PLAINTIFF'S EXHIBIT

ASI-668

EMPIRE BOILER

by

AMERICAN-Standard

INSTALLATION—OPERATION AND MAINTENANCE MANUAL

FOR

TYPE O-GS-E GAS FIRED BOILERS

APPROVED BY AMERICAN GAS ASSOCIATION

12/56

Notice to Installer and Operator
This Booklet Must Be Affixed to or Placed in Suitable Pocket on the inside of the Access Panel

AMERICAN-Standard

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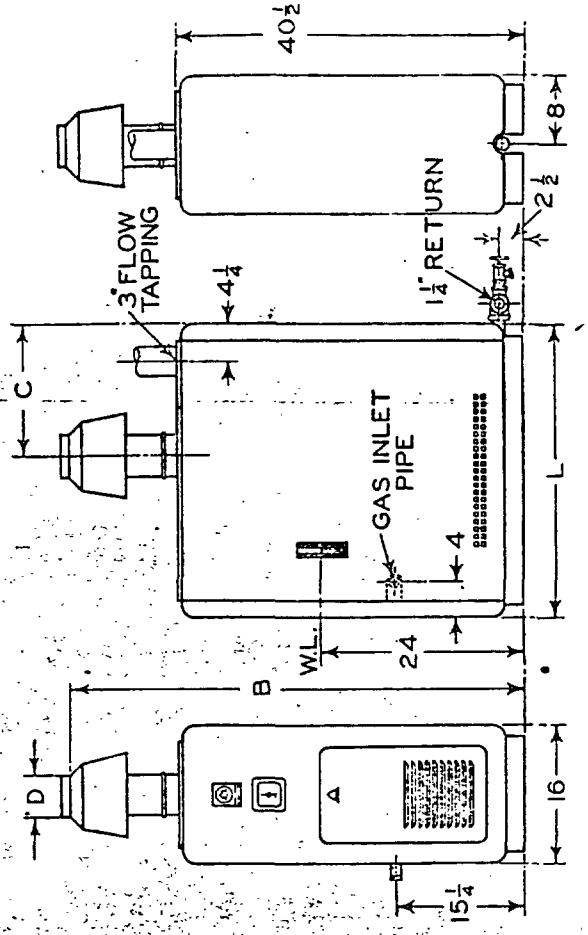


BOILER NUMBER	NO. OF SECTIONS	NO. OF BURNERS	B	C	D	L
O-GS-4-E	4	2	53⅛	14⅞	5	33¾
O-GS-5-E	5	2	53⅝	16⅞	5	37¾
O-GS-6-E	6	2	56⅝	18⅞	6	41¾

ERECTING

Location

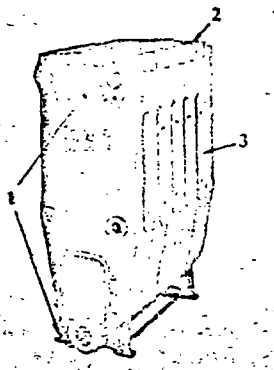
If water condition is encountered in basement, or if it has been necessary to water-proof the basement floor, boiler should be mounted on concrete or hollow tile base at least 3 inches above floor level.

Testing

Before connecting boiler, plug openings for testing. Flanged openings can be closed by using flanges provided on Low Water Cutoff and Gauge Glass Piping with openings plugged. Fill boiler with water and subject to not less than 10 lb. nor more than 30 lb. pressure. Inspect boiler inside and outside for leakage to insure against breakage from handling and shipping. To safeguard accuracy of gauge supplied with boiler do not install gauge until after test of boiler. This precaution of testing the boiler will simplify handling of any necessary replacements or adjustments and assist in treating claims against transportation companies. After test, drain and remove plugs where required. Remove plugs and replace flanges on Low Water Cutoff and Gauge Glass Piping.

Assembly of Platework and Controls

1. Position boiler section assemblage so that removable cleanout plates are accessible for periodic cleaning.
2. Remove outer nut from front of upper tie rod, then loosen all other tie rod nuts until they are finger-tight only.
3. Install metal backed insulation plate at front of boiler and fasten in place with outer nut from upper tie rod. See Fig. 3. Attach terminal block and number-series plate to insulation plate with sheet metal screws.



