### Purification of Water.

The cleaning of storage ponds, it has been said, is all a mistake, and that it would be far better to leave the vegetable debris and add to the accumulation, rather than diminish it. Comparative experiments upon reservoirs have shown, however, that improved water invariably follows cleaning, and it must be remembered that while good water may be obtained from swamp sources, where vigorous growth disposes of the products of decay, beyond question the reverse obtains under conditions permitting the products of decomposition to accumulate. The bottom of a prepared reservoir should be cleaned of all varieties of vegetable matter. Decomposition of recently killed vegetation takes place quite rapidly under water at first, but afterwards proceeds with great slowness.

A reservoir with gently sloping sides furnishes favorable conditions for contaminated water supply. Such sides permit thin layers of water to be over heated by the summer sun, thus favoring the growth of aquatic and land plants, which subsequently decay and damage the water.

Great trouble with the water supply (New York and Croton supply line) arose at Purdy station from the fact that they had not disposed of the grass of the farms covered with water. They removed the trees, but did not remove the stumps or plow the grass lands, and when the latter were flooded and again exposed, the stench was so tremendous that it nearly drove the Purdyites out of town.

Water from underground sources should be distributed as soon as possible after being brought to the surface. As they are commonly well supplied with plant food in solution and under the influence of light and air, there is danger of the development of algae if much exposure to these elements be allowed.

Sedimentation—suspended impurities, is of two sources, one arising from the impounding of surface water. Bacteria die slowly, and although a large percentage will disappear through storage, they are very long in settling, so that it should not be expected that a reservoir could do the work accomplished by a filter.

With reference to the influence of precipitating mud—if the water be roily—let us take one roily and one not, but each containing the same number of bacteria per cubic centimeter. The one that is muddy or roily will, during the same length of storage, improve the more so far as the bacterial contents are concerned. The precipitated mud acts as a carrier of these bacteria and drags them down as it falls.

It is the common American practice to deliver water raw to the consumer. Even when its purity is unquestioned, such is not the European custom; public sentiment practically demands that surface water should receive sufficient purification before distribution for domestic uses. In Germany this matter is regulated by statutory law. Filters are established to filter waters equal in natural purity to the best supplies America can show.

To abandon an existing water supply system, or to purify a polluted water, always involves the outlay of much money, and the taxpayer has the right to inquire whether the cash is fairly expended. No better measure can be furnished of the wholesomeness of a water supply than the actual list of typhoid fever cases in the community supplied. The means of prevention, in the shape of great public works are expensive, and the question is asked. Do these works pay? Can we afford to save the typhoid victims?

According to Rochard, the economic value of an individual is what he has cost his family, the community or the state, for his living, development and education. It is the loan which the individual has made him by his relatives and the state in order to reach the age when he can restore it by labor. Chadwich considers an English laborer equivalent to a permanent deposit of $980; Farr gives $780 as the average value of each human life in England. The French soldier is rated at $1,200. In view of the fact that typhoid fever selects by far the greatest number of its victims from among those in the very prime of life, to the relative exclusion of the very young and the very old, it will be reasonable to place the loss caused the community by a death from typhoid fever at $2,000. This is less than half the figure so frequently referred to in the courts of New York state as the value of a human life.—*Municipal Engineering.*

### Electric Railways—How to Make Them a Commercial Success.

For an electric road in a town or city street, or wherever pavements of a permanent character are used, the girder rail seems to be the only one suitable. The depth of the rail should be not less than 7 inches, and should weigh from 70 to 90 pounds to the yard. What the exact weight of the rail should be would depend upon the frequency of the service required, and the weight of the rolling stock to be used. In a macadam or unpaved roadway, a T rail of 65 pounds to the yard is all that is necessary. While it may be better under certain conditions to have rails laid in concrete with a permanent pavement, my experience has been that cars rattle and jar a great deal more than when running over a road-bed of less rigidity. In all paved streets, rails should be firmly spiked on oak ties 5 in. x 7 in. x 7 feet, spaced two feet apart. The grade should first be properly levelled, and the whole surface covered with good coarse gravel 6 inches in depth. Fish plates or angle bars 3 feet long, with not less than 6 bolts at each rail joint, should be properly fitted and bolted. Soft copper bonds of sufficient size to carry the maximum return current from any distant part of the line to the power house, should be properly attached at each joint.

The trolley should be carried with a straight line hanger thoroughly insulated and attached to a flexible bracket or span wire.

The rolling stock should be the best obtainable, and for city traffic, mounted on single truck with wheel base not more than 7 feet 6 inches.

The power house should be built near a railroad track, so that coal can be cheaply delivered, and it is very desirable that the site selected should be near a good water supply, so that condensing engines may be used. If these conditions can be had near the centre of distribution, a very great saving can be effected in the cost of copper feeders.

In Canada where soft coal is used for fuel, the high freight and duty rates make it essential to have boilers of the highest efficiency, without much regard to their first cost. For this same reason, the boiler room should be fitted with fuel saving appliances, such as an economizer, heater, stoker, automatic damper, regulators, etc.

A certain degree of revenue is the reward of all street railways, but it is not enough that we carry our regular customers. These come to us anyway, and it is to these that we look for a guarantee of our operating expense. The profit or success of the railway lies in the margin of how many we can induce to become patrons, and thereby increase the regular revenue. One good way is to issue annually a handsomely illustrated booklet, which contains cuts of all the interesting points touched by the cars, briefly telling how to get there. A specially illuminated car for trolley parties is a profitable source of revenue. Many electric railway companies establish parks at the end of one or more of their lines, and provide amusements in the way of band concerts, etc. This brings considerable increased revenue, at a time of the day when cars would otherwise be running light. Some companies claim to have profited by this departure, while others have an adverse experience.

The selection of employees has more to do with the success of an electric railway than anything else. The idea that anyone can run a street car, has, in many cases, resulted in the employment of incompetent, careless and ignorent men, who, through these qualities, have brought the railway into public disfavor. Conductors, motormen, inspectors and shopmen have the power to earn or lose money, make the railway popular or odious with the public, keep claims for damages at a minimum or make them a burden, and very often their selection does not receive the care that is exercised in the purchase of ordinary supplies.—*C. E. A. Carr in Canadian Engineer.*