely due to the fact that the inhabitants
look to it as their source of water supply and not t
wells, hence they are the more careful to prevent pollu
tion. So long as these conditions exist, the possibility
of any serious pollution is removed.

SOUTH SHORE

A sanitary survey of the south shore was
made by Major Drum and Dr. Hodgetts be
ginning at Pier No. 1. There is a general shore pollu
tion which is less in winter than at any other time in
the year. The pollution has been, however, yearly
becoming greater, owing to the suburban growth of the
city westward.

We found discharging into Nepean bay, at the point
indicated in Appendix I a considerable amount of sewage
which runs through a culvert under the tracks of the
Canadian Pacific railway. This evidently drains that
portion of the Company's property lying between the
line of the Wellington street sewer and the river, with
the exception of the round-house which has only
recently been connected up with the sewerage system.

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Cave creek, showing location of privies.

At the time of this inspeetion, the privies situated on the Company's property over a pool lying between the tracks, were out of use and the pool was being filled in.

Continuing in a westerly direction, the surfaee drainage east of Bayview road and north of the C.P.R. tracks, is into Nepean bay. In that area there are located, elose to the shore a large stable, a mill, and several houses, all of whieh are without sewer eonneetion, and the pollution at this point must be considerable.

Further westward is Lazy bay into which Cave ereek diseharges. In addition to the surface washings from yards, stables and streets, which must find its way into either the bay or the creek, we found located on, or discharging into the creek 120 privies, as shown in Appendix V. An idea of how some of these privies are located directly upon the ereek may be obtained from the illustrations facing pages 6 and 15. In some instances, we found the houses built so that the baek portions were directly over the creek, to permit of the construction of indoor conveniences. From Meehanicsville west to Britannia-on-the-Bay, eontamination eomes from surface washings, but at the latter point, whieh is the summer residenee of many hundreds of people, and the daily resort of large numbers of visitors, the provisions for treatment of human excreta are not such as to obviate the pollution of the waters of the Ottawa at this point.

The laboratory report on speeimens of water taken from Nepean bay and Lazy bay indieate the presenee of baeteria of intestinal origin.

Cave creek, showing location of privies.

BACTERIOLOGICAL ANALYSES OF SAMPLES OF WATER TAKEN FROM NEPEAN BAY AND LAZY BAY

Point From Which Taken	Date	Result of Analyses	Remarks
Hole in the ice in Nepean bay near Pier No. 1..	Feb. 8	Bacillus Colon in 5 c.c. Many fluorescent liquifying organisms noted.....	Water badly contaminated with intestinal organisms, and organisms indicating surface drainage.
Lazy bay.....	Feb. 11	Bacillus Colon found in 10 c.c.....	Contaminated with intestinal organisms.

FOOD SUPPLY

MILK SUPPLY AND MILK INFECTION

The milk supply of the city is chiefly furnished by one company which by careful inspection of its own, supplements that of the city Board of Health. It is gathered from dairy farms situated in the provinces of Ontario and Quebec, chiefly however, in the former province.

In most cases the milk is mixed, a fact which greatly favours the dissemination of any infection that may have taken place. In the case of the company, this danger is guarded against by the efficient pasteurization of the milk; a process which materially lessens the chances of the milk being a cause of typhoid infection. Yet it must be remembered, pasteurization does not destroy the toxins generated in any milk that may be infected.

View of plumbing in living room of a St. Patrick St. house.
The tub was used to collect slops from the sink.

An inspection of the premises of the individual milk vendors showed that the precautions generally taken in the storing of the milk were only fair; and in the cleaning of the cans and bottles, there was room for considerable improvement. A dark, underground, badly lighted, unventilated cellar, without either a wooden or concrete floor, with an open drain connecting therewith, certainly does not make an ideal dairy.

About seventy to seventy-five per cent. of the milk supply of Ottawa is distributed from the depot of one company, and all the milk supplied by this company is pasteurized, whether distributed in bulk, or in bottles, to hotels, restaurants, or houses. The certified milk sold in the city is the product of one dairy, and is bottled at the farm.

It was found that the milk supplied to the infected persons was about in the proportion to the general distribution, seventy-one per cent. using the company's milk, and twenty-nine per cent. the milk of other vendors, or that of their own cows.

In this connection it may be noted that proper sterilization of milk vessels of all kinds, and the efficient pasteurizing of milk, may prove somewhat of a safeguard when an outbreak of typhoid fever occurs which has been caused solely by water infection; for if the infectious bacteria find their way into the milk from the washing out of cans and utensils, they may so multiply as to cause the milk to be a source of greater danger than the water itself.

Another danger is that of the possibility of the milk becoming infected if those handling it are either them-

selves suffering from typhoid fever of a mild type and are carriers, or, by reason of their careless contact with persons suffering from typhoid fever, may thus convey the infection to the milk. It is therefore considered that these possible channels of infection should be carefully controlled by the Medical Health Officer.

ICE CREAM, RAW FRUIT, VEGETABLES, &c.

The data in reference to these articles of food, the latter being chiefly celery and lettuce, were such as to make it evident that they may be excluded as possible causes of the epidemic.

RAW SHELLFISH

The small proportion of cases where oysters or other shell fish had been eaten, either raw or cooked, also excludes this class of food supply as a factor to be considered.

ICE SUPPLY

As the season of the year was not one in which there was a general consumption of this domestic commodity, it does not require consideration as a possible cause of the epidemic.

BAKERY AND OTHER FOOD SUPPLIES

The food supplies of the city are handled pretty much in the same manner all the year round, but the conditions surrounding the preparation and distribution of them are complex, as they pass through many persons' hands before reaching the consumer. It is therefore more than probable that food supplies played some part in the spread of infection after the epidemic had started. Apart from this as a possible means for secondary infection, there is nothing unusual to note, and it can be excluded as a primary factor in the case.

"Everything overflowing," the privy of a typhoid infected house on Stirling Ave.

"A pair," Stirling Ave.--the privy of a typhoid infected house on Stirling Ave .

SANITARY CONDITIONS

The general sanitary conditions of the premises where typhoid occurred were reported upon by the inspectors. Where they were reported as bad, a personal inspection was subsequently made by Dr. Hodgetts in company with either Col. Carlton Jones or Major Drum.

In view of the disgraceful conditions disclosed by the investigation, a letter (Appendix II) was sent to the Mayor on March 11th, informing him that immediate action by the Board of Health was required.

That there was an unusually large number of privy pits within the city limits was a well known fact: but to find many of such a primitive character and kept in such a disgracefully unsanitary condition was something for which one was not prepared. Indeed it was difficult to believe it possible that within the city limits, such disgusting practices could be permitted.

As will be seen from the accompanying illustrations —taken exclusively from typhoid fever infected houses,—human excreta were to be found scattered about upon the ground, without undergoing previous disinfection, thus becoming a menace to many. The only fortunate feature is the fact that it was wintry weather, and fly season had not arrived, otherwise secondary infection from this source would have been a marked factor.

The illustrations portray the actual conditions at the time of the personal inspection. They are not given as indicating a factor in the cause of the outbreak but simply to show, as well as illustrations can, the unsanitary conditions of some typhoid fever premises. Many other similar examples could be added but the

few suffice to portray what *should not be in Ottawa*. There were found also some rural conditions which, when existing in a large city, are not conducive to the health of its inhabitants.

THE PLUMBING

Several cases occurred during the first week of the epidemic, in houses without water closets and, in some instances, without sinks, and therefore, without sewer connection. The possibility of sewer gas being a causative factor in these houses is thus excluded.

As the reports of the inspectors in many instances indicated the plumbing as "bad," they were personally investigated, and an expert plumber was engaged to apply the "smoke test," under our personal supervision. In all some twenty-seven houses were thus examined and the expert's report is given in Appendix VI.

The results of the examination of the plumbing fully justifies the enquiry in this direction as it will draw attention to the necessity for a thorough and systematic inspection of all plumbing in the city by means of the smoke test.

A house in which the plumbing is in an unsanitary condition is not fit for human habitation, as the inmates are constantly exposed to the emanations of sewer gas, which weakens and debilitates the constitution and may be the means of carrying infection.

THE CAUSE OF THE EPIDEMIC

The following factors may be excluded in considering what was the primary cause of the epidemic:

Plumbing at 79 Cartier Street. Note the condition of vent pipe.

Typhoid excreta thrown on the ground in the corner of the yard, St. Patrick St.

Milk;
Food supplies of all kinds, including ice;
Unsanitary conditions;
Sewage from the sewerage system, and sewer gas.

As the seasonal conditions excluded flies and dust, we come to consider the only other common factor, that of the water supply which was in general use.

It will be observed that the entire population of the city had been exposed, no class or section, no age or condition being exempt, and this too, at a season of the year when the temperature was at its lowest point—mid-winter.

