

duces a more secure feeling in the customer's mind when putting in gas-fired house-heating equipment, if he knows that he can burn coal at any time he may desire.

For steam or vapor installations, it is desirable to have the water line in both boilers at the same level so that if desired the gas boiler may automatically take up the load if the fire in the coal boiler goes out.

CHIMNEYS FOR GAS FIRED APPLIANCES

The burning of gas differs from the burning of coal in that the force which supplies the air for combustion of the gas comes largely from the pressure of the gas in the supply pipe, whereas air is supplied to a bed of burning coal by the force of the chimney draft. If, with a coal-burning boiler, the draft is poor, or if the chimney is stopped, the fire is smothered and the combustion rate reduced. In a gas boiler or furnace such a condition would interfere with the combustion of the gas, but the gas would continue to pass to the burners and the resulting incomplete combustion would produce a dangerous condition. In order to prevent incomplete combustion from insufficient draft, all gas-fired boilers and furnaces should have a back-draft diverter in the flue connection to the chimney.

A study of the drawing of a typical back draft diverter will make it plain that a stoppage in the chimney will cause the combustion products to come out into the boiler room, but there will be no interference with the complete combustion of the gas. Another feature in the construction of the back-draft diverter is that a down draft from the chimney will have practically no effect upon the combustion of the gas, due to the baffle deflecting the draft into the boiler room.

As is the case with the complete combustion of almost all fuels, the products of combustion for gas are carbon dioxide (CO_2) and water vapor with just a trace of sulphur trioxide (SO_3). Sulphur usually burns to the trioxide in the presence of an iron oxide catalyst. The volume of water vapor in the flue products is about twice the volume of the carbon dioxide when coke oven or natural gas is burned. Because of the large quantity of water vapor which is formed by the burning of gas, it is quite important that all gas-fired central heating plants be connected to a chimney having a good draft. Lack of chimney draft causes stagnation of the products of combustion in the chimney and results in the condensation of a large amount of the water vapor. A good chimney draft draws air into the chimney through the openings in the back-draft diverter, lowers the dew-point of the mixture, and reduces the tendency of the water vapor to condense.

A chimney for a gas-fired boiler or furnace should be constructed in accordance with the principles applicable to other boilers. Where the wall forming a smoke flue is made up of less than an 8 in. thickness of brick, concrete or stone, a burnt fire clay flue tile lining should be used. Care should be used that the lengths of flue tile meet properly with no openings at the joints. Cement mortar should be used for the entire chimney.

Chapter 20

HEATING WITH ELECTRICITY

Advantages of Electric Heating; Types of Electric Heaters; Off-Peak Electric Thermal Storage Systems; Cost Comparisons; Insulation Required; Heat Equivalents of Electricity.

THE use of electricity as a direct heating medium, employing so-called space or radiant heaters, is confined largely to mild climates, or to localities where electric rates are low. Direct electrical heaters take energy co-incidentally with the heater requirements, which means that the load usually comes directly on the power station's peaks. The thermal storage system uses off-peak electrical energy for which commercially economical rates are now being made available. Therefore, this off-peak form of electrical heating is becoming practicable in many northern climates as well as in milder climates. In some cases electricity is used as a supplementary means of heating such as in industrial plants for the heating of remote spaces.

ADVANTAGES OF ELECTRIC HEATING

The following are some of the important advantages of electric heating:

1. Accurate regulation of room temperatures.
2. Simplicity of operation.
3. Freedom from the dangers attending the presence of a flame.
4. Freedom from handling and disposition of resulting products of combustion.
5. Reliability of source of supply.
6. Maximum efficiency of conversion of the energy into usefulness.
7. Cleanliness.
8. Minimum maintenance and reconditioning.
9. Efficient servicing and supervision by public utility at low cost.

From the foregoing items it is apparent that electricity embraces all the requirements of an ideal heating agent, excepting low cost. Consequently, where electrical energy is sufficiently low in cost, it is being used more or less for heating buildings.

TYPES OF ELECTRIC HEATERS

The various commercial types of electric heaters may be classified as follows:

1. DIRECT HEATERS

a. *Radiant Type.* For quick intermittent heating. The heating