

rec'd 12/15/60

PLAINTIFF'S EXHIBIT

ASI-674

G-4 GAS BOILER

by

AMERICAN-Standard

INSTALLATION—OPERATION AND MAINTENANCE MANUAL

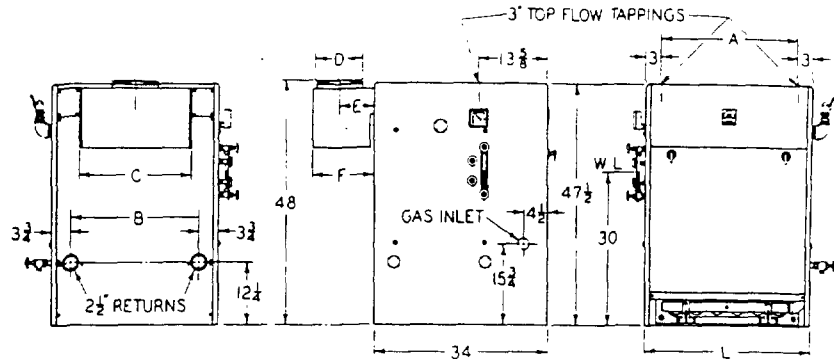
APPROVED BY AMERICAN GAS ASSOCIATION

*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

First in heating ... first in plumbing

GENERAL DIMENSIONS

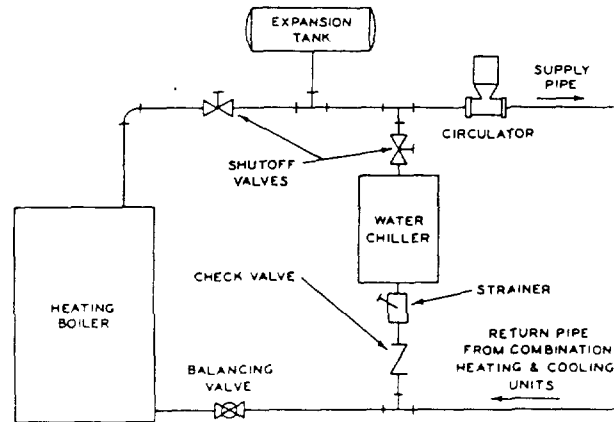


BOILER NUMBER	NO. OF SECTIONS	NO. OF BURNERS	A	B	C	D	E	F	L	SIZE GAS CONNECTION		
										NAT. GAS AND 800 TO 1400 L.P.A.	BUTANE & PROPANE 525 TO 800 L.P.A.	MANUFACTURED AND 525 TO 800 L.P.A.
G-44	4	3	14½	13	9½	6	5	8½	20½	½	½	½
G-45	5	4	18½	17	13½	7	5½	9½	24½	½	½	½
G-46	6	5	22½	21	17½	8	6	10½	28½	½	½	½
G-47	7	6	26½	25	21½	9	6½	11½	32½	1"	½	½
G-48	8	7	30½	29	25½	9	6½	11½	36½	1"	½	½
G-49	9	8	34½	33	29½	10	7	12½	40½	1"	½	½
G-410	10	9	38½	37	33½	10	7	12½	44½	1½"	½	½
G-411	11	10	42½	41	37½	11	7½	13½	48½	1½"	½	½

Caution

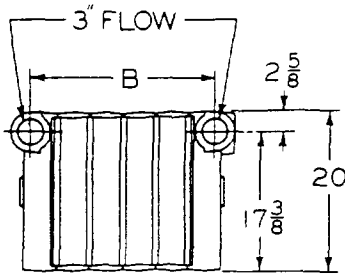
If and when this boiler is used in connection with refrigeration systems, boiler should be so installed that chilled medium is piped parallel with the heating boiler using appropriate valves to prevent the chilled medium from entering the heating boiler.

When hot water heating boilers are connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, such 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.



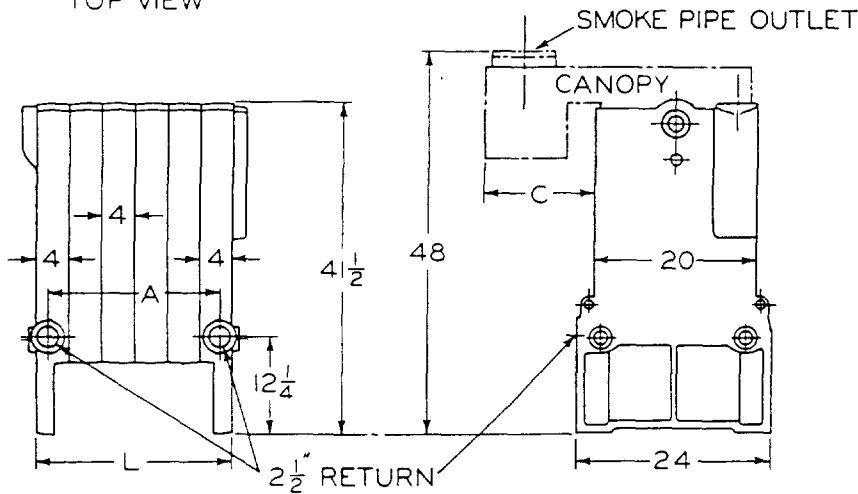
RECOMMENDED BOILER PIPING FOR
COMBINATION HEATING & COOLING UNITS

ARRANGEMENT OF FLOW AND RETURN TAPPINGS



TOP VIEW

BOILER NUMBER	No OF SECTIONS	L	A	B	C
G-44	4	16	13	14 $\frac{1}{2}$	11 $\frac{3}{4}$
G-45	5	20	17	18 $\frac{1}{2}$	12 $\frac{3}{4}$
G-46	6	24	21	22 $\frac{1}{2}$	13 $\frac{3}{4}$
G-47	7	28	25	26 $\frac{1}{2}$	14 $\frac{3}{4}$
G-48	8	32	29	30 $\frac{1}{2}$	14 $\frac{3}{4}$
G-49	9	36	33	34 $\frac{1}{2}$	15 $\frac{3}{4}$
G-410	10	40	37	38 $\frac{1}{2}$	15 $\frac{3}{4}$
G-411	11	44	41	42 $\frac{1}{2}$	16 $\frac{3}{4}$



BACK VIEW

SIDE VIEW

MINIMUM PIPING RECOMMENDATIONS FOR G-4 GAS BOILERS (Number and Size of Outlets)

Boiler Size	Steam No.	Steam Size	Water No.	Water Size	Boiler Size	Steam No.	Steam Size	Water No.	Water Size
G-44	1	2"	1	1 $\frac{1}{4}$ "	G-48	2	2 $\frac{1}{2}$ "	1	2"
G-45	1	2 $\frac{1}{2}$ "	1	1 $\frac{1}{2}$ "	G-49	2	2 $\frac{1}{2}$ "	1	2 $\frac{1}{2}$ "
G-46	1	3"	1	1 $\frac{1}{2}$ "	G-410	2	3"	1	2 $\frac{1}{2}$ "
G-47	1	3"	1	2"	G-411	2	3"	1	2 $\frac{1}{2}$ "

Note: Either right or left hand supply outlet may be used on water boilers using circulators, but limit control should be placed in that section carrying the supply outlet being used. On gravity circulation use both outlets of sizes shown above.

