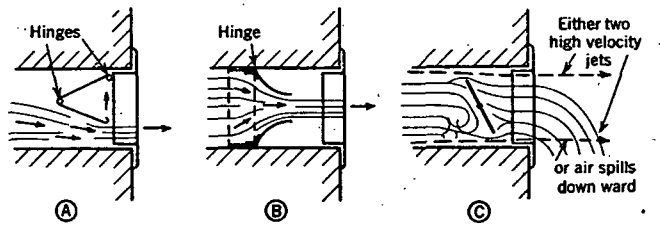

FIG. 7. EFFECT OF VARIOUS DAMPER ARRANGEMENTS DESIGNED FOR STRAIGHT BLOW

circuit between the supply and the ceiling exhaust or return intakes if supply velocities are low.

Some circular ceiling outlets combine the supply and return openings in a single unit. The return duct is in the center with the supply pattern on the outside. This method gives best results for cooling applications. The application for heating is more critical and requires consideration of ceiling height, amount of outside wall area, and number of air changes required. In extreme cases, stratification of warm air will cause short circuiting. Where the wall losses are a small part of the total, little difficulty is encountered with stratification.

Floor locations are used in heating installations for ceiling or side wall supply. When located so that air is drawn across exposed walls, the performance of the system may be somewhat improved. In general, floor locations tend to collect dirt and refuse.

Wall and door locations, depending on their elevation, have the characteristics of either floor or ceiling returns. In large buildings with many small rooms, the return air may be brought through door grilles or door undercuts into the corridors and then to a common return or exhaust. The pressure drop through door returns should not be excessive; otherwise the air distribution to the room may be seriously unbalanced with the opening or closing of the doors. Outward leakage through doors or windows cannot be counted upon for dependable results. In many cases, particularly in buildings with double glass or hollow glass block walls, forced return and relief systems are essential.

SPECIFIC APPLICATIONS

The two methods shown in Fig. 8 are suitable for application to theaters, churches, and auditoriums. In small or medium size theaters, it is sometimes practicable to use sidewall or front wall distribution. For the satisfactory operation of such a system during the winter heating period, the returns should preferably be located at the floor level and near

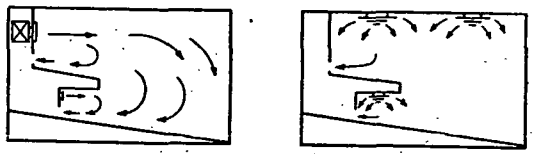

FIG. 8. AIR DISTRIBUTION METHODS FOR THEATERS, CHURCHES, AND AUDITORIUMS

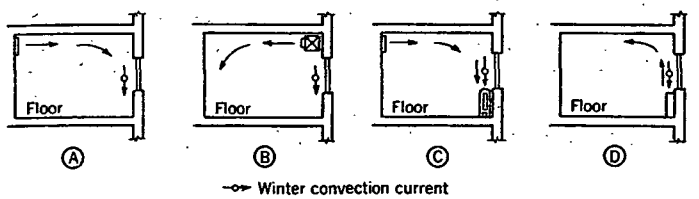

FIG. 9. DISTRIBUTION METHODS FOR SMALL ROOMS

A. Satisfactory for cooling. Unsatisfactory for heating in severe climates where the outside temperature is consistently below 40 F, and single glass and uninsulated walls are prevalent.

B. Performance approximately that of A when small diffusers are used in bottom of the duct.

C. Satisfactory for cooling. Satisfactory for heating if direct radiation is properly controlled.

D. Satisfactory for both cooling and heating. The air should be discharged slightly away from the wall, and for low velocities should be fanned out parallel to the wall.

the front of the theater to prevent cold spots which may result from exposed wall convection or infiltration from exits. Return intakes may be located higher where the exits and stage have separate means of heating.

Diagrams shown in Fig. 9 illustrate distribution methods for small rooms with exposed walls, such as for offices, hospital rooms, hotel rooms, apartments, etc. The cooling performance of various distribution methods as applied to a small store is shown in Fig. 10.

For specific requirements in connection with air distribution in marine applications see Chapter 49.

BALANCING SYSTEM

In designing an air conditioning system, it should be the aim of the engineer to so proportion the duct system that proper distribution of air to every supply opening will be obtained. Since this is almost impossible to accomplish in practice, it becomes necessary to have means of balancing

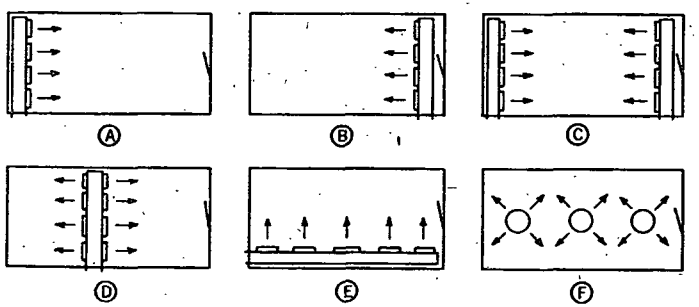

FIG. 10. SMALL STORE COOLING DISTRIBUTION

A. *Rear Wall.* High outlet velocity, satisfactory if properly designed; possibility of excessive air motion and drafts if used for wrong application.

B. *Front Wall.* High outlet velocity, results same as A.

C. *Front and Rear Walls.* Moderate room air motion, outlet blows should not impinge giving rise to down drafts in center.

D. *Center.* Moderate air motion, no impingement of air streams. Good results.

E. *One Side.* Moderate room air motion; should blow toward exposed wall. Good results.

F. *Ceiling.* Low room air motion. Good results. Outlets should be selected of sufficient size to allow for blocking when not located in perfect squares.