MANUAL NO. 23766-3-79

92C · 93C

SERIES

Oil Burners

INSTALLATION MANUAL

ABC Sunray
An ŒRTLI Energy Co.
45 South Service Road, Plainview, New York 11803 • 516/293-6800 TELEX: 967893

PRICE $1.00

THESE BURNERS ARE U/L APPROVED FOR A MAXIMUM FIRING RATE OF 7.00 GALLONS PER HOUR WITH ALL AVAILABLE AIR. WHEN FIRING CERTAIN HEATING UNITS WHERE IT IS NECESSARY TO OBTAIN AS LOW AS 9% to 10% CO_2, WITH ALL AVAILABLE AIR, THE MAXIMUM FIRING RATE MAY BE REDUCED. IN SUCH CASES TESTING WILL BE NECESSARY TO DETERMINE THE MAXIMUM FIRING RATE.

GENERAL PARTS INFORMATION

MOTOR: Standard equipment includes a continuous duty, flange mounted, split phase type, 3450 RPM, 115V/60C motor. Motors for other conventional current specifications are available. Burner models with the suffix "-1," "-2", or "-2X", have 1/4 H. P. motors. All models with a "-S" suffix are equipped with 1/8 H. P. motors.

FUEL UNIT: The fuel unit assembly consists of pump, strainer and pressure regulating valve in one compact unit. The fuel unit is driven by the motor through a flexible coupling and operates at motor speed. Use proper piping and hook-up as specified by the fuel unit manufacturer.

TRANSFORMER: Standard equipment includes an ignition transformer with 115 volt/60 cycle primary and 10,000 volt mid-point grounded secondary circuit. Transformers for other conventional current specifications can be furnished.

DRAWER ASSEMBLY: The combination of oil pipe, electrode support or spinner, static pressure disc (where used), insulators, electrodes and nozzle adaptor is designated as a "Drawer Assembly". The electrodes are mounted through hollow high-tension insulators which are clamped in the electrode support. The entire drawer assembly is easily removable for inspection and adjustment.

ASSEMBLY: Motors, transformers and fuel units made by several different manufacturers are used in assembly of this burner; however, these components are interchangeable on all ratings. The motor and fuel unit are mounted on an accurately fabricated blower housing assembly, insuring correct alignment. A flexible coupling is used between the motor and fuel unit so that either can be removed quickly for inspection or replacement.

AIR TUBE: The actual overall air tube measurements are 5-3/4", 6-3/4", 7-3/4", 10-3/4" and 16-3/4". The 5-3/4" and 6-3/4" tubes are considered standard, with other lengths available at an additional charge.

BURNER MOUNTING: A rugged pedestal, adjustable for height is furnished as standard. Flange mounting is optional, the flange has slots on 90°, 45° and 120° angles to fit 3/8" studs on a 6" to 7-1/2" diameter bolt circle. The burner can also be furnished with a flange welded to the air tube at an additional charge. This flange can be welded to the air tube at a dimension from the end of the choke determined by the dimension from the face of the boiler to the inside of the refractory.

NOZZLE SPECIFICATIONS: Solid spray nozzles with seventy degree spray angle are usually specified; however, these may vary from 60 to 90 degrees, depending on the design of the combustion chambers and units in which the nozzles are to be fired. The delivery of oil from the nozzles may differ from the marked GPH and spray angle due to variations in the temperature and viscosity of the oil.

Burner Data

Burner Model Numbers	Burner Ratings	Blower Wheel Size	Capacity Range G.P.H.	Control Information	Motor H. P.	Fuel Unit
92C-S	B to H1	5-1/4" x 3-1/4"	0.65 - 3.00	Group 1 & 2	1/8	Low Torque Type
93C-S	B to H1	5-1/4" x 3-1/4"	0.65 - 3.00	Group 1 & 2	1/8	Low Torque Type
94C-S	B to H1	5-1/4" x 3-1/4"	0.65 - 3.00	Group 1 & 2	1/8	Low Torque Type
92C-1	B to H1	5-3/4" x 4"	0.65 - 3.00	Group 1 & 2	1/4	Standard Type
93C-1	B to H1	5-3/4" x 4"	0.65 - 3.00	Group 1 & 2	1/4	Standard Type
94C-1	B to H1	5-3/4" x 4"	0.65 - 3.00	Group 1 & 2	1/4	Standard Type
Note: G2 rating only use 5-1/4" x 3-1/4" Blower Wheel						
92C-2	H2 to L	5-3/4" x 4"	2.25 - 6.00	Group 7	1/4	Standard Type
93C-2	H2 to L	5-3/4" x 4"	2.25 - 6.00	Group 7	1/4	Standard Type
94C-2	H2 to L	5-3/4" x 4"	2.25 - 6.00	Group 7	1/4	Standard Type
Note: H6 and H7 ratings only use 5-1/4" x 3-1/4" Blower Wheel						
93C-2X	L1 to O	6" x 3-5/8"	3.00 - 7.00	Group 7	1/4	Standard Type
94C-2X	L1 to O	6" x 3-5/8"	3.00 - 7.00	Group 7	1/4	Standard Type

Models 92C-1, 93C-1, 94C-1

"OIL BURNER RATING CHART"

Rating	Choke Part No. - I.D.	Static Disc Part No. - O.D. Type	Support	Air Bands	12 Blade Spinner Part No. - O.D.	Range
B	10850 - 2-1/8"	8474 - 3-1/2" Perf.	12680	(2) SA-9604	SA-10856 2"	.65 - 1.10
B-1	10850 - 2-1/8"	8474-CS 3-1/2" Perf.	10875	(2) SA-9604	SA-10856 2"	1.00 - 1.25
B-2	10850 - 2-1/8"	7893-CS 2-1/2" Solid	10875	(2) SA-9604	SA-10856 2"	1.00 - 1.50
B-3	10850 - 2-1/8"	7397-CS 3-1/2" Solid	10875	(2) SA-9604	SA-10856 2"	.75 - 1.10
C	10850 - 2-1/2"	8474 3-1/2" Perf	12680	(2) SA-9604	SA-11624-2-1/4"	1.00 - 1.25
C-1	10850 - 2-1/2"	7891-CS 3" Perf.	10875	(2) SA-9604	SA-11624 2-1/4"	1.25 - 1.50
C-2	10850 - 2-1/2"	8474 CS-3-1/2" Perf.	10875	(2) SA-9604	SA-11624 2-1/4"	1.25 - 1.75
D	10850 - 2-5/8"	8474 3-1/2" Perf.	12680	(2) SA-9604	SA-11624 2-1/4"	1.10 - 1.50
D-1	10850 - 2-5/8"	7914-CS 2-3/4" Perf.	10875	(2) SA-9608	SA-11624 2-1/4"	1.50 - 2.00
D-2	10850 - 2-5/8"	7891-CS-3" Perf.	10875	(2) SA-9604	SA-11624 2-1/4"	1.25 - 1.75
E	10850 - 2-3/4"	8474 3-1/2" Perf.	12680 12680	(2) SA-9604	SA-11624 2-1/4"	1.25 - 1.75
F	10850 - 2-7/8"	8474 3-1/2" Perf.	12680	(2) SA-9604	SA-11624 2-1/4"	1.35 - 2.00
F-1	10850 - 2-7/8"	8297-CS 2-3/4" Solid	10875	(2) SA-9604	SA-11624 2-1/4"	1.35 - 2.00
F-2	10850 - 2-7/8"	8058-CS 2-1/2" Perf.	11648	(2) SA-9608	SA-11624 2-1/4"	1.75 - 2.25
F-3	10850 - 2-7/8"	None	11648	(2) SA-9608	SA-11624 2-1/4"	2.00 - 2.50
G	10850 - 3"	8474 3-1/2" Perf.	12680	(2) SA-9608	SA-11624 2-1/4"	1.50 - 2.50
G-1	10850 - 3"	9502-CS-2-1/4" Perf.	11648	(2) SA-9608	SA-11624 2-1/4"	2.00 - 2.50
*G-2	10850 - 3"	7549-CS-3" Solid	11648	(2) SA-9608	SA-11624 2-1/4"	2.25 - 3.00
H	10850 - 3-1/8"	None	12680	(2) SA-9608	SA-11772 2-1/2	1.75 - 2.50
H-1	10850 - 3-1/8"	8563 3-1/4" Solid		(2) SA-9608	SA-11624 2-1/4"	2.00 - 3.00

Models 92-C-1, 93C-1 and 94C-1 will use 5-3/4" dia. x 4" blower wheel assembly (A-9175)
*Note "G-2"Rating to use 5-1/4" dia. x 3-1/4" blower wheel assembly (A-10309)

Models 92C-2, 93C-2 and 94C-2

Rating	Choke Part No. - I.D.	Static Disc Part No. - O.D. Type	Support	Air Bands	12 Blade Spinner Part No. - O.D.	Range
H-2	10850 - 3-1/8"	None	12680	(2) SA-9608	SA-11624 2-1/4"	2.50 - 3.50
H-3	10850 - 3-1/4"	None	11648	(2) SA-9608	SA-11624 2-1/4"	2.25 - 4.00
H-4	10850 - 3-1/4"	9502-CS 2-1/4" Perf.	11648	(2) SA-9608	SA-11624 2-1/4"	2.75 - 3.75
H-5	10850 - 3-1/4"	None	11648	(1) SA-9604 (1) SA-9608	SA-12262 2-1/2" w/shroud	2.50 - 4.00
*H-6	10850 - 3-1/4"	7891-CS-3" Perf.	11648	(2) SA-9608	SA-12262 2-1/2" w/shroud	2.50 - 4.00
*H-7	10850 - 3-1/4"	9502-CS-2-1/4" Perf.	11648	(2) SA-9608	SA-12262 2-1/2" w/shroud	2.50 - 4.00
J	10850 - 3-1/2"	None	12680	(2) SA-9608	SA-11772 2-1/2"	2.50 - 3.50
J-1	10850 - 3-1/2"	9502-CS 2-1/4" Perf.	11648	(2) SA-9608	SA-11624 2-1/4"	3.00 - 5.00
K	None	None	12680	(2) SA-9608	SA-11772-2-1/2"	3.00 - 4.50
K-1	8809 - 3-9/16"	None	11648	(2) SA-9608	SA-11772 2-1/2"	3.00 - 5.00
K-2	8809 - 3-9/16"	None	11648	(2) SA-9608	SA-12262 2-1/2" w/shroud	4.00 - 6.00
K-3	8809 - 3-9/16"	9502-CS-2-1/4" Perf.	11648	(2) SA-9608	SA-11624 2-1/4"	2.50 - 4.50
L	8809-3-9/16"	None	11648	(2) SA-9608	SA-11624 2-1/4"	4.00 - 6.00

