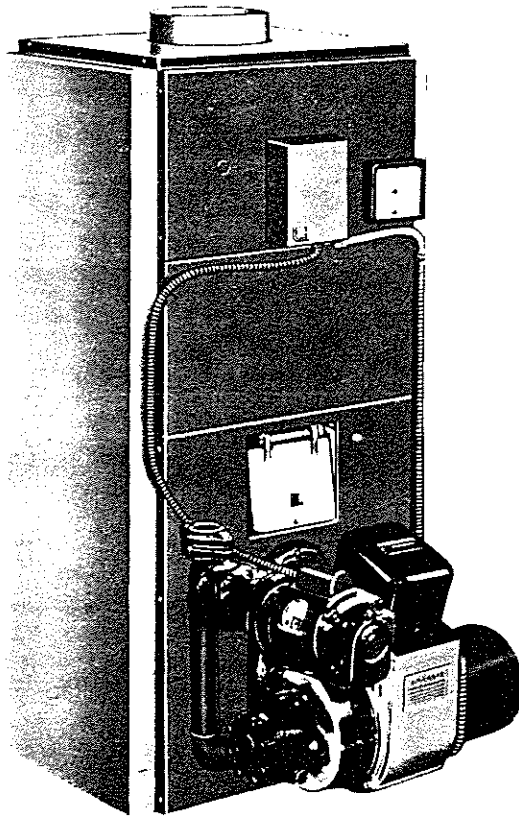


INSTALLATION AND OPERATING INSTRUCTIONS AND PARTS LIST

NO. OHB-13W



OIL FIRED CAST IRON HOT WATER BOILERS



These Instructions Must Be Affixed On Or Adjacent To The Boiler

THE H. B. SMITH COMPANY, INCORPORATED

BOSTON
886 WASHINGTON ST. DEDHAM, MASS. 02026
PHONE: 617-329-1287

WESTFIELD, MASS.
57 MAIN ST. 01085
PHONE 413-562-9631

NEW YORK
331 MADISON AVE. 10017
PHONE 212-687-6076

PHILADELPHIA
1612 MARKET ST. 19103
PHONE 215-563-9828

GENERAL OFFICE and PLANT — WESTFIELD, MASS.

When Shipment Arrives

PACKAGING OF YOUR BOILER DEPENDS UPON THE MODEL NUMBER (REFER TO PAGE 3). IF YOU HAVE ORDERED A BURNER SEPARATELY, REFER TO THE INSTRUCTION BOOK PACKAGED WITH IT.

First, inspect each item received for visible damage. If any parts are damaged, report this to the freight company immediately, and request them to call and make an inspection - before you make any installation. Have the inspector prepare a signed report . . . send us a copy of this report . . . and we will send replacements for the damaged parts. But we must have the signed inspection report of the freight company to prove their liability.

Second, if you have purchased a complete planned heating system, check the parts received against your materials list. Report at once to us if any parts are missing.

Third, examine all packing material carefully for loose parts before discarding it. Also, store all parts received where they cannot be damaged.

NOTE

If you have had to uncrate your unit outside, you may also have to disassemble it to carry it to the installation area. In this case, use the PARTS LIST drawings herein to guide you.

Locating Your Boiler

Locate your unit as nearly as possible to your chimney. If unit is to be part of an existing system, it is best located where old unit was. In both cases, alteration of location may require additional materials to connect the unit with your system.

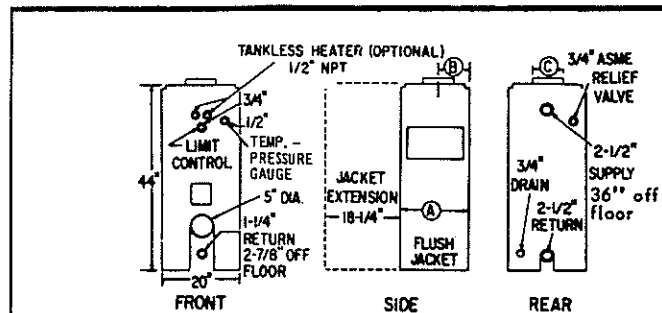
Set the unit on a solid, level floor. If floor is subject to dampness, construct a raised base. Observe minimum working clearances recommended between unit and surrounding walls. (See illus. below.)

BE SURE YOU HAVE THE PROPER MODEL

HOT WATER BOILER RATINGS						
	UNIT MODEL	No. Sec.	I-B-R Gross MBh Output	I-B-R Net MBh Rating	*Max. Firing Rate GPH	Chimney Size
KNOCKED DOWN	WOB-W-4	4	100	87.0	1.00	8"x 8"x15'
	WOB-W-5	5	130	113.0	1.30	8"x 8"x20'
	WOB-W-6	6	160	139.1	1.65	8"x 8"x20'
	WOB-W-7	7	190	165.2	1.95	8"x 8"x25'
	WOB-W-8	8	220	191.3	2.25	8"x12"x25'
	WOB-W-9	9	260	226.1	2.55	12"x12"x25'
PACKAGED LESS COIL	OHB13-W-4	4	100	87.0	1.00	8"x 8"x15'
	OHB13-W-5	5	130	113.0	1.30	8"x 8"x20'
	OHB13-W-6	6	160	139.1	1.65	8"x 8"x20'
	OHB13-W-7	7	190	165.2	1.95	8"x 8"x25'
	OHB13-W-8	8	220	191.3	2.25	8"x12"x25'
	OHB13-W-9	9	260	226.1	2.55	12"x12"x25'
PACKAGED WITH COIL	OHB13-W-4T	4	100	87.0	1.00	8"x 8"x15'
	OHB13-W-5T	5	130	113.0	1.30	8"x 8"x20'
	OHB13-W-6T	6	160	139.1	1.65	8"x 8"x20'
	OHB13-W-7T	7	190	165.2	1.95	8"x 8"x25'
	OHB13-W-8T	8	220	191.3	2.25	8"x12"x25'
	OHB13-W-9T	9	260	226.1	2.55	12"x12"x25'

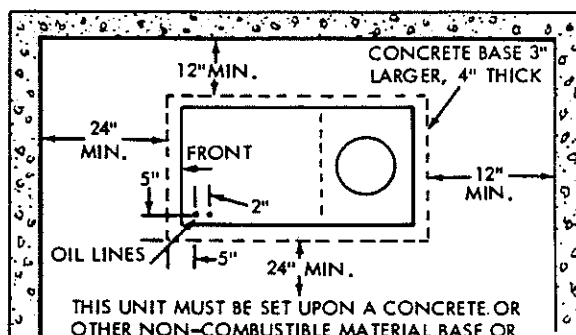
The Net I=B=R Water Ratings shown are based on the I=B=R Code allowance of 1.15. The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements.

