

*Revised 9-1-64**1/10/10/10*

Installation Instructions

245

GAS-FIRED STEAM OR WATER BOILER

bryant

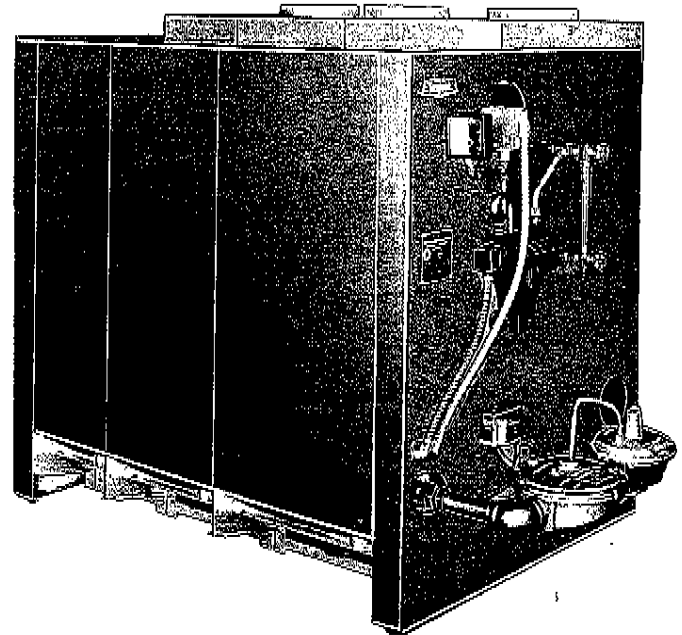
39245D1

The Bryant Model 245 Gas Fired Boiler is approved by The American Gas Association for use with natural, mixed, manufactured and propane gases.

It is a low pressure, sectional, cast iron boiler, designed for use with water or steam. Type "S" for steam can be used in systems with a maximum working pressure of 15 psig. Type "W" for water can be used in systems with a maximum working pressure of 50 psig.

Installer: The boiler is shipped knocked down. Check rating plate for type of gas, input, voltage, etc., to be sure that all equipment furnished meets the requirements of the installation.

Read these instructions completely before beginning the installation. On the end of manifold fitting box there is a master copy of all packages required to assemble a boiler of the particular controls, size and gas type received. On each box will be a package number. Check each package to be sure all packages required have been received. It is recommended that the following step-by-step instructions be followed for best assembly results.



CODES GOVERNING INSTALLATIONS

All installations are subject to local utilities or other authorities having jurisdiction. This jurisdiction normally covers electrical wiring, gas piping, flue specification, and insulation of adjacent combustible material where required clearances cannot be maintained. As a practical guide, the following American Gas Association pamphlet is highly recommended: ASAZ21.30 - 1959, or later edition.

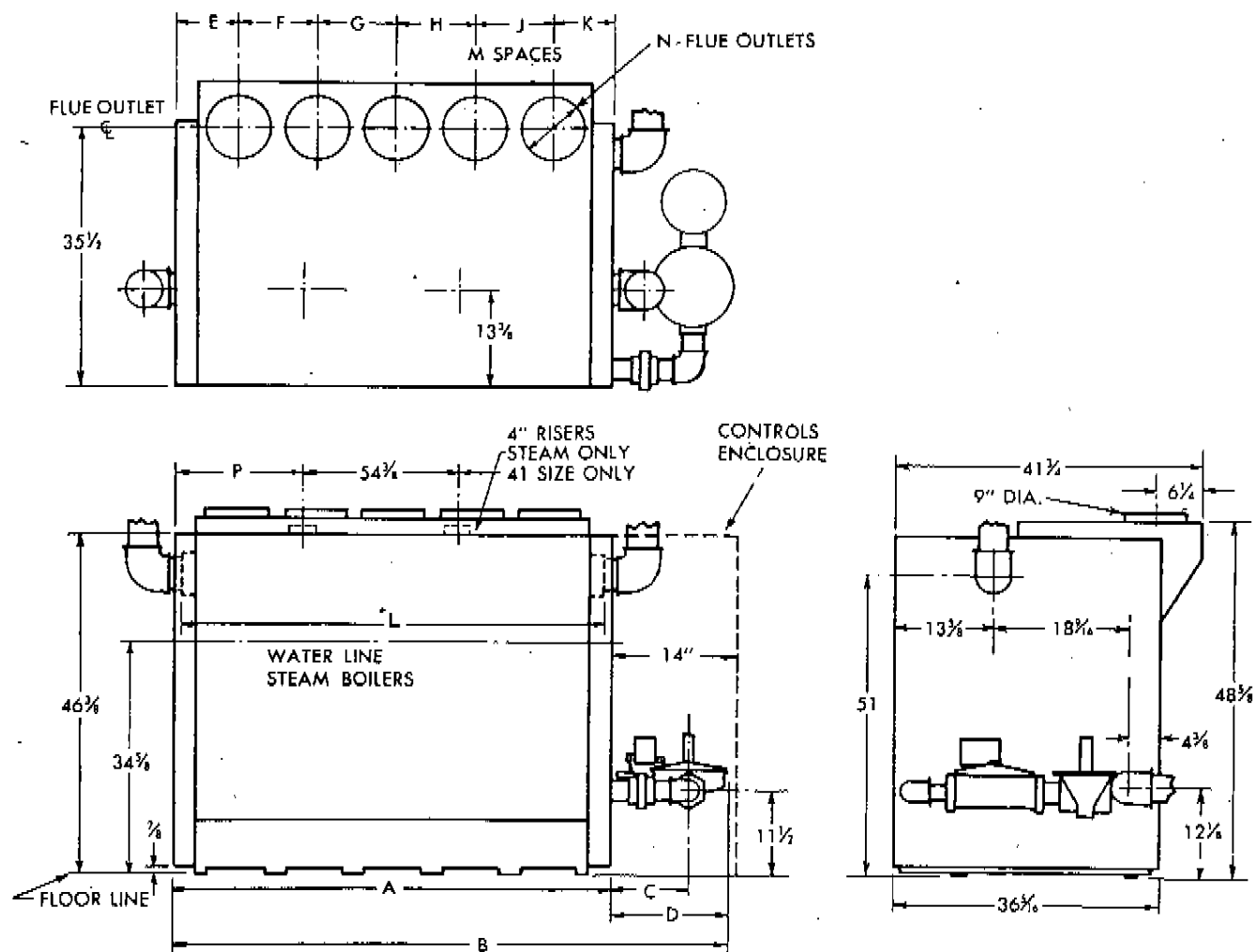
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INSTALLATION

The end sections are so designed that the controls may be placed on either the left or right end. For purposes of orientation, the manifold side of the boiler is considered the front. This instruction is written for the assembling of a boiler whose gas controls will be on the right end. The left end section is a mirror image of the right end section. Plugs are provided for both sections for the tappings not used.

COMBUSTION AIR

When the unit is installed in a small room or a building of relatively air-tight construction, provide air for combustion and ventilation. This air must be supplied through two openings of equal area; one located above the draft diverter relief opening and the other near the floor. The total free area of each opening should be equal to one square inch for each 1,000 Btu of input for indoor openings. There should be a minimum of one square inch per 3,000 Btu input for outdoor air.



DIMENSIONAL DATA

DIMENSIONAL DATA																				Width Over 4" Flow Outlets	Width Over 6" Flow Outlets	Number of J-Spaces	Number of Flue Outlets	Gas Connection Sizes			Flue Collector Size To Chimney (1)	P	Estimated Shipping Weight In Lbs.	
Boiler Size	A	B			C			D			E	F	G	H	J	K	L	L	M					N						
		Prop.	Nat.	Mfd.	Prop.	Nat.	Mfd.	Prop.	Nat.	Mfd.															Prop.	Nat.				Mfd.
4	16%	26%	26%	27 1/4	7 7/8	7 7/8	7 3/4	8 1/2	9 1/2	10 3/4	8 7/8							15		1	1 1/2	1 1/2	1	9	860					
5	20%	30	31 1/4	31 3/4	7 7/8	7 3/4	6 3/4	9 1/2	10 3/4	11	10 3/4							18 3/4		1	1 1/2	1 1/2	1	9	1055					
6	24%	33 3/4	34%	35 1/4	7 7/8	7 3/4	6 1/4	9 1/2	10 3/4	11	12 1/4							22 1/4		1	1 1/2	1 3/4	1 1/4	9	1245					
7	27%	35 3/4	38 3/4	47 1/4	7 7/8	7 3/4	14 1/4	9 1/2	10 3/4	19 1/2	8 7/8	10 3/4	19 1/2					25 3/4		2	1 1/2	1 3/4	1 1/4	10	1475					
8	31%	42	42	50 3/4	7 3/4	7 3/4	14 3/4	10 3/4	10 3/4	19 1/2	8 7/8	12 1/4						29 1/2		2	1 3/4	1	1 3/4	10	1555					
9	35	45%	45%	54 3/4	7 3/4	6 3/4	14 3/4	10 3/4	10 3/4	19 3/4	10 3/4	14 1/2						33 3/4		2	3/4	1	1 1/4	10	1855					
10	38%	49 1/4	50 1/4	59 3/4	7 3/4	6 3/4	15 1/4	10 3/4	11 3/4	21	10 3/4	16 3/4						36 3/4		2	3/4	1 1/4	2	10	2045					
11	42%	52 3/4	53 3/4	63 3/4	7 3/4	6 3/4	15 1/4	10 3/4	11 3/4	21	12 1/4	18 3/4						40 3/4		2	3/4	1 1/4	2	12	2250					
12	45%	56 3/4	57 1/4	67 3/4	7 3/4	7 3/4	15 1/2	10 3/4	11 3/4	21 1/2	8 7/8	10 3/4	14 1/2	14 1/2				44		3	3/4	1 1/4	2	12	2455					
13	49 1/2	60 3/4	63 3/4	71	7 3/4	9	15 1/2	10 3/4	13 3/4	21 1/2	10 3/4	14 1/2	14 1/2					47 3/4		3	3/4	1 1/4	2	12	2665					
14	53%	63 3/4	64 1/2	74 3/4	7 3/4	7 3/4	15 1/2	10 3/4	11 3/4	21 1/2	8 7/8	14 3/4	18 3/4					51 3/4		3	3/4	1 1/4	2	12	2835					
15	56%	67 3/4	68 3/4	78 3/4	7 3/4	7 3/4	15 3/4	10 3/4	11 3/4	21 3/4	10 3/4	16 3/4	18 3/4					54 3/4		3	3/4	1 1/4	2	12	3040					
17	64	74 3/4	82	85 3/4	7 3/4	13	15 3/4	10 3/4	18	21 3/4	10 3/4	14 3/4	14 3/4	14 3/4	14 1/2			62 3/4	67 3/4	4	3/4	1 1/2	2	14	3445					
18	71%	82 3/4	89 3/4	92 3/4	6 3/4	13 3/4	15 3/4	11 3/4	18 3/4	21 3/4	8 7/8	14 3/4	18 3/4	18 3/4	18 3/4			69 3/4	74 3/4	4	1	1 1/4	2	14	3855					
21	78%	90%	92%	99%	6 3/4	13 3/4	15 1/4	11 3/4	18 1/4	21 1/4	12 1/4	18 3/4	18 3/4	18 3/4	18 3/4			76 3/4	82 3/4	4	1	1 1/4	2 1/2	14	4240					
23	85%	97%	104%	107	6 3/4	13 3/4	15 1/4	11 3/4	18 3/4	21 1/4	8 7/8	12 1/4	16 3/4	18 3/4	18 3/4	18 3/4		83 3/4	89 3/4	1	5	1	2	2 1/2	14	4655				
25	93	104%	111%	114 1/4	7 3/8	13 3/4	15 1/4	11 3/4	18 3/4	21 1/4	10 3/4	16 3/4	18 3/4	18 3/4	18 3/4	18 3/4		91 3/4	96 3/4	1	5	1	2	2 1/2	16	5055				
27	100 3/4	111 3/4	121 1/4	121 1/4	7 3/8	15 3/4	15 1/4	11 3/4	21 1/4	21 1/4	8 7/8	10 3/4	14 3/4	18 3/4	18 3/4	18 3/4		98 3/4	103 3/4	2	6	1	2	2 1/2	16	5490				
29	107 3/4	118 3/4	128 3/4	128 3/4	7 3/8	15 3/4	15 1/4	11 3/4	21 1/4	21 1/4	8 7/8	14 3/4	18 3/4	18 3/4	18 3/4	18 3/4		105 3/4	111 3/4	2	6	1 1/4	2	2 1/2	16	5870				
31	114 3/4	128 3/4	136	136	9	15 3/4	15 1/4	11 3/4	21 1/4	21 1/4	12 1/4	18 3/4	18 3/4	18 3/4	18 3/4	18 3/4		112 3/4	118 3/4	2	6	1 1/2	2	2 1/2	16	6255				
33	122	135 3/4	143 1/4	143 1/4	9	15 3/4	15 1/4	13 3/4	21 1/4	21 1/4	8 7/8	12 1/4	16 3/4	18 3/4	18 3/4	18 3/4		120 3/4	125 3/4	3	7	1 1/4	2	(2) 2 1/2	18	6660				
35	129 3/4	142 3/4	150 3/4	150 3/4	9	15 3/4	15 1/4	13 3/4	21 1/4	21 3/4	10 3/4	16 3/4	18 3/4	18 3/4	18 3/4	18 3/4		127 3/4	132 3/4	3	7	1 1/2	2	(2) 2 1/2	18	7045				
37	136 3/4	151	157 3/4	158 3/4	9 1/2	15 3/4	15 1/4	14 3/4	21 1/4	21 1/4	8 7/8	10 3/4	14 3/4	18 3/4	18 3/4	18 3/4		134 3/4	140 3/4	4	8	1 1/2	2	(2) 2 1/2	18	7450				
39	143 3/4	158 3/4	165	165 3/4	9 1/2	15 3/4	15 1/4	14 3/4	21 1/4	21 3/4	8 7/8	14 3/4	18 3/4	18 3/4	18 3/4	18 3/4		141 3/4	147 3/4	4	8	1 1/2	2	(2) 2 1/2	18	7840				
41	151	165 3/4	172 1/4	172 3/4	9 1/2	15 3/4	15 1/4	14 3/4	21 1/4	21 3/4	12 1/4	18 3/4	18 3/4	18 3/4	18 3/4	18 3/4		149 3/4	154 3/4	4	8	1 1/2	2	(2) 2 1/2	18	8220				

