THERMOSTATS

Primarily there are four types of thermostats used today in the heating industry. (See Figs. 1, 2, 3 and 4).

The *first* type may be called the diaphragm type which, by means of an expanding liquid or gas within a diaphragm or bellows, furnishes motion; and this motion may be mechanically transmitted in proportion to the rise and fall of temperatures surrounding the diaphragm.

The *second* type may be called the bi-metal type which furnishes motion by means of intimately attached metals having dis-similar coefficients

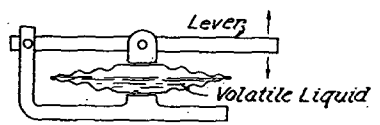

FIG. 1. DIAPHRAGM TYPE THERMOSTAT

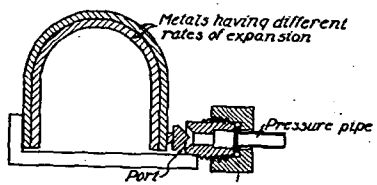

FIG. 2. BIMETALLIC TYPE THERMOSTAT

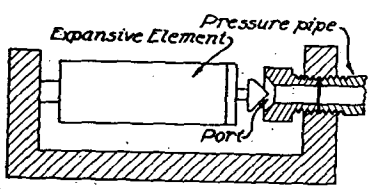

FIG. 3. DIRECT EXPANSION TYPE THERMOSTAT

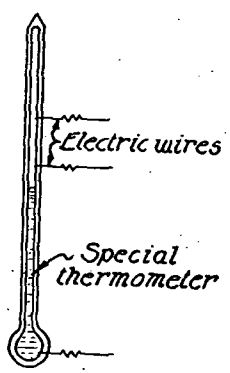

FIG. 4. MERCURY TYPE THERMOSTAT

FOUR GENERAL TYPES OF THERMOSTATS

of expansion. This type is inherently more sensitive to temperature changes than the first type but lacks in force to transmit or cause motion.

The *third* type operates by direct expansion and contraction of a substance which has a high coefficient of expansion such as hard rubber. The slight movement of the thermostatic element usually must be multiplied through a system of levers.

The *fourth* type is the mercury type. Usually it takes the form of a standard thermometer with electric contacts carried through the glass tube at the degree points where motion is to take place. For instance, if heat is to be turned on at 68 deg. and off at 70 deg., the contacts would be welded through the glass tube at 68 deg. and 70 deg. This is a very sensitive type of thermostat, but is not subject to adjustment for different

temperatures. This type of thermostat is well-adapted for situations where there is considerable vibration, as for instance in the control on moving vehicles.

Thermostats may further be subdivided into two classes or types.

One, the self-contained or unit type, which by means of its thermo-element exerts its resultant force directly upon the flow of the medium through the agency of a damper or valve.

Two, the pilot type, which in itself transmits only sufficient motion to operate very small valves or to make and break light electrical contacts. Through these small valves liquids or gases already under pressure may be employed to an unlimited degree. So, also, the delicate electrical contacts may energize relay circuits which in turn may place in operation the most gigantic machinery.

A further classification may be made, namely, thermostats having two or more thermo-elements acting in conjunction to transmit a combined or integrated motion.

Thermostats are designed with a multitude of motion-ratios and modifications to meet a wide range of requirements, a few of which are:

1. Room thermostats for controlling *air temperatures* in living quarters.
2. Immersion thermostats for controlling *liquid temperatures* in tanks.
3. Thermostats for controlling or limiting *flue gas temperatures*.
4. Thermostats for controlling *maximum and minimum pressure or temperature* conditions in boilers, refrigerators, etc.
5. Thermostats for operating electric circuits and for closing fuel valves on automatic fuel burners on failure of any part of apparatus or of fuel, commonly called *safety thermostats*.

The ever-increasing demand for greater perfection in heating, with minimum attention and care, are responsible for the many thermostatic devices which not only control but limit or stop automatic fuel feeding-machines when safety demands it.

RESIDENCE HEATING

Homes of every description and in nearly every clime from cottages to palaces require some heat at some time beyond that given by the sun in its daily course.

This heat may be called manufactured heat, and in order that it shall be supplied in the correct amount to produce comfort some means of regulation must be used, it being assumed that the equipment employed to deliver the heat is of sufficient capacity to produce enough under any and all circumstances. In modern accepted practice heating equipment may today be called upon to supply the maximum load, and tomorrow 90 per cent of it may be or should be idle if the human comfort curve and heat curve run at all parallel.

An average residence, not employing mechanical ventilation but maintaining a temperature of approximately 70 deg., can, in a climate having an average temperature of 40 deg. during the heating season, closes off its heat source fully one-third of the time; that is, for a heating season of 5,040 hours the heat supply may well be cut off for more than 1,700 hours.

Refinements, such as conditioning of air, effect the heat requirements, but also need additional control to perfect their operation.