Caution

On hot water systems, expansion tank should not be installed in cold or exposed place. If the pipe leading to or from the tank freezes, serious damage may result. If valve of any description is installed in the piping leading to or from the expansion tank **BE SURE THAT IT IS OPEN WHILE THE BOILER IS IN OPERATION.**

"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

Locate the boiler near the chimney or flue and as centralized with respect to the heat distribution system as practicable.

If water condition exists in the basement, or if it has been necessary to water proof the basement floor, the boiler should be mounted on a concrete or hollow tile base, preferably to a height of at least three inches.

In utility room installations, the door shall be wide enough to allow the largest boiler part to enter or to permit the replacement of another appliance such as a gas water heater.

Clearance

Minimum clearance of 6 inches must be maintained between the boiler (including projecting drafthood and vent connector) and any combustible material. A minimum front clearance of 18 inches must be provided for servicing the burners and controls.

Air for Combustion and Ventilation

Adequate facilities must be available for providing air for combustion and ventilation. Except for installations in large spaces (such as full basements) where infiltration can normally be assumed to provide sufficient air, this will usually necessitate:

- (a) Two openings, one near the floor, the other near the ceiling, installed in the door or a single wall of the heater room.
- (b) Opening to interior space, minimum free area of one (1) square inch per (1000) Btu per hour of input rating. (This method should always be used where practicable.)
- (c) Opening to outdoors, minimum free area of one (1) square inch per (2500) to (3000) Btu per hour of input rating. (This method should only be used where openings to interior spaces are impracticable.)

Chimney

- 1. Flue or vent connector to chimney must be the same size as the outlet of the draft diverter.
- 2. Where two or more appliances vent into a common flue, the area of the common flue should at least equal the area of the largest flue or vent connector plus 50 per cent of the areas of the additional flue or vent connectors.
- 3. Flue or vent connector must be inserted into but not beyond the inside wall of the chimney flue. Horizontal runs of flue pipe should be kept at a minimum and should be installed with a $\frac{1}{4}$ inch pitch per foot maintained.

Pipe Delivery Schedule

Capacity of Pipes in Cubic Feet of Gas per Hour.

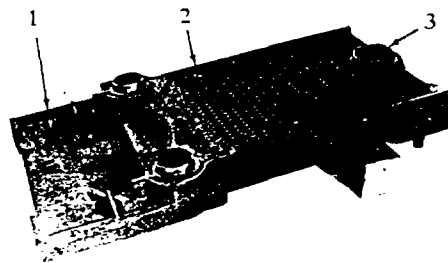
Length of Pipe in Feet	¾"	SIZE 1"	1¼"
10	212	425	725
20	150	300	510
30	122	252	425
40	105	215	370
50	95	195	330
75	77	160	270
100	66	134	232

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 or preferably an aluminum headed hammer if available. Gage nipples in both directions to insure that they are driven squarely and to proper depth in nipple openings; nipple setting gage is provided for 4" nipples. Cutout in gage should rest on both sides of nipple when legs of gage are touching finished ribs on section. See Fig. 2.



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

FIG. 1—Right End Section

Each 3" nipple must project outside of finished face of section $\frac{1}{16}$ inch more than half its length. Use rule to gage 3" nipples to insure that they project outside of opening equally all around. Most nipple leaks are caused by tilted or cocked nipples.

4. Paintground rib, around 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.

6. Place sections in upright position and support with suitable blocking. Sections should stand approximately in their final position with Front facing correctly. See Fig. 3 (Note Cleanout openings are at front of boiler).

7. Insert tie rods through lower nipple openings and tappings on end section and through cored hole below upper nipple port. Place 3" C.I. washers on lower rods against tappings.

Place assembling blocks on lower rods across nipple ports as shown on Fig. 3 placing nuts and washers on all rods. Draw up evenly on all tie rods, starting with lower tie rods. Tighten nuts alternately and bump sections with heavy block of wood at nipple ports to facilitate assembly. Continue to draw up alternately until sections make contact at ground

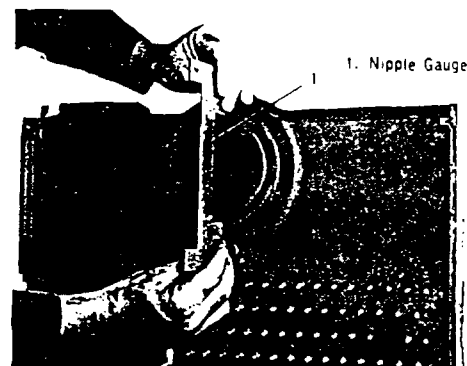


FIG. 2—Gaging Nipple

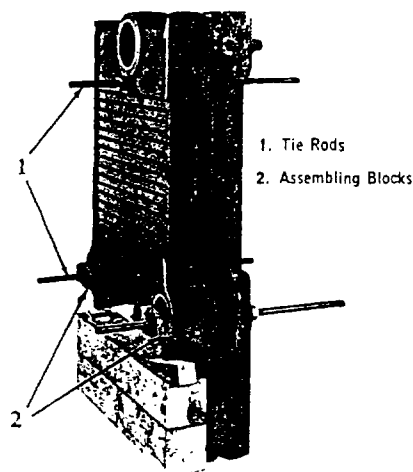


FIG. 3—Assembling Sections

joints. 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 as in previous operations 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 as a result of breakage from handling and shipping. To safeguard accuracy of gage and controls supplied with boiler, do not install 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.

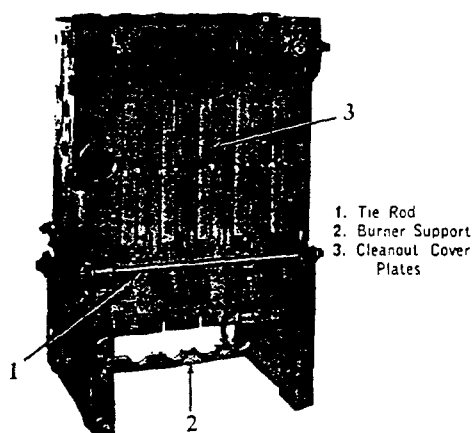


FIG. 4—Section Assemblage

Assembly of Platework, Main Burners and Manifold

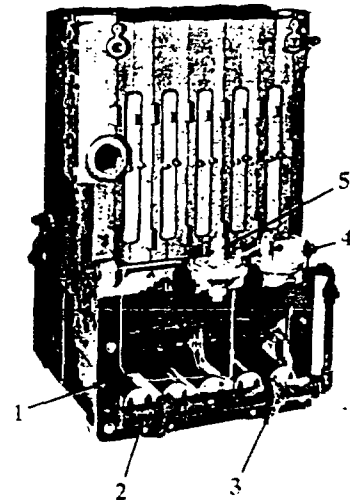
1. Screw short threaded end of brass studs into tapped bosses in recess between sections and attach cleanout cover plates to front of boiler.