1) Flue (Collector) sizes shown are based on having the end of the collector no more than 6 feet from the chimney, and no more than one 90° elbow in the connection to the chimney.

Also adequate combustion air must be provided. If low chimney height is mandatory, vertical stacks directly off the flue collar on the boiler may be used providing they are at least 6 feet in height and that they clear surrounding obstruction by at least 2 feet to avoid down drafts.

MAIN GAS SUPPLY CONNECTIONS

The following recommendations should be followed in bringing the main gas supply line to the boiler:

1. Run a separate gas line as direct as possible from the gas source to the boiler. The size of the pipe should be as large as practical to minimize the pressure loss (consult local utility). The pipe size should never be smaller than the inlet to the main manual gas shut-off valve supplied with the boiler.
2. Mount the main manual shut-off valve approximately 5 feet above the floor level. The tapping for the pilot supply valve should be on the inlet (supply) side of the main shut-off valve. See Figure 1.
3. Provide a drip leg below the main manual shut-off valve. Extend it to the floor to help support the main supply piping. In addition, support the supply pipe with adequate hangers or straps. See Figure 1.
4. Provide a ground joint union in the line between the main manual shutoff valve and the gas burner controls. See Inset, Figure 1.

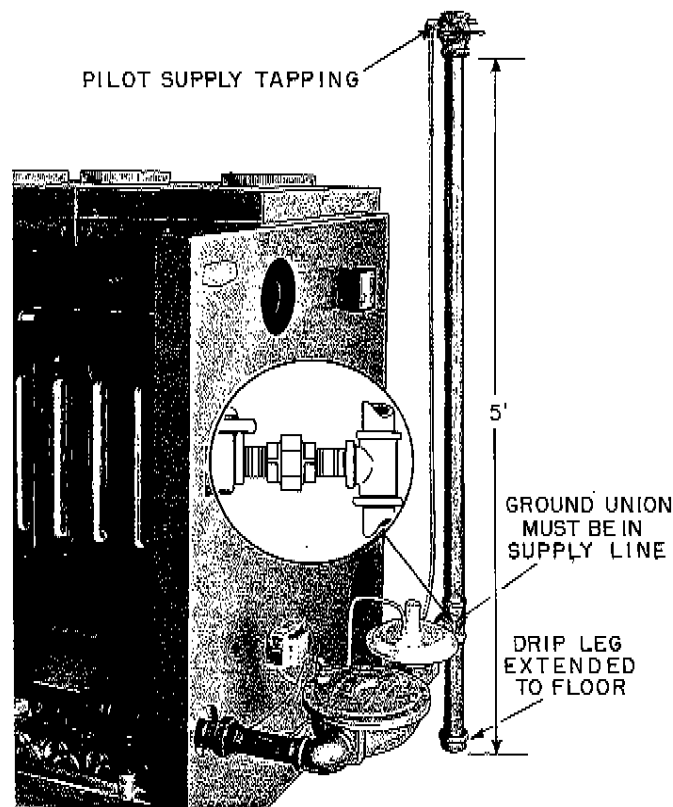


Figure 1 - Gas Piping

LOCATION OF BOILER

1. The boiler should be as centrally located with respect to the distribution system as possible; also as close to the chimney as possible.
2. This boiler is not approved for use on combustible floors.
3. The floor of the installation site must be level. Construct a level concrete pad if necessary.
4. Minimum clearance from combustibles is 6 inches on all sides including the top and draft diverter. However, a clearance of 24 inches on the front and the control end will be necessary for servicing and for cleaning. It is recommended that 24 inches clearance on all sides be the least amount of clearance for a 245 installation. (In some cases local codes govern clearances).
5. Advise owner that all air openings must be kept clean and unobstructed.

GAS CONTROLS

Table I shows the four gas control types that will be used on the 245 Boiler. The D4 controls are to be used on natural gas only; D5 controls can be used with manufactured or natural gas; D2 controls are for propane only and D6 controls are for natural gas on the 4, 5 and 6 size boiler.

Table I

	Natural and Mfd			Propane
	D4	D5	D6	D2
Bryant Automatic pilot	x			
Bryant gas control valve	x	x		x
Gas pressure regulator	x	x	x	
*Pilot gas filter		x		
Thermocouple pilot(s)		x		x
Pilot relay(s)		x		x
Self-generating pilot			x	
M-H gas valve			x	

* Mfd gas only

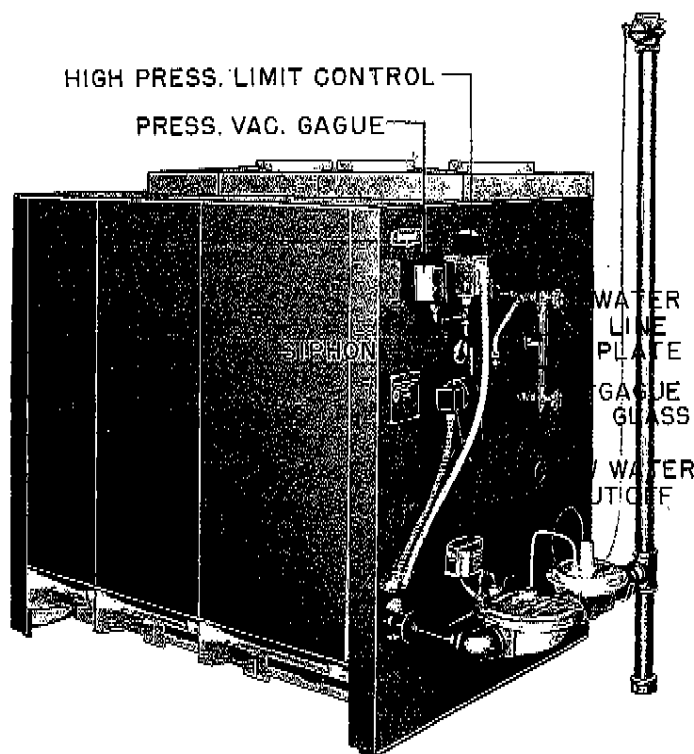


Figure 2 - Steam Trim (pressure relief valve not shown)

BOILER TRIM

The following controls are supplied as standard equipment. Details of their function and operation will be found in the section on Controls and Adjustments.

STEAM TRIM

1. Low water cut-off (mounted externally) with blow-off valve.
2. High pressure limit control.
3. Compound pressure-vacuum gauge.
4. Water gauge glass set.
5. Siphon.
6. Pressure relief valve (15 psig).

WATER TRIM

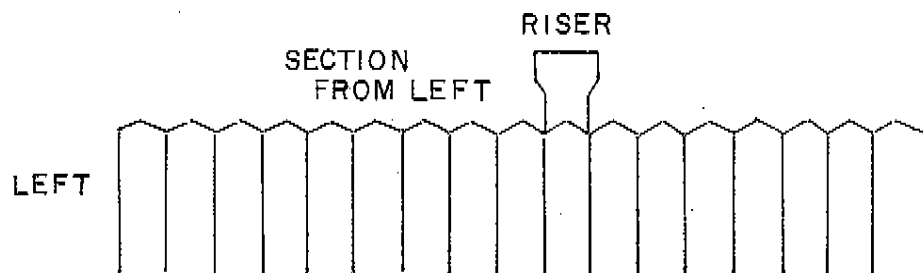
1. Water temperature high limit control - electric.
2. Combination temperature-pressure-altitude gauge.
3. Pressure relief valve (30 psig).

WC TRIM

1. Limit relay combination.
2. Low limit circulator control.
3. Temperature-pressure-altitude gauge.
4. Pressure relief valve (30 psig).

STEAM RISERS

Figure 3 shows the location of the steam risers for boilers 29 to 41 sizes. These risers are not required for smaller sizes. The locations must be held, otherwise the front jacket cover will not fit properly.



Size	Riser Section from Left End
29	16th
31	18th
33	15th
35	17th
37	19th
39	21st

Figure 3 - Location of Risers

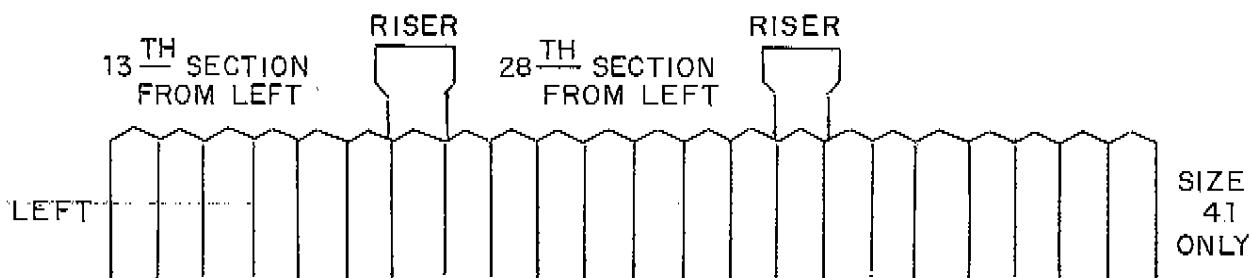


CHART I – COMBINATION BASE CHART

The 4, 5 and 6 section boilers each have an individual base. The 4 section has 6 burners; 6 section, 10 burners. In order to build any boiler larger than 6 sections, a combination of the above three bases must be used. The assembly of any size boiler must follow Chart I in order for the gas manifold header piping to fit if gas controls are on right end.

Boiler Size (No. of Sections)	Number of Bases	Number of Burners * Per Base-Left to Right
4	1	6
5	1	8
6	1	10
7	2	6-6
8	2	6-8
9	2	8-8
10	2	8-10
11	2	10-10
12	3	6-6-10
13	3	8-8-8
14	3	6-10-10
15	3	8-10-10
17	4	8-8-8-8
19	4	6-10-10-10
21	4	10-10-10-10
23	5	6-8-10-10-10
25	5	8-10-10-10-10
27	6	6-6-10-10-10-10
29	6	6-10-10-10-10-10
31	6	10-10-10-10-10-10
33	7	6-8-10-10-10-10-10
35	7	8-10-10-10-10-10-10
37	8	6-6-10-10-10-10-10-10
39	8	6-10-10-10-10-10-10-10
41	8	10-10-10-10-10-10-10-10

* Reverse base order if controls are on the left end.

ERECTION

When selecting the installation site, remember it must have a firm, non-combustible, level foundation. Should the boiler base not be level when assembly begins, the sections will not align properly and assembly difficulties will be encountered.

If the 245 is to be used as a steam boiler, and is to be connected to another steam boiler, the factory design waterlines of the two boilers must be of equal distance above floor level.

ASSEMBLY OF BASES

It will be necessary to use a combination of bases on all 245 Boilers, water or steam, larger than six (6) sections. See Chart I for various combinations. When using two or more bases, be sure the top angles of the bases are even and level.

