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Sandwashers of Drifting Sand Filters

Construction and Method of Operation — Overcoming Erosion of Metal Parts—Losses of Head in Typical Drifting Sand Filters—Detailed Observations — Two Further Difficulties Overcome — Performance of Sandwashers

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SUCCESSFUL application of the drifting sand filter system which has been established at Toronto and elsewhere depends upon the efficient working of continuously operated sandwashers. These sandwashers have something in common with the ejector sandwashers developed for use with slow sand filters, but differ to the extent that they form part of a closed hydraulic system, and are required to work with a minimum water pressure, with water practically unlimited in quantity. While water pressures of 120 lbs. per square inch are commonly adopted with slow sand ejector washers, these are called upon to work with pressures of 1/100th of that amount.

The system with a sandwasher applied to a single unit is illustrated in Fig. 1. The treated raw water enters the filter partly by a standpipe running through the centre of the unit, passing up through a separator or sandwasher in the bottom and delivering above the sand at the top of the pipe, and also partly through a by-pass. Within the sandwasher the raw-water pipe is made similar to that of the tube of a Venturi water meter, and the drifting sand, after being collected and washed in the sand-washer, is inducted into the raw-water at the throat of this Venturi tube. This sand passes up the standpipe with the raw coagulated water, and is delivered with it above the top of the sand already there. It forms a volcano-like cone that continuously drifts away and is continually being replaced with the washed sand from the sandwasher, leaving a round topped body of stationary sand below, resting upon the filtered water collecting system. The body of stationary sand does the final filtration. The surface of this body is more than twice the plan area of the unit, and is the actual filtering surface, thus economizing the plan area of the filters. The drifting sand passes down all round the boundary of the stationary sand to a system of slots and continues through a system of converging ports to the outlets on the external extractors and thence by a system of pipes to the sandwasher.

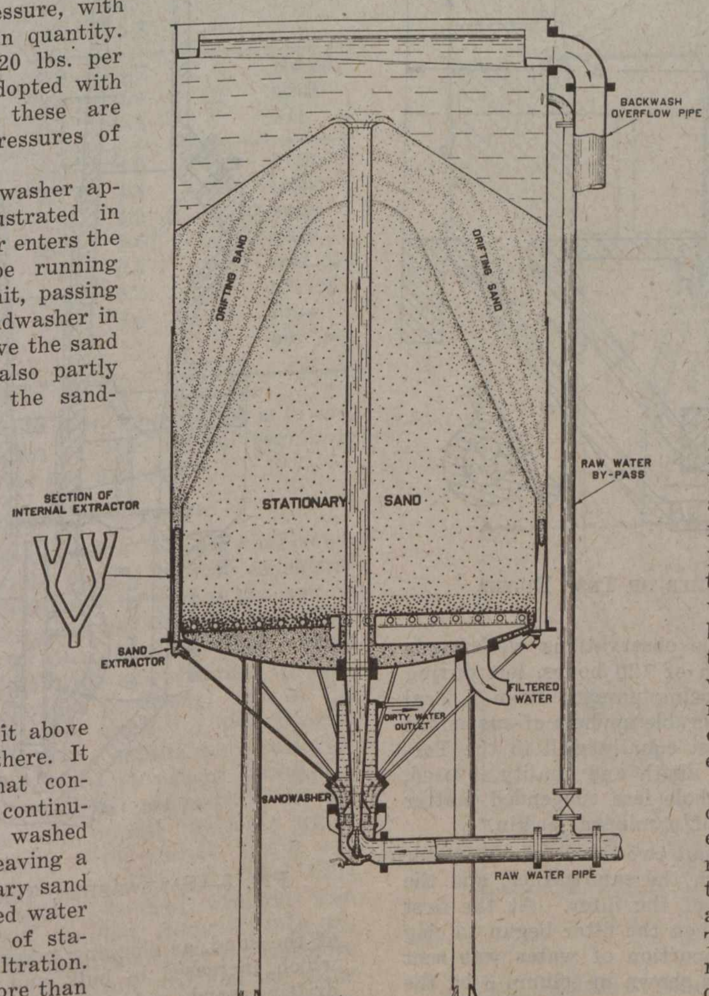

Fig. 1—Typical Single Unit Drifting Sand Filter

At the sandwasher, the sand falls to the bottom through a current of raw-water, and is thus freed from its impurities. It is picked up by the inductor and is carried on to the filter as previously described. The dirty water, impurities or suspended matter pass upward and out at the top of the sandwasher by an outlet suitably controlled. In the external extractors, sand traps are placed of such a form that the sand is kept out of the piping system, except when the inductor is in full operation. That is to say, the sand moves only when there is an abundance of running water to carry it forward to the sandwasher and from the sandwasher back again into the filter.

The main difficulty so far experienced with this system has been the erosion of the metal parts of the handwasher where the sand and water are moving at high velocity or with unsteady motion. The erosion has taken place in the throat of the Venturi tube, in the sand nozzle which conveys the cleansed sand from the bottom of the washer to the throat, and in the bottom of the washer itself, and a good deal of research work has been carried out in order to get rid of this erosion.

In the earlier washers, side delivery of the sand to the ejector throat was adopted, but more recently the longitudinal or trailing nozzle delivery has been adhered to, except for small units. The adoption of the trailing sand nozzle arose from experiments carried out at Toronto in 1915 with a filter unit 8 ft. 7 in. in diameter, similar to that of Fig. 1, and equal in area to one of the units, thirty of which make up a single filter in the Toronto plant.