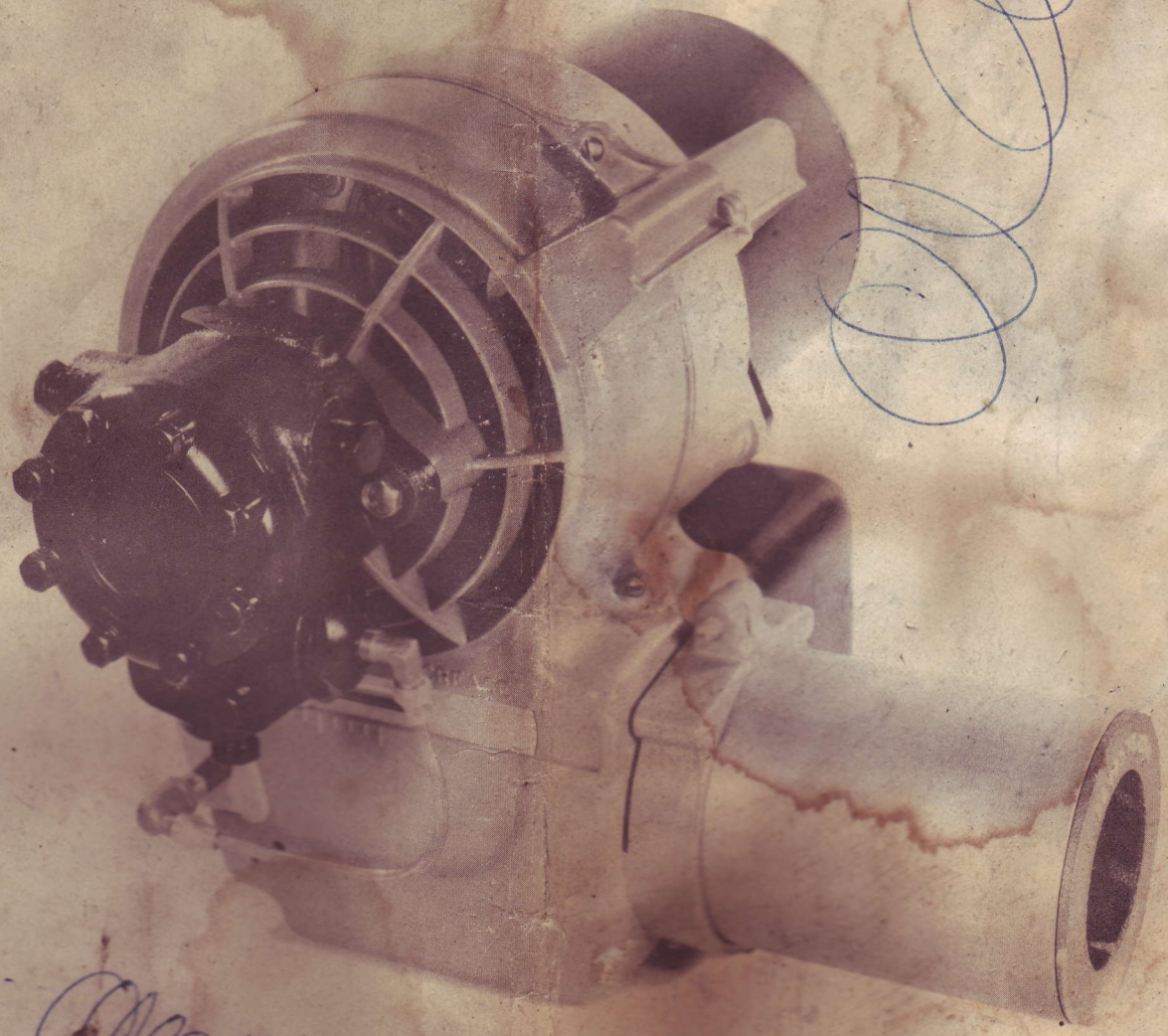
ARCOFLAME OIL BURNERS

by AMERICAN-Standard

INSTALLATION INSTRUCTIONS

FOR MODEL DH



FIRING RATE—0.65 TO 3.00 G.P.H.

Plumbing and Heating Division
AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
40 W. 40TH STREET, NEW YORK 18, N.Y.

AMERICAN-Standard PRODUCTS

PART NO. 17609-01

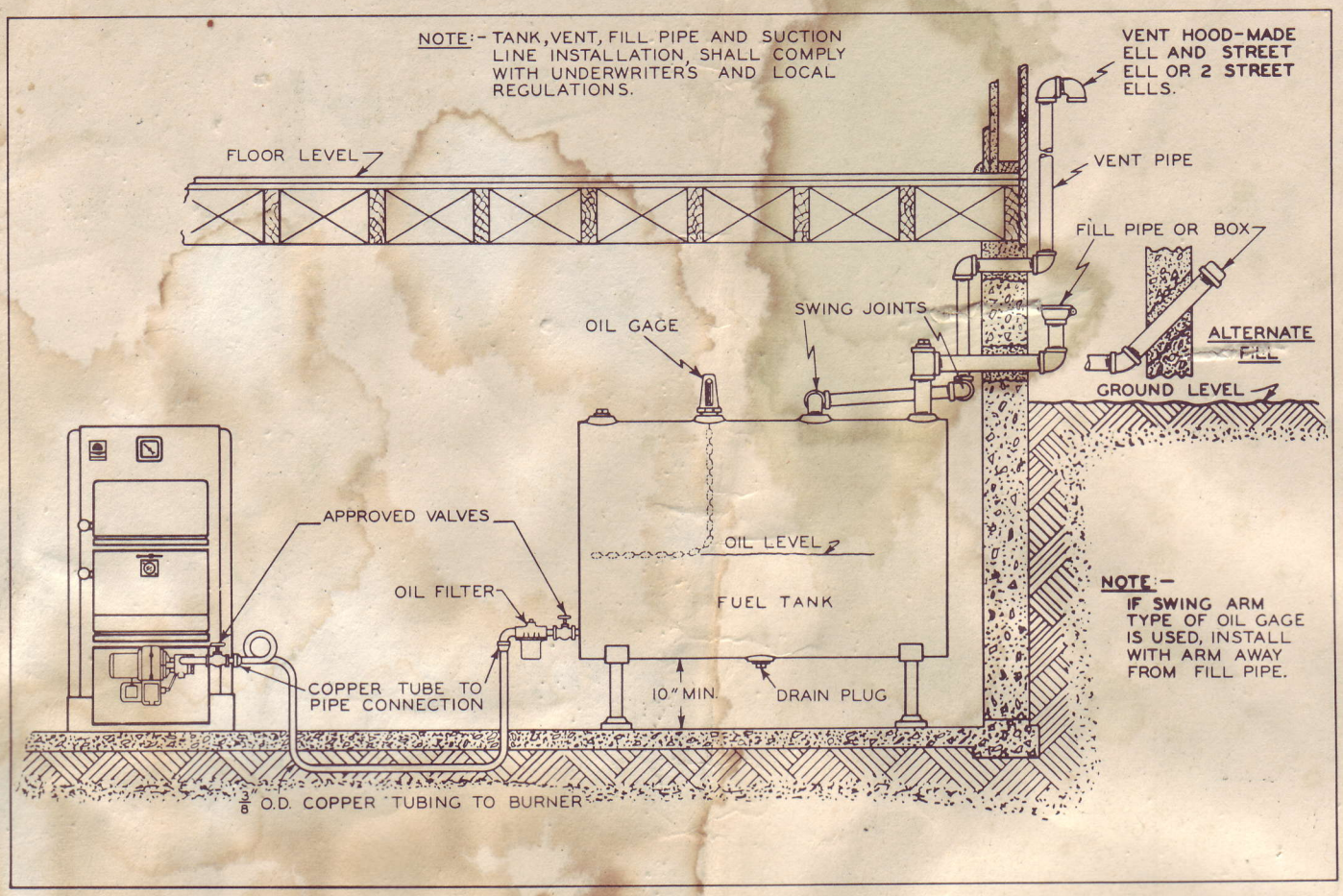


Figure 1

Arcoflame Oil Burner Installation Instructions

FOR ALL DH MODELS

The Model DH Arcoflame Oil burner is listed by the Underwriters' Laboratories, Inc. for use with No. 1 or No. 2 commercial fuel oil as defined by Commercial Standard CS12-48 obtained either by the distillation or the catalytic process (or a blend of both).

