

With this system water is heated to its boiling point (212° F) and steam rises by convection through pipes to radiators located throughout the house. The air in the pipes and radiators is dissipated into the rooms through air-vent valves that are located either on the radiators or at the end of the steam main. The steam gives up its heat at the radiators by conduction to the air; condenses and the water flows back to the boiler by gravity for re-heating. This system is less efficient than a hot-water system since there is no forced convection (like a hot-water system with a circulating pump) so it's not installed in new residential construction but may still be found in older homes.

It is similar to a hot-water boiler but operates at a higher temperature and lower pressure. Unlike a hot-water system, there is no pressure-reducing valve or expansion tank. Instead there is an automatic safety control and pressure gauge. A **glass water-level gauge** shows the water level in the boiler and the **low-water cutoff** automatically shuts down the boiler should the water level drop too low.

A steam system is a **gravity system** that is inefficient and slow to respond to changing demands for heat. It works on the principle of convection – steam rises and cooler water descends. *To retain heat, most steam pipes are covered with asbestos insulation.* This covering should not be disturbed. Inspect the condition of the pipe insulation on an annual basis. If it looks "**friable**," call for professional service. Boilers were typically made with heavier-gauge steel and may last about 50 years - some as old as 80 years! The automatic **pressure-reducing valve** reduces household water supply from 30 to 60 psi (pounds per square inch) to **2 to 10 psi**. The boiler is also equipped with a **pressure-relief valve** that discharges steam if the pressure exceeds 30 to 45 psi.

In a **ONE-PIPE SYSTEM**, the same pipe is used to distribute steam to various radiators and carries the condensate back to the boiler. The radiators used in this system must be sloped so the condensate flows back through the supply valve. Each radiator has a manually operated vent valve and supply valve.

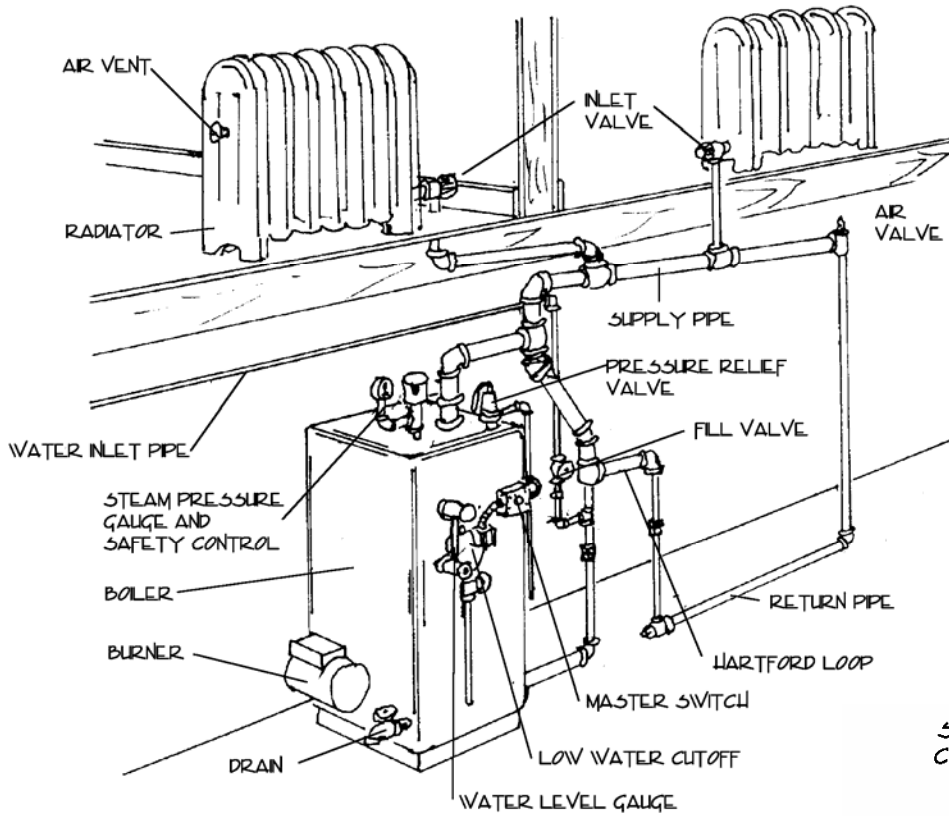
With a **TWO-PIPE SYSTEM**, the steam is supplied in one pipe and the condensate returned by gravity to the boiler by another. The radiators do not have an air-vent valve, instead they are equipped with **steam traps** that allow the air bound in the radiator and condensate to flow in the return pipe but closes on steam contact. The air is then vented by a main vent. A two-pipe steam system can be converted to a forced hot-water system.