The bases are to be securely fastened together by the use of 5/16 inch cap screws and nuts. Install two screws in the front posts, two in the rear posts, as shown in Figure 4.

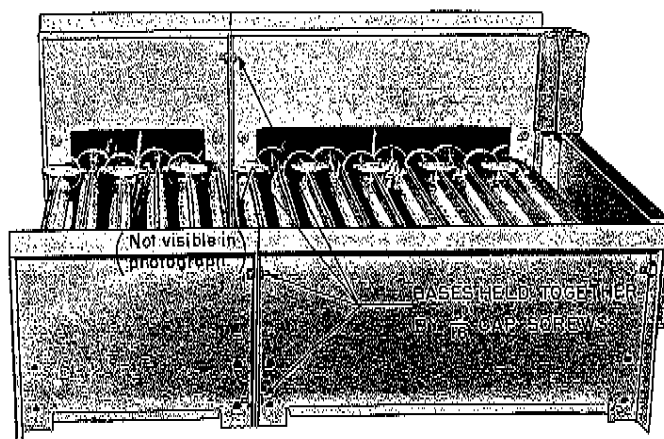


Figure 4 - Fasten Bases

END CLOSING PLATES & BACK CASING SUPPORTS

Fold the insulation into the front angle of each corner post before beginning the installation of the end closing plate. Allow 3/4 inch of insulation to extend beyond the outside edge and above the top of the front post. This is to seal the expansion space between the base and the battery. See Figure 5.

The end closing plate is fastened to the base by three 5/16 inch cap screws.

The two cap screws in the front post screw into weld nuts on the end closing plate. The back of the closing plate is fastened to the base by a 5/16 inch cap screw and nut through the top hole in the rear angle of the base. See Figure 5.

The back casing support fastens to the base by the use of a 5/16 inch cap screw and nut with the notches tight against the edge of the rear post. See Figure 5.

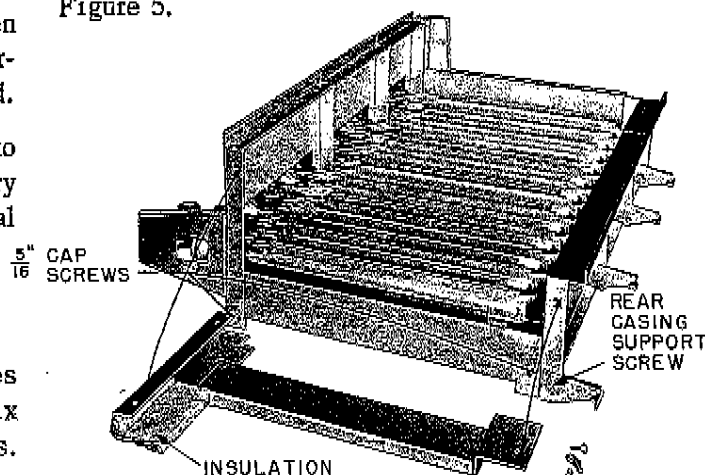


Figure 5 - Install End Closing Plate

STARTING BATTERY POSITION

Whenever possible the assembly should be started with the left end as this is always a battery of two sections.

Place the end section or battery on the end of the base with the parting line of the web 1/4 inch outside the front edge of the top angle of the base. Also the parting line on the back of the section should be 1/4 inch from the edge of the rear top angle of the base. See Figure 6. Be sure that the parting line of the intermediate sections fall on the base divisions. Note in Figure 9 how parting line of intermediate sections align with base dimensions.

PULLING SECTIONS TOGETHER

Before beginning, clean nipples and nipple ports with an approved solvent. Coat all nipples and nipple ports with the read lead supplied.

When placing nipples in nipple ports, float the nipples in the ports; do not drive the nipples into the ports before beginning the pull up operation.

Note: Be sure nipples are started straight.

Using the "Pull up Tool," pull the remaining sections into a completed boiler.

Insert tie rods in lugs. Each tie rod is the width of base. Nuts are to be finger tight.

INSTALLATION OF PLUGS AND WELLS

Place the necessary plugs and wells in the correct position. Refer to end section, Figure 15. Plug all other holes and connect water. Before filling with water, leave an air vent in the top of one end section. Fill the boiler with water until it runs out of the air vent. Plug the air vent. Check for any water leaks before continuing with assembly.

Note: Hydrostatic test should comply with applicable code.

DRAFT HOOD ASSEMBLY

Refer to Figure 7. The draft diverter comes knocked down and packaged with the bases and also one end plate is with the end casing panel. The diverters are the same size as the boiler bases. Use 3/8 x 1/4-20 screws and nuts furnished for assembly.

1. Fasten the left end closing plate to the diverter.
2. Fasten baffle to left end closing plate.

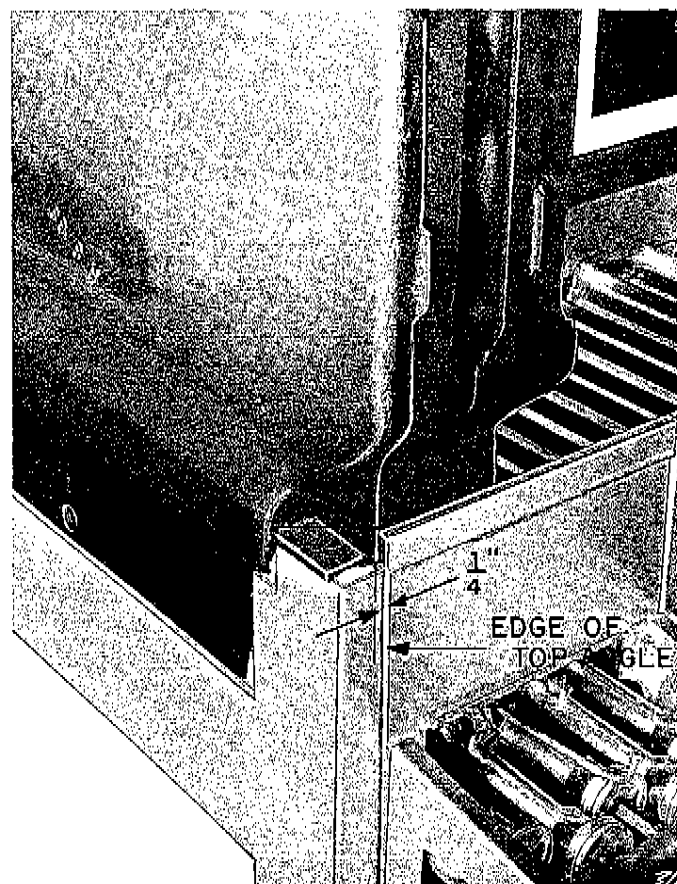


Figure 6 - Locating End Battery

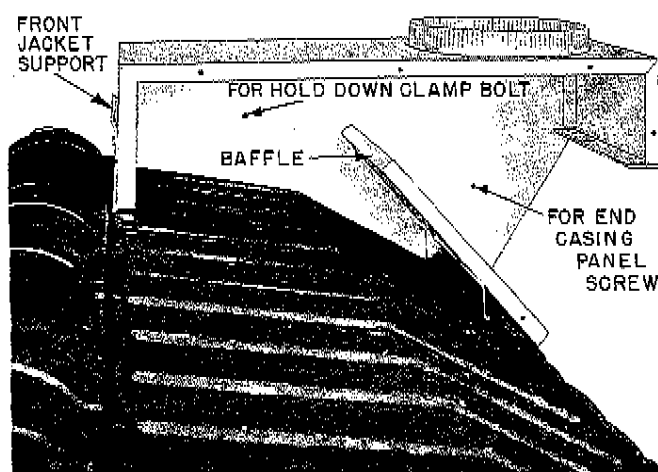


Figure 7 - Assemble Draft Hood

3. Fasten right end closing plate to diverter and baffle.
4. Install the hold down clip and the jacket clip. See Figure 8.
5. Finish and putty.

For combination diverters:

1. Fasten end plate and next diverter to first diverter at the same time.
2. Finish and putty.

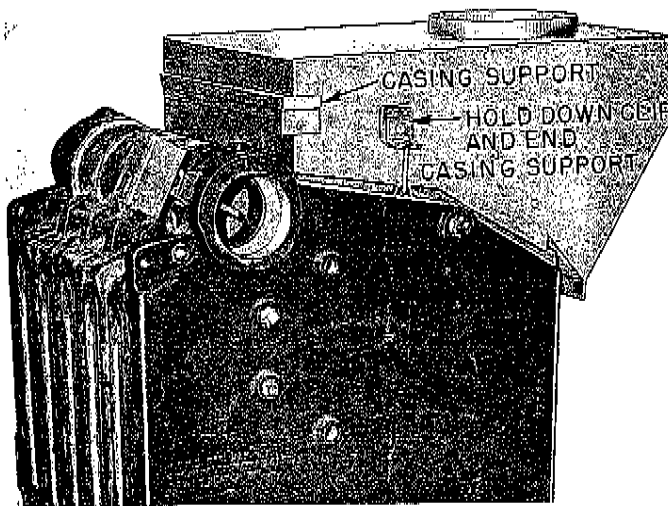


Figure 8 - Hold Down Clip & Jacket Clip

CLEAN OUT PANELS

1. Liberally apply boiler putty which is supplied, at the junction of all sections, (front, back and top). Putty should also be applied around the sections, the base and end closing plates.

2. Install clean out panels and tap them into place. Apply putty around the clean out panels. See Figure 9.

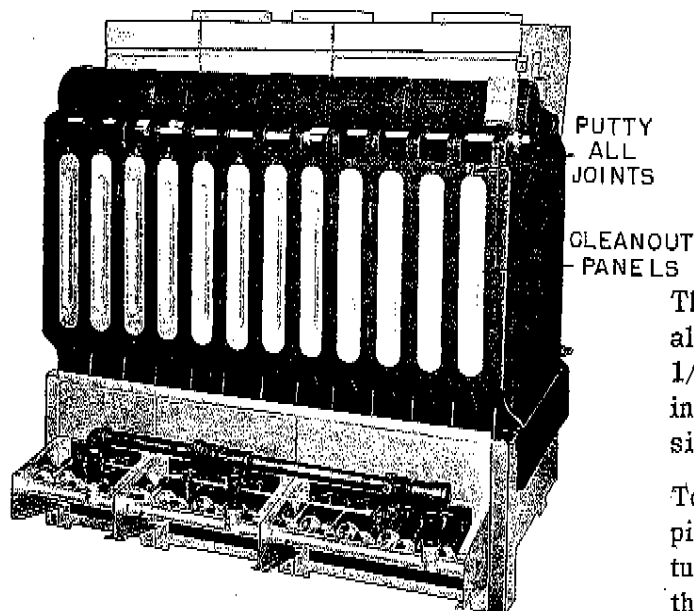


Figure 9 - Install Clean Out Panels

LIMIT FOR WATER BOILER

The screw in the limit well must be accessible with end casing panels in place. Place the limit in the well and tighten the screw. The limit will always be in the right end section. See Figure 10.