Models 92C-2, 93C-2 and 94C-2 to use 5-3/4" dia. x 4" Blower Wheel Assembly (A-9175)
*Note: "H-6" and "H-7" rating to use 5-1/4" dia. x 3-1/4" Blower Wheel Assembly (A-10309)

Models 93C-2X and 94C-2X

L-1	8809 - 3-9/16"	None	11648	(2) SA-9608	SA-11624 2-1/4"	4.00 - 6.00
M	None	None	11648	(2) SA-9608	SA-11624 2-1/4"	5.00 - 7.00
N	8809 - 3-9/16"	None	11648	(2) SA-9608	SA-11772 2-1/2"	3.00 - 5.00
O	None	None	11648	(2) SA-9608	SA-11772 2-1/2"	4.00 - 7.00

Model 93C-2X and 94C-2X to use 6" x 3-5/8" Blower Wheel Assembly (A-12175)

ALL OF THE ABOVE CAPACITIES ARE BASED ON OPERATION AT SEA LEVEL, WITH 115 VOLT, 60 CYCLE CURRENT, CATALYTIC OIL, AND PUMP PRESSURE SET AT 100 P.S.I. WHEN USED WITH 25 OR 50 CYCLE CURRENT, THE CAPACITY OF THE BURNER IS REDUCED BY 20%. CAPACITY OF EACH RATING IS APPLICABLE UP TO 1000 FEET OF ALTITUDE. FOR EACH ADDITIONAL 1000 FEET OF ALTITUDE, EACH RATING IS REDUCED BY 5%. ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

NOZZLE SPECIFICATIONS: The hollow type of spray is recommended for the smaller capacity nozzles and the solid spray types for the larger sizes (Refer to Rating Tables). Sixty degree spray angle nozzles are usually specified; however, these may vary from 60 to 90 degrees, depending on the design of the combustion chambers and units in which the nozzles are to be fired. The delivery of oil from the nozzles may differ from the marked GPH and spray angle due to variations in the temperature and viscosity of the oil. Pump pressure also has a bearing on the delivery as shown in the following table:

APPROXIMATE OUTPUT OF NOZZLES

At 75 p.s.i., 100 p.s.i., & 125 p.s.i. *

U.S. Gallons per Hour -- #2 Fuel Oil

Single Nozzle Rating in GPH at 100 p.s.i.	Pump Operating Pressure * Pounds per Square Inch			Single Nozzle Rating in GPH at 100 p.s.i.	Pump Operating Pressure * Pounds per Square Inch		
	75	100	125		75	100	125
1.00	0.87	1.00	1.12	1.75	1.51	1.75	1.96
1.10	0.96	1.10	1.23	2.00	1.73	2.00	2.24
1.25	1.09	1.25	1.40	2.25	1.95	2.25	2.52
1.35	1.17	1.35	1.51	2.50	2.16	2.50	2.80
1.50	1.30	1.50	1.68	2.75	2.40	2.75	3.08
1.65	1.43	1.65	1.85	3.00	2.59	3.00	3.35

Based on fuel oil weight 7.16 pounds per gallon at 74° Farenheit and 34 SSU Viscosity at 100° Farenheit.

For an accurate check on the oil delivery, remove the drawer assembly and connect it outside the burner. Start the burner, collect the oil flow from the nozzle for one minute and measure it in a graduate marked in cubic centimeters. (Some safety controls may trip if operated for one minute. In this case, collect the flow from the nozzle for 30 seconds, measure the cubic centimeters, multiply by two and then check with the chart). Listed below is the required flow in cubic centimeters (cc) per minute to obtain the output shown in gallons per hour.

GPH	CC per Min.
1.00	63.0
1.10	69.0
1.25	78.5
1.35	85.0
1.50	95.0
1.65	104.0

GPH	CC Per Min
1.75	110.0
2.00	126.0
2.25	141.5
2.50	157.0
2.75	173.0
3.00	190.0

Due to the variations in oil and nozzles, there might be occasions where it is difficult to clean up the fire. Make sure that the nozzle is the correct input and spray angle. If, with the air inlet band wide open, the fire cannot be cleaned up, change the static pressure disc to the next smaller size. In some cases, it might correct the condition by changing the choke to the next larger diameter choke.

INSTALLATION POINTERS

OIL TANKS AND PIPING:

a. Miscellaneous Information: If suction and return lines are under 30 feet in length, 3/8" OD copper tubing may be used, but never smaller; however, when the oil line is 30 feet or over, 1/2" tubing is recommended. Where basement tanks or tanks installed above the burner are used, and when the oil flows by gravity to the oil pump, a single-stage fuel unit with a single oil line to the pump may be used. Avoid as many connections as possible in the suction line and make up all connections as tightly as possible, using a good pipe joint compound for oil on all pipe threads. To minimize the possibility of air leaks, tighten packing gland on any valve installed in the suction line. Also, be sure to tighten the cover on oil filter, as filter gaskets often shrink. Check for kinks in the oil lines as well as for possible air pockets and for loose connections.

Underwriters' Laboratories' requirements now in effect stipulate a bottom outlet on all 275 gallon tanks. This is to prevent the accumulation of condensate which causes the tank to rust. A water trap can be installed at the tank outlet to prevent the water from entering the burner. There are a number of additives on the market that can be put in the tank with the fuel oil. These additives hold the water in suspension and allow it to pass into the burner. Consult a local fuel oil dealer for information concerning the use of these additives.

b. Single Line System: This type of installation is used where the tank is above the burner and gravity oil feed to the burner is permitted. It is not recommended where it is necessary to lift the oil. The strainer cap should be in the single line position on Webster Q and T series fuel units. For Webster R series fuel units and for Sundstrand fuel units do not install the bypass plug. The oil outlet should be taken from the bottom of the tank and the line should have a gradual slope downward of approximately 1/2" per foot or more to a point directly below where it is connected to the burner. Sloping the line will prevent the formation of air pockets and the collection of air bubbles which might interfere with the proper operation of the burner. A shut-off valve should be installed in the line.

c. Two Line System: If an oil tank is buried or if a suction line is long, it is recommended that a two-stage fuel unit with a two line (suction and return) installation be installed. For Webster T series fuel units the strainer cap should be turned to the two line position. For Webster R series insert the bypass plug through the inlet port and turn tight. For Sundstrand fuel units insert the bypass plug through the return port and turn tight.

d. Suction Line: It is recommended that extra heavy wall copper tubing be used for this line. If standard wrought iron pipe is used, it should be scale-free and not smaller than 1/2". A complete loop of 3/8" copper tubing should be installed to connect the pipe to the fuel unit. Where tubing is used, one complete loop should be made in the tubing immediately below the fitting connecting it to the oil pump in order to reduce transmission of noise and to prevent strain on the burner. When the top of the tank is below the level of the fuel unit, high points or air pockets in the suction line must be avoided between the tank and the fuel unit, and a 3/8" ball check valve should be installed in the basement to prevent the return of the oil to the tank during the off-cycle period of the burner. Do not run suction or return line overhead as this greatly increases the possibility of air traps, oil leaks, syphoning and transmission noise. When the top of the tank is above the fuel unit, and gravity feed to the fuel unit is not permitted, the suction line should be run to a point above the tank where an approved anti-syphon valve and a 3/8 gate valve must be installed. These valves should be installed inside. No ball check valve is required, but a union should be installed between the gate valve and the strainer to facilitate the removal of the strainer for cleaning when necessary.

e. Return Line: The return line should be the same size as the suction line and run as directly as possible from the return opening in the fuel unit to the tank and should extend into the tank to the same depth as the suction line.

f. Pressure Test for Buried Oil Lines: It is important that buried oil lines be thoroughly tested for leaks before being covered.

DRAFT REGULATORS: Use a draft regulator on all installations, but never use a small one. They do not do a satisfactory job. An 8" or 9" draft control is satisfactory up to 2.50 GPH. Install the draft regulator as close as possible to the chimney. If the smoke pipe is too short to make a satisfactory installation, the draft regulator may be installed in the chimney either above or below the smoke pipe entry into the chimney. There is a considerable difference of opinion as to whether or not the draft regulator may be installed in the chimney; however, many satisfactory installations have been made with the draft regulator installed in the chimney either above or below the smoke pipe. If a 6" or 7" outlet is furnished on the heating unit, it is often advisable to run a 6" or 7" pipe within three feet of the chimney, and then increase the size to 9", and then at that point, install a 9" draft regulator.

CHIMNEY: Be sure that the chimney is sufficiently high and large enough to meet specifications of the heating unit installed. It is best that only the heating unit be connected to the chimney. for other units connected to the same flue can cause trouble. The chimney should be clean. See further information on chimney towards end of this manual.

FILTER: All burners using 1.00 GPH or less should have two filters in the oil supply line. It is well to have one as near as possible to the tank (but always inside the building) and the other as near as possible to the burner. On burners using more than 1.00 GPH, one filter is sufficient. The filter cartridge should be replaced at least once a year. The filter body should be thoroughly cleaned before installing a new cartridge.

AIR FOR COMBUSTION: Do not install burners in rooms with insufficient air to support combustion. Occasionally, it is necessary to install windows or cut holes in a door to these rooms to obtain sufficient air. An opening at least twice the area of the smoke pipe is necessary.

COMBUSTION CHAMBER: If the combustion chamber is not furnished with the heating unit, it should be constructed to the proper dimensions for heating load as shown in Nozzle and Combustion Chamber Data Chart. Slight variations can be made in the dimensions when required.

WIRING: All wiring must be done in accordance with the National Electric Code and local ordinances. In many localities, No. 14 wire run in rigid conduit must be used, but, where permissible, two and three wire BX is recommended, particularly for connections to the controls and burner motor. A cut-off switch for the main 115 volt line to the burner should be mounted on a fire-proof wall in an accessible place close to the burner.

