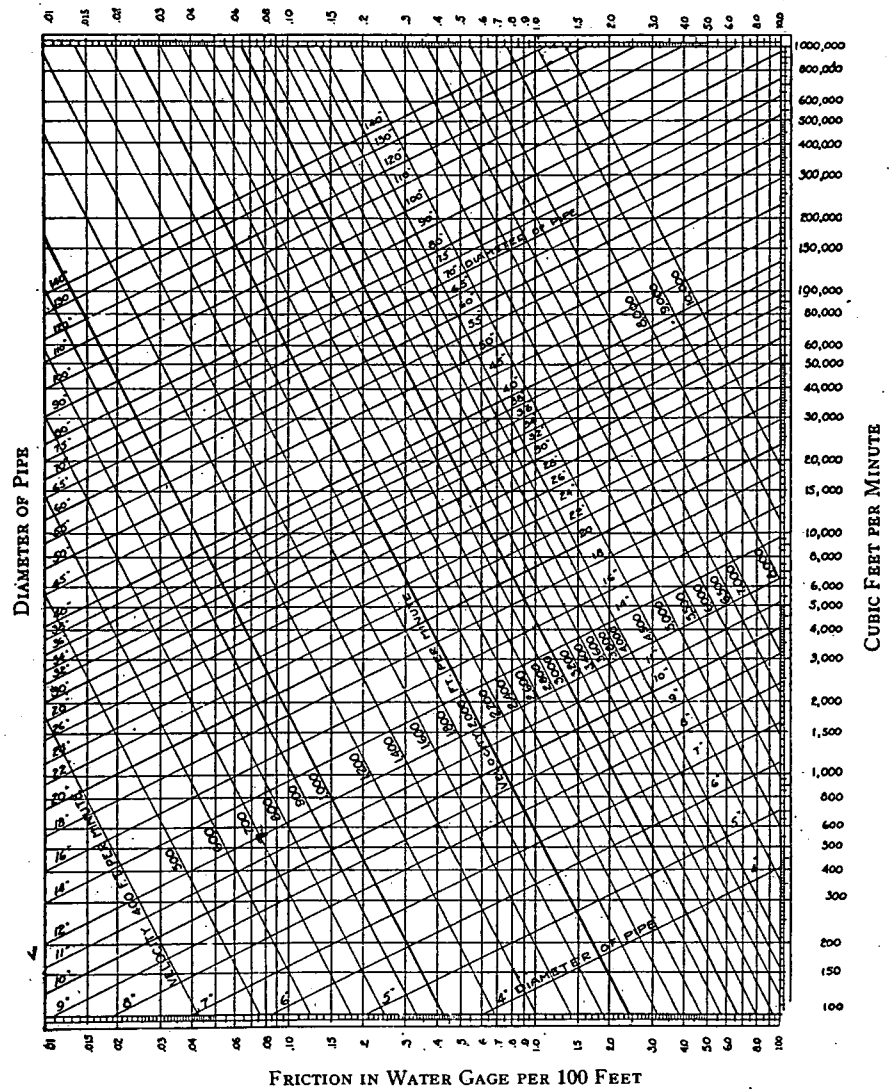

FIG. 1. FRICTION CHART

HOW TO USE THE FRICTION CHART

While this chart can be used to determine the friction of air which is flowing through ducts, it also can be used for determining the size of a pipe to handle a specified volume or the velocity that will be necessary. For example:

1. Assume that a volume of 20,000 cu. ft. per min. is to be discharged through a 36 in. duct. The volume is given on the right hand margin; follow along the horizontal line opposite 20,000 cu. ft. per min. until it intersects with the diagonal line sloping upward to the right which is marked 36 in. diameter of pipe. The velocity will be found to be 2,800 ft. per min., this being the other diagonal line sloping downward to the right. At this point of intersection is a vertical line giving the friction, which is indicated at the bottom of the chart as being 0.4 in. water gage per hundred feet of length. Thus if the duct is only 40 ft. long, the friction will amount to $\frac{40 \times 0.4}{100} = 0.16$ in. W. G.
2. The friction of elbows varies with the radius; an elbow having a radius in the throat that is half the diameter of the pipe, will present a frictional resistance that is equivalent to a straight pipe that is 30 times its diameter. For instance, a 36 in. diameter elbow having a radius of 18 in. in the throat would present as much friction as $\frac{30 \times 36}{12} = 90$ ft. of straight 36 in. pipe.

   If the radius in the throat is equal to the diameter then the friction would only be equal to 10 diameters. If the radius is twice the diameter, the friction is only 4.3 diameters.

   The friction of a rectangular pipe for a given velocity (not for volume) can be converted to an equivalent round pipe as follows: $D = \frac{4\,W\,H}{2\,W + 2\,H}$, in which W is the width, H is the height and D is the diameter, all in inches.

   To find an equivalent diameter for a given volume and the same friction as a rectangular duct, proceed as follows:

$$D = \frac{W}{0.79 \sqrt[5]{\left(\frac{W}{H}\right)^2 + \left(\frac{W}{H}\right)^3}}$$

SOME GENERAL INSTALLATION AND CONSTRUCTION HINTS

1. Ducts should be not less than 6 x 6 in. in size and made of galvanized iron or steel.
2. Angular turns should be made with elbows having a radius not less than the width or diameter of the duct.
3. Offsets should be at an angle of 30 to 45 deg.
4. Branch ducts should make curved connection with main duct and should have accessible dampers.

GAGES OF GALVANIZED IRON OR STEEL TO BE USED FOR DUCTS, FOR OUTSIDE AIR INTAKE

Heating and Ventilating

ROUND DUCTS, DIAM., IN.	GAGE	RECTANGULAR DUCTS WIDTH, IN.	GAGE
6 to 19	26	4 to 18	26
20 to 29	24	19 to 30	24
30 to 39	22	31 to 60	22
40 to 49	20	61 to 118	20
50 and above	18	118 and above	18

5. Rectangular ducts should have metal strap or rod supports and when over 36 in. in width should be stiffened with angle iron at 4 ft. intervals.
6. Longitudinal seams and transverse joints should be flat and smooth inside; slip joints should be in direction of air flow.
7. Access doors to ducts should be hinged and fire dampers in supply and vent ducts should be of ⅛ in. steel plate, held by fusible link for release at 160 deg. fahr.
8. Air intake should be screened with 1 in. mesh or less and protected from weather.
9. Final exit for exhaust ducts should be protected from weather and placed so as not to contaminate air supply.
10. Underground ducts should be waterproofed, drained, and provided with means of access for inspection and cleaning.