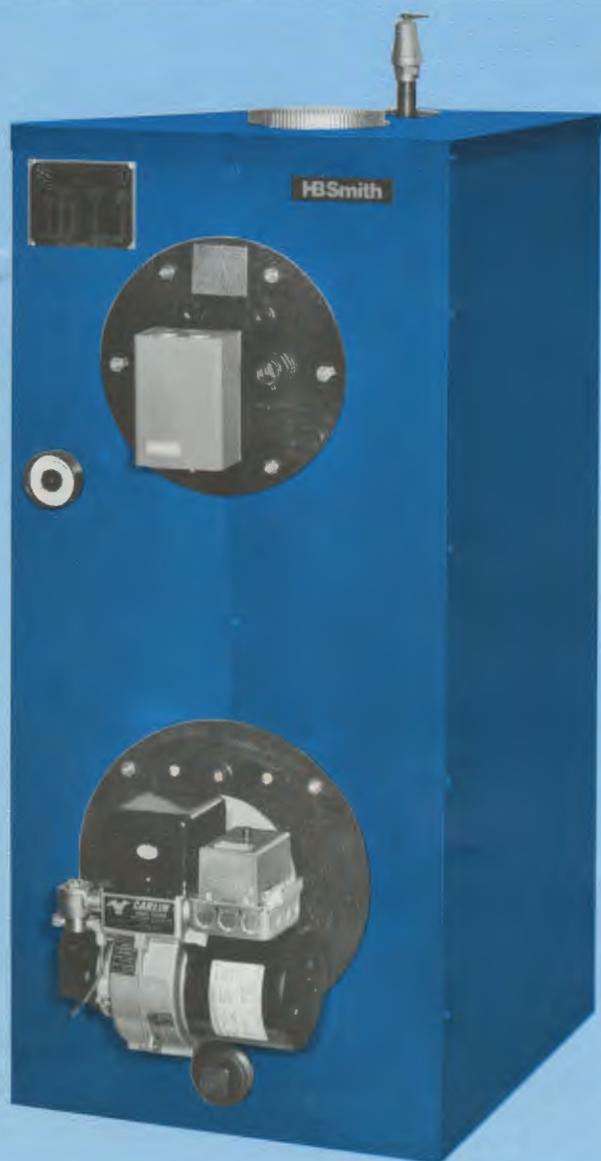


HB Smith

BB14 Boiler/ Burner Unit



**CAST IRON, WET BASE,
BOILER/BURNER
UNIT (LIGHT OIL)**
for all residential installations

- Cast Iron Wet Base Design — for maximum heat transfer
- Flame Retention Head Burner — for increased efficiency
- Assembled Sections — for easy installation
- Wide Flue Passages — for easy cleaning
- Large Water Content — for excellent domestic hot water supply
- Limited 10-Year Warranty — to ensure satisfaction

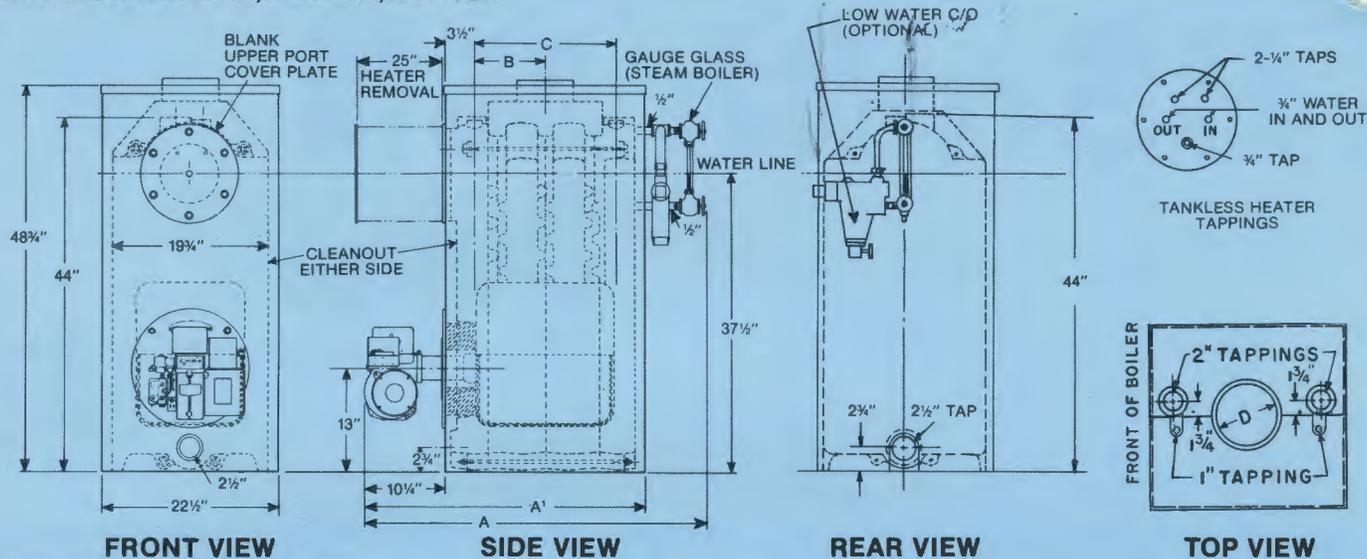
Four sizes and eight ratings from 99 MBH Heating Capacity to 305 MBH Gross Output.

Warming America Since 1853

HB Smith BB14 cast-iron boiler/burner unit



LIGHT OIL RATINGS 99,000 to 305,000 BTUH



RATINGS, FIRING RATES, CHIMNEY SIZES, DIMENSIONS

Boiler No. (Note 1)	O.O.E. Heating Capacity MBH	NET I=B=R RATINGS (Note 2)		I=B=R Burner Capacity GPH (Note 5)	Overall Length		Flue Conn. Location B	Distance Between Tappings C	Diam. Flue Conn. D	Chimney Size (Note 6)	Heating Surface Sq. Ft.	Furnace Volume Cu. Ft.	Water Content Gallons		Combustion Chamber Width x Length	Air Tube Insertion	Air Tube Opening Diam.	
		Steam Sq. Ft. (Note 3)	Water MBH (Note 4)		Steam A	Water A1							Steam	Water				
BB14-Δ-3	99.0	310	74.3	86.1	.85	37 3/4"	30"	6 1/4"	12 1/2"	6"	8" x 8" x 15'	20.69	1.20	20.9	27.2	11"W x 8 1/2"L	4 3/4"	4 3/4"
	126.0	395	94.5	109.6	1.10													
BB14-Δ-4	162.0	505	121.5	140.9	1.40	43 3/4"	36"	9 1/4"	18 1/2"	7"	8" x 8" x 15'	29.33	2.00	26.3	34.7	11"W x 16 1/2"L	4 3/4"	4 3/4"
	186.0	580	139.5	161.7	1.60													
BB14-Δ-5	226.0	705	169.5	196.5	1.95	49 3/4"	42"	12 1/4"	24 1/2"	8"	8" x 12" x 15'	37.97	2.61	31.7	42.2	11"W x 20 1/2"L	4 3/4"	4 3/4"
	246.0	770	184.5	213.9	2.15													
	I=B=R GROSS OUTPUT MBH																	
BB14-Δ-6	275	860	206.3	239.1	2.50	55 3/4"	48"	15 1/4"	30 1/2"	8"	8" x 12" x 15'	46.61	3.03	37.1	49.7	11"W x 20 1/2"L	4 3/4"	4 3/4"
	305	955	228.8	265.2	2.75													

(Note 1) Important Ordering Information.

(Δ) Insert "S" for Steam, "W" for Water.

(Note 2) I=B=R ratings are based on combustion conditions of 12 1/4 percent CO₂, 0.02 W.C. overfire draft, and reasonable boiler maintenance.

(Note 3) The Net I=B=R Steam Ratings shown are based on a piping and pickup allowance of 1.333.

(Note 4) The Net I=B=R Water Ratings shown are based on an allowance of 1.15.

(Note 5) Light oil having heat content of 140,000 BTU/Gal.

(Note 6) Inside dimensions of unlined chimney or nominal clay tile liner to fit within these inside dimensions.

The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc.

STANDARD EQUIPMENT

ALL BOILERS

- Factory assembled cast-iron sections with burner mounting plate and blank heater cover plate installed. (uncrated)
- Carlin 3450 RPM flame retention oil burner with burner mounted cad cell and relay with nozzle.
- Barometric draft control.
- Flue collector, cleanout panels, burner insulating block, combustion chamber, hardware, and sealing materials. (separate carton)
- Flush jacket with fiberglass insulation. (separate carton)
- Thermostat.

STEAM

- High-pressure limit control.
- ASME side-outlet safety valve set at 15 psi.
- Steam pressure gauge.
- Gauge glass and fittings.

WATER

- High-temperature limit control.
- ASME relief valve set at 40 psi.
- Theraltimeter.

Before purchasing this appliance, read important energy cost and efficiency information available from your retailer.

TANKLESS WATER HEATER CAPACITIES

Boiler Number	Continuous Draw GPM* 100F Temp. Rise	Intermittent Draw GPM* 100F Temp. Rise	Inlet/Outlet Tappings N. P. T. Female
BB14-3	1.75	2.75	3/4"
BB14-4	2.80	4.00	3/4"
BB14-5	3.90	4.70	3/4"
BB14-6	5.00	5.35	3/4"

*GPM from 40F to 140F with 200F boiler water temperature. Heater ratings based on highest firing rate each boiler.

HB Smith

CAST IRON BOILERS

Warming America since 1853

WESTFIELD, MASSACHUSETTS 01086



HBSmith BB 14 Oil Boiler



HYDROSTATICALLY TESTED - A.S.M.E. STANDARD
MAXIMUM ALLOWABLE WORKING PRESSURE - STEAM 15 LBS. WATER 40 LBS.

INSTALLATION INSTRUCTIONS

BOILER NUMBER	Heating Capacity MBH	*I-B-R Burner Capacity GPH	**NET I-B-R RATINGS			CHIMNEY SIZE	VALVE Capacity LBS/HR	
			STEAM		WATER			
			SQ.FT.	MBH	MBH			
BBI4-S/W-3	L	99.0	.85	310	74.3	86.1	8" x 8" x 15'	207
	H	126.0	1.10	395	94.5	109.6		
BBI4-S/W-4	L	162.0	1.40	505	121.5	140.9	8" x 8" x 15'	294
	H	186.0	1.60	580	139.5	161.7		
BBI4-S/W-5	L	226.0	1.95	705	169.5	196.5	8" x 12" x 15'	380
	H	246.0	2.15	770	184.5	213.9		
	I-B-R Gross Output							
BBI4-S/W-6	L	275.0	2.50	860	206.3	239.1	8" x 12" x 15'	466
	H	305.0	2.75	955	228.8	265.2		

- * * The net I-B-R Steam Ratings shown are based on a piping and pickup allowance of 1.333.
- * * The net I-B-R Water Ratings shown are based on an allowance of 1.15. The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements such as intermittent system operation, extensive piping systems, etc.

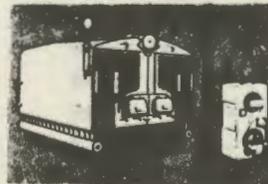
*LIGHT OIL HAVING A HEAT CONTENT OF 140,000 BTU/HR

EXTRACT FROM A.S.M.E. BOILER CONSTRUCTION CODE

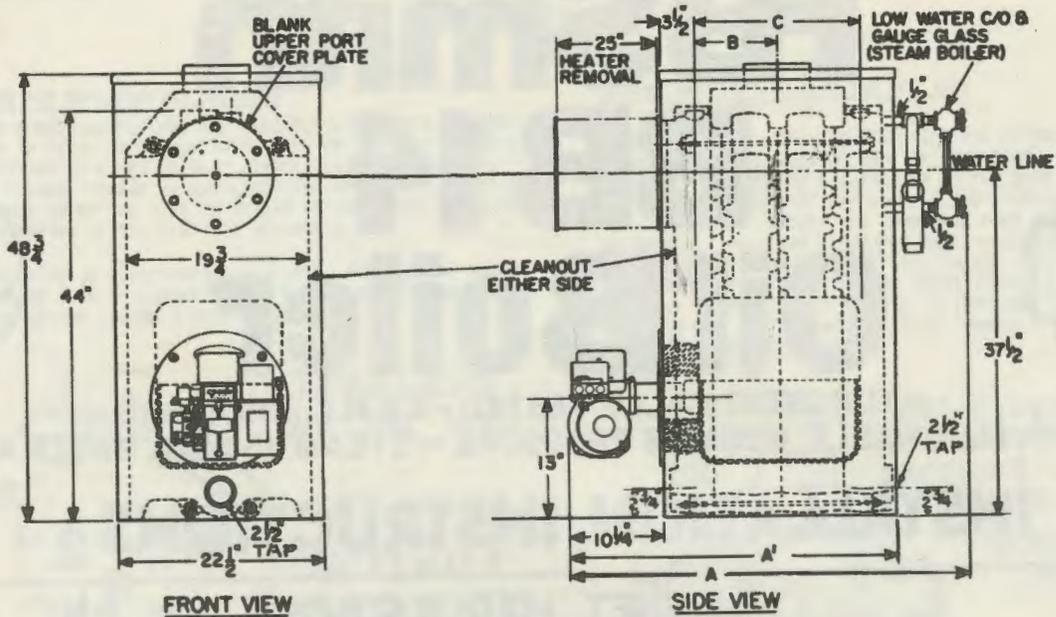
"WHEN FEED OR MAKE-UP WATER IS INTRODUCED FROM A PRESSURE LINE, IT SHALL BE CONNECTED TO THE PIPING SYSTEM AND NOT DIRECTLY TO THE BOILER"

THE DRAW-OFF COCK SHOULD BE CONNECTED TO THE OPPOSITE SIDE OF THE BOILER FROM THE FEED WATER CONNECTION TO ASSIST IN REMOVING SEDIMENT FROM THE BOILER.

THE
HBSmith
COMPANY, INC.
WESTFIELD, MASSACHUSETTS
Established 1863



THESE INSTRUCTIONS TO BE LEFT WITH THE BOILER FOR REFERENCE PURPOSES



NO. OF SECTIONS	STEAM	WATER	B	C
	A	A'		
3	37-3/4	30	6-1/4	12-1/2
4	43-3/4	36	12-1/4	18-1/2
5	49-3/4	42	18-1/4	24-1/2
6	55 3/4	48	24-1/4	30-1/2

PARTS LIST

<u>CATALOGUE NO.</u>	<u>DESCRIPTION</u>	<u>CATALOGUE NO.</u>	<u>DESCRIPTION</u>
3402	Front Section		Combustion Chamber
2884	Intermediate Section		3 sect. 9-5/8" long O.A.
3513	Back Section		4 sect. 17-5/8" long O.A.
2530	7-inch Top Nipple		5 & 6 sect. 20-5/8" long O.A.
2382	3-inch Bottom Nipple		
3200	Burner Mounting Plate		
3383	Sight Opening Cover Plate		
3407	Blank Top Port Cover Plate		
3408	Heater Plate		
B-1648	Top Port Plate Gasket		
	Flue Collector		
	3 sect. = 8-9/16" long w/6" outlet		
	4 sect. = 14-9/16" long w/7" outlet		
	5 sect. = 20-9/16" long w/8" outlet		
	6 sect. = 26-9/16" long w/8" outlet		
	Cleanout Covers w/Insulation		
	3 sect. = 2-11-7/8" wide		
	4 sect. = 2-17-7/8" wide		
	5 sect. = 4-11-7/8" wide		
	6 sect. = 2-11-7/8" wide and 2-17-7/8" wide		
			<u>STEAM TRIM</u>
		3-4-5 Sect. - 3/4" Side Outlet	
		Safety Valve (set at 15 PSI)	
		6 Sect. - 1" Side Outlet	
		Safety Valve (set at 15 PSI)	
		B-2291	Steam Pressure Gauge
		2633	Upper Gauge Cock (1/2")
		2634	Lower Gauge Cock (1/2")
		-	Gauge Glass (5/8" x 8-3/8")
			<u>WATER TRIM</u>
		-	3/4" Relief Valve (set a 40 psi)
		-	2-1/2" Theraltimeter
			<u>MISCELLANEOUS</u>
		-	Burner Plate Insulating Block
		-	3/8" Rope Seal for Burner Plate
		-	3/8" Rope Wicking
		-	1/2" Tie Rods

GENERAL:

THE BB14 BOILER IS A WET-BASE, VERTICAL FLUE TYPE, SECTIONAL CAST IRON BOILER SHIPPED WITH THE SECTIONS FACTORY ASSEMBLED WITH ROPE SEAL BETWEEN SECTIONS AND HYDROSTATICALLY TESTED FOR LEAKS. THE BLOCK OF SECTIONS WILL BE EQUIPPED WITH A BLANK HEATER OPENING COVER PLATE AND WITH THE BURNER MOUNTING PLATE IN PLACE.