BURNER INSTALLATION:

a. Controls: Instructions for installing and wiring the controls will be found packed with the controls. The controls should be installed strictly in accordance with these instructions, and, in case the control should prove defective, it should be returned direct to the control manufacturer or one of his service stations for repair or replacement.

b. Setting The Burner: The center line of the burner air tube should coincide with the center line of the heating plant. The burner should level across the top of the motor and fuel unit. The air tube should slant slightly downward (2° to 4°) toward the combustion chamber. The end of the burner air tube should be flush with the inside surface of the front wall of the combustion chamber. Be sure that it does not extend into the combustion chamber. For distance of the air tube above the floor of the combustion chamber, refer to Nozzle and Combustion Chamber Data Chart. If combustion chamber is already installed in heater, use opening provided for burner tube. Space between burner tube and refractory should be sealed with asbestos or other insulating material. Where a pedestal mounted burner is used, make sure that the burner does not touch heating unit at any point.

c. Installing Nozzle: Make sure that the proper size nozzle for the installation has been selected. Loosen the screw holding the transformer in position and swing the transformer back. Disconnect the oil line and remove the drawer assembly. The drawer assembly should be removed from the burner for screwing the nozzle in place. Do NOT attempt to get a tight joint between the nozzle and the nozzle adaptor unless two wrenches are used. Although the electrodes are adjusted at the time of manufacture, they should be checked at the time of installation to be sure that they are set in accordance with the drawing in this manual. Replace the drawer assembly, connect the oil line, close the transformer and tighten transformer locking screw. When changing nozzles on the burner, remove the 12 blade spinner, replace nozzle. Replace the spinner making sure it is tight against the spinner stop before securing spinner to nozzle adaptor. After the drawer assembly is installed in the burner, make sure the adjusting plate is tight against adjusting plate stop. Secure lock nut and oil line.

d. Rotate Blower Wheel: The blower wheel should be rotated by hand to be sure that the motor and fuel unit turn freely.

e. Oil Motor: Oil motor with one or two drops of good motor oil.

f. Priming The Fuel Unit: When the burner is installed and ready to operate, connect a 1/8" pipe nipple or a piece of small copper tubing with a 1/8" connector into the gauge tapping on the pressure side of the fuel unit so that the end of the nipple or tube points into a container. With the main cut-out switch off, set the thermostat well above room temperature and set the limit control (s) so that they call for a burner start. Be sure the safety switch on the combustion control is in operating position. Then close the main cutout switch and burner will start. Oil will be delivered into the container as soon as the air had been vented from the suction line. While running under these conditions, the pressure valve in the pump will not open, hence there will be no flame. It is advisable to allow a gallon or two of oil from the tank to be pumped into the container in order to wash out the suction line. If burner goes into safety before this is accomplished, it may be necessary to hold the combustion control in burner operating position in order to keep the motor running along enough to accomplish this. Then shut off the burner with the main cutout switch.

The above is not necessary when the two pipe system is used. Install pressure gauge and turn burner on. The system will vent itself through the return line and flame will appear as soon as the air has been eliminated.

g. To Put The Burner Under Fire: Remove the temporary oil connection previously used and install a pressure gauge. See that all controls are set in normal starting position. With the heating plant door open and with the air inlet on burner about half open, close the main cutout switch. Do not stand in front of open door. The burner should start, ignite and burn. Then close the heating plant door. After you have obtained a flame, the oil pressure should be checked and adjusted to a pressure of 100 lbs. (if necessary). This is the normal operating pressure. The air inlet can then be adjusted so that the flame is a clean yellow with slightly smoky tips. It may be necessary to readjust the air inlet after the burner is running twenty minutes or more in order to obtain the proper fire with a hot heating plant. After final adjustment, tighten lock screws on air inlet, let unit cool and start burners once again, in order to be sure burner operates on a cold start. Remove the pressure gauge and install pipe plug. Viewing the flame front with a flame mirror, make sure fire burns off the 12 blade spinner approximately 1/4". If the fire burns on the 12 blade spinner, pull drawer assembly back. If the fire burns off the spinner more than 1/4", move the drawer assembly forward.

h. Using Instruments To Set Fire: It is far better to use combustion test instruments when adjusting a flame. National Bureau of Standards, Commerical Standards CS75-56 require a minimum of 8% CO_2 with a smoke reading no darker than No. 2 on the Bacharach scale; however, we recommend a smoke reading no darker than No. 1. When using instruments to obtain this, adjust the air inlet on burner for minimum air for clean combustion while combustion chamber is hot. Adjust the draft regulator so that there is .02" draft over the fire. Seal all air leaks around combustion chamber, heater joints and stack. Take your readings and adjust air so that a minimum of 8% CO_2 is obtained with the least smoke possible. When using instruments in setting a fire, do not lean towards getting a greater percentage of CO_2 than a clean fire will give. It is more important to keep the inside of the heating plant clean than to receive a higher CO_2. A smoke scale reading of No. 3 may produce some sooting in certain types of units, but rarely will require cleaning more than once a year.

i. Nozzle (oil input) Variations: Several nozzles of different manufacture, angles and types of spray should be carried by installer to determine the most suitable for the particular application. Fuel oils vary greatly. Because of this, nozzles will not always deliver the gallonage per hour or angle of spray that is stamped on them. In addition, it has been found that, in certain areas, due to local conditions, nozzles other than those furnished as original equipment give better performance due to the type of oil being delivered.

j. Draft : Check to be sure that the overfire draft or pressure condition is in accordance with the appliance manufacturers specifications. High draft loss may be caused by low CO_2, or may cause an excess deposit of soot in the flues of the heating plant and in the smoke pipe. High draft loss may also be caused by overfiring or too much excess air. With a draft gauge reading of .02" over the fire, the draft reading in the stack should be .04" to .06" for low inputs (up to 2.00 G.P.H.) and .06" to .08" for the higher inputs (2.00 to 5.50 G.P.H.). These figures are average and do not apply to all heating plants. If in doubt as to some particular heating plant, contact the manufacturer for detailed information on the darft loss of this unit at specified firing rates.

If there is back draft caused by down draft, do not install the burner until this situation is corrected. Back pressure (back draft or down draft) may also be caused by the chimney being lower than surrounding objects, such as buildings, hills, trees, rooftops, etc. It may also be caused by an exhaust fan in the building when there is too small an air intake in the heater room. The air intake in this room should be of sufficient size so that there is no change in the draft reading in the stack with the exhaust fan running or not running, and at least twice the area of the smoke pipe.

k. Conversion Installations: Clean Heating unit thoroughly before starting burner installation and inspect for leaks and other defects.

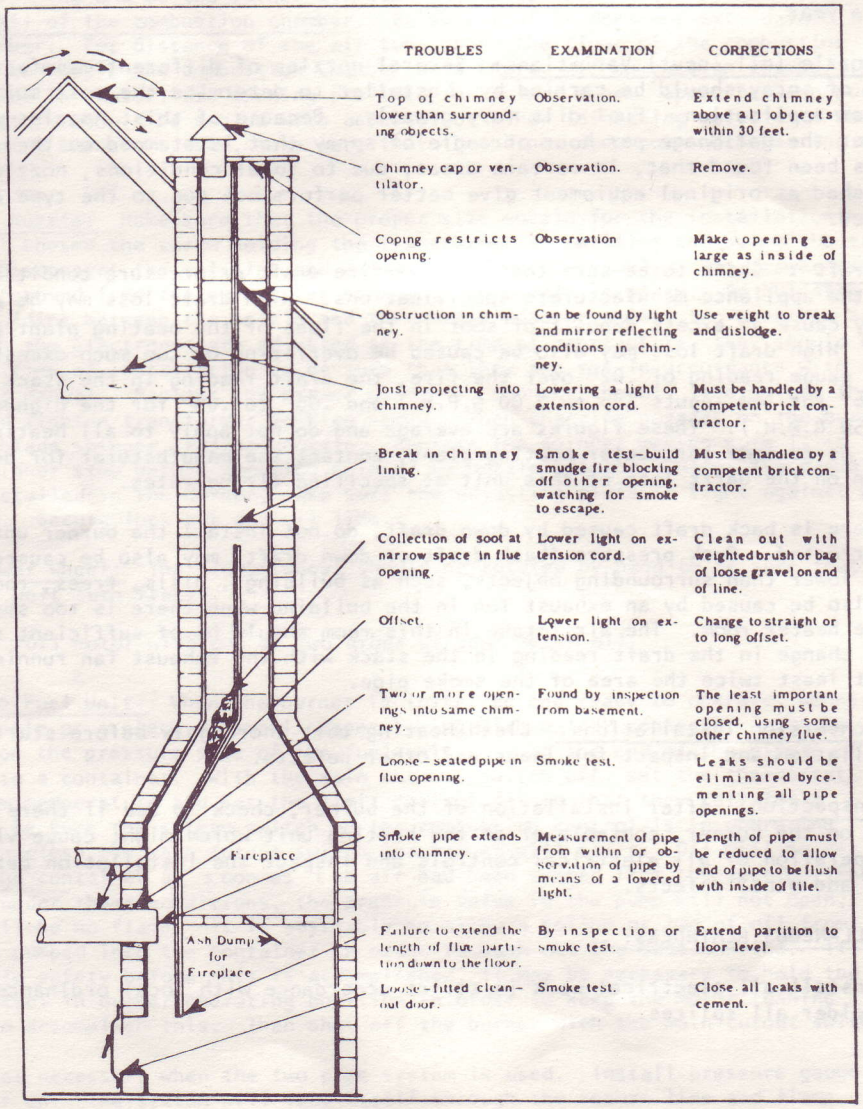
l. Inspection: After installation of the burner, check to see if there are any loose parts on the burner, controls or on the heating unit which might cause vibration. Check the operation of all electrical controls and inspect the installation carefully for oil leaks and other defects.

MISCELLANEOUS REMINDERS:

a. Install all electrical work in strict accordance with local ordinances.
b. Solder all splices.

c. Steam pressure controls must be protected by a "pig-tail" or patented trap.
d. All unions must be of the ground seat type. Gasket unions will not do.
e. A check valve must be installed in the suction line when the tank is below the burner to prevent the return of the oil to the tank when the fuel unit is not in operation.
f. Do not permit any part of the burner to come in metallic contact with any part of the heating plant.
g. Rotate burner blower wheel by hand to be sure pump and motor are free.
h. Lubricate oil burner motor.
i. See if the draft conditions are right. Air leaks may kill the draft. Test chimney, smoke pipe and heating unit for air leaks.
j. See that the smoke pipe enters into chimney far enough to be tight and yet not so far as to reduce flue area. Its end should be flush with the inside of the flue.
k. Be sure that there is at least .02" draft over the fire.
l. Be sure that there is no down draft or back draft.
m. Be sure that there is sufficient air in heater room for proper combustion at all times.
n. Explain the operation of the burner to the owner--show where to oil-- how to operate controls and main cutout switch.
o. Hang Burner Operating Instructions in prominent place near installation.

