

CG ser. 4

# START-UP, SERVICE AND MAINTENANCE INSTRUCTIONS for WEIL-McLAIN GAS BOILERS

Below, the procedure is outlined for starting your Weil-McLain Boiler including instructions for the care of your heating system. All mechanical equipment needs occasional attention. The boiler should be inspected, cleaned and if necessary, adjusted once a year. We recommend that your serviceman be called as he has been trained for the job and will have the necessary instruments to check your boiler. This will assure you that the operation of your heating system will remain highly efficient. Your Weil-McLain boiler will give you a lifetime of heating comfort, if you follow the few simple suggestions listed on this card.

## FILLING STEAM AND WATER BOILERS

Do not fill the boiler (except for leakage tests) until the boiler is ready to be fired. **CAUTION: Do not add large quantities of cold feed water to any hot boiler!**

**Steam Systems:** The boiler should be filled to the normal water line and fired for about 15 minutes at a low rate sufficient to keep the boiler at steaming temperature with the steam vented to drive off dissolved gases (also see Skimming Steam Boilers).

**Water Systems:** The boiler and the entire system should be filled and heated to approximately 210°F for about 15 minutes to drive off dissolved gases. Before filling the system, make sure all the system air vents are closed. Open the hand water feed valve and beginning on the lower floor, open the air vents (one at a time) until water starts to flow; then, close the vent. Repeat this throughout the building until all heat distributing units are filled with water. Close the hand water feed valve when the correct boiler pressure is reached. After the system is in operation, keep the system filled with water by occasionally opening the air vents allowing any entrapped air to escape and adding enough make up water to maintain the correct system pressure. If your system is provided with a purge valve located in the system return piping, connect a garden hose to the drain valve located above the purge valve. Close the purge valve and open the hand water feed valve and allow the system to purge all air. Where the system has more than one circuit, purge each circuit separately by opening each balancing valve one at a time. When the system is purged of all air, close the drain cock located above the purge valve and open the purge valve. Fill the boiler and the entire system to the correct pressure. **Air in the system can interfere with circulation of water and prevent the heat distributing units from properly heating.**

## TO START THE BOILER

1. Be sure the main electric switch in the boiler electrical circuit is turned to the **off** position.
2. **CAUTION:** Make sure that the manual main shutoff valve and the pilot valve have been closed for at least five minutes before lighting the safety pilot burner.
3. Remove the jacket door and access panel.
4. Follow the "Starting up Boiler Instructions" on the operating instruction plate which is mounted on the Jacket Panel.

## IF BOILER FAILS TO START, CHECK THE FOLLOWING

1. Check for loose connections and blown fuses.
2. Be sure the high limit control setting is above the boiler temperature or pressure.
3. Make sure that gas is turned on at meter.
4. Be sure pilot is burning.
5. Make sure manual main shut-off valve is open.
6. If the above checks do not eliminate the trouble, call in your serviceman.

## MEASURE GAS INPUT TO BOILER

For proper aspiration, the gas pressure at the burner manifold should be at least 3.5 inches water column for natural gases and 11.0 inches water column for propane gases.

Measure the gas input to the boiler by reading the rate of flow at the gas meter. Be sure any other appliances connected to the same meter are shut off. The measured rate of flow in cubic feet per hour multiplied by the heating value in B.T.U. per cubic foot of the gas employed should check with the A.G.A. design certified input shown on the boiler rating plate. If the actual input is within 5 percent of the rated input, adjust the gas pressure regulator to obtain the required gas flow. To adjust the gas input, remove the cap on the pressure regulator and turn the adjusting screw clockwise to increase the gas flow or counter-clockwise to decrease the gas flow. If the actual input is more than 5 per cent off the rated boiler input, change orifice sizes and again measure the gas input to the boiler.

## SKIMMING STEAM BOILERS

All new boilers and steam and water piping contain oil, grease, chips, and other foreign matter. It is essential to clean new steam heating boilers to remove these materials in order to avoid overheating of boiler metal, foaming and priming, and high maintenance costs on strainers, traps, and vents. The boiler installer should use the following procedure to clean oil, grease, and other impurities from the new boiler.

1. Close the valve in the building steam supply main(s).
2. Provide a full sized skim line, with valve, from the

boiler skin tapping and run this line to a convenient floor drain.

3. Fire the boiler at a low rate sufficient to keep the boiler at steaming temperature allowing the steam, along with entrained water and impurities, to discharge through the skim piping to the drain.
4. Feed the water to the boiler as required to maintain proper water level in the gauge glass. It may be necessary to cycle the burners to prevent a rise in steam pressure above several pounds.
5. Continue the boiling and skimming process for at least two hours or until the water leaving the skim line is clear of all grease, oil and impurities. On unusual jobs, the skimming procedure may require repeating one or more times. **CAUTION — THE USE OF CLEANERS IS NOT RECOMMENDED!**
6. Drain boiler and, while boiler is warm but NOT HOT and without steam pressure, remove safety valve and insert a hose nozzle into the opening. Flush all interior surfaces of the boiler with water under full pressure until all traces of dirt and impurities are removed and the drain water runs clear.
7. Replace safety valve; close drain cock, fill with fresh water to the water line. Start burners and steam for 15 minutes to remove all dissolved gases; stop burners.
8. Drain boiler sufficiently to remove skim piping; plug skim tapping; refill boiler to waterline.
9. To prevent the return of impurities to the boiler from new or old piping systems, waste all condensate for several days or until no impurities are contained in the condensate. **NOTE — IT IS IMPERATIVE THAT FEEDWATER BE SUPPLIED TO MAINTAIN THE CORRECT WATER LEVEL AND THAT A LOW WATER CUTOFF IS OPERATIVE!**

## BOILER SERVICE AND MAINTENANCE

Leaks in the boiler and piping system must be repaired at once. The use of makeup water in large quantities is undesirable and may damage the boiler after an extended period of time. If serious leaks occur, stop the burners and gradually reduce boiler pressure or temperature. Do not attempt to make repairs while a steam boiler has pressure or hot water boiler temperatures are above 130°F.

Foaming or priming may occur in a steam boiler and cause large quantities of water to pass out into the steam main. It can be observed by violent fluctuations of water level, in the gauge glass. This trouble may be caused by dirt, oil, or precipitates in the boiler water, too high a boiler water level, a high overload on the boiler (i.e., the sudden release of boiler steam pressure into the mains by action of fast operating valves), or the addition of too much boiler water treatment. With serious foaming or priming, stop the burners and decrease boiler load. Then alternately blowdown and slowly feed fresh water several times. If trouble persists, it may be necessary to skim the boiler one or more additional times.

Any problem in regard to large amounts of makeup water, extreme foaming or priming, scale in the boiler, or internal corrosion or pitting, should be referred to a company specializing in boiler water chemistry. **DO NOT try "Homemade cures" or boiler "patent medicines" on the**

market under various trade names, or serious damage to the boiler, personnel, and property may result.

Frequently check the boiler water level in the gauge glass of steam boilers, and check the boiler operating pressure of steam or water boilers. Test the low water cutoff by opening its blowdown valve to remove dirt, rust, and sediment, and observe that burners stop as the water level approaches the bottom of the water gauge glass (gauge glass on steam boilers only).

On steam boilers, open the water gauge glass blowdown valve and blow clear; close blowdown valve. If water gauge glass leaks or breaks, close both gauge glass cocks and repair; open gauge cocks after repairing.

