sufficient energy from the thermostat itself. This class of apparatus is especially adpated to single installations, as for service hot-water heaters, residence heating, and the like. It is suggested that this kind of thermostat be called the unit type. In present commercial practice most unit type thermostats use the expansive power of a liquid or gas, contained in a hermetically sealed receptacle.

2. The other and more elaborate class of thermostat, Fig. 60, includes the type of thermostat which controls air or liquid or electricity already under pressure, and which by controlling this outside power, operates the dampers or valves against springs or weights and similar opposition which will reverse conditions when the outside power is shut-off. There is practically no limit to the power which can be applied in this manner.

It is suggested that this kind of thermostat be called the pilot type. In present commercial practice, pilot type thermostats are used for large buildings, where many thermostats are required, usually with air at about 15 lb. pressure, from an electric or steam compressor.

Compressed air is a very reliable agent, capable of great flexibility and elaboration of control, and is of considerable corollary use for remote

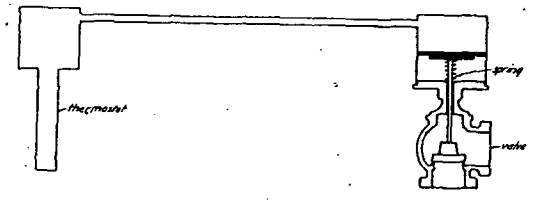

FIG. 60. EXAMPLE OF UNIT TYPE THERMOSTAT

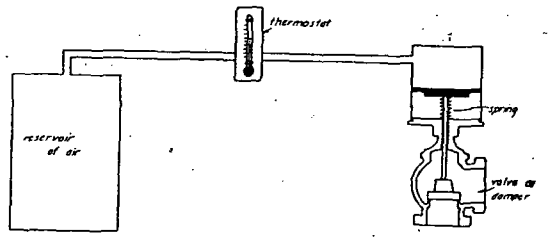

FIG. 61. EXAMPLE OF THERMOSTAT USING OUTSIDE POWER

Note.—When thermostat opens, air passes from reservoir and closes valve. When thermostat closes, air between thermostat and valve is released and spring opens valve.

operation manually of distant dampers and valves. Pilot type thermostats are used to operate electric switches, the current then passing to electric motors or to magnets which move the dampers and valves. Electricity is so flexible and adaptable that very complicated and elaborate interlocked functions are possible.

Pilot type thermostats are also used to operate valves on pipes from water supply mains, thus using hydraulic power for moving valves and dampers. Owing to silting up of pipes which have sluggish currents and to corrosion, this method is not always to be advised.

APPLICATIONS OF AUTOMATIC HEAT CONTROL

New uses and styles are developed daily. Some of the applications will be listed which are believed to be approved methods of installation.

Tempering Heaters

The tempering heaters, particularly if they are of copper with extended surfaces, and there is a two-pipe vacuum system of steam circulation having a vacuum pump, should be a separate outer layer of radiation capable of heating the air from the coldest temperature likely to be encountered to a temperature above freezing. This outer layer should be controlled by an outside thermostat set to shut off steam when the outside temperature reaches around 34 deg., and to keep steam turned on when the outside temperature is cooler than 34 deg. There should be an additional layer of tempering heater, controlled by an additional thermostat in the duct beyond the fan, where mixing of the strata of air has been accomplished by the fan. This thermostat should be set to control the temperature at the desired degree for cooling the building, such as will give an average temperature at the delivery opening of say 65 deg., or if this causes drafts, at a slightly higher temperature.

If there is no vacuum system of steam circulation, it is decidedly likely that any attempt to control the temperature by opening and closing steam and return valves will result unfavorably, due to freezing of the radiation and sudden temperature fluctuations in the rooms, as tempering heaters are immediately responsive and flash hot or freeze solid with great rapidity. Where no vacuum system is available it will be wiser to control the tempering heaters by means of dampers, preferably of the interlocked double type operating in a slow or intermediate manner and reducing positively the air volume through the heaters as they increase the air volume through the by-pass around the heaters. Under this condition no diaphragm valves will be placed on the tempering heater supply and return connections.

Air Washers

The air washer should invariably be placed between an outer tempering heater capable of warming the air above a freezing temperature, preferably controlled by an outside thermostat, and an inner tempering heater capable of warming the conditioned air to the desired delivery temperature and controlled by a thermostat in the duct beyond the fan. It is never permissible to use a by-pass damper around a tempering heater in front of an air washer.

Control of humidity is possible by adjustment of the temperature of the air as it meets the water, and in greater refinement, by control with an additional thermostat, of the water temperature, cooler for lower relative humidity, possibly from a refrigerated supply; and warmer for a higher relative humidity, possibly from a heated supply.

Room Temperatures

The room temperatures are controlled by individual thermostats, operating valves on the radiators and mixing dampers in the flues, as may be necessary. If a vacuum system of steam circulation is installed,