COMMON CHIMNEY TROUBLES AND THEIR CORRECTIONS



TROUBLES	EXAMINATION	CORRECTIONS
Top of chimney lower than surrounding objects.	Observation.	Extend chimney above all objects within 30 feet.
Chimney cap or ventilator.	Observation.	Remove.
Coping restricts opening.	Observation	Make opening as large as inside of chimney.
Obstruction in chimney.	Can be found by light and mirror reflecting conditions in chimney.	Use weight to break and dislodge.
Joist projecting into chimney.	Lowering a light on extension cord.	Must be handled by a competent brick contractor.
Break in chimney lining.	Smoke test-build smudge fire blocking off other opening, watching for smoke to escape.	Must be handled by a competent brick contractor.
Collection of soot at narrow space in flue opening.	Lower light on extension cord.	Clean out with weighted brush or bag of loose gravel on end of line.
Offset.	Lower light on extension.	Change to straight or to long offset.
Two or more openings into same chimney.	Found by inspection from basement.	The least important opening must be closed, using some other chimney flue.
Loose-seated pipe in flue opening.	Smoke test.	Leaks should be eliminated by cementing all pipe openings.
Smoke pipe extends into chimney.	Measurement of pipe from within or observation of pipe by means of a lowered light.	Length of pipe must be reduced to allow end of pipe to be flush with inside of tile.
Failure to extend the length of flue partition down to the floor.	By inspection or smoke test.	Extend partition to floor level.
Loose-fitted clean-out door.	Smoke test.	Close all leaks with cement.

NOZZLE AND COMBUSTION CHAMBER DATA

FOR CONVERSION BURNER INSTALLATIONS

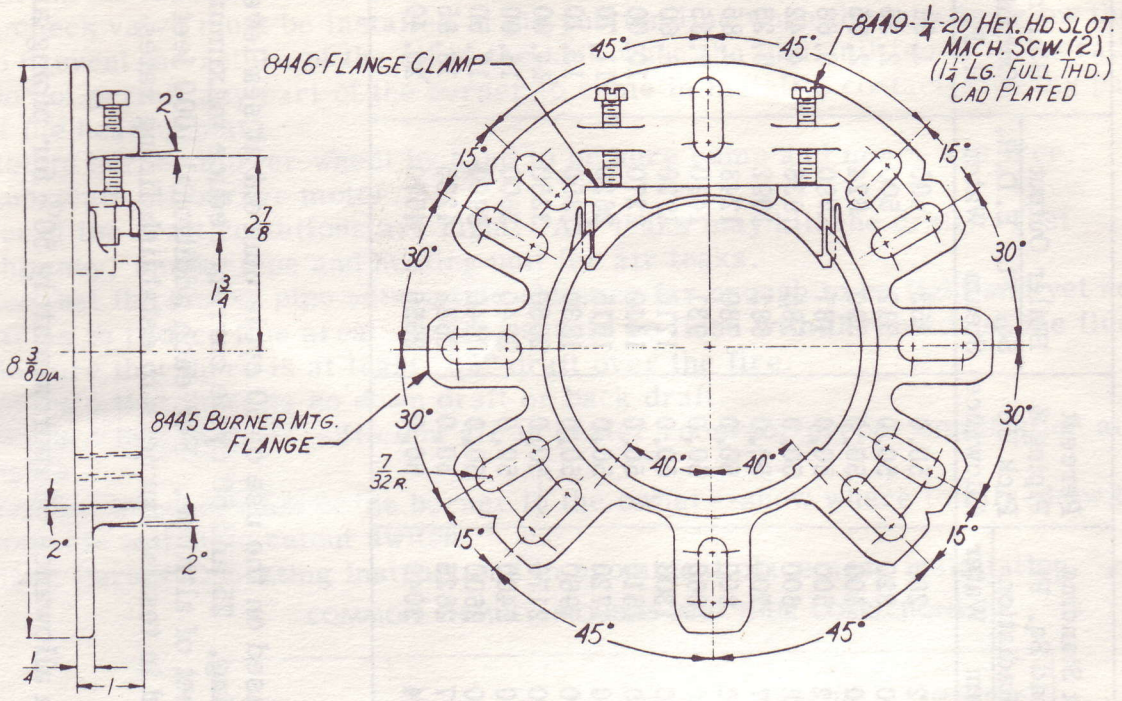
Gallon Per Hour Input	Combustion Chamber		Height of Air Tube*	B. T. U. per Hour		Net Standing Load Sq. Ft. Radiation		Percent Piping & Pick Up Allowance	Boiler Output		Boiler Output H. P.
	Width	Length		Heater Input	Output at 70% Eff.	Steam	Water		Sq. Ft. Steam	E. D. R. Water	
0.65	7"	7"	1.5"	91,000	63,700	162	260	50.0	253	405	1.91
0.80	9"	9"	2.0"	112,000	78,400	200	320	50.0	312	500	2.35
1.00	10"	10"	2.5"	140,000	98,000	250	400	50.0	390	624	2.95
1.25	11"	11"	3.0"	175,000	122,500	312	500	50.0	487	780	3.68
1.50	12"	12"	3.0"	210,000	147,000	375	600	50.0	585	936	4.42
1.75	12"	15"	3.0"	245,000	171,000	437	700	50.0	683	1092	5.25
2.00	12"	15"	3.0"	280,000	196,000	500	800	50.0	780	1248	5.85
2.50	13"	18"	3.0"	350,000	245,000	680	1060	50.0	931	1490	7.35
3.00	15"	18"	4.0"	420,000	294,000	810	1300	50.0	1210	1920	8.60
3.50	15"	20"	4.0"	490,000	343,000	950	1510	50.0	1410	2270	10.00
4.00	15"	20"	4.0"	560,000	392,000	1090	1720	50.0	1615	2620	11.70
4.50	16"	22"	5.0"	620,000	441,000	1220	1960	50.0	1830	2850	13.10
5.00	16"	22"	5.0"	700,000	490,000	1360	2170	50.0	2030	3250	14.60
5.50	18"	24"	5.5"	770,000	539,000	1490	2400	50.0	2240	3600	16.00
6.00	18"	24"	5.5"	840,000	588,000	1630	2600	50.0	2440	3900	17.50
6.50	19"	25"	5.5"	910,000	637,000	1767	2825	50.0	2648	4235	18.95
7.00	23"	30"	6.0"	980,000	686,000	1904	3049	50.0	2856	4570	20.40

The above firing rates are for conversion burners, and are based on the use of 60 cycle current at sea level. I. B. R. firing rates can be established only by laboratory testing. 25 and 50 cycle current reduce maximum capacity by 20%. Capacity of each rating applies up to 1000 feet of altitude. For each additional 1000 feet of altitude each rating is reduced 5%. Catalytic fuel oil was used in testing burners to establish firing rates shown.

Net standing load square feet of radiation is calculated with an allowance of approximately 50% for piping and pickup.

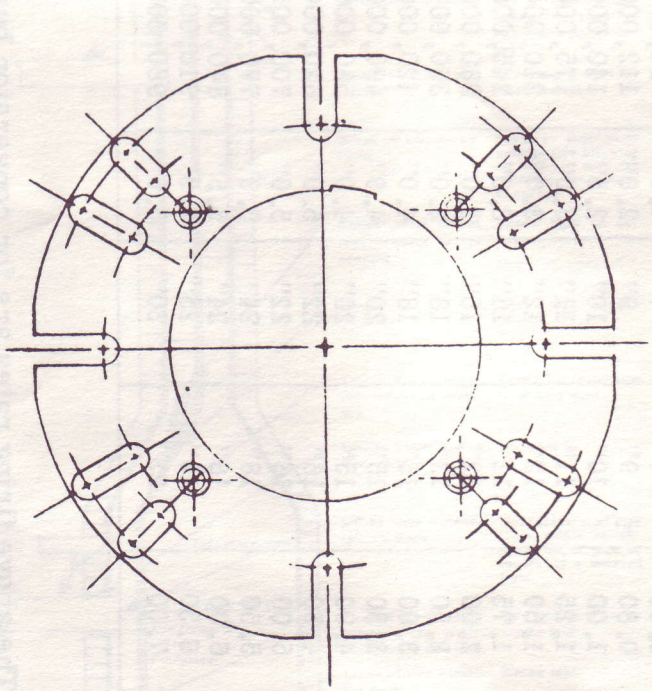
*The height of the air tube specified is distance between the bottom of the air tube and the floor of the combustion chamber.

ADJUSTABLE BURNER MOUNTING FLANGE



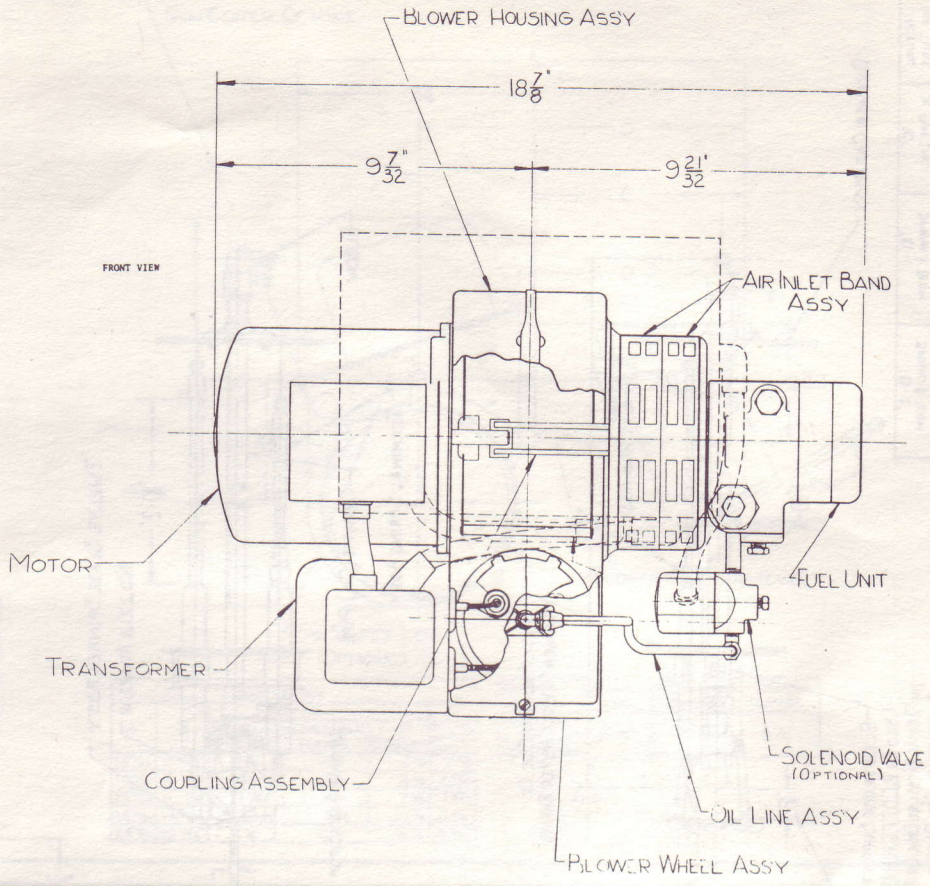
This flange has slots on 90, 45 and 120 degree angles to fit 3/8" studs. All slots (except upper two 45 degree angle slots) are on a 6" to 7 1/2" diameter bolt circle. Upper two 45 degree angle slots are on a 6 5/8" to 7 1/2" diameter bolt circle.