THE FLUE COLLECTOR, CLEANOUT COVER PLATES, CERAMIC FIBER COMBUSTION CHAMBER, RATING PLATE AND WARRANTY CARD ARE SHIPPED IN ONE CARTON FOR FIELD ASSEMBLY ON THE BOILER.

STEAM OR WATER TRIM IS PACKED IN SEPARATE CARTONS AS FOLLOWS:

STEAM TRIM

PRESSURE GAUGE: 0-30 PSI WITH SYPHON
 GAUGE GLASS WITH GAUGE COCKS
 A.S.M.E. SIDE OUTLET SAFETY VALVE (SET AT 15 PSI)

WATER TRIM

THERALTIMETER
 A.S.M.E. SIDE OUTLET PRESSURE RELIEF VALVE SET AT 40 PSI

THE INSULATED METAL JACKET IS PACKAGED IN A SEPARATE CARTON MARKED TO IDENTIFY THE BOILER SIZE FOR WHICH IT IS INTENDED.

OTHER PARTS OF EQUIPMENT PACKED SEPARATELY ARE AS FOLLOWS:

1. TANKLESS HEATER AND GASKET.
2. STEAM CONTROL CARTON - PRESSURE LIMIT CONTROL AND SYPHON, 24 VOLT ROOM THERMOSTAT, LOW WATER CUTOFF.
3. WATER CONTROL CARTON - TEMPERATURE LIMIT CONTROL, 24 VOLT ROOM THERMOSTAT.
4. OIL BURNER (TWO SIZES).
 BAROMETRIC DRAFT CONTROL

CODES AND STANDARDS

THE INSTALLATION OF THE BOILER, BURNER, COMBUSTION AIR SUPPLY, CHIMNEY AND CONNECTION, OIL STORAGE TANK AND PIPING, CONTROLS AND WIRING SHALL BE CARRIED OUT SO AS TO CONFORM TO NATIONAL BOARD OF FIRE UNDERWRITERS PAMPHLET NO. 31 AND/OR SUCH OTHER CODES AND REGULATIONS REQUIRED BY THE AUTHORITIES HAVING JURISDICTION OVER THE INSTALLATION OF OIL BURNING EQUIPMENT.

LOCATING THE BOILER

THE BOILER SHOULD BE LOCATED ON A SMOOTH, LEVEL, HARD SURFACE WITH ADEQUATE CLEARANCE FROM COMBUSTIBLE CONSTRUCTION AND WITH SUITABLE ACCESS TO EITHER RIGHT OR LEFT SIDE CLEANOUT COVERS AND TO FRONT FOR BURNER MAINTENANCE AND ADJUSTMENT. THE BOILER SHOULD BE AS CLOSE TO THE CHIMNEY AS POSSIBLE TO ENABLE THE SMOKE CONNECTION TO BE RUN TO THE CHIMNEY AS DIRECTLY AS POSSIBLE WITH THE MINIMUM NUMBER OF ELBOWS OR TURNS.

CHIMNEY AND FLUE PIPE

THE BOILER MUST BE VENTED TO A SUITABLE CHIMNEY. THE CHIMNEY SHALL BE FREE FROM RESTRICTIONS AND LEAKS. THE TOP OF THE CHIMNEY SHOULD EXTEND AT LEAST TWO FEET HIGHER THAN THE RIDGE OF THE ROOF TO PREVENT DOWNDRAFTS. THE BASE OF THE CHIMNEY SHOULD BE PROVIDED WITH A SUITABLE CLEANOUT OPENING AND TIGHT

THE FLUE PIPE SHALL BE THE FULL SIZE OF THE BOILER FLUE OUTLET. RUN THE PIPE TO THE CHIMNEY AS DIRECTLY AS POSSIBLE USING THE MINIMUM NUMBER OF ELBOWS. THE CHIMNEY ENTRANCE CONNECTION SHOULD TERMINATE FLUSH WITH THE INSIDE OF THE CHIMNEY AND SHOULD BE SEALED IN PLACE TO PREVENT MOVEMENT AND LEAKAGE.

THE BAROMETRIC DRAFT CONTROL SHOULD BE INSTALLED IN THE VERTICAL RISE OR THE SIDE OF THE HORIZONTAL RUN OF FLUE PIPE.

COMBUSTION AIR SUPPLY

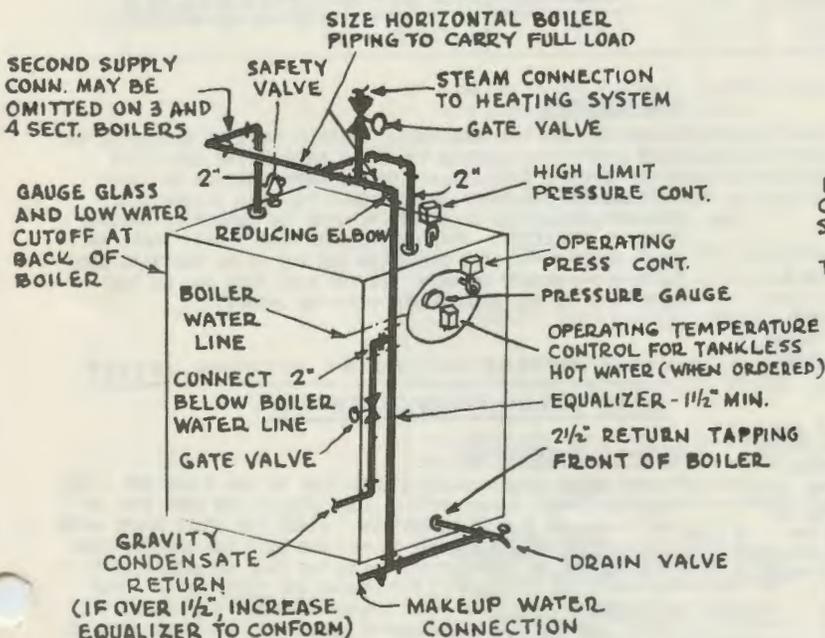
GOOD COMBUSTION REQUIRES AN AMPLE SUPPLY OF AIR. IN NORMAL RESIDENTIAL CONSTRUCTION INFILTRATION THROUGH DOOR AND WINDOW CRACKS MAY BE SUFFICIENT. WHEN EXTRA TIGHT CONSTRUCTION IS ENCOUNTERED, CONSIDERATION SHOULD BE GIVEN TO PROVIDING POSITIVE FRESH AIR INLET THROUGH A FIXED OPENING HAVING FREE AREA EQUAL TO THE CHIMNEY AREA. IF THE BOILER IS LOCATED IN AN INSIDE ROOM, LOUVRES SHOULD BE PROVIDED IN DOORS OR DUCTS SHOULD BE RUN TO ALLOW COMBUSTION AIR TO REACH THE BURNER.

WIRING

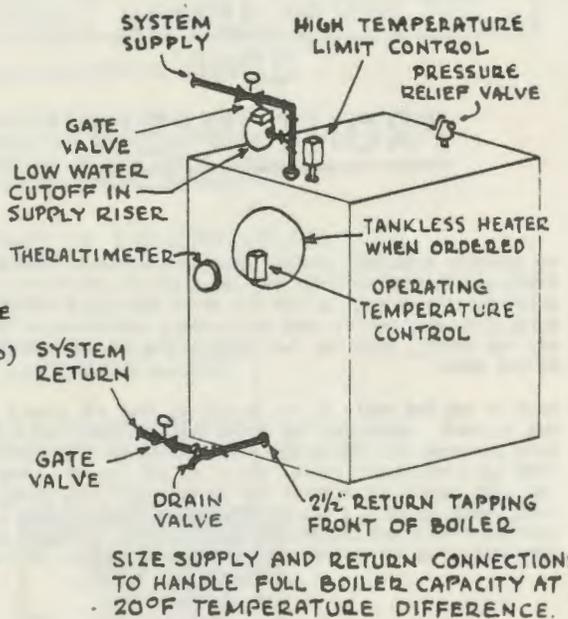
THE WIRING FOR POWER SUPPLY AND CONTROLS SHOULD BE DONE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND THE REQUIREMENTS OF THE LOCAL AUTHORITIES HAVING JURISDICTION. "EMERGENCY" SWITCH AND OTHER INTERLOCKS SHOULD BE PROVIDED AND INSTALLED AS CALLED FOR.

BOILER PIPING CONNECTIONS

TYPICAL BOILER PIPING DIAGRAMS FOR STEAM AND HOT WATER ARE INCLUDED IN THESE INSTRUCTIONS. IF UNUSUAL PIPING REQUIREMENTS ARE ENCOUNTERED, CONSULT YOUR H.B. SMITH REPRESENTATIVE FOR ADDITIONAL PIPING SUGGESTIONS.



TYPICAL STEAM BOILER PIPING

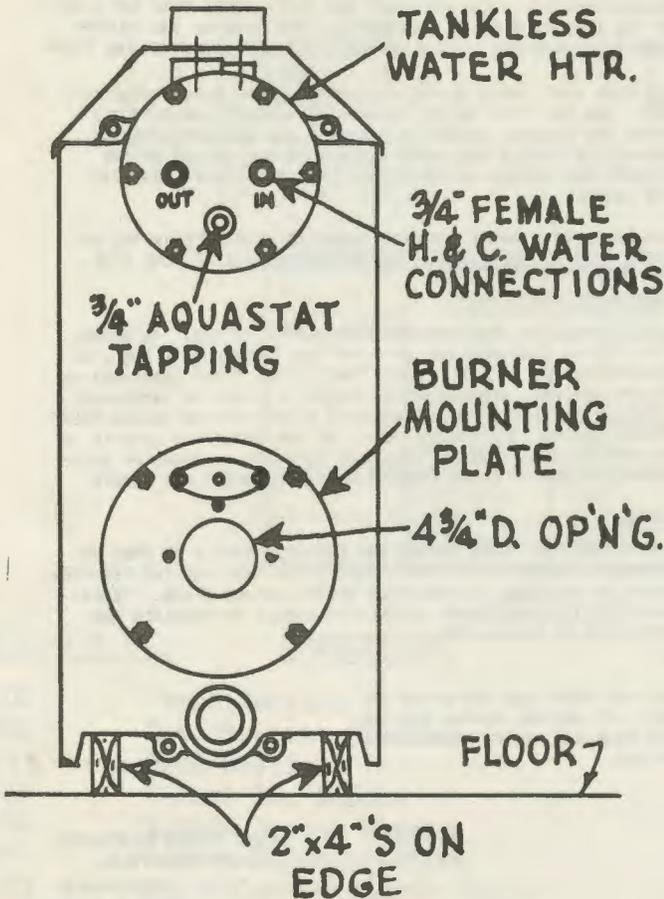


TYPICAL WATER BOILER PIPING

SEPARATING AND REASSEMBLING SECTIONS

THE 5 AND 6 SECTION BOILERS ARE PROVIDED WITH EXTRA LENGTH DRAW RODS TO ALLOW ONE JOINT TO BE MADE UP IN THE FIELD. A KIT CONSISTING OF A SET OF PUSH NIPPLES, NIPPLE COMPOUND, ROPE AND FURNACE CEMENT IS AVAILABLE FOR REASSEMBLING BOILERS IN INSTANCES WHERE THE SIZE OR WEIGHT OF THE BLOCK OF SECTIONS MAKES SEPARATION OF THE SECTIONS DESIRABLE.

WHEN SEPARATING OR REASSEMBLING SECTIONS, SUPPORT THE BOILER ON LENGTHS OF 2" x 4" LUMBER SET ON EDGE UNDER THE BOILER ON BOTH SIDES OF THE BOTTOM NIPPLE AS SHOWN BELOW.



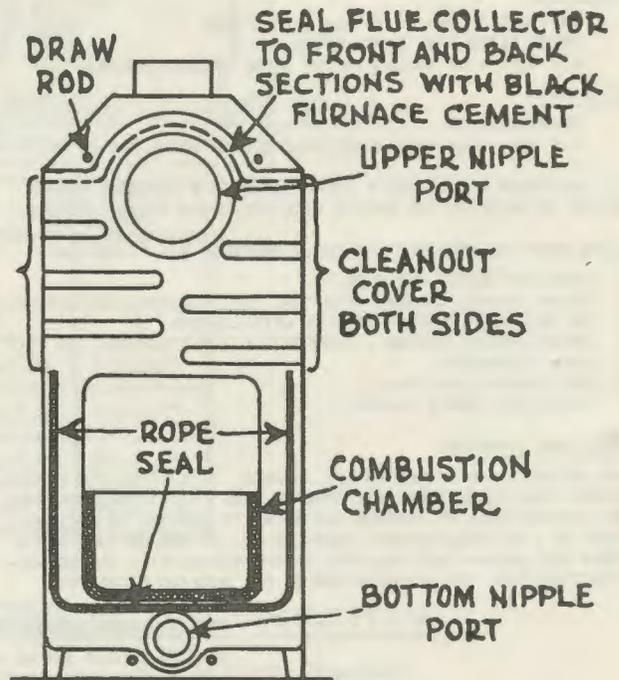
FRONT VIEW

TO SEPARATE A BOILER, REMOVE THE FOUR DRAW RODS. USING A PINCH BAR OR SIMILAR TOOL, PRY THE SECTIONS APART AT A CENTRALLY LOCATED JOINT. REMOVE THE UPPER AND LOWER NIPPLES EXERCISING CARE NOT TO COCK THE NIPPLES SUFFICIENTLY TO DAMAGE THE PORTS. MOVE THE TWO PARTS OF THE BOILER INTO THE BOILER ROOM.

SHIM UP THE TWO PARTS OF THE BOILER SO THAT THE NIPPLE PORTS ARE ALIGNED. CLEAN OUT THE PARTS AND LUBRICATE THE NIPPLES WITH COMPOUND AND INSERT THE UPPER AND LOWER PUSH NIPPLES INTO THE APPROPRIATE PORTS. POSITION THE END OF NIPPLE WITH THE LUGS TOWARD THE REAR OF THE BOILER. SET EACH NIPPLE BY HAND, THEN, USING A BLOCK OF WOOD AND A HAMMER, SEAT THE NIPPLES FIRMLY AND SQUARELY IN THE PORTS SO THAT THEY WILL NOT COCK WHILE THE OTHER PART OF THE BOILER IS MOVED INTO PLACE.

SEPARATING AND REASSEMBLING SECTIONS

PLACE THE LENGTH OF ROPE SEAL OVER THE BOTTOM NIPPLE SO THAT THERE IS EQUAL LENGTH OF ROPE ON BOTH SIDES. SLIDE THE FRONT PART OF THE BLOCK OF SECTIONS UP TO THE BACK PART. SHIM UP THE TWO PARTS SO THAT THE NIPPLES AND NIPPLE PORTS ARE PROPERLY ALIGNED. INSERT THE FOUR DRAW RODS AND DRAW THE BOILER UP EVENLY. WHEN THE EXTERIOR JOINT IS CLOSED DOWN TO ABOUT 1/4 INCH, POSITION THE ROPE SEAL IN THE GROOVE SO THAT IT WILL BE COMPRESSED IN PLACE AS THE JOINT IS DRAWN UP TIGHTLY. CONTINUE DRAWING UP UNTIL IRON TO IRON CONTACT IS OBSERVED AT BOTH TOP AND BOTTOM PORTS. APPLY FURNACE CEMENT OVER THE JOINT TO COMPLETE THE SEAL.



