A MODERN SEWAGE DISPOSAL PLANT

IN NEWTON, N. J.

—BY—

CLYDE POTTS, C. E.

Williams, Proctor & Potts, New York

Printed from New Jersey Herald, November 26th, 1908

A Typical Pipe Line of a Water Carriage Sewer System.—Sewer on Linwood Avenue.

A MODERN SEWAGE DISPOSAL PLANT IN NEWTON.

A sewage system that is working properly receives little more thought from the average citizen than does his alimentary canal. This is as it should be for cesspools, the predecessor of the modern system of pipe sewers make their presence painfully known at stated intervals when it becomes necessary to empty them. The great argument for the water carriage system of sewers, such as is in use at Newton, is one of convenience. The householder takes no thought of wastes after they are emptied in sink or closet. Where they go or what becomes of them is no longer of concern to him. They cease to annoy or to endanger his health, and as an average citizen they do not interest him. The problem of disposing of the sink and closet wastes after they enter the sewers in the streets, however, is still a live one. Its solution is with the municipal authorities ; in disposing of sewage the municipal authorities are limited by law. They cannot empty the wastes after collection into any of the waters of the State of New Jersey for the Legislature has declared it unlawful. It is unlawful because it is a form of water poisoning.

Sewage carries with it intestinal bacteria. These are small micro organisms that inhabit the intestines of human beings. Some species of these bacteria or micro organisms have the power to produce disease such as typhoid and dysentery and when they enter the systems of other persons with the drinking water they do produde these diseases. Hence the Legislature has in effect declared that polluted waters are poisoned waters because they produce disease and death.

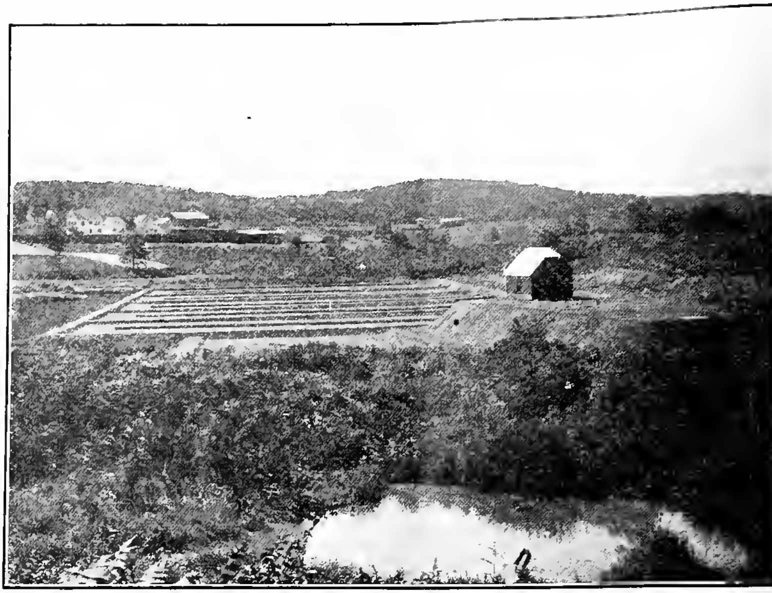
Type of Plant in Newton.

When it was decided by a vote of the people of Newton in July, 1905, to build a modern water carriage system of pipe sewers to supplement the excellent system of water supply the former committee, then composed of Senator L. J. Martin, George N. Harris and John N. Calvin, employed the firm of which the writer is a member to design the system and to also recommend a proper system or method of disposing of the sewage when collected.

That recommendation was to the effect that the sewage be first settled and then filtered at two disposal plants. One plant to be located just off Sparta avenue below the shoe factory, and another just off Clinton street at the foot of Townsend street. The plants are alike except that the Clinton street plant is about double the size of the Sparta avenue plant. The description given hereafter applies to the Clinton street plant. Carrying out that recommendation a contract was made with Messrs. Hinman & Sproul in September, 1905, to build settling tanks of 150,000 gallons capacity and 2 acres of filters. These were completed in November, 1906. The tanks were immediately put in operation and the filters in the following spring.

Settling Tanks.

The settling tanks are of reinforced concrete 80 feet long, 40 feet wide,



View of the Completed Sparta Avenue Plant.

6½ feet deep, and divided into two compartments, so that one portion may be emptied while settling is still taking place in the other.

The settling tanks are arranged to be emptied and drained on to a small filter where the liquid and solid matter may be separated by straining.

Adjacent to the settling tank is another tank into which the sewage from the settling tank continually overflows. The province of this tank is to store the sewage after it has been settled. It is so designed that the sewage may be held in storage for any length of time. When the given amount of sewage has been accumulated, a float in one corner of the tank opens a valve and allows the stored sewage to escape with a rush into one of the five filter beds The mechanism * of which the float and valve form a part is so constructed as to automatically apply the sewage to each of the five filters in rotation.

Filter Beds.

The Filter Beds are constructed on the edge of what was formerly meadow lands. Sufficient earth was removed to construct dykes, thus forming 5 basins. The bottoms of these basins are covered with tile underdrains surrounded by gravel 6 inches in depth. This gravel is covered with a layer of sand 3 feet deep—this sand was all screened and carted from a sand bank about one-quarter of a mile east of the silk mill. In all about 10,000 yards of sand were employed in the construction of the two acres of filters.