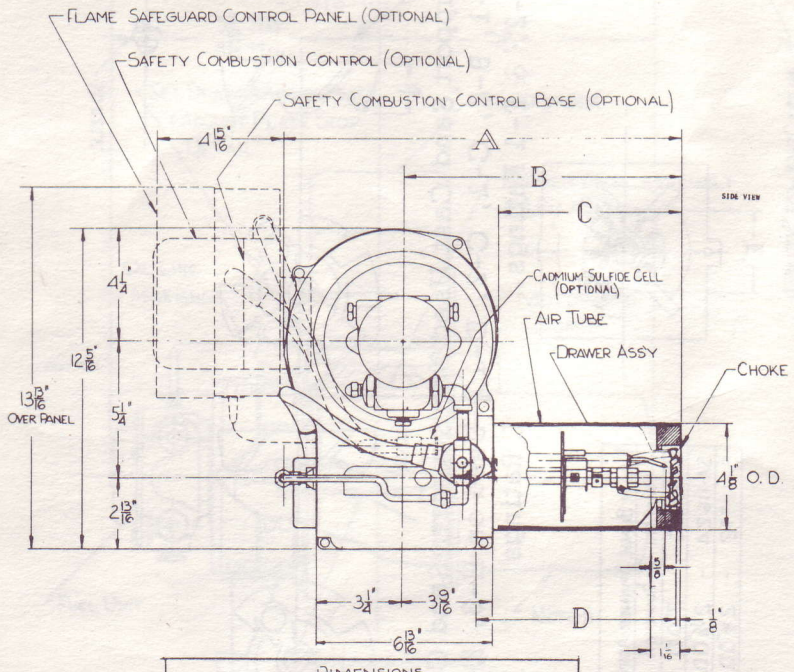
FIXED BURNER MOUNTING FLANGE



This flange has slots on 90, 45 and 120 degree angles to fit 3/8" studs. All slots (except 45 degree angle slots) are on a 6" to 7 1/2" diameter bolt circle. 45 degree angle slots are on a 6 5/8" to 7 1/2" diameter bolt circle.

Models 92C-1, 92C-2 & 92C-S Burner Assembly Drawing

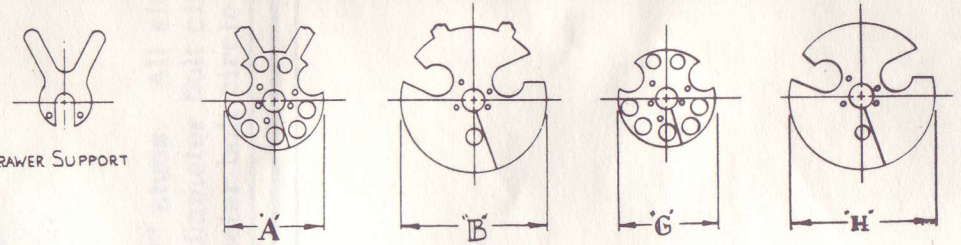


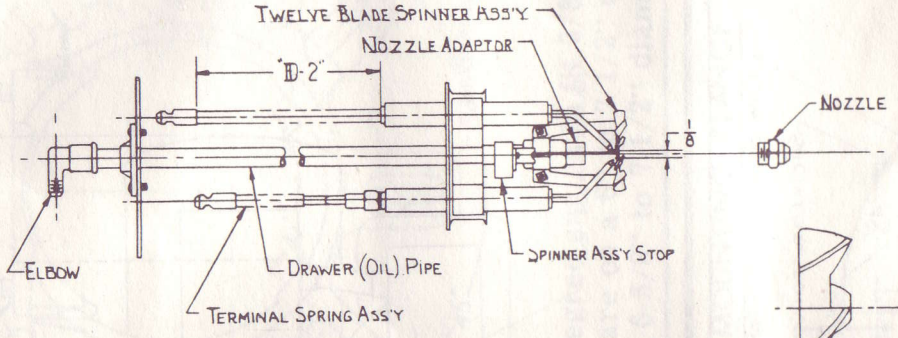


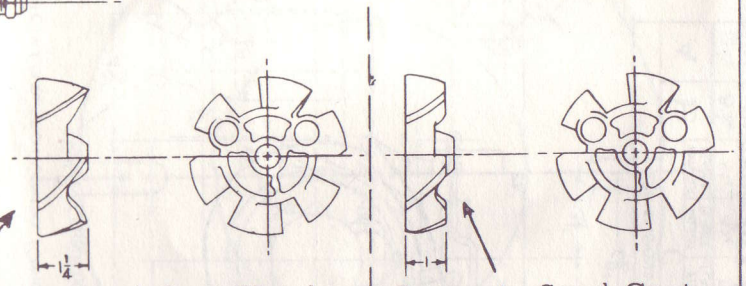
DIMENSIONS						
A	B	C				D
		WITHOUT FLANGE	ADJUST FLANGE	FIXED FLANGE	PEDESTAL	
13 3/8	8 13/16	5 1/4	4 1/4	5 1/8	3 13/16	5 3/4
14 3/8	9 13/16	6 1/4	5 1/4	6 1/8	4 13/16	6 3/4
15 3/8	10 13/16	7 1/4	6 1/4	7 1/8	5 13/16	7 3/4
18 3/8	13 13/16	10 1/4	9 1/4	10 1/8	8 13/16	10 3/4

Models 92C-1, 92C-2 & 92C-S Drawer Assembly Drawing

Static Pressure Disc			
Perforated "A" Dia.	Solid "B" Dia.	Perforated "G" Dia.	Solid "H" Dia.
8474 - 3½	8563 - 3¼	8474CS - 3½	8297CS - 2¾
		7891CS - 3	

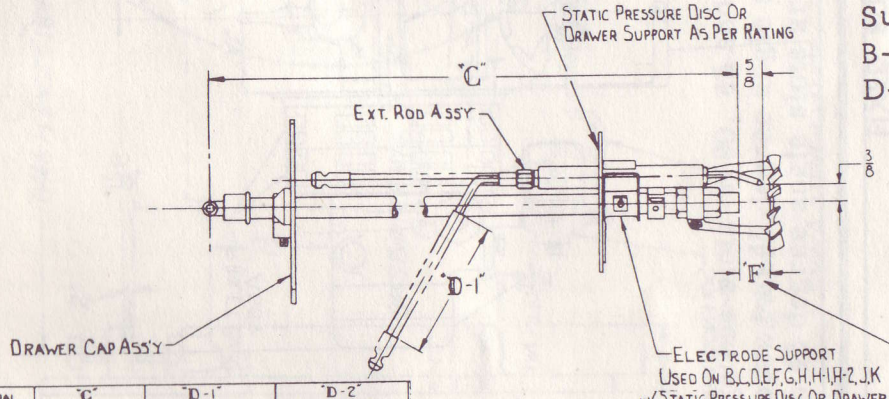


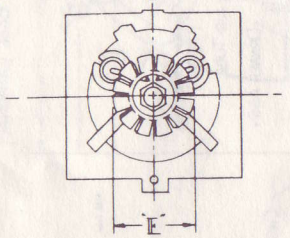




Support, Sand Cast Used on B-1, B-2, C-1, C-2, D-1, D-2, & F-1 Ratings.

Support, Sand Cast Used on H-3, K-1 & L Ratings

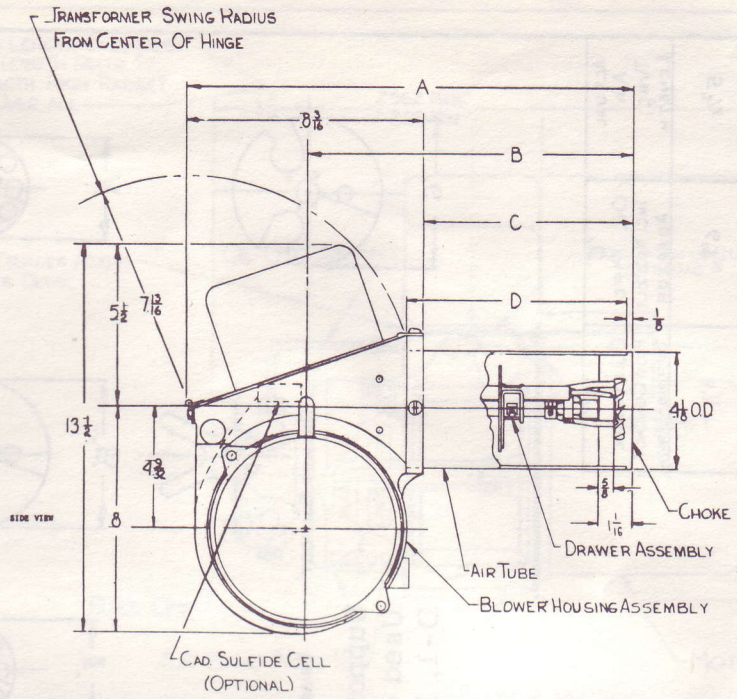




Twelve Blade Spinner Assy	
Part No.	"E" Diameter
SA-10856	2" O.D.
SA-11624	2¼" O.D.
SA-11772	2½" O.D.