GENERAL ARRANGEMENT

FLUE COLLECTOR

REMOVE THE TWO TOP DRAW RODS. INSTALL THE FLUE COLLECTOR IN PLACE. NOTE THE SLOT IN THE FRONT FACE OF THE COLLECTOR WHICH MUST FIT OVER THE KEY ON THE FRONT SECTION TO INSURE LOCATING THE COLLECTOR BAFFLES OVER THE BACK BOILER FLUE. WHEN THE COLLECTOR IS SEATED, REPLACE THE DRAW RODS THROUGH THE FLUE COLLECTOR. TAKE UP THE NUTS HAND TIGHT. SEAL THE JOINT BETWEEN THE FLUE COLLECTOR AND THE FRONT AND BACK SECTIONS WITH FURNACE CEMENT. CUT THE DRAW RODS OFF SO THAT THERE WILL BE NO INTERFERENCE WITH THE JACKET.

SEAL ENTIRE BOILER AT SECTION JOINTS WITH BLACK FURNACE CEMENT.

CLEANOUT COVER PLATES

THERE IS ONE COVER PLATE ON EACH SIDE OF THE 3 AND THE 4 SECTION BOILERS. THERE ARE TWO COVER PLATES FOR EACH SIDE OF THE 5 AND THE 6 SECTION BOILERS. PLACE THE COVER PLATE WITH THE INSULATION AGAINST THE BOILER AND WITH THE SLOTTED EDGE UP. INSERT THE COVER PLATE UNDER THE FLUE COLLECTOR WITH THE SLOTS IN POSITION TO FIT AROUND THE SKIRT OF THE FLUE COLLECTOR. SLIDE THE PLATE UPWARD TO A DEPTH OF ABOUT 1/2 INCH. USE THE 1/4" x 1" SQUARE HEAD BOLTS AND WING NUTS TO FASTEN THE PLATES AT THE BOTTOM. SEAL THE JOINTS WITH FURNACE CEMENT.

BURNER & CONTROL INSTRUCTIONS

HBSmith

BB-14 BOILER BURNER

W/CARLIN IO0CRD & IOICRD BURNERS

READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLING
CONTROLS OR BURNER. THEY WILL SAVE TIME AND RE-
SULT IN MORE EFFICIENT BURNER OPERATION.

THESE INSTRUCTIONS TO BE LEFT WITH THE BOILER FOR
REFERENCE PURPOSES

HBSmith

CAST IRON BOILERS

Warming America since 1853

WESTFIELD, MASSACHUSETTS 01086

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1. GENERAL

THE H. B. SMITH BB-14 BOILER BURNER UNIT IS SUPPLIED WITH CARLIN 100CRD OR 101CRD OIL BURNERS. BURNERS SUPPLIED BY H. B. SMITH CO. HAVE BEEN LABORATORY TESTED TO DETERMINE OPTIMUM OIL NOZZLE SELECTION AND BURNER ADJUSTMENT. USE OF SPECIFICATIONS LISTED IN THESE INSTRUCTIONS WILL SAVE TIME IN BURNER ADJUSTMENT AND RESULT IN MORE EFFICIENT BURNER OPERATION FOR THE CUSTOMER.

2. CONFORMANCE TO CODES AND REGULATIONS

ALL LOCAL CODES AND REGULATIONS MUST BE ADHERED TO FOR CORRECT EQUIPMENT INSTALLATION, PROPER CLEARANCE FROM COMBUSTIBLES, PIPING, COMBUSTION AND VENTILATION AIR SUPPLY AND ELECTRICAL WIRING. IN THE ABSENCE OF THESE CODES THE MINIMUM REQUIREMENTS OF ACCEPTED NATIONAL CODES MUST BE MET.

INSTALLATION OF OIL BURNING EQUIPMENT -
NFPA 31-1978

NATIONAL ELECTRIC CODE NFPA 70-1981

A.S.M.E. BOILER AND PRESSURE VESSEL CODE,
SECTION IV-1983

A.S.M.E. CONTROLS AND SAFETY DEVICES,
CSD-1, 1983.

3. ELECTRIC POWER AND WIRING

SINGLE PHASE, 110-120 VAC, 60 CYCLE POWER IS REQUIRED FOR THE BURNER AND CONTROLS. A SEPARATE CIRCUIT SHOULD BE PROVIDED FOR THE BURNER, CIRCULATOR AND CONTROLS. THE UNGROUNDED LEG OF THE POWER SUPPLY MUST INCLUDE A 20 AMP. CIRCUIT BREAKER OR FUSE. APPROPRIATE "EMERGENCY SHUT-OFF SWITCHES" MUST BE INSTALLED IN SERIES WITH ALL LIMIT CONTROLS IN THE UNGROUNDED POWER SUPPLY LEG. THIS INTERRUPTS POWER TO THE BURNER WHEN AN UNSAFE CONDITION OCCURS.

THERMOSTAT WIRING (24 VOLT) SHOULD BE INSTALLED TO AVOID CONTACT WITH SHARP OBJECTS SINCE MOST CODES DO NOT REQUIRE THIS TO BE INSTALLED IN METAL CONDUIT.

ALL ELECTRICAL CONDUCTORS MUST BE PROPERLY SIZED.

4. BOILER CONTROLS

ALL BOILER CONTROLS SHOULD BE INSTALLED AND WIRED ACCORDING TO THEIR INSTRUCTIONS AND THOSE INCLUDED IN THE BOX OF EACH CON-

TROL. CONTROLS SHOULD BE LOCATED TO MINIMIZE DAMAGE AND GROUNDING DUE TO ACCIDENTAL LEAKAGE, FLOODING OR CONTACT WITH MOVING EQUIPMENT OR OBJECTS.

5. COMBUSTION AND VENTILATION AIR

THE BOILER ROOM MUST HAVE SUFFICIENT AIR INFILTRATION TO PROVIDE AIR FOR COMBUSTION. VENTILATION AIR REQUIREMENTS ARE CALCULATED IN ADDITION TO THAT NEEDED FOR COMBUSTION. IF CONSTRUCTION IS EXTREMELY TIGHT THEN MAKEUP AIR OPENINGS MUST BE PROVIDED. OPENING SIZES MUST BE DETERMINED FROM LOCAL CODE REQUIREMENTS OR NFPA 31-1978 INSTALLATION OF OIL BURNING EQUIPMENT.

6. CHIMNEY AND BREECHING

BREECHING SHOULD HAVE AS FEW ELBOWS AND BE AS SHORT AS POSSIBLE. IT SHOULD BE PITCHED UPWARD 1/4"/FT.. THE BAROMETRIC DAMPER SUPPLIED SHOULD BE PROPERLY INSTALLED. SEE BOILER INSTALLATION INSTRUCTIONS. IF THE CHIMNEY IS INADEQUATELY SIZED, POOR BURNER OPERATION WILL RESULT FROM INADEQUATE DRAFT. REFER TO BOILER INSTALLATION INSTRUCTIONS FOR CHIMNEY SIZING.

7. OIL TANKS AND PIPING

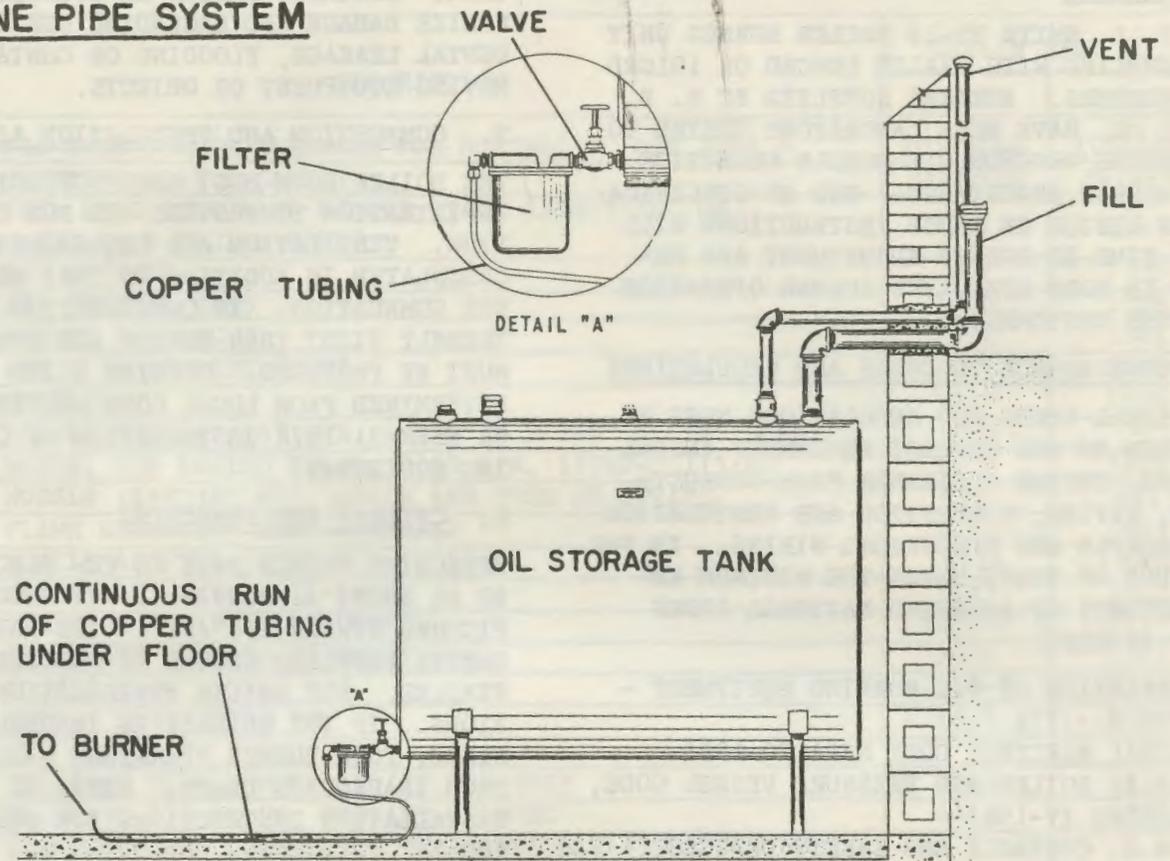
TANK AND PIPING INSTALLATION MUST CONFORM TO ALL LOCAL CODES. IN THE ABSENCE OF OTHER CODES, NFPA 31-1978, INSTALLATION OF OIL BURNING EQUIPMENT, SHOULD BE FOLLOWED.

OIL TANKS MAY BE INSTALLED EITHER INDOORS OR OUTDOORS. CODES LIMIT THE SIZE AND NUMBER OF TANKS INSTALLED INDOORS. FIGURES NO. 1 AND 2 SHOW THE GENERAL ARRANGEMENT OF TANKS INSTALLED INDOORS AND OUTDOORS. LOCAL CODES OR NFPA 31-1978, INSTALLATION OF OIL BURNING EQUIPMENT, MUST BE ADHERED TO FOR MINIMUM PIPE SIZES, VENT AND FILL PIPE REQUIREMENTS, PIPE MATERIALS AND VALVE, FILTER AND GAUGE REQUIREMENTS.

FOLLOWING THESE INSTALLATION RECOMMENDATIONS WILL PROVIDE TROUBLE FREE OPERATION AND MINIMIZE SERVICE CALL BACKS.

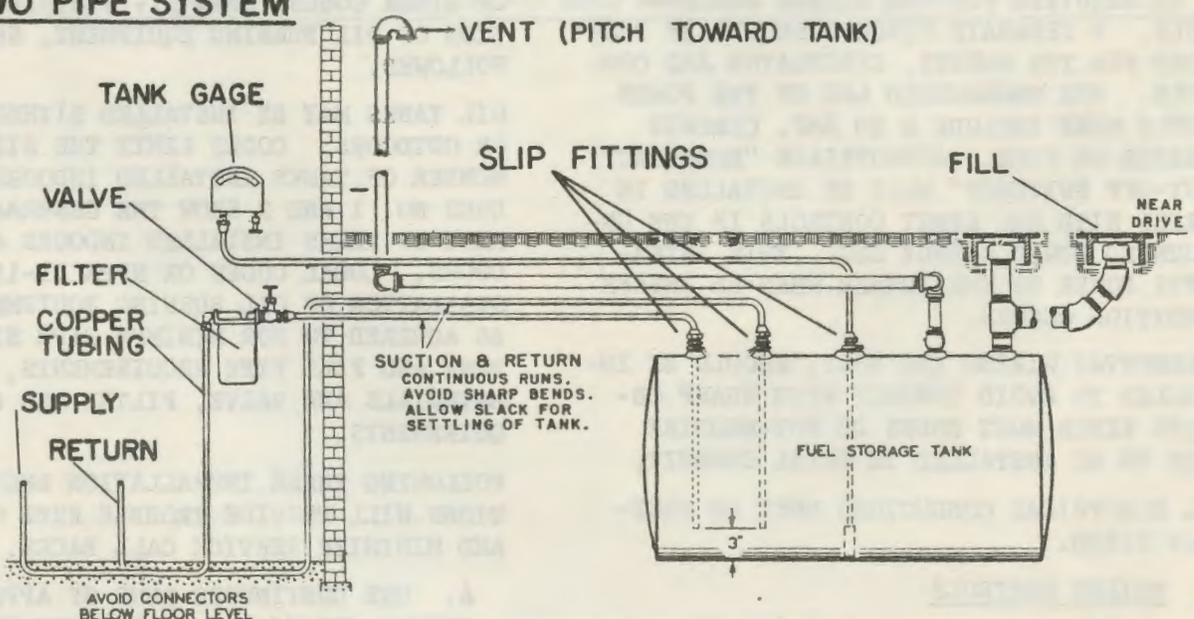
A. USE CONTINUOUS RUNS OF APPROVED COPPER TUBING AND DO NOT USE TUBING SMALLER THAN 3/8" OR IRON PIPE.

ONE PIPE SYSTEM



INSTALLATION OF OIL TANKS INDOORS
FIGURE 1

TWO PIPE SYSTEM



INSTALLATION OF BURIED OIL TANKS
FIGURE 2

B. USE FLARE FITTINGS ONLY. COMPRES-
SION FITTINGS LEAK WHEN FLEXED.

C. TRENCH ALL PIPING RUNS ACROSS
FLOORS.

D. ALLOW PLENTY OF SLACK AT THE TANK
AND BURNER ENDS OF COPPER TUBING. MAKE
LOOPS IN EACH END BY WRAPPING AROUND A
COFFEE CAN OR SIMILAR ROUND OBJECT.
LOOPS SIMPLIFY SERVICING AND MINIMIZE
TUBING FATIGUE.

E. AVOID UNNECESSARY UNDERGROUND FIT-
TINGS ON BURIED PIPING.

F. USE TANK SLIP FITTINGS FOR UNDER-
GROUND TANKS.

G. PROVIDE SLACK AND PROPER SWING
JOINTS TO ALLOW FOR SETTLING OF UNDER-
GROUND TANKS.

H. INSULATE OIL LINES ON OUTDOOR ABOVE
GROUND TANK INSTALLATIONS.

I. MAKE SURE ALL OIL LINE CONNECTIONS
ARE FREE FROM LEAKS. VALVE PACKINGS
AND FILTER COVERS MUST BE SEALED. LEAKS
IN SUCTION LINES ALLOW AIR TO ENTER THE
SYSTEM.

CONSIDERATION SHOULD BE GIVEN TO IN-
STALLATION OF AN ANTISYPHON VALVE AT THE
BURNER, TANK OR HIGH POINT OF THE SYSTEM.
THIS PREVENTS THE OIL TANK FROM DRAINING
IN THE EVENT OF A LINE RUPTURING ON GRA-
VITY FEED INSTALLATIONS.

8. PIPING SYSTEMS

ONE-PIPE SYSTEM - TANKS LOCATED INDOORS
WITH BURNER AT OR BELOW THE TOP OF THE
TANK OR OUTDOOR ABOVE GROUND TANKS LO-
CATED ABOVE THE BURNER MAY USE ONE-PIPE
SYSTEMS. THIS SYSTEM CONSISTS OF A SING-
LE PIPE FROM THE TANK OUTLET TO FUEL UNIT
INLET. A VERTICAL LIFT OF 8 FEET CANNOT
BE EXCEEDED WITH THIS SYSTEM. SEE FIGURE
NO. 1.

CAUTION

DO NOT EXCEED MAXIMUM ALLOWABLE PIPE
LENGTHS SHOWN ON TABLE 1.