From what has already been said of the normal water supply as derived from the Ottawa river in the main channel, it cannot be looked upon in the present instance, as the immediate cause of the outbreak, although the liability of the main channel to sewage contamination at times is not free from suspicion. We have the facts before us. Two cities derive their supply from the same source, and in Hull, where the intake was most exposed to pollution, there was no typhoid fever; while in Ottawa, there had been 1,196 known cases in ten weeks.

What then were the unsanitary or abnormal conditions affecting the Ottawa water supply, just previous to the outbreak? These conditions may be grouped under the following main heads:

(1) The unusually low water in the river.

(2) The meteorological conditions whereby, owing to the shallowness, the river became frozen to the bottom in places, blocking some of the ordinary

channels; and the freshet during the first week in January.

(3) The contamination of Nepean bay and the river above.

(4) The occurrence of typhoid fever in Mechanicsville last autumn.

(5) The opening of the emergency valve at Pier No. 1.

(6) The pollution of the old aqueduct by sewage.

(7) The possibility of pollution of the water in its passage through the intake pipe.

(8) The effect of neglect to carry out Mr. Hazen's recommendation of October 5th, 1910, *re* hypochlorite treatment.

(1) The lowering of the water in the river drew down the polluting matter from the shore of Nepean bay and points above, so that by concentrating it, the main south channel at Pier No. 1 was the more readily contaminated. Thus, upon the opening of the emergency valve, there would be a direct suction of this matter into the pipe, causing a pollution of the water supply.

(2) The freezing of the river to the bottom in the shallow places, thus blocking some of the channels, would divert the current of any creek or other body of water flowing into the Ottawa, so that it would be more likely to reach the main south channel in a less diluted and fresher state than under ordinary conditions. Further, the thaw which occurred on January 2nd and 3rd, 1910, while markedly increasing the flow

An example of how typhoid excreta were allowed to pollute adjoining premises.—Bayswater Ave.

The rear of a Stott St. house, showing human excreta and filth close to shed.
Note chickens on pile.

of Cave creek, the discharge into Nepean bay from the Canadian Pacific property, and the volume of surface washings, was not sufficient to affect the ice along the shore and, an increased amount of polluting matter was thus thrown into the south channel.

(3) From a careful survey of the shores of Nepean bay and points above, it is quite evident that polluting matter of both human and animal origin reaches the Ottawa river. The pollution of the Ottawa river from Cave creek is indicated in Appendix V, upon which is also indicated the location of privies, the majority of which discharge directly into this creek flowing into Lazy bay. Cave creek is, and has been for some years past, the common sewer for many hundreds of persons resident in Mechanicsville and Hintonburg; human excreta, kitchen and houschold waste, and the drainage from animals and street washings being constantly deposited in it. There is also a considerable volume of sewage, possibly of a more diluted character than that discharged from Cave creek, but sewage nevertheless, which comes from the property of the Canadian Pacific railway and discharges much nearer Pier No. 1 than does Cave creek. The possibilities of the pollution of this effluent by human excreta are evident, and this fact, coupled with its nearness to the emergency valve, and also that its flow, so far as can be ascertained, is constant, makes it another factor to consider in the pollution of the water of the main south channel before it passes Pier No. 1.

It was also ascertained that considerable surface drainage from several premises west of the Canadian Pacific yards reaches the waters of Nepean bay.

(4) It has been definitely ascertained that there were cases of typhoid fever in Mechanicsville and Hintonburg last fall, and that the premises occupied by these persons drain either directly, or indirectly, into Cave creek. The following are the notes in reference to two cases:

A. B.—Merton street; ill, July and August; privy drains into Cave creek.

A. R.—First avenue; ill August and September. The stools were buried about a foot deep in the garden, there being partial disinfection with a solution of carbolic acid. Since recovery, patient has used privy situated at one end of the garden. Surface drainage from the premises is by a gentle slope to the creek which lies at a distance of about one hundred yards.

(5) In order to secure an adequate amount of water either for ordinary consumption or for fire protection, there are two emergency valves in the system, one at the north end of the pump house, the other at Pier No. 1. That at the pump house, it was stated by Mr Ker, City Engineer, has not been opened since May 17th, 1910, when repairs were being made to it. (See letter, Appendix IVa).

The valve at Pier No. 1 was opened under conditions laid down in the orders issued by the Engineer (see Appendix IVb) and was only opened on the occasion of a fire alarm, and for ten days in the first half of the month of December, 1910, when it was opened about one-sixth of its area, at a time when anchor ice was running. (See Appendix IVa).

We have, therefore, the fact before us that the valve was partially open for ten days in the first half of December, 1910, and fully open—for fire purposes—on ten occasions from the 9th to the 24th of the same month, for a total period of some three hours. (See Appendix IVa).

It has already been shown how the pollution of the south channel was effected. We have next to note the fact that the emergeney valve at Pier No. 1 was opened partially for ten days and fully opened for fire purposes on ten different occasions between December 9th and 24th, under the unusual conditions already referred to. That contamination of the city water supply did take place is shown by the fact that,—allowing for the incubation period of the disease after these pollutions took place,—while there were only ten cases during the month of December, 1910, yet there were thirty-one cases in the first week of the month of January, 1911, which was the first week of the epidemic. The subsequent daily and weekly occurrence is shown on page 5.

The opening of the valve did not discontinue on December 24th (See Appendix VIII), for it was opened again on the following dates for fire purposes:

1910, December 27, 3 times.
" 30, twice.
" 31, once.
1911, January 3, once.
" 4, twice (3 hours, 29 minutes).
" 5, 3 times.
" 8, once.

January 10, once.
" 13, once.

The result was that the epidemic began on January 1st with two cases, and continued with the daily variations as indicated in Table on page 5.

Further, it will be seen by reference to Appendix I that, of the 901 cases reported upon, only one was outside the zone of the city water supply.

(6) The pollution of the old aqueduct by sewage from September, 1910, to January 15th, 1911, was an additional menace to the water supply, for the grosser material contained in this fresh, raw sewage would readily find lodgment around the pipe and be drawn in through the joint in the manner described in the next paragraph. An additional and unwarranted menace was thereby added. When it is remembered that the dejecta from one typhoid patient or one typhoid 'carrier' contains all the potency required to produce an outbreak, the danger from these sources can readily be understood.

(7) In considering the possibility of the infection of the water system by reason of the location of the intake pipe which lies at the bottom of the Ottawa, in what may be termed a valley of the bed of the river, it is taken for granted that there were no leaks at any of the joints such as could be detected by the eye or the hand. But it is possible that the joints are not so impervious as to prevent the suction of small quantities of any liquid polluting matter which might gather around them. Moreover, the pipes lying in this bed are in the very place in which just such polluting matter would find lodgment.

(8) The effectiveness of the hypochlorite treatment in producing a sterile water is well evidenced at the present time. The accompanying laboratory report showing the results from the inception of this treatment until Mareh 18th, fully proves the soundness of the recommendation made by Mr. Hazen, and it is safe to conjecture that, if this valuable recommendation had been followed out in the manner indicated in his report, the epidemic would have been minimized, if not altogether prevented. Mr. Hazen recommended as follows:

PARTIAL TREATMENT.*

"Pending the installation of sueh a system, a partial treatment of water might be adopted with advantage, sueh partial treatment eonsisting of the addition of hypoehlorite of lime. The best amount to be added would be determined by experiment. Possibly a water with this degree of eolor would take a somewhat larger quantity than a water with less organic matter. For the present, base the estimate on 15 pounds per million gallons, or 50 tons per annum, at $25 per ton, eosting $1,250. The cost of applying would be represented by the salaries of four men and something extra for supervision, say $3,500 per annum. The total cost would probably be something like $5,000 per annum.

"In order to carry out this treatment all the water should be brought to the pumping station through one pipe. There is now one 40-ineh pipe supplying water and a new 42-ineh pipe is being built. It was the intention to give these two pipes separate eonneetions with the pumping station. This arrangement would not lend itself eonveniently to the hypoehlorite treatment. In order to carry out the treatment advan-

*Report on Improvement of the Ottawa Water Supply, by A. Hazen.

tageously both of these pipes should be connected to a new 60-inch pipe at a little distance from the pumping station, say at a distance of two or three hundred feet, where the two pipes could be brought together and the single large pipe carried to the pumping station.

"I would put a Venturi meter on this pipe so that the amount of water pumped could at all times be known with certainty.

"The hypochlorite of lime could be dissolved and controlled in a space in the attic over the present pumping station which is adapted to this use. The solution would be carried to the beginning of the 60-inch pipe and would become mixed with the water by the flow through it, and by the flow through the throat of the Venturi meter, so that the water taken to each pump would have its fair share of the substance. Passing through the pumps of course would affect a very thorough mixing.