Periodically, check the seal afforded by any gasket installed on the boiler or heating system (i.e., heater, heater opening cover plate, circulator, etc.). If necessary, thoroughly tighten all bolts to restore the water-tight seal.

Periodically test boiler safety or relief valve to make sure it opens at the proper pressure. Make sure that the valve reseats and does not leak. Replace any defective or leaking valve.

Periodically check and if necessary, clean the boiler flues. The frequency of cleaning will depend upon the fuel uses, the flame adjustments, boiler temperature, draft conditions, and other job factors. Protect the burners and controls from dust and dirt during cleaning.

**DO NOT DRAIN BOILER** during periods of shutdown unless heating system is exposed to freezing temperatures. On steam boilers, open boiler blowdown valve and flush till clear while under steam pressure. On water boilers open boiler drain cock to remove impurities that have settled to the bottom of the boiler. Refill as required to correct water line for steam boilers or the correct pressure for water boilers. Turn off all electrical power connections to the boiler and its auxiliaries. Clean all carbon, rust, and other deposits from the fire-side of the boiler heating surfaces in order to protect the boiler from the corrosive action of combustion deposits (see *Cleaning Boiler Heating Surfaces*). If the water side of the boiler must be cleaned or inspected, open the blowdown valve and drain the boiler. Hose the inside of the boiler with high pressure water to remove sludge and sediment, flush again. Replace plugs and jacket panels when all traces of sludge and sediment have been removed. Dry insides of boiler thoroughly, or refill with fresh water and heat to release dissolved gases (see *Filling Steam and Water Boilers*). Repeated draining and filling of the boiler and/or the heating system can lead to the same consequences as adding too much makeup water—this is mainly true where the makeup water is "hard" and the same precautions must be used as indicated in an earlier paragraph under column heading *Boiler Service and Maintenance*.

## SHUT DOWN OF BOILER

1. Turn off main electric switch in the boiler electrical circuit.
2. Close manual main shut-off gas valve.
3. Close pilot valve.
4. Open the boiler drain cock to remove impurities that may have settled to the bottom of the boiler; it may be necessary to drain one or two gallons of water until all traces of sediment are gone. Refill the boiler to the proper water level or pressure (see *Filling Steam and Water Boilers*). Boiler water does not have

to be crystal clear for proper operation, but should be free of any sludge or sediment.

5. During severe winter weather have heating system operation checked periodically or thoroughly drain your heating and plumbing systems.

### CLEANING THE MAIN BURNERS

At the start of every heating season, it is most advisable to inspect and, if necessary, clean the main burners of any dust or lint or any other foreign particles that may have accumulated in the burners. To clean the burners, attach a piece of metal tubing to the hose end of a hand air pump (or tire pump). Bend one end of the metal tubing to form a 90 degree angle and pump air through the openings at the top of each main burner. If the main burners can not be properly cleaned in this manner, it will be necessary to remove and thoroughly clean the burners.

### CLEANING BOILER HEATING (fire-side) SURFACES

At the end of every heating season, it is advisable to inspect and if necessary clean the flues in the boiler. Soot is an effective insulator and prevents the hot gases from heating the boiler water as efficiently as possible. Normally this boiler will be cleaned from the top as described below.

1. Remove the top jacket panel of the boiler.
2. Remove the cleanout opening cover or the flue opening cover at the top of the boiler sections.
3. Remove the burners, if not already removed for cleaning, to avoid brushing soot and dirt into the burner openings or extinguish the pilot and cover all the main burners with heavy papers.
4. Insert a wire flue brush vertically through openings between sections and scrub all flue surfaces vigorously.
5. Replace the clean burners or remove papers which covered the main burners.
6. Replace the cleanout opening cover making sure the original gas-tight seal is maintained between the cover and the boiler sections.
7. Replace jacket top panel.
8. Start the boiler according to the procedures outlined in these instructions under column heading "To Start The Boiler".

### WATER BOILER CONTROLS

#### CIRCULATOR CARE:

**Never operate the circulator without water.**

- A. Follow lubricating instructions on circulators that are provided with oil cups or oil holes.
- B. Follow venting instruction on circulators with water lubricated bearings which require no oil.

**BOILER PRESSURE:** The initial fill pressure of the boiler and entire system should be according to the design requirements of the heating system (in general, the fill pressure for most heating systems would be to 12 pounds per square inch). When the system is heated to the limit control setting, the system pressure may rise up to the relief valve opening pressure. Normal system pressure will fluctuate between the fill pressure, when the system is cold; and rise to maximum pressure (just below the relief valve opening pressure), when the system is hot.

**BOILER WATER TEMPERATURE:** Modern hot water heating systems with "closed" type expansion tanks may operate at water temperatures up to 250°F. The high limit control must be set according to the design requirements of the heating system, during severe winter weather, you may find that this temperature setting need to be raised or lowered depending upon characteristics of your system.

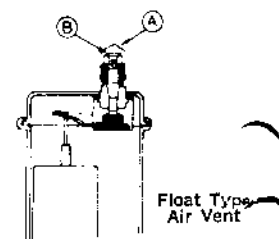
**COMPRESSION TANK:** Compression tank is employed with hot water heating systems to accept the increased water volume which results from heating the system water. The compression tank on a closed hot water heating system should provide adequate pressurization under all system operating conditions. Frequent opening of the pressure relief valve can be the result of an undersized compression tank because provisions for the necessary expanded water volume has not been provided. Compression tanks may be of the open, closed, or closed diaphragm type.

**Open Type Expansion Tank:** Open type expansion tanks are located above the highest heat distributing unit in the system usually in a closet or attic space and equipped with a gauge glass and an overflow pipe to a drain. The open type expansion tank and drain piping should not be located in any area where freezing temperatures could occur.

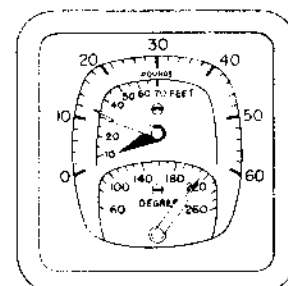
**Closed Type Expansion Tank:** Closed type expansion tanks are welded gas-tight and are usually located just above the boiler but may be located at any point in the heating system. In order to utilize the built-in air elimination system on the boiler, the closed type compression tank must be piped to the air elimination tapping on the boiler. When the system is initially filled with water, a cushion of air is trapped within the tank and this air cushion is compressed to provide the initial fill pressure. When the system is heated, the expansion of the system water further compresses the air cushion and provides the additional space required for the additional water volume. A rapid increase in boiler pressure with frequent opening of the pressure relief valve during warm-up of the boiler and heating system usually indicates a "waterlogged" compression tank. Your serviceman should be called to correct this condition by partially draining the compression tank to again establish an air cushion.

**Closed Diaphragm Type Compression Tank:** Closed diaphragm type compression tanks are welded gas-tight and a rubber diaphragm is employed to separate the air cushion from the system water. The closed diaphragm type expansion tank may be located at any point within the heating system but is usually located as close to the boiler as possible. Where a closed diaphragm type expansion tank is employed, an automatic air eliminating device should be installed in the air elimination tapping on the boiler to provide system air control. Before the initial fill of the heating system, the closed diaphragm type compression tank should be charged with air (by means of a tire pump) to a pressure equal to the initial fill pressure; the tank pressure may be checked by means of an air pressure gauge. As the system is filled, water will not enter the tank until the system pressure exceeds the tank charge. When the system is heated, the expansion of the system water causes the diaphragm to flex and further compress the air cushion and additional space is provided for the additional water volume. Since the system water is separated from the air cushion by means of a diaphragm, absorption of the air cushion by the system water is eliminated.

