

head per annum, compares favorably with the above cities. This consumption, however, is the average for the year, but there are days in the year and hours in the day for weeks and months together, when the average is greatly exceeded—perhaps doubled.

On the 1st September, 1879, it is probable that the consumption for at least a couple of hours was at the rate of 3,600,000 gallons per 24 hours, or over 100 gallons per head of the population. On that day no pumping was done, and at 6 o'clock a. m., Sept. 1st, the reservoir level was 21.40; at 6 o'clock p. m., the level was reduced to 18.40, exactly 3 feet in 12 hours. The quantity abstracted in that time was nearly one and a half millions of gallons, the delivery averaging about 120,000 gallons per hour, and to maintain it at that rate, a head of about 45 feet would be required upon the main; in other words, the pressure in the city would be reduced about 45 feet in forcing the water through the main at that uniform rate throughout the day. But there is reason to believe that for two hours or more on that day this loss of head was very greatly exceeded. For two hours in the afternoon it was reported that no water could be obtained on the Dundurn ridge which is 115 feet above Lake level and 70 feet below the full level of the Barton reservoir. There must have, therefore been at this time a loss of head of at least 60 feet and a delivery of the main approaching a rate of 4,000,000 of gallons per 24 hours.

This quantity of water can be obtained through the present main only by submitting to a corresponding loss of pressure. There appears to be an impression that the pressure can be maintained in the city by the pumps. From what has been stated it will be seen that this cannot be done with the reservoir in use. Moreover, without the aid of the reservoir the maximum consumption during certain hours of summer days could not now be maintained as that consumption is greater per hour than the delivery of the pumps.

To maintain the full pressure in the city and at the same time force the maximum consumption of the 1st September last through the present main with the reservoir shut off would require an additional head of 120 feet at the pumps or a total lift of over 300 feet at the engine house. The rapid increase of pressure required to force an increased quantity through the present main, 18 inches diameter and 28,000 feet in length, is as follows;

1,000,000	gallons	per	diem,	head	required	93	feet.
2,000,000	"	"	"	"	"	38	"
3,000,000	"	"	"	"	"	88	"
4,000,000	"	"	"	"	"	156	"
5,000,000	"	"	"	"	"	245	"
6,000,000	"	"	"	"	"	345	"

This is the head required to overcome friction alone and is exclusive of the power required to lift the water.

In a very short time the maximum demand for summer days, exclusive of fires, will require double the delivery of the present