Arcoflame Oil Burner Installations must be made to comply with:

(a) National Board of Fire Underwriters Regulations

(b) Local Regulations or Codes

(c) Commercial Standard CS75

Authorities having jurisdiction should be consulted before installations are made.

For information on calculating heat loss of buildings, see American-Standard books on Radiator Heating and Warm Air Furnaces.

Cautions

GENERAL: Use cooper tubing for all oil lines. For threads use a good oil-proof joint compound. Use only one oil line (suction) on all basement tanks when connection is made to outlet at bottom of oil tank. Bottom of tank should be above center line of pump.

Use two oil lines (suction and return) on all tanks, outside or inside of building, if buried under-ground, or if bottom of inside tank is more than 6" below pump.

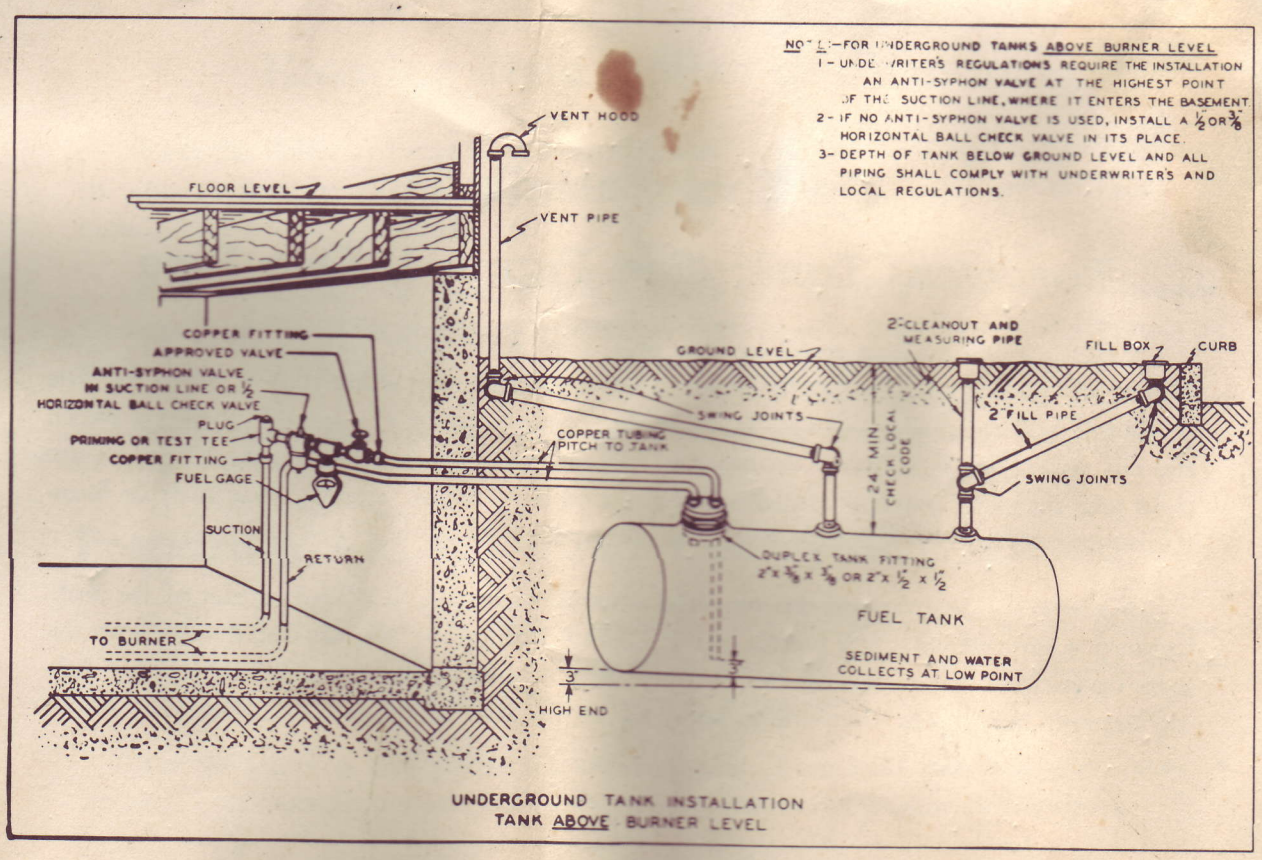
An auxiliary oil filter, of ample capacity, connected in the burner oil supply line is recommended for all firing rates and especially of 1.50 GPH and below.

When connecting more than one burner to a single tank, separate suction lines shall be run to each burner. Return lines may be manifolded.

Whenever a new burner is installed to replace an old one, a new suction line must be installed, or else the old one must be thoroughly tested for leaks to avoid serious operating difficulties in the future.

Never fasten oil lines along basement ceiling.

BURNERS COME FROM FACTORY WITH PUMP ARRANGED FOR ONE PIPE HOOK-UP. FOR TWO PIPE HOOK-UP SEE INSTRUCTIONS PACKED WITH FUEL PUMP. THE "INTERNAL BY-PASS PLUG" WILL HAVE TO BE INSERTED IN THIS CASE.



