

size when the stem is horizontal. When the stem is in the vertical position the capacity is reduced very much further.

The capacity of various sized lines containing a gate valve is given in Table 49.

In a number of the tables listed the word *maximum capacity* is used. This is the maximum value obtained at the Research Laboratory with smooth operation. In actual practice the system should be so designed as to allow a reasonable factor of safety.

CHAPTER V

THE BOILER

FUNCTIONS OF THE MAJOR PARTS OF THE HEATING SYSTEM

A STEAM heating plant consists of three major parts, the *boiler*, the *pip*ing and the *radiation*, each of which has certain functions to perform in offsetting the heat loss from the building. It is the function of the *boiler* to deliver at its outlet the necessary amount of dry steam to the piping system. It is the function of the *pip*ing system, including valves, to distribute this dry steam to the various radiators and to return the condensate to the boiler at the same rate as it leaves the boiler in the form of steam. It is the function of the *radiators* to transmit the heat contained in the steam to the various rooms to be heated. It is understood that before the piping and valves can distribute the steam, they must first eliminate the air from the system. By dry steam is meant steam containing less than 2 per cent moisture.

RATED VS. OPERATING CAPACITY OF A BOILER

Commercial ratings of boilers are generally computed on the following basis: Number of pounds of dry steam (or its equivalent, as stated, in square feet of direct radiation) that the boiler can deliver at its outlet per hour, when operating under certain specified conditions, as to: Condition of boiler, draft intensity, kind and quality of coal burned per hour, and period of firing and method of operation as indicated by the CO₂ recorder and temperature of flue gases. No rating is reliable unless definite operating conditions are specified. The operating capacity of a boiler may range anywhere from 20 per cent of its rated capacity to 150 per cent of its rating in modern heating boilers. To expect a boiler to develop its rated capacity with oil in the boiler, air leaks between the sections or through the setting, fouled heating surface, dirty grade of coal, weak draft, and incompetent firing and operating conditions, is about on a par to expect a racing automobile to win a race with water in the oil, leaky set of tires, fouled spark plugs, poor grade of gas, improper carburetor adjustment, and a novice at the wheel.

The operating capacity or efficiency of any heating boiler, high or low pressure, depends more upon the operating conditions than upon the design of the boiler—important as proper design may be. This point cannot be emphasized too strongly as it is one that is frequently lost sight of.