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MINNEAPOLIS MECHANICAL WATER FILTRATION SCHEME.

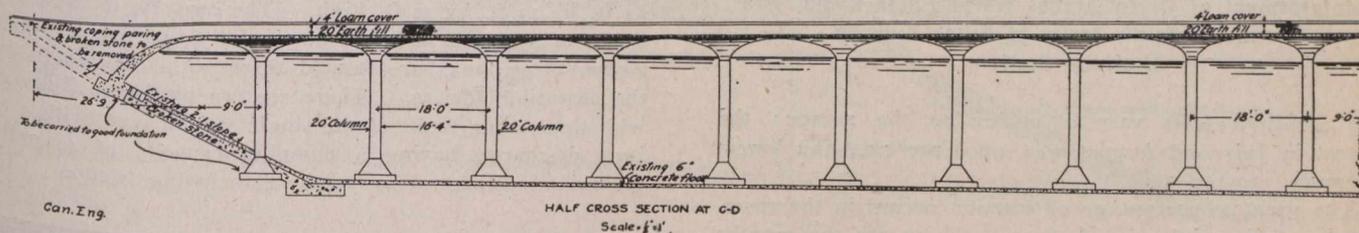
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The Minneapolis mechanical water filtration scheme is now nearing completion, which will fill a long-felt want as regards the city's water supply. In the early stages Minneapolis had under discussion two projects, i.e., mechanical water filtration, and piping of the water from Mille Lacs, a distance of eighty-one miles. The vital points were: pure water, quantity, description of project, and cost.

The present average consumption of water in Minneapolis is twenty million gallons with a population of 316,000, with a per capita consumption of sixty gallons per day, quite a low figure at a glance, but a study of the analyses of the Mississippi water is explanatory. On account of the evaporation, run-off, and shrinkage of the water on Lake Mille Lacs, also the estimated cost of \$3,913,414, approximately \$48,915 per mile, the Mille Lacs scheme was abandoned

Color: The Mississippi River varies greatly in color at different points along its course. These changes in color are caused by the confluence of contributory streams. Along some of the highly-colored tributaries are large swamps, the water of which shows a color as high as 700 to 800. This color is derived from macerated vegetable matter, and persists as a considerable factor in the total color of the Mississippi at Minneapolis. The greatest reduction of color occurs during the months of August and September, and very little in the winter. This is coincident with the greatest and least amount of plankton. When copper-sulphate was used to destroy plankton, the bleaching process at the reservoirs was interfered with.

Suspended and dissolved matter: The organic residues are greatest in summer months. The inorganic residues



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in favor of the mechanical filtration scheme, by this means utilizing the existing pumping stations with an increased pumping capacity of 80,000,000 gallons per day.

The mechanical filtration system having been decided upon, various analyses of the water were taken to determine the extent of the mechanical scheme. Briefly the water of the Mississippi River contains:

Chemical analysis (sanitary)—Free ammonia, alb. ammonia, chlorine, alkalinity, hardness.

Physical analysis—Suspended matter, (a) mineral, (b) organic; rate of sedimentation, color, suspended and dissolved matter, (a) organic, (b) inorganic.

Biological analysis—Bacteria, plankton.

Mud analysis—Mineral, clay, silica, organic (dead and living.)

Chemical Analysis.—Free albuminoid and ammonia varies from .430 in May to as low as .059 in October.

Alkalinity and permanent hardness: The average total hardness reached a maximum of 173 and a minimum of 139. The maximum is during the months of December, January, February. The minimum during April.

Chlorides: These vary greatly with the heights of the water, and follow directly the alkalinity and total hardness. During the past ten months the chlorides have varied in about the same relative amount as the permanent hardness.

follow the alkalinity and chlorides. The mineral residue varies from 113 to 162. The organic from 62 to 75.

Turbidity: The turbidity of the Mississippi River water at Minneapolis is usually low—so low, in fact, that it has been regarded as a negligible quantity in the earlier analysis. In occasional instances it has for a short time risen to 25 or 30, but quickly subsides. It is safe to assume that in 350 days of the year it is in the neighborhood of 10.

The Mississippi water deposits on an average .13 cubic yards of sediment per million gallons of water during a period of four days of sedimentation. In the process of sedimentation, the algae and diatoms are the first to be deposited; at the end of 24 hours, only fine clay remains suspended in water, and at the end of 96 hours but 36% of the original turbidity remains.

The following is an analysis of deposited matter taken from the city reservoir recently:

Organic matter	19.3%
Alumina	13.6%
Silica	50.3%
Iron (ferric-oxide)	6.5%

The most objectionable feature of the Mississippi River water at Minneapolis is the bacterial content. Colon bacilli are constantly found in the water. This indicates the presence of animal contamination. The high rate of typhoid