UNDERGROUND TANK INSTALLATION
TANK ABOVE BURNER LEVEL

Fig. 2

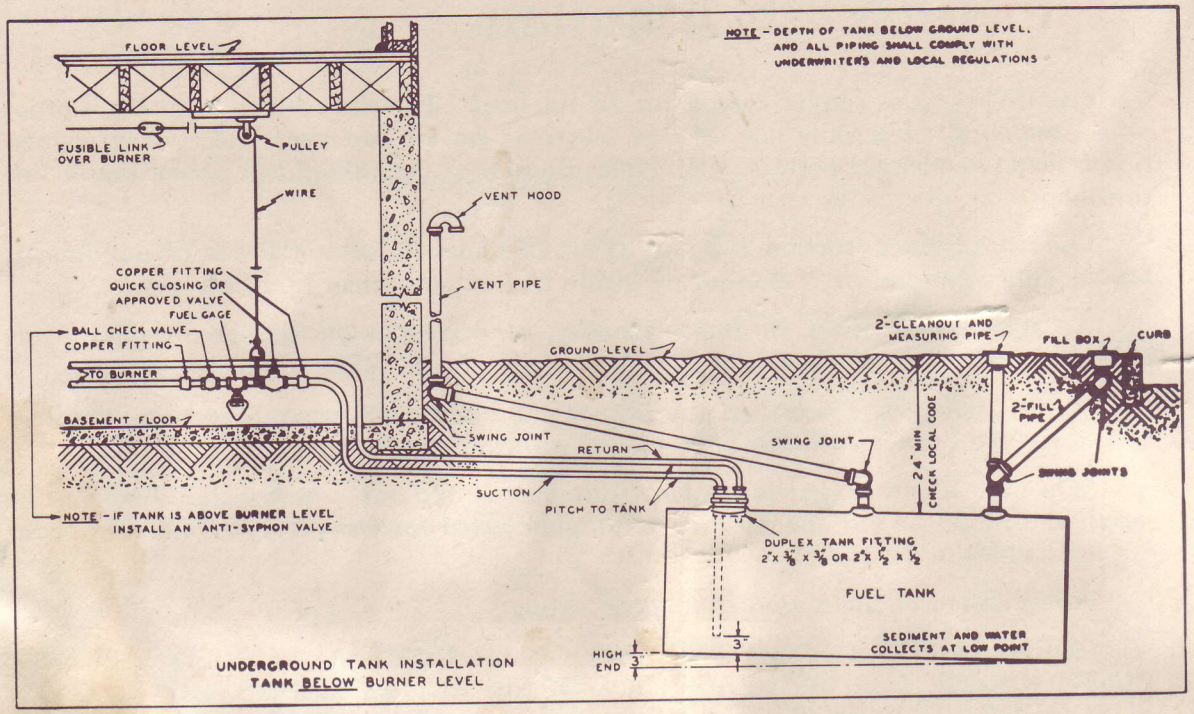


Fig. 3

Oil Tank Installation

Basement Tank: (See Figure 1) One Pipe

Erect tank on an iron stand or iron pipe legs with floor flanges about 10″ high. Never rest tank on the basement floor. Find a suitable spot more than 5′ from any fire or flame, and cut a single or two holes in the foundation or framework through which the fill and vent pipes pass. Install the fill and vent pipes. Make sure all joints are tight and that they pitch to drain to the tank with no traps. Neatly plug hole in foundation or wall with suitable water proof material.

Screw a 3/8″ nipple and the required shut-off valve into the lower outlet of the tank. Connect a suitable oil filter to this valve. Screw another 1/4″ nipple and a valve into the inlet opening of the pump on the burner. Run a piece of heavy walled soft copper tubing between the valves. Provide a loop or a swing joint at the burner connection.

Underground Tank: (See Figures 2 & 3)
Two Pipe

Locate the tank at least 4 feet from the foundation with the suction lines as short as possible, and to be convenient for filling. The depth shall be such that the top of the tank is below the frost line. In general this is a minimum of 2 feet, unless local regulation requires more. Install fill, vent, cleanout, or measuring pipe, and oil gage as shown in figures 2 and 3.

Suction line shall be one piece from outside the wall and reach within 3″ of bottom of tank. Use 3/8″ O.D. for runs about 30 feet from tank to wall, 1/2″ O.D. for longer runs. Pitch line from wall back to tank. To inside end attach an approved shut-off valve.

Screw a "tee" with a 1/2″ side outlet, to this valve; in the side outlet, secure a fuel storage gage. Next install a horizontal ball check valve (or an anti-syphon valve if required). Run a one piece copper tube suction line from the check valve to the required valve at the burner. This tubing may be one size smaller than the outside line. Provide an expansion loop at the burner connection.

Return line from burner to tank must be installed. It may be same or one size larger than the suction line.

Erecting New Boiler or Furnace

Erect the Boiler or furnace as outlined in the "Installation Directions" furnished with the unit. It must be set on a solid concrete floor or preferably a concrete slab about 3″ high.

If the boiler has a dry base, be sure to grout base to floor with portland cement. Also seal carefully with boiler putty between sections as well as between the bottom of the sections and the base.

Air leakage at these points will seriously reduce the flame efficiency (CO_2).

Preparing A Coal Fired Heater–Conversion Job

Remove ashpit door, its frame if necessary, and the grates. Clean all inside surfaces, fire pot, crown sheet, flue passage, etc. of soot and scale. Clean breeching, smoke-pipe and chimney, and remove all dampers and obstructions.

Seal all joints in smoke-pipe and chimney and all air leaks into base and frames of heater. Seal between boiler sections and base as outlined for New Boiler above.

Important

INSTALLATION INFORMATION

SUNDSTRAND FUEL UNITS

MODEL J SINGLE STAGE AND MODEL H TWO STAGE

NOTE: This unit may be used on either single-pipe or two-pipe systems. It is shipped from the factory with the internal by-pass plug left out and is, therefore, ready to be installed on a single-pipe system.

All Sundstrand fuel units are shipped from the factory with pressure set at 100 P.S.I. Should it be necessary to change this pressure refer to Figure 4. Use pipe dope or thread sealer on all fittings and pipe plugs.

SINGLE-PIPE INSTALLATION

CAUTION: Where a "single-pipe" System is used, the bottom of the tank **must** be above the pump.

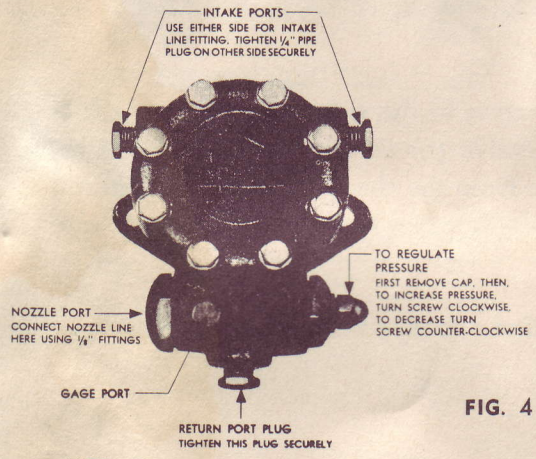


FIG. 4

NOTE: This port may be used for intake port on one pipe system ONLY.

1. Remove 1/4" intake port pipe plug from either side of the unit and assemble intake line fittings.
2. Tighten return port plug.
   Use 6 Pt. Box or Socket Wrench. Do Not Use Open End or Crescent Wrench.
3. Before starting burner, be sure to bleed air out of the system by loosening **unused intake port** (port opposite to one into which intake line is assembled) until there is a flow of oil out of port. Then tighten unused intake port plug securely. Burner is now ready for operation.

TWO-PIPE INSTALLATION

IMPORTANT: On "two-pipe" system, Model H **must** be mounted with return port at bottom as shown in Fig. 5.

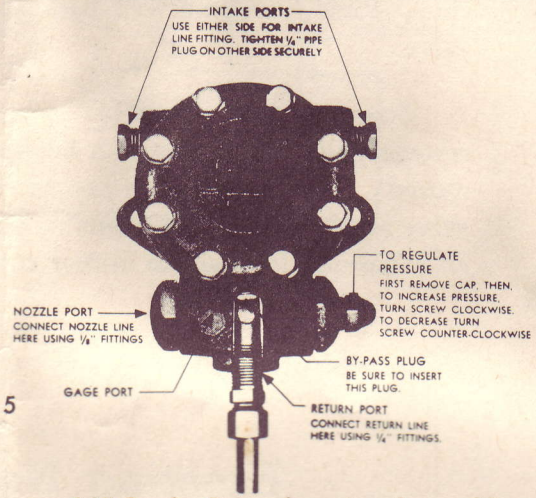


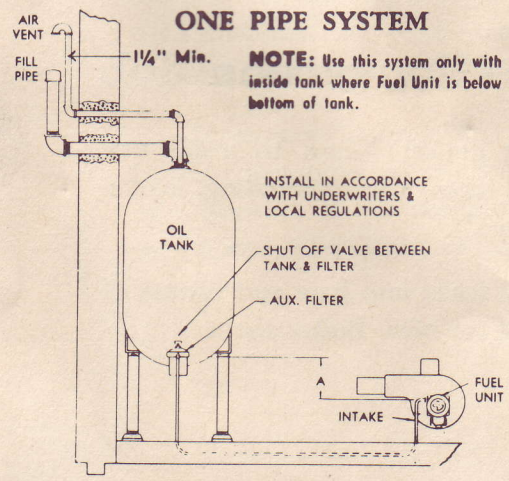
FIG. 5

1. Remove 1/4" Intake Port pipe plug from either side of the unit and assemble intake line fittings.
2. Unscrew return port plug.
3. Remove internal by-pass plug from cloth bag. Insert as shown in Figure 5, and tighten securely.
4. Assemble return line fittings in return port.
5. Tighten 1/4" pipe plug in unused intake port. Use 6 Pt. Box or Socket Wrench. Do Not Use Open End or Crescent Wrench.
6. On two-pipe system, air bleeding is automatic.