*Oil at 140,000 BTU per Gal.



Number of Sections	4	5	6	7	8	9
A	14 ³ / ₄	17 ³ / ₄	20 ³ / ₄	23 ³ / ₄	26 ³ / ₄	29 ³ / ₄
B	6 ³ / ₄	8 ¹ / ₄	9 ³ / ₄	11 ¹ / ₄	12 ³ / ₄	14 ¹ / ₄
C	7	7	7	8	8	10

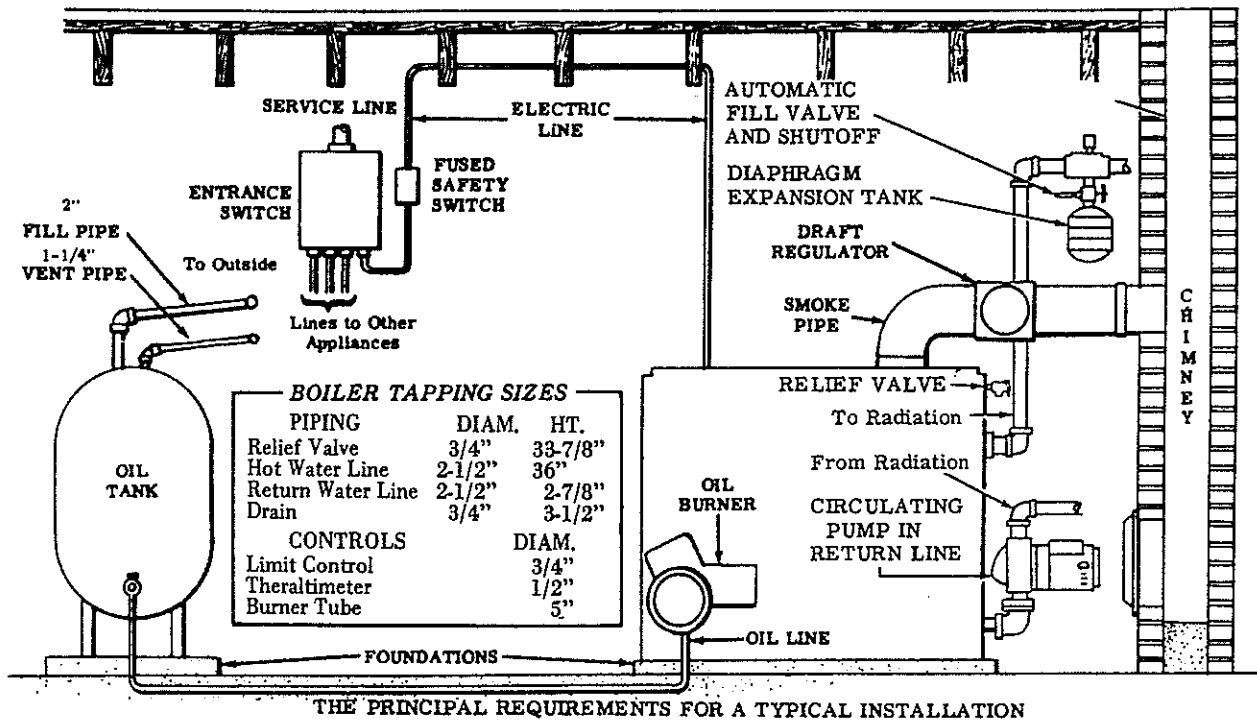
DIMENSIONS MIN. CLEARANCES



THIS UNIT MUST BE SET UPON A CONCRETE OR OTHER NON-COMBUSTIBLE MATERIAL BASE OR FLOOR. FOR MINIMUM SAFE CLEARANCES BETWEEN THE UNIT AND COMBUSTIBLE MATERIALS, REFER TO SECTION: "INSTALLING YOUR UNIT."

CHIMNEY OPENING MUST BE MIN. OF 52" HIGH AT CENTER.

Installation Requirements



PACKAGED BOILERS

These models are shipped (crated) completely assembled, with burner installed - ready for installation. All you need do is: provide an oil tank and lines (page 4). Provide a base and set-up the unit (page 5). Connect the boiler to your heating system (page 8). Install the thermostat and electrical service wiring (page 9). Install the smoke pipe and the draft regulator (page 15).

KNOCKED DOWN (Unassembled) BOILERS

These models are shipped either with or without a burner, and partially disassembled. The boiler shipment includes: 1) An uncrated assembly of Boiler sections with the Preformed Ceramic Fiber Combustion Chamber cemented in place. 2) A carton containing the several Boiler Jacket panels with sheet-metal screws to assemble these parts. 3) A carton containing the Flue Collector, Can of Cement, Tankless Heater Opening Gasket and Plate (when ordered), and Flue Cleaning Brush, Bag of Bolts containing nine 3/8 x 3/4 Cap Screws, four 1/4 x 1 Rnd. Hd. Stove Bolts, Barometric Draft Control, Temperature-Altitude Gauge, Data Plate, Instruction Book, Side Clean-out plates and ASME 3/4" Relief Valve.

If a Tankless Heater Coil is ordered with the Boiler, it will be in a separate carton. If Boiler is ordered less Tankless Heater Coil, the blank cover plate will be in the carton containing the Flue Collector.

The complete installation for these models requires: Provide an oil tank and lines (page 4). Provide a foundation, and set-up the boiler sections (page 5). Install the side clean-out plates (page 5). Install heater port cover plate or tankless coil (if used), and flue collector (page 5). Install oil burner and controls (page 6). Install the boiler jacket (page 7). Connect the boiler to heating system (page 8). Install the thermostat and all wiring (page 9). Install the smoke pipe and the draft regulator (page 15).