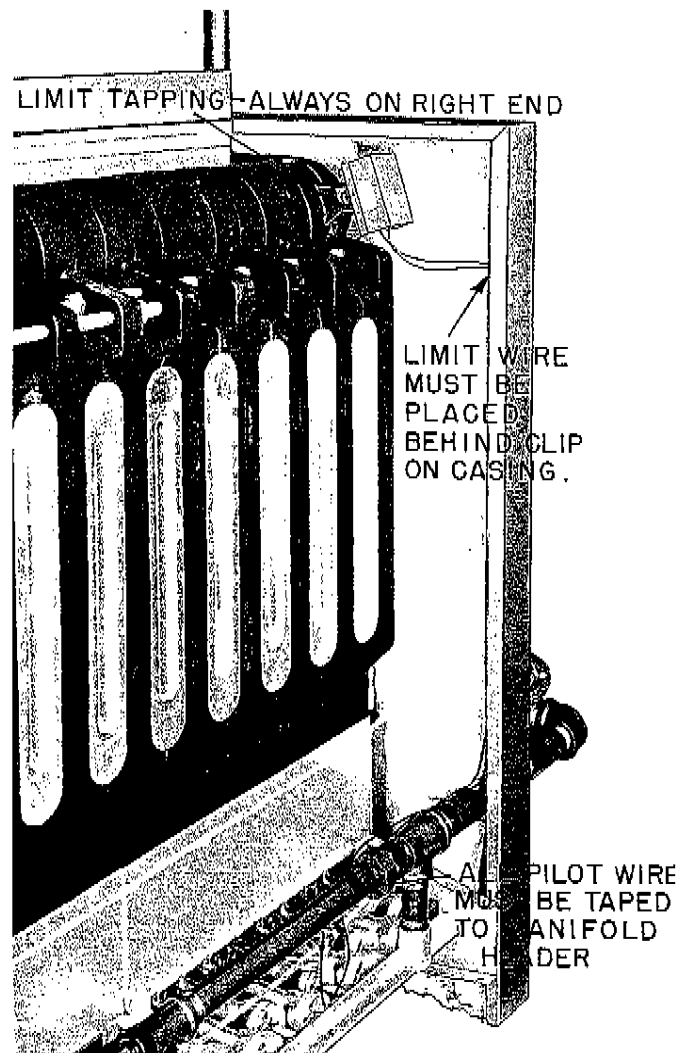


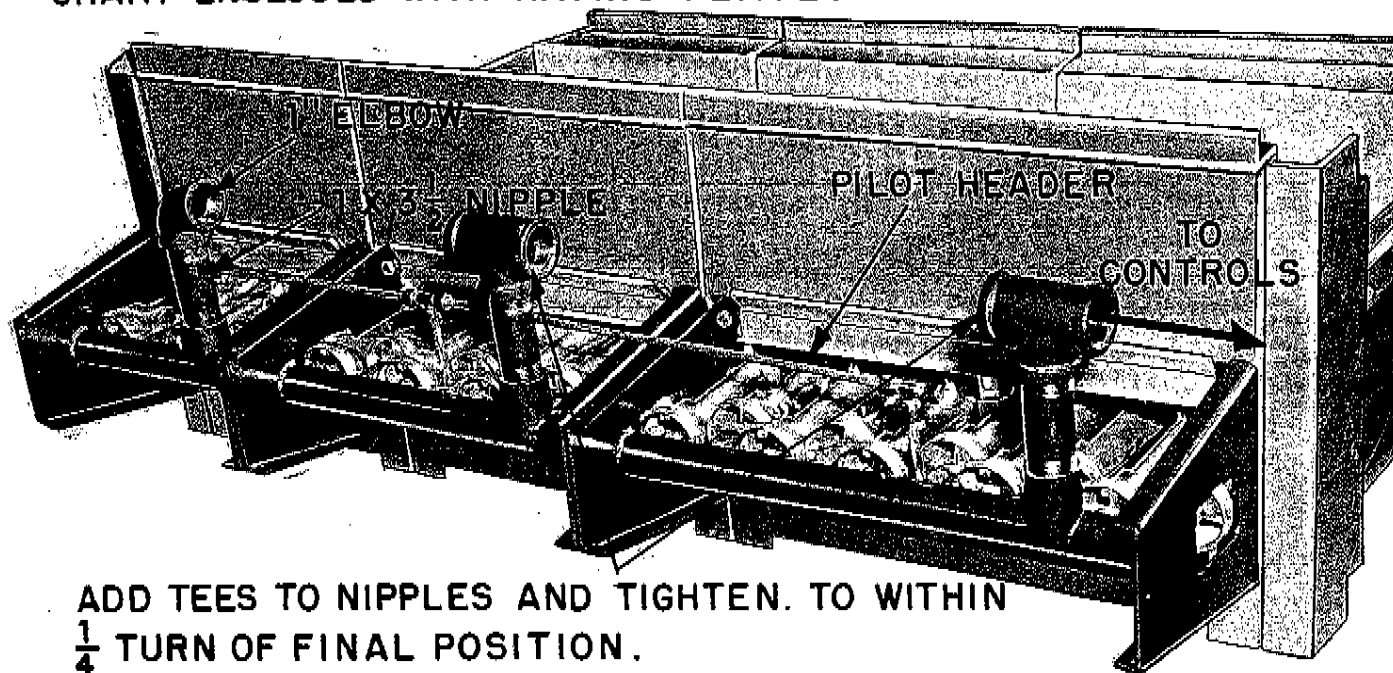
Figure 10 - Limit Switch on Water Boiler

PILOT HEADER CONNECTIONS

The pilots must be connected by a tube header for all boilers of two or more bases. Propane will use 1/4 inch tube all sizes, natural gas will use 1/4 inch tube as will manufactured gas up to the 23 size. From the 23 on 3/8 inch tube will be used.

To assemble the pilot header add an elbow to the pilot tube on the smallest base. Cut a piece of tubing long enough to fit between the first pilot and the pilot in the next base. To the next pilot add a tube tee and place the tube between the elbow and tee. Continue this process to complete the pilot header assembly.

FOR FITTING SIZES & NIPPLE LENGTHS SEE
CHART ENCLOSED WITH RATING PLATE.



ADD TEES TO NIPPLES AND TIGHTEN. TO WITHIN
 $\frac{1}{4}$ TURN OF FINAL POSITION.

Figure 11 - Assemble Manifold Header

Figure 11a

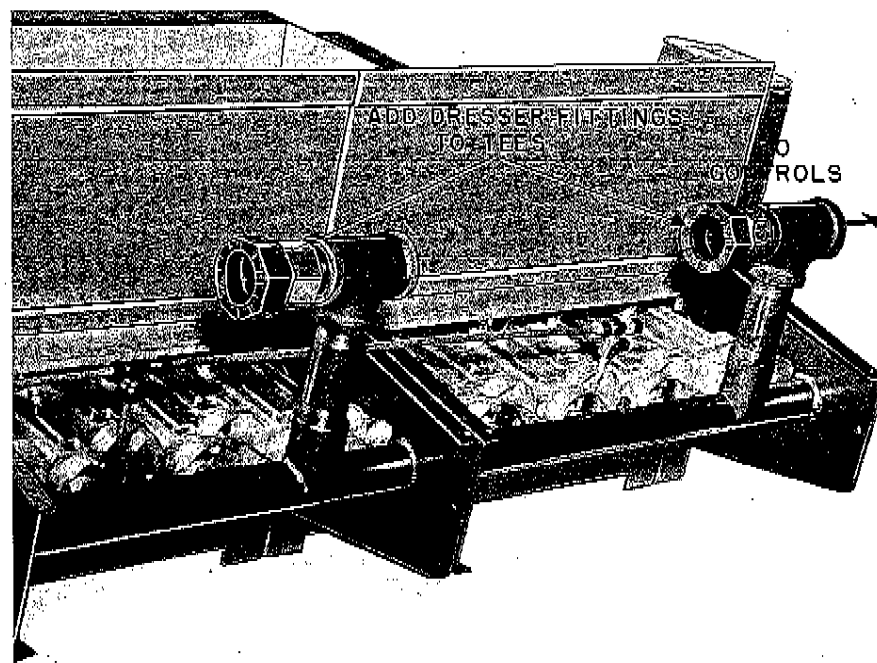
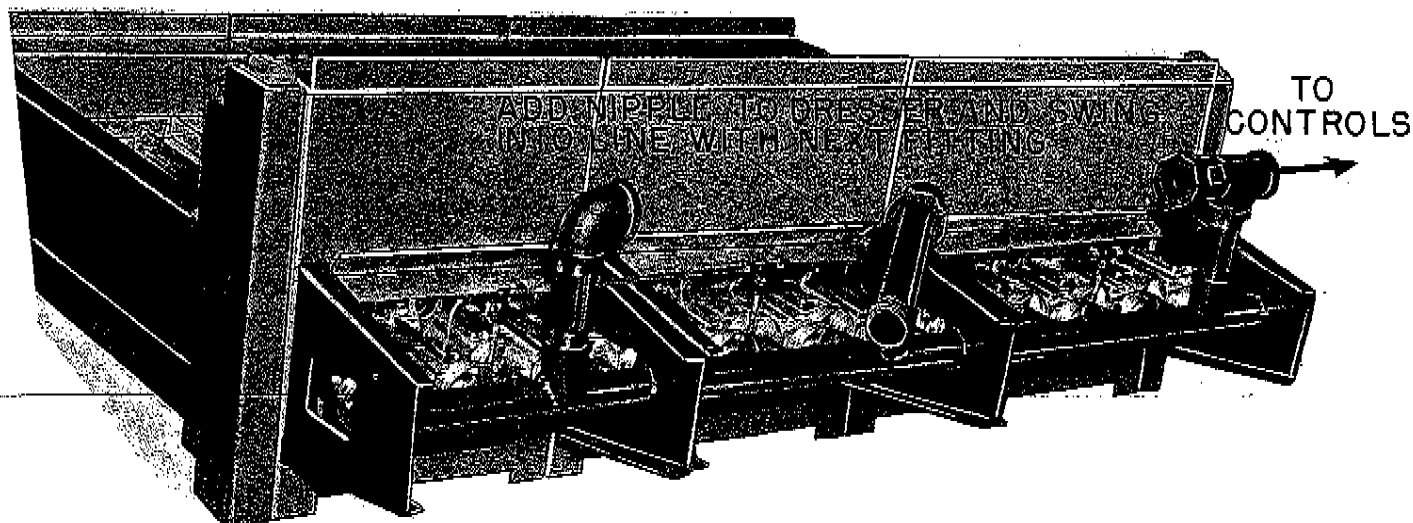


Figure 11b



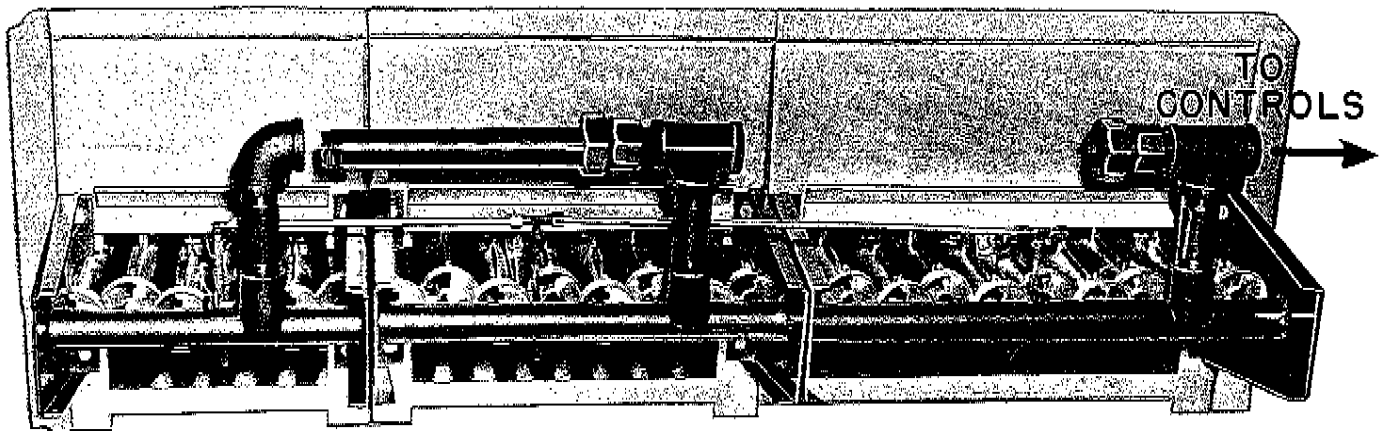


Figure 11c

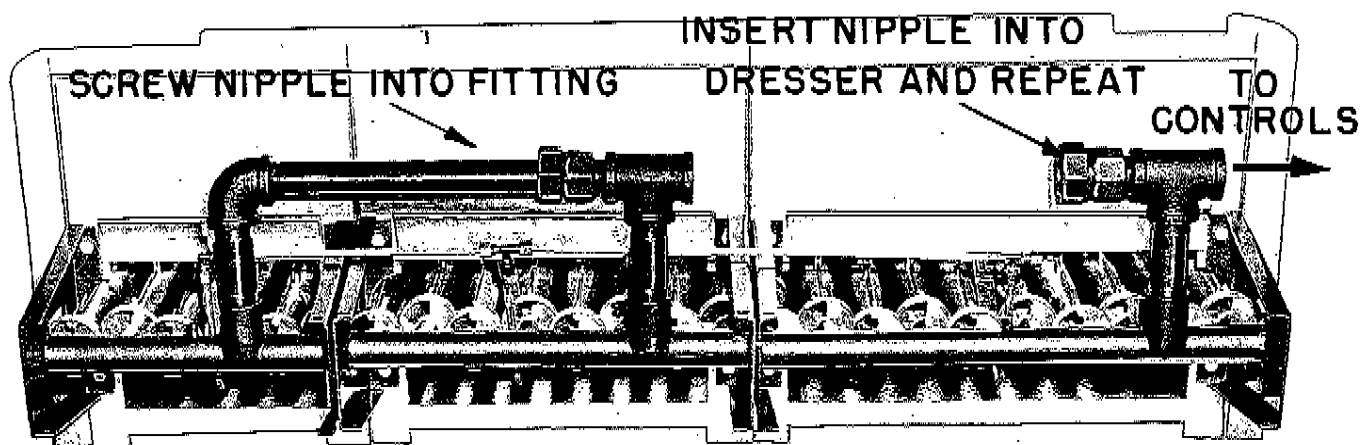


Figure 11d

ASSEMBLY OF MANIFOLD HEADER

When assembling sizes 4, 5 and 6 follow Steps 1 and 2 listed below. Refer to Manifold Installation Diagram packaged with Boiler Rating Plate for the placing of various lengths of pipe and fittings.

