

governments provide sanctuary for all creatures, including the beasts of the field and the fowls of the air, but make no mention of the erector. The erector must not have an opinion nor even think; or what he thinks, he must not speak, and what he speaks he must not think. If errors become apparent in the shop work, he must assume the burden personally and protect the shop. It is bad form to criticise before strangers one's source of revenue, always remembering that if you get your salary, you must first help your employer to get it.

An Unnecessary Shut-Down

In the course of travel covering eastern Canada and the United States, I note the almost entire neglect of the water wheel. Of course the reason is obvious; but for all that, it is vitally necessary that water wheels should be kept in good condition, not simply inspected, but possible failures anticipated and prevented.

Recently I repaired a hydro unit and found a pedestal bearing (water bearing) which had chafed down into its cement base for five-eighths of an inch, resulting in a broken shaft and runners and a shut-down for four months. This could easily have been avoided if carefully inspected and repaired.

Too many look upon a water wheel simply as a shaft sticking out of the water, and avoid investigating the lower end; let it run as long as it will, seems to be the slogan. This imposes an unnecessary burden upon the manufacturers and seriously reduces the production of the plant. In the interests of the country at large, the water wheel is a vital factor; that it may be rescued from this superstitious horror that now surrounds it, let us know that the wheel is a machine that has parts, bolts, nuts and screws, and that must be watched like a steam engine, for it is an engine.

CHLORINATION OF SEWAGE*

Tests at New Haven on Crude and Screened Sewage and the Effluents from Imhoff Tank and Activated Sludge Process

IN the experiments on sewage disposal conducted last year in New Haven, Conn., tests were made of the use of chlorine in reducing the bacterial content of crude sewage and plant effluents. "The effluents from the screen chamber, the Imhoff tank and the activated sludge process were conducted by wooden flumes to small baffled tanks giving detention periods of from two to five minutes, where they were chlorinated. The chlorine was applied in the form of liquid chlorine delivered from a Wallace and Tiernan solution-feed apparatus, designed for these experiments, with three solution jars and volumetric meters. The chlorinated samples were held in the sample bottles for 30 minutes before plating to reproduce the action of the small storage tanks that would be required in an operating plant."

Twenty-Seven Tests on Crude

Twenty-seven tests were made in the application of chlorine to crude sewage, the amounts of chlorine varying from three to eight parts per million. Averaging the several tests, it was found that with three parts per million the total bacteria were reduced 87 per cent. and the B. coli 55 per cent. With five parts, the total bacteria were reduced 96 per cent. and the B. coli 99 per cent., while with eight parts, the total bacteria were reduced 99 per cent. and the B. coli 94 per cent. (No explanation is offered of the lessened effectiveness of the chlorine in reducing B. coli with an increase in the dose.)

Testing screened sewage, it was found that, with three parts of chlorine per million, the total bacteria were reduced 88 per cent. and the B. coli 48 per cent.; with five parts the

reductions were 99 per cent. and 97 per cent., respectively; and with seven parts per million both total bacteria and B. coli were reduced 99 per cent.

In treating Imhoff effluent, the results obtained with three parts per million were 99 per cent. and 65 per cent., respectively, while with six parts per million the reduction was 76 per cent. and 84 per cent., respectively. "The unstable organic bodies which result from septic action tend to use up a considerable portion of the chlorine before it can act on the bacteria," and this probably accounts for the less effectiveness of these tests with Imhoff effluent, and possibly for the irregularity also.

"The effluent from activated sludge treatment is particularly amenable to further purification by the use of chlorine, since its original bacterial content should be already reduced, and since its free oxygenated condition leaves the chlorine free to exert a maximum disinfection action. The activated sludge process, operated as we operated it, with a minimum degree of aeration, and acting on the abnormal East Street sewage, yielded only a moderately purified effluent." With an addition of two parts of chlorine the total bacteria were reduced 78 per cent. and the B. coli 88 per cent. In the three samples tested with three parts of chlorine, the activated sludge process had already reduced the number of B. coli 73 per cent. and no further reduction was effected by the use of chlorine.

Summing up their conclusions in regard to chlorine treatment of sewage, Professor Winslow and F. W. Mohlman, the chemist of the experiment station, report as follows:—

Conclusions Regarding Chlorination

"It appears evident that three parts of chlorine will yield fairly satisfactory results with the effluent of the activated sludge process; that seven or eight parts are needed for crude sewage; that five parts will probably suffice for screened sewage; and that, so far as the Imhoff effluent is concerned, six parts will not give satisfactory results as to total bacteria, but may yield an effluent which is low in colon bacilli.

"In making our estimates as to the cost of chlorination combined respectively with fine screening and with Imhoff treatment, we have assumed, in the absence of more conclusive data, that five parts of chlorine will produce a satisfactory degree of purification in both instances, basing this assumption chiefly on the results of the colon tests, which are of much more practical moment than the counts of total bacteria. It is evident, however, that this amount may very possibly have to be increased in practice, particularly in the case of the Imhoff effluent."

The cost of chlorination in each case is estimated at \$4.05 per million U.S. gallons.

The Graves bill has been passed by the New York Legislature, appropriating \$3,000 for the expenses of a committee which will work with a Canadian committee to bring about the construction of a peace memorial bridge across the Niagara River. It is said that the money will be spent in publicity work with the idea of cultivating sentiment in New York State in favor of the proposed structure.

The annual meeting of the Engineers' Club of Peterborough, Ont., was held April 12th, and the following officers elected for the ensuing year:—Hon. president, C. E. Canfield; president, G. R. Munro, of the William Hamilton Co.; vice-president, R. H. Parsons, city engineer; secretary-treasurer, R. L. Dobbin, water works superintendent; directors, R. B. Rogers, P. L. Allison, H. O. Fisk, E. R. Shirley, James Mackintosh and G. R. Langely. The meeting was addressed by Secretary Keith of the Engineering Institute of Canada, who discussed the possibility of organizing a Peterborough branch of the institute. A committee was appointed to report upon the advisability of organizing such a branch. There are about fifteen corporate members of the institute in Peterborough and others have signified their intention of joining.

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