## RESULT OF FILTRATION AT ALBANY.

The filtration plant at Albany, N.Y., which receives its supply from the Hudson River and comprises a sedimentation basin, 16 roughing filters and 8 slow sand filters, each having an area of 0.7 acres, purified during the year ending September 30, 1911, an average daily quantity of 21,506,490 gal. at a cost of $5.32 per million gallons, including a charge of $2.64 per million gallons for pumping. The latest annual report of Mr. H. J. Deutschbein, superintendent of the Bureau of Water, to Mr. Wallace Greenlach, commissioner of Public Works, contains the following data on the operating results during the year.

The raw water was remarkably uniform in its character during the year. The turbidity average 22 parts per million, the color 35 parts and the bacteria 37,166 per cubic centimeter. There were no especially heavy freshets; each reaching its maximum height gradually and subsiding slowly. The sharpest flood stage occurred from December 31 to January 21, when the water rose to El. 105 in 24 hours. The largest freshet extended from February 27 to May 23, the highest stage being reached on April 17 at El. 106.8. The turbidity was highest at this time, being 400 parts per million. Table 1 shows the efficiency of the system under extreme conditions:

**Table 1.—Operating Results During Largest Freshet, March 29.**

| | Suspended matter. | Turbidity. | Turbidity coefficient. | Suspended matter efficiency, per cent. | Turbidity efficiency, per cent. |
|---|---|---|---|---|---|
| River | 170 | 400 | 0.43 | .... | .... |
| Basin | 63 | 320 | 0.19 | 62.9 | 20.0 |
| Primary Eff. | 19 | 80 | 0.24 | 69.8 | 75.0 |
| Secondary Eff. | 0 | 0 | .... | 100.0 | 100.0 |

From table 1, it is seen that most of the matter in suspension was of a coarse nature, nearly 70 per cent. being taken out by the basin. The primary filters easily removed the remainder. The plant as a whole experienced no difficulty in handling this flood.

Owing to the uniform conditions the water was of a weaker nature than of past years. The average bacterial content per cubic centimeter being 37,000 against 44,000 of last year. The organic matter likewise was below normal. During the latter part of July and the early part of August, a heavy growth of sponge developed, which seeded up the basin and primary filters to such an extent that the spores were carried over onto the secondary filters and materially lessened their lengths of runs. The life cycle of this organism was short, however, and did not necessitate any remedial measures.

The basin was out of commission from November 1 through November 11 for cleaning. Since the last cleaning 16,514,600,000 gal. of water passed through the basin. This amount of water caused the deposition of 1,770 tons of silt, or approximately 0.11 ton per million gallons. Most of this silt subsided immediately upon entrance, the remainder settling out uniformly over the basin to an average depth of 3 inches.

Outside the overgrowth of sponge no trouble was experienced from aquatic organisms.

The bacteria efficiency was 23.3 per cent. against 17.0 per cent. of last year, while the turbidity efficiency was 34.6 per cent. against 37.5 per cent. last year.

**Primary Filters.**—The prevailing conditions of these filters throughout the year were about normal. The approximate average length of run was 35 hours. The amount of wash water used was 4.1 per cent. The average vertical rise was 1 foot, and the average duration of wash 10 minutes. Owing to the enormous amount of silt and organic matter passing onto these beds and owing to their high efficiency of 71.9 per cent., it was necessary to employ two supplemental washes during the year. At these times the entire sand layer down to the gravel was ejected and replaced by means of the Nichols separator. Before these beds were washed in this manner, the average initial loss of head at a 70,000,000-gallon rate was 2 feet. After washing, the initial loss of head was reduced to 0.8 feet.

Primary filter No. 9 is supplied with a uniform quartz sand whose effective size is 0.65 mm. All the other beds have a uniform sand of effective size of 0.45 mm. Table shows a comparison between primary No. 9, with a coarse sand, and primary No. 12, with a fine sand, before and after the supplemental wash:

**Table 2.—Washing Coarse and Fine Sands.**

Primary Filter No. 12 (Fine Sand).

| | Before Wash. | | | After Wash. | | |
|---|---|---|---|---|---|---|
| Section. | Turb. | Org-N. | Ox-con. | Turb. | Org-N. | Ox-con. |
| 0-10 in. | 4000 | 2.04 | 43.8 | 1200 | 0.97 | 25.5 |
| 10-30 in. | 3500 | 2.44 | 35.6 | 1500 | 1.45 | 26.4 |

Primary Filter No. 9 (Coarse Sand).

| | Before Wash. | | | After Wash. | | |
|---|---|---|---|---|---|---|
| Section. | Turb. | Org-N. | Ox-con. | Turb. | Org-N. | Ox-con. |
| 0-10 in. | 3200 | 1.45 | 40.0 | 950 | 0.13 | 11.6 |
| 10-30 in. | 2000 | 1.20 | 21.6 | 1000 | 0.18 | 12.5 |

Note.—Organic nitrogen and oxygen consumed determinations are expressed in parts per 10,000 dry sand.

From the above table it is clearly shown that the normal upward flow wash is much more effective with a coarse sand, and that the efficiency of the supplemental ejection is far greater.

**Table 3.—Sand Before and After Washing.**

| | Turbidity. | Organic Nitrogen Pts. per 10,000 | Required Oxygen Pts. per 10,000 |
|---|---|---|---|
| Secondary No. 7. | | | |
| Top 10 in. before wash | 2000 | 2.00 | 17.5 |
| Top 10 in. after wash | 650 | 0.15 | 4.2 |
| 10 in.-20 in. after wash | 850 | 0.20 | 5.0 |
| 20 in.-30 in. after wash | 900 | 0.22 | 6.2 |
| Secondary No. 1. | | | |
| Top 10 in. before wash | 1800 | 2.15 | 15.4 |
| Top 10 in. after wash | 525 | 0.20 | 3.8 |
| 10 in.-20 in. after wash | 700 | 0.22 | 4.3 |
| 20 in.-30 in. after wash | 1000 | 0.48 | 8.1 |
| Secondary No. 6. | | | |
| Top 10 in. before wash | 2200 | 0.35 | 15.0 |
| Top 10 in. after wash | 700 | 0.17 | 3.2 |
| 10 in.-20 in. after wash | 750 | 0.21 | 4.7 |
| 20 in.-30 in. after wash | 900 | 0.38 | 5.1 |
| Secondary No. 4. | | | |
| Top 10 in. before wash | 2500 | 3.10 | 20.0 |
| Top 10 in. after wash | 600 | 0.20 | 5.0 |
| 10 in.-20 in. after wash | 650 | 0.25 | 5.8 |
| 20 in.-30 in. after wash | 900 | 0.25 | 6.0 |
| Secondary No. 8. | | | |
| Top 10 in. before wash | 1950 | 2.20 | 18.0 |
| Top 10 in. after wash | 650 | 0.28 | 5.5 |
| 10 in.-20 in. after wash | 800 | 0.32 | 5.6 |
| 20 in.-30 in. after wash | 950 | 0.40 | 6.4 |