"The hypochlorite treatment on present evidence is equal in its effect to the ozone treatment in every respect, and is both surer and cheaper. It would not reduce the color of the Ottawa river water appreciably, nor would it remove any turbidity and sediment in it. Its object would be to remove as many as possible of the bacteria resulting from the sewage pollution of the river. A considerable bacterial purification could be secured in this way. The process is worth installing at once and continuing in use until permanent purification works or a new supply is installed, and I recommend that this be done."

CAUSE OF THE CONTINUANCE OF THE EPIDEMIC

The cause of the continuance of the epidemic was in the main due to a continued contaminated water supply. After the hypochlorite treatment became effective in efficiently disinfecting the water, on or about the last

A St. Patrick St. house having a case of typhoid fever. Note filth on the ground.
The cross marks the rear entrance.
The arrow marks the rear entrance of one of four houses in the rear thereof.

week of the month of February (eighth week of the epidemic) there was a marked decrease in the number of cases, as is shown in the returns of the week ending March 11th (tenth week of the epidemic), and the practical termination of the epidemic in the week ending March 18th (eleventh week of the epidemic).

Doubtless other secondary causes were operative after the epidemic had started, such as, personal contact, the washing of uncooked foods and household utensils in the infected water; also the defective plumbing and general unsanitary conditions of many premises. There was evidently no attempt to correct either of these latter causes by such systematic and thorough inspection as their preventable character and their importance demands.

APPENDIX II—LETTER TO MAYOR AND HEALTH OFFICER *re* PRIVY PITS

OTTAWA, March 11, 1911.

CHARLES HOPEWELL, ESQ.,
MAYOR, CITY OF OTTAWA,
OTTAWA, ONT.

Dear Mr. Mayor:

Acting on the reports made by the officers now engaged in the work of the collection of information for the Commission of Conservation, I have personally visited some of the premises reported to be in an unsanitary state. I find conditions existing in some of the houses where privy pits are in use, to be of such a disgraceful character as to warrant my drawing your immediate attention to the same. They are a menace to the persons living in the immediate vicinity, and, if allowed to continue, the untreated excreta of typhoid patients, which have been deposited in these sometimes overloaded privies and, in some instances, even thrown upon the ground, can not fail to be a source of infection, and will, with the approach of milder weather, prove a ready means of spreading the disease.

Where such a relic of mediævalism (privy pit) is in use, and becomes the receptacle of the excreta of a typhoid fever patient, it is imperative that there should be thorough and careful disinfection of the contents; and for this purpose, the Health Department should exercise the greatest vigilance, by systematically performing the necessary services; for, if left to the individual householder, it is found the work is never properly performed.

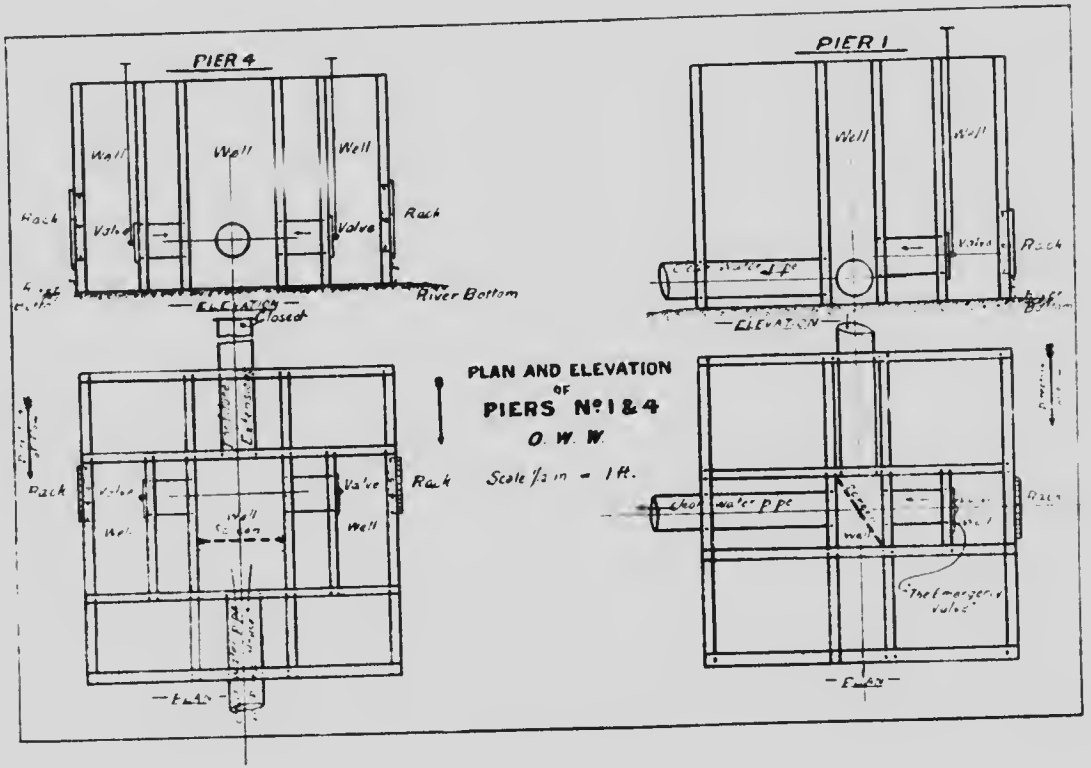
The conditions to which your attention is directed


OTTAWA WATER INTAKE
LEMIEUX
HULL WATER INTAKE
CHAUDIERE FALLS
MECHANICSVILLE
PIER No 1
WELLINGTON
4 outlet
12" outlet
24 outlet
EXPERIMENTAL FARM
DOW LAKE
EXHIBITION GROUNDS
OTTAWA EAST WATER SUPPLY
10" iron main to city
12" tile pipe in gravel
Septic Tank
Outlet
Clay bank
RIDEAU CANAL
HOGSBACK

Commission of Conservation
Canada

PLAN of the CITY of OTTAWA

• Indicates location of typhoid fever case.
Location of Water intakes of Ottawa and Hull, in BLUE.
Location of Sewer outlets of Ottawa and Hull, in RED.
The BLUE BAND indicates areas supplied by City water.


PIER 4
Wall
Wall
Wall
Rack
Valve
Valve
Rack
River Bottom
ELEVATION
Closed
Rack
Valve
Valve
Rack
Wall
Wall
PLAN AND ELEVATION
OF
PIERS Nº 1 & 4
O. W. W.
Scale 1/2 in = 1 ft.
PIER 1
Wall
Wall
Valve
Rack
ELEVATION
Rack
The Emergency Valve

An overflowing privy into which typhoid excreta were placed.
Note the tub and floor

are such as to call for immediate action by yourself and the local Board of Health, which would look to the thorough disinfection of the pits and their contents, and also of the premises immediately around the pits wherever they are found to be contaminated by the typhoid excreta, and for the careful removal of the contents of the pits after disinfection.

This matter I trust will, in the interests of public health, receive your immediate attention.

Accompanying this communication is a list of houses in which typhoid fever has been discovered and where the officers of the Commission find privy pits in use. Similar lists will be sent you from time to time.

A copy of this letter is being forwarded to Dr. Law.

Yours truly,

(Signed) CHAS. A. HODGETTS.
Medical Adviser.

APPENDIX III—LETTER TO MAYOR AND HEALTH OFFICER *re* CAVE CREEK.

OTTAWA, March 13, 1911.

DR. ROBERT LAW,
MEDICAL OFFICER OF HEALTH,
OTTAWA, ONT.

Dear Doctor:

Having examined a portion of that section of the city situated along Cave creek in order to ascertain the sanitary conditions, I am of the opinion it is necessary that immediate attention should be given the same.

Instances are many where outside closets are discharging directly into the creek and, in one case, the back portion of the house is built over the creek, and

all excremental matter is deposited in it from an outside closet. From this house, the creek flows under other houses in process of construction.

Again, the creek has overflowed into back yards carrying sewage with it, and in the floor of a shed of one house I found several inches of frozen sewage with masses of human excreta embedded therein. A more disgusting sight I have never seen in any city; and with the advent of spring, the conditions will not improve.

As it is now, Cave creek is simply a sewer of the crudest and most dangerous type, and drastic measures should be adopted forthwith whereby its pollution will be prevented.

I find that water is being taken from Lazy bay at a point not far distant from the mouth of Cave creek and sold to residents in the vicinity. If the sale extends to residents within the city limits, the practice should be prohibited.

It is possible that you are already aware, through your sanitary inspectors, of the conditions indicated above. If so, the information may be unnecessary, but, in the interests of the inhabitants of the vicinity as well as of the city in general, I feel warranted in pointing out the necessity for immediate action thereon by yourself as Medical Officer of Health.

A copy of this communication is being forwarded to His Worship Mayor Hopewell.

Yours truly,

(Signed) CHAS. A. HODGETTS,
Medical Adviser.

