

end of the washer. When this source of heat is insufficient, the reverse-acting relay opens normally-closed damper *P* (Fig. 16) to admit air from the warm-air chamber.

2. Direct-acting thermostat *G* operates double damper *R* (Fig. 16) to mix heated air with that coming direct from the washer through passage *X*, to obtain the proper temperature for delivery into the conditioned space. The dew-point temperature produced at *E* is not affected by passing some of the air through the furnaces, and the proper relative humidity is thus secured.

### Summer Operation

3. Thermostat *E*, through its reverse-acting relay, operates a three-way valve (such as *V*, Fig. 15) to regulate the cooling effect on the spray water; or, through its direct-acting relay, it operates another three-way valve (such as *U*, Fig. 15) to shut off the sprays when the temperature is too low.

4. Thermostat *H* moves a dehumidifier bypass damper (not shown) in conjunction with *G* as a pilot, as described for a steam system.

Additional information on the control of fan-furnace systems will be found in Chapter 23.

## Chapter 15

# AIR POLLUTION

*Sources of Air Pollution, Effects of Air Pollution on Health, Pulmonary Effects, Occlusion of Solar Radiation, Industrial Air Pollution, Abatement of Atmospheric Pollution, Smoke Abatement, Dust and Cinder Abatement*

**T**HIS chapter considers the hygienic aspects of atmospheric pollution and the methods by which this pollution may be lessened. Information concerning the cleaning of air brought into buildings for ventilating purposes will be found in Chapter 16; and a discussion of the exhausting of dusts and toxic gases from factories and industrial plants is considered in Chapter 21.

## SOURCES OF AIR POLLUTION

The impurities which contribute to atmospheric pollution include carbon from the combustion of fuels, particles of earth, sand, ash, rubber tires, leather, animal excretion, stone, wood, rust, paper, threads of cotton, wool, and silk, bits of animal and vegetable matter, and pollen. Microscopic examination of the impurities in city air shows that a large percentage of the particles are carbon. (See Fig. 1, Chapter 16, for size of impurities in air).

### Dust, Fumes, Smoke

The most conspicuous sources of atmospheric pollution may be arbitrarily classified according to the size of the particles as dusts, fumes, and smoke. *Dusts* are particles of solid matter varying from 1.0 to 150 microns in size. *Fumes* include particles resulting from chemical processing combustion, explosion, and distillation, ranging from 0.1 to 1.0 micron in size. *Smoke* is composed of fine soot or carbon particles, less than 0.1 micron in size, which result from incomplete combustion of carbonaceous materials, such as coal, oil, tar, and tobacco. In addition to carbon and soot, smoke contains unconsumed hydrocarbon gases, sulphur dioxide, sulphuric acid, carbon monoxide, and other industrial gases capable of injuring property, vegetation, and health.

The lines of demarcation in these three classifications are neither sharp nor positive, but the distinction is descriptive of the nature and origin of the particles, and their physical action. Dusts settle without appreciable agglomeration, fumes tend to aggregate, smoke to diffuse. Particles larger than one micron will eventually settle out by gravitation; particles smaller will remain in suspension as permanent impurities unless they agglomerate to sizes larger than one micron.