**FLOAT TYPE AIR VENT:** If your system is equipped with a Float Type Air Vent(s) which automatically expells air from the heating system, when the system is filled with water, loosen cap A slowly so that particles of dirt or scale are not deposited on the valve seat by the escaping air. Should dirt or scale lodge on the valve seat causing it to leak, remove cap and push the valve core B in by hand to permit water to flush the valve seat clean. Release the valve core quickly and replace cap. For normal operation and venting, unscrew the cap at least two turns.

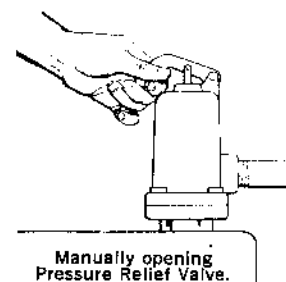


**PRESSURE-TEMPERATURE-ALTITUDE GAUGE:** This gauge indicates the boiler pressure in pounds-per-square-inch and in feet of water column (altitude) above the boiler by the moveable hand. The fixed hand may be changed to indicate the proper position for the moveable hand on manually filled hot water heating systems. For those systems with automatic fill valves, the fixed hand is usually left at the zero setting. The third hand indicates the boiler water temperature in degrees fahrenheit.



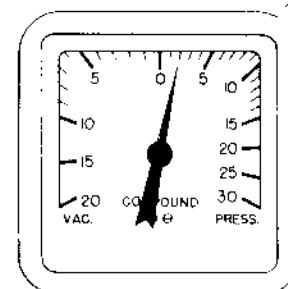
Combination Pressure-Temperature-Altitude Gauge

**WATER RELIEF VALVE:** Check the relief valve at least once a year by pulling the handle and allowing a small quantity of water to flow. Be sure the relief valve reseats properly and is entirely free from seepage. If the relief valve sticks or appears to be clogged, it should be repaired or replaced immediately. The relief valve outlet should be piped to a floor drain or near the floor. The relief valve discharge must not be piped to any area where freezing temperatures could occur.



## STEAM BOILER CONTROLS

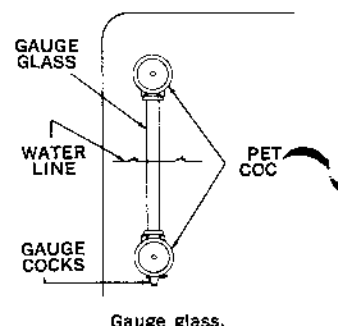
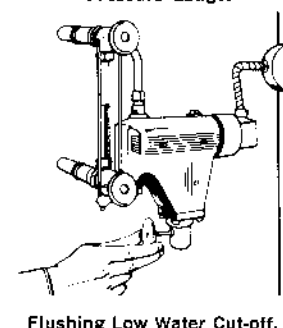
**BOILER PRESSURE.** Steam boiler pressures may range up to 15 psig maximum, but in normal service usually will not exceed 12 to 13 psig and may be much less, possibly operating under vacuum conditions at certain times. The compound gauge used for steam boilers indicates steam pressure in pounds per square inch (psig) and boiler vacuum in inches of mercury (hg).



Pressure Gauge.

**CLEANING LOW WATER CUT-OFF.** Accumulated sediment in the low water cut-off should be flushed out through a blow-off valve provided for this purpose at least once each month of heating system operation.

**CLEANING THE GAUGE GLASS.** This may be done by closing the lower gauge glass cock and carefully opening the petcock below the glass to blow water and sediment out of the gauge glass by steam pressure. Then slowly open the lower gauge glass cock, allowing a small amount of water to flush out through the open petcock. Close and fully open the lower gauge cock. The water level should immediately rise to its proper level. If gauge glass breaks, close off both gauge cocks and loosen glass retaining nuts to remove gauge glass. Replace broken gauge glass with new gauge glass made of heavy pyrex. **DO NOT USE THIN WALL GLASS TUBING!**



**CHECKING THE SAFETY VALVE.** The safety valve should open at 15 psig to prevent excessive boiler pressure. Manually open the safety valve once each year by pulling the valve lever or handle and allowing a small amount of steam to escape. This will help to assure proper operation of the safety valve if boiler pressures reach 15 psig. Be sure that the valve reseats properly and does not leak steam. If the safety valve sticks or appears to be clogged it should be repaired or replaced immediately by your serviceman. Side outlet safety valves should be piped to a floor drain or near the floor.

## GENERAL INSTRUCTIONS AND REQUIREMENTS

The side of the boiler to your left as you face the front of the boiler will be referred to in these instructions as the Left End (LE); the side to your right will be referred to as the Right End (RE).

Locate the boiler as close as possible to the chimney and be sure to provide ample clearance for access to the piping. It is required that a minimum clearance of 24 inches be allowed at sides where servicing and cleaning will occur and 18 inches at a side where passage is necessary to another side requiring servicing or cleaning. Minimum clearance on any remaining side should not be less than 6 inches. For permissible minimum clearances for closet installations, see Page 3.

**Note:** Installations must conform with the requirements of local utilities, or any local, state, or insurance requirements or codes having jurisdiction.

## CHIMNEY OR VENT REQUIREMENTS

(also refer to Breeching Erection)

The masonry chimney or vent to which the boiler is to be connected should not be smaller than the size recommended on the last page of these instructions under Ratings—Dimensions—Engineering Data. The chimney or vent should extend high enough above the building or any other obstructions so that wind from any direction will not strike the chimney or vent from an angle above horizontal and thus produce down drafts. Unless the obstruction is of great magnitude, it is the usual experience that a chimney or vent extended at least 2 feet above flat roofs or 2 feet above the highest part of wall parapets and peaked roofs which are within 30 feet will be reasonably free from down drafts.

A lined chimney is preferred and must be used when required by federal, state, or local building codes. Vitreous tile linings with joints which prevent the retention of moisture and linings made of noncorrosive materials are advantageous. Advice regarding recommended practice and material for flue connections and chimney linings can usually be obtained from the local gas utility and should be given careful consideration. If a Type B or Type C vent is acceptable and is used, the instructions relative to the size and height contained in the **American National Standard Installation Manual for Gas Appliances and Gas Piping** should be followed. The chimney should be examined before the gas boiler is installed to be certain that it is properly constructed, clear, and will freely conduct the products of combustion to the atmosphere.

In entering the chimney, the breeching connection must be above the extreme bottom of the chimney to avoid stoppage. The breeching must not enter the chimney so far as to unduly restrict the space between the end of the breeching and the opposite wall of the chimney. A thimble or slip joint should be used where the breeching enters the chimney to facilitate removal of the breeching for cleaning. Do not place a damper or any other obstruction in the breeching. The breeching should slope upward toward the chimney at least  $\frac{1}{4}$  inch per lineal foot of breeching; the breeching should not be smaller than the size shown on the last page of these instructions under column heading Chimney and Breeching Size.