APPENDIX IV (a)—LETTER OF THE CITY ENGINEER re WATER SUPPLY

OTTAWA, CANADA, Mar. 17, 1911.

CHAS. A. HODGETTS, ESQ., M.D.,
MEDICAL ADVISER,
COMMISSION OF CONSERVATION,
OTTAWA, ONT.

Dear Sir:

Replying to yours of the 15th instant, I herewith submit answers to the questions asked, as follows:

(a) Q. The date of the placing of men in charge of the emergency valve at Pier No. 1.

A. The men were placed in charge of the emergency valve on October 6th, 1910.

(b) Q. The instruction, if any, to these men and to the engineer at the pump house in respect to their respective duties as regards the operation of the opening of the valves.

A. The instructions as given in writing to these men and the engineers at the pumping station are herewith attached. Letters are marked A and B respectively.

(c) Q. The dates when the valve was opened since the men were placed in charge.

A. The dates when the valve was opened are shown on attached lis of fire alarms. In addition to this, the valve was opened for about one-sixth of its area for ten days in the first half of December, when the anchor ice was running. I am unable to give you the exact dates, but it was about the time the ice formed in the river.

(d) Q. The location of the fires and the longest period for which it was open.

A. The location of the fire alarm boxes and list of fire alarms is given on the schedules herewith attached.* The longest period, outside the time of opening for the anchor ice, was on January 4th, 1911.

(e) Q. Any information you may have in respect to the emergency valve at the pump house itself, and when it was last opened.

A. The emergency valve at the north end of the pumping station connects with the intake pipe throughout the pumping station, and in the past, has been used when large fires were under way to augment the supply and let water in from the aqueduct. It was last opened on May 17th, 1910, when repairs were being made to it.

(f) Q. The sewers, if any, emptying into the aqueduct and when and under what circumstances was sewage run into the aqueduct.

A. There are no sewers emptying into the old aqueduct.

In constructing the new aqueduct, which is being built across Broad street and on Ottawa street, it was necessary to break sewers running along this street for the distance of a block, as shown on the plan recently submitted to you. The sewage from these sewers mingled with the water which found its way through the crevices of the rock, broken water mains and services, leaks in the stop-logs, and in other ways, obtaining an entrance into the new work, which is 30

*See Appendix VIII.

feet deep. This was pumped into the old aqueduct from September to the middle of January. The proportion of sewage to the total volume of water pumped was small. The engineers at the pumping station were notified of the conditions.

(g) Q. The date when the hypo-plant was first operated with the quantities used then and since.

A. The sterilization plant at Pier No. 1 was started Tuesday, January 31st. At that time we were using 16 lbs. of hypochlorite to 1,000,000 gallons of water. Later this was increased to 22½ lbs. to 1,000,000 gallons, then 30 lbs. and at present we are using 40 lbs. to 1,000,000 gallons of water. The auxiliary sterilization plant at the pumping station was started March 15th using at the rate of 18 lbs. of hypochlorite to 1,000,000 gallons water pumped. This makes a total at the present time of 58 lbs. hypochlorite to every 1,000,000 gallons water pumped.

(h) Q. The amount of water pumped in 24 hours.

A. The average amount of water pumped per day in December, 1910, was 15,835,000 gallons and the average for January was over 16,000,000 gallons.

(i) Q. The maximum and normal flow in the Ottawa river and the minimum flow to which it has recently fallen.

A. The maximum flow in the Ottawa river is approximately 150,000 cubic feet per second. The normal flow is approximately 42,000 cubic feet per second in June, and 25,000 cubic feet

per second in September. The minimum flow to which it has recently fallen has been 7,000 cubic feet per second.

(j) Q. What effect, if any, in your opinion, would the lowness of the water level have upon the water in Nepean bay?

A. The lowness of the water level in Nepean bay has had the effect of allowing the surface ice on the shores and in the shallower portions of the river, in the centre of the bay, to freeze to the bottom, so much so, that recently our dredge has been entirely out of water. In addition to this, the shallower channels have become blocked with anchor ice. I do not think the low level has had any other effect upon the main south channel, some 18 feet in depth, which runs past Pier No. 1, as I believe the water in this channel and in the north channel to be the same quality in winter time. In fact, this south channel is largely fed from the north channel, by the deeper portion of the river in which the old intake pipe is laid.

The valve leading to Pier No. 1 is in the south channel, which is 18 feet deep at this point, and in a strong current. The water is not by any means stagnant.

In previous winters,—to my certain knowledge for the past twelve years,—this valve has been left open nearly all winter without any bad effects.

Should you have mislaid the plan, showing the sewers, sent you last week, I shall be pleased to forward others.

Yours truly,

(Signed) NEWTON J. KER,
City Engineer.

APPENDIX IV (b)—CITY ENGINEER'S INSTRUCTIONS TO VALVE MEN.

OTTAWA, CANADA, Oct. 6, 1910.

Dear Sir:

Confirming my conversation with you this morning and the visit to the valve at No. 1 Pier, I wish you to take the position of watchman in charge of the valve at Pier No. 1, starting Saturday morning, October 8th.

A telephone (No. 4308) has been installed.

The valve in the crib in the pier is to be kept closed at all times, except when you get a message from the engineer or engineers at the pumping station (No. 100), asking you to open the valve. As soon as you get this message, open the valve and when opened, immediately telephone No. 100 and advise the engineers that the valve has been opened. You will keep this valve open until you receive a return message from the engineers telling you to close the valve.

It will be absolutely necessary for you, when you are on watch, to keep within sound of the telephone and not leave your post, as very serious results will arise, as the valve is to be opened principally on account of fire requirements.

You will have to be on duty twelve hours a day and you can arrange with your fellow watchman as to the time to come and go, but one man must be on duty, and the pier never left without a watchman, Sunday included and holidays.

The wages will be $1.80 per day.

Your immediate foreman will be M. Cain, Superintendent of the aqueduct and intake pipe.

Yours truly,

NEWTON J. KER,
City Engineer.

Commission of Conservation

OTTAWA, CANADA, Oct. 6, 1910.

TO THE ENGINEERS AT THE PUMPING STATION:

I have appointed two watchmen, either one of whom will be on duty at Pier No. 1 continuously, to open the valve leading to the intake pipe, whenever you require same to be opened either on account of low water in the intake pipe, for ordinary consumption, or principally for fire protection, whenever you require more water than the ordinary.

When you receive an alarm and wish to draw more water do not order the valve to be opened for three or four minutes as it is quite possible it might be a false alarm or a fire of small duration, but after a few minutes have passed, it would be advisable to telephone the watchmen at 4308 and tell them to open the valve. This will give you a greater head of water in the intake pipe.

After the watchman has opened the valve, he will telephone you, notifying you that the valve has been opened and will keep same open until he receives a message from you after the return blow has been rung in, telling him to again close the valve.

The object of these arrangements is to exclude the water from Nepean bay as much as possible and draw the required supply from Pier No. 4, except when absolutely necessary to open in case of fire, at Pier No. 1.

Instructions to the watchmen are herewith attached.

The watchmen will be on duty Saturday, October 8th.

NEWTON J. KER,
City Engineer.

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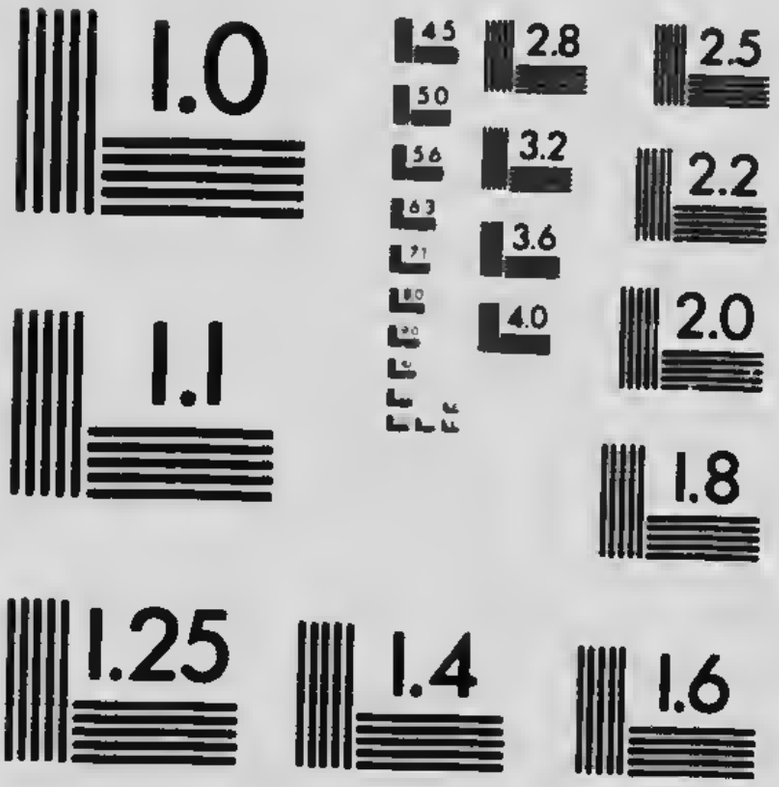
MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