Putty openings between plates and sections. Putty outside of sections at joints with boiler putty. Place burner support on lugs provided on end sections. See Fig. 4.

2. Fill space between second and third horizontal ribs from top on back of Front Frame with boiler putty and attach frame to front of boiler with four $\frac{3}{8}$ " x 1" hex head cap screws.

3. See that orifices in ends of orifice holders assembled in manifold are screwed in tight and that orifices are drilled to size specified on tag attached to manifold.

4. Install control piping (coupled at union) manifold and bracket assembly to front frame with $\frac{3}{8}$ " x 1" Hex Head cap screws. Arrow on automatic gas valve and gas pressure regulator must point in direction of gas flow.



1. Front Frame 3. Manifold Support Bracket
2. Manifold 4. Automatic Gas Valve
5. Gas Pressure Regulator

FIG. 5—Manifold and Gas Piping

5. See that air shutter is assembled on each mixer tube, then place mixer tubes firmly on orifice holders and burner support. Assemble main burners on tapered ends of mixer tubes so they are straight and level, and tighten set screws in manifold brackets.

Pilot Burners

Attach pilot burner and tubing assembly (or assemblies) to main burners with two #10-24 x 1" fillister head screws.

Pilot installations for all gases require a tube for venting pressure regulator and automatic valve. Vent tube is provided with tip, tubing connector and clip for installation with the pilot burner: (left pilot in case of 8 to 11 section boilers). See Fig. 7 for pilot burner locations.

NOTE—Pressure regulator is not used for Butane and Propane Gases.

The vent tube clip is secured with the pilot burner attaching screws. The vent tube is inserted under the clip before tightening the screws, with the tip of the tube approximately level with the top of the main gas burner. See Fig. 8 for manual ignition and Fig. 9 for boilers with electric ignition. See Fig. 5 for boiler with burners, manifold and control piping installed.

In case of boilers provided with RIBBON BURNERS, the ends of the burners having two #10-24 tappings must be toward the front of the boiler. The installer is to remove and discard the truss head screw which holds the ribbon clamp at the front of the burner(s) where the pilot is to be installed. Two tappings are then available for the 1" fillister head screws for holding the pilot burner assembly. Install sheet metal baffle at front of boiler on lug cast on leg of each end section.

Runner Pilot Ignition

The lanced runner pilot assembly is attached to the pilot burner by means of a clip. Attach the end with the push button valve to the manifold with the clamp provided. Fig. 6A method of clamping and arrangement of piping and tubing. See Fig. 18 for connection at the shutoff and throttling valve. The flame along the side of the lanced tube should be about $\frac{1}{2}$ " long. The flame is regulated by an adjusting screw under the cap on the pilot valve. (Boiler with two pilots)—Install connecting tube from the branch outlet of the tee fitting at the push button valve to the tee fitting on the L.H. Pilot tube. Then run $\frac{1}{4}$ " tubing between the fittings on L.H. and R.H. Pilot tubes.

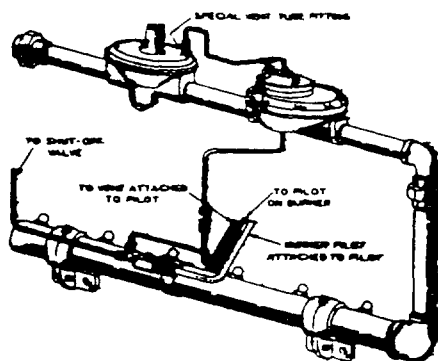
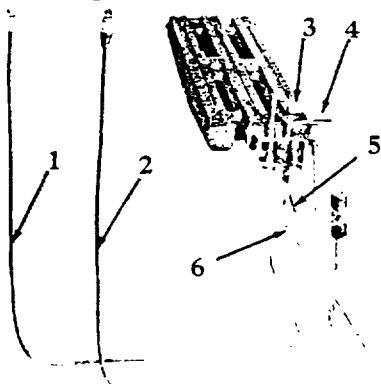


FIG. 6A—Runner Pilot Tubing and Clamping Arrangement for Boiler With One Pilot



- | | | |
|--------------------------|-----------------|---------------|
| 1. Thermocouple | 3. Pilot Burner | 5. Vent Tube |
| 2. Electric Igniter Lead | 4. Igniter Plug | 6. Pilot Tube |

FIG. 6B—Electric Pilot Ignition

Electric Pilot Ignition

Attach electric pilot burner and tubing assembly to the main burner with two #10-24 x 1" fillister head screws. See Fig. 7 for pilot burner locations. Use left pilot in case of 8 thru 11 section boilers. See page 13 for connecting the thermocouple and Baso ignition leads.

