CHAPTER VIII.

TEMPERATURE CONTROL.

GENERAL REMARKS.

There is, perhaps, no device that contributes more to comfort and convenience in the home during the winter months than an automatic temperature regulator. Not only may an even temperature in the house be secured, but those sudden and severe strains are avoided to which a furnace is often subjected when regulated by hand. The fire is maintained so evenly that the coal is burned to the best advantage, and few, if any, clinkers are formed.

TYPES OF REGULATORS.

These devices may be divided into two classes, one comprising those in which the drafts are regulated directly by the temperature of the air passing through the furnace, and the other those in which they are governed indirectly by changes in the temperature of the rooms.

In the former the difference in the rate of expansion of certain metals is taken advantage of, to operate the dampers by means of levers connected with them by wires or chains.

In the latter the thermostat placed on the wall of one of the rooms is so constructed that a change in temperature causes a metal strip or U shaped piece to open or close an electric or pneumatic circuit connected with a motor or diaphragm which operates the dampers. For large installations the pneumatic system is principally used.

A quite different style of thermostat consists of a closed vessel containing a volatile liquid. Changes in the temperature of the room produce variations in the pressure within the vessel, which are transmitted through a small tube to a diaphragm operating the dampers. The thermostat should be placed in a room most nearly representing the average temperature of the house. It

should be located where it will not be subjected to cold drafts or to currents of warm air from registers.

DAMPER CONNECTIONS.

To give the best results the regulator should be connected with both smoke pipe and ash pit dampers; a sufficient air supply will then be assured to promote proper combustion. The fire will respond more quickly to the action of the regulator than when the latter is connected only with the smoke pipe damper.

OPERATION OF THE REGULATORS.

Regulators acted upon by changes in the temperature of air within the furnace serve to control the fire much as an ordinary diaphragm regulator on a steam apparatus. When used with house heating furnaces, regulators of this type must be set each day with reference to the outside conditions. If these remain nearly uniform an even temperature in the house will be maintained, but with sudden changes in the weather this type of regulator, unless reset, is not capable of preventing variation in the temperature of the rooms.

Regulators run by clockwork, which open dampers at any desired time, are often used to automatically turn on the drafts in the early morning. They generally consist of a simple alarm clock with a ratchet or gear arranged to trip a lever, thus allowing the weighted damper to open.

CONTROL OF MIXING DAMPERS.

In schools, churches and public buildings where mixing dampers connected with warm and cold air ducts are used, they may best be controlled by thermostats having a gradual movement. These thermostats have no connection with the draft dampers of the furnaces, and hence no control of the fire; therefore the direct acting type of regulator may be applied to them to advantage to prevent their becoming overheated.

CHAPTER IX.

ESTIMATES AND CONTRACTS.

FORMS AND BLANKS.

In laying out furnace heating work it is desirable to have the necessary items conveniently arranged on a printed form, either in an indexed book or on loose cards or sheets, which may be filed alphabetically. By the use of printed forms omissions will be avoided and the data preserved in a form convenient for reference.

It is well to make a rough sketch of the house, giving outside dimensions and showing the general arrangement of rooms and the points of the compass. The items may well include: Date, name and address of owner, location of house, name of architect, location of house in regard to exposure to cold winds, list of rooms with size and number of sides exposed, size of registers and pipes, length of hot air pipes, length of smoke pipes, clear hights of basement and floors above, square feet of exposed wall, size of furnace adapted to the estimated exposure, combined area of hot air pipes, area of air passages through furnace, area of cold air box. A form of data card, 3¾ x 8 inches, used by a Boston company, is shown herewith.

In computing the cost of furnace pipes it is convenient to allow for elbows by adding a length of straight pipe equivalent in cost. Two feet of straight pipe may be considered approximately equal in cost to one elbow of the same diameter.

ESTIMATES.

Having determined the size of the furnace, pipes and registers the cost of the job may be estimated. For an ordinary house heating apparatus the following are the principal items of expense:

Furnaces (number, kind, size, diameter fire pot, portable or brick set), covering bars and man door for brick setting, smoke pipe and check damper, fire tools, pipes and registers, stones, boxes, nettings, plaster rings, floor flanges, dampers, furnace col-

lars, covering tin or asbestos millboard, cold air box, galvanized iron cold air neck, shield over furnace, labor in erecting, fares and expenses, freight and carting, masons' or carpenters' work and materials.

An estimate for heating schools, churches or public buildings may include, in addition to the items stated above:

Galvanized iron heating and ventilating flues, mixing dampers, chains and fixtures, regulating and shut off dampers, wrought iron smoke stack in ventilating shaft, stack heater at base of ventilating shaft, steam boiler with coils in ventilating flues in place of stack heater, pipes, valves, fittings and labor in connection with same, hood for top of galvanized iron ventilating shaft.

A hot water combination heating estimate commonly includes these items:

Water heating section or coil in furnace, radiators or coils, pipes, valves, fittings, air valves, pipe covering, expansion tank and fittings, labor of erecting, painting and bronzing, fares and expenses, freight and carting.

SPECIFICATIONS.

The specifications should be clear and to the point, leaving no opportunity for misunderstanding between the contractor and the owner. The items just enumerated form the basis of the specifications, which should describe each of them fully.

GUARANTEE.

Unless expressly stipulated to the contrary it is commonly understood that the apparatus specified in a proposal for heating is to be capable of warming rooms having registers or radiators to 70 degrees in zero weather, when operated continuously as directed by the contractor.

PAYMENTS.

On small jobs the entire payment is generally made on completion of the work; on larger ones payments are made as the work proceeds, on the certificate of the architect or engineer. In case a job is completed too late in the season to be tested in severe weather and the owner is unwilling to have the final payment com-

strued to mean a final acceptance of the work, the contractor, if responsible, can generally secure a prompt settlement by giving the owner a written extension of the guarantee over another winter, allowing ample time for a thorough trial of the apparatus.

.....*Date*.....
Owner.....
Address.....
Location of House.....
Architect.....

Room	Size	Sides exposed	Reg size	Pipe size	Length of pipes		
					Run off	Riser el. col. damp.	Total

On back of card show plan of house, with outside dimensions, arrangement of rooms and points of compass.

Clear h't's B'ment.....*1st*.....*2d*.....*3d*.....*4th*.....
Smoke Pipe..... *ft.*
Exposure, Severe.....*Moderate*.....*Sheltered*.....
Total Exposure.....*sq. ft. Material*.....
Furnace; Use No.....*Rated at*..... *sq. ft.*
Combined Area. Hot Air Pipes..... *sq. in.*
Area, Air Passage in Furnace..... *sq. in.*
¾ *Combined Area of Pipes*..... *sq. in.*
Area, Cold Air Frame..... *sq. in.*
Designed by.....

The custom of allowing a portion of the contract price to remain unpaid until the apparatus has been tested in zero weather is becoming less common among responsible contractors.

In heating contracts for schools, churches or public buildings a bond for the successful completion of the work is often required.