to the air heater. Such instruments usually are placed in the path of the return air as it enters the unit to be conditioned, as the entering air is a sample of room air. The spray water can be heated by an ejector or by a closed type heater.

For dehumidifying work cold water may be supplied under automatic control as needed. It usually is found best where refrigeration is used to employ a separate water cooler located in close proximity to the compressors and condensers, rather than to use direct expansion coils or brine coils within the air conditioning units.

COOLING UNITS

Air cooling units are of two general kinds, the coil type, which is similar in appearance to the floor-mounted heating unit, and the brine spray type, which is similar in appearance to the floor mounted air conditioning unit. The coil type may use cold water, brine, or may use ammonia, or other refrigerants, while the brine spray type normally uses pre-cooled brine, or includes a refrigerating coil for chilling the brine.

The coil type unit is identical in operation with the heating unit except that the coil is supplied with cold water or a refrigerant instead of with steam. The coil must be made of bare pipe, since a finned surface would soon clog with frost.

The coil type unit is less expensive than the brine spray type, and may be used where there is not an excessive amount of moisture present. It is rapidly replacing the bunker coil in storage rooms for fur, meat, vegetable, poultry, and some dairy products.

In rooms containing excessive moisture, such as pre-chill rooms in slaughter houses, the coil type unit is not satisfactory unless the room temperature is carried above 40 deg. If lower room temperatures are required, the coil of the unit would frost excessively, thereby reducing its output. For these conditions, the brine spray unit has the advantage of having no coil to frost (the coil, if used, is for the purpose of chilling the brine) and the moisture which is extracted is deposited in the spray, drops to the tank and escapes through the overflow.

The specific gravity of the brine solution must be frequently checked and when necessary, increased so that the brine will not become diluted to the point where it will freeze at the conditions under which the unit is expected to operate.

In addition to showing a saving on installation and first cost, the cooling unit gives a positive air circulation and a much more even distribution of temperature than previous methods of cooling. On account of this positive circulation and even distribution, a slightly higher room temperature may be carried than is customary with bunker coils, which gives an operating economy and results in improved quality of some products.

Usually refrigerating coils must be defrosted at intervals. An advantage of the unit system is that the cooling surface is concentrated in one point, and melted frost or condensation is collected in the drip pan, which may be connected to the sewer if desired.

Under certain room conditions, when properly applied, cooling units are virtually self-defrosting.

Cooling units, like heating units, lend themselves to alteration of plant layout or expansion, since they are easily disconnected and reinstalled at a new location.

UNIT VENTILATING MACHINES

A unit heating and ventilating machine for schoolrooms and public buildings consists usually of a small rectangular steel cabinet, and has the following essential parts:

1. Outside air inlet.
2. Duct filter (optional).
3. Motor and fan assembly.
4. Radiator or heating element.
5. Temperature control arrangement (may be by damper or by supply valve).
6. Outside air damper.
7. Recirculating damper (optional).
8. Discharge grille or diffuser.

This machine often is partly recessed into the walls, so as to minimize interference with aisle-passages.

When the outside air inlet damper is open and the fan is operated the air is drawn immediately from out-of-doors, and is forced by the fan through the cleaning and heating apparatus contained in the machine.

All of the air handled by the fan may be driven through the convector-heater and thence to the room, or part may be by-passed around the convector, depending on temperature requirements of the room. In some cases, instead of a by-pass damper for controlling the temperature, this is accomplished by valves which control the heat supply to all or to part of the convector-radiator inside the machine.

In some machines the closing of the outside air damper simultaneously opens the recirculating grille at the floor line, so that the air can circulate by gravity through the radiator if no dust filters are present.

Split System

In the split system shown in Fig. 4, the unit is used for ventilation only, delivering the air to the room at very near the room temperature, sufficient separate direct heaters being placed in the room to heat it to the desired temperature, independently of the unit. With the split system the separate direct heaters tend to improve the air circulation and diffusion within the room, since they constantly pull the cold air from the floor, warm it and use it to counteract the window chill.

The split system permits of operation of the room during failure of electric current, since the radiator-conductors will furnish heat, but on the other hand it permits a careless operator to avoid the bother of operating the ventilating equipment. On the whole the split system in normal operation probably gives the best satisfaction where attention and maintenance are mediocre.

In some cases the amount of direct radiation required to maintain the desired room temperature is deficient by deliberate intention of the designer. With this arrangement the ventilating machine must have sufficient surplus heating capacity, over and above that required for