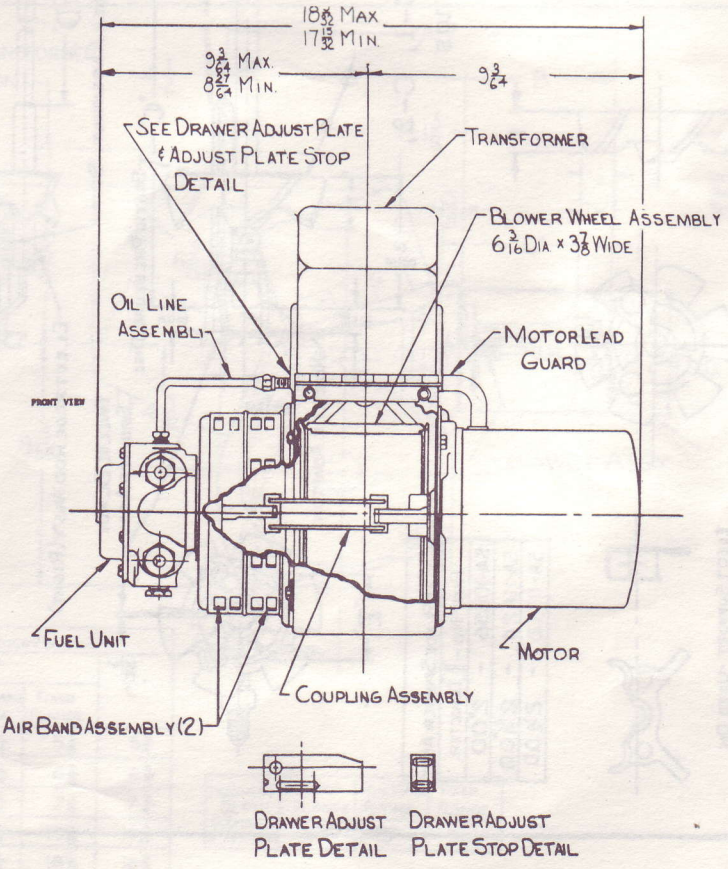
Actual Air Tube Length	"C" Oil Pipe Inc. Nozzle Adaptor	"D-1" Spring & Term. Overall Length	"D-2" Spring & Term. Overall Length
5¾	12 3/16	3½	4½
6¾	13 3/16	4½	5½
7¾	14 5/16	5½	6½
10¾	17 5/16	8½	9½
16¾	23 3/16	14½	15½

Models 93C-1, 93C-S, 93C-2 & 93C-2X Burner Assembly Drawing

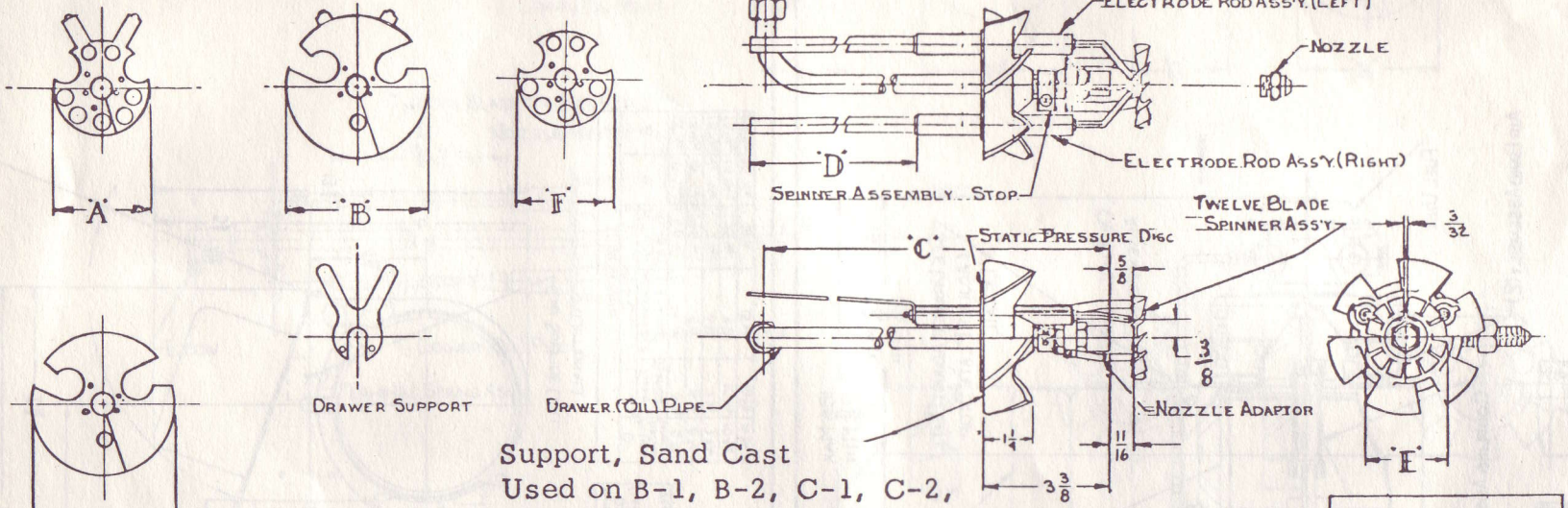


DIMENSIONS					
A	B	C WITHOUT FLANGE	C ADJUSTABLE FLANGE	C FIXED FLANGE	D ACTUAL AIR TUBE LENGTH
13 9/32	9 11/16	5 1/4	4 1/4	5 1/8	5 3/4
14 11/32	10 11/16	6 1/4	5 1/4	6 1/8	6 3/4
15 13/32	11 11/16	7 1/4	6 1/4	7 1/8	7 3/4
18 9/32	14 11/16	10 1/4	9 1/4	10 1/8	10 3/4
24 9/32	20 11/16	16 1/4	15 1/4	16 1/8	16 3/4

MINIMUM DEPTH (LENGTH) OF VESTIBULE	WITHOUT FLANGE	ADJUSTABLE FLANGE	FIXED FLANGE
	8 3/8"	9 3/8"	8½"



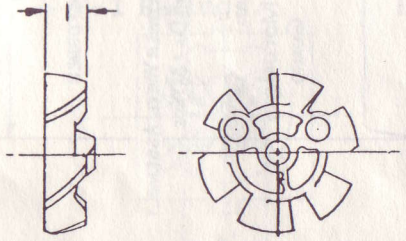
Static Pressure Disc			
Perforated "A" Dia.	Solid "B" Dia.	Peforated "F" Dia.	Solid "G" Dia.
8474 - 3½	8563 - 3¼	8474CS - 3½	8297CS - 2¾
		7891CS - 3	



Support, Sand Cast
Used on B-1, B-2, C-1, C-2, D-1, D-2 & F-1 Ratings

Twelve Blade Spinner Ass'y	
Part No. — "E" Diameter.	
SA-10856	- 2" O.D.
SA-11624	- 2¼" O.D.
SA-11772	- 2½ O.D.

Actual Air Tube Length	"C" Oil Pipe Inc. Nozzle Adaptor	"D" Electrode Rod Contact Spring-Length
5 3/4	6 7/16	1½
6 3/4	7 15/16	2½
7 3/4	8 15/16	3½
10 3/4	11 15/16	6½

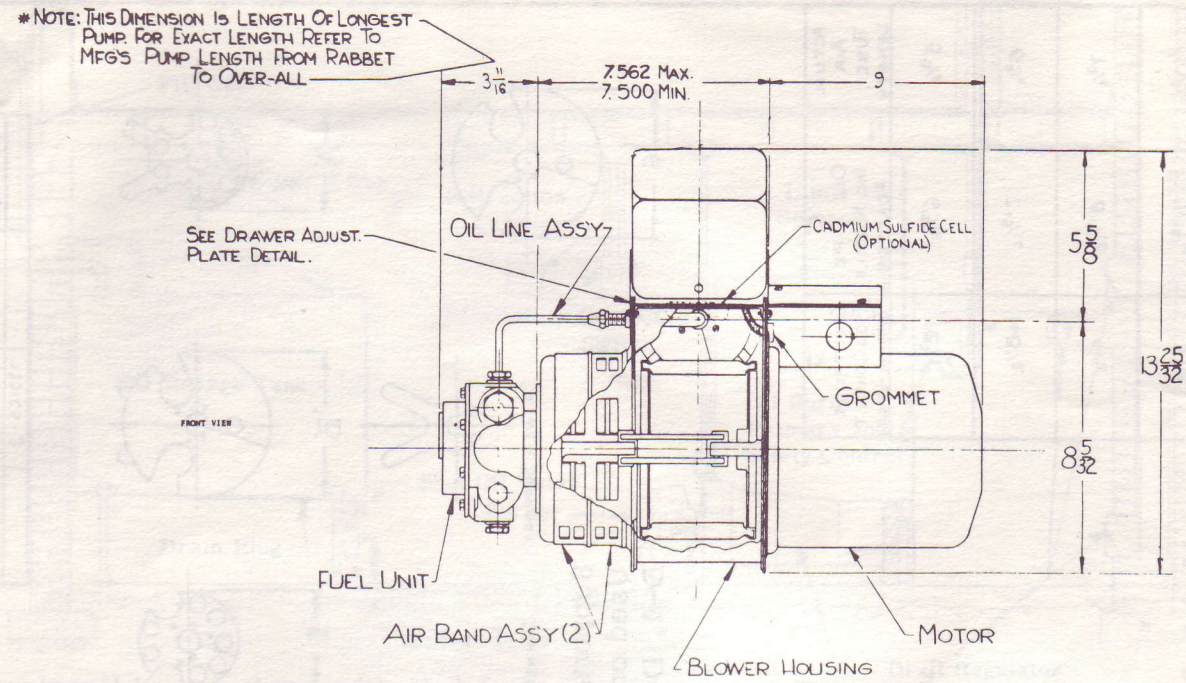


Support, Sand Cast
Used on H-3, K-1, L, L-1, M, N, & O Ratings

Elect Support - Used On B,C,D,E,F,G,H,H-1,H-2,J,K, w/Static Pressure Disc Or Drawer Support As Per Rating

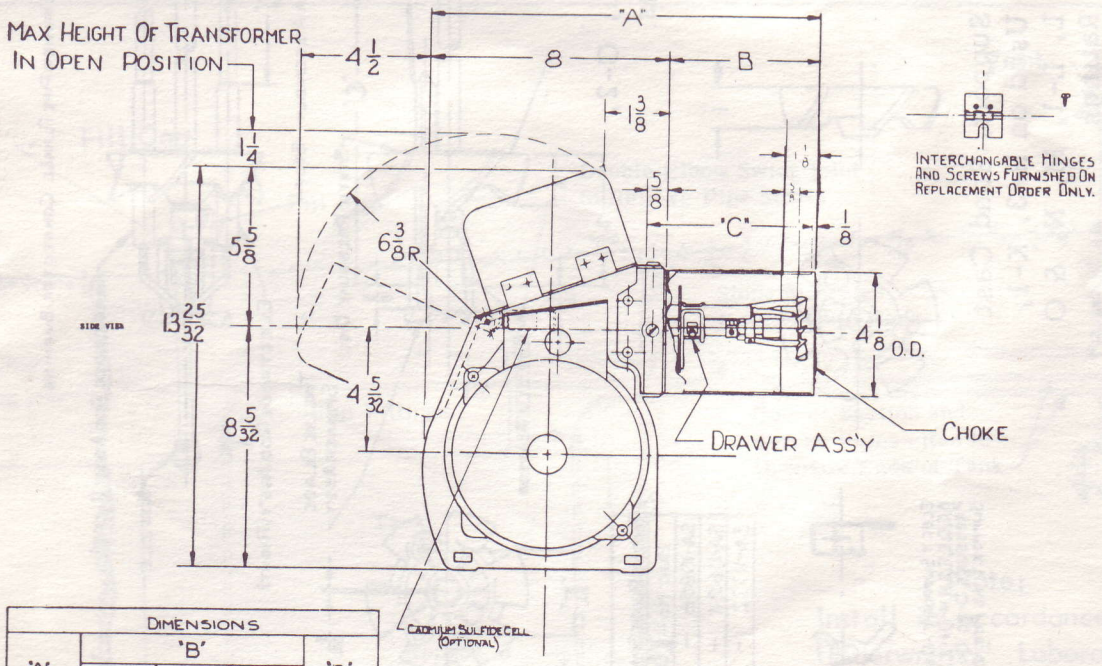
Models 93C-1, 93C-S, 93C-2 & 93C-2X Drawer Assembly Drawing

