To accomplish best results, care must be exercised to follow certain rules in designing the enclosure, the most important of which are:

1. Enclosures should be insulated with 1 in. magnesia or asbestos block, lined with bright tin or non-corrosive sheet metal, placed next to the radiator.
2. The surface of the radiator should be painted flat black, maroon japan, white enamel or white zinc. If the radiator is entirely concealed it may be unpainted.
3. The free area of the grill or opening at the outlet should be not less than the free area through the sections of the radiator.
4. The free area of the grill or opening at the inlet should be not less than 80 per cent of the free area at the outlet.
5. If the outlet is in the face of the enclosure so that the air flow is horizontal, the free area of the outlet should be at least 150 per cent of the free area about the radiator, and the clear height between the top of the radiator and the underside of the top of the enclosure should be not less than the depth of the enclosure.
6. Best results are obtained with a tight fitting enclosure, provided the free area about the radiator at point of greatest restriction is not excessive. As a general rule the efficiency of the radiator is inversely proportional to the depth of the enclosure.

EFFECT OF LOCATION OF RADIATION

The effect of position of radiator upon its heating effect has received a great deal of attention. It is generally accepted that the radiator best serves its purpose when placed under a window. This seems logical for the following reasons.

1. Heat emitted by radiation from the radiator will counteract the effect of heat radiated out through the window from occupants in the room.
2. Cold air leaking in through the window is warmed before it reaches the interior of the room.
3. Air currents from the radiators pass upward, mingling with the cold infiltering air, and across the top of the room then downward to the floor on the opposite side and back to the radiator for another cycle.

Heat emission by a radiator at the ceiling or floor will differ little provided the surrounding air and objects are at the same temperature. The effect on heating the room or on temperature distribution in the room may however, be very great. Heat applied near the ceiling will tend to stratify, resulting in a hot ceiling and cold floor, unless there is mechanical disturbance to produce circulation.

SPECIFICATION CLAUSES

Specifications for radiation should contain the following clauses:

1. Manufacturers must guarantee that the heat emission per radiator shall not fall below the values given in Tables 1 to 13.
2. Radiation must be free from flaws on surface and leaks at nipple connections, and guaranteed to stand a hydrostatic test of not less than 100 lb. per sq. in.
3. Radiation must be thoroughly cleaned of all core sand, and if for vapor or modulation steam systems must be washed out and the openings plugged before shipment.
4. Radiation must not be placed where dirt can get into the interior and if to be placed in the weather or damp location must be given a priming coat of paint before shipment or immediately upon delivery at location.
5. Long or low radiators should be crated, and the crating not removed until placed in final location.
6. Radiators supported from the wall or ceiling shall be supported on steel or wrought iron hangers.

CHAPTER III

STEAM HEATING SYSTEMS AND PIPING

INTRODUCTION

THE selection of proper pipe sizes for steam heating systems has been a perplexing problem to heating engineers and contractors for some years. No uniformity of practice is discernable, and of the numerous tables available to the profession many indefinite and variable factors have entered into the calculations with the result that a concerted effort has been made by committees of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *Heating and Piping Contractors' National Association* to study the subject on a scientific basis.

For several years the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS Laboratory has been investigating the flow of steam in pipes and the capacity of pipes for steam heating work with the result that the reports of its Technical Advisory Committee on Pipe Sizes have been used by the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS Guide Committee and the *Heating and Piping Contractors' National Association* Committee on Standardization in the compilation of Standard Tables for Pipe Sizes of Steam Heating Systems.

Where data have not been available from research work as in the case of dry returns, standard formula have been applied so that the user of these tables may feel confident that the values given may be applied with safety.

The information resulting from the cooperative effort of these two organizations it is anticipated will provide engineers and contractors with a standard method for selecting pipe sizes for steam heating systems, that will result in the design of plants that are scientifically correct. All data in this chapter are so arranged that the subject is covered under four general divisions—(1) A description of systems, (2) A discussion of steam distribution, (3) Pipe sizes Tables for steam heating systems and (4) Examples to show correct use of tables.

DESCRIPTION OF SYSTEMS

Piping systems for steam heating are broadly classified as gravity one-pipe, two-pipe, vapor and vacuum pump systems; the condensation returning to boiler by gravity or mechanical devices.