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 the heating requirements. Fig. 6 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

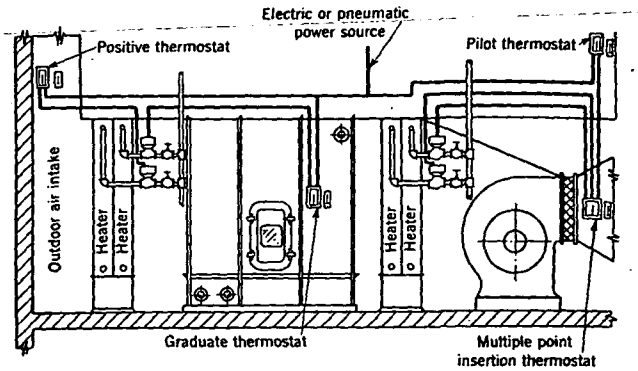

Fig. 5. Use of Pilot Thermostat on Ventilating System with Air Washer

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. When the ventilating fan is started, the relay causes the damper operator to open the outside air damper.

Recirculating dampers and vent dampers may also be opened and closed by means of damper operators controlled from remote locations. Generally these damper operators are positive acting and are either completely opened or closed. However, in some cases where part outside air and part recirculated air is used, it is advantageous to use damper operators which have a certain number of definite positions. With this type of operator it would be possible to use 75 per cent outside air and 25 per cent recirculated air, or any other proportions which might be predetermined. These damper operators are controlled from switches generally mechanically interlocked so that the total opening of the two dampers is 100 per cent.

Hand-Fired Coal Systems

In small buildings the heating plant may be controlled by a single thermostat located in a key room in the building, instead of each room having its own control.

The most common control for a hand-fired furnace or boiler consists of a room thermostat and a furnace regulator of some type. The thermostat should be located in a representative room; never, of course, near the chimney or heat flue, too close to a radiator, or in a drafty hallway, and preferably on an inside wall. The regulator is attached to the draft and check dampers of the furnace. When the temperature of the air surrounding the thermostat drops, the thermostat causes the furnace regulator to open the draft and close the check damper. As soon as the room comes up to temperature, the draft is closed and the check damper opened. With this arrangement on hot water heating systems it is advisable to install an immersion thermostat in the boiler. This thermostat should be connected with the room thermostat so that both must call for heat before the draft is opened, but either one may cause the draft to be closed. On warm air systems it is advisable to use a bonnet thermostat and on steam heating systems a pressure limiting device, in series in each case with the room thermostat. If the temperature of the heating medium becomes too high, the drafts will be closed even though the room thermostat continues to call for heat.

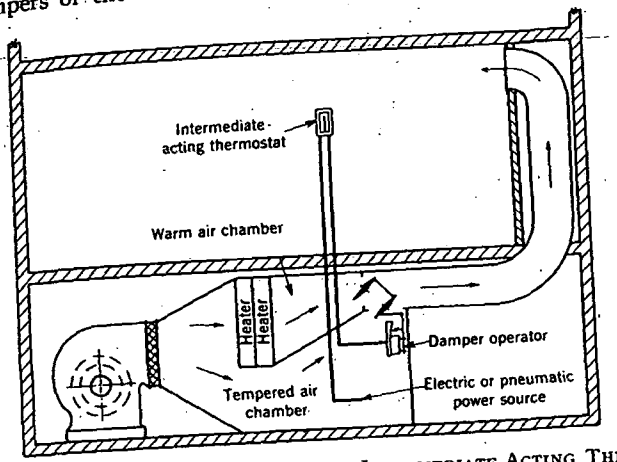

Fig. 6. Control of Mixing Dampers with Intermediate-Acting Thermostat

There have been some recent improvements in controls of this type, involving the use of special types of thermostats and auxiliary apparatus which will give closer control and prevent overheating in mild weather.

CONTROL OF AUTOMATIC FUEL APPLIANCES

It is essential that automatic temperature control be used with oil burners, gas burners, and stokers to aid economical operation. There are