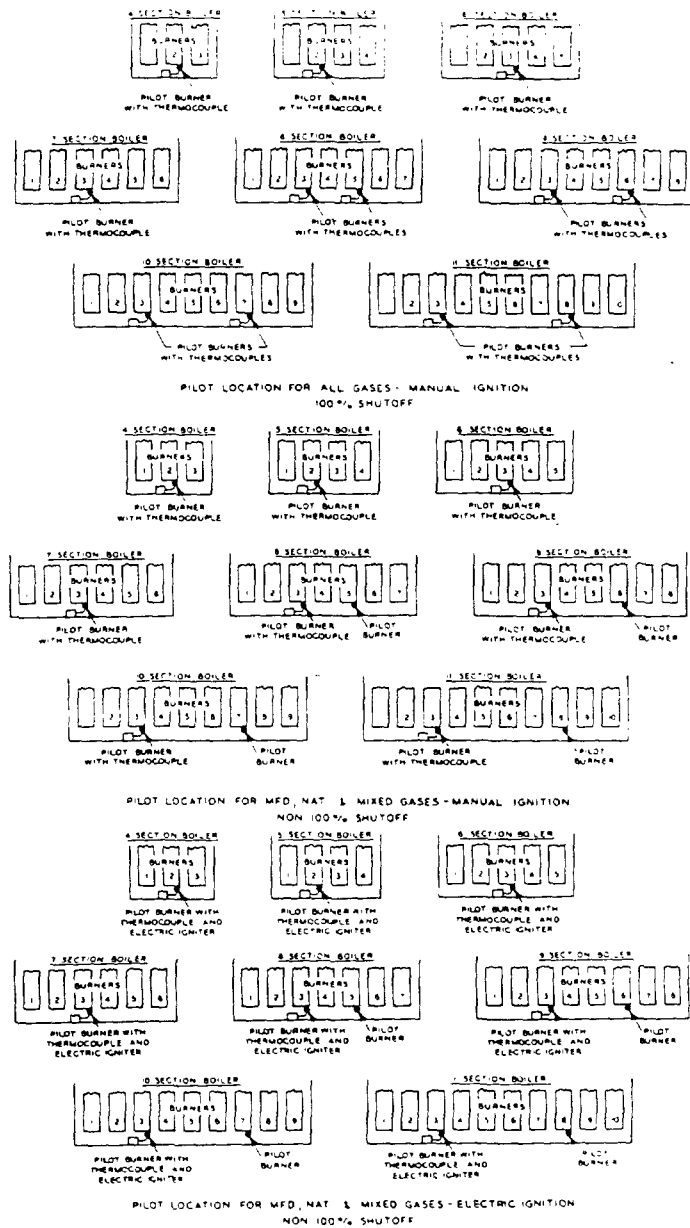


FIG. 7—Burner and Pilot Locations

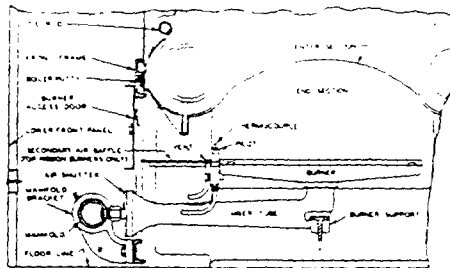


FIG. 8—Burner and Pilot Installation—Manual Ignition

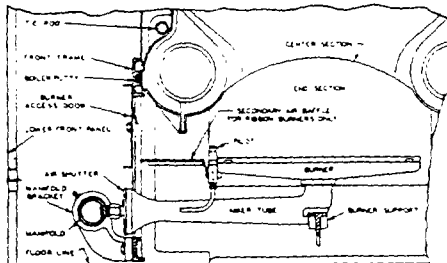


FIG. 8A.—Burner and Auxiliary Pilot

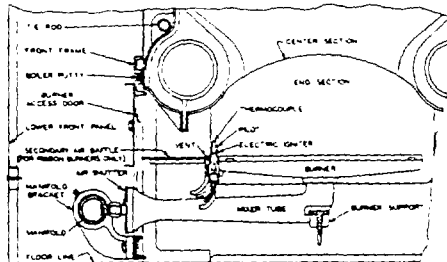


FIG. 9—Burner and Pilot Installation—Electric Ignition

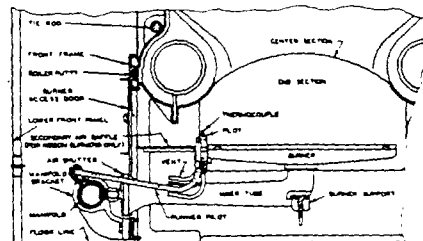
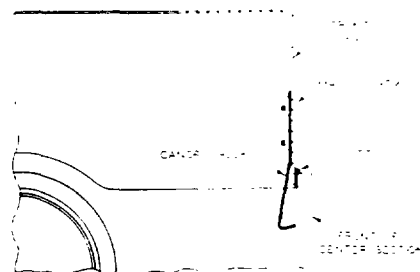


FIG. 10—Burner and Pilot Installation—Runner Pilot Ignition

Assembly of Jacket, Controls and Wiring

1. Attach canopy hook (or hooks) to front of canopy with $\frac{1}{4}$ "—20 x $\frac{1}{2}$ " washer head machine screws. Place canopy on boiler with canopy hooks engaging lugs cast on sections. Seal between outside of canopy and sections with boiler putty. Refer to Figs. 11 and 12.



METHOD OF HOLDING
CANOPY TO BOILER

FIG. 11—Detail of Canopy Hook

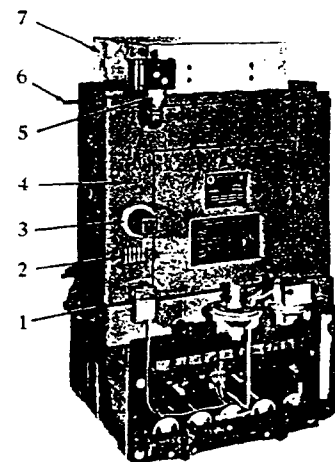
2. Remove knockouts from Front Liner for controls, either for steam or water boilers, as required. Attach terminal block and Baso pilot switch, also Baso ignition switch in case of boilers with electric ignition. Locate ignition switch on right side of Front Liner for 4 and 5 section boilers and on left side for 6 section and larger boilers using the holes nearest to the center of the panel.

Attach Front Liner to boiler with $\frac{1}{4}$ "—20 x $\frac{1}{2}$ " washer head machine screws in tappings near top, on each end section.

3. Attach lighting instruction plate and the number and series plate to the cleanout door and set cleanout door in place.

4. Assemble jacket spacer studs if provided, three in each end section. Refer to Fig. 12.

5. Assemble the left side panel to the $\frac{1}{4}$ "—20 tapping on the section with $\frac{1}{4}$ "—20 x $\frac{1}{2}$ " washer head machine screw after removing knockouts for



1. Baso Automatic Pilot Switch
2. Terminal Block
3. Low Water Cutoff
4. Front Liner with Cleanout Door
5. Steam Limit Control (Steam Boilers) or Immersion Operating Control (Water Boilers)
6. Jacket Spacer Studs
7. Canopy

FIG. 12.—Boiler with Canopy,
Front Liner and Controls

(item 5 cont'd)

water column trim in case of steam boilers, also knockout for drain cock from either left or right side panel, whichever side is most convenient to drain.

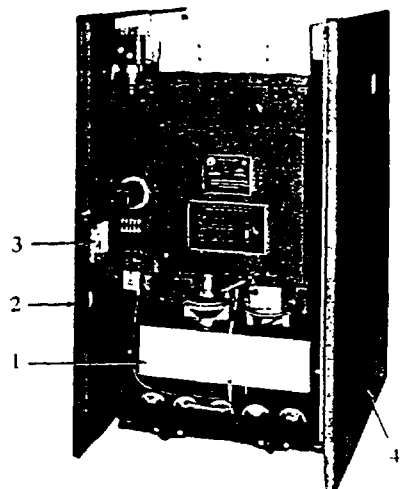
6. Install the controls and the control wiring to accord with the wiring diagram supplied then assemble the right side panel in same manner as left side panel after removing knockout for safety valve, in case of steam boiler.

Place burner access door (or doors) in position on projections cast on front frame. Refer to Fig. 12.