1. Tie Rod Nuts
2. Rutty Groove
3. Cleanout Cover Plates

Fig. 1—Section Assemblage

4. Attach low water cutoff and gauge glass piping assemblies to boiler. Assemble the working mechanism to the low water cutoff with gasket and screws (This mechanism is furnished in separate package). Fig. 2, shows complete assemblies. Fig. 3, shows these assemblies attached to boiler.

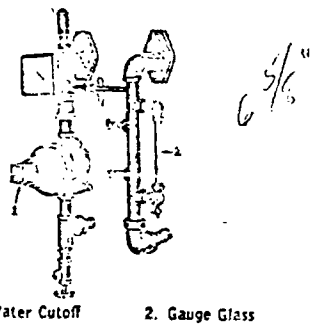


FIG. 2—Low Water Cutoff and Steam Trim Assemblies

5. Assemble the water gauge glass trim to the gauge glass pipe and attach the steam gauge as shown in Fig. 3.

6. Fill putty groove around top of sections with boiler putty then place canopy so that turned-down edges are firmly imbedded in putty to make gas seal. Smooth off excess putty.

7. See that air shutters are assembled on mixing tubes, then seat burners firmly on tapered ends of mixing tubes. Place burner with pilot bracket and attachments and mixing tube assembly in left side of combustion chamber with lugs on the mixing tube resting on the support cast on center section. Place remaining burner and mixer assembly in right side of combustion chamber.

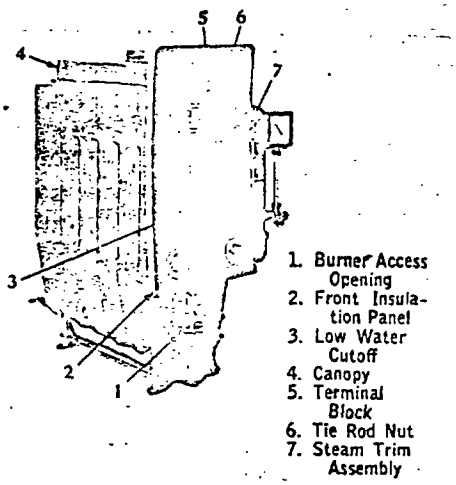
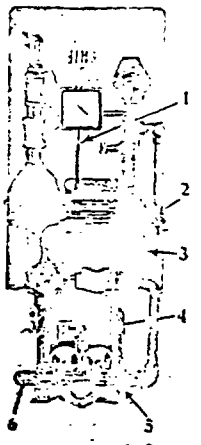


FIG. 3—Steam Trim Assembled

8. See that orifice spuds in ends of spud holders or burner cocks are screwed in tight and that orifices are drilled to size specified on tag attached to manifold. Place manifold and piping assembly in position with ends of burner cocks or spud holders pushed firmly into tapered holes of mixing tubes, then attach manifold brackets to front section with 5/16 inch round head screws.

Be sure arrows on automatic gas valve, gas pressure regulator and BASO automatic pilot valve point in direction of gas flow. Connect steam control element of automatic gas valve to tee fitting on steam gauge piping with 5/16 inch copper tubing and connections. Remove plug and fill tubing with water before starting boiler.