JACKET EXTENSION CARTON (when ordered)
Contains 5 Panels, bag of screws for assembling, 4 spring clips for attaching to Flush Jacket, 2 Door Handles and mounting bolts.

ALL MODELS

To obtain the economical, efficient and entirely satisfactory performance for which this boiler is designed, it is absolutely necessary that the burner be carefully checked and adjusted (page 16). You must also properly maintain your boiler (page 18).

For information on the operation, adjustments, servicing and parts for the oil burner, refer to the oil burner instruction book.

FOR ALL MODEL NUMBERS SEE TABLE, TOP PAGE 2

Installing Your Oil Tank and Piping

GENERAL INSTALLATION REQUIREMENTS

NOTE

The installation must conform with the requirements of your local fire ordinances — and with the National Board of Fire Underwriters. Consult these, *before* planning your installation. Also read *SPECIFIC TANK INSTALLATION REQUIREMENTS* in the book packaged with your Oil Burner.

The following installation procedures will be found to be in conformance with most regulations — and we suggest them for your use. In case any questions arise, consult your local authorities.

Tank Locations

In general, oil tanks may be located: 1) In a basement or crawl space; 2) In a garage, shed or similar enclosure adjoining the building; 3) Outdoors, above ground; or 4) Outdoors, below ground. A tank of over 60-gallon capacity may not be located above a cellar or basement, or above any first-floor room. *No tank can be installed closer than 7 feet from the oil burner, or any other source of flame.*

Tank Types

The most commonly used *indoor tank* is a welded, 14-gage steel, obround tank of 275 gallon capacity. Most localities approve indoor use of one such tank (maximum 275 gal) — or of two similar tanks having a combined total capacity of not over 550 gallons. All *outdoor tanks* must be of heavier steel (consult your local code for the proper gage). Above ground installations are generally limited to one or two tanks, the same as for indoors; but below ground tanks are usually 1000-gallon size.

Installing Tanks

Every tank must be installed on a substantial footing — to prevent settling. The foundation must be of *nonflammable* material. For indoor tanks (if not on a concrete floor) we recommend either a 3-in. concrete (or equivalent) slab, or four 8 x 16 x 4 concrete blocks placed under the four legs. For outdoor above ground tanks a 3- to 4-in. concrete slab should be used. Local rules may require diking around an above-ground outdoor tank (consult your local code).

Each tank should be installed with the front part (where supply line connects) approximately 2 inches

lower than the back (to prevent sediment from remaining in the tank). The tank should be protected with a rust-resistant paint. Painting is very important if the tank is to be installed underground.

Tank Fittings Required or Recommended

VENT PIPE: Every tank (or pair of tanks) must have a vent pipe. This must be at least 1-1/4-in. size. It must run continuously upward (*no dips*) from the tank — and terminate *outside the building* at least 3 feet above ground and a minimum of 3 feet distant from any door or window. It should terminate either in a downward bend (like an el pointing down) or a weather-protected vent cap — to keep out rain, etc. Its end should be situated where it can never be blocked by drifted snow, debris, etc.

VENT ALARM: Most oil companies prefer that you install an alarm on the vent pipe (where it enters tank). This alarm facilitates filling the tank by informing the delivery man when the tank is full. It thus prevents overflowing of the oil from an overfilled tank.

FILL PIPE: Outdoor tanks need only a cap over the fill opening; but indoor tanks must have a fill pipe, terminating *outside the building* at a point at least 5 feet from any building opening that is on the same or a lower level. The fill pipe must be at least 2-in. size, and *must be capped* at the end. It should terminate where an oil truck can conveniently fill the tank — where it will never be obstructed by drifting snow, debris, etc.

OIL GAGE: Each tank (or pair of tanks) should be fitted with an oil gage — to register contents. This should be placed, if possible, where it can be read from inside and outside.

Types of Feed Systems

GRAVITY-FEED: A gravity feed system requires that the bottom of the tank (or tanks) be positioned either level with or a specified distance above the intake of the oil burner (so that all the oil from the tank(s) can drain to the burner). This type of system uses *only one* (supply) oil line between the tank and burner.

FORCED-FEED: Whenever the tank bottom has to be lower than the specified distance above the intake of the oil burner or whenever the tank has to be at some distant location, a *two-line* force-feed system is required. That is, there must be a return line in addition to the supply line.

Assembling Your Boiler

NOTE IF YOU HAVE A PACKAGED BOILER

Read only the first paragraph below, "Providing a Foundation" – then turn to "Installing Your Boiler . . ." starting on page 8 for the balance of your installation instructions. The assembly information below and on pages 6 and 7 applies only to uncrated boilers.

PROVIDING A FOUNDATION

Unless you already have a substantial concrete floor it is important that you provide a concrete foundation per the illustration on page 2. If you construct a foundation, it is advisable to install your oil line(s) first – and run it (them) up through the foundation (as illustrated on pages 2 and 3) at the right-front corner so they will be available when installing the burner. For oil tank installation refer to page 4.

