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

Rooms	From Chapter 6 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*				
Owner's	15030	90	63	11 or 12	5 × 12	12 × 14
S. W. Bed	9800	59	41	9	3½ × 12	8 × 12
Bath	2450	15	10	8	3 × 10	8 × 10
N. Bed	14800	89	62	11 or 12	5 × 12	12 × 14
Third Floor		= 0.005*H*				
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 gas or oil burners are running 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[9].

[9]University of Illinois, *Engineering Experiment Station Bulletin* No. 141 p. 79, and No. 246.

Chapter 20

MECHANICAL WARM AIR FURNACE SYSTEMS

Furnaces, Fans and Motors, Sound Control, Sprays and Filters, Air Distribution Design, Automatic Controls, Design of Heating System, Selecting the Furnace, Selecting the Fan, Heavy Duty Fan Furnaces, Humidification, Cooling Methods, Cooling System Design

MECHANICAL warm air or fan furnace heating systems[1], which are a special type of central fan systems, are particularly adapted to residences, small office buildings, stores, banks, schools, and churches. Circulation of air is effected by motor-driven fans instead of by the difference in weight between the heated air leaving the top of the casing and the cooled air entering its bottom, as in gravity systems described in Chapter 19. The advantages of mechanical systems, as compared with gravity systems are:

1. The furnace can be installed in a corner of the basement, leaving more basement room available for other purposes.

2. Basement distribution piping can be made smaller and can be so installed as to give full head room in all parts of the average basement, or be completely concealed from view except in the furnace room.

3. Circulation of air is positive, and in a properly designed system can be balanced in such a way as to give a greater uniformity of temperature distribution.

4. Humidity control is more readily attained.

5. The air may be cleaned by sprays or filters, or both.

6. The fan and duct equipment may be utilized for a complete cooling and dehumidifying system for summer, using either ice, mechanical refrigeration, or low temperature water for cooling and dehumidifying, or adsorbers for dehumidifying.

7. The use of the fan increases the volume of air which can be handled, thereby increasing the rate of heat extraction from a given amount of heating surface and insuring sufficient air volume to obtain proper distribution in a large room.

Much of the equipment used in central fan systems is the subject matter of other chapters. It is the purpose of this chapter to discuss the coordinated design and to deal in detail only with problems not covered elsewhere which refer particularly to the whole problem of fan warm air furnace heating and air conditioning.

[1]See University of Illinois *Engineering Experiment Station Bulletin* No. 266 by A. P. Kratz and S. Konzo for details of tests conducted in Warm Air Research Residence.

Complete specifications for the furnace unit and the installed duct system are shown in The Yardstick for the Evaluation of a Forced Warm Air Heating System, obtainable from the *National Warm Air Heating and Air Conditioning Association*, 145 Public Square, Cleveland, Ohio.