NOTE: Intake line **cannot** be teed to more than one fuel unit unless oil tank is higher than both pumps and tee.

HOW TO DETERMINE CORRECT LINE SIZE FOR ONE PIPE INSTALLATION *

ONE PIPE SYSTEM



NOTE: Use this system only with inside tank where Fuel Unit is below bottom of tank.

MAXIMUM ALLOWABLE LENGTH OF INTAKE LINE IN FEET
(includes horizontal and vertical run)

NOTE: Values apply to any model Sundstrand pump. For values not shown, chart can be interpolated.

NOTE: Distance from top of oil tank to fuel unit should not exceed 12 feet.

3/8" O. D. TUBING

FIRING RATE ⟶ in gallons per hour		1	3	6	10	14	20
Distance "A"	0'	150'	53'	26'	16'	11'	8'
	1'	150'	73'	36'	22'	16'	11'
	2'	150'	93'	46'	28'	20'	14'
	3'	150'	113'	56'	34'	24'	17'
	4'	150'	132'	66'	40'	28'	20'
	5'	150'	150'	76'	46'	33'	23'

1/2" O. D. TUBING

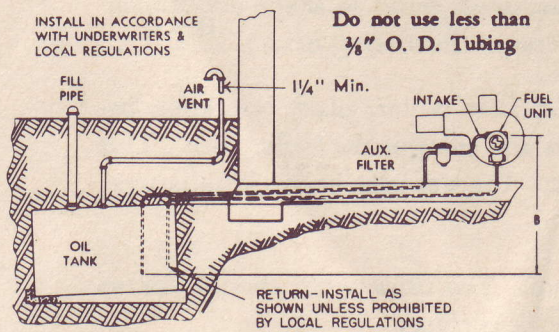
FIRING RATE ⟶ in gallons per hour		1	3	6	10	14	20
Distance "A"	0'	150'	150'	117'	70'	50'	35'
	1'	150'	150'	150'	97'	69'	48'
	2'	150'	150'	150'	123'	88'	62'
	3'	150'	150'	150'	150'	107'	75'
	4'	150'	150'	150'	150'	126'	88'
	5'	150'	150'	150'	150'	145'	101'

Do not use less than 3/8" O. D. Tubing

HOW TO DETERMINE CORRECT LINE SIZE FOR TWO PIPE INSTALLATION *

NOTE: Do not use less than 3/8" O. D. tubing.

Inside or outside tank Fuel Unit above tank



MAXIMUM ALLOWABLE LENGTH OF EITHER INTAKE OR RETURN LINE IN FEET.
(Includes horizontal and vertical run)

"LIFT" INSTALLATION VALUES

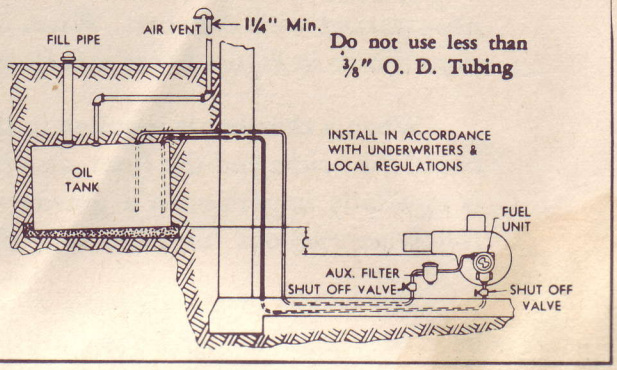
3/8" O. D. TUBING

Distance "B"	J2	J3	J4	J5	J6	H2	H3	H4	H5	H6
0′	60′		51′	39′	28′	102′	87′	80′	68′	57′
1′	56′		46′	36′	26′	98′	83′	76′	65′	55′
2′	51′		43′	34′	25′	95′	80′	73′	62′	53′
3′	47′		40′	30′	23′	91′	77′	70′	59′	50′
4′	43′		35′	27′	20′	88′	74′	66′	56′	48′
5′	38′		32′	24′	18′	83′	71′	63′	53′	46′
6′	34′		28′	22′	16′	80′	68′	60′	50′	44′
7′	28′		24′	18′	13′	75′	65′	58′	48′	42′
8′	24′		21′	15′	11′	72′	62′	55′	46′	40′
9′	20′		17′	13′	—	69′	58′	52′	44′	38′
10′	15′		13′	10′	—	65′	55′	49′	42′	36′
11′	—		—	—	—	60′	51′	46′	40′	34′
12′	—		—	—	—	56′	48′	43′	38′	32′
13′	—		—	—	—	52′	45′	40′	36′	30′
14′	—		—	—	—	49′	42′	37′	34′	28′
15′	—		—	—	—	45′	40′	34′	32′	26′

1/2" O. D. TUBING

Distance "B"	J2	J3	J4	J5	J6	H2	H3	H4	H5	H6
0′	150′		150′	150′	112′					
1′	150′		150′	140′	102′					
2′	150′		150′	125′	96′					
3′	150′		150′	119′	89′					
4′	150′		138′	108′	80′					
5′	150′		125′	95′	71′					
6′	132′		110′	83′	62′					
7′	112′		95′	71′	53′	150′	150′	150′	150′	150′
8′	95′		80′	61′	45′					
9′	79′		66′	50′	37′					
10′	60′		50′	39′	29′					
11′	42′		36′	27′	—					140′
12′	25′		21′	16′	—					130′
13′	—		—	—	—					120′
14′	—		—	—	—				140′	110′
15′	—		—	—	—	150′	150′	140′	125′	100′

Inside or outside tank Fuel Unit below tank



MAXIMUM ALLOWABLE LENGTH OF EITHER INTAKE OR RETURN LINE IN FEET.
(Includes horizontal and vertical run)

3/8" O. D. TUBING

Distance "C"	J2	J3	J4	J5	J6	H2	H3	H4	H5	H6
1′	35	35	29	21	17	40	40	40	40	40
2′	32	32	28	19	15	35	35	35	35	35

For Values above 2′ Use 1/2" O. D. Tubing for Return Line.

1/2" O. D. TUBING

Distance "C"	J2	J3	J4	J5	J6	H2	H3	H4	H5	H6
1′	150		130	95	74	150		150		110
2′			115	85	66					130

NOTE: For any installations not covered by this bulletin, or any special installation, contact Sundstrand factory for instructions.

More than one pump may be connected to a single intake line, *only* if bottom of supply tank is above pump intake ports and connecting tee. Intake line must be connected to bottom of tank and run horizontally below minimum fuel level. Size supply line for total firing rates involved.

If the tank is not above both pumps and the connecting tee, an elevated automatic wall pump may be used, or otherwise each burner will require a separate intake and return line.

With single pipe installations, horizontal runs should be located below bottom of tank due to bleeding difficulties which otherwise result.

Always terminate return line about six inches above end of suction line.

Combustion Chamber

When a refractory combustion chamber is furnished with unit, install per instructions packed with chamber. When chamber is not furnished, build to shape and dimensions shown in Figure 6, use soft firebrick (high temperature insulating brick).

When a chamber is installed in the ashpit of a dry base boiler, place insulation between the bricks and the floor, also between the bricks and sides of the boiler base. This is especially important in a gravity warm air furnace. For wet base boiler installations, follow instructions furnished with chamber.