SETTING UP THE BOILER SECTIONS

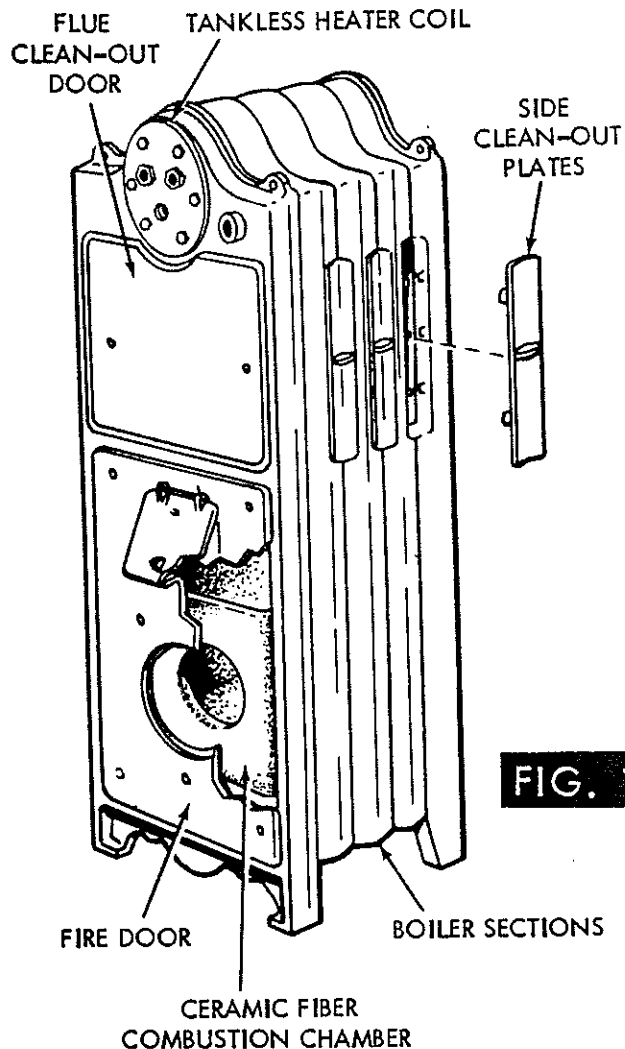
When your concrete foundation is thoroughly set, place the assembled Boiler Sections on it with the rear face 4 in. in from the foundation rear edge (if you have made the foundation 3 in. larger all around, per illus. on page 2). Center it between the two sides of the foundation. Use shims under the low legs as necessary to make it perfectly level in both directions.

INSTALLATION OF SIDE CLEAN-OUT PLATES

Take the Side Clean-Out Plates and place each one in position (fig. 1). Put Boiler Cement all around the edges of each one to seal them all tightly.

COMBUSTION CHAMBER

The ceramic fiber combustion chamber is installed in boiler prior to shipment. WARNING do not try to remove, it is cemented in place.

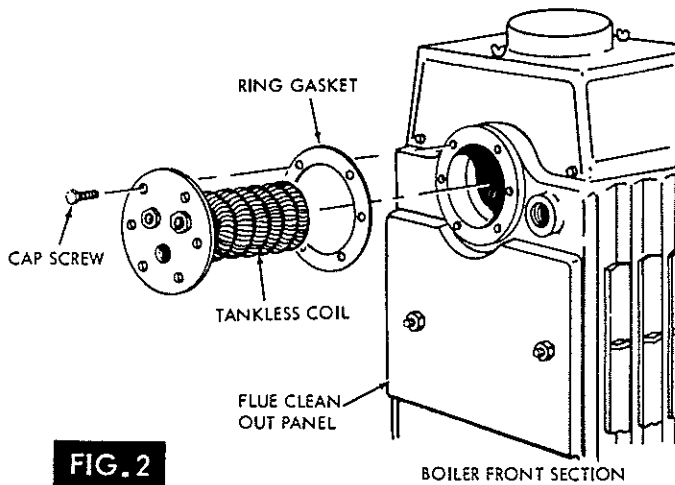


FOR ALL MODEL NUMBERS SEE TABLE, TOP PAGE 2

INSTALL HEATER PORT COVER PLATE

When You Do Not Have a Tankless Coil

This Cover Plate is to be mounted over the large opening in the upper part of the Front Section. First clean the sealing surfaces of the opening and Cover Plate. Position the Cover Plate (with the word "UP" at the top) and the gasket over the opening and secure with the six $3/8 \times 3/4$ cap screws furnished. Draw up cap screws evenly, tightening each alternately, until all are snug.



If You Have a Tankless Heater Coil

The Coil and Cover Plate are integral. Clean the sealing surfaces as noted in preceding paragraph. Place the sealing gasket over the coil and against the inside of the mounting plate. Position and bolt to the boiler as stated above.

NOTE

The use of this coil (designed for these model boilers) eliminates the need for a hot-water storage tank. Instantaneous heating of water in the coil will provide a flow of hot water for domestic use — if proper water supply line controls are used (refer to page 10).

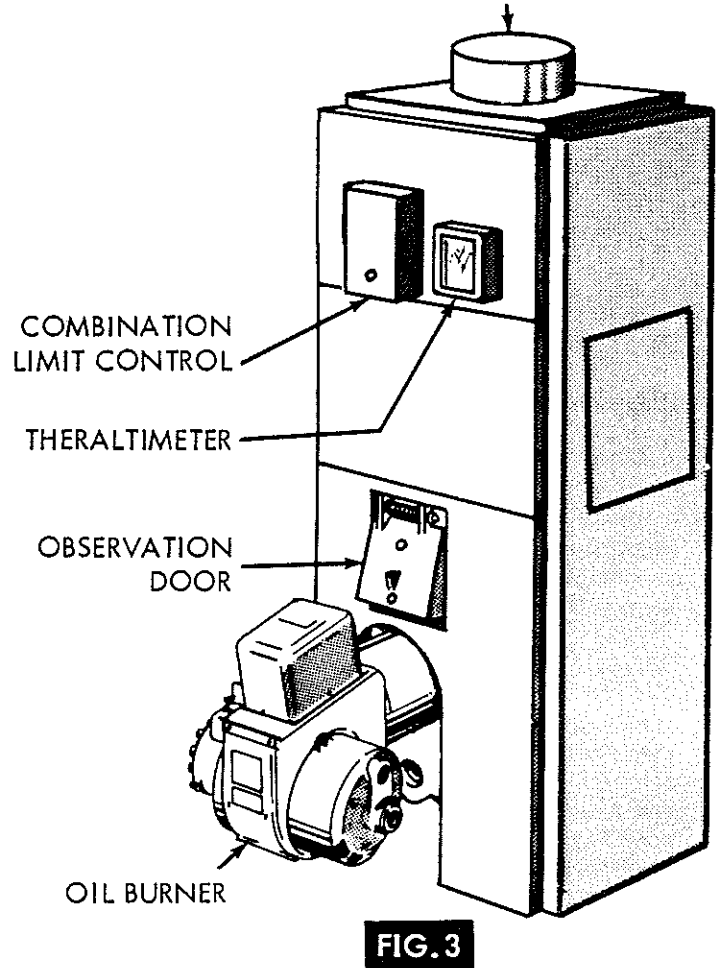
IMPORTANT

Do NOT use a tankless coil if yours is a Gravity Hot Water System, or if your water is excessively hard with lime or other deposits which will accumulate inside the coil.

