gradually and in sequence until the correct temperature is reached. The opening or closing of the damper *B* and the valves *D* and *E* must be gradual or there will be a wide fluctuation in air temperature.

In ventilating systems it is customary to supply air to the ventilated spaces at an inlet temperature approximately equal to the temperature maintained in the rooms. The radiators therefore are designed to take care of all the heat losses from the room. Hence, in order to maintain controlled room temperatures it is necessary to use room thermostats governing control valves placed on the radiators. With this type of central fan system it is possible to ventilate a large number of rooms by means of one fan.

In some installations, such as in theaters or auditoriums, it is difficult to install sufficient direct heating surface to offset the heat losses from the room. Also there are installations where a short heating-up period is allowed before occupancy of the room, and it is advisable to use the

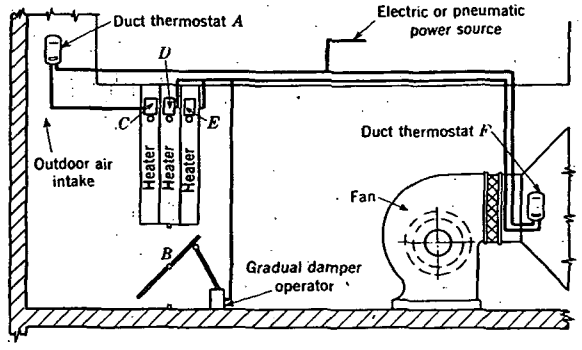



Fig. 6. Control of a Split System of Ventilation

entire heating capacity of the ventilating system for this purpose. An additional thermostat may be installed in the room to disable the duct thermostat and utilize the full heating capacity when the room is below a certain temperature, or a switch may be provided in the room or elsewhere for this purpose.

In central fan systems, air washers are often used and in such cases, due to the effect of temperatures on humidity, additional control is required. Fig. 7 shows such an arrangement with control of the second tempering heating unit by the air washer temperature and with the usual control of the first tempering heating unit by the outside temperature. This permits the air to be kept cool while passing through the washer so that too much moisture will not be absorbed. Fig. 7 also shows control of the reheating units by a duct thermostat in the fan discharge, and the application of a pilot thermostat to a system of this sort.

*Combined Systems.* There are various central fan systems which are used for both heating and ventilating. They are usually arranged with tempering heating units, automatically controlled to provide a minimum temperature for ventilating only, and additional heating units to supply





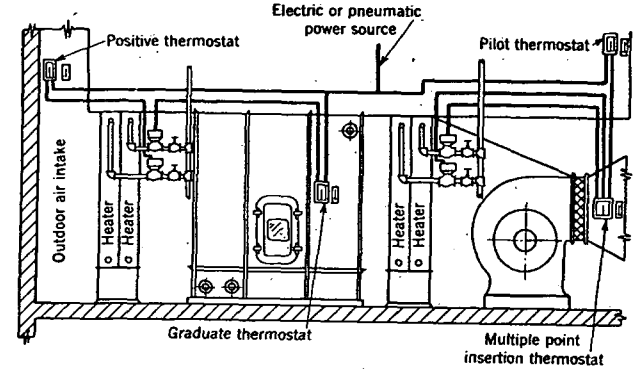



Fig. 7. Use of Pilot Thermostat on Ventilating System with Air Washer

the heating requirements. Fig. 8 shows a type of system which has the reheating units located in the fan room. Tempered air at about 70 F is supplied to the fan. It may be further heated by the reheating units, or it may pass into the tempered air chamber. A room thermostat controls a gradual-acting damper operator on the double mixing damper in the warm and tempered air chambers. When the thermostat calls for heat, the damper operator moves the dampers so that more air is taken from the warm air chamber. It is essential that the double mixing damper be moved slowly to prevent alternate blasts of hot and cold air from being supplied to the room.

*Outside Air, Recirculating, and Vent Dampers.* In all types of plenum systems, the outside air damper is usually opened and closed by a damper operator. This operator may be controlled from a switch in the engineer's room or it may be operated by a relay in the fan motor circuit.

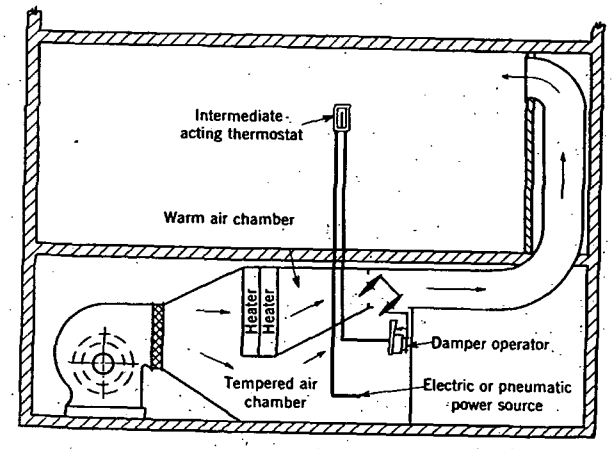



Fig. 8. Control of Mixing Dampers with Intermediate-Acting Thermostat