The height of the chamber as shown is minimum. The brick work should always be carried high enough to cover 2 inches of water back surfaces.

CAUTION: Do not use back fill or cement with steel chamber.

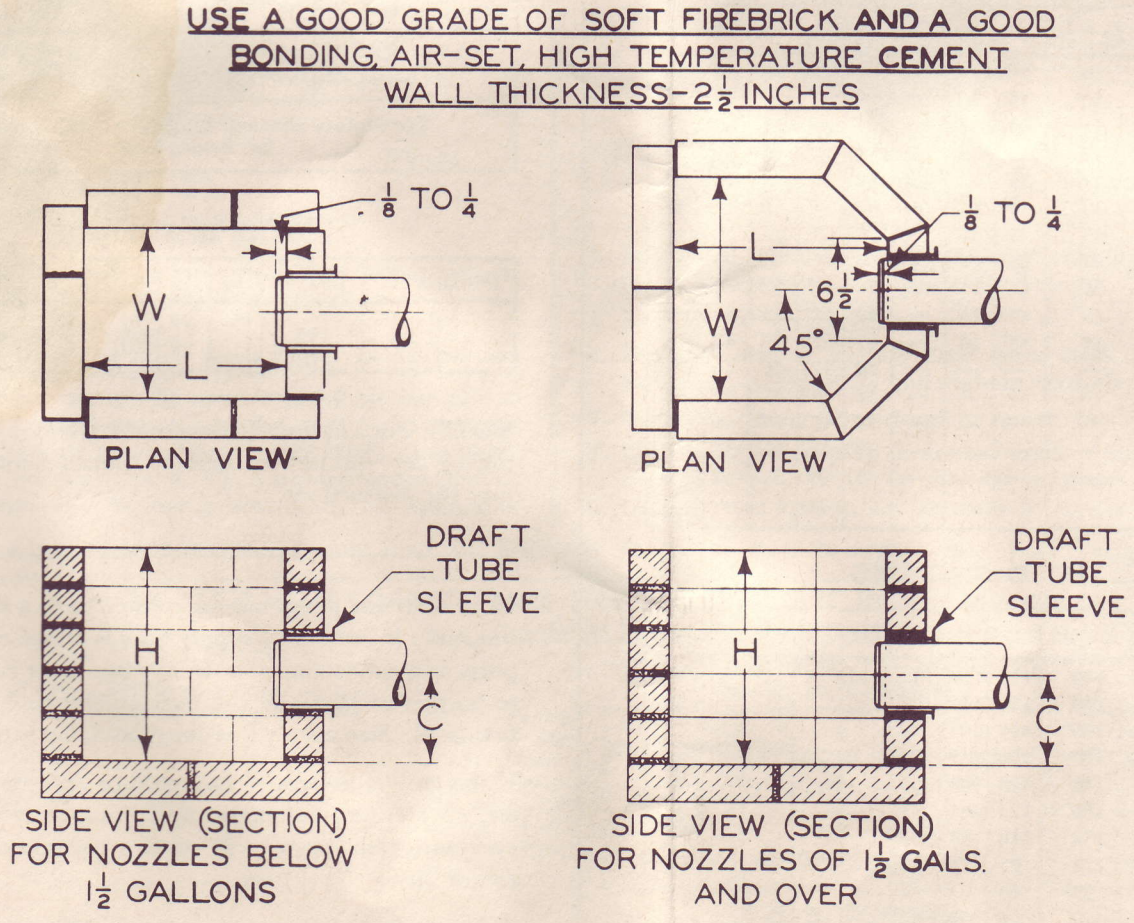


Fig. 6

Combustion Chamber Dimensions

(Made From High Temperature Insulating Firebrick)

Firing Rate G.P.H.	Combustion Chamber Size—Ins.			Floor of C.C. to C.L. of Nozzle "C"
	Length	Width	Height *	
.65	7	7	14	4
.75	8	8	14	4½
1.00	10	10	14	5
1.25	11	11	14	5
1.35	12	11	14	5
1.50	13	11	14	5
1.65	14	12	14	5½
1.75	15	12	14	5½
2.00	15	12	14	5½
2.25	16	13	14	6
2.50	17	13	14	6
3.00	18	14	14	6 - 6½

* NOTE: Height chamber as shown is minimum

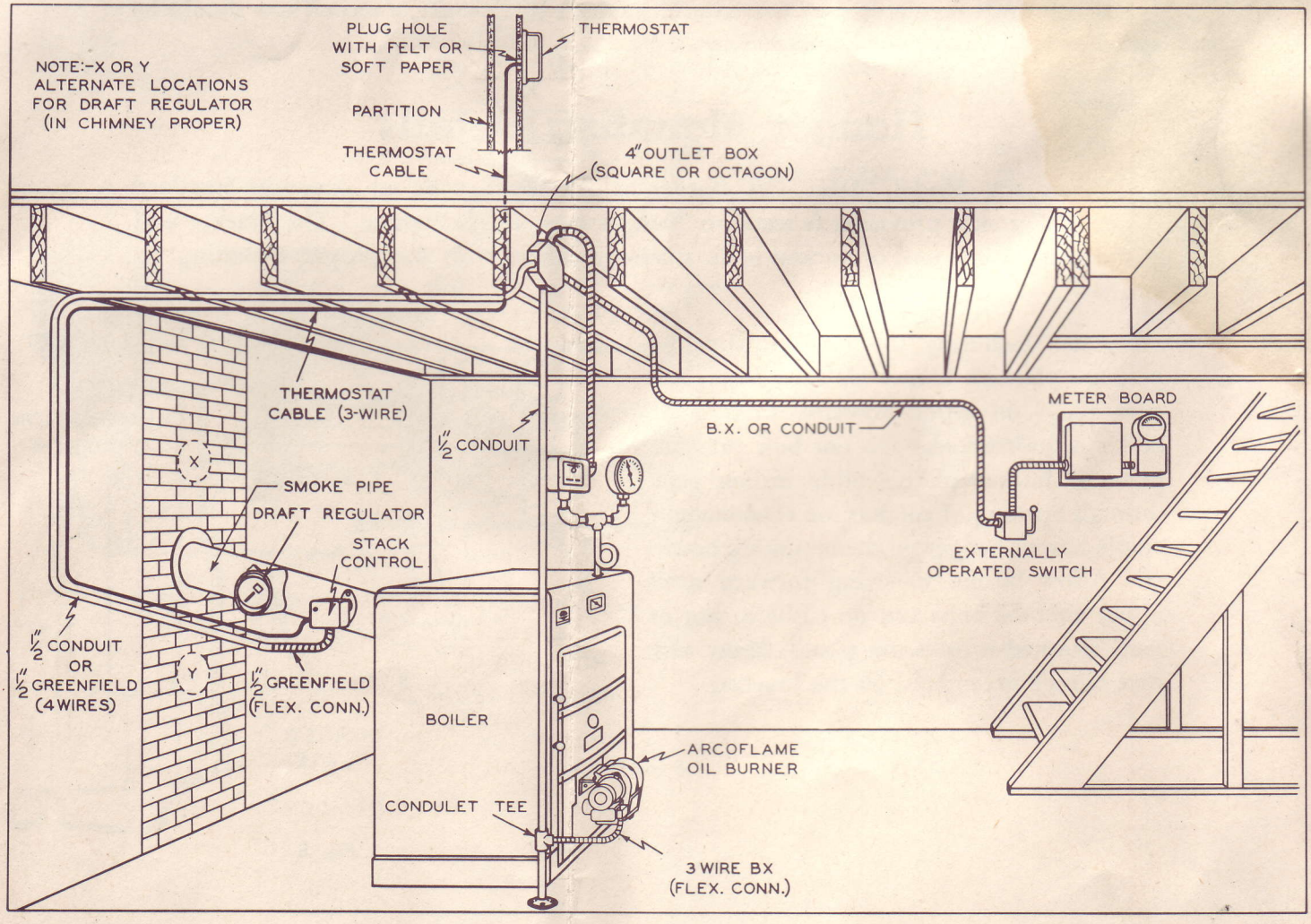


Figure 7

Electrical Work

Wire the burner exactly as shown in the diagram found in the control package. Figure 7 shows a simple hook-up which may be used as a guide. Install all electrical wiring in accordance with the National Electric Code and Local Ordinances. (If any.)

