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PLEASE REPLACE IMMEDIATELY IN
ERECTING DIRECTIONS FILE *R-23*

PLAINTIFF'S EXHIBIT
ASI-632

STANDARD BOILERS

by

AMERICAN-Standard

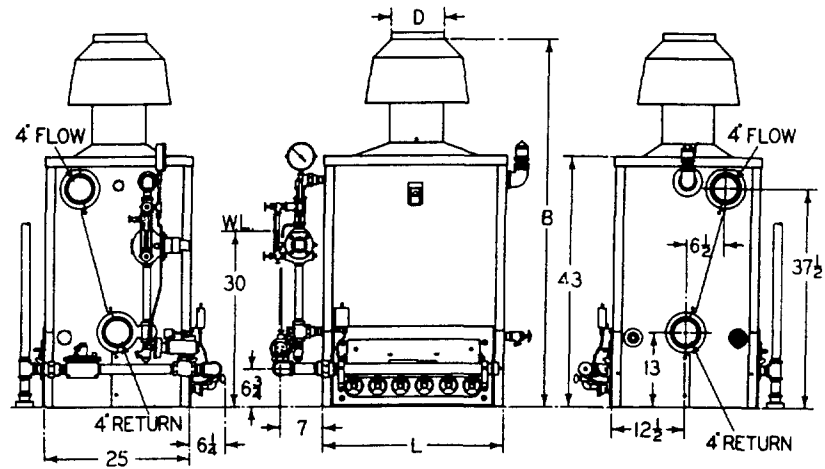
INSTALLATION-OPERATION AND MAINTENANCE MANUAL FOR TYPE 1-G GAS FIRED BOILERS

APPROVED BY AMERICAN GAS ASSOCIATION

*Notice to Installer and Operator
This booklet must be affixed on or
adjacent to the heating equipment*

AMERICAN-Standard
First in heating . . . first in plumbing

GENERAL DIMENSIONS



NO. OF BOILER	NO. OF SECTIONS	NO. OF BURNERS	B	D	L
I-G-4	4	3	57 ³ / ₈	6	19
I-G-5	5	4	59 ³ / ₄	7	23
I-G-6	6	5	60 ¹ / ₄	8	27
I-G-7	7	6	62 ³ / ₈	9	31
I-G-8	8	7	63 ¹ / ₄	9	35
I-G-9	9	8	65	10	39
I-G-10	10	9	65 ⁵ / ₈	10	43

ERECTING

Caution

On hot water systems, expansion tank should not be installed in cold or exposed place. No valves of any type should be installed in piping between boiler and expansion tank. Sealing system at any time during operation may cause breakage of boiler or radiators.

"This appliance should be installed in accordance with the latest AGA Instructions For Installation of Gas Piping And Gas Appliances in Buildings. Reference should also be made to gas company regulations and local building, plumbing or other codes in effect in the area in which the installation is made."

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.

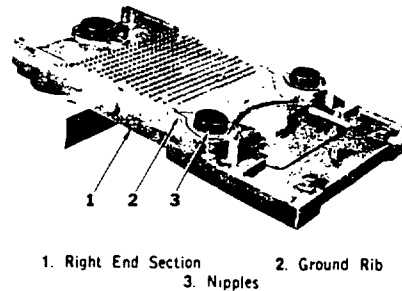
Assembly of Sections

1. All reference to right or left refer to observer's right or left when facing front of boiler where manifold is attached.

2. Select right end section and place on block on floor, as shown in Fig. 1. Clean nipples and nipple openings with kerosene or gasoline and apply good lubricating oil. Do not use paint or red lead.

3. Drive nipples squarely into section, using block of wood and hammer. Each nipple must project outside of finished face of section $\frac{1}{16}$ inch more than half its length. Use rule or gage to insure that nipples project outside of opening equally all around. Most nipple leaks are caused by tilted or cocked nipples.

4. Paint ground rib, around



1. Right End Section 2. Ground Rib
3. Nipples

FIG. 1—Right End Section

outside of section only, with red lead.

5. Place center section in position on nipples in end section. Drive sections together with heavy block of wood striking section squarely as possible over nipple ports.

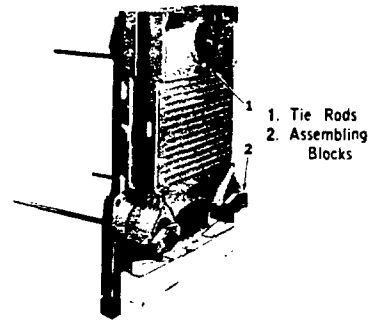


FIG. 2—Assembling Sections

6. Place sections in upright position as shown in Fig. 2 and support with suitable blocking. Sections should stand approximately in their final position with Front facing correctly. (Note—Flow tapping is toward rear of end section.)

7. Insert tie rods through lower nipple openings and tappings on end section and through cored hole below upper nipple port.

