

son for this. This applies not only to Toronto, but to the many cities, towns and municipalities in the vicinity which are daily discharging enormous quantities of sewage into the lake. With the exception of the city of Toronto, little attempt is being made to treat the effluents so as to render them innocuous. As far back as 1912 (city engineer's report) it was clearly shown that the water of Lake Ontario was polluted by currents some seven miles out from the intakes. When these conditions are taken into consideration, together with the various pollutions arising from marine traffic, dredging operations, spring freshets and the frequent pollution following summer storm floods, it will be seen that the contributory causes are numerous. Probably there are no cities on the great lakes where the pollution of the raw water in the immediate vicinity is not yearly increasing, regardless of the steps taken to prevent the discharge of putrescible matter into the rivers or lakes involved, those responsible for the purification of water supplies depending upon filtration for clarification and chlorine for final sterilization.

While the occurrence of pollution in the raw water is yearly increasing, the degree of pollution is intensifying. As has been the case for several years past, the most serious pollution occurred in the summer and fall months. On forty-seven days the raw water contained the colon bacillus in 1/10th part of one cubic centimetre, on twelve occasions in 1/100th part, and on two occasions in 1/1000th part of one cubic centimetre. Assuming that crude sewage contains at

previously mentioned as occurring in the raw water, and show that the actual results achieved by filtration alone would almost have rendered the water fit for consumption without final sterilization, but it must be remembered that a water that is initially polluted with matter of excremental origin can never be filtered so efficiently as to render it innocuous. For instance, if a water before filtration contained 5,000 bacteria per cubic centimetre and filtration removed 99.5%, there would still be twenty-five remaining, some of which might belong to the pathogenic group, which, if of a virulent nature, might be capable of causing a serious

TABLE H.—FILTER OPERATION

Average Rate of Filtration for the Year.—3.27 million Imperial gallons per acre per day.
Total Amount of Water Filtered.—11,470 million Imperial gallons.
Maximum and Minimum Amount of Water Filtered in 24 hours.—Maximum, 40.04; minimum, 18.58 million Imperial gallons.
Average Amount of Water Filtered Daily.—31.42 million Imperial gallons.
Number of Filters Raked or Cleaned.—181.
Filter runs, length of runs in days completed during each month, showing maximum, minimum and average figures, and yield per run in million Imperial gallons per acre.

Month	Maximum	Minimum	Average	Yield Per Run Per Acre
January	42	1	20.7	75.368
February	50	7	26.5	99.96
March	46	8	30.0	116.20
April	35	13	20.9	77.56
May	38	8	28.2	106.55
June	33	3	21.2	78.36
July	24	5	17.1	56.91
August	30	7	18.1	68.67
September	25	3	19.1	70.42
October	35	15	25.1	86.86
November	32	13	23.2	73.37
December	39	2	19.4	65.04

TABLE G

Average Monthly Chemical Figures: Results Expressed in Parts Per Million Raw Water

Month	Free Ammoniacal Nitrogen	Albuminoid Nitrogen	Total Nitrogen	Nitrates	Chlorides	Oxygen Consumed 4 hours at 80° F.	Oxygen Dissolved	Alkalinity as CaCO ₃
Jan.	.009	.073	.082	....	9.64	.45	....	....
Feb.	.005	.074	.079	....	9.63	.44	13.21	93.35
Mar.	.020	.082	.102	....	....	....	13.49	92.20
Apr.	.018	.084	.102	....	....	....	13.46	94.05
May	.013	.079	.092	....	....	....	13.23	95.80
June	.007	.073	.080	.069	10.17	.49	12.92	94.15
July	.003	.077	.080	....	10.10	.56	12.97	94.25
Aug.	.007	....	....	.065	....	....	11.41	95.20
Sept.	.008	....	....	.020	10.05	.66	11.35	93.70
Oct.	.021	.069	.090	.093	10.04	.54	11.67	94.88
Nov.	.007	.051	.058	.040	9.57	.45	11.39	94.30
Dec.	.036	.037	.063	.013	....	....	12.16	94.80
Average	.013	.070	.083	.050	9.89	.51	12.48	94.24