Controls

Insert controls in openings indicated in "Installation Directions" accompanying each new boiler or furnace. Follow wiring diagram furnished in control package. This is important for proper performance.

Draft Regulator

Install the automatic draft regulator as outlined in the instructions furnished with the regulator. It must be located between the stack control and chimney, and at least 12 inches from the stack control. The closer to the chimney the better. See Figure 7. The draft regulator may be installed in the chimney, above the smoke-pipe connection, and if this is not practical, as last resort it may be installed below the smoke-pipe.

If one draft regulator does not reduce the draft sufficiently, a second one should be added to insure maximum flame efficiencies.

Hanger Mounting Details

When any Model "DH" Oil Burner is furnished with an American-Standard Boiler or Furnace, provision is made to "hanger mount" the burner. The bracket will be mounted on the unit or packed in an accessory carton with the proper mounting instructions.

After mounting the bracket, slip the pressure plate on burner air tube with pressure plate insulation towards furnace or boiler or as marked. Do not bolt pressure plate to burner plate. Slide burner tube through opening of combustion chamber and cradle burner hanger on the mounting bracket. Allow burner to swing forward until upper air tube bolts rest on cushion, rug or pads attached to pressure plate. Make sure that burner is centered on the bracket.

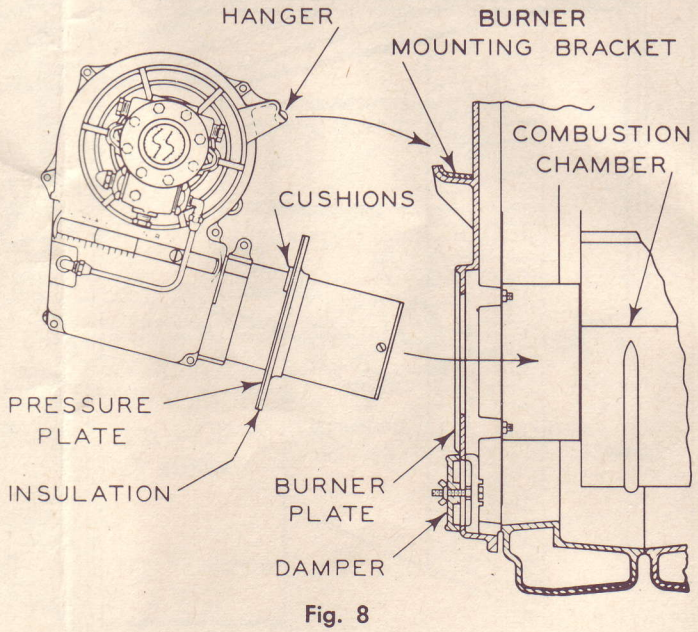


Fig. 8

Electrode Setting

Alloyed metal electrodes that will not burn out or oxidize at high temperatures are furnished. The electrodes for Model DH Oil Burner are set as shown in Figure 9. The electrodes shall be 5/8" above center of nozzle, 1/8" in front, and 1/8" to 5/32" gap. These settings should be checked when installing the burner and at that time make sure that no part of the exposed electrode tips come closer than 1/4" to the nozzle or any other metal part. Also, check that the oil spray does not strike the electrode tips.

AIR ADJUSTMENT

The amount of air supplied for combustion on all Model DH Burners is regulated by a new design air damper slide on the outlet side of the blower. The adjustment is located in the right side of the housing. (See Figure 9). To adjust the air supply loosen thumb screw A and slide to increase or decrease air as shown by marking A. When the correct amount of air is obtained, tighten thumb screw which locks the air damper in place.

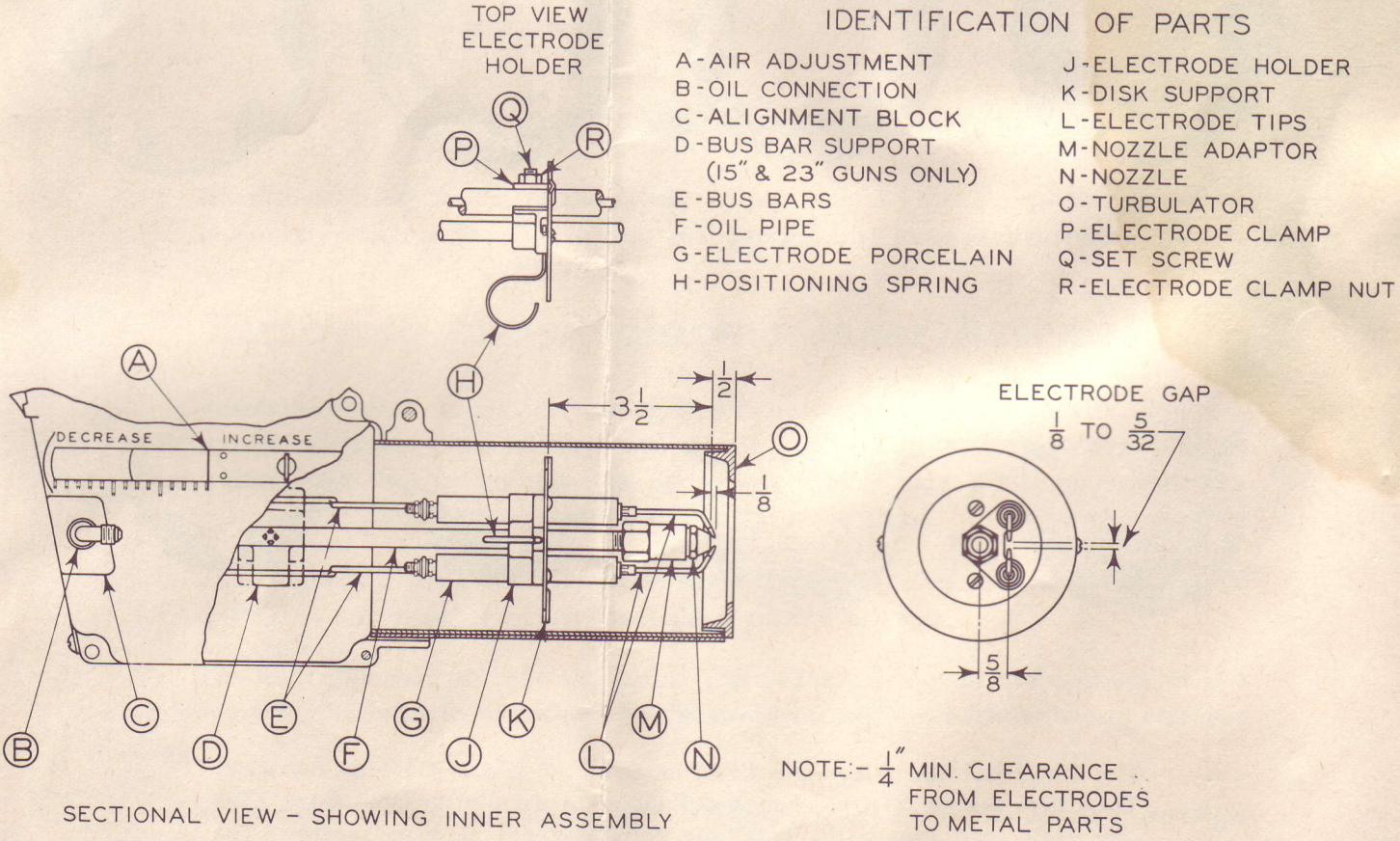


Figure 9

Combustion Parts

Number	Firing Rate GPH	Static Disc Marking	Turbulator Marking	Nozzle Spray Angle & Type
1	.65 to 1.1	.65 to 1.1	.65 to 1.1	60°-70° Hollow
2	.90 to 1.25	.90 to 1.75	.90 to 1.75	60°-70° Hollow
	1.30 to 1.75	.90 to 1.75	.90 to 1.75	60°-70° Solid
3	1.80 to 2.30	1.80 to 3.00	1.80 to 2.30	60°-70° Solid
4	2.35 to 3.00	1.80 to 3.00	2.35 to 3.00	60°-70° Solid

Turbulator and Disc Combinations as shown on above table.