1. Copper Tubing
2. Steam Control Element
3. Automatic Gas Valve
4. Burners
5. Manifold Brackets
6. Manifold

FIG. 4—Burners and Control Piping

9. Install manual shutoff valve assembly in gas supply line as shown in Fig. 9.

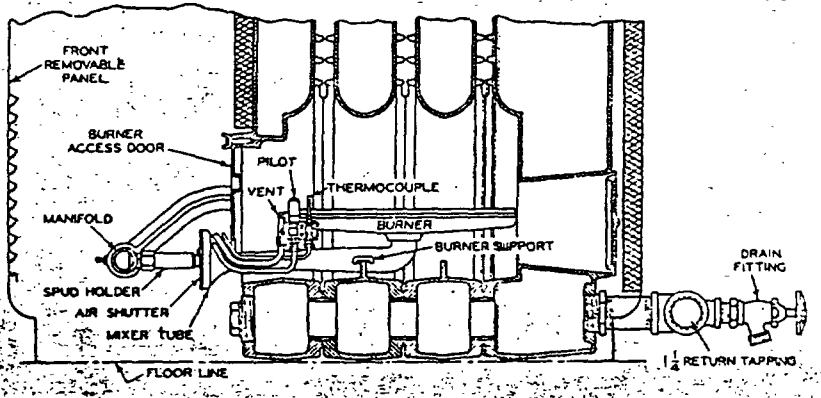
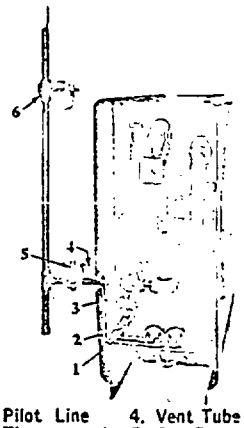


FIG. 5—Cross Section Through Combustion Chamber

Connecting Controls For Mfd., Nat. and Mixed Gases, Manual Ignition

1. Connect pilot line from pilot cock on manual shutoff valve assembly to union in pilot line attached to pilot burner.

2. Connect vent tube from gas pressure regulator to vent tube on pilot burner bracket. Be sure stainless steel tip is screwed in securely and that flame check is in place in vent tube connection on regulator. (See Fig. 7.)



1. Pilot Line
2. Thermocouple
3. BASO Automatic Pilot Valve
4. Vent Tube
5. Gas Pressure Regulator
6. Manual Shutoff Valve Assem.

FIG. 6—Connecting Controls City Gases

3. Connect thermocouple lead from pilot burner bracket to BASO automatic pilot valve.

4. Wire according to wiring diagram in Fig. 8.

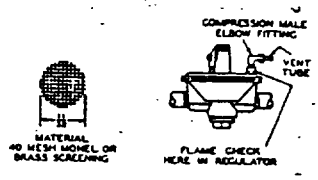


FIG. 7—Flame Check

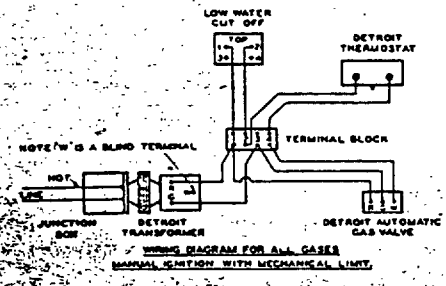


FIG. 8—Wiring Diagram

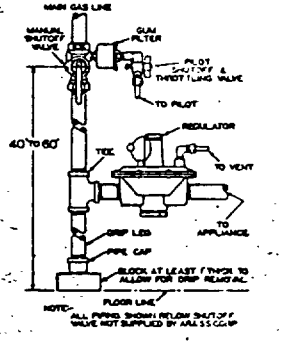


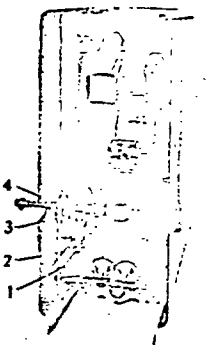
FIG. 9—Supply Piping Arrangement

Connecting Controls For Liquefied Petroleum Gases, Manual Ignition

1. Connect pilot line from pilot cock on BASO automatic pilot valve to union in pilot line attached to pilot burner.

2. Connect thermocouple lead from pilot burner bracket to BASO automatic pilot valve.

3. Wire according to wiring diagram in Fig. 8.



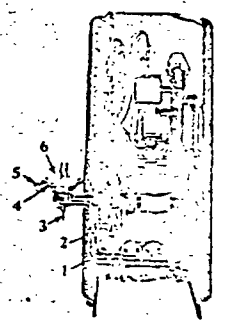
1. Thermocouple
2. Pilot Line
3. Pilot Cock
4. BASO Automatic Pilot Valve

FIG. 10—Connecting Controls Liquefied Petroleum Gas

Connecting Controls For Liquefied Petroleum-Air Gases, Manual Ignition

1. Connect pilot line from pilot cock and pilot filter on BASO automatic pilot valve to union on pilot line attached to pilot burner.