Place assembling blocks on lower rods across nipple ports as shown on Fig. 2 placing nuts and washers on all rods. Draw up evenly on nuts until sections make contact at ground joints. Bumping sections with heavy block of wood alternately at nipple ports during drawing up operation will facilitate assembly.

Apply oil or grease freely to tie rod threads while assembling sections to prevent stripping of threads on rods.

Paint ground ribs of each section with red lead and continue assembling center sections one at a time. Shift blocking each time so that support is under the last section assembled.

8. Remove tie rods and place Left End in position. Insert lower tie rods through lugs on ends and upper tie rod through hole in sections. Draw sections together until ground joints are tight.

Back off all tie rod nuts until they are finger tight only, to allow for expansion.

Testing

Before connecting boiler, plug openings, fill boiler with water and subject to not less than 10 lbs. nor more than 30 lbs. pressure. Inspect boiler inside and outside for leakage to insure against breakage from handling and shipping.

To safeguard accuracy of gage supplied with boiler do not install gage until after test of boiler. This precaution of testing the boiler will simplify handling of any necessary replacements or adjustments and assist in treating with claims against transportation companies. After test, drain and remove plugs where required.

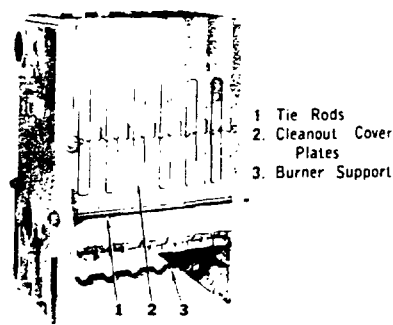


FIG. 3—Section Assemblage

Assembly of Platework

1. Screw short threaded end of brass studs into tapped bosses in recess between sections and attach cleanout cover plates (with asbestos rope gaskets) to front. See that asbestos rope gasket is on each plate and makes gas seal when drawn up tight.

Attach filler plates in like manner to back of boiler. Putty openings between plates and sections. Putty outside of sections at joints with boiler putty. Place burner support on lugs provided on end sections. Fig. 3 shows section assemblage with cover plates and burner support installed.

2. Fill grooves on back of burner access door frames with putty and attach frames to boiler using $\frac{3}{8}$ — 16 x 1" brass hex head cap screws and washers in four corners.



Assembly of Piping and Controls

1. Attach manifold brackets to front burner access door frame with hex head screws.

2. Assemble sub-assemblies of manifold, manifold piping, automatic gas valve and gas pressure regulator or automatic pilot valve and attach to boiler. See that orifice spuds in ends of spud holders are screwed in tight and that orifices are drilled to size specified on tag attached to manifold. (See Fig. 4)

NOTE: Arrow on automatic gas valve and gas pressure regulator or automatic pilot valve must point in direction of gas flow.

3. See that air shutter is assembled on each mixer tube, then place mixer tubes firmly on spud holders and burner support. Assemble main burners on tapered ends of mixer tubes so they are straight and level. (See Figs. 5, 6, 7 and 8).

NOTE: No. 50 thermocouple has larger diameter than No. 80 thermocouple.

Assembly of Jacket

1. Fill groove at top of sections with boiler putty and place canopy in position so that turned down edges are firmly imbedded in the putty to make gas seal. Smooth off excess putty.

2. Assemble left and right side jacket panels, fastening front and rear halves together with washer head screws passing through front half into caged nuts in rear half. Attach panels to boiler section with washer head screws. (See Fig. 9.)

