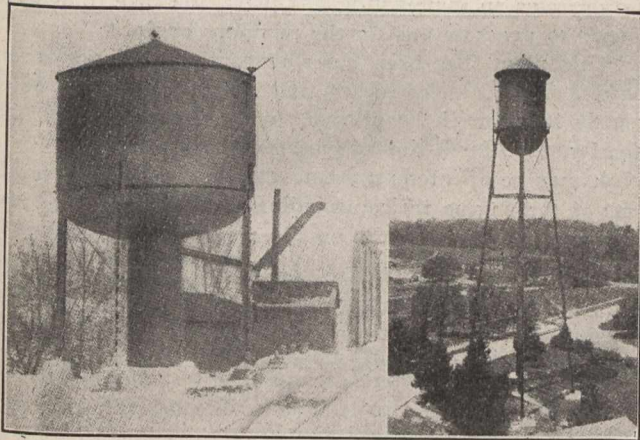


made of the structures that failed, and it seems to be noticeable that there were fairly high unit stresses involved in all cases.

In years past little attention seemingly has been given by designers of standpipes to the efficiency of the rivet connections. In analyzing this question of efficiency of connections we assume that rivet shear is equal to two-thirds the tension value of the material, and it is not unusual to find standpipes with rivet efficiency of no more than 30 per cent. of the value of the plates.

The question of rivet efficiency in anything like boiler or tank work is of paramount importance. While it is possible by double butt strap joints to make a rivet joint of more than 90 per cent. efficiency, yet due to the added weight of material as well as cost of labor, it may be doubted if there is any advantage in attempting to develop efficiency to exceed 80 per cent. In fact, in moderate-sized tanks something like 70 per cent. efficiency will quite likely work out the most satisfactory. Experience seems to justify the use of lap joints on material up to, say, $\frac{1}{2}$ -inch thickness.

There never has been a failure where the stresses on the efficiency of the joints in the standpipe were as low as 15,000 pounds per square inch, and larger numbers of pipes are standing and have stood for a long period of years where the stress on the efficiency of the joints is over 30,000 pounds per square inch.



60,000 Cals.—35 ft. High. C.P. & St. Louis Ry., Lock Haven, Ill. **100,000 Cals.—150 ft. High. Hospital for Insane, Columbus, O.**

The group of standpipes referred to above were designed on a basis of gravity stress of about 15,000 pounds per square inch of the gross section of the plates. That the mortality has not been more serious is surely a kind interposition of an over-ruling Providence. While there may have been bad material and bad workmanship, there has also been most unfortunate designing. To such designs the failures must be charged.

Towers and tanks have a better record as to their mortality. In fact, very little in the way of failure or criticism has presented itself. There have been examples of conical bottoms attached to the cylindrical part with a moment on the joint. Great difficulty has been experienced in keeping such joints tight, and the one only very considerable failure of a tower and tank has occurred from this fault in design.

It is my pleasure to present to you some illustrations of sundry examples of elevated towers as constructed. These have been selected as showing a variety of use, as also a variety of structures.

We have the tower and tank, with sundry expressions of architectural effort and atmosphere, all of which reminds us that the personal must have consideration, and the further very interesting fact that there is no gauge in the matter of taste.

We have a tank with elaborate protection against the cold in the extreme north. We have them with no protection in the south.

The towers and tanks shown are in use for:—

City Water Works.
Public Institutions.
Private Estates.
Industries.
Railroads.
Hydraulic Works.

With examples of:—

Three supports to tank.
Four supports to tank.
Six supports to tank.
Eight supports to tank.
Twelve supports to tank.

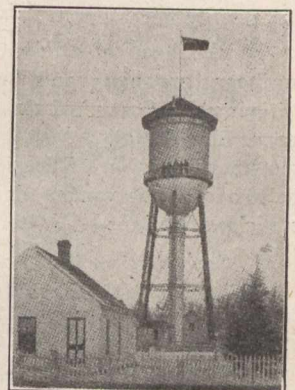
Also the:—

Flat bottom tank.
Conical bottom tank.
Hemispherical bottom tank.
Semi-elliptical bottom tank.

We also have a lantern slide showing a 50-foot diameter tank bottom, fully assembled in the yard for reaming 15,000 radial holes through approximately $1\frac{1}{8}$ -in. from 11-16-inch to 1-16-inch.



125,000 Cals.—135 ft. High. C.P.R., Winnipeg, Man.



75,000 Cals.—91 ft. High. Edmonton, Alta., N.W.T.

In the matter of spherical work, the surface cannot be developed, while the cylinder or cone may be. The difficulties of mechanical execution are such as to generally preclude the use of the sphere or sections thereof in plate metal construction.

The amount of water pumped for Erie, Pa., during 1908 was 4,483,392,032 gallons, an increase of 157,295,184 gallons over 1907. The average daily pumpage was 12,249,705 gallons, or a per capita of 175 gallons on a basis of 70,000 population. The amount of water furnished by meter measurement to manufacturers and other large consumers was 1,169,536,621 gallons, a decrease of 27,590,994 gallons from the previous year. Deducting the amount of water furnished by meter measurement from the total amount of water pumped, gives the approximate amount of water furnished for domestic use, churches, schools, charitable purposes, fire protection and other city uses, 3,313,855,441 gallons, a daily average of 9,054,249 gallons, and an average daily consumption for the several uses mentioned of 129.35 gallons, being an increase in the daily per capita of 2.35 gallons.

The Canadian Pacific Railway Company's fiscal year closed last Thursday, and the new year started on Friday morning. Gross earnings for the year ending June 30th, 1909, were the greatest on record, being at least \$76,117,167, compared with \$71,384,173 last year. In June the gross earnings amounted to \$6,354,000, but this figure will be considerably augmented by the miscellaneous receipts when the final reports are made up. Steamship earnings will be added to the above figures in the final report.