2. Connect vent tube from gas pressure regulator to vent tube on pilot burner bracket. Be sure stainless steel tip is screwed in securely and that flame check is in place in vent tube connection on regulator. (See Fig. 7.)



1. Pilot Line
2. Vent Tube
3. Thermocouple
4. Pilot Filter
5. Pilot Cock
6. Gas Pressure Regulator

FIG. 11—Connecting Controls Liquefied Petroleum-Air Gas

3. Connect thermocouple lead from pilot burner bracket to BASO automatic pilot valve.

4. Wire according to wiring diagram in Fig. 8.

Flow and Return Connections

1. Make flow and return connections and tighten all bushings and fittings that will be covered by jacket.

2. Plug all unused tappings and install drain cock return fitting subassembly in return tapping at rear of boiler.

3. Screw short end of 1/4 inch brass stud in tapping on front section and install front burner access door. Fasten with wing nut.

4. Be sure rear burner access door is attached to rear section with 1/4-20 x 1/2 in. round head screws.

Jacket Assembly

1. Place rear jacket panel in position then place side jacket panels with grooved edges engaging flanges of rear jacket panel. Attach side jacket panels to rear jacket panel at top and bottom with screws and nuts. An opening is provided in Left Side Panel for gas inlet pipe.

2. Place front jacket panel with flange engaging grooves of side jacket panels and attach at top and bottom with screws.

3. Place top jacket panel in position with perforations over controls.

4. Attach Lighting Instruction Plate to inside of control access door. Plate should be placed on "Z" clips and secured by bending down six tabs which are provided. Install control access door on front jacket panel.

5. Place draft hood in position through top jacket panel firmly engaging flue outlet of canopy.

6. Connect flue pipe to draft hood.

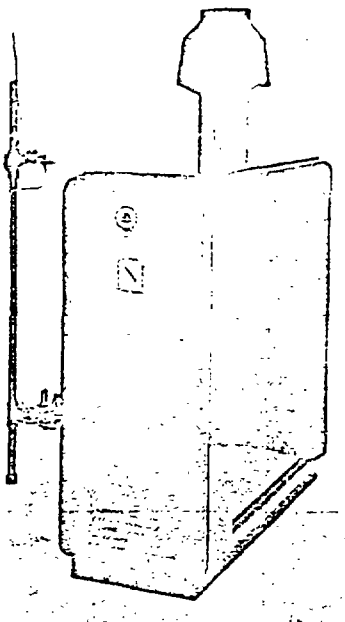


FIG. 12—Front View

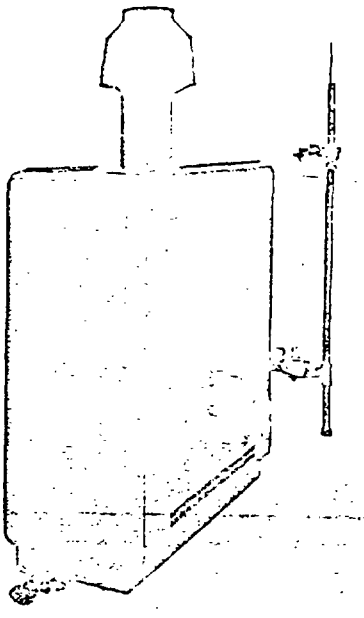


FIG. 13—Rear View

Filling System

Caution: Never start boiler unless it is properly filled. After boiler is in operation, make up water should be added slowly.

Fill until water is visible midway up gauge glass between try cocks. Keep boiler properly filled.

Pilot Adjustment

Light boiler as directed in operating instructions and check for gas leaks. Adjust pilot flame to extend just over top of burner. Pilot rate can be adjusted with screw underneath cap on pilot cock.

Normal Pilot Input For BASO Pilot Burners

	Mfd.	Nat.	Mixed	L.P.	L.P.—Air
Input per Burner Btu/Hr.	1000	1400	1200	1000	1000

Main Burner Input Adjustment

After boiler is warmed up, shut off all other gas appliances connected to gas meter and time gas consumption. Adjust gas pressure regulator to give rated input indicated on nameplate.

$$\text{Gas Consumption (Cubic Feet per Hr.)} = \frac{\text{Input Rating (Btu. per Hr.)}}{\text{Heating Value of Gas (Btu per Cu. Ft.)}}$$

To increase consumption, turn adjustment screw (beneath cap on pressure regulator) clockwise; to decrease, turn screw counterclockwise.