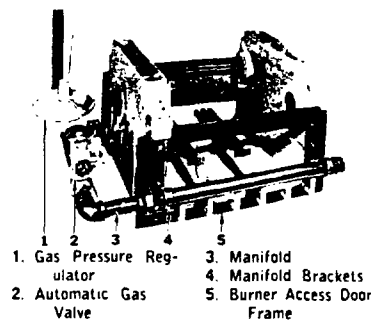


FIG. 4—Manifold and Piping

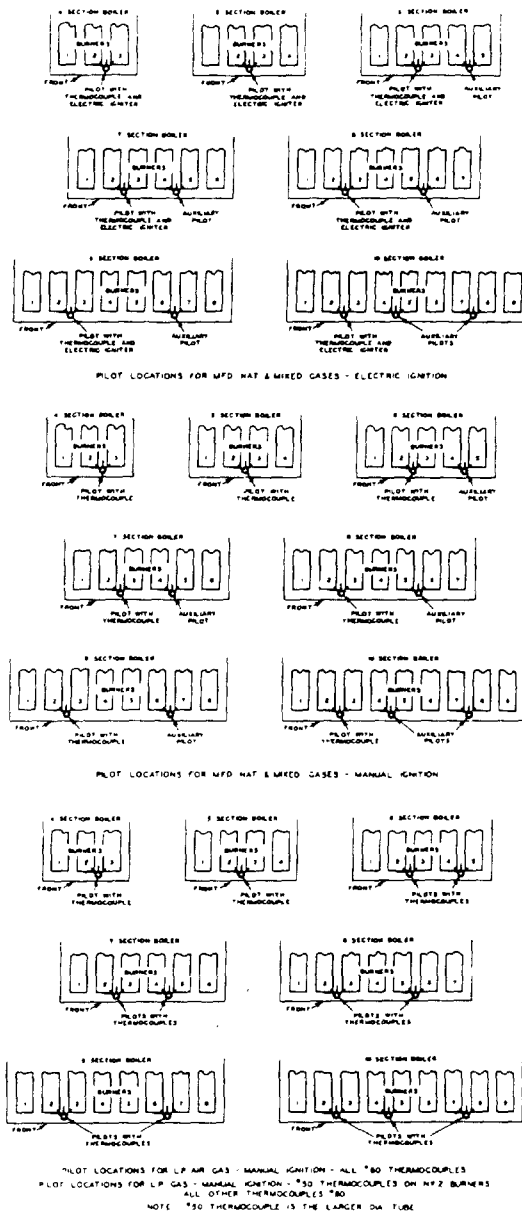


FIG. 5—Burner and Pilot Locations

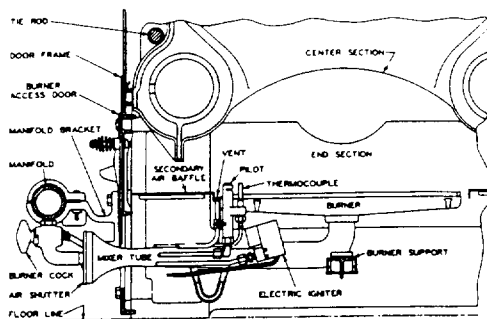


FIG. 6—Burner No. 2 and Pilot Installation—Electric Ignition

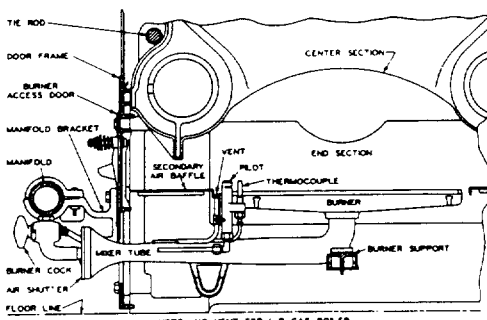


FIG. 7—Burner No. 2 and Pilot Installation—Manual Ignition

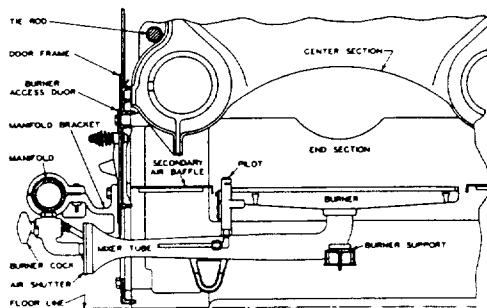


FIG. 8—Burner and Auxiliary Pilot

3. Place front jacket panel in position, bottom of panel to rest in back of flange on cast iron panel frame. Flanges of front jacket panel to lap over end jacket panels. Be sure that jacket panel is pushed down so that it rests on rib of cast iron panel frame.

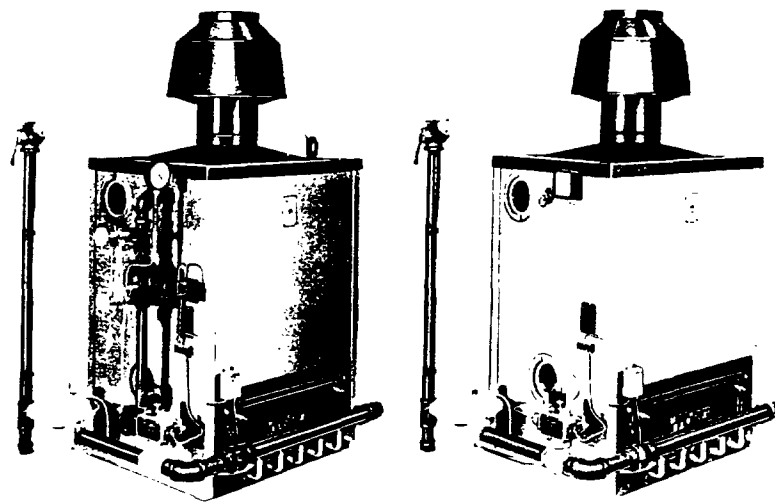
4. Attach rear jacket panel in similar manner.

5. Place four short vertical keys in position at ends of front and rear panel frames, inserting top of keys under flanges of front jacket panels. Attach keys to cast iron panel frames with washer head jacket screws.

6. Place top jacket frame in position, making sure that frame is down tight over top edges of jacket panels.

7. Place sheet metal secondary air baffles on lugs of end sections, one baffle at front and one at rear of boiler. Flanges must be toward burners and extend downward. Place burner access door with Series and Number Plate on front frame and remaining door on rear frame.