TWO-PIPE SYSTEM - UNDERGROUND TANKS RE-
QUIRE A TWO-PIPE SYSTEM. ONE PIPE CON-
NECTS THE TANK OUTLET TO FUEL UNIT IN-
LET AND ANOTHER THE FUEL UNIT RETURN TO
THE TANK. THIS SYSTEM INCREASES THE OIL

FLOW THROUGH THE SUCTION LINE PURGING
AIR FROM SYSTEM. OIL FLOW ABOVE NOZZLE
CAPACITY RETURNS TO THE TANK. RETURN
LINE MAY BE ONE SIZE SMALLER THAN SUPPLY
BUT NOT SMALLER THAN 3/8".

IMPORTANT

MAKE SURE THE FUEL PUMP IS ARRANGED FOR
THE PIPING SYSTEM USED. REFER TO SEC-
TION 13, FUEL UNITS.

A MAXIMUM VERTICAL LIFT OF 12 FEET IS
RECOMMENDED. ALTHOUGH FUEL UNITS ARE
CAPABLE OF PUMPING FROM GREATER HEIGHTS,
VOLATILE COMPONENTS OF FUEL OIL CAN
CAUSE GAS POCKETS IN FUEL LINES RESULT-
ING IN PUMP CAVITATION, EVENTUAL PUMP
DAMAGE AND POOR BURNER PERFORMANCE. THIS
PHENOMENA VARIES WITH LOTS OF FUEL OIL.

TWO-PIPE SYSTEMS WITH HIGH VERTICAL LIFT
MAY REQUIRE A TWO-STAGE PUMP. THESE ARE
AVAILABLE ON SPECIAL ORDER. CONSULT H.
B. SMITH FOR ASSISTANCE WHERE UNUSUAL
PIPING REQUIREMENTS EXIST.

IMPORTANT

FOR ALL INSTALLATIONS, PUMP SUCTION PRES-
SURE SHOULD NOT EXCEED - 15 IN. MERCURY
(HG) (-7.5 PSIG).

OIL PIPING
TABLE 1

LIFT (FEET)	LENGTH OF TUBING * (FEET)	
	3/8" OD	1/2" OD
0	53	100
1	49	100
2	45	100
3	41	100
4	37	100
5	33	100
6	29	100
7	25	99
8	21	83
9	17	68
10	13	52

* INCLUDES BOTH VERTICAL AND
HORIZONTAL LENGTHS

9. FUEL FILTERS

AN APPROVED FUEL FILTER SHOULD BE IN-
STALLED AT THE TANK OUTLET. IT SHOULD
HAVE A MINIMUM CAPACITY OF 7 GPM.

10. BURNER INSTALLATION

INSPECT IGNITION ELECTRODE SPACING AND RETENTION RING ALIGNMENT BEFORE INSTALLING BURNER. INSTALL PROPER NOZZLE. REFER TO SECTION 15, BURNER ADJUSTMENT. ADJUST IF NECESSARY.

WARNING

THE BURNER INSULATING BLOCK MAY NEED TRIMMING FOR THE BURNER TO BE PROPERLY INSTALLED. THIS MAY BE DONE WITH A HACKSAW BLADE.

MOUNT BURNER AND GASKET OVER STUDS ON THE BURNER MOUNTING PLATE. ASSEMBLE AND TIGHTEN BURNER MOUNTING HARDWARE.

11. CONTROL INSTALLATION

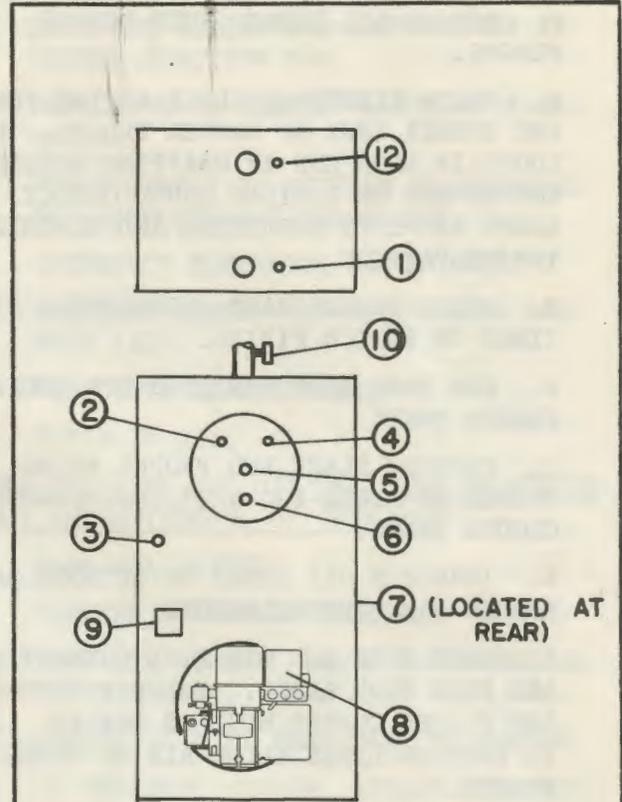
MOUNT CONTROLS AS SHOWN IN FIGURE NO. 3.

IMPORTANT

ALL ELECTRICAL CONDUCTORS EXCEPT 24 VOLT THERMOSTAT WIRE MUST BE IN FLEXIBLE METAL CONDUIT.

WIRE CONTROLS TO DIAGRAMS IN FIGURES NO. 4 OR 5.

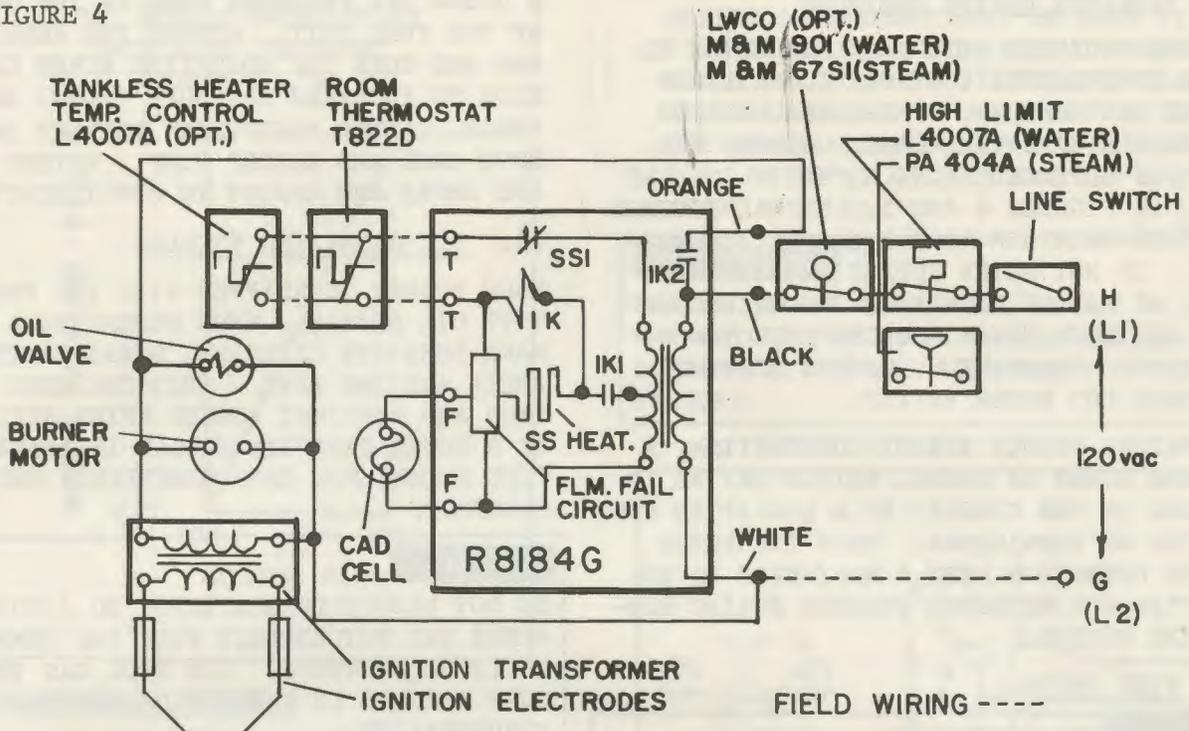
LOCATE THERMOSTAT ON A WALL AWAY FROM WINDOWS, DOOR OR HEAT SOURCES. THIS WILL PROVIDE THE MOST UNIFORM HEATING.



CONTROL LOCATION
FIGURE 3

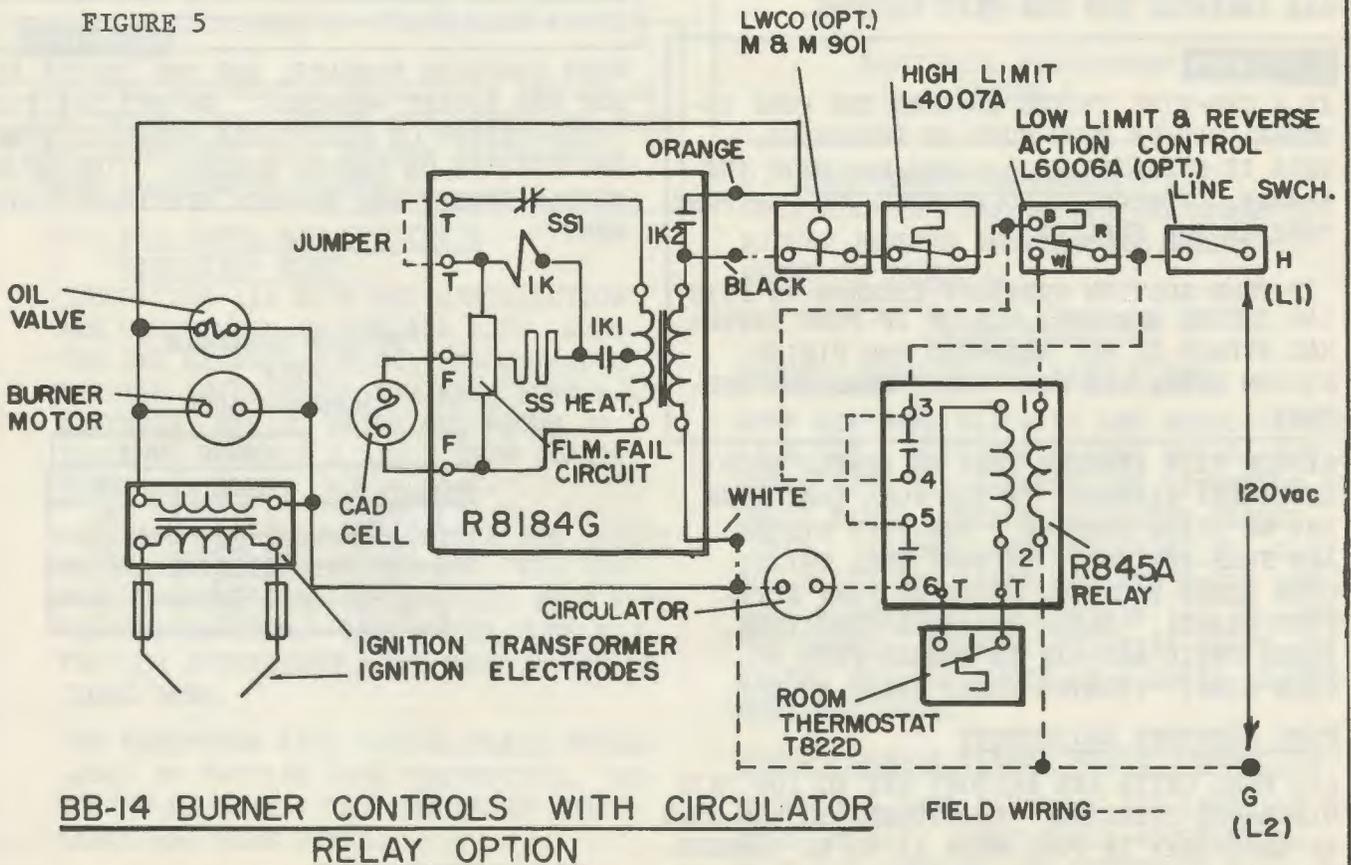
NUMBER LOCATION	DESCRIPTION	CONTROLS	
		STEAM	WATER
1	LIMIT CONTROL	PA404A	L4007A
2	PRESSURE GAUGE	2-1/2"DIA.	-
3	THERALTIMETER	-	2-1/2"DIA.
4	OPERATING CONTROL (OPT.)	PA404A	-
5	OPERATING CONTROL (OPT.)	-	L4007A
	OPERATING CONTROL (TANKLESS HEATER) (OPT.)	L4007A	L4007A
6	COMB. REVERSE & OPERATING CONTROL (TANKLESS HEATER) (OPT.)	-	L6006A
7	LOW WATER CUTOFF (OPT.)	M/M 67S1	-
8	PRIMARY CONTROL	R8184G	R8184G
9	CIRCULATOR RELAY (OPT.)	-	R845A
10	LOW WATER CUTOFF (SUPPLY PIPING TEE) (OPT.)	-	M/M 901
11	SAFETY OR RELIEF VALVE (TAPPING 1")	-	-
12	ROOM THERMOSTAT (NOT SHOWN)	T822D	T822D

FIGURE 4



BB-14 STANDARD BURNER CONTROLS - STEAM/WATER

FIGURE 5



BB-14 BURNER CONTROLS WITH CIRCULATOR
RELAY OPTION

12. TANKLESS HEATER CONTROLS

BOILERS EQUIPPED WITH TANKLESS COILS REQUIRE TEMPERATURE CONTROLS TO MAINTAIN BOILER TEMPERATURE. THESE ARE MOUNTED IN THE HEATER COVER PLATE. WIRING FOR CONTROLS SUPPLIED BY H. B. SMITH CO. ARE SHOWN IN FIGURES 4 AND 5. NORMAL CONTROL SETTINGS MAINTAIN 180° F BOILER TEMPERATURE. IF HOT WATER SUPPLY IS OVERABUNDANT, IT MAY BE DESIRABLE TO LOWER CONTROL SETTINGS WHICH REDUCES ENERGY CONSUMPTION. CONVERSELY, HIGHER SETTINGS INCREASE HOT WATER SUPPLY.

TO FURTHER REDUCE ENERGY CONSUMPTION, A 24 HOUR TIMER OR MANUAL SWITCH MAY BE INSTALLED IN THE CIRCUIT BY A QUALIFIED CONTRACTOR OR SERVICEMAN. THIS INTERRUPTS BURNER OPERATION WHEN A RESIDENCE IS UNOCCUPIED FOR EXTENDED PERIODS DURING NON-HEATING MONTHS.

13. FUEL UNITS**CAUTION**

DO NOT OPERATE FUEL PUMP DRY.

ALL FUEL UNITS SHIPPED FROM THE FACTORY ARE ARRANGED FOR ONE-PIPE SYSTEMS.

CAUTION

IF A TWO-PIPE SYSTEM IS USED THE PUMP INTERNAL BYPASS PLUG MUST BE INSTALLED. THIS IS SUPPLIED IN A CLOTH BAG WITH THE BURNER. INSTALL PLUG THROUGH THE "RETURN" PORT ON THE FUEL UNIT.

IF PUMP SUCTION PRESSURE EXCEEDS +3 PSIG (+6 INCHES MERCURY, HG) OR IF PUMP INTERNAL BYPASS IS NOT ARRANGED FOR PIPING SYSTEM USED, THE PUMP SHAFT SEAL MAY RUPTURE.

SINGLE PIPE SYSTEMS MUST BE VENTED WHEN INITIALLY STARTED, IF THE FUEL TANK RUNS DRY OR AFTER SERVICE. TWO-PIPE SYSTEMS ARE SELF-VENTING. TO VENT FUEL UNITS, OPEN BLEED VALVE ON FRONT OF PUMP AFTER PUMP STARTS. CATCH OIL IN A CONTAINER. BLEED UNTIL ALL AIR IS PURGED FROM SUCTION LINE. TIGHTEN BLEED VALVE SNUGLY.

FUEL PRESSURE ADJUSTMENT

ALL FUEL UNITS ARE FACTORY SET TO 100 PSIG DISCHARGE PRESSURE. ADJUSTMENT SHOULD ONLY BE NECESSARY IF FUEL FLOW IS TO BE CHANGED. TO CHANGE PUMP DISCHARGE PRESSURE, INSTALL

A 0-200 PSI PRESSURE GAGE IN THE GAGE PORT OF THE FUEL UNIT. REMOVE THE REGULATOR CAP AND TURN THE ADJUSTING SCREW CLOCKWISE TO INCREASE PRESSURE (FLOW) AND VICE VERSA. AFTER ADJUSTMENT REPLACE CAP, REMOVE GAGE AND REVENT PUMP. RETEST CO₂ AND SMOKE AND ADJUST TO SPECIFICATIONS.

