

IMPROVED METHODS OF SEWAGE DISPOSAL. BY CHARLES G. HORETZKY, C.E.

(Continued)

In the Lawrence experiments above quoted, the sludge was removed by burning at a cost of \$5.43 for coke per million gallons treated, while in any chemical process 8 tons of semi-fluid, evil-smelling cake are produced at a heavy expense for filter presses, cloth and labor, and afterwards the problem of getting rid of this foul asset has to be faced, since it is utterly futile to think of selling this cake to farmers, and the further expense of carting it away must undoubtedly be taken into consideration. In England the cost of producing sludge cake may be taken, at the majority of works (according to Santo Crimp), at 2s. 6d. sterling per ton ; and the same authority states that although it is sometimes sold for a trifle, or taken away by farmers, the latter are as often paid to remove it. In the vicinity of large cities it has been dug into the ground, or spread out to dry, but however handled or disposed of, it is an undoubted nuisance; hence, any method of sewage disposal whereby the sludge difficulty can be eliminated entirely must recommend itself to practical men. In estimating the cost of sludge removed (per million gallons of sewage treated) by coke strainers, as against sludge pressing into cake, we have roughly, taking the Lawrence prices of materials used :

BY COKE STRAINERS.

Say 41/2 tons of coke at \$1.25..... \$5.62 By SITTIGE PRESSING

1000 lbs. slaked line \$9 4 50

Required for precipitation of one million gallons of sewage\$21.80

Therefore, is there much to be said in favor of coke as a strainer, as compared with any "precipitation "process; while the cost of buildings, tanks, and other accessories required in the last named process will certainly counterbalance that of a furnace, drying ovens and chimney necessary for clogged coke combustion.

The Pennsylvania Sanitation Company of Philadelphia have taken advantage of the foregoing facts as regards the valuable properties of coke breeze and aerated sand and gravel filters, in their sewage disposal plant erected at Reading, Penn., which has been in very successful operation for the last year and a half.

The population of Reading is about 80,000, as I am informed, but so far only about 25,000 people contribute to the sewerage system.

The average daily flow of sewage treated by the Philadelphia Sanitation Co.'s works during August last was 1,586,463 gallons.

These works comprise of a very handsome pumping station situated at Sixth and Canal streets. This station includes two large receiving reservoirs in which the coke strainers are placed, two large pumps of 5,000,000 gallons capacity each, three 65 h.p. boilers, drying ovens and tall chimney stack, which ventilates the receiving chambers.

A force main 7,200 feet in length conducts the strained sewage along the banks of the Schuylkill River to the filter beds. These filter beds comprise an area of 25,000 square feet, or fifty-seven hundreds of an acre. One-half of this area is supported by an iron structure, and is at a level 8' 6" higher than the lower half. The upper beds are divided up into ten compartments, each 25 feet by 50 feet. Iron pipes resting upon beams and girders, supported by iron columns, carry the filtering materials, which consist of three different layers of broken stone and rather fine sand, the whole being two feet in depth. The surface of the filters is protected from wind, and the erosive action of the falling sewage by a slatted floor, removable for cleaning purposes.

There is usually one foot head of water on the upper filters while in operation. The open gridiron-like bottom affords access to the outside air, and is, in fact a modification of the "Forced Aeration" experiments of the Massachusetts State Board; further aeration is obtained by the 8' 6" rain-like drops of the effluent to the surface of the second filter, which is of coarser material, and about three feet in depth, and is aerated throughout by pipes and gutters. The effluent from the last filter emerges as a clean, bright fluid, quite sufficiently purified to enter any large stream or river, and certainly of a better quality than that of the Schuylkill, into which it finally empties.

These works have been extremely well designed, and appear to me to be an excellent practical illustration of the Massachusetts experiments with coke and forced aeration. The filtration area is rather circumscribed—a defect easily remedied. Too much credit cannot be accorded the designer and engineer, Mr. John Jerome Deery, of Philadelphia.

Bacterial and chemical analyses of the effluent from this plant have been made in Philadelphia, and these show high results, as the accompanying statement indicates. Uusually about one half only of the filtering area is in operation, the other half being rested, aerated and cleaned. The cleaning operation involves the daily removal of about two tons of the sand on the top of the filters, which

has become clogged by the organic matter still remaining in the coke strained effluent. This daily loss of sand costs about \$2.00 for the material alone.

Reverting to the preliminary operation undergone by the crude sewage in the receiving chambers at the terminus of the main sewer, there are two suspended layers of coke 12" thick through which the sewage must pass. The upper one the sewage must pass. The upper one holds back the course sludge, while the lower effects a partial filtration or straining of the sewage before it is taken hold of by the pumps. Every week the sewage is shunted from one receiving chamber to the other, and the clogged coke of the strainer is entirely removed, upper hoisted to the drying ovens, and finally consumed under the boilers as ordinary fuel. The weekly removal of clogged coke from the upper strainer is about 5 In my opinion the clogged coke tens. should be removed at more frequent intervals and the coke should be, not commercial coke such as I saw, but breeze, or ordinary coke broken up into very small fragments. I believe the very small fragments. I believe the specification of the Sanitation Company demanded "breeze," but since the plant has been turned over to the corporation of Reading, several changes for the worse seem to have been made. During last August the cost for steam coal was \$72 for 48 tons. In addition to this 16 tons of coke from the receiving chambers were burned. pumped during that month was 49,180,368 The total quantity of sewage gallons.

The cost of this plant has been given to me as under :

Pumping station complete, with one	
pump and two boilers	\$59,000
The pipe line	31,000
Site for disposal works	7,000
Right of way	1,700
Iron structure for filters complete, in- cluding viaduct over creek and all	
accessories	62,300

\$161,000

As one-half of the upper filtering area is said to be generally out of operation for cleaning purposes, it follows that the daily flow of sewage treated (1,586,463 gallons) passes through the upper filter at the rate of about 2,286 gallons per square yard, or 11 million gallons per acre. Although this seens an enormously rapid rate, it must be borne in mind that the second filter below will pass the effluent from the first filter at only hali the above rate, and that, with the large amount of aeration obtained, not only by falling through the 8' 6" air space, but through the last filter, very good results can certainly be looked for. As a matter of fact, a very fair sample of effluent was collected by me on the 4th instant. As regards cost of labor, it is safe to say that four men and a foreman could very well attend to the filters, although at present three foremen and eight men are employed by the corporation of Reading. (Concluded in next issue)

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