Since the plan (Fig. 6) shows a moderately short run of main duct, and with no risers at a considerable distance away, a fan should be selected which will have the required capacity of 26,455 cfm with a maximum velocity over the fan outlet of 1600 fpm. The outlet area should therefore be 16½ sq ft.

From the fan outlet to the main duct, a cone connection is used by means of which a part of the velocity head is transformed into static pressure, which regain, if the reduction in velocity is considerable, may be deducted from the resistance of the system. From a velocity of 1300 fpm in the main duct next to the fan, a gradual reduction is made as indicated on the basement plan (Fig. 6).

Fig. 7 shows an alternate basement plan for underground ducts. Lower velocities are

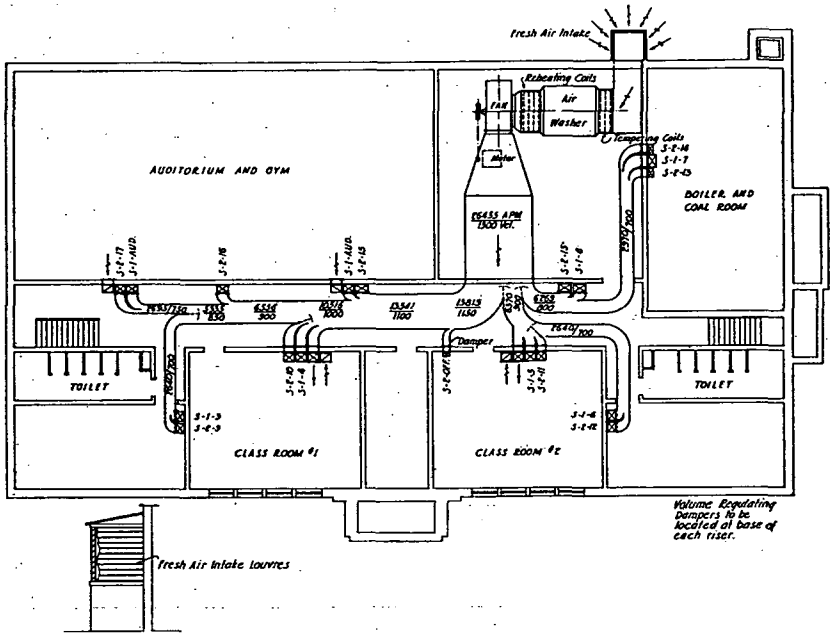

FIG. 6. BASEMENT PLAN METAL DUCT DISTRIBUTION TYPICAL SCHOOL LAYOUT

recommended than with the sheet metal duct system. Concrete ducts are usually made the full width of the corridor, and of uniform depth throughout.

The clear area of the fresh air inlet is based on a velocity of 900 fpm or $\frac{26,455}{900} = 29\frac{1}{2}$ sq ft. The tempering coil will raise the temperature of the incoming air from zero to 32 F with a velocity of 1000 fpm through the clear area. The air washer should have a maximum velocity of 500 fpm, or a clear area of 53 sq ft. The air washer, if provided with humidity control, will raise the temperature from 32 F to saturation at 42 F, which includes the heat required for evaporation; if no humidity control is provided, this heating load must be assumed by the tempering coils. The reheater coil will raise the temperature from 42 F to 70 F. If the system is used for both heating and ventilation, the reheater coil must be of sufficient depth to supply the maximum heat requirements for extreme weather. For more detailed information on tempering coil and air washer control, see Chapter 31, Design of Central Fan Systems.

The friction of the system in inches of water for this typical school is as follows:

	Friction Losses
Outside air intake 900 fpm velocity (1½ heads × 0.051)	0.077 in.
Tempering coil loss (from manufacturers' table)	0.100 in.
Air washer loss (from manufacturers' table)	0.250 in.
Reheater loss (from manufacturers' table)	0.100 in.

Discharge duct friction:

(A length of 50 diameters occasions a friction loss equivalent to one velocity head)

5 diameters of duct at 1300 fpm velocity

$$\left(\frac{5 \text{ diam}}{50} \times 0.106\right) \quad 0.011$$

Elbow at 1150 fpm velocity

$$\left(\frac{10 \text{ diam}}{50} \times 0.083\right) \quad 0.017$$

7 diameters of duct at 1100 fpm velocity

$$\left(\frac{7 \text{ diam}}{50} \times 0.076\right) \quad 0.011$$

2 diameters of duct at 1000 fpm velocity

$$\left(\frac{2 \text{ diam}}{50} \times 0.0625\right) \quad 0.003$$

4 diameters of duct at 900 fpm velocity

$$\left(\frac{4 \text{ diam}}{50} \times 0.051\right) \quad 0.004$$

2 diameters of duct at 850 fpm velocity

$$\left(\frac{2 \text{ diam}}{50} \times 0.045\right) \quad 0.002$$

5 diameters of duct at 700 fpm velocity

$$\left(\frac{5 \text{ diam}}{50} \times 0.0305\right) \quad 0.003$$

2 elbows at 700 fpm velocity

$$\left(\frac{20}{50} \times 0.0305\right) \quad 0.012$$

(Friction loss of one well rounded elbow is equivalent to 10 diameters of straight duct)

15 diameters riser at 540 fpm velocity

$$\left(\frac{15}{50} \times 0.018\right) \quad 0.006$$

2 bad elbows in riser at 540 fpm velocity

$$\left(\frac{60}{50} \times 0.018\right) \quad 0.022$$

(Friction loss of one bad elbow equivalent to 30 diameters of straight duct)

	0.091	0.091
Allowance for regulating damper and diffuser		0.100
Static pressure		0.718 in.

The fan should be selected from manufacturers' ratings which, according to the A.S.H.V.E. Standard Code for the Testing of Centrifugal and Disc Fans, will deliver 26,455 cfm of air at a static pressure of 0.718 in. and which has an outlet area of 16½ sq ft.