To assemble:

1. Starting from end of boiler opposite controls, dope the short nipple and place in the inlet of the manifold and tighten securely.
2. See Figure 11. Add elbow, tighten securely to where inlet of elbow is parallel to the manifold. Add the nipple specified by the manifold header chart. For the 4, 5 and 6 sizes this places the piping outside the casing. Add 1/2 of a union then connect the control train.
3. Dope the short nipple and place in the inlet of the next manifold and tighten securely.
4. Attach the appropriate fitting to the short nipple and tighten to within 1/4 inch turn of final tightness.
5. See Figure 11a. Place the appropriate dresser coupling in the outlet of the fitting.
6. Place unthreaded end of pipe in dresser coupling and tighten fitting last 1/4 inch turn. See Figures 11b and 11c.
7. Dope and place threaded end of pipe into elbow and tighten. Tighten dresser coupling around pipe. See Figure 11d.

Repeat above procedure for larger boilers. See Figure 11e.

To reverse the controls the base order must also be reversed. The controls will always be on the largest base with the smallest base on the opposite end.

Figure 11e is on the next page

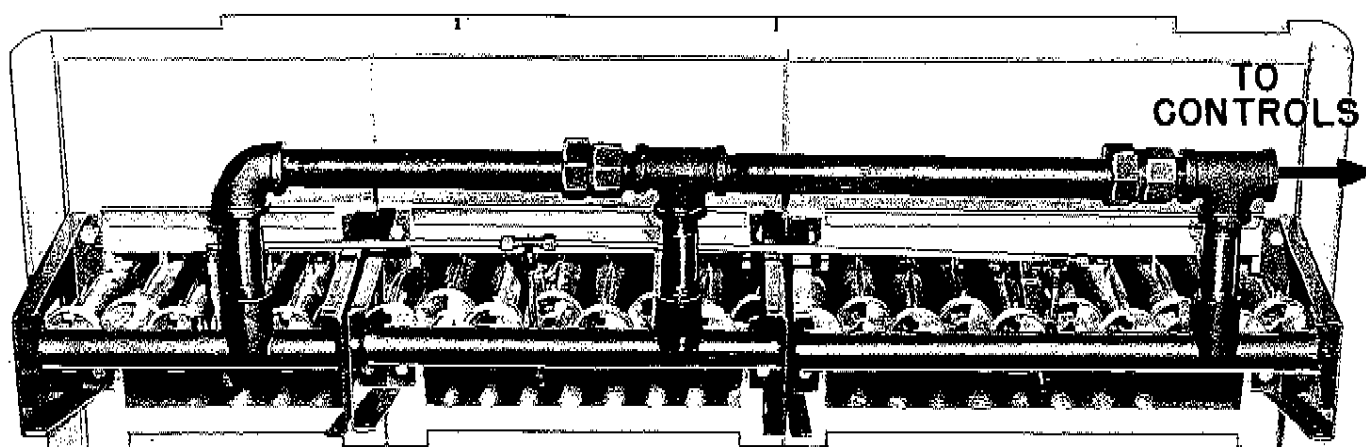


Figure 11e

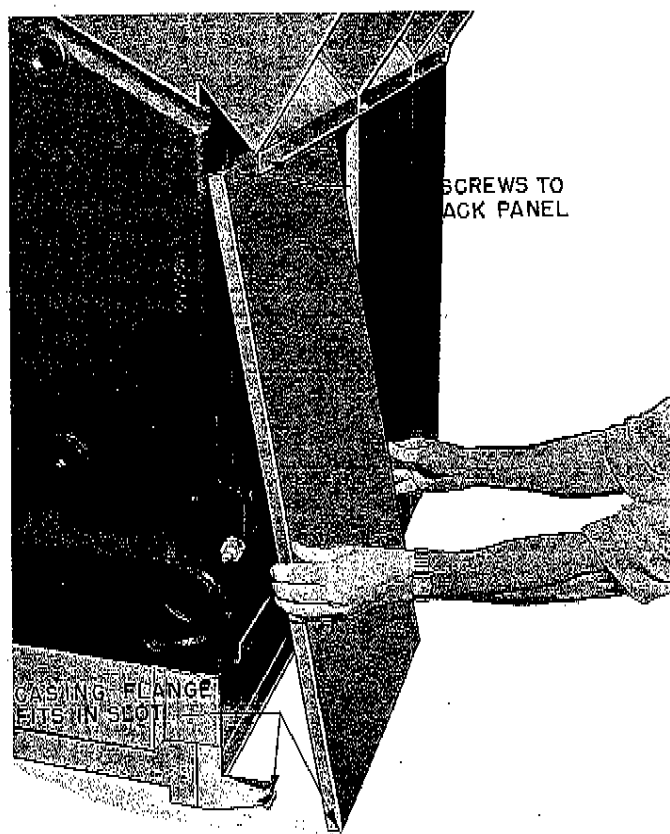


Figure 12 - Install Back Casing Panels

BACK CASING PANELS

Place the back casing panels under the flange on the draft diverter baffle, and the side flanges of the back casing panels into the rear casing supports. Place screws through flange of draft diverter into back casing panel. See Figure 12.

END CASING PANELS

To position the end casing panels, place the rear flange of the end casing panel in the slot of the rear casing support. See Figures 13 and 13a.

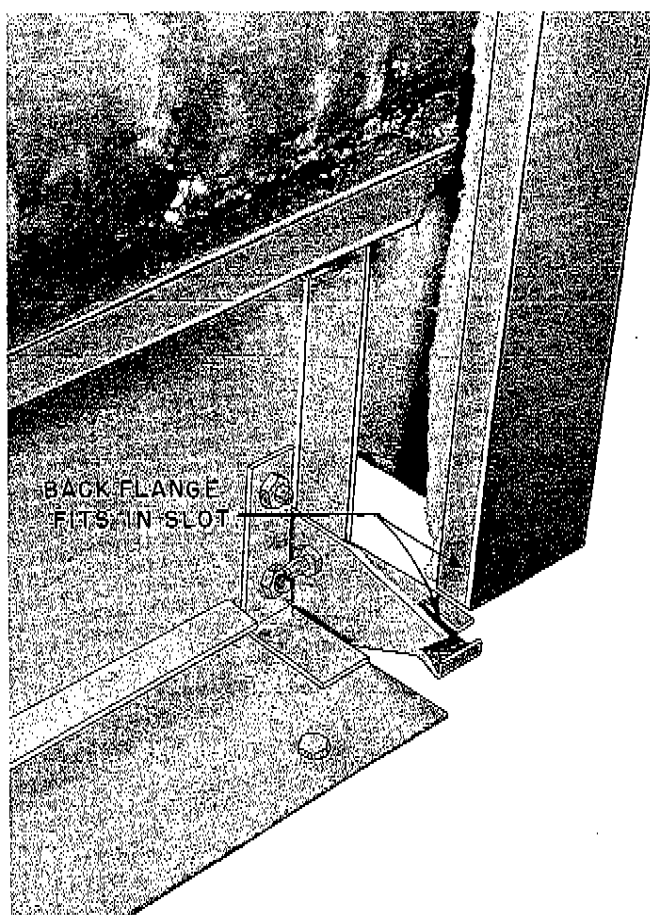


Figure 13 - Install End Casing Panel

Next rotate the panel toward the front of the boiler placing the top flange of the end panel in the retaining clips on the draft diverter. Place screws into the end panel through the holes provided in the flue collector and manifold bracket. See Figures 7 and 14.

Place rating and name plate on end panel.

For steam boilers attach water line plate in its proper location on control end. See Figure 2.

Install a drain cock in lower tapping on each end of boiler; install front casing panels.

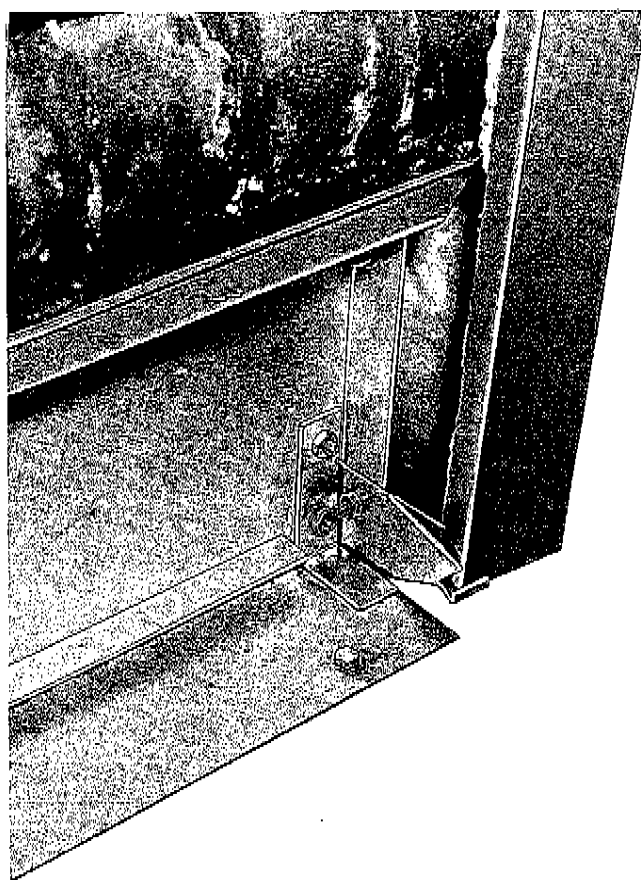


Figure 13a

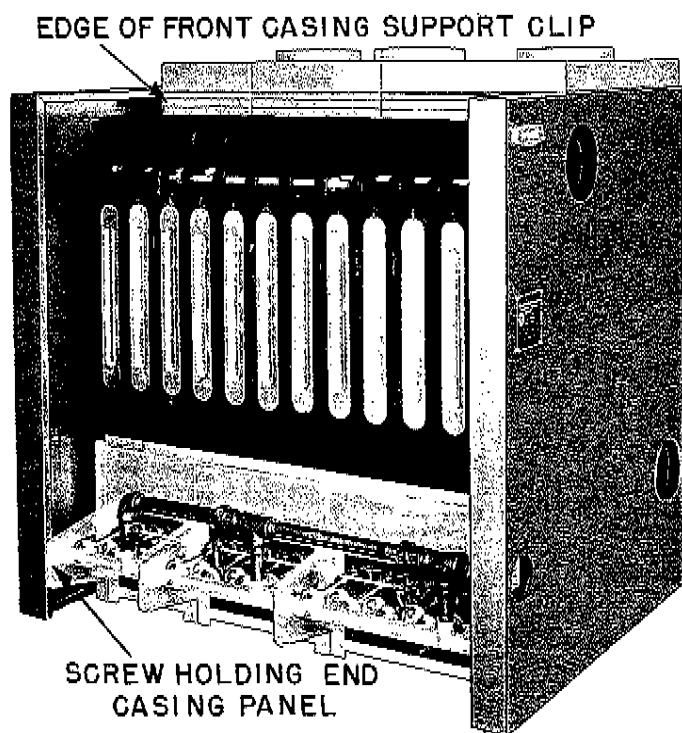


Figure 14 - Complete End Casing

INSTALL GAS CONTROLS AND COMPLETE GAS PIPING

1. The Bryant diaphragm gas control valve is shipped as part of an assembly consisting of the valve, a controller, regulator (when required), and piping. Install a half-union on the outlet nipple of this assembly.
2. Install the other half of the union on the control end of the manifold header and connect the valve assembly to the manifold header.
3. Continue the piping to the main gas supply. Follow all local codes and ordinances and refer to the recommendations given on Page 3 of this instruction manual.
4. Connect the pilot supply tubing between the manual pilot shutoff valve and the various pilots. For all sizes of 23 sections and up on natural and manufactured gases, use 3/8 inch tube. All sizes on propane use 1/4 inch tube.
5. Install the bleed tip to burner venturi just in back of carry-over and tighten clamp securely. This bleed tip will go on the first base if one tip is supplied. If there are two tips furnished (27 and larger) they should be installed on the first and second bases.
6. Run a 1/4 inch tube from the vent in the gas pressure regulator (does not apply to LP controls), to the bleed tip assembly of the pilot that is closest to the regulator for all regulators larger than 1 inch. Do not connect this vent to the escapement on the controller of the diaphragm gas control valve. It must be vented to the pilot tip as indicated.
7. The D6 controls consist of the Minneapolis-Honeywell VS-8187 gas valve and the thermopile pilot. These controls are available only on the 4, 5 and 6 size Boilers.