14. OIL ATOMIZING NOZZLES

EACH BURNER IS SHIPPED WITH THE PROPER TYPE OIL NOZZLE. WHEN REPLACING A NOZZLE, MAKE SURE ITS CAPACITY, SPRAY PATTERN AND ANGLE ARE THE SAME. TEST FOR GOOD COMBUSTION AND READJUST BURNER AFTER REPLACEMENT. IF A LOWER CAPACITY NOZZLE IS INSTALLED, TEST BURNER FOR GOOD COMBUSTION AND READJUST.

WARNING

DO NOT REDUCE BURNER INPUT TO A POINT WHERE THE BOILER EXIT FLUE GAS TEMPERATURE FALLS BELOW 400°F. LOW FLUE GAS TEMPERATURE RESULTS IN CHIMNEY DAMAGE FROM CONDENSATION.

DO NOT ATTEMPT TO DISASSEMBLE, CLEAN OR REPAIR OIL NOZZLES. REPLACE NOZZLE ANNUALLY OR WHEN DIRTY OR DEFECTIVE.

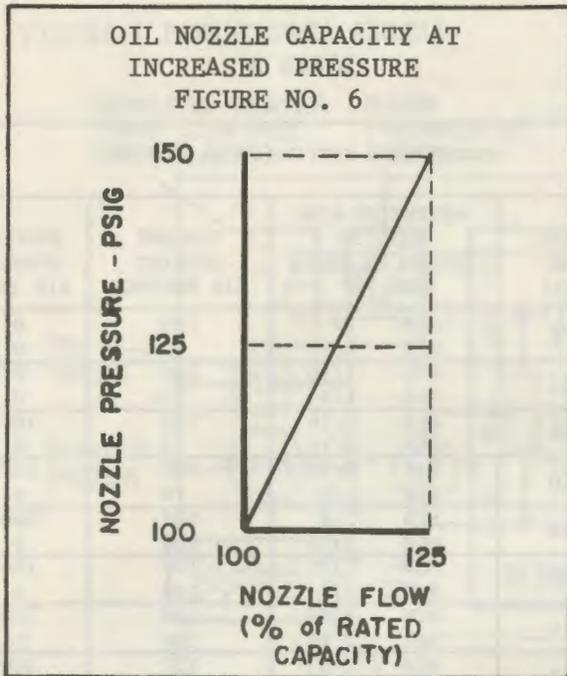
WHEN CHANGING NOZZLES, USE THE PROPER SIZE BOX AND SOCKET WRENCHES. DO NOT USE PLIARS, "VISE-GRIPS" OR ADJUSTABLE WRENCHES WHICH MAY DISTORT OR DAMAGE NOZZLE. TIGHTEN NEW NOZZLE SNUGLY AND RECHECK ELECTRODE ADJUSTMENT.

NOZZLE SCHEDULE

TABLE 2

MONARCH 60°R

BOILER SIZE	FIRING RATE	
	HIGH	LOW
3 SECT.	1.10	.85
4 SECT.	1.65	1.35
5 SECT.	2.25	2.00
6 SECT.	2.50	2.50



BURNER ADJUSTMENT MUST BE MADE WITH ALL 3 SETTINGS TO OBTAIN OPTIMUM PERFORMANCE. A CO₂ OF 11% WITH 0 BACHARACH SMOKE IS EASILY OBTAINABLE. BOILER OUTLET TEMPERATURE SHOULD NOT EXCEED 450°F FOR LOW INPUT NOZZLES AND 525°F FOR HIGH INPUT NOZZLES.

IMPORTANT
PROPER BURNER ADJUSTMENT CANNOT BE MADE WITHOUT PROFESSIONAL COMBUSTION ANALYSIS EQUIPMENT. VISUAL ADJUSTMENT IS UNSATISFACTORY.

15. BURNER ADJUSTMENT

A. IGNITION ELECTRODES

ELECTRODE ADJUSTMENT MUST BE AS SHOWN IN FIGURE NO. 7. OTHERWISE, SPARKING CAN OCCUR TO OTHER BURNER COMPONENTS.

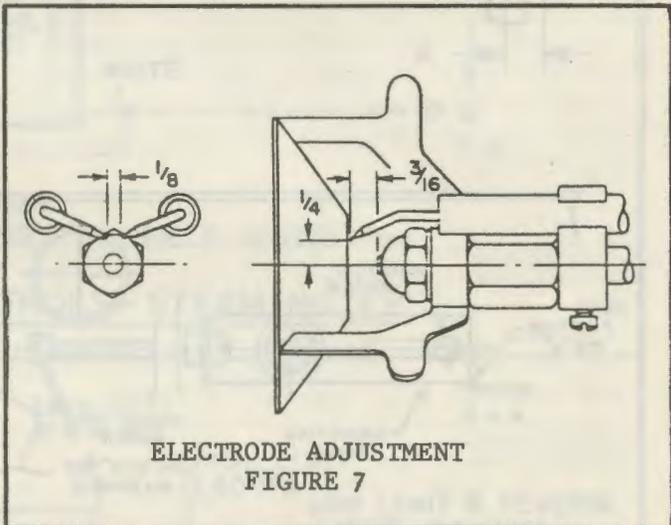
CAUTION
IMPROPER ADJUSTMENT RESULTS IN DAMAGE TO ELECTRODES, OIL NOZZLE AND RETENTION RING AND SUBSEQUENT POOR BURNER PERFORMANCE. CHECK ADJUSTMENT CAREFULLY.

B. AIR BAND, AIR SHUTTER & RETENTION RING

COMBUSTION AIR FLOW AND DISTRIBUTION ARE CONTROLLED BY THE AIR BAND, SHUTTER AND RETENTION RING. RECOMMENDED INITIAL ADJUSTMENTS FOR EACH BURNER AT DIFFERENT FIRING RATES ARE SHOWN IN TABLE 3. FIGURES 8 AND 9 SHOW ADJUSTMENT LOCATIONS.

AIR BAND AND SHUTTER CONTROL THE AMOUNT OF AIR ENTERING THE BURNER. SET AIR BAND TO SPECIFIED SETTING AND TRIM WITH THE AIR SHUTTER. IF SHUTTER DOES NOT PROVIDE SUFFICIENT ADJUSTMENT, OPEN OR CLOSE BAND.

THE RETENTION RING VARIES FLAME TURBULENCE TO PROVIDE GOOD COMBUSTION. REDUCING DIMENSION "A" INCREASES TURBULENCE AND VISE VERSA.



C. ADJUSTMENT PROCEDURE

INITIALLY SET ALL BURNER ADJUSTMENTS MIDWAY BETWEEN MINIMUM AND MAXIMUMS SHOWN IN TABLE 3.

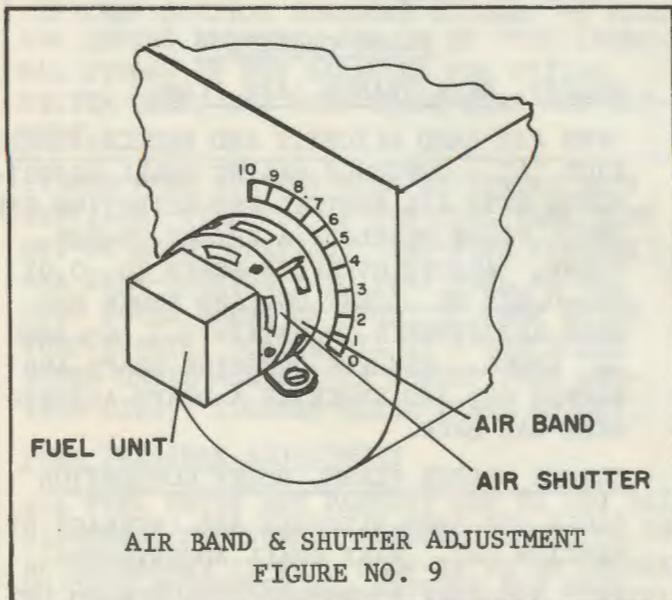
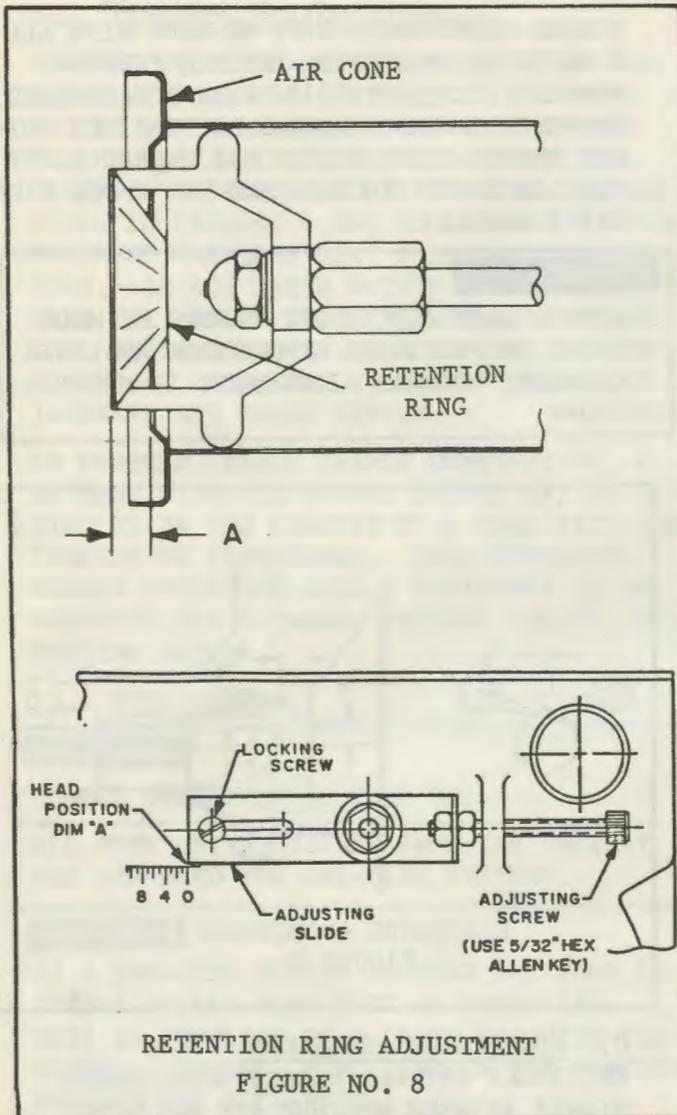
FLAME CONDITION

SMOKEY, DARK ORANGE LAZY FLAME

OPEN AIR BAND SLIGHTLY AND REDUCE DIMENSION "A". CONTINUE MAKING SMALL ADJUSTMENTS WITH AIR SHUTTER AND RETENTION RING UNTIL FLAME DEVELOPS A BRIGHT ORANGE COLOR. ADJUST OVERFIRE DRAFT TO -0.02 TO -0.03" WC. TEST CO₂ AND SMOKE AND MAKE ADJUSTMENTS TO OBTAIN 11% CO₂ AND "0" SMOKE. RECHECK OVERFIRE DRAFT AND RETEST CO₂ AND SMOKE IF A DRAFT ADJUSTMENT WAS MADE.

BRIGHT ORANGE FLAME, NOISY COMBUSTION

CLOSE AIR BAND SLIGHTLY AND INCREASE DIMENSION "A". MAKE SMALL ADJUSTMENTS WITH AIR SHUTTER AND RETENTION RING UNTIL FLAME NOISE AND COLOR SUBSIDE. AD-

**BURNER ADJUSTMENTS**
TABLE 3

RECOMMENDED SETTING MODEL 100 CRD			
FIRING RATE (GPH)	RETENTION RING SETTING INCHES ON SCALE DIM. "A"	PERCENT OPENING AIR SHUTTER	PERCENT OPENING AIR BAND
0.75	MIN 0	100	0
	MAX 3/32	30	0
0.85	MIN 1/16	100	0
	MAX 1/8	50	0
1.00	MIN 1/16	100	100
	MAX 3/16	50	0
1.10	MIN 3/32	100	100
	MAX 1/4	70	0
1.25	MIN 1/8	100	100
	MAX 5/16	100	0
1.35	MIN 5/32	100	100
	MAX 3/8	100	0
1.50	MIN 3/16	100	100
	MAX 7/16	100	20
1.65	MIN 1/4	100	100
	MAX 1/2	100	30

RECOMMENDED SETTING MODEL 101 CRD			
FIRING RATE (GPH)	RETENTION RING SETTING INCHES ON SCALE DIM. "A"	PERCENT OPENING AIR SHUTTER	PERCENT OPENING AIR BAND
1.75	MIN 1/4	100	50
	MAX 1/2	100	0
2.00	MIN 5/16	100	100
	MAX 9/16	100	20
2.25	MIN 3/8	100	100
	MAX 5/8	100	40
2.50	MIN 1/2	100	100
	MAX 11/16	100	60
2.75	MIN 5/16	100	100
	MAX 11/16	100	100

JUST OVERFIRE DRAFT TO -0.02 TO -0.03 " WC. TEST CO_2 AND SMOKE AND MAKE ADJUSTMENTS TO OBTAIN 11% CO_2 AND "0" SMOKE. RECHECK OVERFIRE DRAFT AND RETEST CO_2 AND SMOKE IF A DRAFT ADJUSTMENT WAS MADE.

MEDIUM ORANGE FLAME. SLIGHT RUMBLE FROM COMBUSTION. NORMAL

CHECK OVERFIRE DRAFT AND COMBUSTION FOR CO_2 AND SMOKE. MAKE SMALL ADJUSTMENTS WITH AIR SHUTTER AND RETENTION RING TO OBTAIN A MINIMUM 11% CO_2 AND "0" SMOKE. RECHECK OVERFIRE DRAFT AND ADJUST IF NECESSARY. RETEST CO_2 AND SMOKE IF DRAFT ADJUSTMENT WAS MADE.

16. BURNER AND CONTROL SYSTEM STARTUP

A. INSTALLATION OF BURNER AND CONTROLS MUST BE COMPLETE.

B. LEAVE LINE SWITCH OPEN AND SET OPERATING CONTROL (ROOM THERMOSTAT) ABOVE REQUIRED TEMPERATURE TO MAKE CIRCUIT TO BURNER.

C. OPEN OIL SUPPLY LINE VALVES.

D. MAKE INITIAL BURNER AIR ADJUSTMENTS AS SHOWN IN TABLE 3. HAVE TOOLS AVAILABLE TO VENT FUEL UNIT ON INITIAL BURNER STARTUP.

E. CLOSE LINE SWITCH TO START BURNER. IF BURNER FAILS TO START, PRESS RED "RESET" BOTTON ON TOP OF BURNER CONTROL.

F. VENT FUEL UNIT ON ONE-PIPE SYSTEMS AS SOON AS BURNER STARTS. TWO-PIPE SYSTEMS DO NOT REQUIRE VENTING.

VENTING PROCEDURE

PLACE CONTAINER UNDER BLEEDER VALVE. LOOSEN VALVE WITH PUMP RUNNING TO EXPUL AIR. WHEN OIL DISCHARGE FROM VALVE IS CLEAR, VENTING IS COMPLETE. CLOSE VENT VALVE. OIL IS NOW DELIVERED TO THE NOZZLE UNDER REGULATED PRESSURE. IGNITION SHOULD OCCUR IMMEDIATELY AFTER VENTING.

CAUTION

BURNER CONTROL MAY TIME-OUT FROM FLAME FAILURE DURING VENTING AND STOP BURNER. WAIT 1 MINUTE AND PRESS RED "RESET" BOTTON ON TOP OF BURNER CONTROL.

G. INSPECT FLAME FOR GOOD COMBUSTION. ADJUST BURNER AS OUTLINED UNDER "BURNER ADJUSTMENT PROCEDURE" SECTION 15.

H. MAKE SURE OVERFIRE DRAFT IS SET AT -0.02 TO -0.03 " WC MEASURED AT THE SIGHT OPENING COVER ON THE BURNER MOUNTING PLATE. ADJUST DRAFT BY MOVING WEIGHT ON BAROMETRIC DAMPER.