Where two or more gas appliances vent into a common chimney or vent, the equivalent area of the common chimney or vent should be at least equal to the equivalent area of the vent outlet on the largest appliance plus 50 percent of the equivalent area of the vent outlet on the additional appliance.

## AIR SUPPLY FOR BOILER ROOM

Provisions must be made to supply sufficient clean air to the boiler room at all times for combustion, for ventilation, and for dilution of the combustion gases at the draft hood. If there is a lack of oxygen in the boiler room, the burner flames will be yellow and formation of soot will occur on the boiler flue passages. In buildings of conventional frame, brick, or stone construction without enclosed utility rooms, basement storm windows, or tight stair doors, infiltration is normally adequate to provide air for combustion and for dilution of the combustion gases at the draft hood.

For installations in an enclosed utility room or boiler room without an outside wall, two fresh air openings are required (one near the top and one near the bottom of the room). When all the air comes from inside of the building, each opening should have a minimum free cross sectional area of at least 1 square inch for each 1,000 BTU per hour of boiler input. When all the air comes from outside and is directly connected to the boiler room or is connected to the boiler room with vertical ducts of equal area, each opening should have a minimum free cross sectional area of at least 1 square inch for each 4,000 BTU per hour of boiler input. When all the air come from outside and is connected to the boiler room with horizontal ducts of equal area, each opening should have a minimum free cross sectional area of at least 1 square inch for each 2,000 BTU per hour of boiler input.

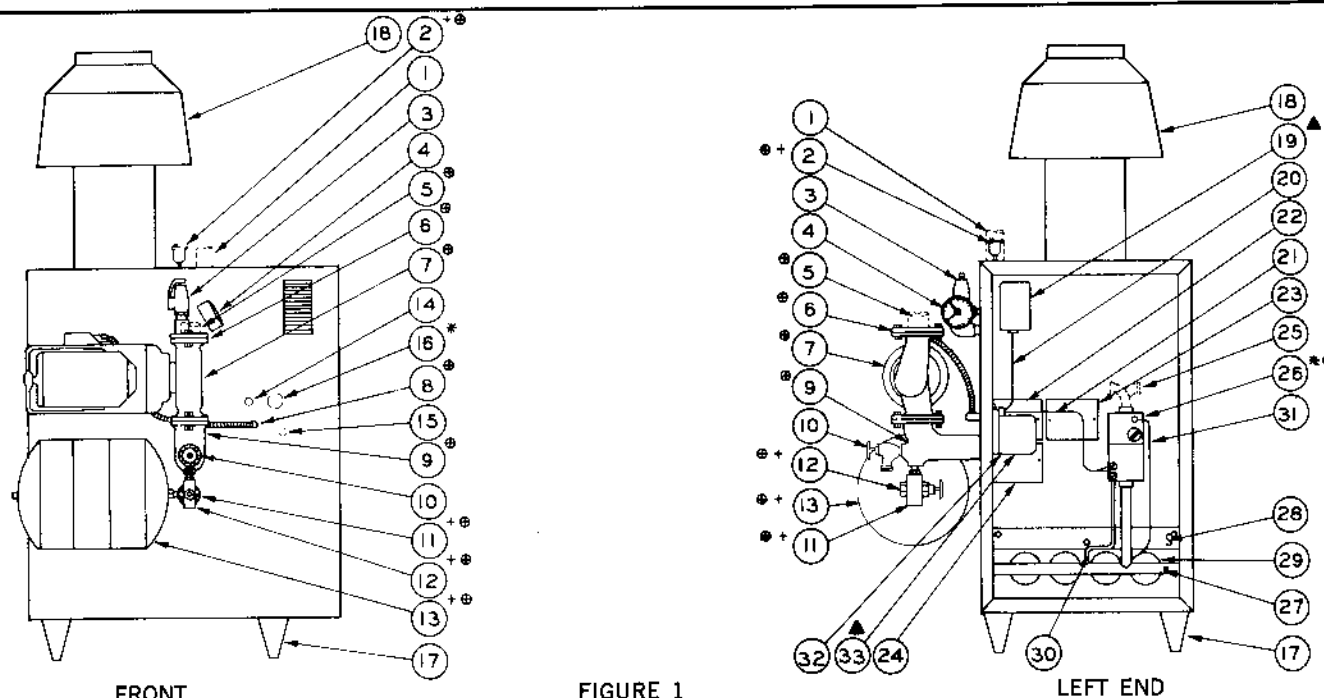


FIGURE 1

- 1. Supply Outlet
- + 2. Float Type Automatic Air Vent
- 3. ASME Pressure Relief Valve
- 4. Combination Pressure-Temperature-Altitude Gauge
- 5. Return Inlet (for P-CG and CGM boilers)
- 6. Circulator Counter Flange
- 7. Circulator
- 8. Circulator Wiring Harness
- 9. Angle Circulator Flange
- 10. Drain Cock (not shown for CG boilers, locate in tee in return piping where the piping enters the boiler)
- + 11. Combination Automatic Fill Valve and Manual Shut-off Valve
- + 12. Cold Water Fill Connection

- + 13. Air Cushion Tank (closed diaphragm type)
- 14. Thermostat Wiring Inlet
- 15. Electrical Supply Inlet
- \* 16. Knockout for Gas Supply Piping (jacket right end and left end panels)
- 17. Boiler Leg (four used)
- 18. Draft Hood
- 19. High Limit Control
- 20. Safety Circuit Wiring
- 21. Gas Valve Wiring
- 22. AGA Rating Plate
- 23. Operating Instruction Plate
- 24. Closet Clearance Plate
- 25. Street Elbow, or Elbow and Close Nipple (not furnished)

- + 26. Combination Manual Main Shut-Off Gas Valve, Main Automatic Gas Valve, and Pressure Regulator
- 27. Gas Manifold
- 28. Access Panel
- 29. Main Burners
- 30. Safety Pilot Burner Gas Supply Tubing
- 31. Thermocouple
- 32. Wiring Junction Box (not furnished with CG boilers, equipped with self generating controls)
- 33. Combination Relay with 40VA Transformer (for boilers equipped with 24 volt controls, not furnished when boiler is equipped with self generating controls)

⊕ Not furnished with Model CGM boilers.

+ ⊕ Not furnished with Model CG boilers.

\* The gas supply piping may be located at the left side or right side of the boiler. If an additional manual main shut-off gas valve is required, it should be located in the gas supply piping according to the local utility requirements.

▲ For boiler ordered with self generating controls, the combination high limit control, relay and 40VA transformer (with manual switch to permit gas valve operation with limit protection in the event of power failure) will be furnished in place of the separate high limit control and combination relay with 40VA transformer.

• For boilers ordered for propane gas firing, the combination type gas control valve will be equipped with a pressure regulator cover plate which will be installed on the gas valve body. This prepares the boiler for propane gas firing with unregulated gas supply.

## IMPORTANT PRECAUTIONS

Proper installation and wiring of the control equipment and proper adjustment of the gas burners are necessary for the successful operation of the gas-fired boiler. Follow the proper wiring diagram furnished with the boiler or the wiring diagram label located on the inside of the jacket door for connecting the electrical supply wiring and for wiring any additional controls. The operating instruction plate is located on the jacket interior panel and should be carefully followed. Be sure to read and carefully follow these instructions.

