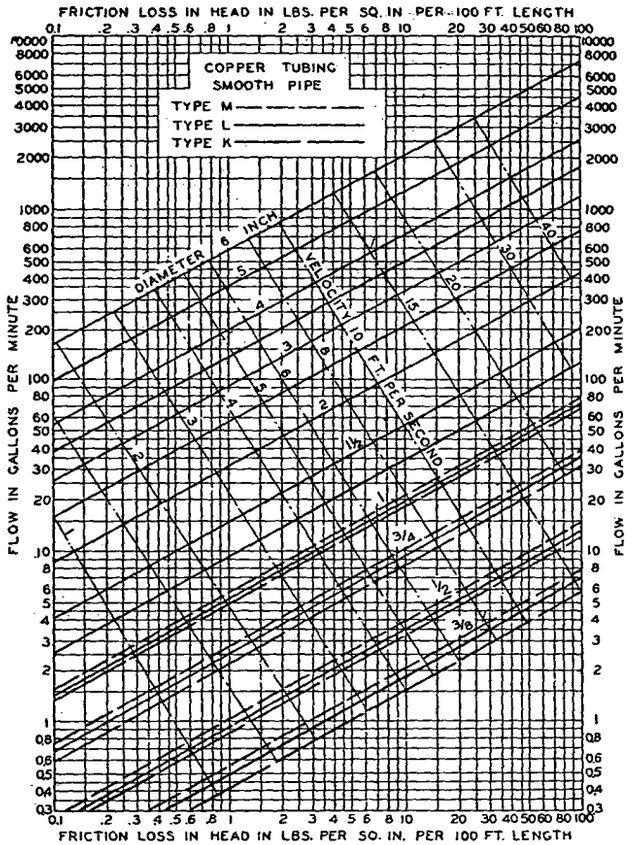

FIG. 3. FLOW CHART FOR COPPER TUBING

pressure required for the operation of the topmost fixture. (A pressure of 15 psi is ample for flush valves, but reference should be made to the manufacturers' requirements. A minimum of 8 psi should be allowed for other fixtures.) The pressure differential thus obtained will be available for overcoming pressure losses in the distributing system, and in overcoming the difference in elevation between the water main and the highest fixture.

The pressure loss, in pounds per square inch, caused by the difference in elevation between the street main and the highest fixture, may be obtained by multiplying the difference in elevation in feet by the conversion factor 0.43.

When water flows through a pipe, friction occurs as the result of the sliding of water particles past one another. If the pipe wall is rough, the roughness projections cause additional friction, owing to the development of increased turbulence in the flowing water. As the water flows along a uniform pipe, the pressure decreases as a result of a dissipation of

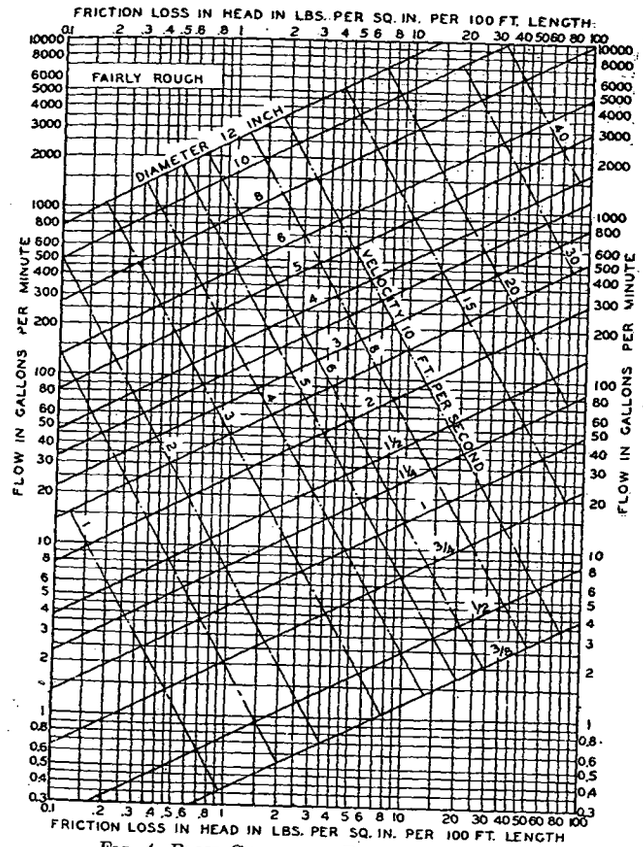

FIG. 4. FLOW CHART FOR FAIRLY ROUGH PIPE

energy arising from the internal friction set up by viscosity of the water. This loss in energy is shown by the loss of pressure. The pressure loss is proportional to the length of straight uniform pipes, and varies greatly with flow velocity, pipe diameter, and roughness of pipe.

On the basis of inside surface conditions, pipes may be classified as smooth, fairly rough and rough, as follows:

Smooth. The pipe surface shows no perceptible roughness. Pipes made of copper, brass, or lead may usually be classified as smooth.

Fairly Rough. All ordinary pipes, such as wrought iron, galvanized iron, steel and cast-iron, after a few years of usage, may be called fairly rough.

Rough. Pipes that have deteriorated fairly rapidly for some 10 or 15 years after being laid, are classified as rough.

Figs. 3, 4 and 5 give the pipe friction losses corresponding to these three types of pipes for various nominal diameters.[1]

Example 1: A 2½ in. fairly rough pipe supplies 100 gpm of water. Find the friction loss in head if the pipe length is 200 ft.