Each bed has an area of about two-fifths of an acre. The settled sewage from the dosing tank runs through a 12 inch vitrified pipe from the tank to the bed and runs out on to the surface of the beds through a wooden trough with a concrete bottom. The settled sewage then percolates downward through the sand and is collected in the tile drains. These drains lead di-

Showing the Settling Tanks During Construction.

Showing the Interior of Completed Tanks.

rectly into Paulins Kill where the filtered sewage may be seen as it leaves them.

The appearance of this filtered sewage as it enters the creek at the present time is not unlike the tap water used in Newton, and has no more odor. It is clear, sparkling and odorless. The analysis of the State Sewerage Commission for the year 1907, as given in their annual report, page 56, shows that this filtered sewage contains but 20,000 bacteria per cubic centimeter for 3 of the beds and 10,000 for the other 2 beds. The analysis also showed that a like amount of water from Paulins Kill contained 85,000 bacteria or from 4½ to 8½ times as many as the filtered sewage. On a basis of bacterial efficiency the filters give a reduction of 94 to 97 per cent.

* Ansonia Simplex Distributor manufactured by Ansonia M'f'g Co., 355 W. 26th St., New York.

Operation of Plant.

The successful operation of a sewage disposal plant depends upon the skill and industry of the operator or attendant, and Newton is particularly fortunate in having in Mr. M. E. Smith an attendant in whom is combined these two qualities.

The best of sewage disposal plants may not give good results unless properly managed. The plant at Newton gives excellent results for two reasons:

1st. It is based on tried principles in the art of sewage disposal.

2nd. It is properly maintained.

At the present time 200,000 gallons of sewage per day is filtered at the Clinton street plant.

Before filtering, this sewage passes through settling tanks, as above stated, and is applied to the beds in doses of about 20,000 gallons to each of the filters in rotation. This gives each filter a trifle over two applications a day.

The art or science of filtering dirty and polluted waters is ages old. The art or science of removing sediment in dirty or polluted waters, in settling tanks before applying the same to filters is also old. At the present time in art or science of sewage disposal, the only method that will give the highest degree of purification attainable is sand filtration. The future will probably bring forth other methods equally good but none are now at hand. Settling the sewage before applying it to sand filters makes for economy. Settled sewage requires less acreage of sand filters than does raw sewage. The maintainence is also less expensive and a plant with settling tanks is less objectionable than one where raw sewage is applied directly to the filters.

The United States Circuit Court in the State of New York recently handed down a decision that was of great importance to those localities where the sewage is settled before filtration. It is important because a settling tank may be a septic tank on which the court declared the patent to be valid. It would seem, on reading the opinion of the Court that Mr. Cameron, the patentee, was the first to realize that a species of micro-organisms may thrive and grow in old fashioned settling tanks. They feed on the organic matter in the fresh incoming sewage and have completely changed its composition before it escapes through the overflow. It seems that these bacteria requires the organic matter in the sewage for their food and having taken it for that purpose they relieve the sewage of some of its objectionable features. Their own exhalations, being mainly liquids and gases, are not particularly objectionable to the human senses.

Whatever the contention of the Cameron Co., or whatever the decision of the Circuit Court, it is a matter of common knowledge among sanitary engineers that the reduction of waste organic matters, among them sewage, is a bacterial process. It is a process involving chemical and bacterial changes and is continually in operation on all sides of us. Its operation in a sewage disposal plant is merely one of artifical control. Whether the settling tanks at Newton are operated as septic tanks within the meaning of the Cameron patents and the decision of the Circuit Court could only be determined by careful analysis of the sewage before and after its passage through the tanks. It is perfectly possible to operate them in such a manner as not to interfere with the above patents. Whether or not it is desirable to so operate them is entirely a matter of dollars and cents.

CHEMICAL ANALYSIS OF NEWTON SEWAGE

From Report of State Sewerage Commission for 1907, pages 41 and 42.

	Raw Sewage.	Tank Effluent.	Filters 1 and 2.	Filters 3, 4 and 5.
Turbidity	65	60	2	2
Sediment	20	15	0	0
Total Solids	385	356	430 *	423 *
Volatile Solids	133	100	80	73
Total Suspended Solids	13	1	0	0
Per cent. removed			100	100
Volatile Suspended Solids	10		0	0
Nitrogen As Free Ammonia	7.2	7.0	0.1	0.1
Total Organic Nitrogen	12.0	8.0	0.44	0.75
Per cent. removed		33.0	96.0	94.0
Nitrogen as Dissolved Organic	11.0	7 5	0.0	0.0
" " Suspended Organic	1.0	0.5	0.0	0.0
" " Nitrates	1.2	0.0	5.1	5.1
Total Oxygen consumed	25.0	16 5	2.4	2.2
Per cent. removed		34	94	95
Dissolved Oxygen consumed	21	16	2.4	2.2
Suspended Oxygen consumed	4.0	0.5	0.0	0.0
Chlorine	70	70	65	65
Oxygen dissolved	3.7	1.0	9.6	9.6
Per cent. of Saturation	36.0	9.7	94 0	95.0
Temperature Degrees F.	58	57	54	55
Putrescibility (Days)	1.1	0.29	14+	14+

* This increase in total solids is due no doubt to lime taken up from the filters. The sand in the filters contains from 5 to 10 per cent.