The Types P-CG, CGM and CG boilers are A.G.A. design certified for natural and propane gases. For natural gas, the inlet gas pressure to the boiler should be 7 inches

to 10 inches water column. If the inlet gas pressure exceeds 10 inches water column, a pressure regulator of adequate size should be installed upstream of the boiler hand valve; the pressure regulator should be of the 100 percent lock-up type and should not permit gas pressures in excess of 10 inches water column. For propane gas, the inlet gas pressure to the boiler hand valve should be 11 inches to 13 inches water column; the gas pressure regulator (furnished by the gas-supplier) must provide lock-up pressures not exceeding 14 inches water column.

The gas orifices are assembled into the orifice spuds on the gas manifold at the factory and the orifices supplied are for the type of gas specified on the boiler order. See the chart on Page 3 for the Type P-CG, CGM, and CG boiler standard orifice sizes for natural and propane gases.

Type Gas	Heating Valve BTU/cu. ft.	Standard Orifice Size
Natural (Drilled Port Burners)	1,000	34
Propane (Ribbon Burners)	2,500	51
Natural (Ribbon Burners)	1,000	35

### BOILER FOUNDATION

If a boiler foundation is necessary, it should be located to provide proper clearances around the boiler (as indicated under General Instructions) for the installation of the piping, draft hood, and breaching. A level concrete, brick, or wood boiler foundation is recommended and may be from 2 inches to 6 inches higher than the boiler room floor if head room permits and should be constructed according to the dimensions shown in the chart below; these dimensions allow about 1 inch clearance all around the boiler. If the boiler is to be located in a closet or confined space, also refer to Figure 2 for minimum clearances.

BOILER FOUNDATION SIZES		
Number of Boiler Sections	Foundation Width	Foundation Length
3	12"	25¼"
4	15"	25¼"
5	18"	25¼"
6	21"	25¼"
7	24"	25¼"
8	27"	25¼"
9	30"	25¼"

### COMPRESSION TANK SIZING

#### For CGM and CG Boilers:

For Type CGM and CG boilers, size the compression tank according to the requirements of the heating system.

#### For P-CG Boilers:

The No. 109 Fill-Trol (combination automatic fill valve, pressure reducing valve, and expansion tank) is furnished with P-CG-3 through P-CG-5 boilers, the No. 110 Fill-Trol is furnished with P-CG-6 through P-CG-9 boilers. The expansion volume is suitable for a series loop piping system installed in a one-story or two-story house with non-ferrous (convector) type heat distributing units for forced hot water circulation. **For series loop piping systems with cast-iron heat distributing units or for other piping systems for forced hot water circulation where higher system water contents are encountered, additional compression tank capacity must be provided.** When additional compression tank capacity is required, do not replace the tank furnished with the boiler with a larger sized tank; an additional Ex-Trol tank should be connected to a tee in the supply or return piping close to the boiler. Refer to the table above to determine if an additional Ex-Trol will be required.

### P-CG COMPRESSION TANK SIZING\*

For Type CGM and CG boilers, size the compression tank according to the requirements of the heating system.

Boiler Number	Standard Fill-Trol Tank—Adequate for Series Loop Piping Systems with Convector Baseboard	Additional Ex-Trol Tank Required for One Pipe Systems with Convector Baseboard	Additional Ex-Trol Tank(s) Required for Cast-Iron Radiators	Additional Ex-Trol Tank(s) Required for Cast-Iron Baseboard
P-CG-3	No. 109	—	No. 15	No. 15
P-CG-4	No. 109	No. 15	No. 15	No. 30
P-CG-5	No. 109	No. 15	No. 15	No. 30
P-CG-6	No. 110	—	No. 15	No. 30
P-CG-7	No. 110	—	No. 30	No. 30
P-CG-8	No. 110	No. 15	No. 30	No. 15 & 30
P-CG-9	No. 110	No. 15	No. 15 & 30	No. 15 & 30

\* Tank selection based on 220°F. average system water temperature.

NOTE: Converted gravity hot water circulation systems may require additional compression tank capacity.

### CLOSET INSTALLATIONS

Where the boiler is to be located in a closet or confined space, minimum clearances must be provided all around the boiler as illustrated in Figure 2. The vent pipe must be at least 6 inches from combustible material.

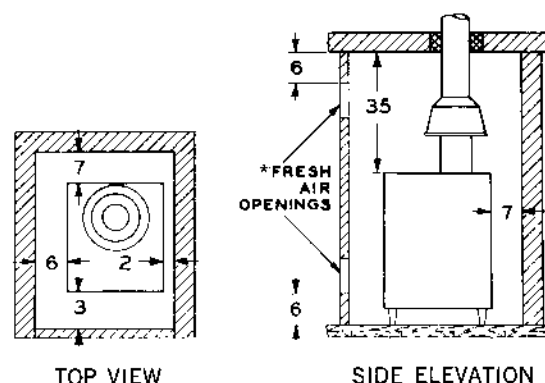


FIGURE 2

\*Refer to Column Heading Air Supply For Boiler Room For Sizing Required Fresh Air Openings.

### LOCATING THE BOILER

Position the boiler near the chimney and be sure to provide minimum clearances around the boiler as indicated under General Instructions or as shown in Figure 2. The boiler is A.G.A. design certified for installation on a combustible floor. Be sure to remove the boiler from the shipping pallet as directed on the envelope containing these instructions, after the boiler has been removed from the shipping pallet and moved to the desired installed position. **Do not alter or remove the legs from the**

**boiler.** After the boiler is positioned in the desired location, be sure the unit is setting level so that air can be thoroughly separated from the circulating water. It may be necessary to place shims under the boiler legs where they rest on the boiler room floor to ascertain that the boiler will remain level. Open the jacket door and remove the access panel by loosening the screws and discard the washers which are required to hold the access panel in position during shipment. **Level and straighten the burners, with equal space between each burner and make sure the gas orifices will inject gas down the centerline of the burner mixer tubes.** Rethread the screws into the same holes in the base, hand tight only. Reinstall the access panel by slipping the screw heads through the holes in the panel; this will permit removal of the access panel without removing the screws. Re-install the jacket door.

### HYDROSTATIC PRESSURE TEST OF BOILER

The individual sections and the complete boiler has been pressure tested at the factory; however, the boiler should be pressure tested at the job location to insure that the water-tight seal was maintained during shipment.

1. Remove the shipping nipple from the supply outlet tapping at the top of the boiler and plug any necessary boiler tappings or openings.
2. **For P-CG boilers,** attach the Float Type Automatic Air Vent to the swaged pipe nipple which is installed in the left end section just behind the supply outlet tapping. **Note: The swaged nipple and Float Type Automatic Air Vent are not standard equipment for CGM and CG boilers.**
3. **For CGM and CG boilers,** plug the compression tank tapping located in the left end section just behind the supply outlet tapping.
4. **For CGM and CG boilers,** make provisions for draining the boiler.
5. Connect the water supply to the boiler and fill the boiler with water. Completely purge all entrapped air. Test the boiler with water pressure not exceeding 30 pounds per square inch. **Note: Submit the boiler to this test pressure for at least 10 minutes, but for no longer than 30 minutes.**
6. Thoroughly inspect the entire boiler for water leaks. At the end of the test period, look at the pressure gauge and ascertain that the water test pressure has remained constant.
7. Thoroughly drain the entire boiler and remove plugs from any tappings that will be used for controls and accessories.

