the reproduction day after day of the same air conditions. An example is, a bakery where the quality of the bread is almost entirely dependent upon the condition of the air in the fermentation room and the proof box.

Tobacco, textiles, paper, rubber, candy and celluloid are a few of the products with which conditioned air may be used to advantage during the manufacturing process.

Conditioning units lend themselves very well to the production of different air temperatures and humidities in the different rooms or departments of a manufacturing plant. When equipped with automatic control they very effectively reproduce the same conditions day after day. Additional units can be added to keep pace with the growth of a department and they can also be moved from one room to another to suit plant alterations or changes in production routine.

In a plant where several units are being used, the breakdown of one unit does not seriously impair the production, inasmuch as the remaining units will furnish a considerable quantity of conditioned air until the disabled unit is repaired.

Other possible advantages are small first cost due to elimination of supply and return ducts, small operating expense due to low air pressure required with the absence of ducts and high salvage value. Possible disadvantages are maintenance costs, cost of supply and return lines for water and steam, cost of electric wiring and possible difficulties met with in keeping a number of sets of regulating and controlling devices in good operating condition.

PIPING CONNECTIONS FOR UNIT HEATERS

Piping connections for unit heaters are similar to those for other types of fan blast heaters.

One-pipe gravity and vapor systems are not recommended for unit heater work. On two-pipe gravity or pump and receiver systems the return from each unit should be fitted with a blast trap or a heavy duty thermostatic trap and an air valve should be connected into the return header of each unit.

On vacuum systems the return from each unit should be fitted with a blast trap to discharge the water of condensation and with a thermostatic air trap for eliminating the air, or with a heavy duty thermostatic trap for handling both the condensation and the air, provided the air can be finally eliminated at some other point in the return system.

On high-pressure systems the same kind of traps may be used as with vacuum systems, except that they must be properly constructed for the pressure used. If the air is to be eliminated at the return header of the unit, it is customary to use pet cocks, otherwise the air is passed with the condensate through the high-pressure return trap.

CHAPTER XI

CENTRAL HEATING SYSTEMS

Typical Service Connections, Control Devices, Underground Distribution Systems, Expansion and Contraction, Conduits and Tunnels, Insulation, Steam Requirements for Different Types of Buildings.

THE object of this section is to present the outstanding engineering features of central station heating, omitting any discussion of contracts, rates and other commercial features. A great deal of the information given will apply not only to the public utilities generally classed as district heating systems, but also to those institutional groups supplied from a central source, and perhaps better classified as central heating systems.

SERVICE CONNECTIONS FROM HIGH PRESSURE AND LOW PRESSURE SYSTEM

The practice of two companies in connecting the customer's premises with the street system are shown in accompanying sketches. Figs. 1 and 2 show the methods employed by a Boston utility for cooling condensate of customer's steam systems before discharging the condensate to the meter. Similar requirements pertain where customers purchase steam by flow meter. In the latter case, however, the company does not insist that the customer meet the requirements completely as any loss in metering is borne by the customer. A vacuum or condensation return pump may be attached to these systems.

Fig. 3 shows a typical installation for service from the system of a New York utility. The practice followed by utilities in other localities may be found in the Handbook or the Proceedings of the *National District Heating Association.*

CONTROL OF STEAM SUPPLY

Because radiation for a building must provide for maximum load conditions, variable weather in many localities brings the problem of variable steam demand from the various heating elements in the building. This condition may be controlled by hand method or by any one of the systems of automatic heat control described in Chapter XVI. Another form of regulation, known as the time limit control, is sometimes employed for regulating the steam supply from the central station main to the building.

Such a control provides an intermittent supply of steam to the radiation either throughout the 24 hours of the day or during the daytime hours only. The setting of a switch may provide no service, continuous service,

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