Commission of Conservation

Canada

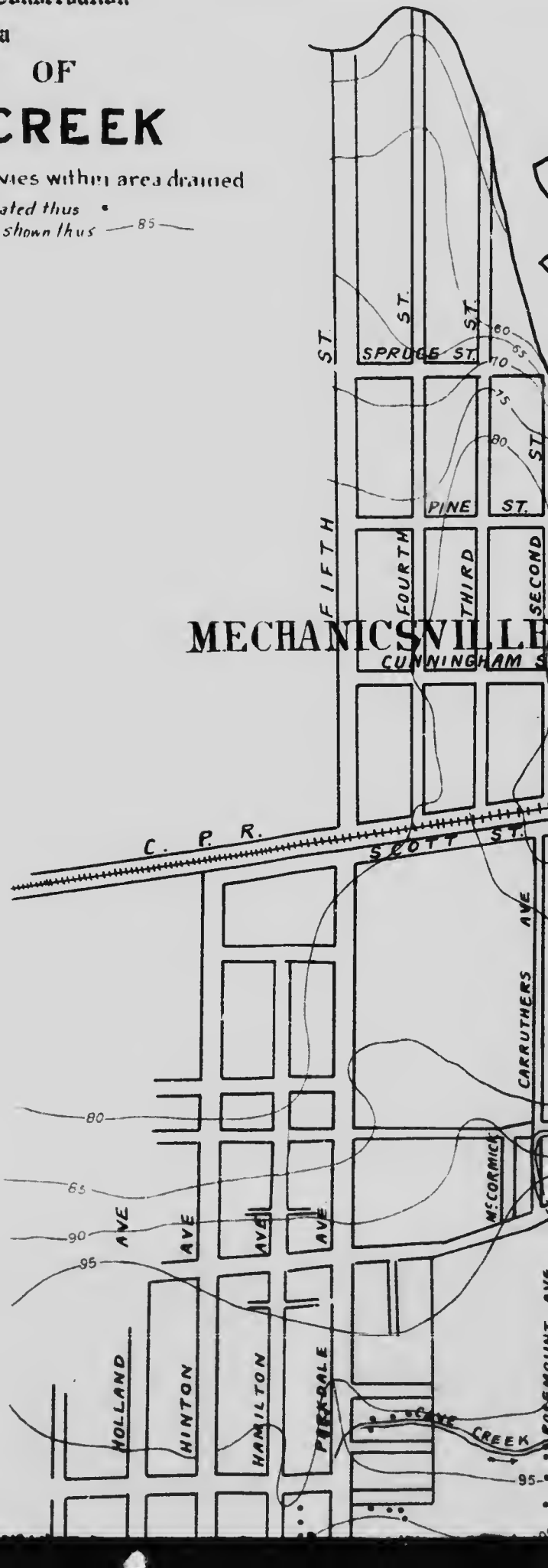
PLAN OF

CAVE CREEK

showing location of privies within area drained

Privies are indicated thus •

Contour interval, 5 feet — shown thus —85—



OTTAWA C. P. R.
RIVER
Route of Pollution
Nepean Bay
RIVER ST.
SLIDELL ST.
MASON ST.
CAVE CREEK
NICHOLAS ST.
NEW ST.
FIRST ST.
SECOND
HAM ST.
CARRUTHERS AVE
STIRLING AVE.
PINNEY ST.
MERTON ST.
WELLINGTON ST.
FAIRMONT AVE.
IRVING AVE.
SPADINA AVE.
McCORMICK
ROSEMOUNT AVE.
SHERBROOKE AVE
CREEK
60
65
70
75
80
85
90
95
100
105
110
115

80
85
90
95
HOLLAND AVE
HINTON AVE
HAMILTON AVE
PIERDALE AVE
McCORMICK
CARRUTHERS AV
CAVE CREEK
ROSEMOUNT AVE
G. T. R.
105
110
115
FARADAY ST.
120
125
130
ROSKIN AV.
135
140
145
150
160
170
TUBERCULOSIS HOSPITAL SITE
CARLING

CARRUTHERS AV.
STIRLING AVE.
PINNEY ST.
MERTON ST.
WELLINGTON ST.
McCORMICK
ROSEMOUNT AVE.
SHERBROOKE AVE
FAIRMONT AVE.
IRVING AVE.
SPADINA AVE.
CREEK
R.
AVE.
85
90
95
100
105
110
115
120
125

APPENDIX VI REPORT OF PLUMBING INSPECTOR

During the progress of the typhoid investigation, Mr. M. M. O'Connell was engaged to examine the plumbing equipment in a number of houses throughout the city. The smoke tests were made under our personal supervision. His report, along with a detailed plan, showing condition of plumbing is given herewith:

HOUSE NO. 79, CARTIER STREET. (See Plan 1).—There is located at the foot of a four-inch cast iron soil pipe, a tile trap. When the sink, bath, basin or closet in either of the houses No's. 77 and 79 are used, the sewage escapes from the tile trap and drain, and the earth is saturated with sewage. This trap is shown on the lower left hand corner of Plan 1. The waste pipe for the sink in house No. 79 is not supported for a distance of four feet, with the result that the pipe has trapped itself for a depth of three inches. This waste pipe is shown at the lower right hand corner of the plan. One of the most defective points of the plumbing system, in these houses, is the sheet galvanized iron pipe from the horn of the water closet. The rain dropping down in this vent as it goes through the roof, has rotted the vent pipe on a horizontal run into the horn of the closet, leaving a hole into which one could easily put his hand. (See illustration facing page 20). When the smoke test was put on in this house, the bath room filled with smoke in a very short time. This vent pipe is shown near the top of the plan, at the right hand side. The position of the fixtures in the bath room is shown in the upper left hand corner of the plan. The fixtures of the closet room are not back vented and the ceiling is not local vented.

Houses No's. 370, 372, 374, 376, 380, 382, Gilmour Street.—The sanitary conditions of these houses are shown by Plans 2 and 3. The plumbing in each of them was tested with the smoke test. A four-inch cast iron pipe is used from the floor of the cellar to the bath room, and a four-inch sheet galvanized iron vent pipe is used from the floor of the closet room through the roof. The joints between the cast iron pipe and the sheet galvanized iron vent pipes in the bath room showed leakages when tested, as did the 4" x 2" connections for the sinks in the kitchens. The smoke also came up through the floor at the four-inch soil pipe, and at the four-inch surface water traps. There is a four-inch trap on the drain in each house that should be taken off, as it is not provided with a fresh air inlet. Not one fixture in these houses is back vented, and the ceilings of the toilet rooms are not local vented. Plan 2 shows the back vent of a closet, entering on a level with a four-inch galvanized iron vent pipe horn of the closet, consequently, it is nothing more nor less than a double waste pipe. This plan also shows the position of the fixtures in the bath rooms.

House No. 434, Lisgar Street.—The plumbing in this house, when smoke-tested showed a number of defects. At the lower right hand corner of Plan 4 will be seen an open sewer connection, without a trap. This has evidently been used for the surface water of the cellar and it is open to the air of the house. The connection of the tile to the iron pipe is a cement joint and leaks gas. At the bend near the floor is shown a four-inch joint made with putty. There is only a two-inch sheet galvanized iron vent used for venting the

drain and on this pipe is an open joint which is supposed to connect with a two-inch lead vent. This vent pipe is taken off the four-inch stack in the wrong place. When the smoke test was applied, the house quickly filled with smoke from the defective joints.

Houses No's. 422, 424, 426, 428, 430, 432, 434, 436, Laurier Avenue West.—Plans 5 and 6 show the conditions existing in these houses.

The pipes were smoke-tested and found to be as follows: Two sinks discharged into one trap and no vent pipe is carried through the roof, so that when the closets are used the trap of the bath syphons, allowing sewer gas to enter the houses. In house No. 434 the drainage is so defective that there is a continuous run of sewage under the floor of the basement. (See Plan 5). In house No. 424, there is a large split in the four-inch cast iron soil pipe above the water-line in the pipe. This drain is not vented through the roof.

Houses No's. 128, 130, 132, 134, 136, 138, 140, 142, 144, Osgoode Street.—In each of these houses the smoke test proved that the plumbing was defective. The following is a summary of the conditions at No. 136 where the plumbing was particularly faulty: The connection between the cast iron pipe and the tile drain was defective, allowing sewage to run in a continuous stream under the floor of the house when either the sink, bath or closet was used. The fixtures in these houses are not vented as they should be.