### SUGGESTED BOILER PIPING CONNECTIONS TO THE HEATING SYSTEM

The Type P-CG, CGM and CG boilers are provided with

a built-in air elimination system to separate air from the circulating water.

**For P-CG boilers,** the Float Type Automatic Air Vent furnished must be installed in the proper tapping as directed under Hydrostatic Pressure Test of Boiler. No additional boiler air eliminating device will be required. **For proper operation and venting of the float type automatic air vent,** unscrew the vent cap at least two full turns.

1. For CGM and CG boilers used with a closed type expansion tank, connect from the compression tank tapping on the left end section (located just behind the supply outlet tapping) to the compression tank using full sized  $\frac{1}{2}$ " N.P.T. piping. Any horizontal compression tank piping must pitch upward at least 1 inch for each 5 feet of piping toward the tank. For CGM and CG boilers used with a closed diaphragm pre-pressurized type compression tank, install a manual or automatic type air vent in the  $\frac{1}{2}$ " N.P.T. tapping.
2. Pipe from the relief valve outlet to a floor drain or near to the floor. **Do not pipe the relief valve discharge to any area where freezing temperatures could occur.**
3. Connect the system supply piping to the supply outlet tapping at the left end of the boiler.
4. For Type CG boilers, connect the system return piping to the tapping at the left side of the boiler. Install the drain cock in a tee where the return piping enters the boiler.
5. For Type P-CG and CGM boilers, connect the system return piping to the circulator counter flange (see Figure 1). The watertight seal between the circulator flange and circulator counter flange is maintained by a rubber "O" ring; where solder type fittings are used, be sure the "O" ring is not between the flanges while the solder connection is made.
6. It is recommended that a separate air vent be installed in a tee located in the return piping at the drop to the circulator.
7. For Type CGM and CG boilers, connect the cold water fill supply piping close to the boiler in the compression tank piping.
8. For Type P-CG boilers, connect the cold water fill supply piping to the union on the combination automatic fill valve and manual shut-off valve. **Before making this connection, refer to the separate instructions on the tag attached to the handle of the valve.**
9. For P-CG-6 through P-CG-9 boilers, attach the No. 110 Fill-Trol Tank to the Combination Fill Valve and Manual Shut-Off Valve. The watertight seal between the tank and the combination valve is accomplished by a rubber "O" ring. For P-CG-3 through P-CG-5 boilers, the No. 109 Fill-Trol Tank is shipped attached to the Combination Valve.



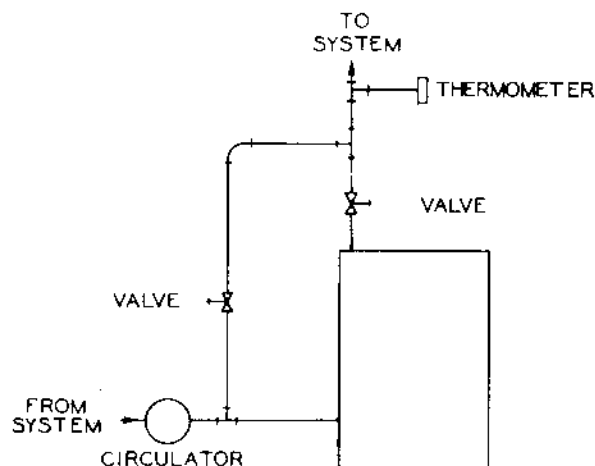


FIGURE 3

Where the boiler is to be used with a radiant panel system or other low water temperature applications (i.e. converted gravity systems, etc.) a boiler by-pass piping arrangement should be used to assure higher boiler water temperature for optimum boiler operation. If a boiler bypass piping arrangement is required, locate a tee in the return piping between the circulator and the boiler and another tee in the supply piping as illustrated in Figure 3. Use the same size bypass piping as the supply and return piping. Locate a valve in the bypass piping and in the supply piping between the supply outlet tapping and the tee as illustrated in Figure 3 so the water flow rate through the boiler and through the bypass can be regulated to maintain a higher boiler water temperature. Adjust the valves to provide 200° to 220°F. boiler water temperature when the system water temperature is at the maximum desired.

### DRAFT HOOD INSTALLATION

Secure the draft hood to the outlet of the flue collector hood at the top of the boiler with sheet metal screws. The draft hood must be installed as it is received without any modifications or alterations. For proper combustion, it is imperative that the bottom of the draft hood "skirt" have the proper clearance dimension above the jacket top panel, as indicated on the draft hood. If the draft hood is altered, the A.G.A. design certification becomes void.

### BREECHING ERECTION

(also refer to Chimney or Flue)

Connect from the draft hood outlet to the chimney or vent with full-sized (same diameter as draft hood outlet) breeching. Where the installation permits, vertical venting of the combustion gases to the outside from the draft hood outlet will afford best performance at lowest total cost. Where the boiler must be connected to a chimney or vent with horizontal breeching, the horizontal breeching must be the same diameter as the draft hood outlet

and should slope upward at least  $\frac{1}{4}$  inch per lineal foot toward the chimney or vent. A vertical height of 3 feet to 5 feet of breeching before any elbow or horizontal breeching is recommended to reduce chances of flue gas spillage at the draft hood. Long horizontal breechings, excessive numbers of elbows or tees, or other obstructions which restrict the flow of combustion gases should be avoided.

### CONNECT THE BOILER TO THE GAS SUPPLY

Determine whether the gas supply is to be piped to the Right Side or Left Side of the boiler. If the gas supply piping is to be located at the right side of the boiler, remove the knockout disc from the Jacket Right Side Panel; if the gas supply piping is to be located at the left side of the boiler, remove the knockout disc from the Jacket Left Side Panel. To remove the knockout disc, bend one side inward until it can be grasped with a pair of pliers; then, bend the disc back and forth until it breaks loose.

The gas supply piping should be installed in accordance with the American National Standard Installation Manual for Gas Appliances and Gas Piping. The pipe joint compound (pipe dope) employed should be resistant to the corrosive action of liquefied petroleum gases and should be applied sparingly only to the male threads of the pipe joints.

1. Remove the Jacket Door and Connect from the gas valve to the gas meter (see Size of Piping to Gas Boilers). Use a street elbow or an elbow and close nipple at the inlet connection of the gas valve so the gas piping will properly pass through the opening in the Jacket Side Panel. If the boiler was ordered for propane gas, make sure the pressure regulator cover plate is installed on the main (automatic) gas valve for propane gas firing with unregulated gas supply.

If a manual main shut-off gas valve is required it must be located in the gas supply piping according to the local utility requirements.

2. A drip leg must be installed at the inlet of the gas connection to the boiler to comply with ANSI Standard requirements. Where the local utility requires that the drip leg be extended all the way to the floor, place an appropriate length of pipe between the cap and tee. A ground joint union must be installed in the piping to provide for easy removal of controls for servicing. Gas supply piping must be supported by external hangers; do not permit gas supply piping weight to be supported by the boiler or its accessories.

3. Purge all air from the gas supply piping.

4. Check all gas connections for leaks; use a soapy solution, do not use a flame. Liability for damage done through the use of a flame can not be assumed by the manufacturer.

### SIZE OF PIPING TO GAS BOILER

In determining the size of gas supply piping to the boiler, the following factors should be considered:

- Diameter and length of the gas supply piping and number of fittings.
- Maximum gas consumption (including any possible future expansion)
- Allowable loss in gas pressure from the gas meter outlet to the boiler. This is specified as three-tenths on an inch water column.