The Model DH Burner covers a firing range of .65 to 3.00 GPH in four steps. These steps and the corresponding specifications are given in the table above. The changeable parts include the static disc, turbulator and of course nozzle. The static discs may be changed without altering electrodes or nozzle adaptor by removing two screws and sliding over the nozzle adaptor and off. The static discs and turbulators are stamped showing the specific range for which each is used.

Selection of Nozzle

Firing Rate	*Nozzle Spray*
.65 to 1.25	60° — 70° Hollow
above 1.25	60° — 70° Solid

The above schedule gives the specifications which will satisfy the majority of installations. However, there are installations whose burner operation is influenced by such surrounding conditions as shape of room, location in that room, chimney, flue connection, etc. These cases may warrant the use of a compromise nozzle with respect to noise and performance. A reduction of firing rate to the minimum that will take care of the installed radiation or the actual "heatloss" of the house is also preferred in these cases.

With the air pattern produced by this burner, a *60° solid* cone nozzle will give the cleanest flame with the highest CO_2 reading. However, the noise level may be a little higher than expected. On the other hand, by using a wider spray, say a *70° hollow* cone nozzle, the noise level may be lowered, but the CO_2 reading will be reduced ½ to 1%, depending on the firing rate.

Adjusting Nozzle Position

The distance from the tip of the nozzle to the front of the turbulator should be ½" as shown in Figure 9. This setting will produce the most desirable flame.

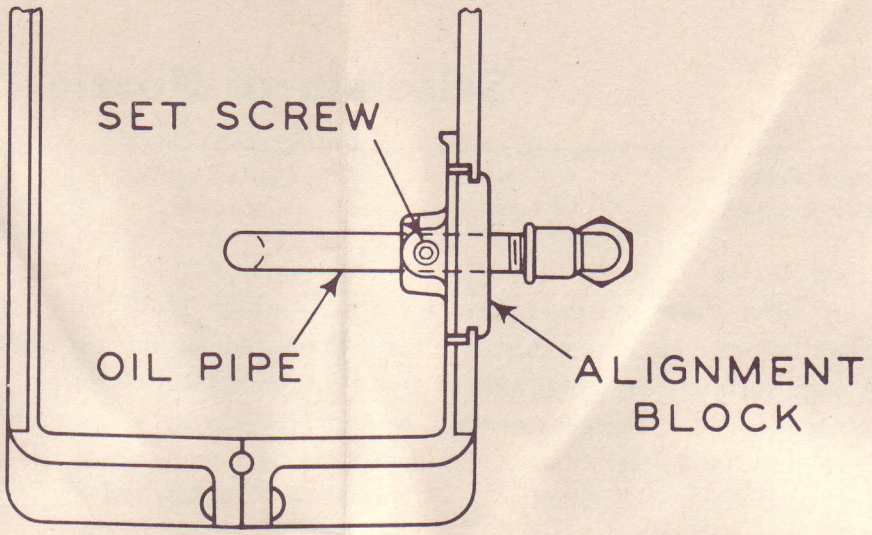
Removing and Replacing Inner Assembly

Disconnect the oil supply tube fitting at the end of the oil pipe. Remove the screw holding the rear cover plate in place and remove cover plate. Release ignition busbars from transformer clips by pulling ends of busbars to the right. The inner assembly is now free to be pulled out of the rear of the burner housing.

When replacing inner assembly, place support legs inside air tube and *make certain to clip busbars into transformer clips.* Replace rear cover plate.

It is very important to have the nozzle centered accurately in the opening of the turbulator for uniform air distribution. This will help give a uniform, clean, efficient flame.

In the event that the alignment block (Figure 10) is loosened on the oil pipe, align nozzle in center of tube by sliding oil pipe through the block and tighten alignment block allen set screw with inner assembly in place.



PARTIAL REAR VIEW OF BURNER
SHOWING ALIGNMENT BLOCK

Figure 10

Starting The Burner

Adjust burner to firing rate required by installing proper nozzle. See Page 13 for directions concerning removing inner assembly. Check electrode setting as outlined on Page 11.

Replace inner assembly and rear cover plate. Open all oil valves and see that observation port or fire door of boiler or furnace is open. Make sure proper fuses are in place. Adjust the air setting to its mid-position.

Purge air from the fuel pump in accordance with instructions furnished with pump. Install a pressure gage and adjust oil pressure to 100 psig or pressure recommended in Furnace or Boiler Installation Manual.

With a lighted candle or match, check for air leaks around base and frames of heater. Seal leaks tightly. Inspect all joints and fittings for oil leaks.

Final Adjustments

After the unit has warmed up adjust the draft regulator to provide 0.02″ WC draft over the fire. Use a draft gage. Whenever excessive draft is encountered and the readings cannot be lowered to 0.02″ over the fire, a second draft regulator should be installed.

Reset the air adjustment until the fame becomes a trifle smoky. Then increase air slightly to a point where a clean flame is procured. Tighten air adjustment thumb screw.

Check the operation of all controls as outlined in the pamphlets found in each control carton. Oil the motor at both oilers with a good grade of electric motor oil SAE 20.

Fill out the Arcoflame Oil Burner Certificate (CS75) and hang it together with the Operating Instructions Card, in the vicinity of burner. Explain operation of Burner to user.

CAUTION: Provide adequate means to furnish air for combustion if the boiler room is all enclosed. Provide ventilation openings totaling a free area equivalent to not less than twice the area of the flue outlet of the heating unit, or 1 square foot of free area for each gallon of oil burned. One opening near the floor and a second opening near the ceiling are required.

FIRE EXTINGUISHER: If required by local ordinance, install approved type.

Follow-up Service

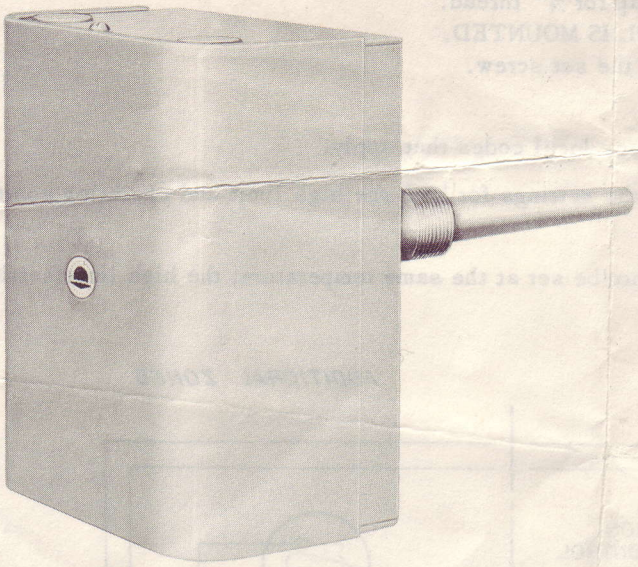
Inspect installation two or three weeks after placed in operation and recheck the control system, electrodes, flame, CO_2, stack temperature, draft, as well as oil lines for leaks.