WARNING

COMBUSTION MUST BE TESTED WITH CO₂ AND SMOKE TESTERS. DO NOT ATTEMPT TO ADJUST COMBUSTION BY VISUAL MEANS OR WITHOUT BOTH OF THESE INSTRUMENTS.

I. ALLOW BOILER AND CHIMNEY TO REACH OPERATING TEMPERATURE. MEASURE THE BOILER OUTLET TEMPERATURE. TEMPERATURE SHOULD BE 450°F FOR LOW INPUT NOZZLES AND 525°F FOR HIGH INPUT NOZZLES. IF

TEMPERATURE IS NOTICABLY DIFFERENT FROM THESE, CHANGE FUEL INPUT BY ADJUST-FUEL PRESSURE ON FUEL UNIT. REFER TO SECTION 13 "FUEL UNITS". IF A CHANGE IN FUEL INPUT IS MADE, COMBUSTION AIR MUST BE READJUSTED AND CO₂ AND SMOKE RETESTED.

WARNING

DO NOT REDUCE FUEL INPUT TO WHERE BOILER OUTLET TEMPERATURE IS BELOW 400°F. LOWER FLUE TEMPERATURES RESULT IN CHIMNEY DAMAGE FROM CONDENSATION.

J. OBSERVE BURNER STARTUP AND SHUTDOWN THROUGH SEVERAL CYCLES TO ENSURE SMOOTH LIGHTOFF.

K. INSTRUCT THE HOMEOWNER ON THE OPERATION AND CARE OF THE BOILER AND BURNER.

17. FOLLOW-UP INSPECTION

AFTER THE BOILER HAS BEEN IN OPERATION FOR A SHORT PERIOD OF TIME THE FOLLOWING SHOULD BE CHECKED:

- A. FLUE GAS CO₂ AND SMOKE CONCENTRATIONS.
- B. CONDITION OF BOILER HEATING SURFACES.
- C. ALL JOINTS IN THE OIL SUPPLY SYSTEM FOR LEAKAGE.
- D. PRIMARY LIMIT CONTROL AND DRAFT REGULATOR OPERATION.
- E. REVIEW OPERATION AND CARE OF HEATING SYSTEM WITH HOMEOWNER.

18. BURNER MAINTENANCE

AT LEAST ONCE ANNUALLY THE FOLLOWING MAINTENANCE SHOULD BE PERFORMED ON THE BURNER, BOILER AND CIRCULATOR.

- A. LUBRICATE BURNER AND CIRCULATOR MOTOR BEARINGS WITH A FEW DROPS OF AUTOMOTIVE GRADE ENGINE OIL.

CAUTION

DO NOT OVER-OIL BEARINGS. EXCESS OIL COLLECTS DIRT AND DUST.

- B. REPLACE FUEL FILTER.
- C. REPLACE OIL ATOMIZING NOZZLE.
- D. CLEAN BURNER AIR INLET AND BLOWER WHEEL OF DUST AND DIRT.

E. CLEAN RETENTION RING AND CHECK ELECTRODE ADJUSTMENT. REPLACE WORN PARTS AS REQUIRED. TEST BURNER PERFORMANCE, FLUE GAS CO₂, SMOKE AND TEMPERATURE. READJUST TO SPECIFICATIONS.

F. CLEAN BOILER FLUES BY REMOVING SIDE PANELS. USE A WIRE FLUE BRUSH FOR CLEANING. RESEAL FLUE COVERS WITH INSULATING CEMENT OR HIGH TEMPERATURE RTV SILICONE RUBBER.

G. INSPECT COMBUSTION CHAMBER. REMOVE SCALE WITH A VACUUM CLEANER. REPLACE CHAMBER IF CRACKED OR DISTORTED.

H. CHECK OPERATION OF LIMIT AND PRIMARY CONTROLS. REPLACE IF DEFECTIVE.

I. CHECK FOR PROPER FURNACE DRAFT AND OPERATION OF BAROMETRIC DAMPER. CHECK CONDITION OF BREECHING. REPLACE BREECHING IF IT HAS DETERIORATED.

J. INSPECT GENERAL CONDITION OF BOILER, BURNER AND HEATING SYSTEM. REPAIR ANY DEFECTS.

19. TROUBLE SHOOTING GUIDE

BURNER FAILS TO START

- A. POWER CIRCUIT DEAD. BLOWN OR LOOSE FUSE OR CIRCUIT BREAKER.
- B. LINE OR EMERGENCY SWITCH OPEN.
- C. LOOSE ELECTRICAL CONNECTIONS.
- D. LIMIT CONTROL SATISFIED OR SET TOO LOW.
- E. THERMOSTAT SET TOO LOW OR DEFECTIVE.
- F. PRIMARY CONTROL TRIPPED, PRESS "RESET".
- G. MOTOR THERMAL PROTECTOR OPEN. PRESS "RESET" BUTTON.

BURNER RUNS BUT NO FLAME DUE TO NO OIL

- A. TANK EMPTY.
- B. FILTER PLUGGED.
- C. MANUAL SHUT-OFF VALVE CLOSED.
- D. FUEL UNIT AIR-BOUND.
- E. ELECTRIC FUEL VALVE DEFECTIVE.
- F. PLUGGED NOZZLE.
- G. EXCESSIVE SUCTION PRESSURE ON PUMP.
- H. FAILED PUMP COUPLING.

BURNER RUNS, OIL DELIVERED TO NOZZLE BUT FLAME DOES NOT IGNITE

- A. IMPROPER ELECTRICAL CONNECTIONS IN BURNER JUNCTION BOX.
- B. DEFECTIVE OR CRACKED IGNITION ELECTRODES.
- C. POOR CONNECTION BETWEEN TRANSFORMER AND HIGH VOLTAGE ELECTRODES.
- D. INCORRECT ELECTRODE ADJUSTMENT.
- E. IMPROPER BURNER AIR ADJUSTMENT (TOO MUCH AIR).
- F. DEFECTIVE TRANSFORMER.
- G. WATER IN OIL.

BURNER OPERATES BUT OIL DELIVERY AT NOZZLE IS NOT INSTANTANEOUS OR CONSTANT

- A. TANK NOT VENTED.
- B. CLOGGED FILTER OR NOZZLE.
- C. PUMP AIR BOUND. CHECK FOR LEAKS IN SUCTION LINE.
- D. EXCESSIVE LIFT FROM TANK TO BURNER.
- E. IF TWO-PIPE SYSTEM, BYPASS PLUG NOT INSTALLED.
- F. DEFECTIVE FUEL UNIT.

BURNER STARTS BUT STOPS AFTER A FEW SECONDS

- A. INCORRECT WIRING.
- B. LIMIT CONTROL SET TOO LOW.
- C. DEFECTIVE THERMOSTAT OR THERMOSTAT WIRING. CHECK HEAT ANTICIPATOR IN THERMOSTAT. SEE THERMOSTAT INSTRUCTIONS.
- D. OIL TANK RUNNING DRY.

UNEVEN FLAME

- A. CLOGGED OR DEFECTIVE NOZZLE.
- B. OBSTRUCTION IN PATH OF OIL SPRAY.
- C. IMPROPER BURNER AIR ADJUSTMENT.
- D. DIRT IN BURNER BLOWER AND AIR TUBE.

FLAME PUFFS AT START

- A. AIR SHUTTER OPEN TOO WIDE.
- B. OBSTRUCTED NOZZLE.
- C. LOW OIL PRESSURE.

- D. ELECTRODES DIRTY OR NOT ADJUSTED PROPERLY.
- E. DEFECTIVE ELECTRODES.
- F. DEFECTIVE TRANSFORMER.

- B. HIGH OIL PRESSURE.
- C. INSUFFICIENT COMBUSTION AIR.

FLAME SMOKEY AT LIGHTOFF BUT CLEANS UP WHEN BOILER WARMS UP.

SLOW CUT-OFF WHEN BURNER STOPS

- A. AIR IN OIL LINES CAUSED BY LEAKS OR INADEQUATE VENTING.
- B. AIR IN NOZZLE LINE. THIS WILL PURGE ITSELF OUT.
- C. LOW OIL PRESSURE.
- D. LEAKY OIL SHUT-OFF VALVE.

- A. INSUFFICIENT INITIAL DRAFT.
- B. COLD BOILER ROOM OR COMBUSTION AIR.
- C. COLD OIL.
- D. LOW OIL PRESSURE.
- E. INSUFFICIENT COMBUSTION AIR.

FLAME IMPINGES ON BACK WALL

- A. INCORRECT OIL NOZZLE.
- B. CLOGGED NOZZLE.
- C. LOW OIL PRESSURE.

PULSATION

- A. OBSTRUCTED OR LEAKY CHIMNEY.
- B. INSUFFICIENT AIR SUPPLY TO BOILER ROOM.
- C. EXCESSIVE FIRING RATE.
- D. IMPROPER ATOMIZING PRESSURE.
- E. OIL LEAKAGE INTO FIREBOX FIRING OFF PERIODS.

FLAME IMPINGES ON SIDE WALLS

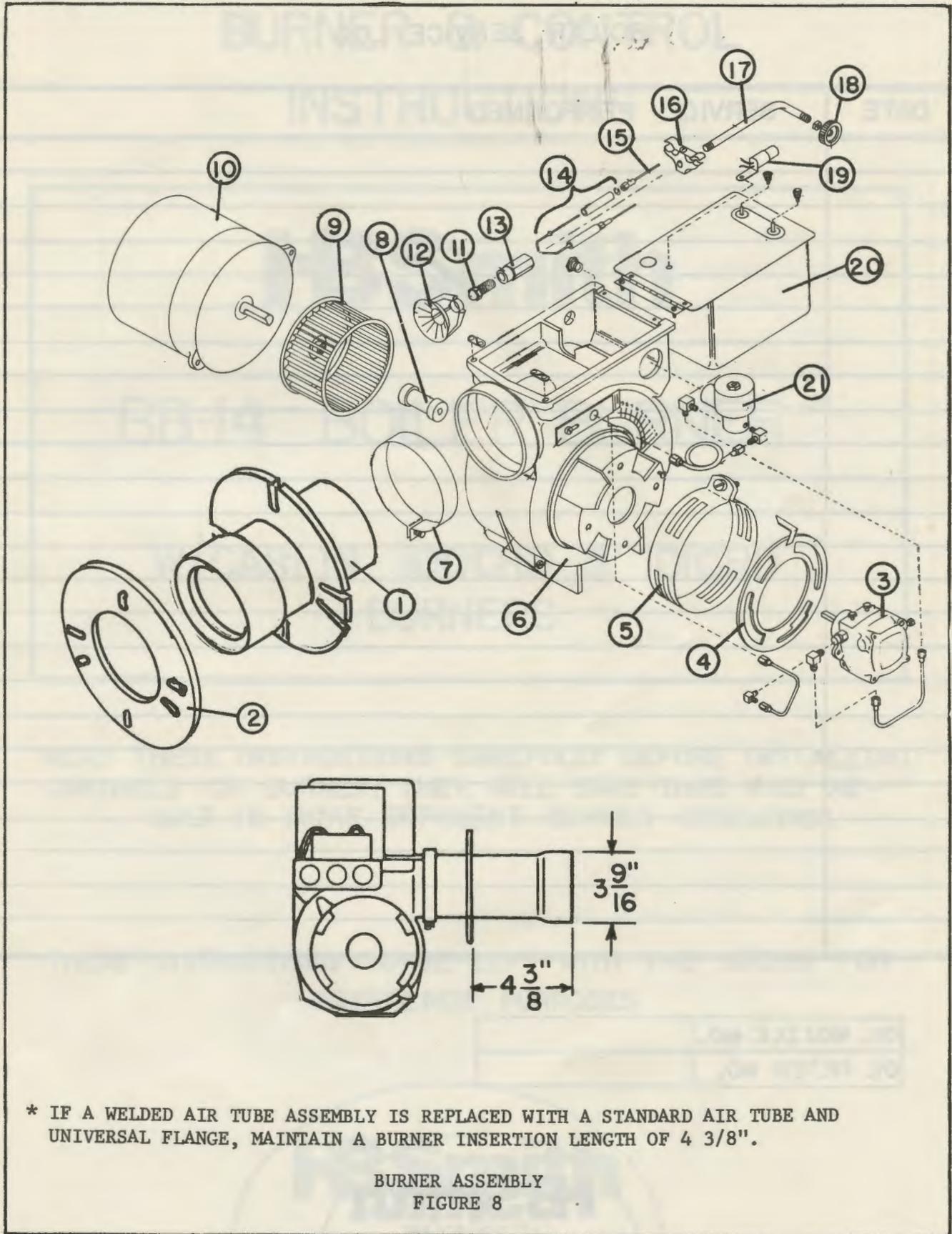
- A. INCORRECT OIL NOZZLE.

BURNER INSTALLATION AND ADJUSTMENT SPECIFICATIONS

OIL NOZZLE	MONARCH 60°R (SEE TABLE 2, PAGE 8 FOR CAPACITY)
OVERFIRE DRAFT	-0.02 TO -0.03" W.C.
CO ₂	11% MINIMUM
SMOKE	0 BACHARACH
MAXIMUM PUMP SUCTION PRESSURE	-15" HG (-7.5 PSIG)
MINIMUM PUMP SUCTION PRESSURE	+6" HG (3 PSIG)
FILTER CAPACITY	7 GPM (MINIMUM)
MINIMUM SUCTION AND RETURN LINE SIZE	3/8" COPPER TUBING

BURNER AND CONTROL INSTRUCTIONS
BB-14

ITEM NO.	DESCRIPTION	CARLIN PART NO.	
		100CRD	101CRD
1	AIR TUBE/FLANGE ASSEMBLY FOR NOMINAL 7" AIR TUBE *	1051A444	1051A444
2	MOUNTING FLANGE GASKET	241A820	241A820
3	FUEL UNIT-SUNSTRAND SINGLE-STAGE A2VA-7116, CW ROTATION FACING SHAFT	1017	1017
4	AIR SHUTTER	1007	1007
5	AIR CONTROL BAND	1008	1008
6	BURNER HOUSING	1001	1001
7	AIR TUBE HOUSING CLAMP	1009	1009
8	COUPLING	1020	1020
9	BLOWER WHEEL-7/16" HUB, 4-1/4" X 2 7/8" X 1/2" BORE	1019S	-
10	MOTOR, CCW FACING SHAFT, 3450 RPM, 1/7HP-1/115/60	1016	1016
11	NOZZLE (SPECIFY GPH, ANGLE AND TYPE OF SPRAY)	421	421
12	FLAME RETENTION RING ASSEMBLY	1013	1013
13	NOZZLE ADAPTER (SPECIAL)	1022A	1022A
14	ELECTRODE ASSEMBLY 3-1/4"	1023	1023
15	IGNITION CABLE (2 REQUIRED)	1025-7	1025-7
16	ELECTRODE BRACKET ASSEMBLY	1004	1004
17	NOZZLE LINE	1011-7	1011-7
18	NOZZLE LINE THUMB NUT	1012	1012
19	CAD CELL		
20	IGNITION TRANSFORMER 120/10,000 VOLT	1018	1018
21	MAGNETIC OIL VALVE, INSTANT-OPENING	443B	443B
	ELECTRODE AND COMBUSTION HEAD ASSEMBLY (INCLUDES NOZZLE ADAPTER 1022A, FLAME RETENTION RING 1013, ELECTRODE BRACKET 1004, NOZZLE LINE 1011, ELECTRODES 1023, IGNITION CABLE 1025-7, NOZZLE LINE THUMB NUT 1012, E-RING 188B)	1052-7	1052-7
	AIR TUBE, ELECTRODE AND COMBUSTION HEAD ASSEMBLY *	1053-7	1053-7



* IF A WELDED AIR TUBE ASSEMBLY IS REPLACED WITH A STANDARD AIR TUBE AND UNIVERSAL FLANGE, MAINTAIN A BURNER INSERTION LENGTH OF 4 3/8".

BURNER ASSEMBLY
FIGURE 8

BURNER AND CONTROL INSTRUCTIONS

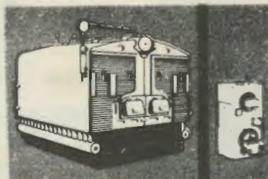
FOR

BB-14 CARLIN UNIT

100CRD-101CRD CARLIN BURNERS

THE **HBSmith**
COMPANY, INC.

