the outlet grille located near the top of the enclosure. Factory-assembled units consisting of a heating element, casing, and outlet grille with damper are widely used. Grilles may be used over air inlets.

In cases where enclosures are to be used but are not furnished by the heater manufacturer, it is important that the proportions of the cabinet and the grilles be so designed that they will not impair the performance of the assembled convector. It is desirable that the enclosure or housing for the convector fit as snugly as possible so that the air to be heated cannot by-pass the heating element in passing through the enclosure.

Cast-iron heating units may be concealed in a cabinet or enclosure for appearance. In such cases a greater percentage of heat is conveyed to the room by convection thereby resulting in a form of gravity convector.

The output of a convector, for any given length and depth, is a function of the height of the discharge grille above the heating element. The published ratings are generally given in terms of Btu per hour or square feet of *Equivalent Direct Radiation*, EDR. For steam convectors, as for radiators, 240 Btu per hr may be taken as an equivalent square foot of radiation. When more than one heating unit is used, one mounted above the other in the same cabinet, the output of the upper unit or units will be materially less than that of the bottom unit.

TABLE 4. CAST-IRON WALL RADIATORS

Approximate Dimensions—Inches			Heat Output[a]	
Height	Length or Width	Thickness	Sq Ft	Btu/hr
13¼	16½	3	6½	1560
13¼	22	3	8	1920
22	13¼	3	8	1920
13¼	29	3	11	2640
29	13¼	3	11	2640

[a] These ratings are based on steam at 215 F and air at 70 F. They apply only to installed radiators exposed in a normal manner, not to radiators installed behind enclosures, grilles, or under shelves For Btu per hour ratings at other temperatures divide table values by factors found in Table 6.

BASEBOARD RADIATION

Baseboard radiation is divided into three types: (1) radiant, (2) radiant-convector and (3) finned-tube.[1] *Radiant-type* baseboard is made of cast iron or steel. This type of unit emits a large proportion of heat to the room by radiation. These units are sometimes suspended from the ceiling in rooms such as kitchens having little or no available wall space for floor mounted units. For this location, as compared with floor mounting, the amount of convected heat obtained from the unit is reduced, and consequently 25 to 50 percent additional surface must be installed.

Radiant-convector type baseboard also is made of cast iron or steel. These units are provided with air openings at the top and bottom to permit circulation of room air over the wall side of the unit where extended surface is provided to obtain maximum heat output. A large part of the heat obtained from these units is transferred by convection. This type of baseboard which has a greater output per linear foot than the radiant type, has advantages where wall space is at a premium or the heat loss of the room is high.

Finned-tube type of baseboard has a finned-tube heating element which is concealed by a long low sheet-metal cover. A major portion of the heat is transferred to the room by convection. The output of this type of baseboard varies over a wide range depending on the enclosure depth and height, the diameter of the tube, and the number and size of fins. When selecting this type of baseboard the designer should avoid using a unit with too high an output per linear foot because performance is best when units are installed along as much of the exposed wall as possible.

The basic advantage of the baseboard radiator or of the long low narrow radiator is that its normal placement is along the cold walls and under areas where the greatest heat loss occurs in a room. Other advantages claimed for the baseboard radiator are: it is inconspicuous; it is clean in operation; it offers a minimum of interference with furniture placement, and, it distributes the heat near the floor. This last characteristic reduces the floor to ceiling temperature gradient to about 2 to 4 F deg, and tends to produce uniform temperatures throughout the room. It also makes baseboard radiators especially adaptable to basementless homes, where cold floors are prevalent.[2]

Heat loss calculations for baseboard heating systems are the same as those used for other types of radiation. The procedure for designing baseboard heating systems is given in $I = B = R$ Installation Guide No. 5.[1] Ratings for baseboard radiation are expressed in Btu per linear foot.

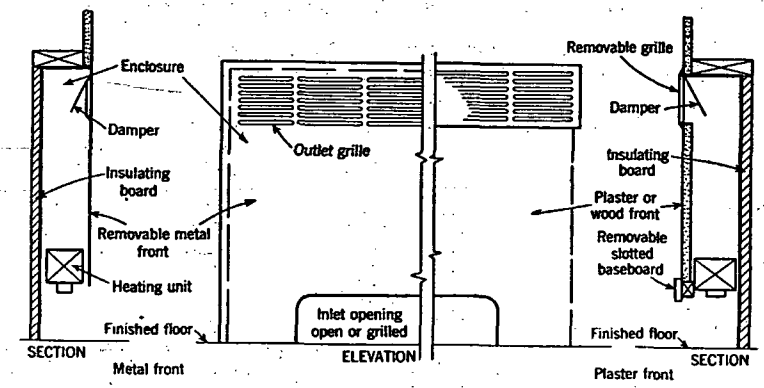

FIG. 1. TYPICAL RECESSED CONVECTOR

FINNED-TUBE RADIATION

The finned-tube type of radiation is always installed in the same manner as pipe or pipe coils. It is rapidly superseding pipe coils as much more output can be obtained per linear foot of pipe. When installed in two or three tiers in a hot-water system, long sweep return bends may be used to connect the tiers. Header type connections are not satisfactory for long hot-water coils due to the tendency of water to short circuit along the path of least resistance.

Pipe coils are assemblies of standard pipe or tubing (1 in. to 2 in.) which are used as radiators. In older practice these coils were commonly used in factory buildings, but are not often found in this service today. When coils are used, the miter-type assembly is preferable, as it readily permits expansion in the pipe.

The heat emission of pipe coils placed vertically on a wall, with the pipes horizontal, is given in Table 5, which has been developed from available data and does not represent definite results of tests. For such coils the