INSTALL THE FLUE COLLECTOR ASSEMBLY

Rest the collector on top of the boiler sections — then secure it in place with the four No. $1/4 \times 1$ Rd-Hd. Stove Bolts (furnished). Afterwards, seal its edges tightly to the boiler sections, using the Boiler Cement (furnished). Be sure to plug all cracks, so that no fumes will escape.

FLUE COLLECTOR ASSEMBLY



INSTALL YOUR OIL BURNER AND CONTROLS

These model boilers will accommodate any standard-make oil burner — and produce efficient heating. However, your boiler has been specifically designed for use with our Oil Burner — and we recommend use of our burner for peak performance and long, trouble-free service.

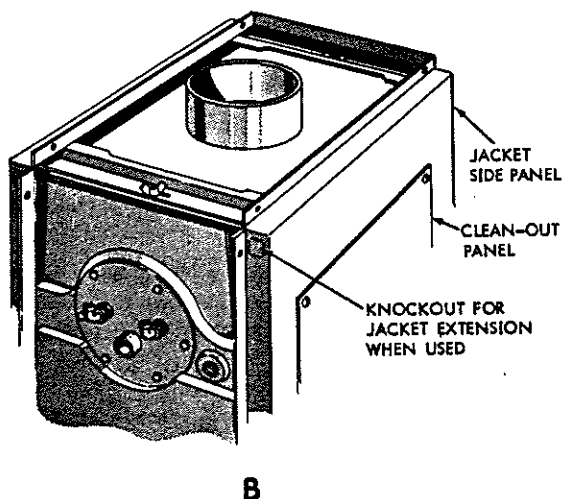
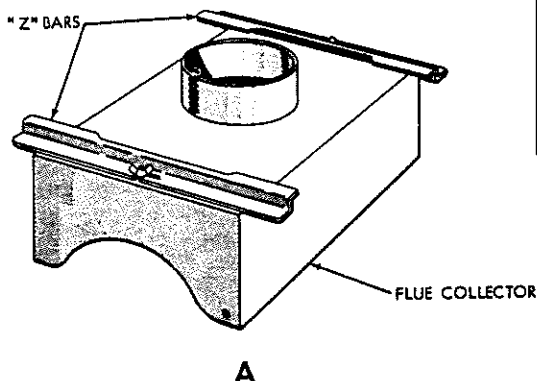
Complete instructions for installation of the oil burner and the controls used with it are packaged with our oil burner. The controls to be mounted on the boiler sections are shown (fig. 3) in their proper locations. Be sure to position Upper Front Panel before mounting controls. Typical wiring diagrams are illustrated here (pages 11-14) but we suggest that wiring be done after the Boiler Jacket (page 7) has been installed.

Whatever burner you use, it is necessary to install it with the tube end $1/4$ in. back from the inside face of the combustion chamber. Refer to the table, top of page 2 for correct nozzle sizes.

INSTALL THE FLUSH BOILER JACKET

The Boiler Jacket is furnished in several pieces (fig. 12), together with screws for assembling these pieces to the Boiler Sections. Following are the assembly steps:

1. The two Z Bars included with your new jacket are to be mounted on top of the flue collector. See sketch A.
2. Loosen the two (2) wing nuts on top of the flue collector and slide a Z bar under each—retighten the wing nuts.
3. Hang the side panels on the ends of the Z Bars and attach to Rear Panel with the sheet metal screws furnished. See sketch B.



NOTE — Be sure you locate the side panels correctly; That is, check the 1/2" flange for the knock-outs for the Jacket Extension clips; face forward. Be sure the clean-out panel is on the right side facing boiler.

4. Place the upper Front Panel in position and attach to Side Panels.
5. Install the controls as shown in Fig. 3 page 6.
6. Attach the Top Panel to the top edges of the two side panels.
7. Position and attach the other two Front Panels to the Side Panels.

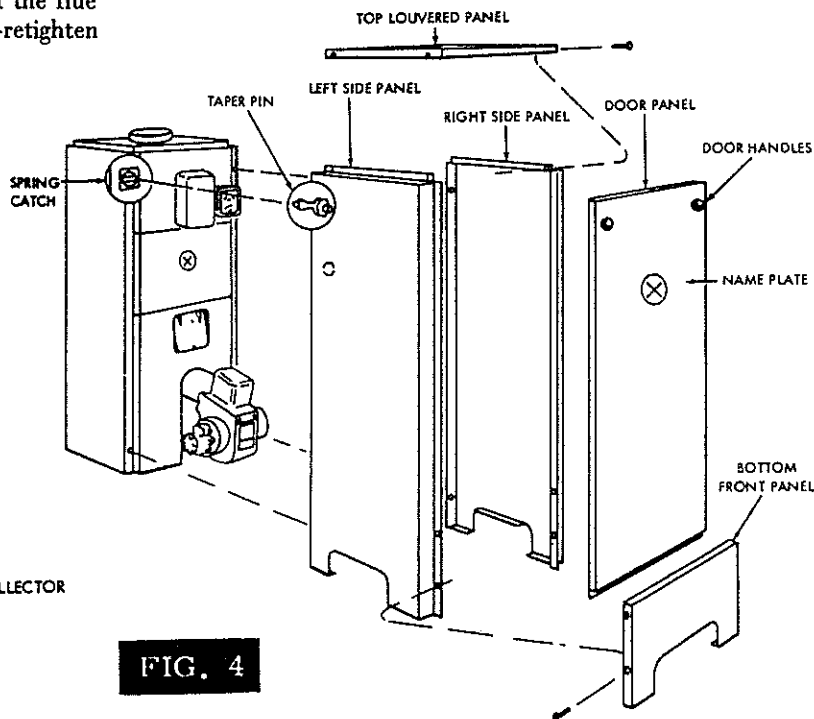


FIG. 4

ASSEMBLING JACKET EXTENSION

When jacket extension is used, assemble bottom front panel to left and right side panels. Place top louver panel in position and fasten with sheet metal screws furnished. Install four tapered pin catches into rear edge of side panels. See Fig. 4, exploded view above.