In a **DRY RETURN** system, the return line in the boiler room is above the boiler water level. With a **wet return** the return line is below the water level. The piping in the latter must include a **Hartford loop** which prevents water from draining out of the boiler if a leak occurs in the return line.

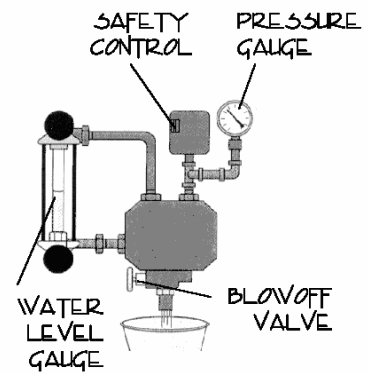
## **MAINTENANCE ITEMS FOR SERVICE TECHNICIAN:**

- **BOILER** - Should be drained once a year when the boiler is cold. Close the **water inlet valve**, unscrew the **pressure relief valve** and attach a hose to the drain cock to lead the water to a floor drain. Fill the boiler about one-third with water and repeat the process. Add a rust inhibitor through the safety valve and replace the valve, close the drain and fill the boiler to the proper level.
- **SAFETY VALVE** - Located on the top of a boiler, the valve allows steam to escape if the pressure in the boiler exceeds a preset safe level. Test the valve every month during the heating season by depressing the handle. If no steam comes out or the valve does not completely close, replace the valve.
- **STEAM PRESSURE GAUGE** – The pressure in the boiler should be between **2 to 10 psi**. If the gauge indicator is not in this range, call for service.
- **WATER LEVEL GAUGE** – The valves at each end of the gauge should be opened once a month. The water level should be in the middle of the valve. If water is not visible, shut off the boiler, let it cool and add water by opening the fill valve on the water inlet pipe. If your system has an automatic water fill valve, call for service.
- **LOW-WATER CUTOFF** – Open the blowoff valve at the bottom of the low-water cutoff once a month when the system is off to drain off sediment-filled water that could clog the cutoff.

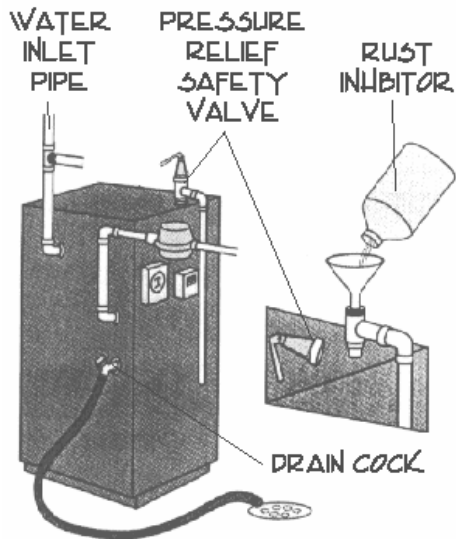
For further information contact your local public utilities office, a licensed HVAC contractor or the America Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE) or the Heating, Refrigerating and Air conditioning Institute of Canada (HRAI).



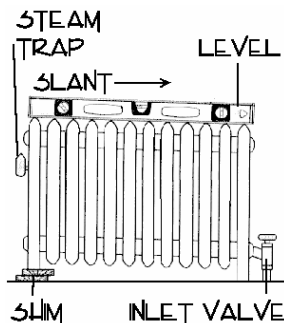
**TYPICAL STEAM BOILER WITH A ONE-PIPE SYSTEM**



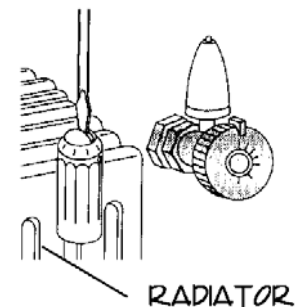
**DETAIL OF A LOW-WATER CUTOFF GAUGE**



**DRAIN AND FLUSH BOILER**



**ONE-PIPE RADIATOR**



**ADJUSTABLE AIR VENT**