The volume of gas to be used (in cubic feet per hour) should be determined, whenever possible, directly from the input rating (in BTU per hour) of the boiler to be installed and the heating value of the gas to be used. To obtain the cubic feet per hour to be used, divide the input (in BTU per hour) of the boiler by the BTU heating value per cubic foot of gas.

### PIPE DELIVERY SCHEDULE

Length of Pipe in Feet	*CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	890
40	63	130	245	500	760
50	56	115	215	440	670
75	45	93	175	360	545
100	38	79	150	305	460
150	31	64	120	250	380

\*Flow determined by Dr. Pole's Formula-Specific Gravity: .60 Pressure Loss: 3/10" water.

#### ADDITIONAL LENGTH OF PIPE TO BE ADDED FOR EACH ELBOW OR TEE BEND IN THE LINE

Pipe Size, Inches	Additional Length, Feet
1/2	1.3
3/4	1.7
1	2.2

### WIRING THE BOILER

The boiler is shipped with the combination relay-transformer, limit control, circulator (for P-CG and CGM boilers), and main (automatic) gas valve completely wired. Bring the electrical supply through the proper opening in the jacket left side panel (see Figure 1) and into the junction box; wire the electrical supply as shown on the wiring diagram label. Bring the thermostat wiring through the proper opening in the jacket left side panel (see Figure 1) and wire the thermostat across the proper terminals on the combination relay-transformer as shown on the wiring diagram label. For CG boilers, connect the circulator to the combination relay-transformer. All safety circuit wiring should be N.E.C. Class - 1 and should be installed in compliance with any local or state codes or requirements having jurisdiction.

When using multiple zone valves with the boiler, follow the separate wiring diagram packaged with the control for proper wiring application.

### OPERATING AND SAFETY CHECK OUT SEQUENCE

- Be sure the boiler and the heat distributing units are filled with water (see Filling Steam and Water Boilers on the operating instruction card). For P-CG boilers, open the vent cap on the Float Type Automatic Air Vent two full turns for the proper operation and venting.
- Be sure all the air is purged from the gas supply piping and that the piping has been checked for gas leaks.
- Caution: Make sure that the manual main shut-off gas valve and/or the manual gas cock knob on the main (automatic) gas valve have been closed for at least five minutes before attempting to light the safety pilot burner.**
- Move the indicator on the room thermostat to the lowest temperature setting so there is **no call for heat** and turn the main electric switch in the boiler electrical circuit to the **off** position.
- Remove the Jacket Door and Access Panel.
- Open the manual main shut-off gas valve and/or turn the manual gas cock knob on the main (automatic) gas valve to the pilot position.
- Hold a burning match or taper over the safety pilot burner and depress the manual gas cock knob on the main (automatic) gas valve; the safety pilot burner should then ignite. Continue to hold in the knob for at least 60 seconds, then release. The pilot flame should remain burning.
- Wait at least two minutes then, turn the main electric switch in the boiler electrical circuit to the **on** position. Turn the manual gas cock knob on the main (automatic) gas valve to the **on** position.
- Move the indicator on the room thermostat so there is a call for heat. The main (automatic) gas valve should open and the gas burners should ignite. **Refer to Adjusting The Burners and adjust the primary air shutters to obtain the proper main burner flame.**
- While the burners are operating, move the indicator on the limit control below the actual boiler water temperature, the main (automatic) gas valve should close and the gas burners should go out. Move the indicator on the limit control to the normal setting and the gas valve should open and the burners ignite.
- Replace the Access Panel and the Jacket Door.
- Set the adjustable heat anticipator on the room thermostat according to the power requirements of the primary control employed.
- Set thermostat to desired room temperature.

### ADJUSTING THE BURNERS

While the boiler is operating, adjust each primary air shutter to give a primary cone so that the points of the

cone are between  $\frac{3}{4}$  and 1 inch above the face of the main burner. At this point the main burner flame should be light blue in color. If the main burner flame has a yellow tip, open the Primary Air Shutter until the correct flame is secured. For natural and propane gases, the primary air shutters should be approximately three-quarters open. If the main burner flame is too hard, close the air shutter until the proper flame is secured. **Be sure the main burner heads are level and that the gas orifices will inject gas down the centerline of the burner mixer tubes.**

Measure the gas input to the boiler by reading the gas meter. Be sure all other appliances connected to the same meter are shut-off. Rate of gas flow (cubic feet per hour) multiplied by the BTU value (per cubic foot) of the gas used should check with the A.G.A. design certified input shown on the rating plate of the boiler. If the actual input is within 5 per cent of the rated input, adjust the gas pressure regulator to obtain the required gas flow. For boilers equipped with the combination type gas control valve, the gas pressure regulator is located on the main gas valve body. To adjust the gas input, remove the regulator adjustment screw cap and with a screwdriver, turn the adjustment screw clockwise to increase the gas flow or counter-clockwise to decrease the gas flow; then replace the cap. If the actual input is more than 5 per cent off the rated boiler input, change orifice sizes. Check the main burners again and readjust the burner flame if necessary.

Note: For proper aspiration, the Manifold Gas Pressure should be at least  $3\frac{1}{2}$  inches water column for natural gas and 11 inches water column for propane gas.

### WATER BOILER CONTROLS

**Fail-Safe High Limit:** The temperature limit control furnished as standard equipment with the boiler is of the fail-safe design. The fail-safe mechanism will open the high limit contacts, preventing system start-up upon loss of sensing bulb fill or if the control element is subjected to temperatures below 35°F. (the contacts will not again close until the control element temperature reaches about 45°F.). **If the boiler water temperature is not above 45°F., the control will have to be jumpered to start the boiler. Be sure to remove the jumper after the boiler temperature goes above 45°F.**

**Float Type Automatic Air Vent:** For proper operation and venting, the vent cap must be unscrewed at least two full turns. When the system is filled with water, loosen the vent cap slowly so that particles of dirt or scale are not deposited on the valve seat by the escaping air. Should dirt or scale lodge on the valve seat causing it to leak, remove the vent cap and push the valve core in by hand to permit water to flush the valve seat clean; then, release the valve core quickly and replace the vent cap.

**Boiler Pressure:** The initial fill pressure of a hot water heating system is generally to 12 pounds per square inch. When the system is heated to the limit control

setting, the pressure may range up to 30 pounds per square inch. Normal system pressure will fluctuate between the fill pressure, when the system is cold, and up to 20 to 28 pounds per square inch when the system is hot. For multiple story buildings, it may be necessary to increase the initial system fill pressure in order to be sure that all the heat distributing units are completely filled with water. For boilers equipped with a closed diaphragm type expansion tank (which is shipped from the factory with a standard 12 pound air charge), use a hand air pump to increase the tank air pressure to obtain the necessary initial system fill pressure.