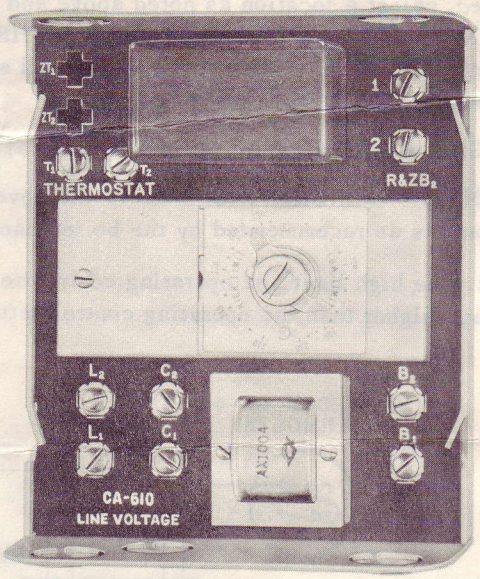
General Maintenance

For general care of burner see Operating Instruction Card. Clean fuel pump strainer and replace filter cartridge (when oil filter is used) every heating season.

TECHNICAL DATA SHEET 17-20

CA-610
COMBINATION IMMERSION CONTROL





The CA-610 Control combines in one unit an operating switch (which maintains boiler water temperature for domestic hot water); a high limit control (shuts down the burner if the boiler water temperature exceeds the high limit setting); a circulator relay (turns on the circulator when the thermostat calls for heat, providing the water temperature in the boiler is above the operating control setting.

Should the temperature of the water in the boiler be below the operating control setting, the circulator will not run. The circulator will start whenever the temperature in the boiler is greater than the operating control setting providing the thermostat is calling for heat.

This control provides fail safe operation in the event power element loses charge.

SPECIFICATIONS: MODEL CB-61000

Low Limit		High Limit		Well		Mounting
Range	Diff.	Range	Diff.	Insertion	Insulation	
100°–230°	Approx. 15°	110°–240°	Approx. 15°	4½" Max.	1½" Max.	¾" Pipe Thread

Finish: Gray Enamel

ELECTRICAL RATING IN AMPERES

Circuit	Voltage	Full Load	Locked Rotor
Circulator and Burner	115	7.4	44.4

Thermostat Load: 0.4 Amp. – 15 V. A.C.

MAXIMUM MOTOR LOADS

Motor Horsepower	Amperes 115 V., A.C.	Multiply By
1/12	2.1	Number of Pumps
1/10	2.2	
1/8	2.6	
1/6	3.2	
1/4	4.6	

EXAMPLE:

3 Pumps (Zones) using two 1/12 H.P. Motors and one 1/8 H.P. Motor

2.1 Amp. x 2 = 4.2 Amp.
2.6 Amp. x 1 = 2.6 Amp.
Total 6.8 Amp.

NOTE: TOTAL MUST NOT EXCEED 7.4 AMPERES

INSTALLATION: This control can be mounted in any position.

LOCATION: The CA-610 Control should be installed where the water surrounding the well has free circulation for the entire length of the bulb.

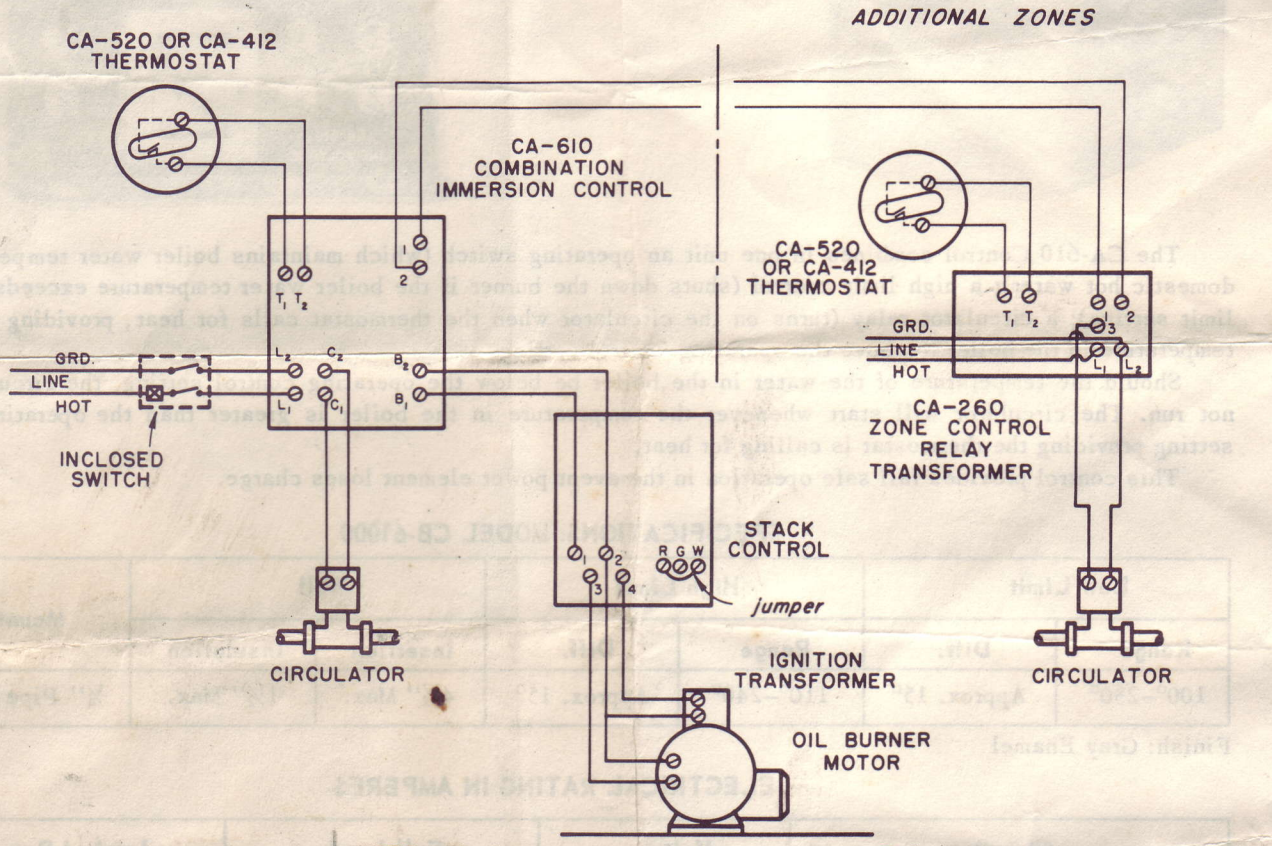
MOUNTING:

1. Drain the water below the selected installation point.
2. Remove the well from the control and install in tapping provided by boiler manufacturer. If no tapping is provided, select a location as noted above and drill and tap for ¾" thread.
   DO NOT TIGHTEN THE WELL AFTER THE CONTROL IS MOUNTED.
3. Insert the control all the way into the well and tighten the set screw.
4. Refill the system completely with water.

WIRING: It must conform to National Electrical Code and any local codes that apply.

SETTING OR CALIBRATING: Remove the cover and set the settings for both the high limit and operating control temperatures as recommended by the boiler manufacturer.

NOTE: The high limit and operating control settings cannot be set at the same temperature; the high limit setting is always higher than the operating control setting.



NOTE: Maximum combined circulator load 7.4 amperes

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