

alarm to ring a bell or buzzer or flash a light in the janitor's quarters or where it will receive his attention.

CLEANING STEAM BOILERS

The grease used to lubricate the cutting tools during erection of new piping systems serves as a carrier for sand and dirt, with the result that a scum of fine particles and grease accumulates on the surface of the water in all new boilers, while heavier particles may settle to the bottom of the boiler and form sludge. These impurities have a tendency to cause foaming, preventing the generation of steam and causing an unsteady water line. Hence, the boiler should be blown off within about one week after it has been placed in operation. This blowing off should be done with the boiler under fire, and should be repeated until a steady water line and clean gage glass result. The scum is best removed through an outlet at the surface of the water.

CLEANING FLUES

All boilers are provided with flue clean-out openings through which the heating surface can be reached by means of brushes or scrapers. Flues of solid fuel boilers should be cleaned often to keep the surfaces free of soot or ash. Gas boiler flues and burners should be cleaned at least once a year. Oil burning boiler flues should be examined periodically to determine when cleaning is necessary.

CARE OF IDLE HEATING BOILERS

During summer months damage is frequently done to heating boilers and is often more serious than during the period of operation. This is due chiefly to corrosion following 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 and if the boiler is of steel the heating surfaces 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 advisable to drain the boiler to prevent condensation of moisture on the surfaces when the boiler temperature becomes lower than the dew point. In steel boilers kerosene poured on the surface of the water will form a protecting film over the inside surface as the water is drained out.
5. When the boiler room is comparatively dry, in the case of cast-iron boilers, the water level should be raised into the steam riser to exclude air from the boiler. A hot water system usually is left filled to the expansion tank.
6. The grates and ashpit should be cleaned.

Chapter 15

DRAFT AND CHIMNEYS

Draft; Types of Draft Systems; Natural and Mechanical Draft Systems; Performance of Natural Draft Chimneys; Economical Chimney Sizes; General Draft Equation and Draft Losses; Construction of Chimneys; Smoke Test.

DRAFT

AIR is fed to the fuel during the process of combustion through the medium of a draft. Draft, in general, may be defined as the pressure difference between the atmospheric pressure and that at any part of the installation through which the gases flow. Since a pressure difference implies a head, draft then is a static force. While no element of motion is inferred, yet motion in the form of circulation of gases throughout the entire boiler plant installation is the direct result of draft. This motion is due to the pressure difference, or unbalanced pressure, which compels the gases to flow.

TYPES OF DRAFT SYSTEMS

Draft-producing systems may be classified into four distinct types according to the type of pressure transformer used and the type of draft created, viz: (1) Natural draft systems, (2) Venturi draft systems, (3) Induced draft systems, and (4) Forced draft systems.

In *natural draft systems*, the pressure difference is created by means of a natural draft chimney and a thermal difference. Natural draft results in a suction and is therefore a negative pressure. Natural draft systems operate with gases whose temperature is always relatively hot.

In *Venturi draft systems*, the pressure difference is created by means of a Venturi chimney together with either a small fan or a small blower. Venturi draft results in a suction and, like natural draft, is a negative pressure. Venturi draft systems likewise operate with gases whose temperature is always relatively hot.

In *induced draft systems*, the pressure difference is created by means of an induced draft fan. Induced draft, like natural and Venturi draft, is a negative pressure. Induced draft systems also operate with gases whose temperature is always relatively hot.

In *forced draft systems*, the pressure difference is created by means of a forced draft fan. Forced draft results in a plenum and is therefore a positive pressure. Forced draft systems ordinarily operate with relatively cool outside air, although in recent years some installations of this type have been designed to operate with pre-heated air.