of design, ease in testing, accuracy at all loads, low cost, and adaptability to low pressure distribution have made it standard equipment with many heating companies.

Condensate meters should not be operated under pressure; they are made for either gravity or vacuum installations. Typical meter installations are shown in Fig. 6. In diagram A a continuous-flow type trap is shown installed ahead of the meter, while in diagram B an intermittent type trap is used. In the latter case, a receiving tank must be placed between the trap and meter to prevent intermittent overloading of the meter. When measuring the discharge from a vacuum pump, a vented receiver should always be installed ahead of the meter.

Installations of meters in a vacuum return line are shown in diagrams C and D. In diagram C a master, float-type, continuous-flow trap is installed immediately ahead of the meter to prevent steam from entering it in case of leaking radiator or fixture traps. Where individual traps are reliable, connections may be made as shown in diagram D.

Flow Meters used for district heating work are of three types: *Area Meters*, *Head Meters* and *Velocity Meters*. Meters are described in Chapter 4, Fluid Flow. Flow meters are generally used for measuring send-out from plants, high-pressure requirements in buildings, and in installations where all of the condensate cannot be returned to a central point. Further information on flow meters is available in the *District Heating Handbook* and from publications of the Fluid Meter committee of the *American Society of Mechanical Engineers*.

REFERENCES

[1] American Standard Code for Pressure Piping, ASA B31.1-1955 (*American Standards Association*).

[2] *District Heating Handbook*, Third Edition, 1951, p. 329 (*National District Heating Association*).

[3] Graphical Solution of Unwin's Formula (a chart published by *National District Heating Association*).

CHAPTER 30

CENTRAL SYSTEMS FOR AIR CONDITIONING

Features of Systems, Zoning, Humidity Control, Cooling Load, Heating Load, Air Quantity and Temperature Differential, Unitary-Central Systems, Low- and High-Pressure Induction Convectors, Dual-Duct Systems, Fan and Coil Units, Evaporative Cooling, Precooling, Sensible Cooling with Unwetted Coils, Selection of Type of System, Location of Apparatus

THE term, central, applied to an air conditioning system implies that the equipment such as fans, coils, filters and their encasement are designed for assembly in the field rather than in a factory as a unit. As a central system usually serves several different rooms, or spaces individual controls are required for each room.

FEATURES OF CENTRAL SYSTEMS

One advantage of a central air supply system is that one apparatus serving many rooms may involve a lower investment cost than that for a number of self-contained plants, each serving a single room. A central system may occupy basement or attic space that is relatively unimportant, whereas individual factory-assembled apparatus placed in each room may occupy otherwise valuable space. Another advantage of a central system is accessibility for servicing, since it is possible to provide doors in the encasement for cleaning and inspecting all of the component parts in a manner usually superior to that practicable with compact factory-assembled equipment. In addition service is concentrated in one or just a few places.

Central air conditioning systems usually are connected by ducts with the various rooms served, and preferably have exhaust fans that may effect complete removal and disposal of any desired proportion of the air. The return-air fan may return air to the supply system for recirculation, as a measure of economy of fuel or refrigeration.

Central air conditioning systems are served by heating and refrigerating equipment which may be located at some distance from the air supply apparatus, and which may serve one or more central air supply systems.

Fig. 1 is a sketch of a typical year-round central system. Outdoor air enters from an intake preferably on that side of the building least exposed to solar heat, and not close to the ground or to a sun-heated or dust-gathering roof. The outdoor-air damper is split into two sections, minimum outdoor-air and maximum outdoor-air, with the maximum outdoor-air damper interlocked with the return-air damper in such a manner that as the outdoor-air volume increases the return-air volume decreases. The return air duct or connection could come from a return-air fan. All the air passes through filters which must have ample room on both sides of the filters for servicing. The filters may be of a mechanically-cleaned type, a replaceable cell type, or may be electronic as described in Chapter 34.

The cleaned air passes to the equipment that changes its temperature