

for producing a draft in the flue pipe and for protection against the formation of condensation therein.

Data on Gas-Fired Residence Installation

The more important data for a typical gas-fired fan-furnace installation in a residence are given in the following tabulation:

1. Calculated heat losses for entire building.....	92,793 B.t.u. per hour
2. Capacity of furnace required (item 1 + 25 per cent).....	116,000 B.t.u. per hour
3. Maximum rating of the furnace selected (input).....	175,000 B.t.u. per hour
4. Minimum rating of the furnace selected at lowest throttling point.....	30,000 B.t.u. per hour
5. Efficiency at maximum rating.....	88 per cent
6. Gas consumption with gas of 550 B.t.u. per cubic foot; density of 0.50 lb. per cubic foot and pressure of 3½ in. water.....	318 cu. ft. per hour
7. Fan capacity at 750 r.p.m. and static pressure of 0.30 in. water.....	1,200 cu. ft. per minute
8. Volume of air per B.t.u. delivery.....	1.57 cu. ft.
9. Velocity of air at heater outlet.....	438 ft. per minute
10. Filter area.....	6.0 sq. ft.
11. Velocity of air through filter.....	200 ft. per minute
12. Return connection area.....	2.10 sq. ft.
13. Velocity through return connection.....	570 ft. per minute
14. Static pressure at heater outlet.....	0.10 in. water
15. Power input to motor.....	125 watts
16. Water evaporated for humidification.....	3.5 lb. per hour

Typical Specifications for Residence System

The following are typical specifications for fan-driven heater for a residence:

Furnace: Capacity at 5 lb. of coal per square foot of grate per hour, 118,000 B.t.u. per hour. (An automatic stoker, or gas or oil burners may be used).

Fan: Canvas connections to and from fan. Fan mounted on 2 in. corkboard. Speed, 400 r.p.m. Brake horsepower, 0.10. Capacity, 1,240 cu. ft. per minute at ¼ in. static pressure or equivalent to three times volume of house per hour.

Motor: ¼ hp., 1,140 r.p.m. **belt:** connected to fan with endless, over-size belt. Belt guarded. Motor mounted on corkboard.

Filters: Two units 20 x 20 in. Made to slide in and out as drawers and tightly fitted to prevent by-pass of air entering from basement. Furnished complete with 2 gal. of adhesive oil and charging tank.

Fan Control: Automatic mercury switch in bonnet of furnace.

Humidifier: Two cast iron water pans, enameled inside and out as well as frames and covers, complete with automatic float valve.

Thermostat: Eight-day duplex, with limit control on furnace and electric motor.

Ozonator: Forty-watt capacity.

Velocities in branches and at inlets and outlets approximately 200 ft. per minute. Velocities in main and return at furnace 413 ft. per minute.

CHAPTER 7

AIR CONDITIONING

General Requirements for Industry; Comfort; Properties of Material; Equipment; Air Distributing Systems; Controls.

AIR conditioning is the science of controlling the temperature, humidity and cleanliness of the air within an enclosure.

AIR CONDITIONING FOR INDUSTRIAL PROCESSES

Conditioning for industrial processes has become an exact science with results measurable in a more perfect product, in increased production, in elimination of waste and in other equally important benefits. Varying degrees of moisture are required in many manufacturing processes. Heating as well as cooling must be considered in the air conditioning of the buildings which house textile mills, printing plants, bakeries, candy kitchens, laundries and many other types of manufacturing.

It has long been recognized that relative humidity is an important factor in the manufacture and processing of certain hygroscopic materials such as textiles. Since the normal relative humidity in textile factories is nearly always lower than that desired, various artificial means have for many years been provided to increase the humidity.

There are other industries which require a definite and unvaried humidity, so that at some periods (minutes, or hours or seasons) the normal quantity of moisture in the air must be increased, and at other times it must be lowered. These industries include the confectionery, the artificial silk, and the printing and lithographing trades.

Other products require not only a constant relative humidity, but also a uniform temperature during the course of manufacture. For example, modern automatic wrapping machines, such as are used for wrapping chewing gum, foods, confectionery and machine-made cigarettes, require exact conditions of heat and moisture in order to function satisfactorily without frequent adjustments.

In the manufacturing and processing of most hygroscopic materials there are usually stages in the process during which moisture must be removed from the material. When the products themselves are not soluble in water, this is usually accomplished by air drying.

In order to avoid injury to the products which require temperature and humidity control, the rate of moisture removal must usually be controlled with accuracy during intermediate stages of the process, and at the end of the process of drying the material must have a very definite moisture content. This is true particularly in the manufacture of various tobacco products, artificial silk, certain gelatine products including photo-