Main Burner Primary Air Adjustment

Adjust burner flame by opening or closing primary air shutter. Flame should burn quietly, show no yellow and should have a noticeable inner blue cone. After adjustment, tighten screw to lock shutter in position.

Checkup of Low Water Cutoff

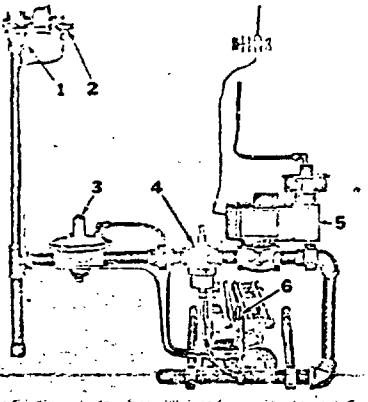
1. Light pilot as indicated in Operating Instructions. Turn thermostat to highest temperature. Automatic Gas Valve should open in approximately two minutes.
2. Open drain cock and drain water until water level is about an inch below center line of Low Water Cutoff. Automatic Gas Valve should close in approximately one minute.
3. Refill until water level is above center line of Low Water Cutoff. Automatic Gas Valve should open in approximately two minutes.

OPERATING

Shutting Off (For All Gases)

1. Close manual shutoff valve and pilot cock.
2. Turn off switch in electric line to appliance.

Relighting (Manual Ignition; Mfd., Nat. and Mixed Gases)

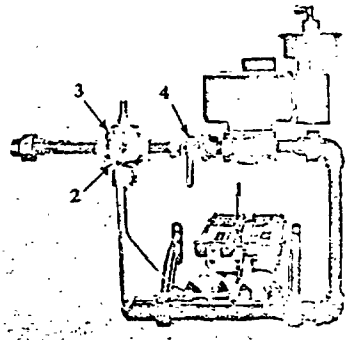


1. Manual Shutoff Valve
2. Pilot Cock
3. Gas Pressure Regulator
4. BASO Automatic Gas Valve
5. Automatic Gas Valve
6. Pilot Burner

FIG. 14—Controls for City Gases

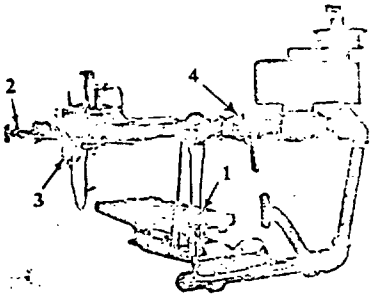
1. Set room thermostat to lowest temperature.
2. Be sure manual shutoff valve 1, pilot cock 2, and switch in electric line to appliance have been shut off for at least five minutes before proceeding.
3. Open pilot cock 2, and light pilot burner.
4. Wait two minutes.
5. Press plunger on Baso automatic pilot valve or switch.
6. Open manual shutoff valve 1.
7. Turn on switch in electric line to appliance.
8. Set room thermostat to desired temperature.

Relighting (Manual Ignition; Liquefied Petroleum Gases)



1. Pilot Burner
2. Pilot Cock
3. BASO Automatic Pilot Valve
4. Manual Shutoff Valve

FIG. 15—Controls for LP Gases



1. Pilot Burner
2. Pilot Cock
3. BASO Automatic Pilot Valve
4. Manual Shutoff Valve

FIG. 16—Control Arrangement for Liquefied Petroleum-Air Gases

1. Set thermostat at lowest temperature, and turn off switch in electric line to appliance.

2. Make sure the manual shutoff valve 4, and pilot cock 2, have been shut off for at least five minutes before proceeding.

