

its use in a boiler, as given by the boiler manufacturer, should be carefully followed.

Care of Idle Heating Boilers

Heating boilers are often seriously damaged during summer months due chiefly to corrosion resulting from the combination of sulphur from the fuel with the moisture in the cellar air. At the end of the heating season the following precautions should be taken:

1. All heating surfaces should be cleaned thoroughly of soot, ash and residue, and the heating surfaces of steel boilers should be given a coating of lubricating oil on the fire side.
2. All machined surfaces should be coated with oil or grease.
3. Connections to the chimney should be cleaned and in case of small boilers the pipe should be placed in a dry place after cleaning.
4. If there is much moisture in the boiler room, it is desirable to drain the boiler to prevent atmospheric condensation on the heating surfaces of the boiler when they are below the dew-point temperature. Due to the hazard that some one may inadvertently build a fire in a dry boiler, however, it is safer to keep the boiler filled with water, particularly in residential installations. Air can be excluded from a steam boiler by raising the water level into the steam outlets. A hot water system usually is left filled to the expansion tank.
5. The grates and ashpit should be cleaned.
6. Clean and repack the gage glass if necessary.
7. Remove any rust or other deposit from exposed surfaces by scraping with a wire brush or sandpaper. After boiler is thoroughly cleaned, apply a coat of preservative paint where required to external parts normally painted.
8. Inspect all accessories of the boiler carefully to see that they are in good working order. In this connection, oil all door hinges, damper bearings and regulator parts.

Radiators and Convectors

Heat Emission of Radiators and Convectors, Types of Radiators, Convectors, Radiator and Convector Ratings, Effect of Operating Conditions, Heating Effect, Heating Up the Radiator and Convector, Enclosed Radiators

THE accepted terms for heating units are: (1) *radiators*, for direct surface heating units, either exposed, enclosed, or shielded, which emit a large percentage of their heat by radiation; and (2) *convectors*, for heating units having a large percentage of extended fin surface and which emit heat principally by convection. Convectors are dependent upon enclosures to provide the circulation by gravity of large volumes of air.

HEAT EMISSION OF RADIATORS AND CONVECTORS

Most heating units emit heat by *radiation* and *convection*. The resultant heat from these processes depends upon whether or not the heating unit is exposed or enclosed and upon the contour and surface characteristics of the material in the units.

An exposed radiator emits roughly half of its heat by radiation, the amount depending upon the size and number of sections. When the radiator is enclosed or shielded, the proportion of radiation is further reduced. The balance of the emission is by conduction to the air in contact with the heating surface, and the resulting circulation of the air warms by convection.

A convector emits practically all of its heat by conduction to the air surrounding it and this heated air is in turn transmitted by convection to the rooms or spaces to be warmed, the heat emitted by radiation being negligible.

The output of a radiator can be measured only by the heat it emits. The old standard of comparison used to be square feet of *actual surface*, but since the advance in radiator design and proportions, the surface area alone is not a true index of output. (The engineering unit of output is the *Mbh* or 1000 Btu per hour.) However, during the period of transition from the old to the new, radiators may be referred to in terms of *equivalent square feet*. For steam service this is based on an emission of 240 Btu per hour per square foot and for hot water service 150 Btu.

TYPES OF RADIATORS

Present day radiators may be classified as tubular, wall, or window type and are generally made of cast-iron. Only the small-tube type of tubular radiators with a spacing of $1\frac{3}{4}$ in. per section are now available, the large-tube type which had a spacing of $2\frac{1}{2}$ in. per section having been discontinued. Small-tube radiators occupy less space and are particularly suited for installation in recesses.

After a complete study of the demand for various sizes of radiators, the *Institute of Boiler and Radiator Manufacturers*, in cooperation with the Division of Simplified Practice, *National Bureau of Standards*, established Simplified Practice Recommendation R174-43 for small-tube cast-iron radiators. Table 1 shows the size and dimensions of small-tube cast-iron radiators which are being manufactured at the present time.

Wall radiators are now rated in terms of equivalent square feet, the same as small-tube radiators. Tests have shown that the heat emitted