BOILER TRIM

Figure 15 is a drawing of the end section showing the use of the various tappings. Note the two unmarked holes at left of supply tapping are holes for the pull rods. On sections with 6 inch tapping the pull rod hole closest to the tapping is not present.

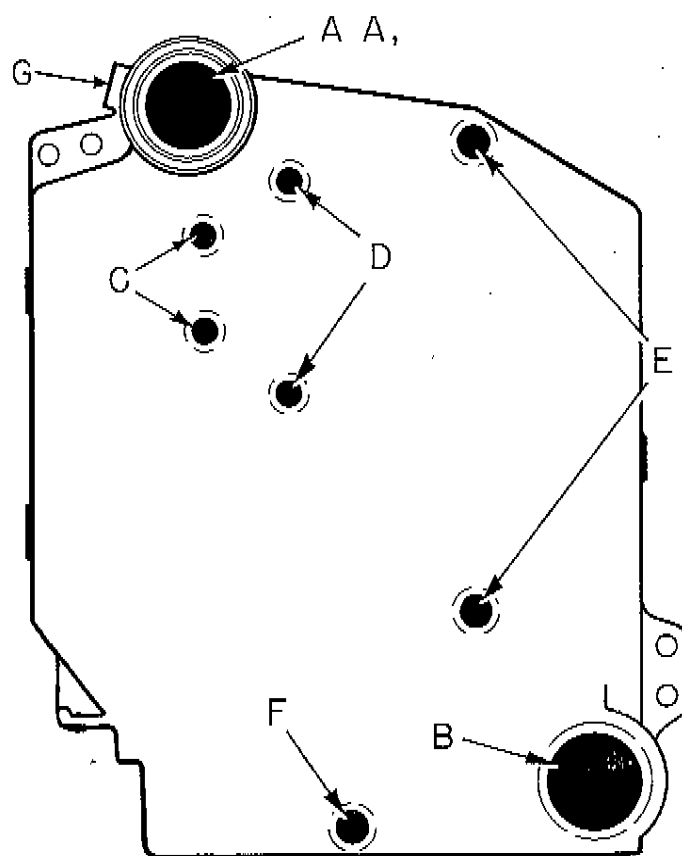


Figure 15

Opening	Size	Steam	Water
A	4"	Supply	Supply
A ₁	6"	Optional Supply (17 to 41 sizes)	
B	4"	Return	Return
C	½"	Tri Cocks *	Plugged
D	½"	L. W. Cut-off and/or Gauge Glass	Plugged
E	1"	Low Water Cut-off & Feeder Combination	Temp.-Alt. Gauge (Top)
F	¾"	Drain	Drain
G	¾"	Plugged	Limit Control

* Tri Cocks not supplied.

INSTALL STEAM TRIM

The steam trim for the boiler consists of the following components:

- Low Water Cut-Off
- Compound Pressure Vacuum Gauge
- High Pressure Limit Control (Pressuretrol)
- Gauge Glass Set
- Siphon
- Pressure Relief Valve

Assemble above components exactly as shown in Figure 16. The necessary loose parts (tubes, nipples, tees, etc.) to make the connections are included in the Steam Trim Package.

The pressure relief valve is to be installed in the boiler supply piping as close to the boiler as possible.

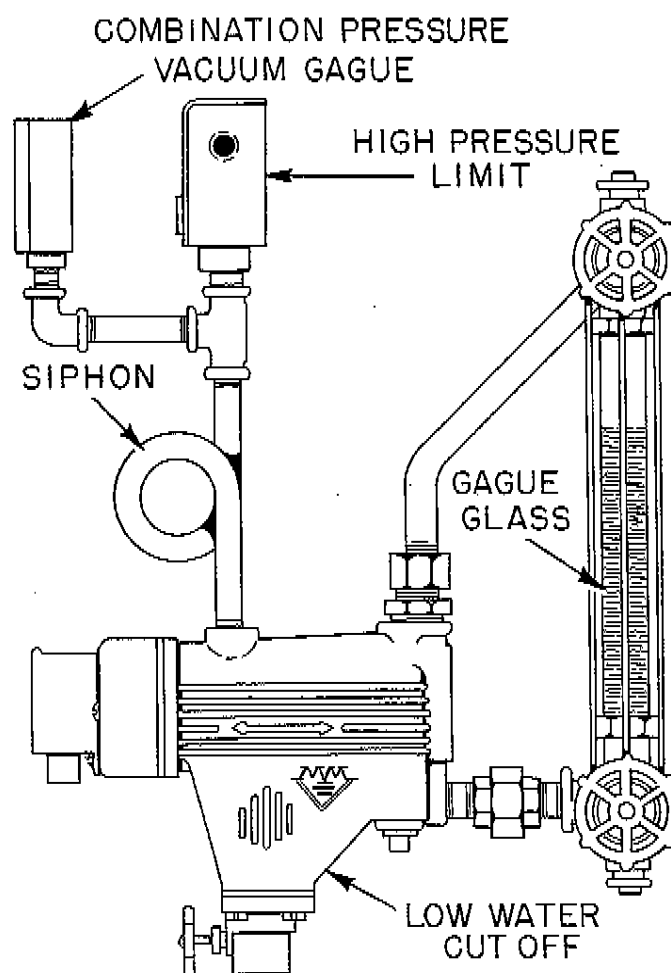


Figure 16

INSTALL WATER TRIM

The water trim for the boiler consists of three components:

- a. Water Temperature Limit Control (Electric)
- b. Temperature-Pressure-Altitude Gauge
- c. Pressure Relief Valve

1. Install temperature-pressure-altitude gauge in tapping indicated in Figure 15. The Red Hand should be set to indicate the height from the gauge to the highest point in the system or to the fill pressure.
2. The pressure relief valve should be installed in the supply piping as close to the boiler as possible.

BOILER WITH REFRIGERATION SYSTEM

VALVES A & B - OPEN FOR HEATING; CLOSE FOR COOLING
VALVES C & D - CLOSE FOR HEATING; OPEN FOR COOLING

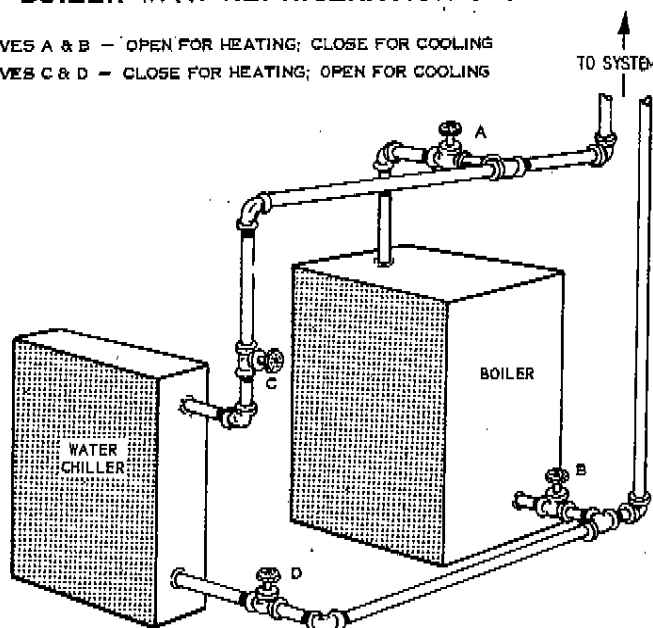


Figure 17 - Refrigerant Diagram

When the boiler is used in connection with a refrigeration system, it must be installed so that the chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating boiler. An example of such piping is shown in Figure 17.

Caution - - - Note: It is recommended that a relief valve be installed between Valve A and the boiler or Valve B and the boiler. This relief valve should preferably be on the boiler itself. The relief valve will protect the boiler from expansion pressures during the cooling season.

INSTALL HEADER AND PIPING

Complete the boiler piping (water/steam lines) paying particular attention to the following recommendations for steam boilers.

1. The return must be piped to both ends of the boiler.
2. The minimum steam header proportions should be as shown in Figure 18.
3. Add skimmer tee as noted.

Never install a shut-off or steam valve between the pressure relief valve and the boiler.

On low pressure boilers, the A.S.M.E. Code requires that a pressure relief valve or valves be installed. The valve(s) discharge capacity in pounds per hour must be at least equal to the output of the boiler. The capacity of the boiler in pounds of steam per hour can be determined by dividing the boiler output in BTU/hr by 1000. For power or process purposes use the following formula:

$$\frac{\text{input}}{1333} \text{ equals pounds steam per hour}$$

FLUE CONNECTION

Consult local codes and gas company requirements. The following is standard practice for installing the flue pipe:

1. Consult dimensional drawing for the number and size of flue pipes required for each size boiler. Also, consult table for size of chimney connection.
2. Maintain a minimum upward slope of 1/4 inch per linear foot from the boiler to the chimney.
3. Run flue pipe as directly as possible. Keep turns to minimum.
4. Do not connect into a chimney serving an open fireplace.
5. Insulate the flue pipe where it passes near combustible material.
6. Rigidly support pipe with hangers and straps.
7. Chimneys should extend at least two feet above any object within a radius of 15 feet. This includes the roof.
8. All flue pipes extend through the roof should be equipped with a hood.

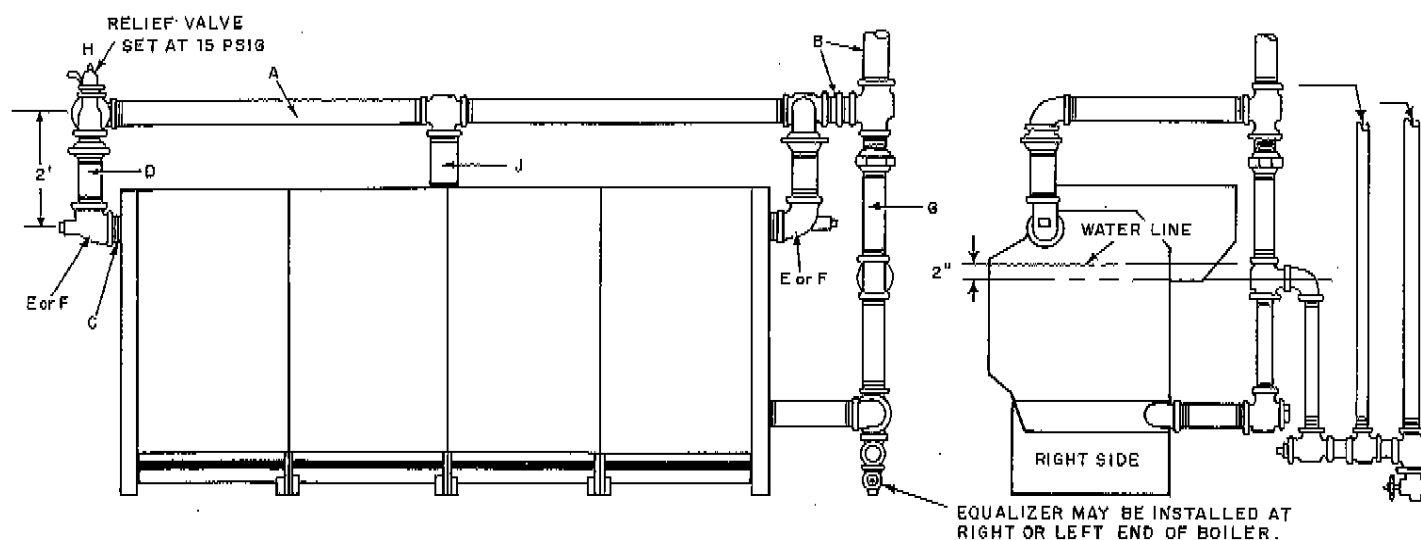


Figure 18 - Steam Header Proportions

Boiler Size	A		B **	C		D		Use One of EACH*				G	H	J
	* Four	Six		Four	Six	E		F						
						Four	Six	Four	Six					
4	4		Size to equal total cross-sectional area of the Distribution Main	4		4		4x4		4x1½x4	6x2x6	4	2	
5	4			4		4		4x4		4x1½x4	6x2x6	4	2	
6	4			4		4		4x4		4x1½x4	6x2x6	4	2	
7	4			4		4		4x4		4x1½x4	6x2x6	4	2	
8	4			4		4		4x4		4x1½x4	6x2x6	4	2	
9	4			4		4		4x4		4x1½x4	6x2x6	4	2	
10	4			4		4		4x4		4x1½x4	6x2x6	4	2	
11	4			4		4		4x4		4x1½x4	6x2x6	4	2	
12	4			4		4		4x4		4x1½x4	6x2x6	4	2	
13	4			4		4		4x4		4x1½x4	6x2x6	4	2	
14	4			4		4		4x4		4x1½x4	6x2x6	4	2	
15	4			4		4		4x4		4x1½x4	6x2x6	4	2	
17	4	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
19	4	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
21	4	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
23	4	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
25	4	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
27	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	
29	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	4" (1)
31	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	4" (1)
33	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	4" (1)
35	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2	4" (1)
37	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2½	4" (1)
39	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2½	4" (1)
41	6	6		4	6	4	6	4x4	4x6	4x1½x4	6x2x6	4	2½	4" (2)

* Refers to Boilers with 4" & 6" tappings.

