

straight strip, the circular strip, the spiral and the helix. Fig. 3-a shows the straight strip used in a compressed air thermostat, Fig. 3-b shows the spiral used in a mercury tube type of thermostat, and Fig. 3-c shows the curved strip used in an open contact thermostat.

#### Direct-Acting and Indirect-Acting Thermostats

Thermostats may control directly, or indirectly, the equipment which regulates the supply of heat and are frequently classified on this basis as follows:

**Direct-Acting or Self-Contained Thermostats.** These instruments have sufficient power in themselves to actuate the controlling devices. They may be subdivided

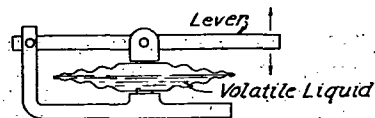


FIG. 1. DIAPHRAGM TYPE THERMOSTAT

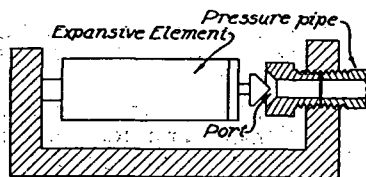


FIG. 2. DIRECT EXPANSION TYPE THERMOSTAT

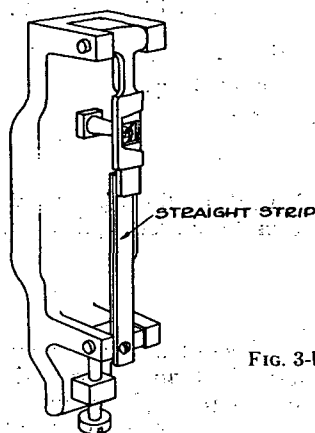


FIG. 3-a. STRAIGHT STRIP BI-METALLIC TYPE THERMOSTAT

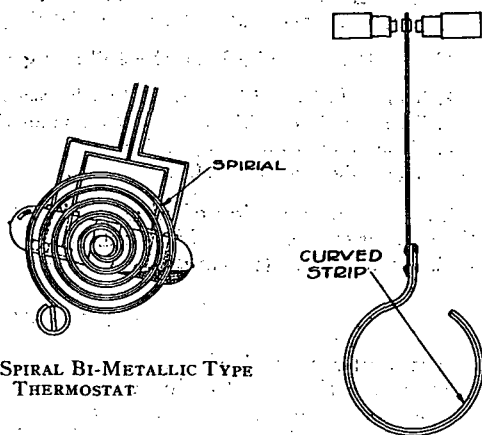


FIG. 3-b. SPIRAL BI-METALLIC TYPE THERMOSTAT

FIG. 3-c. CURVED STRIP BI-METALLIC TYPE THERMOSTAT

further into two groups: (1) those in which the sensitive element and the controlling device are in one body, the power from the thermostat being transmitted by a system of levers; and (2) those in which the sensitive element and the controlling device are separated, the power from the thermostat being transmitted through a capillary tube.

The expansion or volatilization of a fluid actuates a diaphragm which transmits its motion to a valve or damper. The small movement of the diaphragm may, if necessary, be multiplied and transmitted by mechanical means, such as a system of levers, or by liquid pressure in order to produce sufficient movement of the damper or valve. This thermostat is inherently intermediate acting since the expansion or volatilization of the fluid and movement of the diaphragm is proportional to the change in temperature.

There are many types of thermostatic radiator valves which come in the first group. In general they maintain some temperature at their location which bears a relation to the room temperature. Since these control devices are inherently intermediate acting, they should not be used on one-pipe systems because a partially closed valve will not allow the condensation to leave the radiator.

Fig. 4 shows the operation of a self-contained thermostat in connection with a hot water storage tank whereby the supply of steam to the tank is controlled directly by the temperature of the water in the tank. Fig. 5 shows the use of a self-contained thermostat on a hot water tank with vacuum return.

**Indirect Acting Thermostats.** These instruments do not have sufficient power to operate the controlling devices, but function to control the external source of power which in turn operates the valves and dampers. There are two distinct groups of these instruments, the *compressed air* and the *electric*.

Essentially the compressed air thermostat consists of a hole or leak port which is opened or closed by means of the thermostatic element. This port communicates with a diaphragm which in turn controls the supply of compressed air reaching the valve or

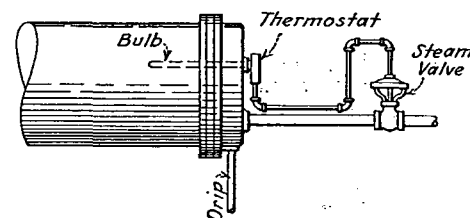


FIG. 4. SELF-CONTAINED THERMOSTAT IN HOT WATER STORAGE TANK

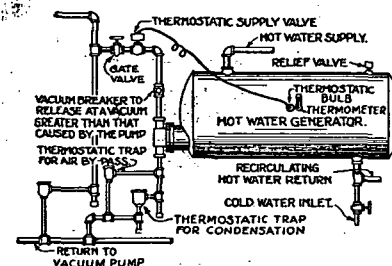


FIG. 5. SELF-CONTAINED THERMOSTAT ON HOT WATER TANK WITH VACUUM RETURN

damper operator. The instrument regulates the flow of the compressed air to and from the controlled devices. There are two classes of these instruments, one of which allows the air pressure to build up or be released instantly and is called the positive or snap-acting type; and the other which allows the compressed air to be maintained at any intermediate pressure called the intermediate or gradual-acting type.

The electric thermostat makes or breaks one or more electric circuits. In other words it amounts to an automatically operated switch which opens and closes circuits in response to the change in temperature. The controlled devices may be constructed to be positive or gradual acting.

There are many models of all of these thermostats which may be generally grouped as follows:

1. **Room Thermostats.** All thermostats which are designed to be used in a room to control the temperature within that area.