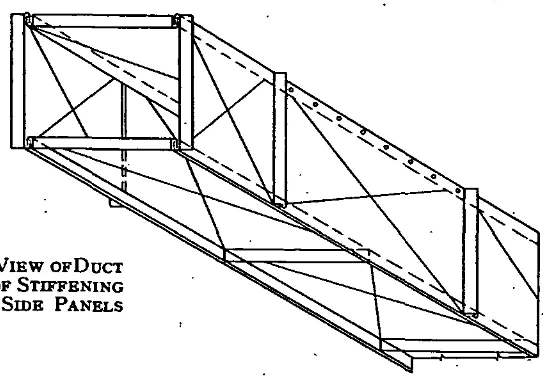

FIG. 8. ISOMETRIC VIEW OF DUCT SHOWING LOCATION OF STIFFENING SEAMS ON TOP AND SIDE PANELS OF DUCT

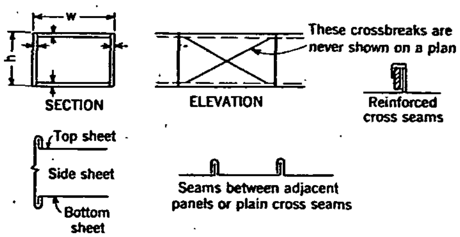

FIG. 9. DETAILS OF SEAMS

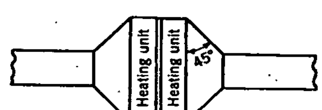

FIG. 10. METHOD OF INSTALLING HEATING UNIT

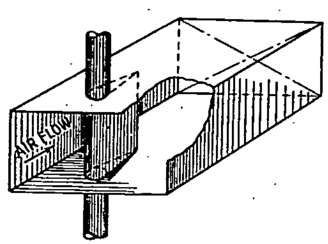

FIG. 11. INSTALLATION OF EASEMENT IN DUCT AROUND OBSTRUCTION

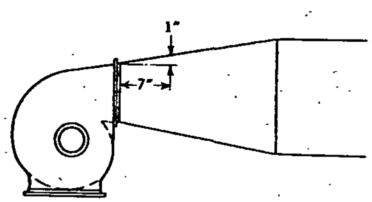

FIG. 12. FAN DISCHARGE CONNECTION

All risers will require dampering as in Example 3. The calculation of the friction is as follows:

The longest run from the intake grille to fan inlet is 100 ft.

(1) Duct friction 100 ft of 47-in. pipe $\left(\frac{100 \times 12}{47}\right)$ .... 25.6 dia.

Two 28½-in., 90-deg elbows in riser $\left(\frac{2 \times 28.5 \times 30}{47}\right)$ .... 36.4 dia.

(Two bad elbows in riser each equivalent to 30 diameters of duct).

One 28½-in., 90-deg elbow in horizontal run $\left(\frac{28.5 \times 8.5}{47}\right)$ .... 5.2 dia.

Total diameter of 47-in. pipe .... 67.2 dia.

Velocity head corresponding to 1400 fpm is $\left(\frac{1400}{4005}\right)^2 = 0.122$ in.

Taking 50 diameters as one head loss, then $\frac{67.2 \times 0.122}{50}$ .... 0.164 in.

(2) Intake loss from grille (1½ heads at a 400 fpm velocity 1½ × 0.01) .... 0.015 in.

(3) Static pressure required to produce one velocity head at 1400 fpm .... 0.122 in.

(4) Loss occasioned by step-up of velocity (0.20 × 0.122) .... 0.024 in.

(This loss varies from 0.05 to 0.40 velocity head depending upon the nature of the change. For average systems 0.20 velocity head is a close approximation.)

Static pressure loss on inlet side .... 0.325 in.

To this must be added the resistance on the discharge side of the fan. A fan outlet velocity of approximately 1500 to 1600 fpm may be used. Assuming the fan outlet to be equivalent in area to a 45-in. pipe, the velocity is 1525 fpm.

Loss on discharge (15 ft from fan outlet to discharge):

$$\frac{15 \times 12}{45} = 4 \text{ diameters of 45-in. pipe.}$$

The velocity head corresponding to a velocity of 1525 fpm is 0.145 and the discharge-side loss is $\frac{0.145 \times 4}{50} = 0.012$ in. The total static pressure loss of the system is then:

$$0.012 + 0.325 = 0.337 \text{ in.}$$

The fan will be selected to handle 16,800 cfm at a static pressure of 0.337 in. and to have an outlet velocity of 1525 fpm. Outlet area 11 sq ft.

Where there are one or more ducts with branches, the velocity of air in the ducts may be either chosen arbitrarily or calculated for friction losses. When arbitrary values are assigned, a certain amount of dampering should be provided for; this will be small when the method chosen permits a drop in velocity as the quantity of air is reduced.

After the total air quantity and the size of fan are ascertained, the main duct is usually fixed as being at least equal in area to the fan outlet, or perhaps 10 per cent greater. From this main pipe all others are proportioned. For example, if the main duct is 30 in. in diameter, a branch to carry 10 per cent of the total capacity should be 12.7 in. in diameter (see Fig. 4) in order to have the same friction per foot of length, while one