7. Assemble the upper front panel to the side panels with four #10 x 1" sheet metal screws. Assemble the bottom cross tie with two #10 x 1" sheet metal screws. Run the electric line to the junction box, located on left hand side panel, connect wiring and install the transformer on the junction box. Refer to Figs. 13 and 14.

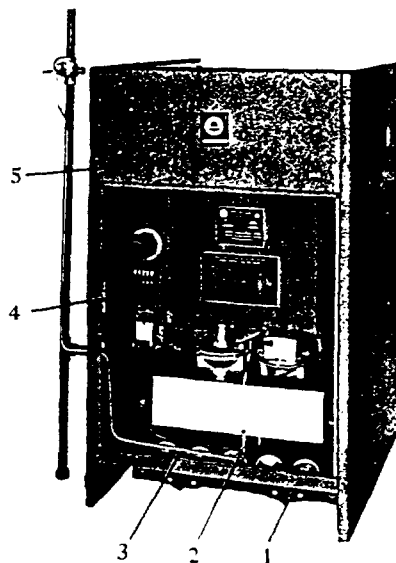
8. Assemble the upper back panel to the side panels with four #10 x 1" sheet metal screws.

9. Assemble the lower back panel by engaging the lock strip with the upper rear panel and attaching to side panels with four #10 x 1" sheet metal screws and to upper rear panel with two #10 x 1/2" sheet metal screws.



1. Burner Access Door 3. Junction Box
2. Left Hand Side Panel 4. Right Hand Side Panel

FIG. 13—Assembly of Side Panels



1. Front Bottom Cross Tie 3. Pilot Tube
2. Vent Tube 4. Transformer
5. Upper Front Panel

FIG. 14—Jacket Cross Tie and Upper Front Panel

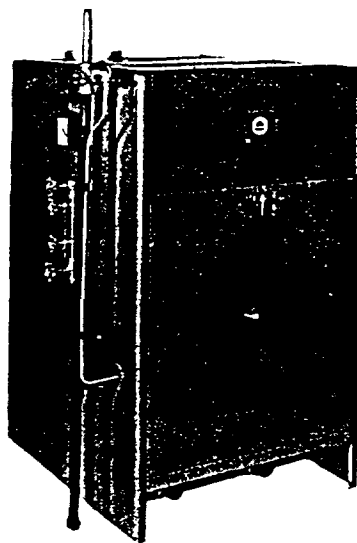


FIG. 15—Front View—Steam Boiler

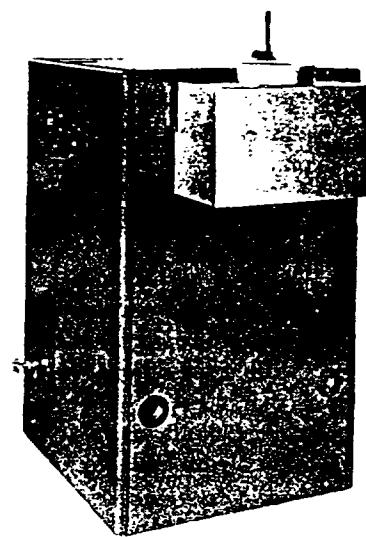


FIG. 16—Rear View—Steam Boiler

10. Assemble draft hood to canopy with $\pm 10 \times \frac{1}{2}$ " sheet metal screws.

11. Assemble top panel (rear) with four $\pm 10 \times 1$ " sheet metal screws.

12. Assemble two, back filler pieces to top panel and upper back panel, each with four $\pm 10 \times 1$ " sheet metal screws. Refer to Fig. 16 for assembly of back jacket pieces and draft hood.

13. Assemble top panel (front) with turned down flange on rear edge, engaging lock on rear top panel. Opening at front is to provide ventilation for the control compartment.

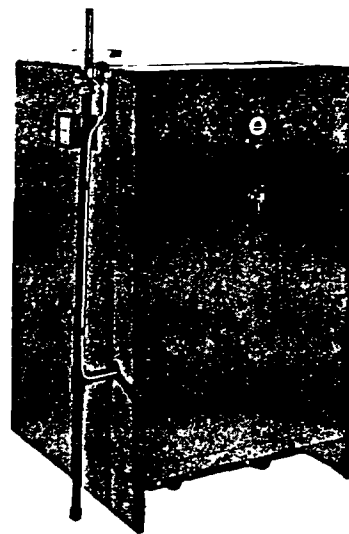


FIG. 17—Front View—Water Boiler

Assembly of Exterior Piping and Pilot Tubing

1. For 10 and 11 section boilers, Manufactured and LP-Air (525 to 800 BTU) gases, install gas pressure regulator outside of the jacket, connecting regulator to automatic gas valve under jacket with long nipple provided.

2. Make up drip leg piping (not supplied by AR & SS Corp.) of suitable height and install the manual shutoff valve assembly.

3. Make suitable connection between tee in drip leg and piping to gas pressure regulator. Be sure to leave sufficient space between pipe cap on bottom of drip leg and floor to allow for drip removal. Place suitable block under drip leg to support control piping in level position.

Caution

Before any system of gas piping is finally put into service, it shall be carefully tested to assure that it is gas tight. Soap and water solution, or other material acceptable for the purpose, shall be used in locating gas leakage. All pilot tubing should be supported and fastened to the gas supply pipe or gas manifold.

4. For Boiler with Non 100% Shutoff, Manual or Electric

Connect pilot line from manual shutoff valve assembly to the pilot burner tube (left hand in case of two pilot burners) running the tubing through the opening in the jacket along the side of the gas piping. In case of 8 to 11 section boilers, inter-connect the pilot line to the right hand pilot burner. Tubing is to be installed above the orifice holders. See Figs. 14 and 19. See Fig. 6A for runner pilot tubing hookup.

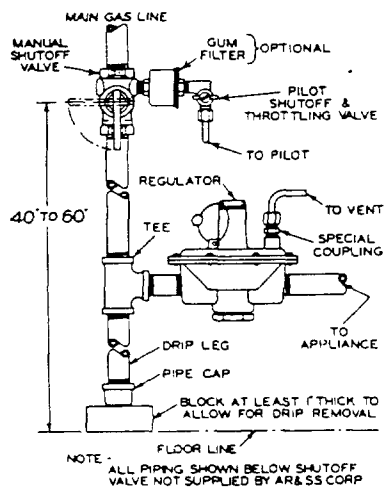
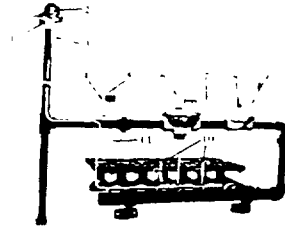


FIG. 18—Supply Piping—Manual Ignition

Connect the thermocouple lead from the pilot burner to the Baso pilot switch. Also connect the electric ignition lead to the Baso ignition switch for boiler with electric ignition. See Fig. 6B.