** Two system risers used on Size 41

* Skimmer Tee should be placed on end of boiler having adequate clearance for access.

ELECTRIC WIRING

All electric wiring should be in accordance with the National Electric Code and any local or gas company requirement which may apply. Wire the controls as shown in Figures 19 through 25. All external wiring must be protected in accordance with local and national codes.

The wiring from the high temperature limit must be fastened to the clips in the end panels. All wiring to the pilots and pilot relay must be taped securely to the manifold header. The wire furnished is a 105C low energy wire with 4/64 insulation.

A NEC class 2 transformer supplied must be used in the control wiring of the Model 245 Boiler.

FINAL INSTRUCTIONS

After the installation is complete, including the connection of all gas and water piping and flue connections, the boiler should be ready for operation and adjustments.

1. Read carefully the following section of "Controls and Adjustments."
2. Then light the boiler in accordance with the Lighting Instruction Plate attached to the boiler.
3. After the boiler is operating, make adjustments as required. Refer to section on "Controls and Adjustments."

See following for description, operation and adjustment of controls.

CONTROLS AND ADJUSTMENTS

Before attempting any control adjustments, make sure that all of the connections have been made and that the boiler is properly filled with water.

On water boilers, in addition to filling, vent all air from the water system, including radiation.

Make sure all valves on the supply and return lines are open.

GAS PRESSURE REGULATOR

This regulator is of the adjustable spring-loaded type. It ensures a constant gas pressure to the burners during main line gas pressure fluctuations. It is adjusted at the factory to deliver an outlet pressure of approximately 3 inches w.c., assuming a range of inlet pressures up to 15 inches w.c. The pressure regulator should be adjusted by the in-

staller as described below.

ADJUSTMENT

While the boiler is in operation, check gas input at the meter. The burners are equipped with fixed orifices sized to produce the rated input shown on the rating plate. If measured and rated input are not approximately the same the gas pressure regulator may be adjusted as follows:

1. To increase input: Turn gas pressure regulator adjusting screw "clockwise".
2. To decrease input: Turn the adjusting screw "counter-clockwise."

The manifold pressure for natural gas should be 3 inches w.c.; for mixed gas 3 inches w.c.; for manufactured 3 inches w.c.

Note: If measured input varies appreciably from rated input after the manifold pressure has been set, it is recommended that the orifices be changed. After changing the orifices again check input and manifold pressure. (LP gas installations have a regulator installed at the supply tank. This regulator should be adjusted to give a manifold pressure of 11 inches w.c.)

BRYANT DIAPHRAGM GAS CONTROL VALVE

This valve operates on the principle of differential pressure on either side of a flexible, weighted diaphragm which divides the main body of the valve into two compartments. The lower compartment is under constant pressure from the gas supply line. The upper compartment is connected by tubing to a Controller attached to the valve. This Controller contains a small, electrically actuated gas valve which permits gas to flow to or from the compartment above the weighted, flexible diaphragm in the flow control valve.

The Controller is connected electrically to the room thermostat or other boiler operating control. When there is a call for heat, the valve in the Controller permits the gas above the diaphragm to bleed off through the escapement. The supply pressure on the bottom then pushes the diaphragm up and gas flows to the main burners. When the operating control is satisfied, the valve in the Controller cuts off the escapement and allows gas pressure to build up on top of the diaphragm. When the pressure above and below the diaphragm is equal, the diaphragm re-

seats and the main gas flow is shut off.

The weight on the diaphragm is carefully sized to ensure that no gas will flow to the burners unless there is sufficient pressure differential.

BRYANT AUTOMATIC PILOT (D4)

The pilot assembly includes a normally open switch wired in series with the Bryant diaphragm gas control valve. The switch is at the free end of the monometal element assembled so that the fixed end is positioned at the pilot flame. Heat applied to the fixed end of the monometal element causes the free end to move. This closes the switch and completes the electrical circuit to the control valve. The circuit will close within one minute. It will remain closed as long as there is normal pilot flame. While closed, the boiler is under the direct automatic control of the room thermostat or other operating control as long as the main gas manual shutoff valve is open. If the pilot flame goes out for any reason, the monometal element will cool and the free end will move back to its original position. This breaks the electric circuit and the Bryant diaphragm gas control valve will close. This shuts off the gas supply to the main burner.

PILOTS WITH THERMOCOUPLE ELEMENT

The D2 and D5 gas controls have pilots equipped with thermocouple elements.

The pilot flame should surround the tip of the thermocouple. It should also extend downward to include 3/8 inch to 1/2 inch of the thermocouple tip. The flame must not come in contact with any other part of the thermocouple.

The thermocouple transforms heat energy from the pilot flame into electrical energy. The current thus generated is sufficient to operate the 100% shut-off valve. The Bryant Diaphragm Gas Control Valve is powered externally from the transformer, and operates independently of the shut-off valve. When there is a pilot flame, the current generated from the thermocouple holds the 100% shut-off valve in the open position and the gas control valve controls the flow of gas. Should the pilot go out, there will be no current generated by the thermocouple and the 100% shut-off valve will close and no gas can flow to the pilots.

If one pilot should go out all other pilots will remain burning. However, the electrical circuit to the main gas valve will be broken and gas cannot flow through the diaphragm valve.

BURNER ADJUSTMENT

Primary Air

Allow boiler to operate at least 15 minutes.

Adjust each burner flame by closing the air shutter until yellow tips appear on the flame. Then open the shutter to allow more primary air until yellow tips appear on the flame. Lock the shutter in this position. Note: shutter is held in place by flat screw.

ELECTRIC WATER TEMPERATURE

High Limit Control

This control is furnished with water boilers, all gases. It will shut off the gas supply to the main burners when the water temperature in the boiler reaches the "cut-out" setting. When the water temperature drops to the "cut-in" temperature, the control allows gas flow to the burners. Cut-out temperature is adjustable from 100 degrees F to 240 degrees F.

Adjustments

Again, consult the installing contractor for setting. Adjust the limit control for desired "cut-out" setting.

GAS CONTROLS AND PIPE CONNECTIONS

When checking gas controls and pipe connections for gas leakage, never use an open flame. Always use a soap and water solution.

FLUE CONNECTIONS

Inspect the flue connection to the chimney each year to make sure it is in good condition and has not become obstructed.

DRAINING BOILERS

Boilers should never be drained unless it is absolutely necessary. The water should remain in the boiler between heating seasons. When it is necessary to add make-up water, trapped air should be removed through the system vents. It has been found desirable under some conditions to keep the pilots lighted during the summer months to reduce surface corrosion.

Frequent addition of water can shorten the life of the boiler. If it is necessary to add water frequently, check the entire system and repair all leaks. If it is

still necessary to add make-up water frequently, be sure the air is removed. The boiler water should be mildly alkaline with a pH of 7 to 8. Consult a local water treatment company for their recommendations.

IMPURITIES IN BOILER WATER

When a boiler is first installed and used for a few days, oil, grease, and sediment from pipe fittings may collect within the boiler. These impurities may cause foaming and an unsteady water line. They may prevent steam generation in a steam boiler and may result in objectionable odors escaping from the vents on water boilers. This condition can be remedied only by giving the boiler a thorough cleaning.

CAUTION

Check the boiler water level. Never risk lighting the pilots or main burners under a dry boiler.

CLEANING STEAM BOILERS

Caution: The boiler should not be left unattended during the clean-out process.

1. Skimming off Impurities

Some of the impurities in the boiler water will float on the water and must be skimmed off. Run a temporary connection from the skimmer tee.

With the boiler empty and cool, slowly begin to add water. After water has entered boiler - never before - turn "on" main gas burners and adjust flame at main manual shut-off valve so that the water being added is kept just below boiling point. Avoid boiling and turbulence.

Gradually raise hot water level to tee being careful not to raise it above the opening in the tee. Skim until there is no trace of impurities. Repeat process if necessary.

Water may be checked to make sure it is free from oil by drawing off a sample at the skimming tee. If the sample is reasonably free from oil, it will not froth when boiled on a stove. This test does not indicate the amount of sediment which may lay in the bottom of the boiler. It is therefore necessary that the boiler be further cleaned by "blowing down".

2. "Blowing Down" Boiler

Before blowing down the boiler, fill it to the water line. Light burners and allow five pounds of steam pressure to build up. Run a temporary connection from one of the drain valves to a nearby sewer. Connect to a drain valve on the opposite end of the boiler from the feed water inlet, if possible. Shut off the gas burners, open drain valve and blow down entire contents of boiler.

Allow boiler to thoroughly cool and slowly refill to water line. Repeat Step 2 as many times as required until blow off water is clear.

3. Using Cleaning Compound

If an exceptional amount of dirt or sludge seems to be present in the boiler, a boiler cleaning compound made by a reputable manufacturer may be used according to the instructions of the manufacturer of the compound. When any type of cleaning compound is used, care must be taken to thoroughly flush all traces of the compound out of the boiler.

Sal Soad (washing soda) is sometimes used for exceptionally dirty boilers but its use requires extreme caution. The boiler can be seriously harmed if the soda is not thoroughly washed out or at least sufficiently so that the water does not exceed the pH value of 7 to 8. Soda is difficult to remove and requires a lengthy process of repeatedly flushing the boiler to assure complete removal.

If soda is insisted upon it is recommended that a solution of one pound dissolved in a pail of hot water be prepared for each ten gallons of boiler water. (Check water capacity of boiler). Pour the solution in any convenient opening at, or above the flow tapping. Fill boiler to flow tapping and adjust fire manually to maintain simmering for five or six hours. Increase fire to build up five pounds pressure and blow down boiler.

Blow down boiler again as in Step 2, then flush continuously until it is certain that boiler is free of the soda. After the boiler has been thoroughly cleaned, add fresh, clear water to the proper level in the heating system. If the degree of acidity or alkalinity of the water must be adjusted, it is recommended that the water be mildly alkaline, not exceeding a pH value of 7 to 8.

BEFORE LIGHTING**All Gases**

1. Make certain that the boiler is properly filled with water.
2. Open all valves in the supply and return mains of heating system.
3. Set the thermostat or operating control below normal setting.
4. Close the manual shut-off valve and the manual pilot valve.

Lighting the Pilots**Natural Gas D4**

1. Open the manual pilot valve and allow time for air to be purged from the line.
2. Light all pilots immediately with a match or taper.

Natural and Manufactured Gases D5

1. Open the manual pilot valve and allow time for air to be purged from the line.
2. Light all pilots immediately with a match or taper.