House No. 144, Osgoode Street.—Alterations had been ordered made by the health office officials on June 29th, 1910. This work as outlined in these instructions

is contrary to the plumbing by-law of the city of Ottawa.* The lead joints on the four-inch cast iron stack in this house leaked when the smoke test was applied. None of these houses is properly back or local vented, and, in every case, the sewage vent, such as it is, is only eight feet from the windows in the rear of the house and is below the level of the top of the windows. The top of the window is seven and a half feet from the level of the roof, while the vent pipes are only six feet, nine inches.

House No. 104, Gilmour Street.—This house was also smoke-tested and found in good order. With one change on the fresh air or sewage vent, and the local vent in the ceiling of the bath room, it would be in good condition. This was the only house inspected where the plumbing was in anything like a sanitary condition.

Respectfully submitted,

(Signed) M. M. O'Connell.

See fac-simile of letter facing page 42

ROBERT LAW, M. D.
HEALTH OFFICER.

PHONE 1287

HEALTH OFFICE

CITY HALL

Ottawa, June 29th 1910

[illegible]

Heating?

[illegible]

[illegible]

Fac-simile of letter from Health Office. The instructions therein are in contravention of city By-laws.

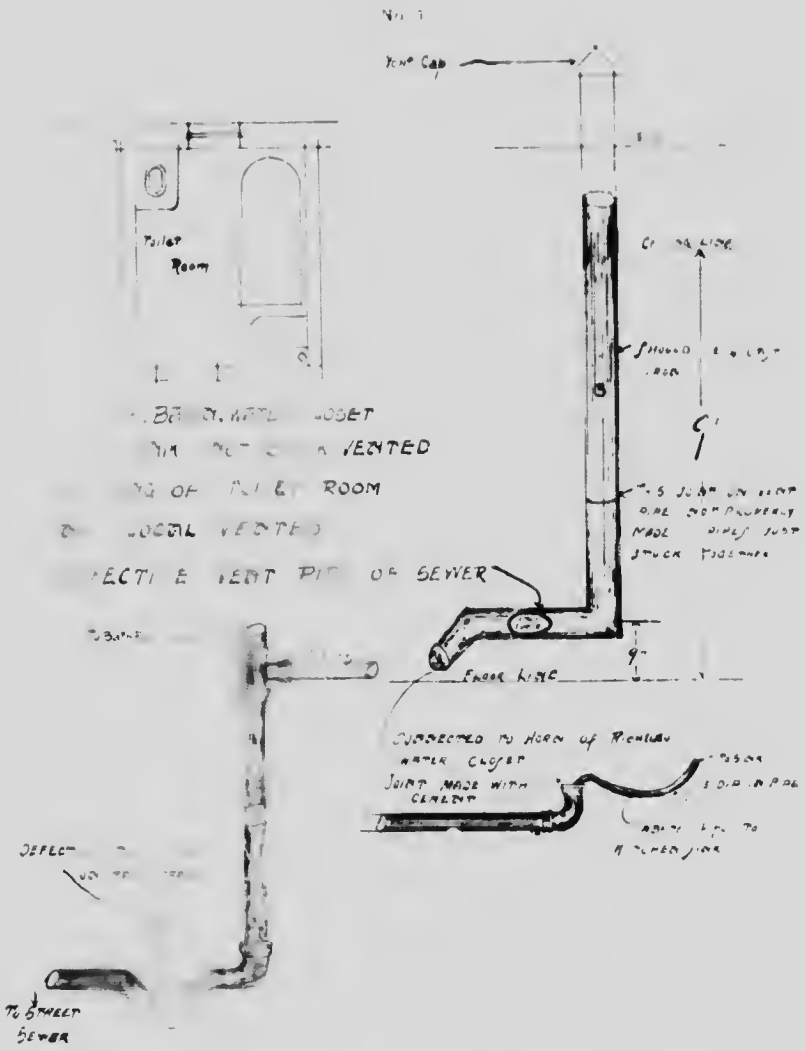


Diagram showing plumbing in house No. 79 Cartier St.
M. M. O'Connell

See illustration ... ing page 20

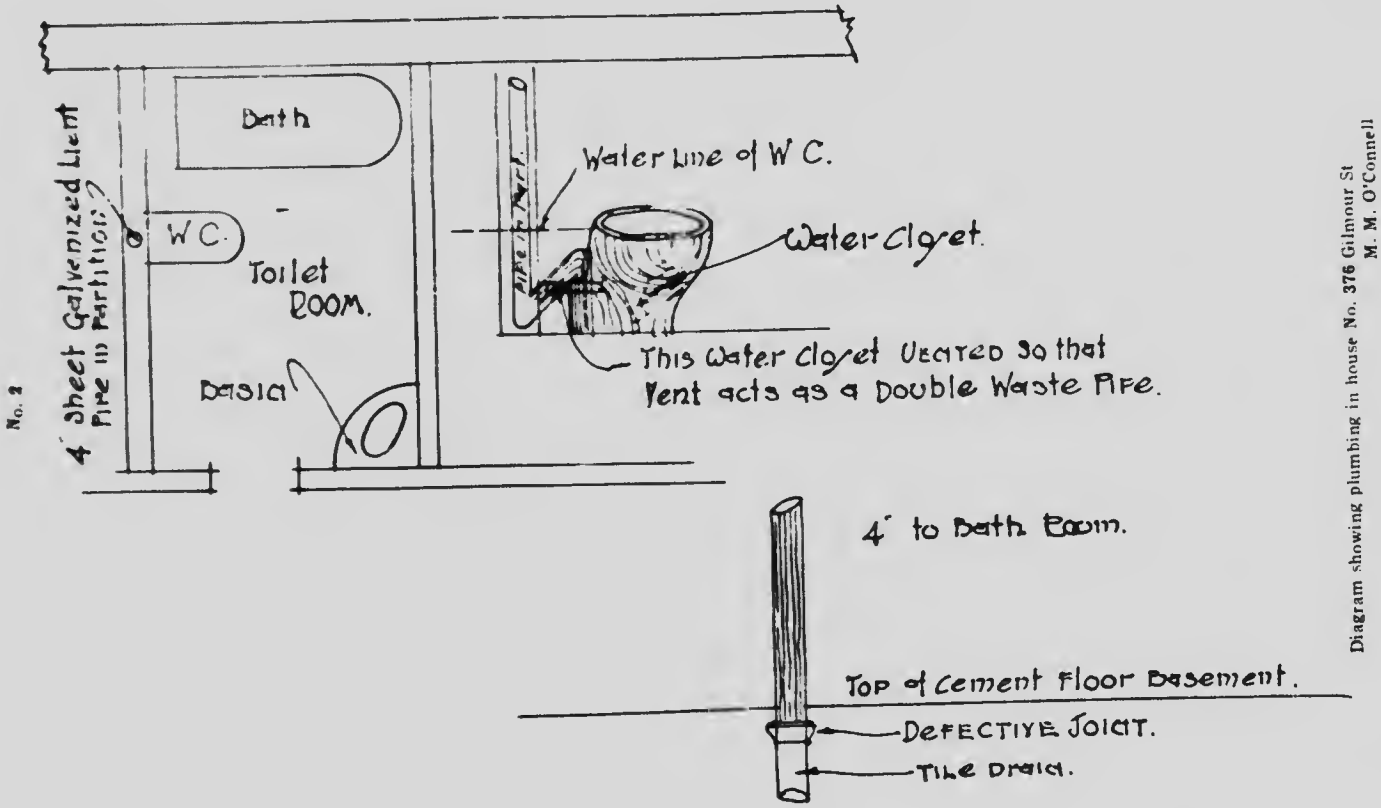


Diagram showing plumbing in house No. 376 Gilmour St
M. M. O'Connell

No. 3

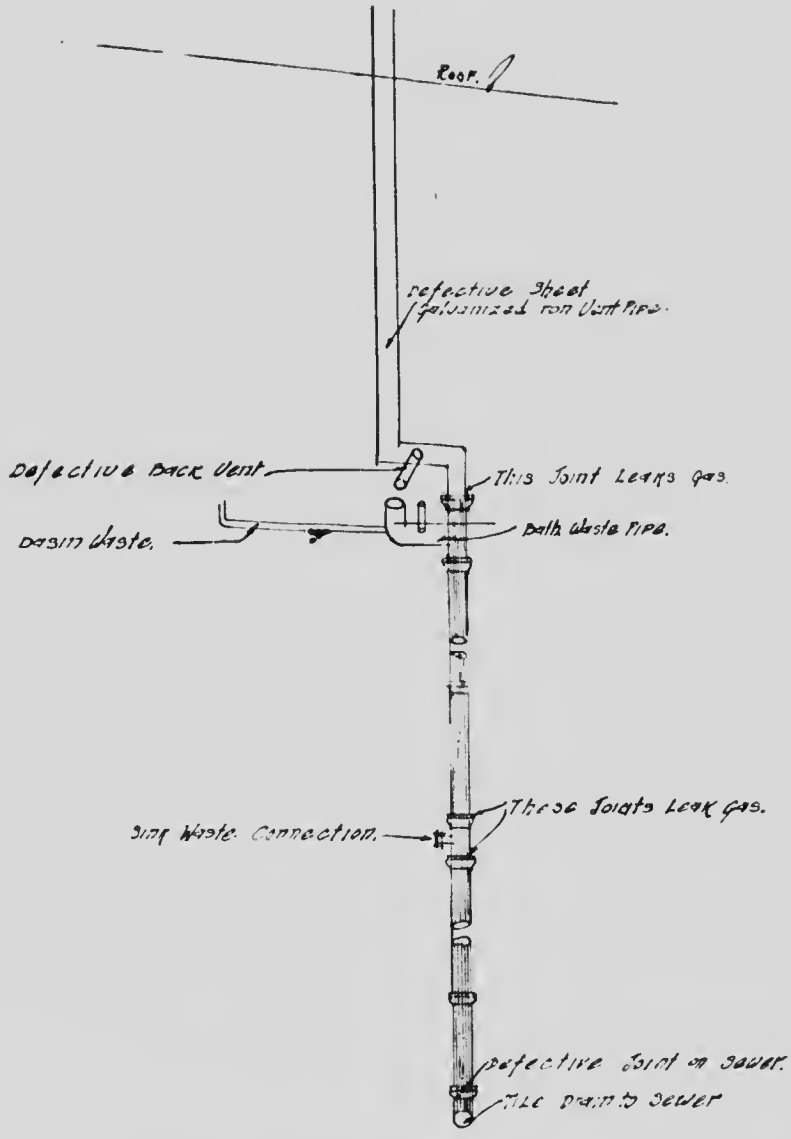


Diagram showing plumbing in houses Nos. 370—382 Gilmour St.
M. M. O'Connell.

[No. 4]

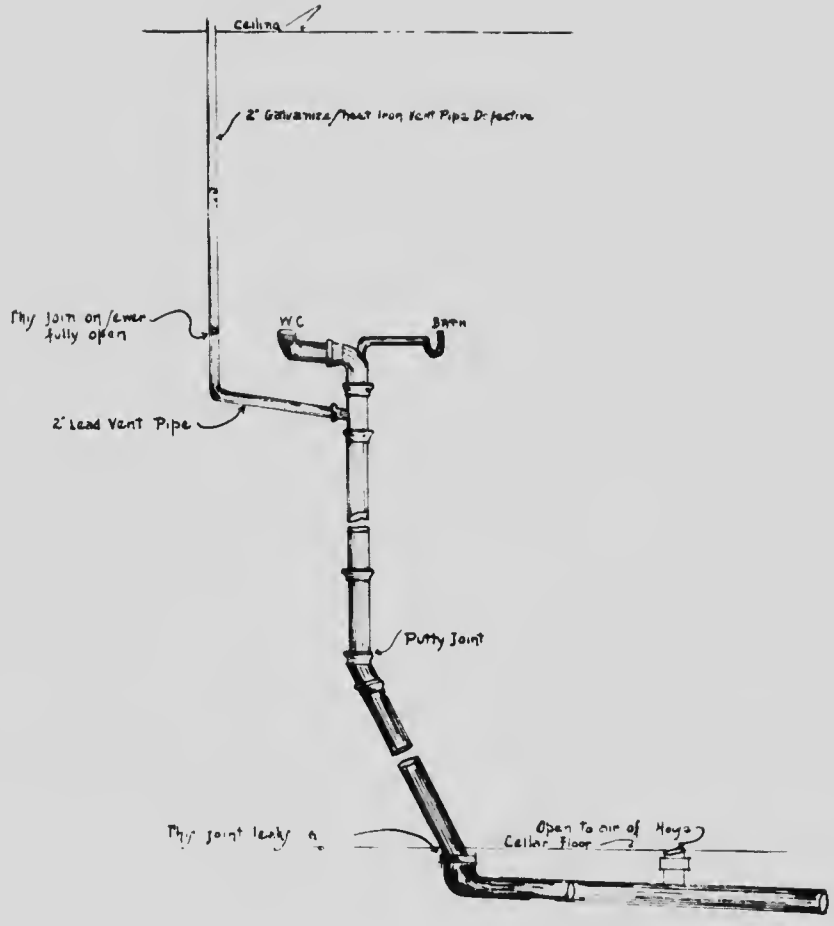


Diagram showing plumbing in house No. 434 Lisgar St.
M. M. O'Connell

No 5

PLUMBING NOT VENTED THROUGH ROOF OR BACK VENTED.

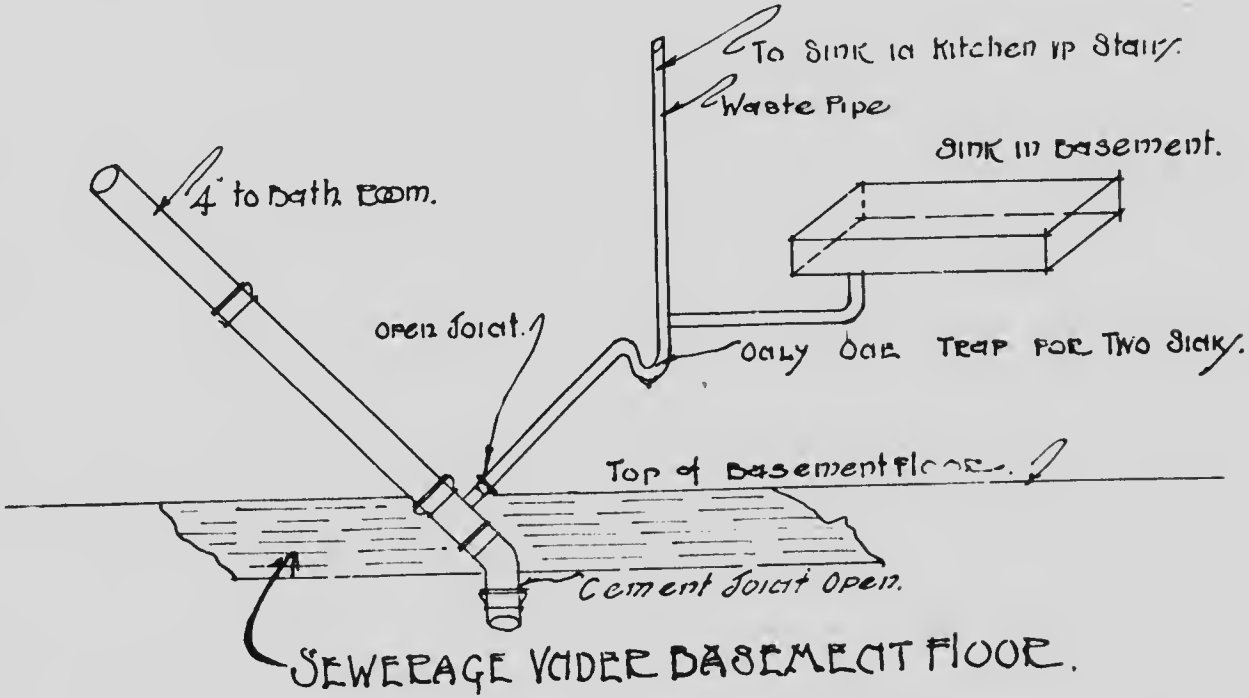


Diagram showing plumbing in house, 434 Laurier Ave. West. M.[s]M. O'Connell.
N.B.--The basement of this house is occupied by a man, his wife and three children, and rents at $5.00 per month.

