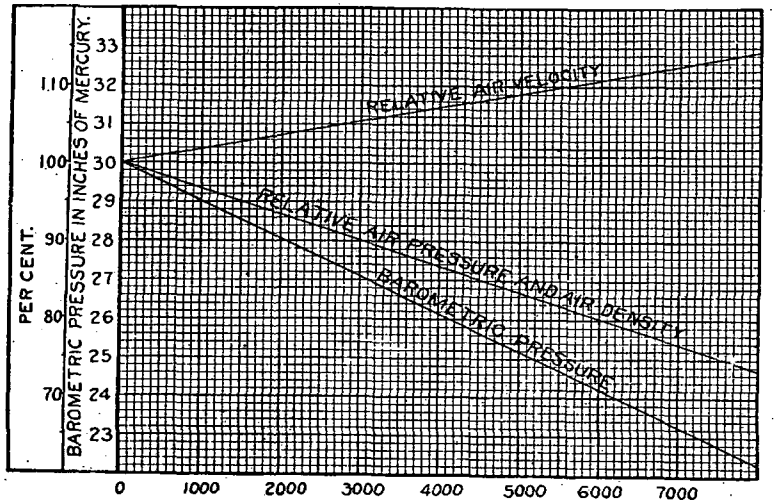
FIG. 2



Relation of Altitude to the Properties of Air

Coefficients of Discharge for Air Measurements

Various coefficients are used in the calculation of fan performance or in air measurements, and the following summary is given merely as a matter of convenience, but the factors should not be used without first having an intelligent understanding of their proper application. In case of special requirements it may be found necessary to modify the given coefficient accordingly.

Coefficient for sharp orifice in thin plate - - - - - - - - - - - - - 0.600

Coefficient for orifice at end of pipe - - - - - - - - - - - - - $\dfrac{0.60}{\sqrt{1-\left(\frac{A_2}{A_1}\right)^2}}$

Coef. for short pipe attached to end of larger pipe - $\dfrac{0.82}{\sqrt{1-\left(\frac{A_2}{A_1}\right)^2}}$

Coefficient for short length of pipe - - - - - - - - - - - - - - - 0.82
(blowing from plenum chamber)

Coefficient for short pipe on outlet of fan - - - - - - - - - - - - 0.95

Coefficient for round pipe (pitot tube in center) - - - - - - - - - - 0.91

Coefficient for converging nozzle (see curve).

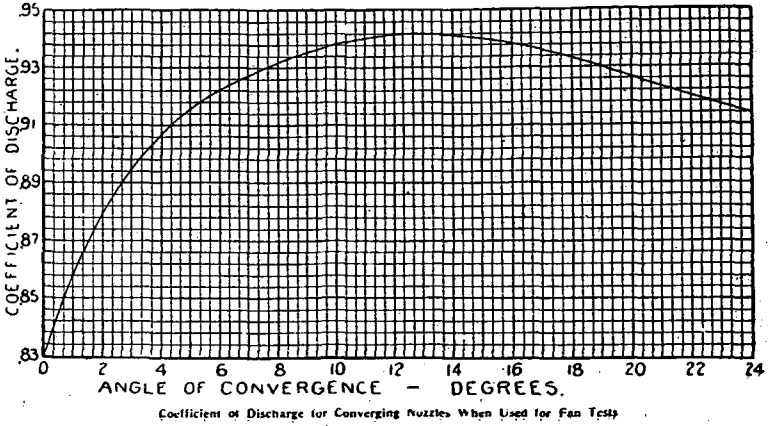
The quantity of air to be measured may be calculated by means of the formula

$$Q = 1096.5\, C\, A \sqrt{\frac{p}{W}}$$

where
- p = static pressure in inches causing flow of air.
- Q = cu. ft. air per min.
- C = coefficient of discharge.
- A = area of pipe in sq ft.
- W = weight of air in lbs. per cu. ft.

For values of the weight of air in pounds per cubic foot for various atmospheric conditions see the table No. 3.

The coefficients given above are to be applied to **velocity, capacity,** or to the **effective area** of pipe or outlet. The proper coefficients to be applied to the **pressure readings** will be the square of the ones given above. Thus the coefficient for **pressure** in a round pipe varies from 0.81 to 0.82. These are to be applied to the pressure readings of the pitot tube when taken at the center of the pipe or duct. This coefficient for round pipes is based on test data, but should be decreased for pipes below 12 inches in diameter and increased by a small amount for pipes above 24 inches in diameter.



Coefficient of Discharge for Converging Nozzles When Used for Fan Tests