### ADDITIONAL INSTRUCTIONS

**Before leaving the job, make sure the unit checks electrically.** Be sure the room thermostat is set to the desired room temperature and that the limit control is set according to the requirements of the heating system. Make sure that the proper main burner flame is secured and that the primary air shutters are securely tightened in a fixed position so that they will not be subject to an accidental change in position. **For additional information on controls, refer to the manufacturer's instructions supplied with the controls.**

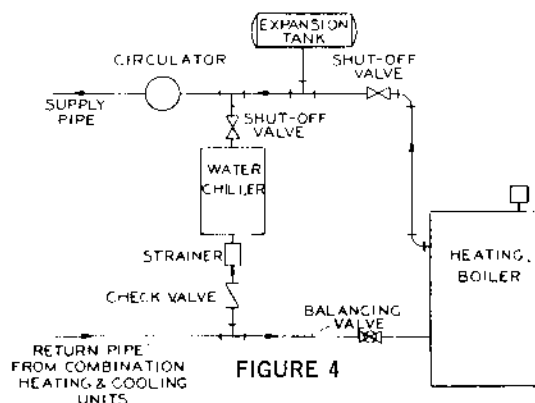
### BOILER SERVICE AND MAINTENANCE

The boiler Start-Up, Service, and Maintenance Instructions contain information for the owner. Review this information with the owner and be sure he receives all instructions.

### WHEN BOILER IS USED WITH REFRIGERATION SYSTEM

When the boiler is used in connection with refrigeration systems, it shall be installed so that the chilled medium is piped in parallel with the heating boiler and with appropriate valves to prevent the chilled medium from entering the heating boiler.

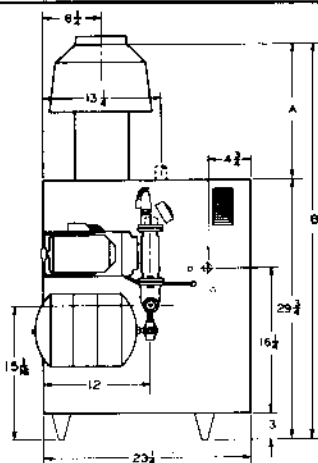
When hot water heating boilers are connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, the boiler piping system shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.



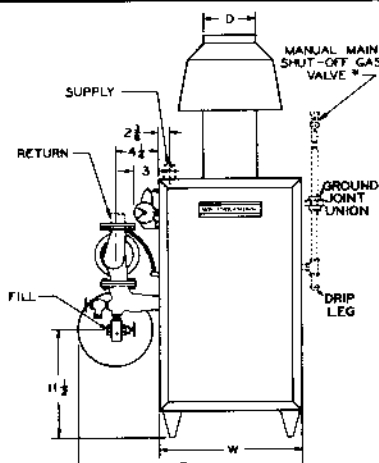
# Installation Instructions

## TYPES P-CG, CGM, AND CG GAS-FIRED BOILERS (Series 4)

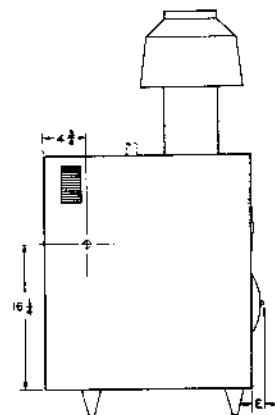
Weil-McLain  
Company, Inc.



LEFT SIDE



FRONT



RIGHT SIDE

\* Locate manual main Shut-Off Gas Valve (where required) according to utility requirements. Gas Supply Piping may be located at the left side or right side of the boiler.



Design  
Certified by  
American Gas  
Association



Net ratings approved by  
Institute of Boiler and  
Radiator Mfrs.



Built to  
ASME  
specifications

### RATINGS — DIMENSIONS

Boiler Number	Natural Gas with Drilled Port Burners				†Natural and Propane Gases with Ribbon Burners				Dimensions in Inches					
	A. G. A. Input BTU/Hr.	A. G. A. Gross Output BTU/Hr.	Net I-B-R Ratings BTU/Hr.*	Net Square Feet of Water**	A. G. A. Input BTU/Hr.	A. G. A. Gross Output BTU/Hr.	Net I-B-R Ratings BTU/Hr.*	Net Square Feet of Water**	A	B	C	D	E	W
◆P-CG-3	70,000	56,000	48,700	325	66,000	52,800*	46,100	305	15"	44 3/4"	18 1/4"	4"	1 1/2"	10"
◆P-CG-4	105,000	84,000	73,000	485	99,000	79,200	68,700	460	17 7/8"	47 5/8"	21 1/4"	5"	1 1/2"	13"
◆P-CG-5	140,000	112,000	97,400	650	132,000	105,600	92,200	615	21 1/4"	51"	24 1/4"	6"	1 1/2"	16"
◆P-CG-6	175,000	140,000	121,700	810	165,000	132,000	114,800	765	21 1/4"	51"	30 7/8"	6"	4"	19"
◆P-CG-7	210,000	168,000	146,100	975	198,000	158,400	137,400	915	25 1/4"	55"	33 7/8"	7"	4"	22"
◆P-CG-8	245,000	196,000	170,400	1,135	231,000	184,800	160,900	1,070	25 1/4"	55"	36 7/8"	7"	4"	25"
◆P-CG-9	280,000	224,000	194,800	1,300	264,000	211,200	183,500	1,225	28 3/8"	58 1/8"	39 7/8"	8"	4"	28"

### ENGINEERING DATA

Boiler Number	Supply Outlet		+ Return Inlet (In Circulator)		Boiler Water Content Gallons	Maximum Allowable System Water Content in Gallons with Standard Fill-Trol ▲	Gas Connection Pipe Size		Gas Manifold Pipe Size All Gases	Chimney and Breeching Size *
	No.	Pipe Size	No.	Pipe Size			Natural Gas	Propane Gas		
◆P-CG-3	1	1 1/4"	1	1"	1.54	18	1/2"	3/4"	1/2"	4" I.D.
◆P-CG-4	1	1 1/4"	1	1"	2.11	18	1/2"	3/4"	1/2"	5" I.D.
◆P-CG-5	1	1 1/4"	1	1"	2.69	18	1/2"	1/2"	1/2"	6" I.D.
◆P-CG-6	1	1 1/4"	1	1 1/4"	3.26	44	1/2"	1/2"	1/2"	6" I.D.
◆P-CG-7	1	1 1/4"	1	1 1/4"	3.84	44	1/2"	1/2"	3/4"	7" I.D.
◆P-CG-8	1	1 1/2"	1	1 1/2"	4.42	44	3/4"	1/2"	3/4"	7" I.D.
◆P-CG-9	1	1 1/2"	1	1 1/2"	5.00	44	3/4"	1/2"	3/4"	8" I.D.

◆ Delete "P" for assembled boiler without circulator and Fill-Trol. Delete "P" and add suffix "M" to designator for package unit without Fill-Trol (example CGM-3).

† Add "R" suffix for Propane Gas Boilers and Natural Gas Boilers which are equipped with Ribbon Burners.

\* Net I-B-R Ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pick-up. Ratings are computed on an allowance factor of 1.15. For usual piping and pick-up loads,

consult Weil-McLain Customer Services Department. Based upon average temperature of 170°F. in heat distributing units.

▲ Includes boiler water volume. For piping systems which have a higher water content, additional compression tank capacity must be provided (see table in text).

• In special cases where surrounding conditions permit, chimney height may be 10 ft.

+ For CG boilers, there is one 1 1/4" N.P.T. tapped return connection at the left side of the boiler.

**WEIL-McLAIN**

COMPANY INC. • MICHIGAN CITY, INDIANA

**HYDRONIC**  
**WM**  
DIVISION