As it will usually be found that several boilers will meet the specifications, the final selection of the boiler may be influenced by other considerations some of which are:

1. Dimensions of boiler.
2. Durability under service.
3. Convenience in firing and cleaning.
4. Adaptability to changes in fuel and kind of attention.

In large installations, the use of several smaller boiler units instead of one larger one will obtain greater flexibility and economy by permitting the operation, at the best efficiency, of the required number of units according to the heat requirements.

Selection of Boilers for Oil Fuel

The boiler or boilers to be installed shall be capable of supplying at the boiler outlets the total Btu per hour as computed by the method outlined under the heading *Selection of Solid Fuel Boilers*. The oil burner to be installed shall have a capacity to burn, with efficient combustion, the quantity of the oil it is proposed to employ per hour sufficient to develop the boiler output required.

Where test data are not available for the contemplated combination of boiler and oil burner, economical performance may be obtained by selecting a boiler in which the heat absorbed per square foot of boiler heating surface at the maximum continuous output is approximately 4,000 Btu per hour. It should be ascertained that the burner selected has sufficient combustion space to permit the burning of the required quantity of the available oil fuel.

Selection of Gas-Fired Boilers

Experience with gas-fired boilers, which are rated on Btu output and which can only slightly exceed the rated output, but which require no chimney draft, has shown that a continuous output capacity of 25 per cent in excess of the normal heat loss of radiation, plus piping, is ample for all direct radiator installations. This corresponds to an output of 40 to 60 per cent in excess of the normal heat loss of the radiation, depending upon the proportion of piping to radiation.

Gas-fired boilers rated according to the *American Gas Association* method, and which therefore have *A.G.A.* ratings are selected in the majority of direct-radiator installations, according to the table of selection factors given in Table 1 of Chapter 19.

SPACE FOR AND LOCATION OF BOILERS

Boiler rooms should, if possible, be situated at a central point with respect to the building and should be designed for a maximum of natural light. The space in front of the boilers should be sufficient for firing, stoking, ash removal and cleaning or renewal of flues, and should be at least 3 ft greater than the length of the boiler firebox.

A space of at least 3 ft should be allowed on at least one side of every boiler for convenience of erection and for accessibility to the various dampers, cleanouts and trimmings. The space at the rear of the boiler

should be ample for the chimney connection and for cleanouts and with large boilers the rear clearance should be at least 3 ft in width.

The boiler room height should be sufficient for location of boiler accessories and for proper installation of piping. In general the ceiling height for small steam boilers should be at least 3½ ft above the normal boiler water line. With vapor heating especially the height above the boiler water line is of vital importance.

When steel boilers are used, space should be provided for the removal and replacement of tubes.

PIPE CONNECTIONS

The pipe connections which must be made to both steam boilers and hot-water heaters are:

1. Steam or flow connections from the top.
2. Return connections to the bottom.
3. Blow-off or drain connections.
4. Cold water connections for filling.

The *steam or flow connections* and also the *return connections* must be carefully designed to provide for expansion of the piping, as well as of proper size and number so as to give low outlet velocities, and uniform distribution of the return water over the boiler heating surfaces. The velocity of flow through the outlets of low pressure steam heating boilers should not exceed 15 ft. per second if entrainment of moisture is to be prevented, as with higher velocities the steam leaving the boiler may carry water with it.

Blow-off or drain connections should be made near the boiler and so arranged that the entire system may be drained of water by opening the drain cock. In the case of two or more boilers separate blow-off connections must be provided for each boiler on the boiler side of the stop valve on the main return connection.

Water service connections must be provided for both steam and water boilers, for refilling and for the addition of make up water to boilers. This connection is usually of galvanized iron pipe, and is made to the return main near the boiler or boilers. The heating contractor is required to run this line to the nearest water service main, in which the plumber has left a plugged tee.

For further data on pipe connections for steam and hot-water heating systems, see Chapters 8 and 9.

SMOKE BREECHING AND CHIMNEY CONNECTIONS

Connections from the boiler outlet to the chimney should be air-tight and as short and direct as possible, preference being given to long radius and 45 deg, instead of 90 deg bends. The bend at the entrance to the chimney should not project beyond the inside of the chimney and it should be pointed up from the inside of the chimney.

Where a battery of boilers is connected into a breeching each boiler should be provided with a tight damper. The breeching for a battery of boilers should not be reduced in size as it goes to the more remote