WESTFIELD, MASSACHUSETTS, 01085

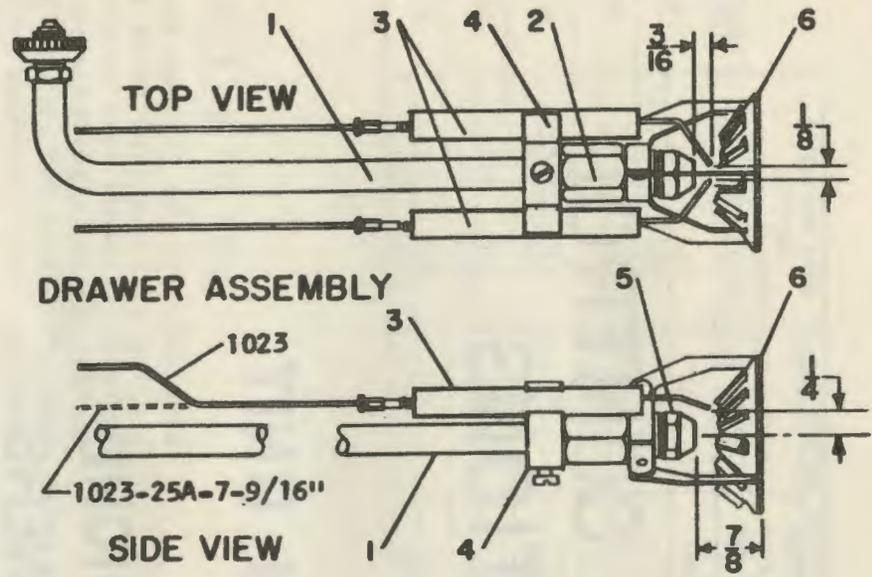
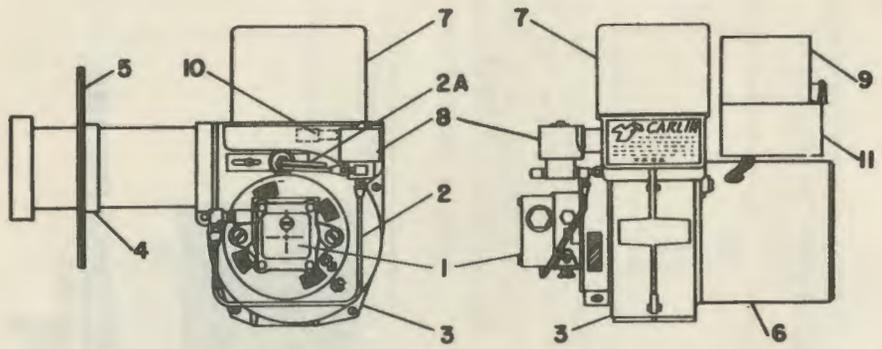


THESE INSTRUCTIONS TO BE LEFT WITH THE BOILER FOR REFERENCE PURPOSES.

**CARLIN OIL BURNERS
MODELS 100CRD AND 101CRD (60 CYCLE)**

100 CRD - 3 & 4 SECTIONS

101 CRD - 5 & 6 SECTIONS



ITEM	PARTS NO.	DESCRIPTION	NO. REQ.	
			MODEL 100	MODEL 101
1	1017	FUEL UNIT - SUNDSTRAND A2W7016 OR WEBSTER H34-DA	1	1
2		OIL LINE ASSEMBLY	1	1
2A		OIL LINE ASSEMBLY	1	1
	1020	PUMP COUPLING - NYLOFLEX OR GUARDIAN (1/2"x5/16"x2-3/8" L)	1	1
3	100	BURNER HOUSING	1	1
	1019S	FAN WHEEL - TORRINGTON 4-1/4" X 2-7/8" X 1/2" HUB	1	
	1019H	FAN WHEEL - TORR 4-3/4" X 2-15/16" X 1/2" HUB		1
4	1010-7	AIR TUBE ASS'Y - 7-9/16" X 3" I.D.	1	1
5	1040-24	FLANGE WITH 1041 GASKET	1	1
6	1016	MOTOR - 1/7 HP, 3450 RPM, 120VOLTS, 60CYCLE, 1 PHASE	1	1
7	1010	IGNITION TRANSFORMER - JEFFERSON OR WEBSTER 120/60-10,000V	1	1
8	1045	OIL VALVE - PETER PAUL 32200250CV	1	1
9	---	PRIMARY RELAY - HONEYWELL R81846	1	1
10	---	FLAME DETECTOR - HONEYWELL C554 (ON TRANSFORMER BASE)	1	1
11	---	JUNCTION BOX	1	1

ITEM	PARTS NO.	DESCRIPTION	NO. REQ.	
			MODEL 100	MODEL 101
1	1011-7	NOZZLE LINE 9-7/16"	1	1
2	422	NOZZLE ADAPTER SINGLE	1	1
3	1023	IGNITION ELECTRODES	2	2
4	1004	ELECTRODE BRACKET	1	1
		NOZZLE-HALO 60°SS		
		3 SECT	1,10	.85
		4 SECT	1,65	1,35
		5 SECT	2,25	2,00
		6 SECT	2,75	2,50
6	1013	FLAME RETENTION RING	1	1

* 1023 OLD STYLE ELECTRODE ASSEMBLY IS USED WITH IGNITION TRANSFORMER SPRING TERMINAL 1015 (SHORT LENGTH)

1023-25A-7-9/16" AIR TUBE LENGTH-NEW STYLE ELECTRODE ASSEMBLY MUST HAVE TRANSFORMER SPRING TERMINAL 1015A (LONG LENGTH)

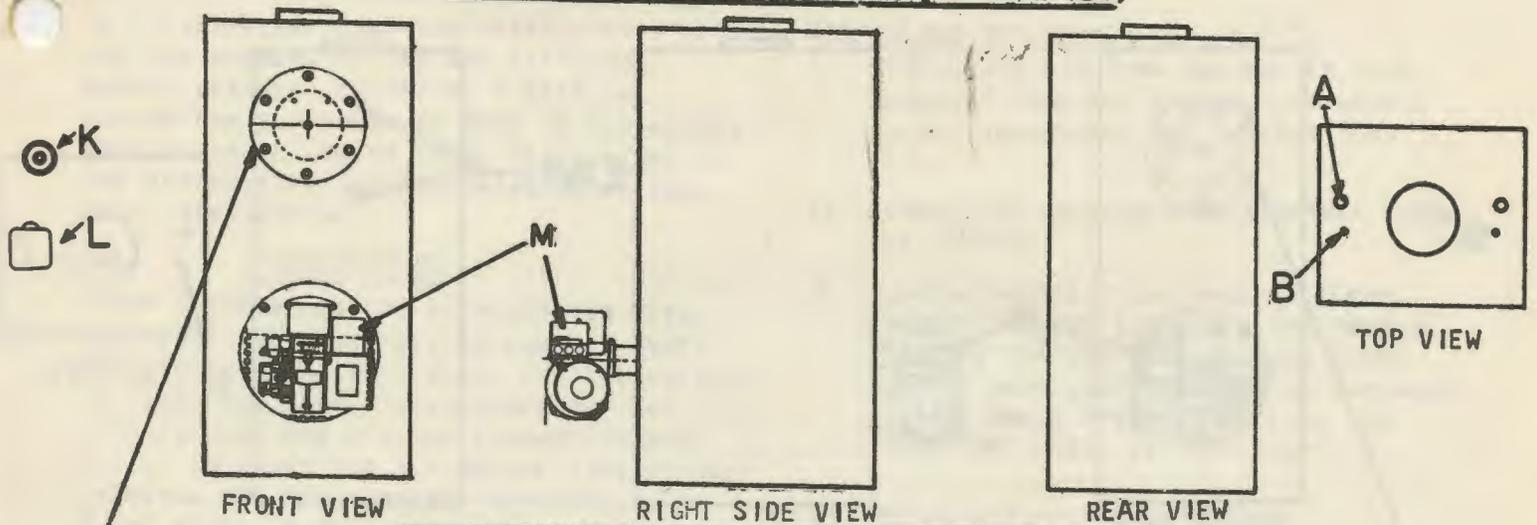
INSTALLING THE BURNER

BURNER MOUNTING FLANGE, FLANGE GASKET, AND MOUNTING CAP SCREWS AND WASHERS ARE IN THE BURNER CARTON. POSITION GASKET AND MOUNTING FLANGE ON BOILER FRONT PLATE WITH LOCKING SET SCREWS AT THE TOP. FASTEN THIS ASSEMBLY IN POSITION WITH CAP SCREWS AND WASHERS PROVIDED.

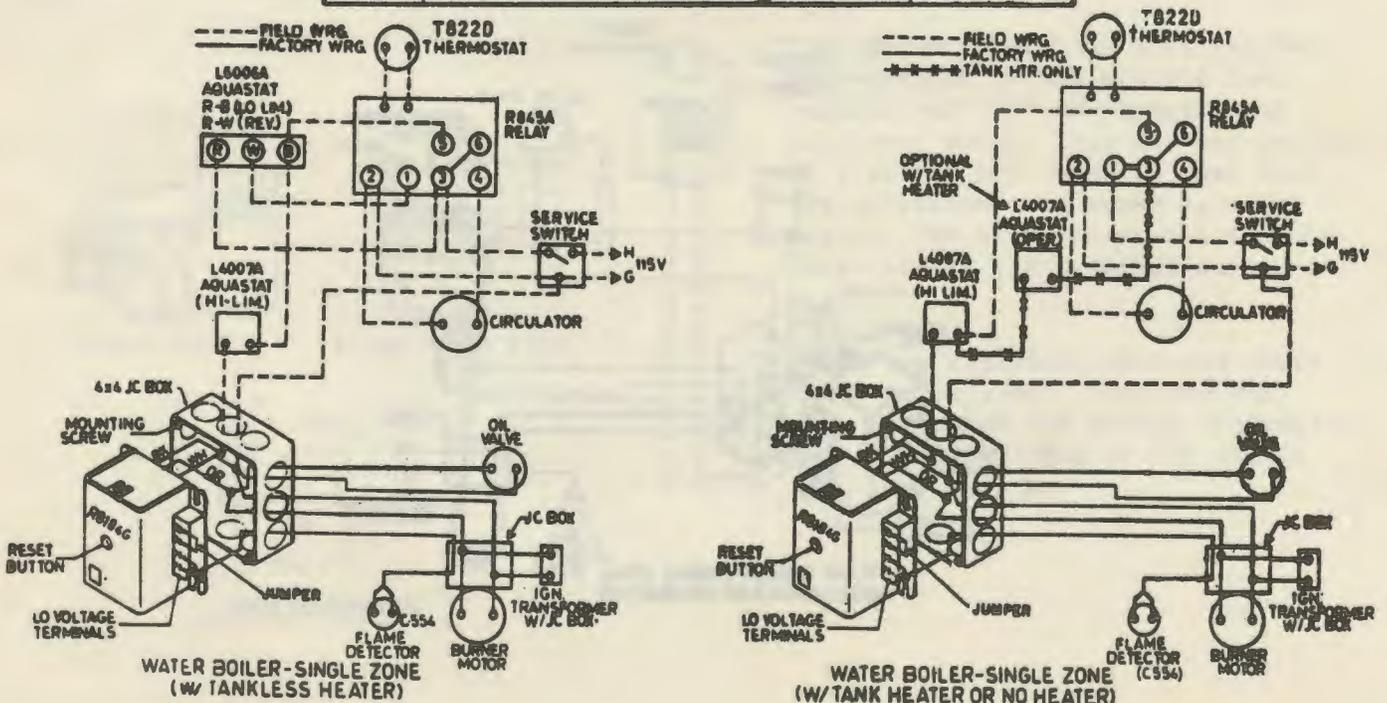
INSERT BURNER AIR TUBE THROUGH FLANGE SO THAT END OF AIR TUBE IS 1/4" BACK OF INSIDE FACE OF CHAMBER FRONT BRICK. SECURE BURNER IN POSITION WITH SOCKET SET SCREWS IN MOUNTING FLANGE.

BB-14 CARLIN

CONTROLS AND CONTROL LOCATIONS (BB-14, WATER)

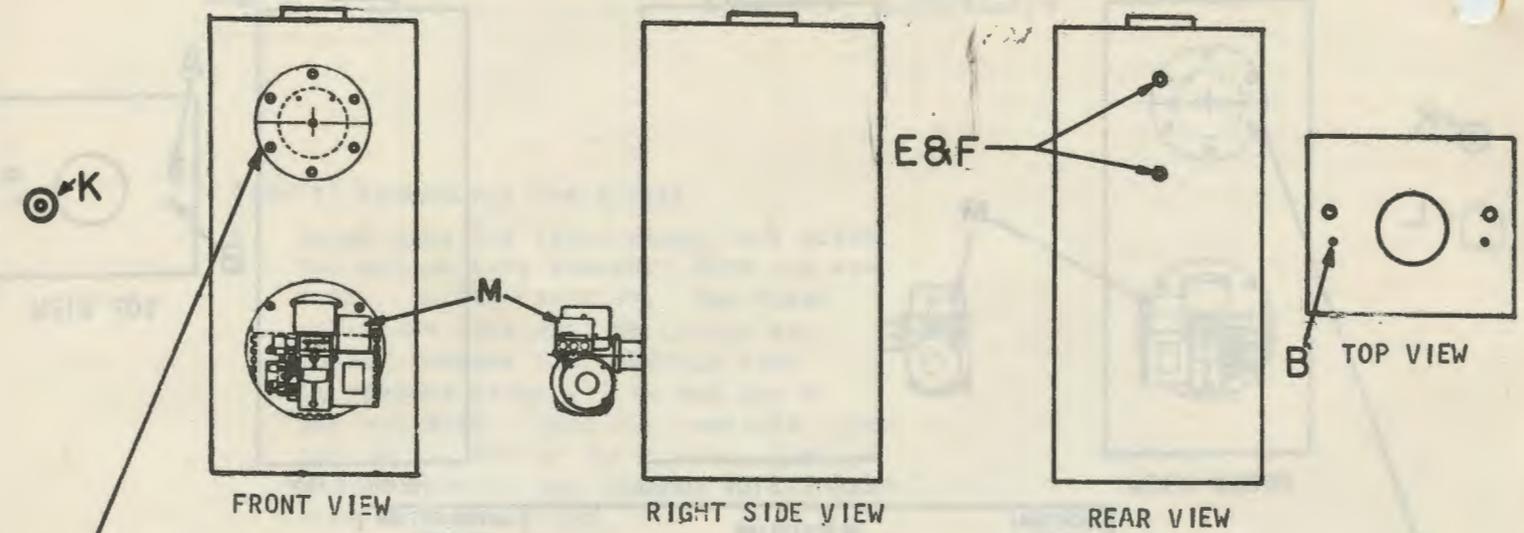


LOCATION LETTER	DESCRIPTION	WATER BOILER CONTROL
STANDARD EQUIPMENT		
K	ROOM THERMOSTAT	T822D
M	PRIMARY CONTROL	R8184G
B	STANDARD HIGH LIMIT	L4007A
EXTRA EQUIPMENT		
A	LOW WATER CUTOFF (IN TEE IN SUPPLY PIPE)	M/M# 901
	COMB. REVERSE & OPERATING CONTROL (TANKLESS HEATER)	L6006A
L	CIRCULATOR RELAY	SEE WIRING DIAGRAM
MANUAL RESET CONTROLS		
A *	RESET HIGH LIMIT (IN SERIES WITH STANDARD HIGH LIMIT)	L4006E
B	STANDARD HIGH LIMIT	L4007A
* INSTALL IN UNUSED (A) TAPPING		

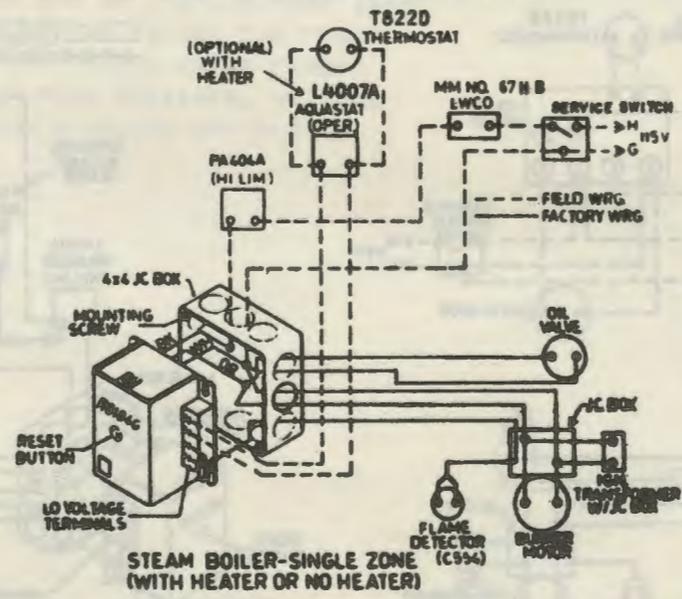


BB-14 CARLIN

CONTROLS AND CONTROL LOCATIONS (BB-14 STEAM)



LOCATION LETTER	DESCRIPTION	STEAM BOILER CONTROLS
STANDARD EQUIPMENT		
K	ROOM THERMOSTAT	T822D
M	PRIMARY CONTROL	R8184G
B	STANDARD HIGH LIMIT	PA404A
EXTRA EQUIPMENT		
E & F	LOW WATER CUTOFF	M/M#67HB
	OPERATING CONTROL (TANKLESS HEATER)	L4007A
MANUAL RESET CONTROLS		
B	RESET HIGH LIMIT (IN SERIES WITH STANDARD HIGH LIMIT) *	L404C
B	STANDARD HIGH LIMIT *	PA404A
* INSTALL ON TWO CONTROL TREE		



STEAM BOILER-SINGLE ZONE (WITH HEATER OR NO HEATER)

BB-14 CARLIN

INSTALLATION DIRECTIONS

PAGE 5

#1.

