

COMBINED SYSTEMS

For a combined mechanical heating and cooling system using refrigeration for cooling, no particular change in the ducts usually is necessary. It is desirable from an economic standpoint to take advantage of the natural tendency of the cooler air to remain below the warmer air overhead, and anything which will bring about such stratification will effect an economy in refrigeration.

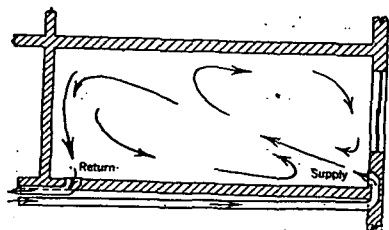


FIG. 1. AIR CIRCULATION WHEN HEATING WITH LOW-SUPPLY AND RETURN OPENINGS

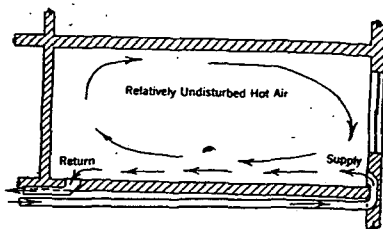


FIG. 2. AIR CIRCULATION WHEN COOLING WITH LOW-SUPPLY AND RETURN OPENINGS

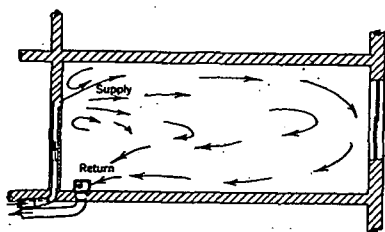


FIG. 3. AIR CIRCULATION WHEN COOLING WITH HIGH-SUPPLY OPENING AND LOW-RETURN OPENINGS

If the return ducts of a mechanically operated warm air system are adequate, appreciable cooling can be accomplished with natural means, as follows:

The fan outlet usually has a by-pass duct leading to a basement window or to a chimney provided for the purpose. The return duct has an alternative shaft opening into the highest part of the house. At night, in summer, the fan may be operated to exhaust the hot air from the top of the house by the return air duct just described and the fan will blow this heated air out of doors through the window, or preferably, of course, through the chimney. The cooler night air must then enter the house through the windows, and by its motion and temperature will extract the heat from the walls and furniture.

Fig. 3 shows the air circulation when cooling with a high supply opening and a low return opening. The air circulation, when heating, will be substantially the same as when cooling. Fig. 4 shows a section through an elemental mechanical warm air heating-cooling system. The attic plan is alternative. Summer night cooling may, of course, be accomplished by placing an exhaust fan in the attic.

SPLIT SYSTEMS

Many buildings which are heated by radiators or convectors and which have rooms requiring ventilation or cooling have air supply and exhaust systems independent of the radiators or convectors. Such installations are termed *split systems*. When the air enters a room through conventional side wall inlets an occupant may feel comfortable if the air is about the temperature of the room, but the introduction of too cool air may cause a feeling of draft. To correct this draft condition, glass chutes and elaborate diffusers are sometimes provided. The arrangement shown in Fig. 5 for supplying cool air to a room supplies satisfactory air circulation in spaces up to 400 sq ft in area with ceilings as low as 8 ft. There is no maximum ceiling limitation as to height.

When the room in question is provided with a unit ventilator which obtains its air supply directly through the wall from out of doors, the problem of distribution is by no means easy, although with a high velocity air jet passing in an upward direction, satisfactory air distribution will be had.

The use of unit air conditioners for summer cooling introduces no new features or difficulties which have not already been encountered in winter heating. Conditioners must be provided with positive control by means of valves or dampers, or both, which will prohibit any sudden and wide temperature variation, and keep the entering air not more than approximately 7 deg cooler than the air already in the space. This temperature margin is dependent on various factors including the ceiling height of the room and the velocity of the air at the discharge grille.

SCHOOL BUILDINGS

The air distribution conditions in school building classrooms are not unlike those illustrated in Fig. 1 for mechanical warm air systems and those in Fig. 6 for unit ventilator-equipped plants. The thermostat (Fig. 6) which controls the mixing damper and the heating unit in the unit ventilator should be in the air stream from the machine. School rooms which have center-ceiling inlets along the lines of Fig. 5 have given excellent results. It is important that the temperature of the entering air, whether this air be supplied by a local unit ventilator or by a distant central fan, be controlled so that the air cannot enter the room from a side-wall inlet or from a unit ventilator at a temperature more than a very few degrees cooler than that of the air already near the ceiling of the room.

Fig. 7 shows a section through a room equipped with a unit air conditioner or unit cooler. This is typical of the condition in effect when any recirculating room-cooling unit is installed.

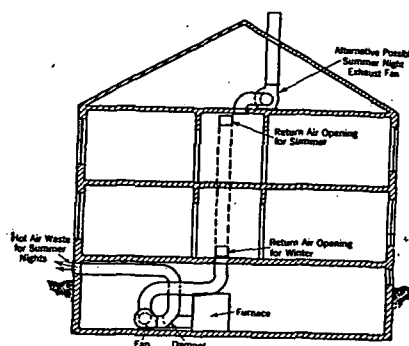


FIG. 4. SECTION THROUGH AN ELEMENTAL MECHANICAL WARM AIR HEATING-COOLING SYSTEM. THE ATTIC FAN IS ALTERNATIVE