TABLE 1. SUMMARY OF DATA APPLIED TO WARM AIR RESEARCH RESIDENCE

Rooms	From Chapter 7 Estimating Heat Losses Btu Heat Losses *H*	Leader Area Sq In.	Stack Area Sq In. 0.7 × *LA*	Leader Diameter Inches	Stack Size Net	Register Size Gross
First Floor		= 0.009*H*				
Living	17250	155	---	14	.....	14 × 16
Dining	6810	61	---	9	.....	8 × 12
Breakfast	2300	21	---	8	.....	8 × 10
Kitchen	9210	83	---	11 or 12	.....	12 × 14
Sun	25710	230	---	Two 12	.....	Two 12 × 14
Hall and stair	12570	113	---	12	.....	12 × 14
Second Floor		= 0.006*H*				
Owners	15030	90	63	11 or 12	5 × 12	
S. W. Bed	9800	59	41	9	3½ × 12	12 × 14
Bath	2450	15	10	8	3 × 10	8 × 12
N. Bed	14800	89	62	11 or 12	5 × 12	8 × 10
Third Floor		= 0.005*H*				12 × 14
E. Bed	8220	41	29	8	3 × 10	8 × 10
W. Bed	8220	41	29	8	3 × 10	8 × 10

BOOSTER FANS

Booster fans often may be arranged to operate when the gas and oil burners operate and to stop automatically when the burners shut down. The booster equipment is most effective in increasing output at low operating temperatures. According to tests, efficiencies may be advanced from 60 per cent for gravity to 70 per cent with boosters at low operating temperatures, but at high operating temperatures gravity and booster efficiencies are almost identical[6].

[6]See University of Illinois *Eng. Exp. Sta. Bulletin No.* 141, p. 79.

Chapter 25

HEATING BOILERS

Cast-Iron Boilers, Steel Boilers, Special Heating Boilers, Hot Water Supply Boilers, Furnace Design, Heating Surface, Testing and Rating Codes, Output, Efficiency, Selection of Boilers, Connections and Fittings, Erection, Operation and Maintenance, Boiler Insulation

STEAM and hot water boilers for low pressure heating work are built in a wide variety of types, many of which are illustrated in the Catalog Data Section, and are classified as (1) cast-iron sectional, (2) steel fire tube, (3) steel water tube, and (4) special.

CAST-IRON BOILERS

Cast-iron boilers may be of round pattern with circular grate and horizontal pancake sections joined by push nipples and tie rods, or of rectangular pattern with vertical sections. The latter type may be either of outside header construction where each section is independent of the other and the water and steam connections are made externally through these headers, or assembled with push nipples and tie rods, in which case the water and steam connections are internal.

Cast-iron boilers usually are shipped knocked down to facilitate handling at the place of installation where assembly is made. One of the chief advantages of cast-iron boilers is that the separate sections can be taken into or out of basements and other places more or less inaccessible after the building is constructed. This feature is of importance in making repairs to or replacing a damaged or worn out boiler and should be given consideration in the original selection. Sufficient space should be provided in the boiler room for assembling the boiler and for disassembling it conveniently if repairs are needed. With the outside header type of boiler a damaged section in the middle of the boiler can be removed without disturbing the other sections and sufficient side clearance should be provided for this contingency.

Capacities of cast-iron boilers range from that required for small residences up to about 18,000 sq ft of steam radiation. For larger loads, cast-iron boilers must be installed in multiple or a steel boiler used. In most cases cast-iron boilers are limited to working pressures of 15 lb for steam and 30 lb for water. Special types are built for hot water supply which will withstand higher local water pressures.

STEEL BOILERS

Two general classifications may be applied to steel boilers: *first*, with regard to the relative position of water and hot gases, distinguished as fire