Models 94C-1, 94C-S, 94C-2 & 94C-2X Burner Assembly Drawing



DRAWER ADJUST PLATE DETAIL

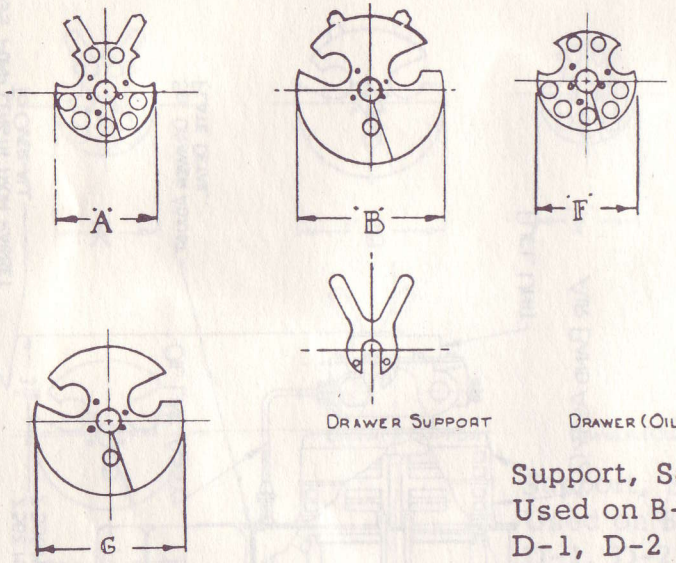
DRAWER ADJUST PLATE STOP DETAIL



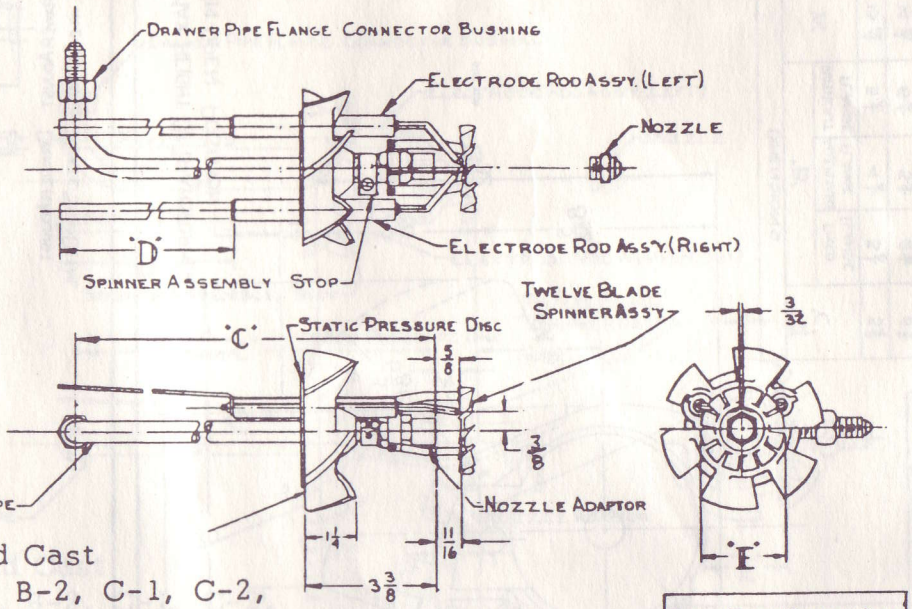
DIMENSIONS				
"A"	"B"			"C"
	WITHOUT FLANGE	ADJUSTABLE FLANGE	FIXED FLANGE	
13 3/16	5 1/4	4 1/4	5 1/8	5 3/4
14 3/16	6 1/4	5 1/4	6 1/8	6 3/4
15 3/16	7 1/4	6 1/4	7 1/8	7 3/4
18 3/16	10 1/4	9 1/4	10 1/8	10 3/4
24 3/16	16 1/4	15 1/4	16 1/8	16 3/4

MINIMUM DEPTH (LENGTH) OF VESTIBULE	WITHOUT FLANGE	ADJUSTABLE FLANGE	FIXED FLANGE
	8	9	8 1/8

Static Pressure Disc			
Perforated "A" Dia.	Solid "B" Dia.	Perforated "F" Dia.	Solid "G" Dia.
8474 - 3½	3563 - 3¼	8474CS - 3½	8297CS - 2¾
		7391CS - 3	

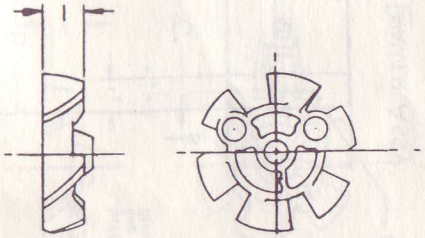


Support, Sand Cast
Used on B-1, B-2, C-1, C-2,
D-1, D-2 & F-1 Ratings.

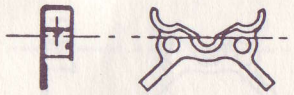


Twelve Blade Spinner Ass'y.	
Part No. –	"E" Diameter.
SA-10856	– 2" OD
SA-11624	– 2 1/4" OD
SA-11772	– 2½ OD

Actual Air Tube Length	"C" Oil Pipe Inc. Nozzle Adaptor	"D" Electrode Rod Contact. Spring-Length
5 3/4	6 7/16	2½
6 3/4	7 15/16	3½
7 3/4	8 15/16	4½
10 3/4	11 15/16	7½