3. Open burner access door.

4. Open pilot cock 2.

5. Light taper and hold to pilot burner.

6. Press plunger on Baso automatic pilot valve 3.

7. Close burner access door.

8. Open manual shutoff valve 4, to full open position.

9. Turn on switch in electric line to appliance.

10. Set thermostat at desired temperature.

Pilot Goes Out

If the pilot flame is extinguished, the automatic pilot will shut off the automatic gas valve. If boiler is not operating correctly, call Heating Contractor or Gas Company service man. If boiler is operating correctly, relight as directed above.

Operation During Failure of Electric Power Supply

In case of failure of supply of electric current, boiler will automatically shut off. Boiler will not operate automatically while electric power is off; however, boilers equipped with Detroit automatic gas valve may be operated manually as follows:

1. If pilot is out, relight as directed for manual ignition.
2. Remove rectangular housing from top of valve.
3. Pull up knob located on top. (Burners should light.)
4. Caution—Shut off boiler by pressing reset lever, located next to knob, before water temperature becomes excessive.

Bear in mind that operating the boiler manually is an emergency condition and that constant supervision is required to prevent the possibility of damage due to overheating. Never allow the boiler to operate under this emergency condition if it is to be left unsupervised for any length of time.

5. Valve is fully recycling and will return to automatic operation when electric power returns.

CARE AND ATTENTION

In Fall before Starting Boiler

Drain system sufficiently to remove sludge in bottom of boiler. Do not drain more water than necessary to remove sludge. Then refill to proper level as directed above.

Care of Boiler while in Operation

1. Check water level regularly and add water slowly when needed.
2. This boiler is fired automatically.
3. Test safety valve on boiler at beginning of season and once a month thereafter:
   a) Fasten cord or wire to valve lever.
   b) When pressure is up, stand safe distance away and pull cord. (Steam should be released.)

In Winter while Not in Operation

Drain entire system to prevent damage from freezing. Drain through drain cock, located at lowest point in system. Be sure boiler is completely drained.

In Summer while Not in Operation

Fill boiler as during heating season. Have boiler inspected by service man before the start of the heating season. If necessary, remove jacket front and side panels so that cleanout cover plates are accessible. These may be removed from either side of the boiler for cleaning between the sections.

General Care of Heating System

1. Keep radiators and convectors clean.
2. Keep system in good repair. It is advisable to have it inspected by your heating contractor at least once a year.

Blowing Off Steam Boilers

In the process of installation, oil, grease or grit works into new systems causing steam boilers to foam. Therefore, it is frequently necessary to blow off boiler under pressure, and to sometimes repeat the operation until boiler water and water column glass are clean.

To blow off, remove front jacket panel; then remove safety valve

and bushing from tee at upper end of low water cutoff piping assembly. Connect a 1" pipe with valve to tee and run pipe to a suitable drain. Close flow and return valves if available or all radiator valves. Fill boiler with water to top of gauge glass. Light burners as directed in Operating Instructions and when steam pressure is over 10 lbs. but below 15 lbs. open blow off valve and regulate valve to maintain pressure in boiler. Add water as required to maintain full gauge level in boiler. Continue for about 2 hours. Then drain water to proper level, remove blow off piping and replace safety valve and bushing.

If water supply has not sufficient pressure proceed as above but open blow off valve fully and let pressure drop to zero. Then close valve, replenish water and repeat several times. At end of blow off build up 10 lb. pressure, shut off burners as directed in operating instructions and blow water out through drain opening. Refill to proper level, AFTER BOILER HAS COOLED. Do not use soda, alkali, vinegar or any acid for cleansing the boiler. In severe cases, the use of "Vinco" is recommended. Use 3 lbs. of Vinco for 350 Sq. Ft. radiation or less and 1 lb. for each additional 150 Sq. Ft.

Caution

After the blow off operation, a checkup should be made of the Low Water Cutoff as directed on Page 8.

NOTE: All parts of this boiler have been carefully inspected and packed. In case of shortage, make sure that all parts have been removed from shipping container and examine packing material thoroughly. If parts cannot be found, report shortage to your dealer, giving boiler size, series number, date, inspector's number and packer's number. (See Parts List and Packer's Check Tickets.)

Give boiler size and series number when ordering repair parts.

PACKERS CHECK TICKET

Boiler Size .....

Series No. (See series plate on boiler) .....

Date .....



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