8. Place draft hood firmly on flue outlet of canopy. Refer to Fig. 9 for assembly of boiler jacket.



Steam Boiler

Water Boiler

FIG. 9—Jacket Assembly

Steam Boiler

1. Assemble low water cutoff and water column piping as shown in Fig. 10 and attach to boiler as shown in Fig. 9. Assemble the working mechanism to the low water cutoff with gasket and screws (furnished in separate package). Make steam gage connection with nipple and tee to $\frac{1}{4}$ " tapping on upper part of low water cutoff. Connect steam control element on automatic gas valve with steam gage tee using copper tubing and connectors. Fill tubing with water and screw steam gage into tee.

Check operation of low water cutoff as per instruction on page 17.

2. Connect safety valve to 2" tapping on right end section near top with reducing elbow.

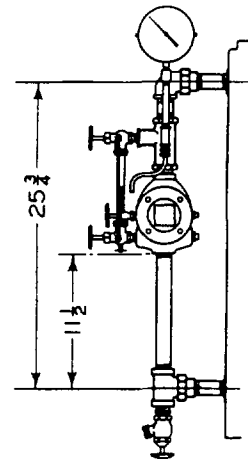


FIG. 10—Low Water Cutoff

Water Boiler

1. Insert temperature bulb element of automatic gas valve in $\frac{3}{4}$ " tapping near top of left end section. (See Fig. 9). For more sensitive operation discard well before installing split nut and gland. Tube leading to bulb is installed under the jacket.
2. Connect combination thermometer and altitude gage to one inch tapping on left end section with nipple and reducing coupling.
3. Plug 2" tapping in right end near top unless relief valve is installed.

Connecting Controls (Electric Ignition)

1. Connect pilot lines from manual shutoff valve, shown in supply piping arrangement, Fig. 14, to unions in line to pilot burner and electric ignition block on burner No. 2. Auxiliary pilot burners should be connected to pilot burner line with $\frac{1}{8}$ brass tee or elbow. See Fig. 12.
2. Connect No. 80 thermocouple from electric ignition pilot bracket to BASO 850 automatic pilot switch. Fasten automatic pilot switch to burner access door frame with two 10-24 x $\frac{1}{2}$ " round head screws.
3. Connect vent tube from gas pressure regulator to union leading to vent tube tip on pilot bracket. Be sure flame check is in place as shown in Fig. 11.

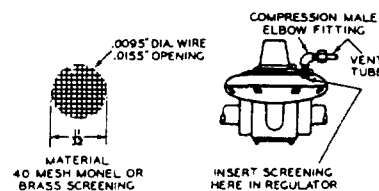
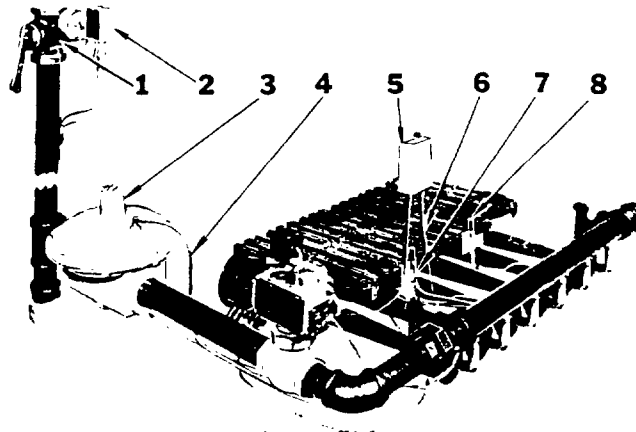


FIG. 11—Flame Check



- | | |
|----------------------------------|----------------------------------|
| 1. Manual Shutoff Valve Assembly | 5. Baso Automatic Pilot Switch |
| 2. Push Button Lighter Box | 6. Thermocouple Lead |
| 3. Gas Pressure Regulator | 7. Pilot Burner Bracket Assembly |
| 4. Vent Tube | 8. Auxiliary Pilot Burner |

FIG. 12—Control Connections

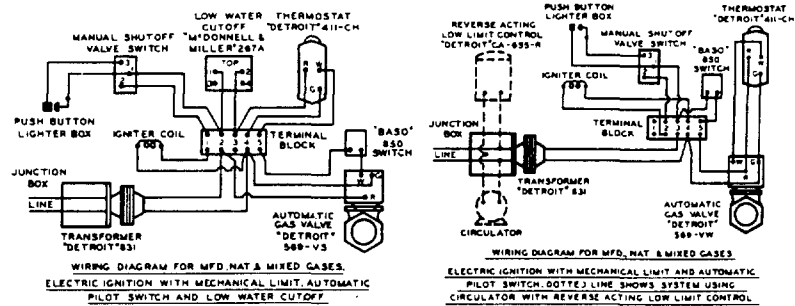


FIG. 13—Wiring Diagrams (Electric Ignition)

