

LINDSAY FILTRATION PLANT.

Several months ago the town of Lindsay, Ont., made a contract with Mr. J. Howard Bridge for an ozonization plant. The building and apparatus have been completed, and Dr. T. D. Archibald, of Toronto, made tests, and upon his report the municipality accepted the plant.

Dr. Archibald's letter of transmission is given with his report, as they must be read together before one can obtain a true idea of the conditions attending the test and the value of the conclusions arrived at.

University of Toronto,
Pathological Department,
Toronto, Canada, July 11th, 1909.

My dear Mr. Ray,—

I enclose the following report which seems to prove, as you will see by the figures, that the plant is entirely satisfactory under ordinary conditions. Should there be anything which you do not understand, or any point on which you wish further information, I would be very pleased to have you let me know as soon as possible, when I will endeavor to give you further light on the matter.

Although outside of the scope of my examination, I should think that attention should be paid to the electric current which is available for the running of the pump and the ozonizing of the water, that is to say that sufficient electricity should be furnished and the amount of current and pressure should be constant. However, that question is one with which an engineer should deal.

I handed over the specimen of water which you gave me to the Board of Health.

Yours truly,

T. D. Archibald.

July 10th, 1909.

The Board of Water Commissioners, Lindsay, Ontario.

Sirs,—I beg to submit the following report on the analysis made by me as to the efficiency of the plant installed in your town by Mr. J. Howard Bridge for removing bacteria from the raw water supplied by the river.

In all, eleven tests were made under varying conditions, and the results of these are seen in the attached table. The conditions under which the water was obtained and any extraordinary circumstances that arose during the tests are likewise noted. It is rather unfortunate that, at the time these tests were made the raw river water should have been so pure from a bacteriological standpoint as it is hardly a fair criterion from which to judge of the efficiency of the plant. There is one instance, however, test No. 10 which seems to prove most definitely that the ozonization of the water has a very marked destructive power on the bacteria present.

No. of tests.	Number of Colonies.					
	Ozonized water.		Filtered water.		Raw water.	
	I C.C.	I-10 C.C.	I C.C.	I-10 C.C.	I C.C.	I-10 C.C.
1	18	1	46	4	97	9
2	21	0	22	4	102	14
3	27	3	113	5	400	34
4	4	0	14	2	34	2
5	229	22	42	8	70	5
6	2	1	19	1	63	6
7	7	0	15	2	42	5
8	18	4	31	3	1,200	128
9	48	5	212	12	15
10	12	2	567	33	1,500	38
11	27	1	48	6	193	11

Examination for pathogenic bacteria.

Raw watercolon bacilli present.
Filtered watercolon bacilli present.
Ozonized watercolon bacilli absent.

All the plate cultures were made under the same conditions, the temperature of the medium being 46° C., and a beef

broth agar, 15 acid to phenolphthalein being used.

Conditions under which the water was obtained:—

In all cases the ozonized water was taken where it makes its entrance into the tank.

The filtered water was drawn from the receptacle into which the filters drain.

The raw water was taken from different sources as follows:—

In tests 1, 2 and 3 from the edge of the river.

Test 4 from the square filter.

Test 5 from the round filter.

Test 6 from the square filter.

Test 7 and 8 from the square filter.

Test 9 and 10 from the round filter.

Test 11 from the square filter.

All the tests, except No. 5, show diminution in the number of bacteria, from the raw water to the filtered water, and from the filtered water to the ozonized water. In test No. 5 a very peculiar condition arises, as is seen by the number of colonies on the plates. There is a diminution from 70 colonies in the raw water to 42 colonies in the filtered water. In the ozonized water, however, there was an increase to 229 colonies. The only explanation that occurs to me for this deviation from the results of all the other tests is; that a few minutes prior to the taking of the sample of ozonized water, a fire broke out in the town and a telephone message was sent to the pump-house for immediate increased pressure. The electric pump was run at its maximum speed thus causing a rapid lowering of the water in the chamber containing the ozonized water; from that a rapid lowering of the level of the filtered water, with the result that the raw water would gravitate with unusual rapidity through the filter beds, and draw with it large numbers of bacteria which had been caught in the beds. The fact that the number of bacteria was lower in the filtered water than in the raw water, and that there was a large increase in the ozonized water, might be explained by the filtered water having been drawn from the surface water which was contained in the chamber, while the increased suction caused by the high pressure pumping would draw the fresh filtered water directly towards the pipes where it mixes with the ozone and passes into the chamber containing the ozonized water;—and the ozone failing to do its work thoroughly.

In case of test No. 8 the water in the square filter was very turbid, having been disturbed from some cause which I was unable to ascertain.

Test No. 10 was made 40 minutes after washing the filter beds, the plant having been run at usual speed during this period. The raw water contained, roughly, 1,500 colonies, the filtered water 567, while the ozonized contained only 12. In the case of this test sufficient time had elapsed for the raw water to have found its way into the filters, from the filters through the ozonizing plant before the samples were taken. This test seems to prove definitely the efficiency of the ozonization of the water as having the desired effect of destroying bacteria, even when present in large numbers, provided that the plant is working under ordinary conditions.

The analysis was made at a time when the raw river water was least liable to contain many or harmful bacteria because there had been a long period drought, and consequently no liability to contamination by surface washings, from soil, manure heaps or sewage, a condition which must inevitably occur in the spring and autumn during freshets and heavy rains. The examination would be most satisfactory had the raw water been at its worst instead of its best. From the tests made, however, one should draw the following conclusions:—

1. The plant when working under ordinary conditions furnishes a water perfectly safe for drinking purposes from a sanitary and public health standpoint as it contained very few bacteria. (The maximum number being 48 and the minimum 2 per c.c.)