are desirable to provide a factor of safety and to allow for more rapid circulation for summer cooling.

For additional information on fans and motors, see Chapter 17.

NOISE ELIMINATION

Special attention must be given to the problem of noise elimination. The fan housing must not be directly connected with metal, either to the furnace casing or to the return air piping. It is common practice to use canvas strips in making these connections. Motors and their mountings

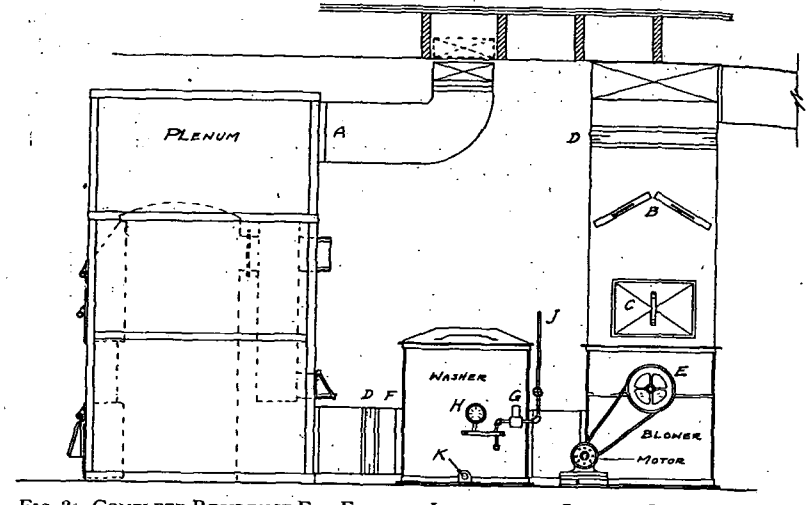

FIG. 3. COMPLETE RESIDENCE FAN FURNACE INSTALLATION SHOWING LOCATION OF FAN, FURNACE, FILTERS, PLENUM CHAMBER AND METHOD OF TAKE-OFF OF WARM AIR PIPE

A. Transition fitting.
B. Filters.
C. Capped opening.
D. Canvas connection.
E. Pulley—3 diam. V-type.
F. Eliminator.
G. Solenoid valve.
H. Pressure gage.
J. Water supply.
K. Drain.

must be carefully chosen for quiet operation. Electrical conduit and water piping must not be fastened to, nor make contact with, fan housing. The installation of a fan directly under a cold air grille is not recommended on account of the noise objection. See also Chapter 18.

AIR WASHERS AND FILTERS

Washers for residence systems may be provided in separate housings to be installed on the inlet or outlet side of the fan, or they may be integral with the fan construction. They operate at water pressures of from 10 to 30 lb and use two or more spray nozzles for washing and humidification. The sprays should be adjusted to completely cover the air passages.

Washers are usually controlled by solenoid valves wired in parallel with

the fan motor. The water supply may, in turn, be controlled by a humidity-controlling device located in one of the living rooms, so that the washer will operate at all times when the fan is in operation, unless the relative humidity should rise beyond a desirable percentage. Washers used in connection with commercial or heavy duty plants should be a regulation type of commercial washer.

There are many satisfactory types of filters on the market. These include dry filters, viscous filters, oil filters and other types, some of which must be cleaned, some of which must be cleaned and recharged with oil, and some of which are inexpensive and may be discarded when they become dirty, and replaced with new ones.

The resistance of a filter must be considered in the design of the system since the resistance rises rapidly as the filter becomes dirty, thus impairing the heating efficiency of the furnace, in fact, endangering the life of the furnace itself. Manufacturers' ratings of filters must be carefully regarded, and ample filter area must be provided. Filters must be replaced or cleaned when dirty. See also Chapter 16.

COOLING METHODS

Some cooling may be obtained under certain conditions by the use of basement air. A more positive cooling effect may be obtained through air washers where the temperature of the water is sufficiently low (55 F or lower), and where a sufficient volume of water can be provided. Unless the water is below the dew point temperature of the indoor air at the time the washer is started, both the relative and absolute humidities will be somewhat increased.

Coils of copper finned tubing through which cold water is pumped are available for cooling. They require less space than air washers and have the advantage that no moisture is added to the air when the temperature of the water rises above the dew point. Ample coil surface is necessary with this type of cooling.

It is thoroughly feasible to use ice or mechanical refrigeration in connection with the fan and duct system for the heating installation, and to cool the building by this method, provided the building is reasonably well constructed and insulated. Windows and doors should be tight, and awnings should be supplied on the sunny side of the building. See also Chapters 9 and 10.

Study of these problems sponsored by the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with the *National Warm Air Heating Association* is in progress at the University of Illinois. The following conclusions may be drawn from the studies thus far completed, subject to the limitations of the conditions under which the tests were run[1]:

1. An uninsulated building of ordinary residential type may require the equivalent of three tons of ice in 24 hours on days when the maximum outdoor temperature reaches 100 F if an effective temperature of approximately 72 deg is maintained indoors.

[1] See A.S.H.V.E. research paper entitled Study of Summer Cooling in the Research Residence at the University of Illinois, by A. P. Kratz and S. Konzo (A.S.H.V.E. Journal Section *Heating, Piping and Air Conditioning*, February, 1933).