4. Wire according to Fig. 13.
5. Install front burner access door.

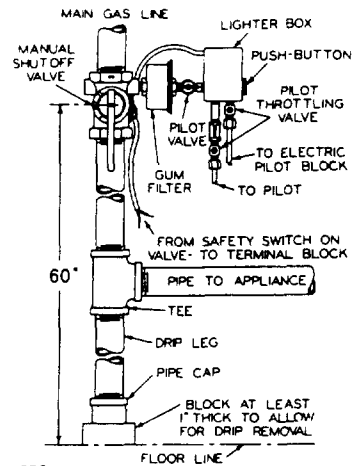


FIG. 14—Supply Piping Electric Ignition

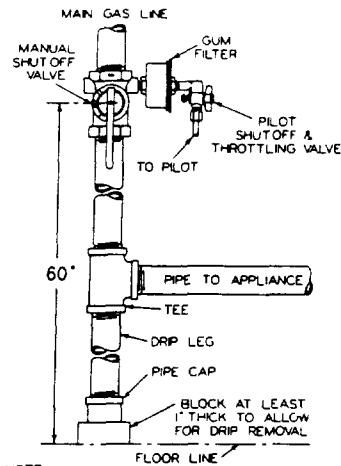


FIG. 15—Supply Piping Manual Ignition

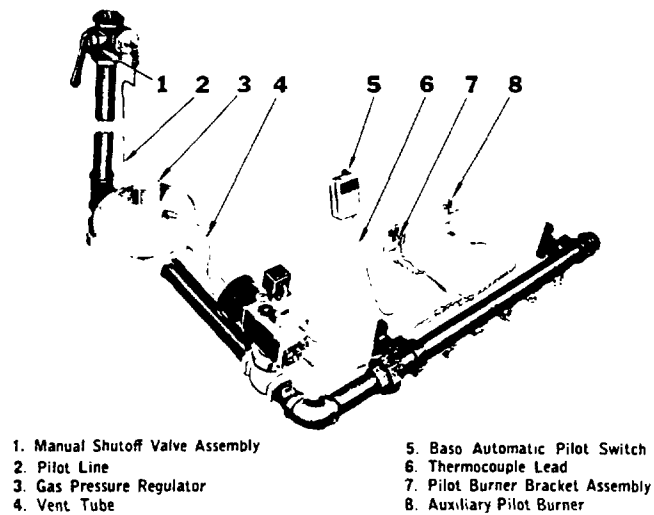


FIG. 16—Control Connections

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

1. Connect pilot line from manual shutoff valve, Fig. 15, to union in line to pilot burner. See Fig. 16.
2. Connect thermocouple from pilot bracket on burner No. 2 to BASO 850 automatic pilot switch. Fasten automatic pilot switch to burner access door frame with two 10-24- $\frac{1}{2}$ " round head screws.

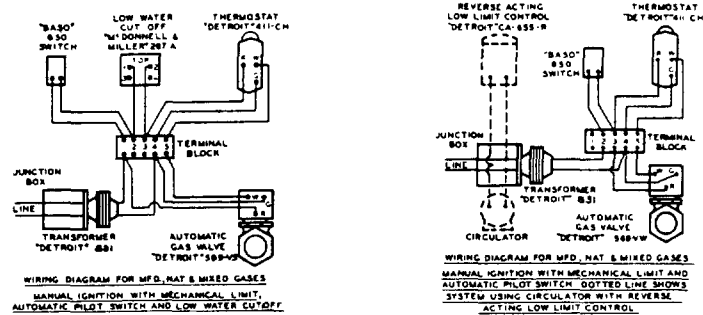


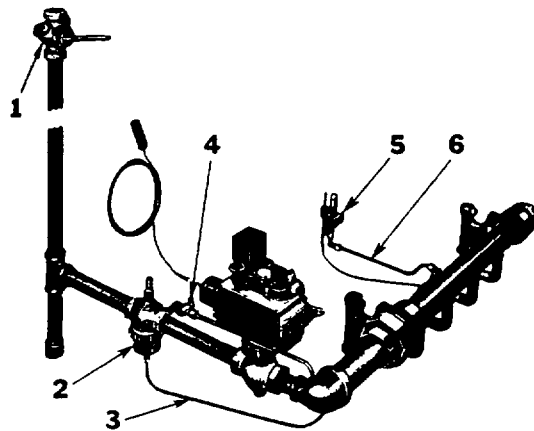
FIG. 17—Wiring Diagrams (Manual Ignition; Mfd., Nat. and Mixed Gases)

3. Connect vent tube from gas pressure regulator to union leading to vent tube tip on pilot bracket. Be sure flame check is in place as shown in Fig. 11.
4. Wire according to Fig. 17.
5. Install front burner access door.

