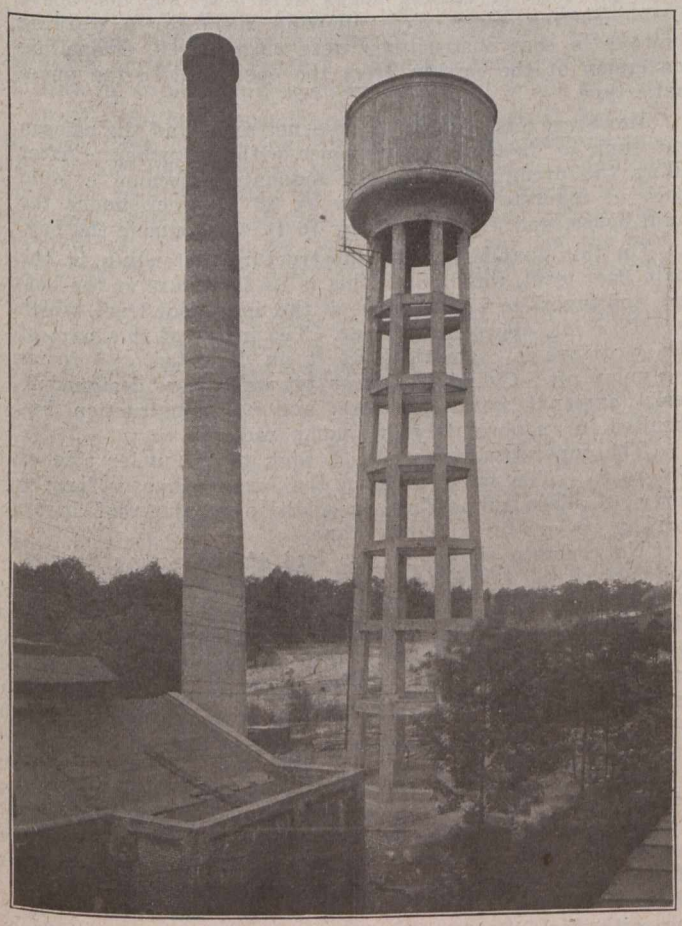
bracing and handling, etc., will usually determine the practicable length to be about 8 ft.

Pipe are cast on end and the molds of sheet steel and cast-iron must be erected on substantial base or foundation of reinforced concrete, the surface of the foundations being truly level, and finished so that when the cast iron base mold is set and the sheet steel casings are erected, the casings will be truly vertical.

In the manufacture of most pre-cast concrete pressure pipe, it is necessary to use 1 volume of portland cement, 1½ volumes of sand and 2½ volumes of coarse aggregate, and this means that 2½ barrels, or 950 lbs., of cement is used per cubic yard of concrete. In the manufacture of pre-cast pipe for the Winnipeg aqueduct, it was found necessary to use but one sack of cement to 3.8 cu. ft. of mixed aggregate, or approximately two Canadian barrels, or 700 lbs., of cement per cubic yard of concrete.

This minimum quantity of cement was found practicable owing to the very excellent grading of the mixed aggregate which was supplied by the Greater Winnipeg Water District from their own pit, at which was located a screening and remixing plant. The concrete is mixed to a quaking or jelly-like consistency, which will easily flow to place when slightly puddled.

The mortar for spigots is made of 1 part cement to 2 parts sand, and is mixed to the same consistency as the concrete, so as to obtain the same rate of setting as nearly

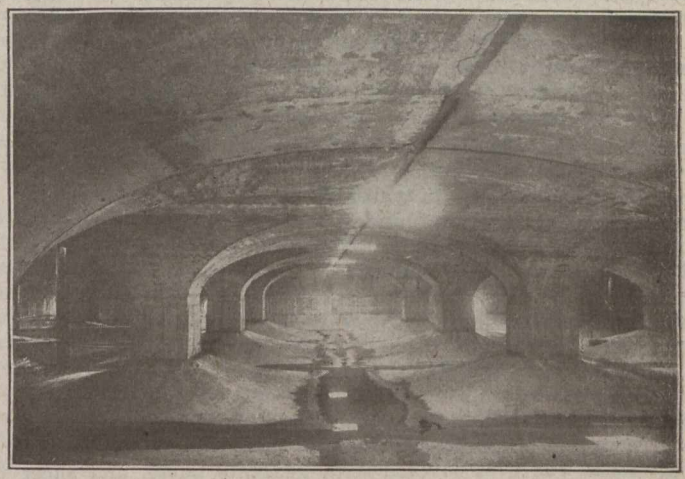


CONCRETE CHIMNEY AND CONCRETE WATER TOWER.

as possible. As the spigot mortar settles, more mortar is added until the settlement ceases, when the joint is finished.

Concrete pressure pipe may be successfully manufactured in cold weather with proper appliances for supplying heat and moisture. In fact, where high speed of manufacture is desired, steam curing should be resorted to and this may be carried on regardless of temperature conditions. For the manufacture of large sizes, appropriate handling equipment and appliances should be provided, such as traveling derricks, locomotives, cranes and light industrial tracks, cars and locomotives.

Good pipe under a test pressure of 50 lbs. per sq. in. should show a leakage of only about 335 Imperial gallons per mile per 24 hrs. This result can be secured by the use of



MONTEBELLO CLEAR-WATER RESERVOIR

well designed equipment, well graded aggregate, proper methods of manufacture and unremitting care.

In Seattle a trunk water conduit operates under a head of 90 ft. and every pipe was tested to 2½ times the working head. Tests were made on short sections of completed line and the leakage was nil.

In addition to the copper-expansion-joint type of reinforced concrete pressure pipe, there has recently been developed a new type of expansion joint which is very efficient. This joint is proposed for reinforced concrete pressure pipe in diameters of 10 to 48 ins. and in lengths of 12 ft., each section of pipe being provided with cast iron spigot ring at one end and a cast iron bell ring at the other, the rings being cast into the concrete.

The faces of the rings bear upon a lead gasket and are accurately machined, providing a very true circular surface. The spigot ring is provided with a seat for the gasket, the object being to provide a greater thickness of gasket at the seat and to prevent the gasket being withdrawn when the pipe contracts or is deflected.

The lead gasket consists of a thin lead pipe filled with fibre and is compressed into the space between bell and spigot when each succeeding length of pipe is shoved home. A light rope of cotton or jute is placed and a weak joint filler of cement mortar is applied, filling the calking space. The joint has remained tight under test at 110 lbs. pressure per sq. in.

Tanks and Standpipes

Familiarity with the success that has been attained in the use of concrete pressure pipe prepares us at once to accept the reinforced concrete standpipe or water tank. Here again we have simplicity in design because of accurate knowledge of the pressures to be withstood. Obviously, if concrete pipe can be constructed uphill and down, and with curves in and out, to withstand over 100 ft. head of water pressure, there should be no difficulty in building a standpipe of like height, and in fact many examples are in existence of concrete standpipes of much greater height than 100 ft.

The Fulton standpipe, at Fulton, N.Y., is 100 ft. high to overflow and is 40 ft. in diameter. The circular concrete tower and tank at Middleboro, Mass., is 123 ft. high. The concrete cylindrical tower and tank of the Central of Georgia Ry., at Savannah, is 188 ft. high.

The supporting tower of elevated tanks may be either of concrete framework or of the cylindrical type. The latter has a number of advantages. The same forms may be used to construct the supporting tower as are used in the construction of the tank support. These forms are usually what are known as moving or sliding forms; that is, they