

There were 151 runs or cleanings during the year; 142 of these runs were on filters cleaned by the Brooklyn method and nine by the other methods. The average length of runs was 40.18 days, the amount filtered between runs being 94,146,000 gals., or 125,194,000 gals. per acre. While the length of runs and quantity filtered with the Brooklyn method was not so large as with the usual method, it proved economical on account of the short time it was necessary to have the bed out of service, the low labor cost of cleaning and the saving in not having to replace the sand.

Seventeen filters were operated for the entire year by the Brooklyn method. The items of cost, etc., in the process of cleaning were as follows.

| | |
|--|--------|
| Number of runs | 142. |
| Average length of runs, days | 40.4 |
| Average m. g. filtered per run | 94.53 |
| Average m. g. filtered per acre per run | 125.71 |
| Average cost of water to wash per m. g. filtered.... | 0.05 |
| Average cost of labor to wash and spade per m. g. filtered | 0.55 |
| Total cost of washing and spading sand in place (water and labor) per m. g. filtered | 0.60 |
| Average gallons water used to wash sand in place per m. g. filtered | 4.109 |

One filter was operated during the year by the "Nichols Separators" method.

| | |
|--|--------|
| Number of runs | 9. |
| Average length of runs, days | 37.38 |
| Average m. g. filtered per run | 88.02 |
| Average m. g. filtered per acre per run..... | 117.05 |
| Average cost of labor, scraping, raking and spading per m. g. | 0.262 |
| Average cost of labor washing per m. g. filtered.... | 0.266 |
| Average cost of water per m. g. filtered..... | 0.02 |
| Average cost per m. g. labor, spading, scraping, washing, water, etc. | 0.55 |
| Average gallons of water used to wash per m. g. filtered | 1.336 |
| Depth of sand scraped per run, inches..... | 1.42 |
| Cu. yds. sand scraped per m. g. filtered..... | 1.590 |
| Daily average turbidity of applied water..... | 14.0 |
| Daily average bacteria in applied water..... | 21.630 |

Comparing the effluent from the Belmont filters with the applied water, the reductions were as follows:

| | Per cent. |
|------------------------------------|-----------|
| Average reduction, turbidity | 99.34 |
| Average reduction, bacteria | 99.19 |

Comparing the effluent from the plain sand filters and the water from the Schuylkill River, the reductions were as follows:

| | Per cent. |
|------------------------------------|-----------|
| Average reduction, turbidity | 99.74 |
| Average reduction, bacteria | 99.66 |

A Blaisdell Filter Washing Machine installed in 1909 for cleaning the preliminary filters has been in operation for the entire year, and has been of great benefit to the filters.

Torresdale Filters.—The Torresdale Filter Station consists of 65 0.75 acre covered beds, a covered clear water basin, preliminary filter plant consisting of 120 concrete tanks, approximately 60 x 20 ft. each, containing 1,140 sq. ft. of filtering surface, with a capacity of 240,000,000 gals. of water per 24 hours; a low lift pumping station, containing eight 40,000,000 gal. centrifugal pumps; three 150 kw. generators and four sand washing pumps, with full complement of boilers, economizers, mechanical stokers, etc.

The amount of water filtered during the year was equivalent to an average rate of 4,270,000 gals. per acre per day. The entire cost of operation, not including the expenses of the low lift pumping station, or the cost of the wash water, which are included in the expenses of the pumping station, and which amounted to \$2.17 per 1,000,000 gals. of water filtered, was \$1.66 per 1,000,000 gals. of water filtered, making the total expense of pumping the water from the river and filtering it, \$3.83 per 1,000,000 gals. filtered, a reduction of 16 cts. over 1910. Of this amount 28 cts. was for operating the preliminary filters, and 16.8 cts. the cost of the laboratory. The filters are operated at rates approximating 6,000,000 gals. per day per acre.

The number of runs or cleanings was less than ten per filter per year, and the average length between cleanings was 35.33 days.

The standard method of cleaning adopted for 1911 was washing the sand in the filters by ejectors and Nichols Separators, the cost of which was as follows:

| | |
|--|--------|
| Number of cleanings by Nichols method..... | 613. |
| Average lengths of runs, days | 35.31 |
| Average m. g. filtered per run | 121.21 |
| Average m. g. filtered per acre per run..... | 161.61 |
| Cost of water to wash per m. g..... | 0.01 |
| Cost to rake, scrape and wash per m. g., labor.... | 0.62 |
| Total cost to clean | 0.63 |
| Average gallons water used to wash per m. g..... | 1.924. |
| Cubic yards scraped per m. g. filtered | 1.62 |
| Average turbidity of applied water | 5. |
| Average bacteria in applied water | 2,610. |

The resanding was done during the year by Bureau labor, using Nichols Separators. There were replaced 11,017 cu. yds. in filters, at a cost of 30.6 cts. per cu. yd.

Comparing the effluent from the Torresdale final filters with the water taken from the Delaware River, the reductions were as follows:

| | Per cent. |
|------------------------------------|-----------|
| Average reduction, turbidity | 99.58 |
| Average reduction, bacteria | 99.67 |

The Torresdale preliminary filters were placed in service on January 21, 1909, and since this date all water filtered by the sand filters has passed through these filters. They normally filter at the rate of 80,000,000 gals. per acre per day, but have given satisfactory results from rates of 100,000,000 gals. per acre per day. The daily average reductions in turbidity and bacteria for the year were 66.98 and 65.45 per cent. respectively. The average turbidity of the applied water to the pre-filters was 16 and the maximum 97. The per cent. of wash water used for the year averaged 0.57 per cent. of the amount filtered. The number of cleanings for the pre-filters was an average of 190 cleanings to each filter, or about 1.9 days between cleanings for the year.

GRAND TRUNK AND NEW HAVEN RAILWAYS.

In connection with the proposed traffic agreement between the Grand Trunk and the New York, New Haven & Hartford, it is stated that the final settlement of the points at issue is remote. The agreement is still in the hands of Mr. E. J. Chamberlin, president of the Grand Trunk, and his officials, and any changes which they may consider necessary will have to be submitted to the directors of the New Haven and approved by them. When all interested parties in Montreal and New York are in accord, the agreement must then be sent to London for ratification by the Grand Trunk board of directors. It is felt that all difficulties will be overcome in time since some kind of arrangement between the two roads is desirable for both.