As a check on the sizes of hot water mains, Table 8 will give safe sizes for gravity systems fed from roof tanks set not less than 20 ft. from the water line in tanks to the highest fixtures.

TABLE 10. SIZES OF HOT WATER MAINS

Gallons per Maximum Hour	Size of Hot Water Main, Inches
500	2
750	2½
1000	2½
1250	3
1500	3
1750	3½
2000	3½
2500	4
3000	4

CHAPTER VII

STEAM AND HOT WATER HEATING BOILERS

THE boiler is the heart of any heating system and its selection, as to type, size, rating, capacity, draft requirements, firing periods, kinds of fuel, principles of operation, efficiency and construction, should be made with great care. Particular consideration should be given to the ultimate use of the boiler. Fuel and pressure are classed as primary factors in boiler selection because these two items require certain characteristics in the boiler itself which no outside alteration is able to obviate while the secondary factors can, in almost every case, be overcome by a modification in the conditions under which the boiler is installed.

Draft can be increased by adding to the chimney height and, up to certain limits, to the chimney diameter; headroom may be secured by raising the height of the boiler room; the height of the water line can be adjusted by lowering the boiler room floor; floor space is always possible to obtain by enlarging the boiler room and the size of the units can usually be arranged to suit some possible condition that can be secured. But a low pressure boiler may not be properly used for high pressure nor will a boiler constructed for the use of anthracite coal give the same service when fired with bituminous in spite of any change which may be made in the environment in which the boiler is located.

In all the numerous types of boilers now on the market the selection of the one particular type which will be most efficient for any particular installation is a monumental task.

As a matter of fact the service secured from a boiler depends largely on the operator; a very high class boiler may not give as much satisfaction when improperly operated as a boiler whose design is not quite so good but which is intelligently handled. Of course, a good operator and a good boiler will give the best results of all, but this combination is frequently lacking.

TYPES OF BOILERS

Boilers used for heating, may be classified according to their construction as *Sectional*, either round cast-iron or rectangular cast-iron with horizontal or vertical sections respectively; *Fire-Tube*, embracing steel firebox, or brick-set return tubular; and *Water-Tube*, with either horizontal or vertical tubes and suitable drum arrangements. The most general use for heating falls in the first two of the three classifications given. For the small installations the round pattern cast-iron sectional boiler predominates, although certain designs of small steel boilers with fire-tubes and coil water tubes are also used to some extent. In the larger installations,

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