- | | |
|--------------------------------|---------------------------|
| 1. Manual Shutoff Valve | 6. Gas Pressure Regulator |
| 2. Pilot Valve | 7. Vent Line |
| 3. Pilot Line | 8. Manual Control |
| 4. Baso Automatic Pilot Switch | 9. Automatic Gas Valve |
| 5. Reset Button | 10. Pilot Burners |
| | 11. Thermocouple |

FIG. 19—Control Connections—Manual Ignition—Nat., Mfd., and Mixed Gases

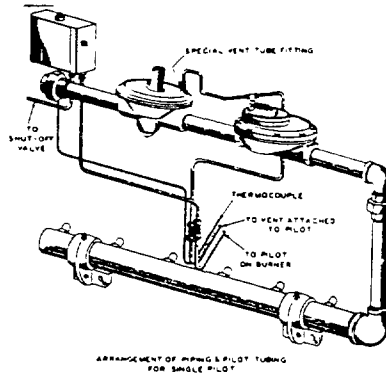


FIG. 20—100% Shutoff—Single Pilot for Mfd., Nat., Mixed and LP-Air Cases

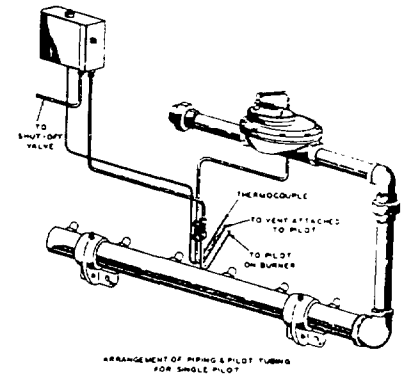


FIG. 21—100% Shutoff—Single Pilot for Butane and Propane Gases

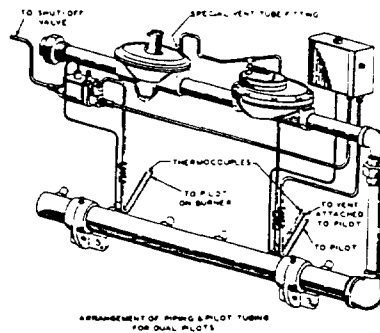


FIG. 22—100% Shutoff—Dual Pilots for Mfd., Nat., Mixed and LP-Air Cases

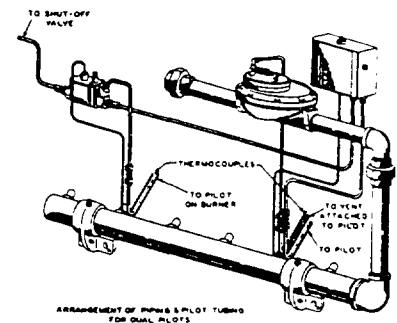


FIG. 23—100% Shutoff—Dual Pilots for Butane and Propane Gases

5. For Boiler with 100% Shutoff

4 thru 7 SECTION BOILERS—Connect $\frac{1}{4}$ " pilot tubing from the manual shutoff valve assembly to the L.H. fitting on the bottom of the Baso pilot

switch (marked "IN") running the tubing through the manifold opening in the jacket. Connect $\frac{1}{4}$ " pilot tubing from the pilot burner to the R.H. fitting (marked "OUT") on the bottom of the Baso pilot switch, also connect the thermocouple lead from the pilot burner to the fitting on the bottom of the switch. See Figs. 20 and 21.

8 thru 11 SECTION BOILERS—Connect $\frac{1}{4}$ " pilot tubing from the manual shutoff valve assembly to the "INLET" end of the Baso pilot valve running the tubing through the manifold opening in the jacket.

Connect $\frac{1}{4}$ " pilot tubing from the pilot burner nearest to the left end of the boiler to the branch connection on the Baso pilot valve. See Figs. 22 and 23.

Connect $\frac{1}{4}$ " tubing from the "OUTLET" end of the pilot valve to the L.H. fitting on the bottom of the Baso pilot switch (marked "IN").

Connect $\frac{1}{4}$ " pilot tubing from the pilot burner nearest to the right end of the boiler to the R.H. fitting (marked "OUT") on the bottom of the Baso Pilot switch, also connect the thermocouple lead from this pilot burner to the fitting on the bottom of the Baso switch.

6. Install drain cock in end section where jacket knockout was previously removed.

7. Assemble door handle (or handles) to front panel and install door after completion of piping and wiring.

Steam Boilers

Install steam gauge and water column trimmings in left end section. Install safety valve piping and safety valve in right end section. Fig 15 shows front view of complete steam boiler (6 sections) Fig. 16 shows rear view of complete steam boiler. (6 sections).

Water Boilers

Install combination altitude gauge and thermometer in left end section. Install relief valve in 2" tapping near top of right end section. Fig. 17 shows front view of complete water boiler. (6 sections).

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 $\frac{1}{3}$ 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 opens. This should be at a pressure not greater than 30 lbs. per square inch. Remove the rim and glass from the gauge and set the movable pointer at a point which will represent an altitude slightly higher than the highest point in the heating system. (An altitude of approximately 69 feet represents a pressure of 30 lbs. per sq. in.) Note that the altitude-temperature gauge is calibrated both in feet of altitude and in lbs. per sq. in. Replace rim and glass and reduce pressure by draining out water until the indicating pointer lines up with the movable pointer.

Keep system filled. Pointers on gauge 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 over top of burner. Pilot rate can be adjusted with screw underneath cap on pilot throttling cock.

Normal Pilot Input for Basis Pilot Burners

	Mfd.	Nat.	Gas Mixed	L.P.	LP-Air
Input per Pilot Burner Btu/Hr.	1000	1400	1200	1000	1000

Manifold Pressure Adjustment for Main Burner Input

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

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

A 1/8" pipe plug is placed in the top of the manifold to provide for checking the gas pressure in the manifold with a manometer or small pressure gauge. The manifold pressure should be set at 3.5 inches of water for natural and mixed gases or 2.5 inches of water for manufactured gas. To adjust the pressure, remove the cap on the gas pressure regulator and screw in the adjusting screw to raise pressure or screw out the adjusting screw to lower pressure. Only small variations in gas flow should be made by means of the gas pressure regulator adjustment. In no case should the final manifold pressure vary more than plus or minus 0.3 inches water column from the above specified pressures. Any necessary major changes in the flow should be made by changing the size of the burner orifice.

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.
2. Open drain cock and drain water until water level is below centerline of low water cutoff. Automatic gas valve should close.
3. Refill until water level is above centerline of low water cutoff. Automatic gas valve should open.