No. 6

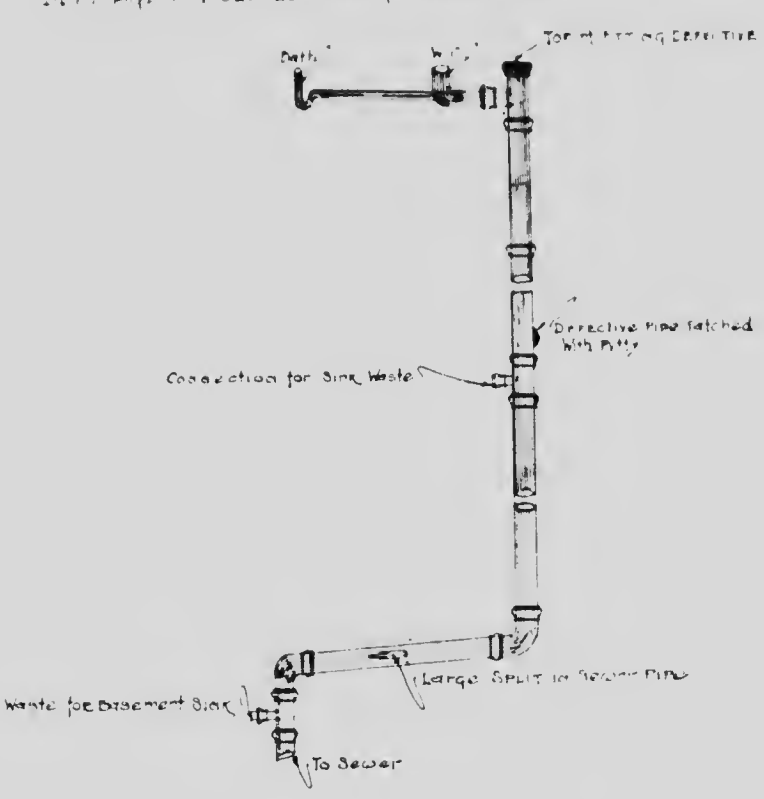


Diagram showing plumbing in house No. 424 Laurier Ave. West
M. M. O'Connell


CHAUDIERE LAKE
EXPERIMENTAL
FARM
DOW'S
LAKE
EXHIBITION
GROUNDS
RIDEAU
RIDEAU
HOGSBACK

Commission of Conservation

Canada

PLAN of the CITY of OTTAWA

SHOWING TYPHOID FEVER CASES

FOR FIRST WEEK

JAN. 1st to 7th, 1911, also

FIRE ALARMS, Dec. 9th to 24th, inclusive, when pumping valve was opened, and also location of 12" water mains.

12" Water Mains shown thus - - -

APPENDIX VIII—FIRE ALARMS,
October 7, 1910, to January 13, 1911

Date	No. of Box	Time Under Pressure	
1910			
Oct. 7	154	10 min.	
" 7	126	10 "	
" 8	43	21 "	
" 8	31	5 "	
" 9	71	7 "	
" 14	165	11 "	
" 14	165	8 "	(see record)
" 16	54	4 "	
" 18	28	5 "	
" 22	8	6 "	
" 23	123	15 "	
" 25	26	5 "	
" 27	125	12 "	
" 27	43	5 "	
" 28	326	9 "	
" 31	131	"	
Nov. 1	135	"	
" 5	54	"	
" 10	6	7 "	
" 11	2	4 "	
" 16	126	7 "	
" 16	138	37 "	
" 17	227	15 "	
" 20	145	5 "	
" 20	122	1 hr. 38 "	
" 22	131	6 "	
" 23	37	12 "	
" 23	133	4 "	
" 27	238	18 "	

Date	No. of Box	Time Under Pressure
Nov. 28	74	14 min.
Dec. 9	151	5 "
" 10	29	22 "
" 13	146	41 "
" 16	84	40 "
" 16	72	19 "
" 17	136	15 "
" 19	163	35 "
" 20	13	10 "
" 24	436	8 "
" 24	3	6 "
" 27	54	12 "
" 27	71	17 "
" 27	126	4 "
" 30	23	16 "
" 30	164	7 "
" 31	41	5 "
1911		
Jan. 3	165	7 "
" 4	8	3 hrs. 18 "
" 4	8	11 "
" 5	17	12 "
" 5	7	36 "
" 5	83	31 "
" 8	147	10 "
" 10	164	5 "
" 13	328	10 "
		16 hrs. 05 min.
Deduct 4 x 55 = 220 min		3 " 40 "
		12 hrs. 25 min.

APPENDIX IX

Daily Record of Bacteriological Analyses of the Water From Laboratory Tap, From February 7 to March 18, 1911

Date When Sample was Taken	Result of Analyses	Remarks as to Hypochlorite Treatment
February 7	Negative. No. B. Colon found in 10 c.c.	Water treated with chloride of calcium beginning Jan. 31st. Dose: 18 lbs. per million gallons.
8	Negative. No. B. Colon found in 10 c.c.	
9	Negative. No. B. Colon found in 20 c.c.	
10	Slight contamination. B. Colon found in 50 c.c.	
11	Slight contamination. B. Colon found in 50 c.c.	
12	Contamination increased. B. Colon found in 10 c.c.	
13	Contamination continued B. Colon found in 20 c.c.	
14	Contamination continued B. Colon found in 50 c.c.	Result noted on the 14th, and in consequence the dose of chloride of calcium was increased 25 per cent. on the same date (i.e., 22½ lbs. per million gallons).
15	Contamination continued B. Colon found in 50 c.c.	
16	Negative. No B. Colon found in 50 c.c.	
17	Contamination noted. B. Colon found in 50 c.c.	
18	Contamination increased. B. Colon found in 20 c.c.	
19	Contamination. B. Colon found in 20 c.c.	
20	Contamination increased. B. Colon found in 10 c.c.	
21	Contamination decreased. B. Colon found in 20 c.c.	

Date When Sample was Taken	Result of Analyses	Remarks as to Hypochlorite Treatment
February 22	Negative. No. B. Colon found in 50 c.c.	30 lbs. per million gallons.
23	Negative. No. B. Colon in 50 c.c.	
24	Negative. No. B. Colon in 50 c.c.	
25	Negative. No. B. Colon in 50 c.c.	
26	Negative. No. B. Colon in 50 c.c.	
27	Negative. No. B. Colon in 50 c.c.	
28	Negative. No. B. Colon in 50 c.c.	
March 1	Negative. No. B. Colon in 50 c.c.	
2	Negative. No. B. Colon in 50 c.c.	Increased to 50 lbs. per millions gallons.
3	Negative. No. B. Colon in 50 c.c.	
4	Negative. No. B. Colon in 50 c.c.	
5	Negative. No. B. Colon in 50 c.c.	
6	Negative. No. B. Colon in 50 c.c.	
7	Negative. No. B. Colon in 50 c.c.	
8	Negative. No. B. Colon in 50 c.c.	
9	Negative. No. B. Colon in 50 c.c.	
10	Negative. No. B. Colon in 50 c.c.	
11	Negative. No. B. Colon in 50 c.c.	
12	Negative. No. B. Colon in 50 c.c.	

Date When Sample was Taken	Result of Analyses	Remarks as to Hypochlorite Treatment
March 13	Negative. No. B. Colon in 50 c.c.	Increased to 58 lbs. per million gallons by operation of sterilization plant at main pumping house.
14	Negative. No. B. Colon in 50 c.c.	
15	Negative. No. B. Colon in 50 c.c.	
16	Negative. No. B. Colon in 50 c.c.	
17	Negative. No. B. Colon in 50 c.c.	
18	Negative. No. B. Colon in 50 c.c.	

APPENDIX X—LETTER TO THE MAYOR *re* CLOSING EMERGENCY VALVE

Ottawa, April 4th, 1911.

Dear Sir:

Without wishing to anticipate my report on the outbreak of typhoid fever, I desire to point out the necessity for continued precaution in reference to the emergency valve at Pier No. 1, and would recommend, in the interest of public health, that this valve should not be opened on any account whatsoever.

Believe me,

Yours truly,

(Signed) Chas. A. Hodgetts,
Medical Adviser.

Charles Hopewell, Esq.,
Mayor, City of Ottawa,
Ottawa, Ont.

APPENDIX XI—FORM OF INSPECTOR'S REPORT USED IN INVESTIGATING TYPHOID FEVER CASES

COMMISSION OF CONSERVATION

Report on Typhoid Fever Cases

Case No.....When reported.....Date of enquiry.....
Name.....Residence.....
Age.....Sex.....Nationality.....Married or single.....
Probable date of onset.....Date of definite symptoms.....
Place of residence when taken ill.....
Name and address of physician.....
State whether treated at home or hospital.....
If latter, name of hospital.....
How long resident in Ottawa.....Temporary absence from Ottawa within 30 days.....from.....to.....
State whether private house, boarding house, tenement or apartment house.....
Number of occupants in house, excluding servants.....
Ages of occupants.....
Number of occupants who have had typhoid fever.....When?.....
New residents in house within three months.....
New residents in house having had typhoid.....
Number of servants, if any.....Have any had typhoid?.....No.....
Give date of attack.....
House plumbing.....
Water closet in house.....Privy in yard..... Condition.....
Location.....
General sanitary condition of premises.....
State place and character of occupation.....
Were there any other cases in place of occupation?.....
Is so, state particulars.....
State source of water supply during last 30 days.....
If water was used from any other source give particulars.....
If food was taken at any other place than residence during 30 days preceding illness, state when and where.....
Source of milk supply.....
Name and address of vendor.....
State whether used raw or boiled.....
Ice cream: from whom purchased?.....Date of use.....
Were uncooked fruits and vegetables used? If so, state particulars.....
Were shell-fish used? If so, state particulars.....
Remarks.....
Association within 30 days with patients or suspected cases.....
Association within 30 days with persons suffering from or having recently had the disease.....
Association with persons who have had typhoid within 6 months, 1 year, etc.....
Were stools treated? If so, how?.....
Was urine treated? If so, how?.....
State general precautions observed.....