Punch out the four knockouts in front flanges of flush jacket, insert the spring catches (furnished). After Boiler has been completely piped, and tested for operation move the jacket extension assembly into position and push the tapered pins into the spring catches.

Set door into position, after mounting the two door handles furnished.

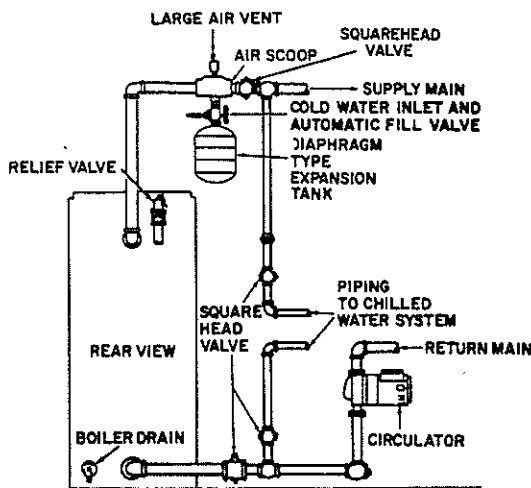
Installing Your Boiler

INSTALL THE WATER PIPING

Your boiler is now in position and ready to be connected with your radiation units. Proper connections require the use of certain additional fittings and parts, as shown on the following diagrams (figs. 5 thru 7)—and as explained hereafter. Whether you have ordered these parts separately (from us or elsewhere), or intend to use parts already in place in an existing heating system, all of the parts shown on the diagram that is appropriate to your installation should be used (as shown)—and you should make certain that you have, in each case, a part that is correctly designed to work with your new boiler. All of the parts shown can be obtained from us...and are correctly designed for your new boiler.

If you are replacing an old boiler with this new one, possibly all you will need do is to connect the existing piping to your boiler, and install the Relief Valve. If you are installing an entire new heating system, first install all of your radiation units (panels, radiators or cabinets) and the Supply and Return Mains—then make the connections at the boiler.

In any event, refer to the proper diagram (figs. 5 through 7) for your model boiler and type of system—and make the final connections at the boiler as shown.



FOR USE WITH COOLING UNITS

A. This boiler, when used in connection with refrigeration systems, shall be installed so that the chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating boiler.

B. When this boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, the piping system shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

Relief Valve

Water expands as it is heated. If there is no place for the excess water bulk to expand into, water pressure will build up inside the boiler and system. Should this happen, the Relief Valve will automatically open at the correct pre-determined pressure, to relieve the strain on the boiler and system. The relief valve also has a lever for manual operation.

Expansion Tank

In a properly assembled system, the expanding water (above) flows into an Expansion Tank. This tank should be of the correct size to receive the thermal expanded water from your boiler. As the water expands into the tank it compresses the air in the tank to form an air pressure cushion...and this "spring-like" cushion serves to maintain a constant, correct operating water pressure in the system regardless of water temperature. This assures a "full measure" of water, even in the highest radiation unit of the system—and (under normal conditions) prevents blowing off of the relief valve.

The air which is in the tank in the beginning (with system filled with cold water) is sufficient for proper expansion tank operation. However, the correct size tank will absorb a normal addition of air from the Air Trap Fitting—inasmuch as all water contains a certain amount of air which, in time and with repeated heating, will be bled out to the tank through this fitting. Thus, the tank also serves as a final trap for this excess air (which, if left in the system would cause "knocking" in the pipes and inefficient circulation).

It is possible for a tank to become "water-logged"—meaning that the air cushion is insufficient. It is also possible for it to become overfilled with air (following the introduction of too much new water into the system). Fittings are therefore provided on the tank and in the line to the tank for bleeding off excess water or air.

When installing this tank it is important: 1) That the tank be higher than the boiler top. 2) That the line to the tank continuously rises up to the tank (so that air can "bubble" up through it).

DIAPHRAGM TYPE EXPANSION TANK

The Diaphragm Type Expansion Tank takes the place of the conventional expansion tank. The function of the Diaphragm Type Expansion Tank is to handle water expansion and contraction. An Air Purger is used to continually remove air and gases from the system. The Air Purger is installed in the supply main. The Diaphragm Type Tank can be mounted in this fitting or at any other convenient place in the supply or return line.

DRAIN COCK

This manual cock provides a means of draining all water from the boiler and system, should this become necessary.

MAIN AIR VENT

Before a system is filled with water there is air in the pipes and radiation units—some of which will be trapped as the system is filled. It is possible to eliminate most of this air through the air vents (automatic or manual) on the radiation units; but a Main Air Vent, properly installed, will speed and simplify this. A main air vent should be installed at the *highest* point in the Supply Main (or in each main if you have more than one).

AUTOMATIC FILL VALVE

The correct amount of water to properly fill a system must be maintained at all times—for safe, efficient operation of the system. Adding new water whenever required can be accomplished manually (by use of a hand valve in the water supply line), but this requires regular attention to the system's needs. An Automatic Fill Valve accomplishes this without attention. It is installed in the Supply Main, ahead of the Drain Cock, as shown. The Auto-Fill valve operates through water pressure differentials—does not require an electrical connection. If you have a Filtril Diaphragm Expansion Tank, a fill valve is in the assembly.

FLOW REGULATOR AND WATER TEMPERATURE VALVE

If you have a Tankless Coil to provide you with domestic hot water, these two parts are essential . . . if you want to fully enjoy the luxury of instantaneous hot water that is neither scalding hot nor merely tepid. The Flow Regulator is installed in the water supply (cold) line to the coil — and assures a steady flow of water through the coil at a reduced rate at which the coil can properly heat it. It thus avoids "spurts" of "half-heated" water; is exceptionally important to any installation where the water pressure is excessively high or variable. The Water Tempering Valve is a tee which is connected at a junction between the hot water line from the coil and a cold water branch from the supply line. It mixes the hot and cold waters as required to furnish a tempered supply of water to the house which will be just the right temperature for your use. Both parts are self-contained and automatic — requires no electrical connections.