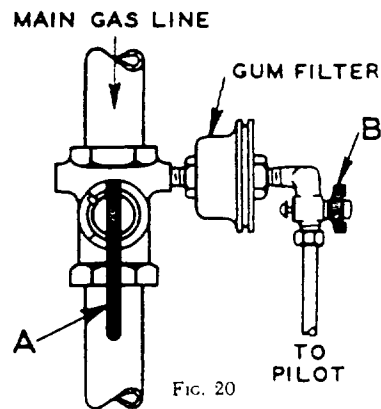
INSTRUCTIONS FOR SHUTTING OFF AND LIGHTING
MANUAL IGNITION – NON 100% SHUTOFF

To Shut Off:

1. Close manual shutoff valve "A" and pilot valve "B."

To Light:

1. Set thermostat (or operating control) at lowest temperature.
2. Be sure Manual shutoff valve "A" and pilot valve "B" have been shut off for at least five minutes before proceeding.
3. Open pilot valve "B" and light all pilot burners.
4. Wait two minutes.
5. Press reset button(s) on all automatic pilot switches.
6. Open manual shutoff valve "A."
7. Set thermostat (or operating control) at desired temperature.



INSTRUCTIONS FOR SHUTTING OFF AND LIGHTING
MANUAL IGNITION - 100% SHUTOFF
(BOILERS WITH ONE PILOT)

To Shut Off:

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

To Light:

1. Set thermostat to lowest temperature.
2. Be sure manual shutoff valve "A" and pilot valve "B" have been shut off for at least five minutes before proceeding.
3. Open pilot valve "B."
4. Press plunger "C" on Baso automatic pilot switch and light pilot "D." Hold plunger "C" for one minute.
5. Open manual shutoff valve "A."
6. Turn on switch in electric line to appliance.
7. Set thermostat to desired temperature.

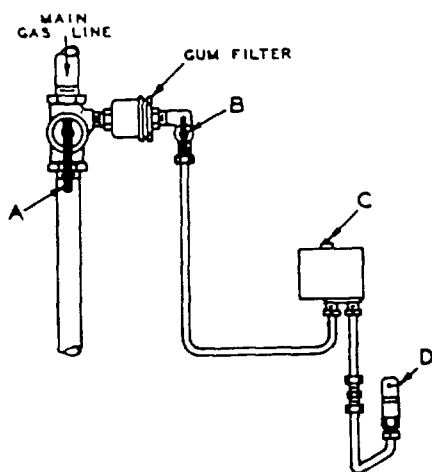


Fig. 21-For Manufactured Gas

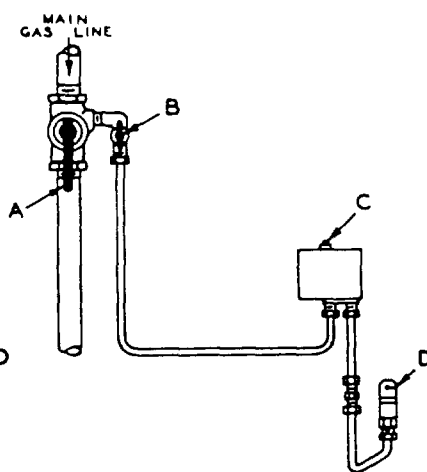


Fig. 22-For Natural, Mixed, L.P.
and LP-Air Gases

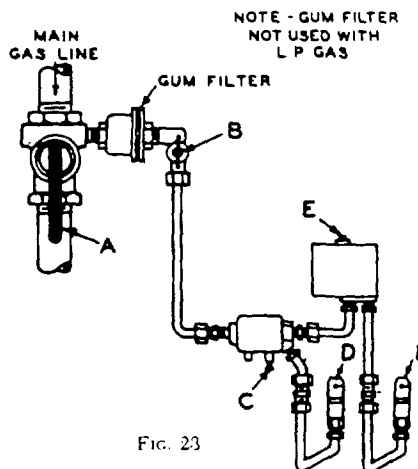
**INSTRUCTIONS FOR SHUTTING OFF AND LIGHTING
MANUAL IGNITION - 100% SHUTOFF
(BOILERS WITH TWO PILOTS)**

To Shut Off:

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

To Light:

1. Set thermostat to lowest temperature.
2. Be sure manual shutoff valve "A," and pilot valve "B" have been shut off for at least five minutes before proceeding.
3. Open pilot valve "B."
4. Press plunger "C" on Baso automatic pilot valve and light pilot "D." Hold plunger "C" for one minute. For additional valves repeat.
5. Press plunger "E" on Baso automatic pilot switch and light pilot "F." Hold plunger "E" for one minute.
6. Open manual shutoff valve "A."
7. Turn on switch in electric line to appliance.
8. Set thermostat to desired temperature.



**INSTRUCTIONS FOR SHUTTING OFF AND LIGHTING
ELECTRIC IGNITION – NON 100% SHUTOFF**

To Shut Off:

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

To Light:

1. Set thermostat (or operating control) to lowest temperature.
2. Be sure manual shutoff valve "A" and pilot valve "B" have been shut off for at least five minutes before proceeding.
3. Turn on switch in electric line to appliance.
4. Open pilot valve "B."
5. Press red electric igniter button "C" until pilot burner lights.
6. Press plunger "D" on Baso automatic pilot switch.
7. Open manual shutoff valve "A."
8. Light main burners by setting thermostat (or operating control) to highest temperature. Wait for approx. 30 seconds, then return to lowest setting. Be sure that all auxiliary pilots have lit.
9. Set thermostat (or operating control) to desired temperature.

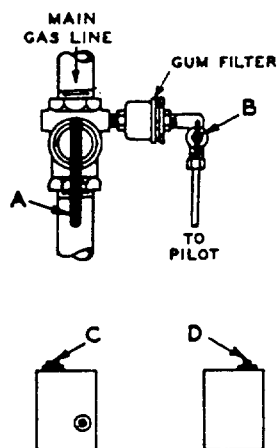


FIG. 24

INSTRUCTIONS FOR SHUTTING OFF AND LIGHTING RUNNER PILOT IGNITION - NON 100% SHUTOFF

To Shut Off:

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

To Light:

1. Set thermostat (or operating control) to lowest temperature.
2. Be sure manual shutoff valve "A" and pilot valve "B" have been shut off for at least five minutes before proceeding.
3. Open pilot valve "B."
4. Push and hold red button "C." Light runner pilot. Release button "C." When pilot burner lights.
5. Wait one minute.
6. Press plunger "D" on Baso automatic pilot switch.
7. Open manual shutoff valve "A."
8. Turn on switch in electric line to appliance.
9. Light main burners by setting thermostat (or operating control) to highest temperature. Wait for approx. 30 seconds, then return to lowest setting. Be sure that all auxiliary pilots have lit.
10. Set thermostat (or operating control) to desired temperature.