Connecting Controls (Manual Ignition; Liquefied Petroleum Gases)

A. Boilers with one pilot burner:

1. Connect pilot line from throttling angle cock on BASO automatic pilot valve to union in line leading to pilot burner on burner No. 2. See Fig. 18.



- | | |
|-------------------------------|----------------------------------|
| 1. Manual Shutoff Valve | 4. Pilot Cock |
| 2. Baso Automatic Pilot Valve | 5. Pilot Burner Bracket Assembly |
| 3. Thermocouple Lead | 6. Pilot Line |

FIG. 18—Control Connections

2. Connect thermocouple lead from pilot burner bracket to BASO automatic pilot valve.
3. Wire according to Fig. 19.
4. Install front burner access door.

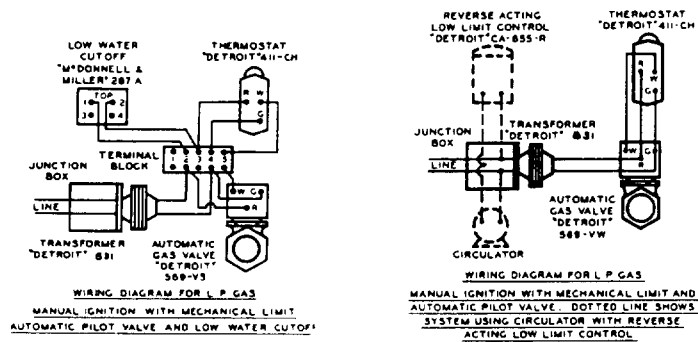
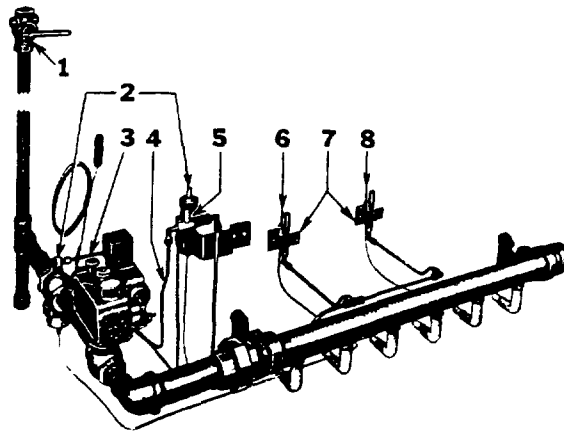


FIG. 19—Wiring Diagrams (Manual Ignition; Liquefied Petroleum Gases)

B. Boilers with 2 or 3 pilot burners:

1. Connect pilot line from BASO 500 series valve in main gas line to BASO 808 series pilot valve. Connect pilot line from $\frac{1}{8}$ inch tee at outlet of BASO 808 series valve to pilots. (If 3 pilot burners are installed, there should be 2 BASO 808 series valves in series). Connect a by-pass line from tee in main line to push button valve attached to tee on BASO 808 outlet. See Fig. 20.



- | | |
|-------------------------------|----------------------------------|
| 1. Manual Shutoff Valve | 5. Push Button Valve |
| 2. Baso Automatic Pilot Valve | 6. No. 50 Thermocouple Lead |
| 3. Pilot Line | 7. Pilot Burner Bracket Assembly |
| 4. By-Pass | 8. No. 80 Thermocouple Lead |

FIG. 20—Control Connections

2. Connect a No. 50 thermocouple from the pilot burner bracket on burner No. 2 to the BASO 500 series valve in the main gas line. Connect No. 80 (smaller diameter) thermocouples from remaining pilot burners to BASO 808 series pilot valves.
3. Wire according to Fig. 19.

4. Install front burner access door.

Connecting Controls (Manual Ignition; Liquefied Petroleum-Air Gases)

1. Connect pilot line from manual shutoff valve assembly, see Fig. 15, to electric pilot valve. Then connect pilot line from electric pilot valve to pilot burners. Attach bracket containing electric pilot valve and BASO 850 switches to burner access door frame with one 10-24 x $\frac{1}{2}$ screw and one $\frac{3}{8}$ -16 x 1" brass hex head cap screw which holds burner access door frame in place. See Fig. 21.

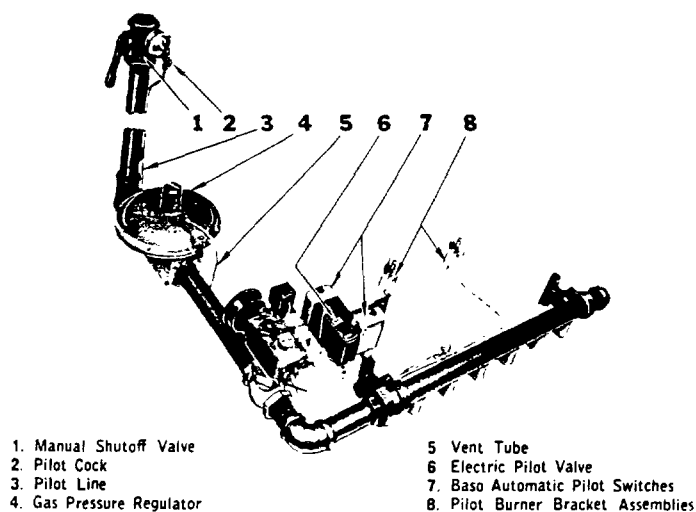


FIG. 21—Control Connections

2. Connect No. 80 thermocouples from pilot burner brackets to BASO 850 switches.

3. Connect vent tube from gas pressure regulator to union leading to vent tube tip on pilot bracket. Be sure flame check is in place as shown in Fig. 11.