Month	Free Ammoniacal Nitrogen	Albuminoid Nitrogen	Total Nitrogen	Nitrates	Chlorides	Oxygen Consumed 4 hours at 80° F.	Oxygen Dissolved	Alkalinity as CaCO ₃
Jan.	.001	.048	.049	....	9.6	.29	....	....
Feb.	.001	.051	.052	....	9.6	.30	12.80	93.25
Mar.	.001	.051	.052	....	....	....	....	91.92
Apr.	.001	.049	.050	....	....	....	....	94.00
May	.001	.048	.049	....	....	....	....	....
June	.001	.038	.039	.109	10.17	.29	....	94.55
July	.001	....	....	.083	10.10	.41	....	95.28
Aug.	.001	....	....	.080	....	....	....	95.05
Sept.	.001	....	....	.070	10.00	.43	10.10	....
Oct.	.001	.032	.033	.098	10.04	.32	10.38	96.74
Nov.	.001	.027	.028	.078	9.55	.31	10.16	95.44
Dec.	.001	.023	.024	.040	....	....	11.63	93.50
Average	.001	.041	.042	.080	9.87	.34	11.01	94.41

Per Cent. Purification Figures

Ammoniacal Nitrogen	Reduction
Free	90.6%
Albuminoid	41.9%
Total	49.4%
Oxygen consumed	34.4%
Nitrates	59.2%
Chlorides and Alkalinity	showed little change.

least 100,000 B. Coli per c.c. the last two figures showed the raw water to contain a pollution equivalent to 1,000 and 10,000 parts of sewage, respectively, to each million gallons of water.

Final Sterilization Always Necessary

The daily examination showed the raw water to be subject to a continuous and increasing degree of pollution, which condition was almost entirely controlled by the meteorological conditions prevailing at the time. From this it would seem desirable that early action should be taken to treat sewage that is being discharged into the lake, so that the effluents are rendered innocuous. The remarkable figures obtained by filtration reduced very materially the degree of pollution

epidemic. The necessity of final sterilization then becomes apparent. Throughout the year the figures obtained by filtration showed splendid efficiencies equalled by few plants on the American continent. At present Toronto is fortunate in having a water supply that is both filtered and chlorinated. The excellent system of chlorination is directed by Col. Geo. G. Nasmith, Director of Civic Laboratories, and consequently the water as finally delivered to the consumers is splendid, being clear, bright and of high bacterial quality.

The name of the firm of Brennan and Hollingworth, contractors, Hamilton, Ont., has been changed to the W. C. Brennan Contracting Co.

A good roads association has been organized at Chilliwack, B.C. Following are the officers: Hon. presidents, F. B. Stacey, M.P., Hon. E. D. Barrow, M.L.A., Mayor Ashwell and Reeve Evans; president, W. L. Mackin; vice-president, E. H. Barton; secretary, W. R. Theal; treasurer, G. O. Nesbitt.

The New England Water Works Association will hold its annual convention September 30th to October 3rd, inclusive, in Albany, N.Y. The preliminary program, which will be published in full next week, includes a paper by Norman J. Howard, of Toronto, on the "Operation of and Purification Effected by the New Drifting Sand Filter System at Toronto." The president of the association is S. E. Killam, superintendent of pipe lines and reservoirs of the Boston, Mass., Water Works. The secretary is Williard Kent, civil engineer, Narragansett Pier, R.I.

The Greater Winnipeg Water Board has decided to wait until next spring before proceeding with the work of under-drainage for a section of the Shoal Lake aqueduct. It is estimated that this work will cost \$330,000. It is necessitated by the alkali waters in the soil surrounding one section of the aqueduct. The proposed pipe line to Transcona will likely be built this fall, the councils of all the municipalities interested having tentatively agreed upon the extension. It is likely that the price of 2c. per 1,000 gals., which is now being charged, will be reduced to 1¼c., as the Board has recommended this reduction, claiming that it has found that the water can be sold without loss at the lower rate. All the municipalities interested have not yet agreed to the reduction, so it is being held in abeyance for the time being.