GENERAL

IT IS IMPORTANT THAT THE INSTALLATION OF THE OIL BURNER, PIPING AND FITTINGS, SAFETY DEVICES, CONTROLS, ELECTRICAL WIRING AND EQUIPMENT BE DONE IN ACCORDANCE WITH NATIONAL AND/OR LOCAL REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION OVER SUCH INSTALLATION.

#2.

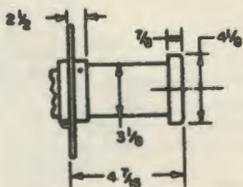
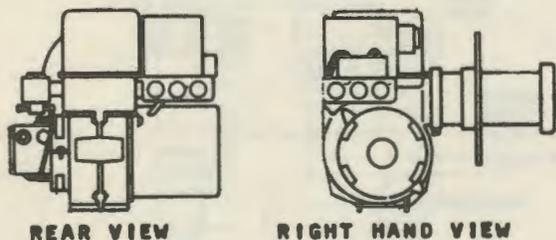
DESCRIPTION

"CRD" BURNERS FEATURE A COMBUSTION HEAD INCORPORATING A NEW DESIGN CONCEPT WHICH PROVIDES A MEANS TO CONTROL THE AIR PATTERN TO MATCH THE NOZZLE REQUIREMENTS. THE AERODYNAMICS FOR OPTIMUM COMBUSTION ARE EASILY ADJUSTED FOR ANY NOZZLE SIZE WITHOUT CHANGING THE AIR-HANDLING HARDWARE. THE FLAME FRONT IS INITIATED INSIDE THE AIR TUBE SO THAT NO ERRATIC RECIRCULATING GASSES FROM THE MAIN CHAMBER AREA CAN QUENCH THE FLAME AT THE RETENTION RING.

THE LETTERS "CRD" STAND FOR "CONTROLLED RETENTION--DOUBLE SPEED."

USE OF A SMALL, NARROW FAN OPERATING AT 3450 RPM PROVIDES A MORE POSITIVE, YET QUIET, AIR FLOW WHICH DOES NOT YIELD TO NORMAL DRAFT VARIATIONS AND THEREFORE ASSURES A MORE CONSTANT AIR-FUEL RATIO FOR DEPENDABLY CLEAN COMBUSTION DAY AFTER DAY.

MODELS 100CRD AND 101CRD ARE IDENTICAL IN DESIGN EXCEPT THAT THE 101CRD HAS A LARGER DIAMETER FAN AND A HIGHER FIRING RANGE.



TUBE DIMENSIONS

#3

ASSEMBLING THE BURNER

1. REMOVE THE AIR TUBE AND NOZZLE LINE ASSEMBLY FROM THE CARTON. IF NOZZLE IS NOT INSTALLED, SEE INSTRUCTIONS (5).
2. REMOVE THE MAIN HOUSING ASSEMBLY FROM THE CARTON.
3. LOOSEN THE AIR TUBE HOLDING CLAMP. INSERT THE AIR TUBE INTO THE HOUSING. TIGHTEN THE AIR TUBE HOLDING CLAMP MAKING SURE THAT THE TUBE IS BOTTOMED IN THE BORED OPENING AND THAT THE "CAUTION" LABEL IS FACING UP.
4. PLACE GASKET OVER AIR TUBE.
5. INSTALL THE NOZZLE.

A.

LOOSEN THE CLAMPING SCREW ON THE RETENTION RING ASSEMBLY AND SLIDE THE RETENTION RING OFF THE ADAPTER.

B.

INSTALL AND TIGHTEN THE PROPER NOZZLE IN THE ADAPTER. BE CAREFUL NOT TO DAMAGE THE ELECTRODE INSULATORS OR TO BEND THE WIRES.

C.

REPLACE THE RETENTION RING ASSEMBLY, SLIPPING ONE OF THE RIVETED ARMS THROUGH THE 1/8" GAP BETWEEN THE ELECTRODE ENDS. THIS TOP ARM SHOULD BE STRAIGHT UP. ALSO BE SURE THAT THE RETENTION RING CLAMP IS TIGHT AGAINST THE SHOULDER ON THE ADAPTER. THEN TIGHTEN THE CLAMPING SCREW.

D.

CHECK THE ELECTRODE SETTINGS SPECIFIED AS FOLLOWS: 1/8 INCH GAP, 1/4 INCH ABOVE THE NOZZLE CENTERLINE, AND 3/16 INCH AHEAD OF THE NOZZLE TIP. SEE PAGE 2.

BB-14 CARLIN**(CON'T) ASSEMBLING THE BURNER**

6. SWING OPEN THE TRANSFORMER, AND SLIDE THE NOZZLE LINE ASSEMBLY INTO THE AIR TUBE. DO NOT FORCE IT. THE FLAME RETENTION RING MUST BE LIFTED AND GUIDED THROUGH THE THROTTLE RING (A REDUCED DIAMETER) IN THE END OF THE AIR TUBE. THEN THE THREADED ADAPTER ON THE END OF THE NOZZLE LINE IS PASSED THROUGH THE OPENING IN THE LEFT SIDE OF THE HOUSING.
7. RUN THE ALUMINUM (KNURLED) THUMB-NUT ONTO THE NOZZLE LINE AND TIGHTEN HAND-TIGHT.
8. CONNECT THE FLARED FITTING ON THE COPPER OIL LINE TO THE NOZZLE LINE AND TIGHTEN.
9. SWING THE TRANSFORMER TO THE CLOSED POSITION.

#4.**INSTALLING THE BURNER: FLANGE MOUNTED**

1. SLIDE THE END OF THE AIR TUBE INTO THE OPENING AND SECURE THE FLANGE TO THE FRONT PLATE USING THREE STUDS AND NUTS PROVIDED. BE SURE GASKET SEALS AROUND THE FLANGE.

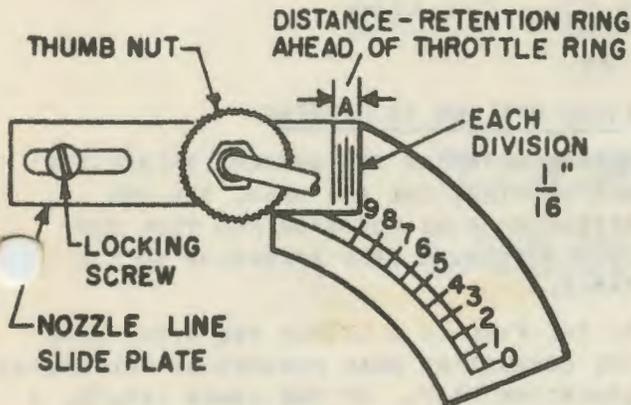


#7. HOW TO ADJUST THE AIR SHUTTER AND AIR BAND

FOR MORE PRECISE REGULATION OF AIR, THESE MODELS HAVE AN AIR SHUTTER FOR FINE CONTROL PLUS AN AIR BAND FOR COARSE CONTROL.

THE AIR SHUTTER HAS A POINTER WHICH INDICATES THE PERCENT OF OPENING AGAINST A CALIBRATED SCALE (9=90%, FULLY OPEN=100%). LOCK IN PLACE BY A SCREW JUST ABOVE THE EAR ON THE FUEL UNIT AFTER FINAL ADJUSTMENT.

THE AIR BAND IS ADJUSTED BY LOOSENING THE 1/4-20 SCREW AND NUT. LOCK IN PLACE AFTER FINAL ADJUSTMENT. SEE TABLE 1 FOR APPROXIMATE SETTING.



#6. HOW TO ADJUST THE COMBUSTION HEAD

BY MOVING THE NOZZLE LINE FORWARD OR BACK, THE LOCATION OF THE FLAME RETENTION RING RELATIVE TO THE THROTTLE RING, WHICH EQUALS DIMENSION "A," CAN BE CONTROLLED. THE NOZZLE LINE SLIDE PLATE AGAINST THE SCALE CALIBRATED IN 1/16" DIVISIONS SHOWS THE RETENTION RING POSITION AT A GLANCE. BY LOOSENING THE LOCKING SCREW AND THE THUMB-NUT AND PUSHING ON THE THUMB-NUT, THE ASSEMBLY CAN BE MOVED TO THE REQUIRED POSITION. TO LOCK IN PLACE, FIRST TIGHTEN THE THUMB-NUT AND THEN THE LOCKING SCREW. SEE TABLE 1 FOR APPROXIMATE SETTING FOR EACH FIRING RATE.

#7. RETENTION RING AND AIR

SHUTTER ADJUSTMENTS

TABLE 1 SHOWS FOR EACH FIRING RATE THE MINIMUM AND MAXIMUM RECOMMENDED POSITIONS OF THE FLAME RETENTION RING WITH THE CORRESPONDING AMOUNTS OF AIR SHUTTER OPENING. WITH THE RETENTION RING SET AT THE MINIMUM RECOMMENDED DISTANCE AHEAD, MORE AIR PRESSURE IS NEEDED, AND THE FIRE IS MORE INTENSE, THEREFORE BETTER FOR OPERATING WITHOUT REFRACTORY CHAMBERS. FOR INSTANCE, AT 1.25 GPH WITH THE RETENTION RING AT 1/8" AHEAD AND BOTH AIR SHUTTERS AT 100% OPEN A VERY INTENSE, HOT FLAME WOULD BE DEVELOPED SO THAT IT SHOULD BE OPTIMUM FOR CLEAN BURNING WITH NOT CHAMBER. A SOFTER, QUIETER FLAME (SOMEWHAT LONGER, TOO) WOULD BE DEVELOPED BY PUSHING THE ASSEMBLY FURTHER AHEAD AND REDUCING THE AIR PRESSURE CLOSING THE AIR SHUTTER(S). IN THIS CASE (1.25 GPH) THE MAXIMUM POSITION WOULD BE 5/16" AHEAD; THE FINE AIR SHUTTER WOULD BE WIDE OPEN AND THE AIR BAND COMPLETELY CLOSED.

TABLE 1 RECOMMENDED SETTING MODEL 100 CRD

FIRING RATE	RETENTION RING SETTING		AIR CONTROL SETTING	
	INCHES ON SCALE (DIM "A" FIGURE)		PER OPENING AIR SHUTTER	PERCENT OPENING PER BAND
0.75	MIN	0	100	0
	MAX	3/32	30	0
0.85	MIN	1/16	100	0
	MAX	1/8	50	0
1.00	MIN	1/16	100	100
	MAX	3/16	50	0
1.10	MIN	3/32	100	100
	MAX	1/4	70	0
1.25	MIN	1/8	100	100
	MAX	5/16	100	0
1.35	MIN	5/32	100	100
	MAX	3/8	100	0
1.50	MIN	3/16	100	100
	MAX	7/16	100	20
1.65	MIN	1/4	100	100
	MAX	1/2	100	30

TABLE 2 RECOMMENDED SETTING MODEL 101 CRD

FIRING RATE	RETENTION RING SETTING INCHES ON SCALE (DIM "A" FIGURE)		AIR CONTROL SETTING	
			PER OPENING AIR SHUTTER	PERCENT OPENING PER BAND
1.75	MIN	1/4	100	50
	MAX	1/2	100	0
2.00	MIN	5/16	100	100
	MAX	9/16	100	20
2.25	MIN	3/8	100	100
	MAX	5/8	100	40
2.50	MIN	1/2	100	100
	MAX	11/16	100	60
2.75	MIN	5/8	100	100
	MAX	11/16	100	100

BE SURE THAT ALL OIL LINE CONNECTIONS ARE ABSOLUTELY AIRTIGHT. CHECK ALL CONNECTIONS AND JOINTS. FLARED FITTINGS ARE RECOMMENDED. DO NOT USE COMPRESSION FITTINGS.

OPEN THE AIR-BLEED VALVE AND START THE BURNER. FOR CLEAN BLEED, SLIP A 3/16" ID HOSE OVER THE END OF THE BLEED VALVE AND BLEED INTO A CONTAINER. CONTINUE TO BLEED UNTIL OIL IS FREE OF AIR BUBBLES. STOP THE BURNER AND CLOSE THE BLEED VALVE.

#8.

FUEL UNITS AND OIL LINES

STANDARD BURNERS ARE PROVIDED WITH SINGLE STAGE 3450 RPM FUEL UNITS WITH THE BY-PASS PLUG REMOVED FOR SINGLE PIPE INSTALLATIONS. USING 3/8" OD COPPER TUBING, THE FOLLOWING TABLE SHOWS THE ALLOWABLE LIFT AND LENGTH OF TUBING:

LIFT (FEET)	LENGTH OF TUBING(3/8"OD) (FEET)
0	100
5	75
8	60
10	50

FOR TWO-PIPE INSTALLATIONS THE BY-PASS PLUG MUST BE INSTALLED. THE FOLLOWING TABLE SHOWS THE ALLOWABLE LIFT AND LENGTHS OF 3/8" OD TUBING FOR BOTH SUCTION AND RETURN LINES:

LIFT (FEET)	LENGTH OF TUBING(3/8"OD) (FEET)
0	65
2	54
4	45
6	35
8	25
10	16

#9.

LIGHT-OFF AND ADJUSTMENT

BEFORE STARTING THE BURNER, PRESET THE AIR SHUTTER, THE AIR BAND, AND THE RETENTION RING POSITION FOR YOUR PARTICULAR FIRING RATE ACCORDING TO THE TABLE.

IF THE FIRE IS A LITTLE TOO RICH, MOVE THE COMBUSTION HEAD FORWARD BY INCREASING DIMENSION "A,". AT THE LOWER INPUTS, A VERY SLIGHT CHANGE IS USUALLY ENOUGH.

ADJUST DRAFT TO 0.01 TO 0.03 INCHES W.C. OVER THE FIRE FOR NATURAL DRAFT UNITS.

RUN A SMOKE TEST. STRIVE FOR ZERO OR A TRACE. EACH TIME FURTHER ADJUSTMENT OF AIR OR RETENTION RING IS MADE, RESET THE DRAFT TO 0.01 TO 0.03 INCHES W.C. OVER THE FIRE.

CHECK CO₂. THIS SHOULD BE OVER 10 PERCENT, AND WILL OFTEN BE OVER 12 PERCENT, IN A WELL-SEALED UNIT AT INPUTS OF 1.00 GPH AND HIGHER

CHECK FOR GOOD IGNITION AND CLEAN CUT-OFF. IF CUT-OFF CONTINUES TO BE POOR, LOOK FOR AIR LEAKS IN THE SUCTION LINE AND CORRECT THEM.

THE **HBSmith**
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WESTFIELD, MASSACHUSETTS, 01085