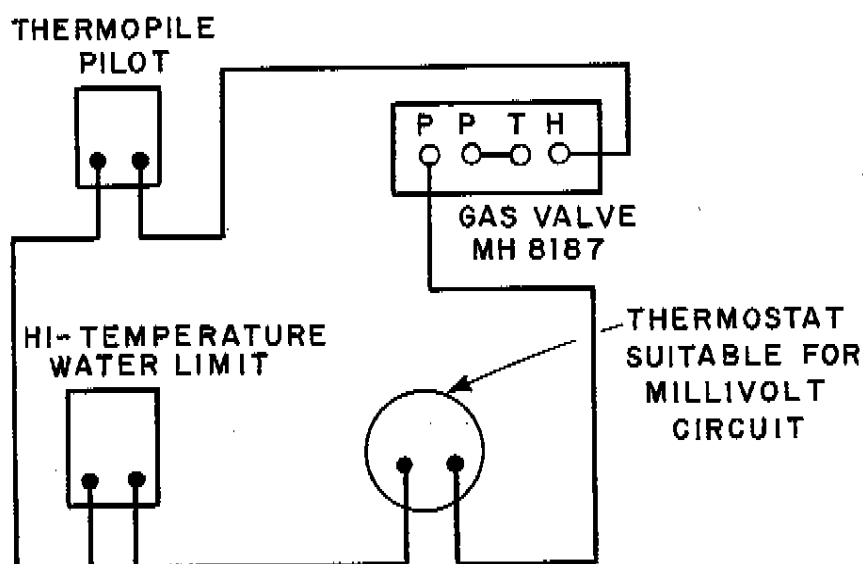
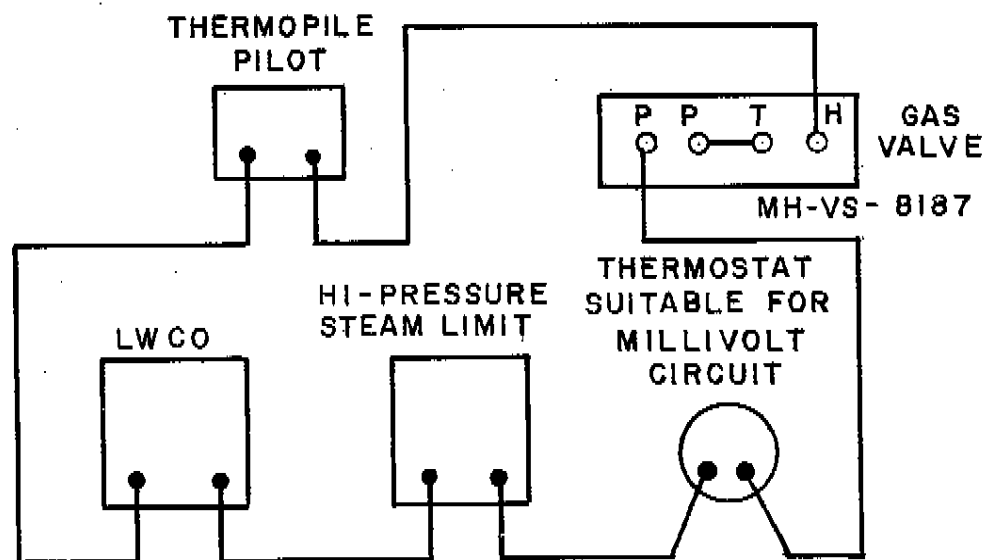
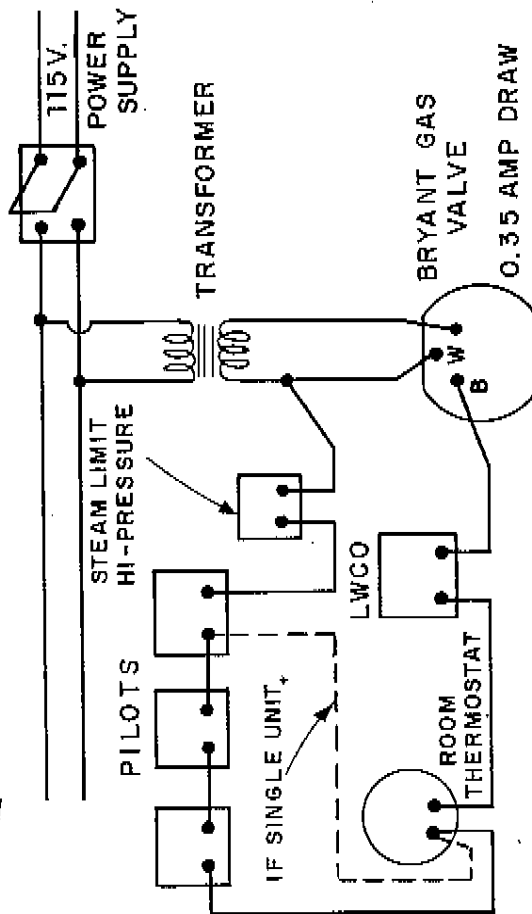


Figure 19

D-6 CONTROLS WATER BOILERS

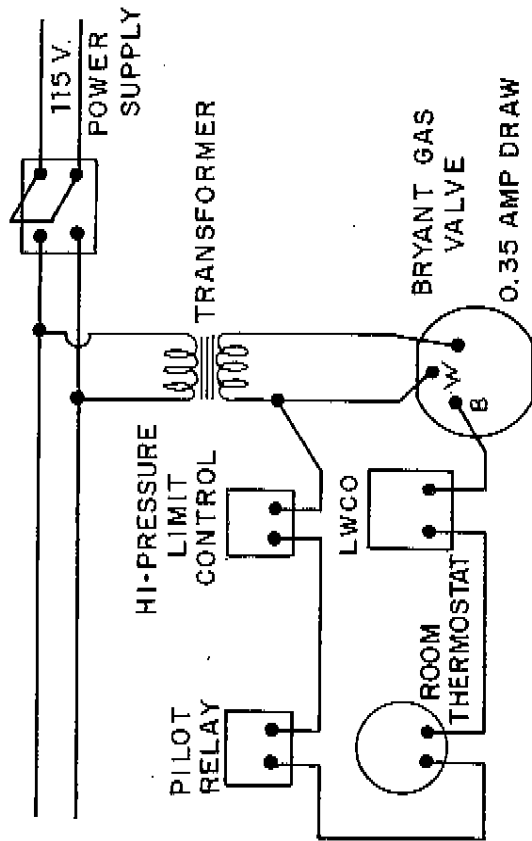
Figure 20

**D-6 CONTROLS STEAM BOILERS
4-5-6 SIZES ONLY**



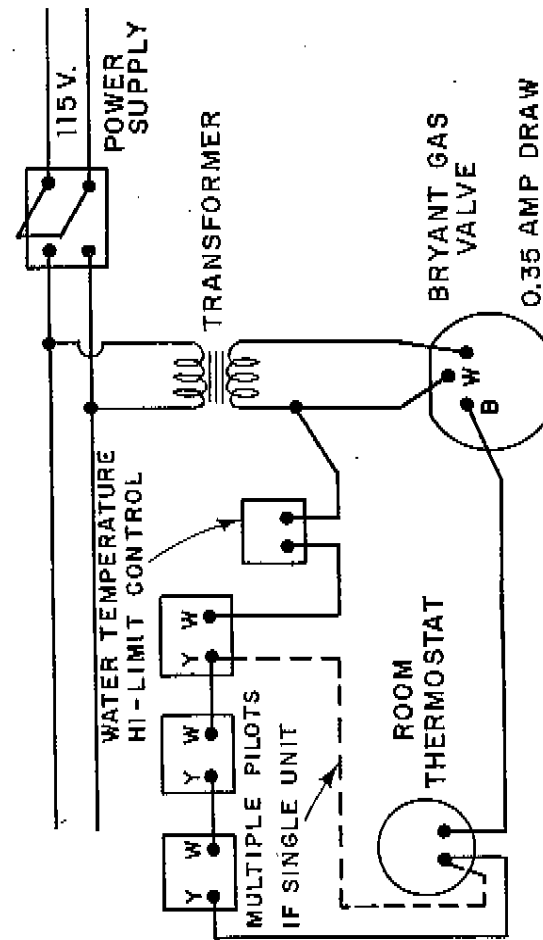
D-4 CONTROLS STEAM BOILERS

Figure 21



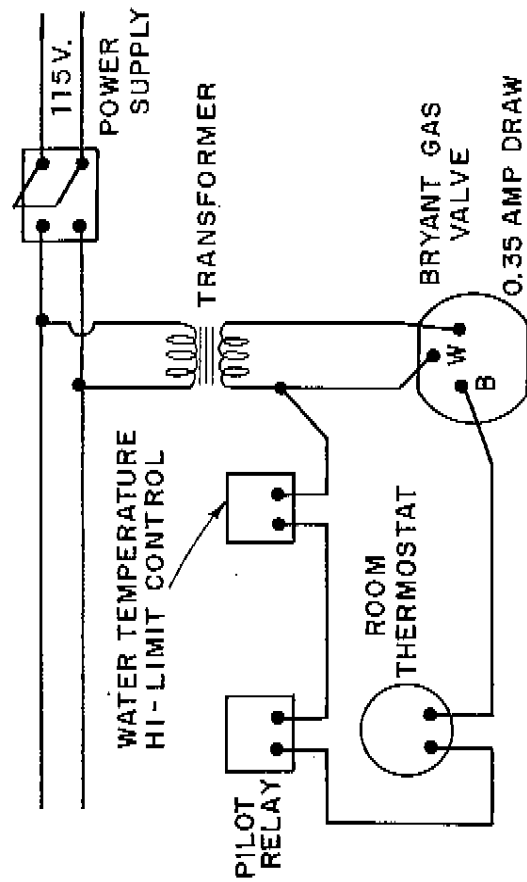
D-2 & D-5 CONTROLS STEAM BOILERS

Figure 23



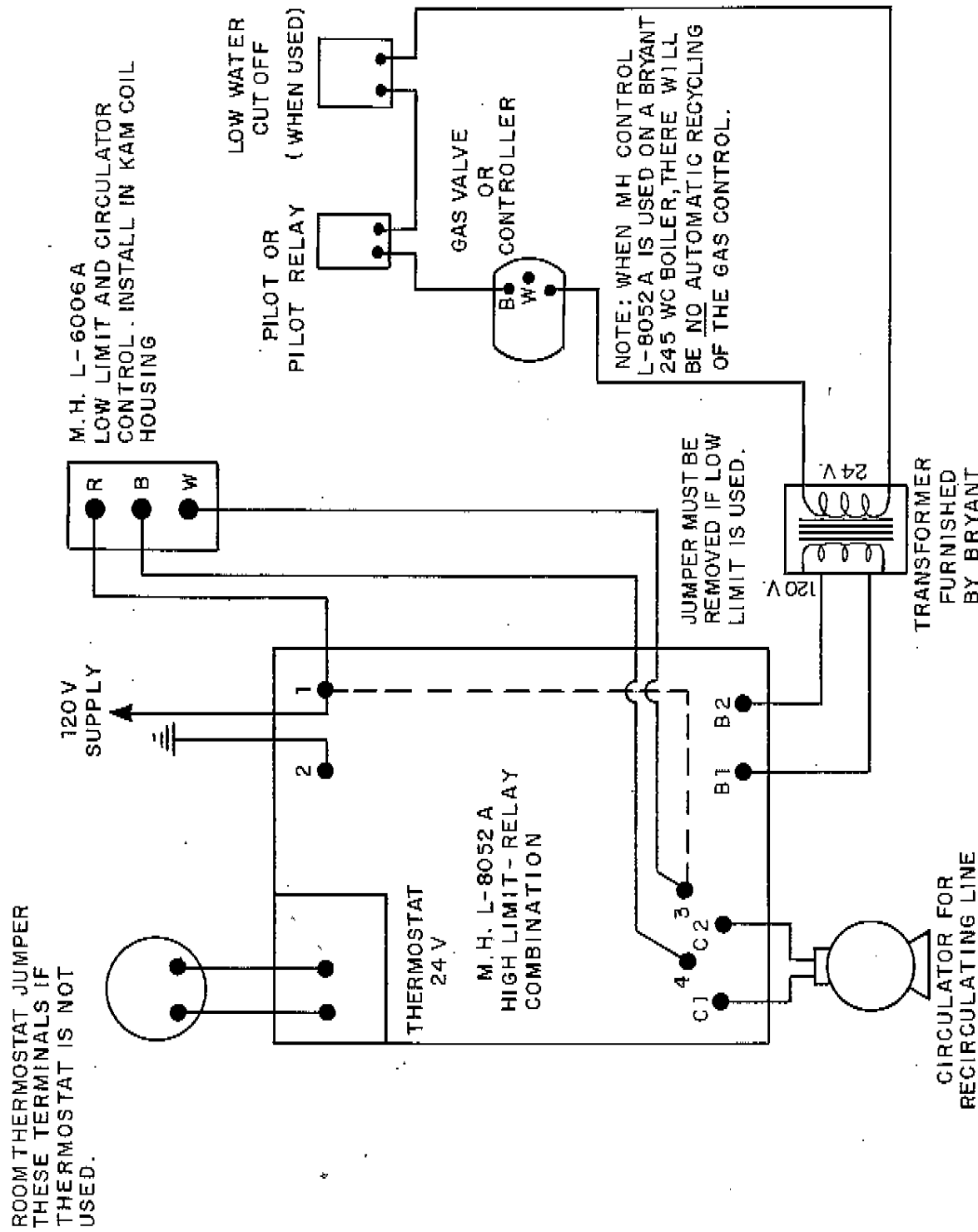
D-4 CONTROLS WATER BOILERS

Figure 22



D-2 & D-5 CONTROLS WATER BOILERS

Figure 24



245 WC BOILER D-2, D-4, D-5, CONTROLS

Figure 25