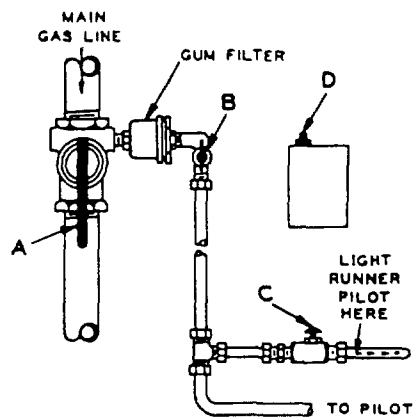


FIG. 25

Pilot Goes Out

If the pilot flame is extinguished, the automatic pilot will shutoff 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 22.

EMERGENCY INSTRUCTIONS FOR OPERATION DURING FAILURE OF ELECTRIC POWER SUPPLY

In the event of failure of electric power supply the gas burner operating this boiler will automatically shut off. It is possible to operate this burner manually by following the directions given below.

CAUTION -- THE BURNER SHOULD BE OPERATED MANUALLY ONLY AS AN EMERGENCY MEASURE. THE AUTOMATIC SAFETY CONTROLS WHICH PROTECT THE BOILER DURING NORMAL OPERATION ARE NOT OPERATIVE. CONSTANT SUPERVISION IS REQUIRED TO PREVENT THE POSSIBILITY OF DAMAGE TO THE BOILER BECAUSE OF LOW WATER OR OVERHEATING. **NEVER LEAVE THE BURNER OPERATING MANUALLY IF IT IS TO BE UNSUPERVISED FOR ANY LENGTH OF TIME.**

IN SUPPLYING THESE BRIEF DIRECTIONS FOR MANUAL OPERATION OF THE BURNER, THE MANUFACTURER CAN ASSUME NO RESPONSIBILITY FOR THE SAFE OPERATION OF THE BURNER, BOILER AND OTHER EQUIPMENT. SAFETY DEPENDS UPON THE CARE AND JUDGMENT EXERCISED BY THE OPERATOR. ALL POSSIBILITIES CANNOT BE COVERED IN THESE BRIEF DIRECTIONS.

BASIC STEPS IN MANUAL OPERATION

1. Be sure the burner pilot is burning properly. If so, then: -
2. Turn off electric power switch controlling the burner. LEAVE THIS SWITCH OFF UNTIL POWER HAS BEEN RESTORED.
3. Burner may now be operated manually by opening the automatic gas control valve in accordance with instructions printed on the valve cover.
4. If the boiler operated by the gas burner is installed on a forced circulation hot water heating system (incorporating electric circulating pump) OPEN FLOW CONTROL VALVE OR VALVES IF PROVIDED IN THE WATER LINES. (Note: - It is suggested that the original position of these valves be carefully observed and these observations recorded, to permit restoring these valves to their original position when automatic operation is resumed.)

Also, REDUCE THE MAIN BURNER FLAME TO A MINIMUM ADJUSTMENT (approximately 1/3 or 1/4 normal size) BY PARTIALLY CLOSING THE MANUAL GAS SHUT OFF VALVE.

TO RESTORE BURNER TO AUTOMATIC OPERATION UPON RESUMPTION OF SUPPLY OF ELECTRIC CURRENT

1. Return automatic gas control valve to its original "automatic" setting, in accordance with instructions on valve cover.
2. Turn on electric power supply switch.
3. On forced circulation hot water heating systems, return flow control valves, if provided, to their normal operating positions.
4. Turn manual gas shut off valve to its wide open position.

MAINTENANCE

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.

Maintenance 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

Keep the system filled as during the heating season. Each boiler should have a periodic check up of all safety controls and a close inspection of the burners, mixing tubes, flue passageways, draft hoods and flue pipe. It is also good practice to recheck the input firing rate and the gas air mixture on the burners to see that the boiler is operating at normal efficiency. This inspection should be made by your heating contractor or a competent service man before the start of each heating season. If necessary, remove the cleanout jacket panel and the cleanout cover plates and clean pin fin surfaces of the boiler sections. The above inspection should include the testing of all safety pilots, limit controls, safety relief valves, and low water cutoff on steam boilers.

General Maintenance 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 (on page 16.) See CAUTION Note.

5. Fill hot water system 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.

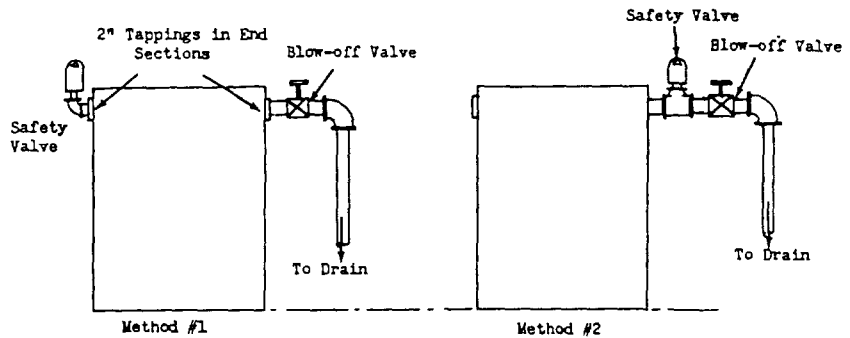
7. Where an expansion tank is used, make sure that neither the tank nor its drain pipe is exposed to freezing temperatures. See caution note on page 2.

CLEANING BOILERS

The grease used to lubricate the cutting tools during erection of new piping systems serves as a carrier for dirt, with the result that a scum of fine particles and grease accumulates on the surface of the water in all new boilers, while heavier particles may settle to the bottom of the boiler and form sludge. These impurities tend to cause foaming, preventing the generation of steam and causing an unsteady water line.

This unavoidable accumulation of oil and grease should be removed by blowing-off the boiler as follows: If not already provided, install a surface blow connection of at least 1¼ inch nominal pipe size with outlet extended to within 18 inches of the floor or to sewer, inserting a valve in line close to boiler. Bring the water line to center of outlet, raise steam pressure, and

while burners are operating open valve in blow-off line. When pressure recedes, close valve and repeat process adding water at intervals to maintain proper level. As a final operation bring the pressure in the boiler to about 10 lbs., close blow-off and manual shut-off valves, then open drain valve. After boiler has cooled, partly fill and flush out several times before filling it to proper water level for normal service. The use of soda or any alkali, vinegar or any acid is not recommended for cleaning heating boilers because of the difficulty of complete removal and the possibility of subsequent injury after the cleaning process has been completed.



SUGGESTED PIPING ARRANGEMENT FOR BLOWING-OFF STEAM BOILERS

Caution

After the blow off operation, a checkup should be made of the Low Water Cutoff as directed on Page 17.

NOTE: All parts of this boiler have been carefully inspected and packed. See Packing and Parts List sheet for details.

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



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ARSS 4699 REV. 4-60