

automatic control. Standard equipment on a steam boiler generally includes provision for control through a room temperature thermostat, a steam pressure regulator, and a device which shuts off the gas in the event that the water level becomes too low. Practically all gas boilers are or may be equipped with automatic safety pilots which shut off the gas if the pilot flame is too low.

Water boilers are adapted to operation under thermostatic room temperature control and are also provided with water temperature control equipment. Warm air furnaces can be under the control of thermostats

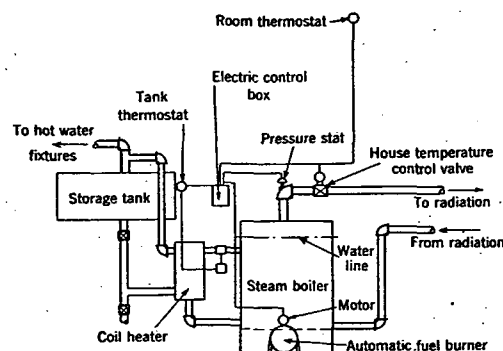


FIG. 10. TYPICAL ARRANGEMENT OF STEAM OR VAPOR SYSTEM WITH TWO THERMOSTATS CONTROLLING AUTOMATIC FUEL BURNER USED FOR HOUSE HEATING AND WATER HEATING

in the spaces being heated, as well as thermostats located in the heat ducts for the purpose of preventing unpleasantly hot air reaching the heated spaces. Variations in the pressure under which the gas is supplied to the appliance are controlled by means of a gas-pressure regulator. This is an essential part of practically all makes of gas-burning heating appliances; in fact, a gas-pressure regulator is required by the *American Gas Association* on all approved gas boilers, warm air furnaces (except floor furnaces), and unit heaters.

INDIVIDUAL ROOM CONTROL

The most complete type of automatic control is that by which the temperature in each room or in a group of rooms can be controlled. A thermostat in each room governs the valves on the radiators in that room, opening them as heat is called for and shutting them when the room is warm enough. The thermostats are all connected in relay so when any thermostat is calling for heat, an automatic burner will supply steam, hot water, or warm air, to the system; and when all the thermostats are satisfied, the burner will shut off. This is an excellent arrangement for larger residences, and it may be applied, in modified form, in houses which have one room or a section that is difficult to heat.

ZONE CONTROL

Zone control is a step between a single thermostat and individual room temperature control. The building is first divided into sections or zones which may have quite different heat requirements. With this method of control:

First: The zoning should be done with reference to the compass, since the north and west quarters in most localities require considerably more heat during the heating season than do the south and east quarters.

Second: Most large office buildings have more or less space occupied by merchants, and some by clubs, or restaurants, which have short hours of occupancy. Much can be accomplished in zoning with reference to the kind of occupancy of space. For additional information on this subject, refer to Chapter 31.

Variations of the usual zone control methods by the use of recently developed special devices have been quite successful in obtaining greater economy from heating systems. Frequently these use an outside thermostat or group of thermostats which adjust the operation of the controls to conform to variations in weather conditions.

COOLING UNITS

Cooling units are readily adaptable to thermostatic control. Several arrangements are as follows:

1. Room thermostat in conjunction with a magnetic or motor-operated valve to regulate the flow of refrigerant to coil. Usually the fans operate continuously.
2. Room thermostat to control the operation of the compressor. The fans operate continuously.
3. Room thermostat to control the operation of the fan motors.
4. Room thermostat to control the operation of the fan motor and the compressor motor simultaneously.
5. Room thermostat to control the operation of the compressor with back pressure control to regulate the fans.

INDUSTRIAL PROCESSES

There are many industrial processes requiring automatic temperature and humidity regulation. The control equipment operates on the same principles that have been described, but it is often especially designed for each particular process. Each installation, or the installation for each process, is likely to be a problem peculiar to that process.

AIR CONDITIONING SYSTEMS

The following fundamental principles should be borne in mind in the solution of problems involving the control of air conditioning systems:

1. Dew-point temperatures vary only with the amount of moisture. That is, no matter how much a given mixture of air and water vapor is heated or cooled, the dew-point temperature remains the same, as long as there is no addition or subtraction of water. Cooling below the dew-point temperature will, of course, cause condensation of the water vapor. Also, at the same temperature, there is always the same proportion of