CIRCULATING PUMP

Every Forced Hot-Water System requires a Circulating Pump—and a separate Zone Valve for each Zone, if you have a Zone Control System. This pump must be of the right capacity (sq. ft. of radiation) to provide the amount of circulation required by your boiler and system. The pump is connected into the Return Main just ahead of where the main enters the boiler — and is also wired to the electrical system (Figs. 8 through 11).

INSTALL YOUR THERMOSTAT

Your Thermostat will call for heat (or shut off the room heat) in accordance with the temperature of the air which circulates around it. It will also be affected by the convected heat from such nearby objects as a light bulb, television or radio set, etc. . . . or by a cold draft or direct sunlight. Therefore, it is very important that it be located in a place where only the air freely circulating in the dwelling will affect it—so that it will respond correctly to average room temperature. Avoid putting it in a "dead air" area (as in a stairwell), or in a draft, on a cold wall, or in the path of any source of heat. Use an inside wall, and choose a spot approximately 4½ ft. above the floor. If you have a Zone Control System, provide a separate thermostat for each zone.

INSTALLING THE WIRING

All electrical work must conform with the requirements of your local ordinances and the National Electrical Code. If you are not familiar with proper wiring methods, see your electrician. The wiring should originate at your Entrance Switch, and be a separate fused circuit out of this switch (rather than be a branch line from some existing circuit). No. 14 wire (or larger) should be used, except where our diagrams call for bell wire. The boiler circuit should contain a Fused Safety Switch (to control the circuit)—and this should be fused with a Time-Lag fuse (4 amp. for a Gravity System; 8 Amp. for a Forced Hot-Water System).

FOR PACKAGED BOILERS

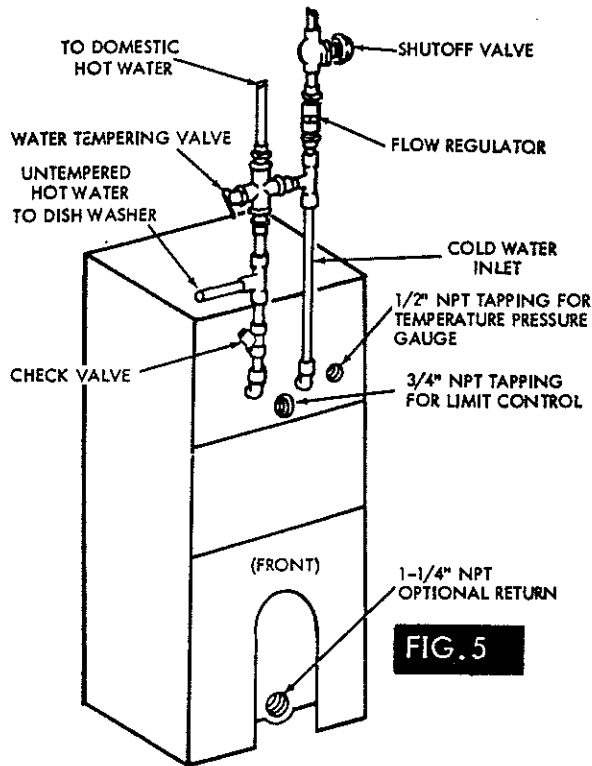
These boilers are shipped with all controls (except thermostat) mounted and wired. All you need do is mount and wire the thermostat, and prepare and electrical circuit and connect it to the boiler. *If you have no tankless heater, refer to Fig. 8. If you have a tankless heater, refer to Fig. 9.*

ALL OTHER BOILERS

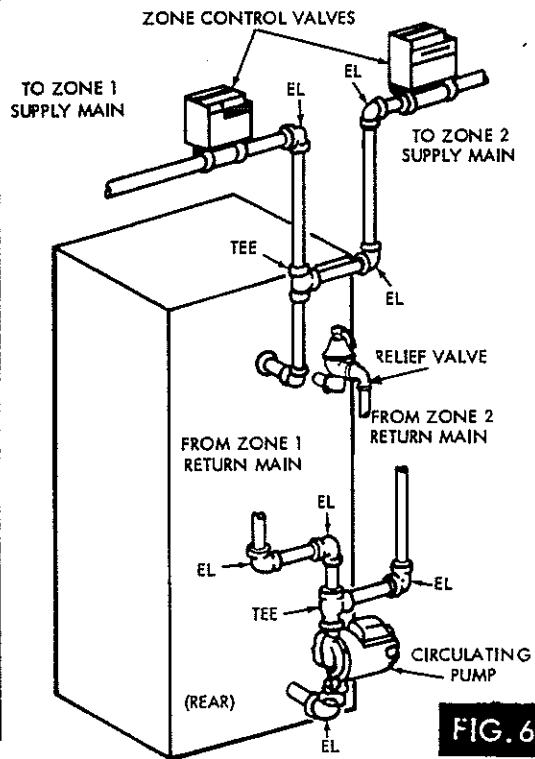
As already noted (page 6) you are to mount and wire all controls—then prepare an electrical circuit and connect it to the boiler. The diagrams (Figs. 8 through 11) show the electrical connections for various types of systems. Use the diagram which applies to your system.