4. Wire according to Fig. 22.
5. Install front burner access door.

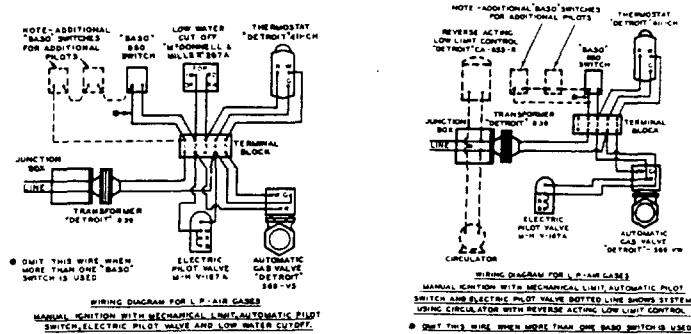


FIG. 22—Wiring Diagram (Manual Ignition; Liquefied Petroleum-Air Gases)

Filling System

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

Steam boilers should be filled until water is visible midway up gage glass between try cocks.

Fill open hot water system to 1/3 height of expansion tank, remove rim and glass from gage and set movable pointer under automatic pointer. Replace rim and glass.

Fill closed hot water system until relief valve relieves. This must be less than 30 pounds pressure. If necessary, adjust relief valve setting. Remove rim and glass from gage and set movable pointer under automatic pointer. Replace rim and glass.

Keep system filled. Pointers on gage should be even. If pressure exceeds 30 lbs. relieve at once by opening relief valve or drain cock.

Pilot Adjustment

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

Normal Pilot Input for BASO Pilot Burners

	Mfd.	Nat.	Mixed	L.P.	LP-Air
Input Per Burner	1000	1400	1200	1000	1000

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 counter-clockwise.

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 pilots 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.

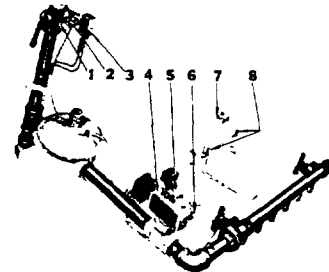
OPERATING

Shutting Off (For All Gases)

1. Close manual shutoff valve (or Hand Shutoff wheel on top of automatic gas valve) and pilot cock.
2. Turn off switch in electric line to appliance.

Re-Lighting (Electric Ignition)

1. Set thermostat at lowest temperature.
2. Close manual shutoff valve and pilot cock.
3. Turn off switch in electric line to appliance.
4. Wait 5 minutes.
5. Turn on switch in electric line to appliance.
6. Open pilot cock.
7. Press button on lighter box until left pilot burner lights.
8. Open manual shutoff valve and Hand Shutoff wheel on top of automatic gas valve.
9. Press down manual control lever on automatic gas valve (main burners should light); then release (all pilots should stay lighted).
10. Wait 2 minutes.
11. Press plunger on BASO automatic pilot switch.
12. Set thermostat at desired temperature.



- | | |
|----------------------------|--------------------------------|
| 1. Manual Shutoff Valve | 5. Hand Shutoff Wheel |
| 2. Pilot Cock | 6. Manual Operating Lever |
| 3. Push Button Lighter Box | 7. Base Automatic Pilot Switch |
| 4. Automatic Gas Valve | 8. Pilot Burner |

FIG. 23—Control Arrangement

Re-Lighting (Manual Ignition; Mfd., Nat. & Mixed Gases)

1. Set thermostat at lowest temperature.
2. Close manual shutoff valve and pilot cock.
3. Turn off switch in electric line to appliance.
4. Wait 5 minutes.
5. Open burner access door.
6. Light taper and hold to left pilot burner.
7. Open pilot cock and light all pilot burners.
8. Close burner access door.
9. Wait 2 minutes.
10. Press plunger on BASO automatic pilot switch.
11. Open manual shutoff valve and Hand Shutoff wheel on top of automatic gas valve.
12. Turn on switch in electric line to appliance.
13. Set thermostat at desired temperature.