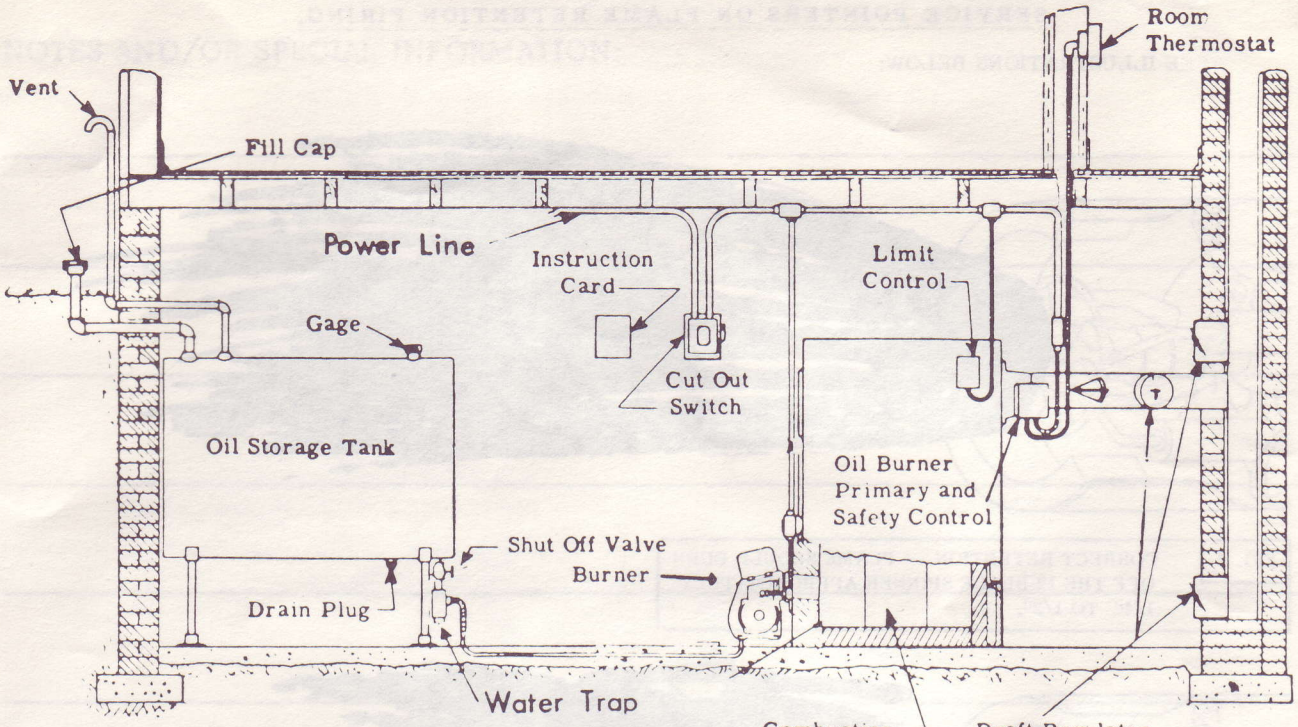


Support, Sand Cast
Used on H-3, K-1,
L, L-1, M, N, & O
Ratings



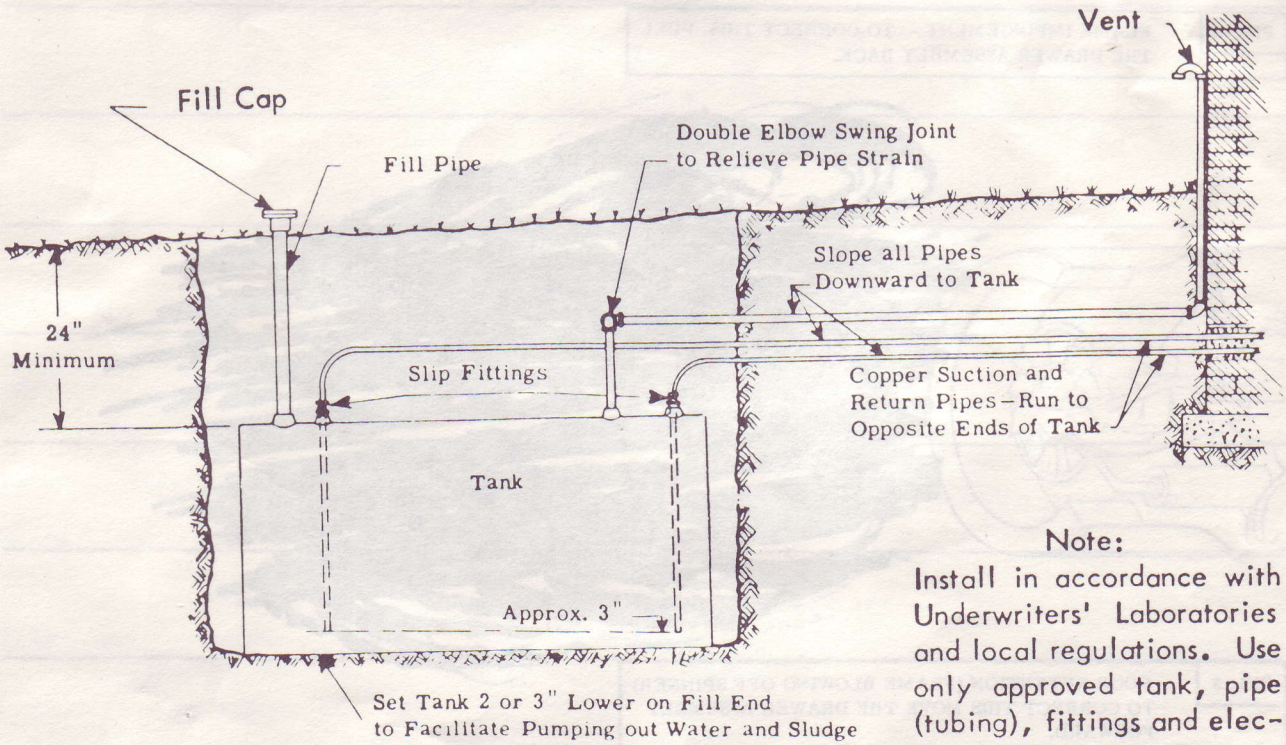
Elect Support - Used On B,C,D,E,F,G,H,H-1,H-2,J,K, w/Static Pressure Disc or Drawer Support As Per Rating

Models 94C-1, 94C-S, 94C-2 & 94C-2X Drawer Assembly Drawing



Note: Install in accordance with Underwriters' Laboratories and local regulations. Use only approved tank, pipe (tubing), fittings and electrical material.

PRESSURE TYPE OIL BURNER INSTALLATION WITH OIL TANK IN BASEMENT



Note:
Install in accordance with Underwriters' Laboratories and local regulations. Use only approved tank, pipe (tubing), fittings and electrical equipment.

OIL STORAGE TANK

SERVICE POINTERS ON FLAME RETENTION FIRING.

SEE ILLUSTRATIONS BELOW:

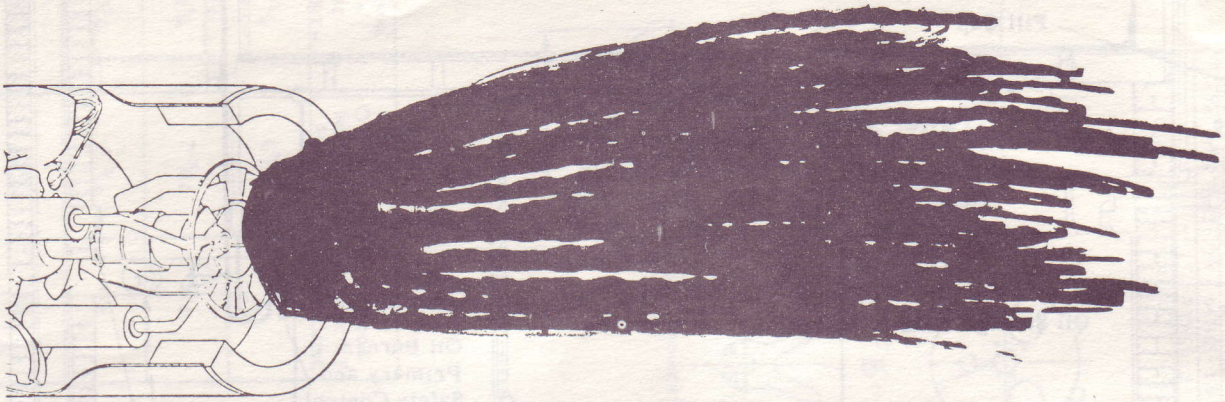


FIG. 1 — CORRECT RETENTION - FLAME SHOULD BURN OFF THE 12 BLADE SPINNER APPROXIMATELY 1/4" TO 1/2".

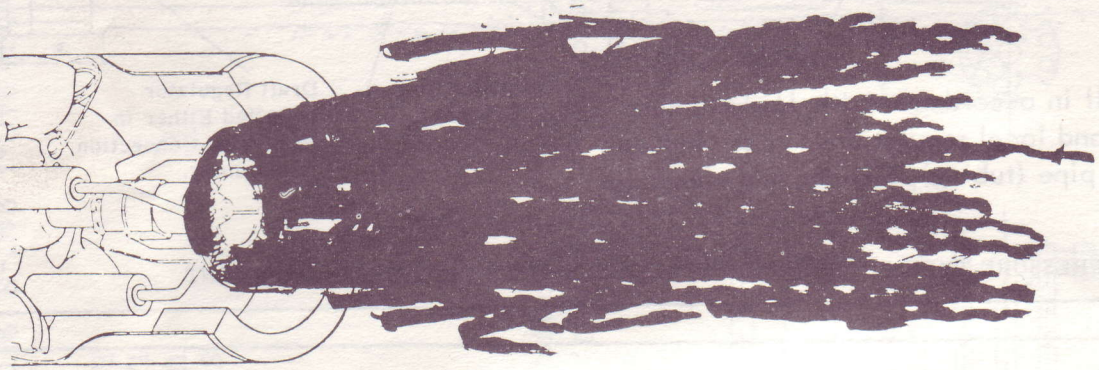


FIG. 2 — FLAME IMPINGEMENT - TO CORRECT THIS PULL THE DRAWER ASSEMBLY BACK.

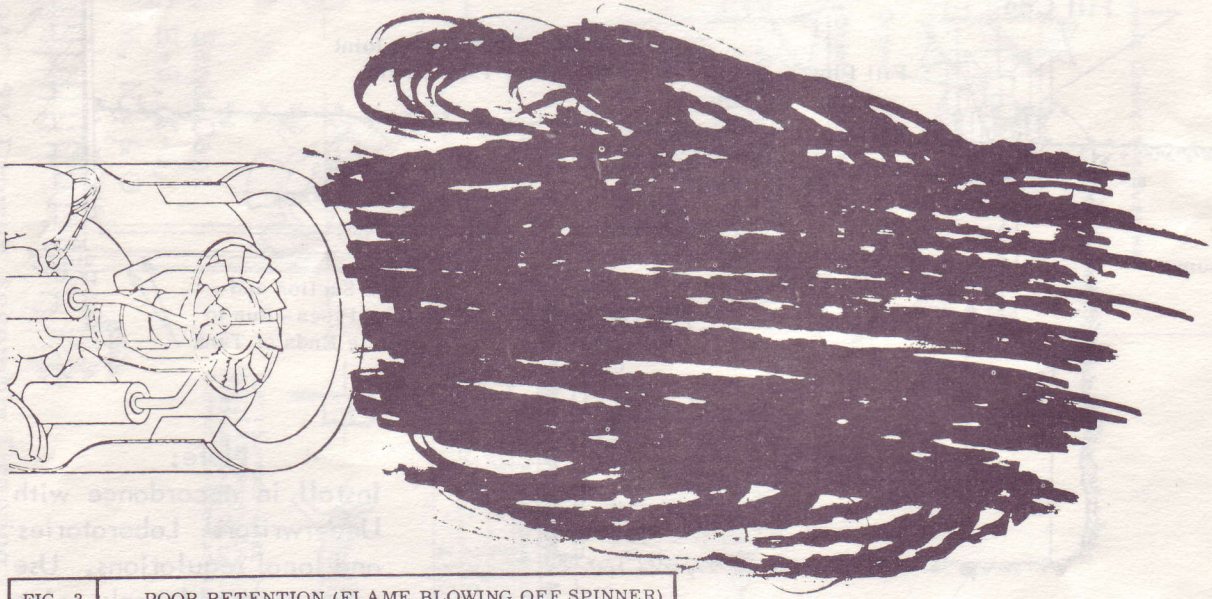


FIG. 3 — POOR RETENTION (FLAME BLOWING OFF SPINNER) TO CORRECT THIS MOVE THE DRAWER ASSEMBLY FORWARD.

NOTE: THE CUT-AWAY VIEW OF THE DRAWER ASSEMBLY SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY.

OIL BURNER OPERATING INSTRUCTIONS

This Burner is listed by UNDERWRITERS' LABORATORIES, INC., and other agencies for fuel oil not heavier than No. 2 commercial standard CS-12-48.

TO START BURNER:
(with main burner switch off)

1. Check oil level in storage tank.
2. Open all oil valves.
3. Check water level in boiler.
4. Check fuse or breaker.
5. Set thermostat above room temperature.
6. Open fire door and turn on main switch.

TO STOP BURNER:

7. Turn off main switch.

IF BURNER FAILS TO OPERATE:

8. Open fire door.
9. Recheck Items 1-6
10. Reset button on primary safety control.
11. Press manual reset on motor.
12. If burner still does not start, call service.

STARTING BURNER AFTER FLAME FAILURE:

13. Open fire door.
14. Do not attempt to start if chamber is hot or if there are fumes or oil in chamber.
15. If Item 14 is satisfactory, reset primary safety control, BUT DO NOT RESET MORE THAN TWICE.

TO STOP BURNER FOR PROLONGED PERIODS:

Turn off main switch, remove fuse, close oil line valves and fill oil tank to prevent condensation.

MAINTENANCE:

Lubricate burner motor twice yearly with 4 drops of #10 S.A.E. motor oil. The complete heating system should be cleaned, adjusted and checked by a serviceman before the start of each heating season.

INSTRUMENT READING DATA

Date _____

Stacks CO_2% _____

Air Shutter Setting _____

Stack Temp. F. _____

Net Stack Temp. F. _____

Overfire Draft H_2O _____

Spray Angle ° _____

Chamber Size _____

Over fire CO_2% _____

Smoke Spot No. _____

Room Temp. F. _____

Stack Draft H_2O _____

Nozzle Installed gal./hr. _____

Boiler Mfg. _____

Combustion Efficiency _____

WHEN SERVICE OR REPAIRS ARE REQUIRED

Call _____

Day telephone _____ Night telephone _____

Always give the following information:

Burner Model _____ Serial No. _____

Date installed _____

CAUTION

DO NOT use gasoline, crankcase oil or any oil containing gasoline.

DO NOT incinerate garbage or refuse in this unit.

DO NOT tamper with burner or controls – CALL YOUR SERVICE MAN.

HANG NEAR BURNER

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