

over sharp-crested weirs set in inlet openings. An automatic syphon in each of the dosing chambers discharges the sewage through cast-iron pipes to the filters; one syphon for each filter. The content of each dosing tank is 3,400 gallons, which volume is discharged in six minutes with no inflow. The basement beneath the head house permits inspection of tank bottoms, which are perfectly water tight.

From the dosers the sewage flows through two cast-iron mains to the filters, these mains being laid in a gallery between the filters.

Each filter is 160 ft. in length and 40 ft. in width. The floors of filters are of concrete, sloping down from the pipe gallery towards the outer walls. Troughs were formed in the concrete floor for drainage, 15 ins. apart c. to c., each covered with a half-round glazed tile. Over the drains, field stone 3 to 4 ins. diameter were hand laid to a depth of nine inches. The next layer consisted of two feet of crushed limestone 2 to 4 ins., then about 4 ft. of crushed stone 2 ins. to 1 in. The total depth of media varied from 6½ ft. to 7 ft.

The effluent from the subdrains flows to two longitudinal collecting channels that discharge into two manholes to the east of the head house.

After careful consideration we decided that fixed spraying nozzles would prove more satisfactory than revolving sprinklers or travelling distributors, owing to their simplicity. The nozzles are spaced ten feet apart in each direction. The transverse main distributors are of 6-in. cast iron pipe, and the branches of 3-in. galvanized pipe. The static head on nozzles varies from 65 ins. to 22 ins., and average discharge of each nozzle is about 9 gallons per minute. It is possible that a slight change in the form of sprayer or size of opening might result in a better distribution. There is no appreciable difference in the sprays at head house end of filters from those at the opposite end.

There are 64 sprayers on each filter, subdivided into groups of 16, each group controlled by gate valves, which permits any section being cut out for repairs, for renewals or for experimental purposes.

A 4-in. water main in the pipe gallery under city pressure provides a means of flushing out the subdrains and collecting drains, or washing down the walls, gallery floor, etc.

The gallery and head house are well lighted by windows and electric lights.

The head house and filter house are of monolithic concrete, with concrete roof supported by columns at 10-ft. centres. "Hyrib" steel reinforcing material was used in the roof. The heat from the sprayed sewage prevents freezing within the building and the capacity of the filters in the winter months will not therefore be seriously reduced. Where uncovered filters have been adopted in the northern part of the United States, east of the Pacific Slope, more than half the surface area of the filter may become a mass of ice which the spraying increases in thickness, and if a nozzle becomes clogged, freezing of pipes follows. It would be impossible to operate open percolating filters satisfactorily in this climate.

Humus Tanks

The effluent from the filters flows through a 24-in. main to a chamber, subdivided into four compartments,—one inlet, one overflow and two outlet compartments. Two outlets, each provided with gate valves, control the flow to the humus tanks. Each of these two tanks is circular in plan, 22½ ft. interior diameter, with vertical sides 12 ft. in height, and conical bottom, the total depth of liquid being 12¼ ft. The inlet pipe discharges upward, into a cylinder 36 ins. in diameter, 42 ins. in height, submerged 15 ins., which diverts the flow downwards, thence radially to the circumference where the liquid discharges over 20 steel plate weirs, very accurately set, into a concrete channel, thence through a chamber in pump house basement.

Each humus tank contains about 23,000 gallons, or 16,000 gallons of clear effluent and 36 cu. yds. of storage for sludge in the cone-sloped bottom.

The sludge which collects in these tanks is removed periodically by a small pump set in the basement of pump house, the pump being operated by an electric motor on

ground floor. The humus sludge is pumped into the main sludge pipe from the sedimentation tanks.

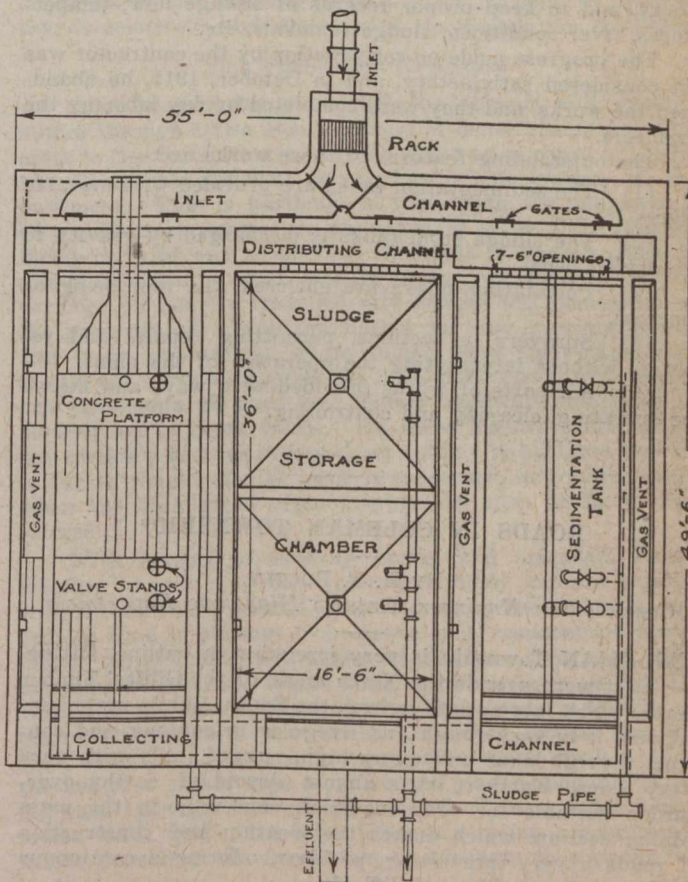
This sludge pump can also be used to flush out the main sludge pipe by pumping clarified sewage through it.

From the pump house basement the effluent flows through a 24-in. outfall, 240 ft. in length to the river.

Disinfection of the effluent may be demanded ultimately, in which case the chemical solution may be applied in the west chamber of pump house basement. Another small building will then be required for storing the chemicals for tanks and for necessary pipes and apparatus.

Sludge Beds

The sludge from the sedimentation tanks is conveyed by gravity through a 12-in. pipe, 1,487 ft. in length, to the



PLAN OF SEDIMENTATION TANKS

sludge beds, which were built at as great a distance as possible from Egerton Street.

The sludge from the two humus tanks is forced by pump through 80 ft. of 8 in. pipe into the 12 in. gravity pipe. If a stoppage should occur in this gravity line, either humus sludge or clarified sewage may be pumped into the main to remove it. The small capacity of this sludge pump, which is only 40 gallons per minute, has been adversely commented upon. It operates quite satisfactorily, however, and about 24 hours pumping in a month will remove the sludge from humus tanks.

The sludge beds are two in number, each 50 ft. x 65 ft. Upon the graded excavation, tile pipes with open joints were laid, these being covered with river shingle. Upon the shingle were laid 9 ins. of broken stone followed by 27 ins. of gravel. It is possible that additional beds will be required in the near future for sludge drying.

The dried sludge may be disposed of by filling low places on the site, but there is a probability that a large percentage will be sold or given to truck gardeners and another large percentage can be used on the sandy portions of the grounds around the tanks.

The normal low-water elevation of the river at the works is 57 above city datum, or 4 feet below the basement floor of