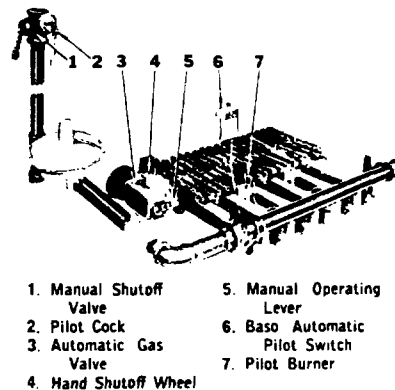


FIG. 24—Control Arrangement

Re-Lighting (Manual Ignition; Liquefied Petroleum Gases)

1. Set thermostat at lowest temperature.
2. Close manual shutoff valve and pilot cock.
3. Turn off switch in electric line to appliance.
4. Wait 5 minutes.
5. Open burner access door.
6. Open pilot cock.
7. Light taper and hold to left pilot burner.
8. Press push button valve (where there is only one pilot, press reset button on BASO valve), hold and light all pilot burners.
9. Hold 2 minutes.
10. Press reset button on all BASO automatic pilot valves then release push button valve (where there is only one pilot, release reset button on BASO automatic pilot valve).
11. Close burner access door.
12. Open manual shutoff valve and Hand Shutoff wheel on top of automatic gas valve.
13. Turn on switch in electric line to appliance.
14. Set thermostat at desired temperature.

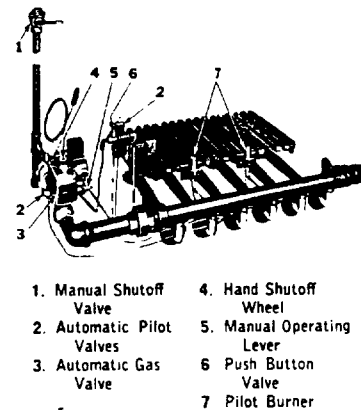
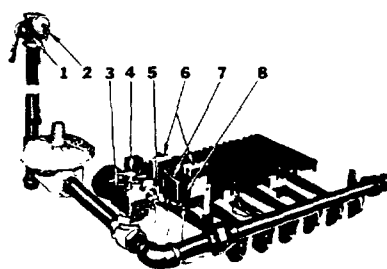


FIG. 25—Control Arrangement

Re-Lighting (Manual Ignition; Liquefied Petroleum-Air Gases)

1. Set thermostat at lowest temperature.
2. Close manual shutoff valve and pilot cock.
3. Turn off switch in electric line to appliance.
4. Wait 5 minutes.
5. Open burner access door.
6. Light taper and hold to left pilot burner.
7. Open pilot cock and turn knob on electric pilot valve to "Manual".
Light all pilot burners.
8. Close burner access door.
9. Wait 2 minutes.
10. Press plungers on all BASO automatic pilot switches.
11. Open manual shutoff valve and Hand Shutoff wheel on top of automatic gas valve.
12. Turn on switch in electric line to appliance.
13. Set thermostat at desired temperature.



- | | |
|-------------------------|--------------------------------|
| 1. Manual Shutoff Valve | 5. Manual Operating Lever |
| 2. Pilot Cock | 6. Baso Automatic Pilot Switch |
| 3. Automatic Gas Valve | 7. Knob |
| 4. Hand Shutoff Wheel | 8. Electric Pilot Valve |

FIG. 26—Control Arrangement

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 on pages 18 thru 21.

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 569-VS (or VW) automatic gas valve may be operated manually as follows:

1. If pilots are out, relight as directed for manual ignition.
2. When pilots are lighted, press down on manual control lever on automatic gas valve; main burners should light; press in hand resetting button to hold lever down, burners will remain lighted.
3. Caution—Shut off boiler before water temperature or pressure becomes excessive by pressing down on manual control lever until reset button is released, then release manual control lever.
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.
4. 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 steam 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 system as during heating season. Have boiler inspected by service man before the start of the heating season. If necessary, remove front jacket and cleanout cover plates and clean heating element.

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.
3. If a hot water radiator is hot at the bottom but not at the top, it indicates that air has accumulated inside and should be vented. To vent radiator: Hold small cup under air vent (Located near top of radiator), open vent until water escapes and then close.
4. Fill steam boilers only as directed. (See Caution on page 16.)
5. Fill hot water systems as follows:

Open all radiator valves, but keep vents at top of radiator closed. Fill open systems till hands on altitude gage are even. If it is a closed system the water filling will stop automatically when proper pressure is reached. (Pressure should not exceed 30 pounds.) Then, beginning with ground floor, vent each radiator as directed above. It may be necessary to add water during this operation to expel air from higher radiators.
6. If much water is added to system, it is advisable to heat system to a high temperature and vent again. This will make less venting necessary during the winter.
7. Where an expansion tank is used, make sure that neither the tank nor its drain pipe is exposed to freezing temperatures. Never place valves in piping leading to or from expansion tank.

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 part 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.

BOILER SIZE

SERIES NO. (SEE SERIES PLATE ON BOILER)

DATE



AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
PITTSBURGH 30, PA.

ARSS 4816 REV. (1-52)