CONNECTIONS FOR A TANKLESS COIL

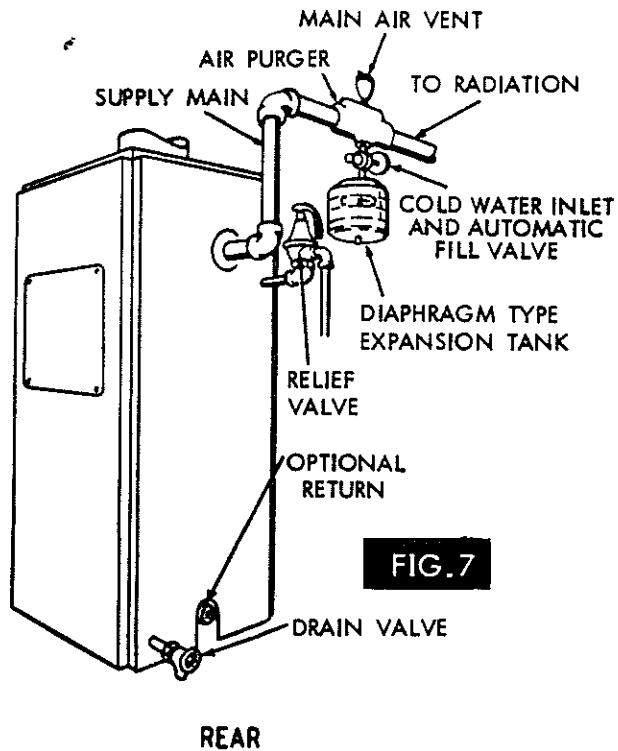
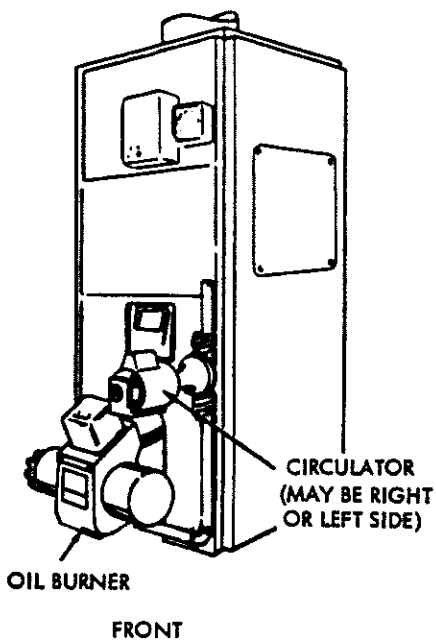
A FLOW CONTROL VALVE OR MOTORIZED VALVES ARE REQUIRED WHEN EQUIPPED WITH TANKLESS COIL



FOR ALL BOILERS
TYPICAL ZONE CONTROL CONNECTIONS TO SUPPLY AND RETURN MAINS

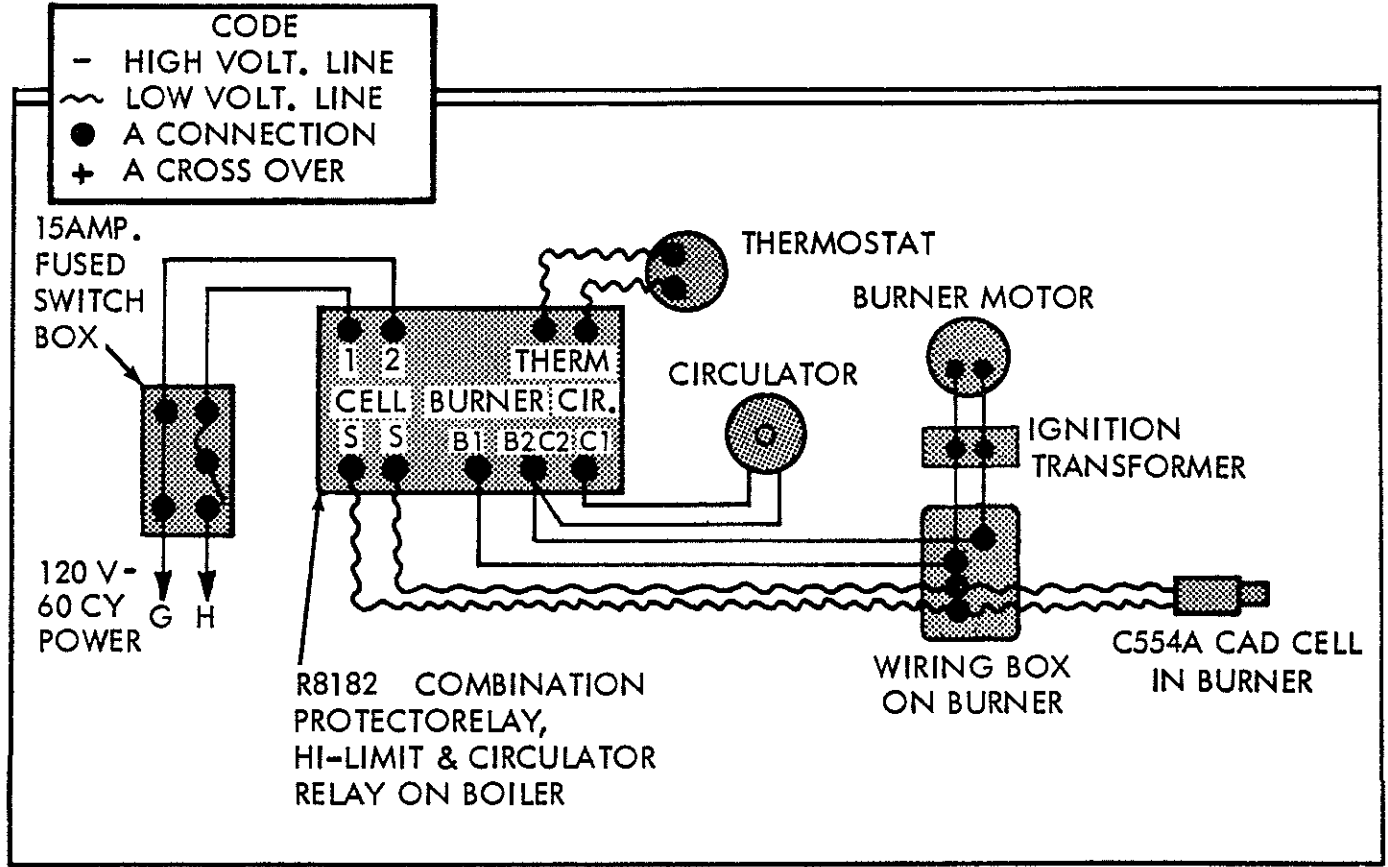


FOR PACKAGED BOILERS
(For TANKLESS Coil connections see Fig. 5)



FOR ALL MODEL NUMBERS, SEE TABLE TOP PAGE 2

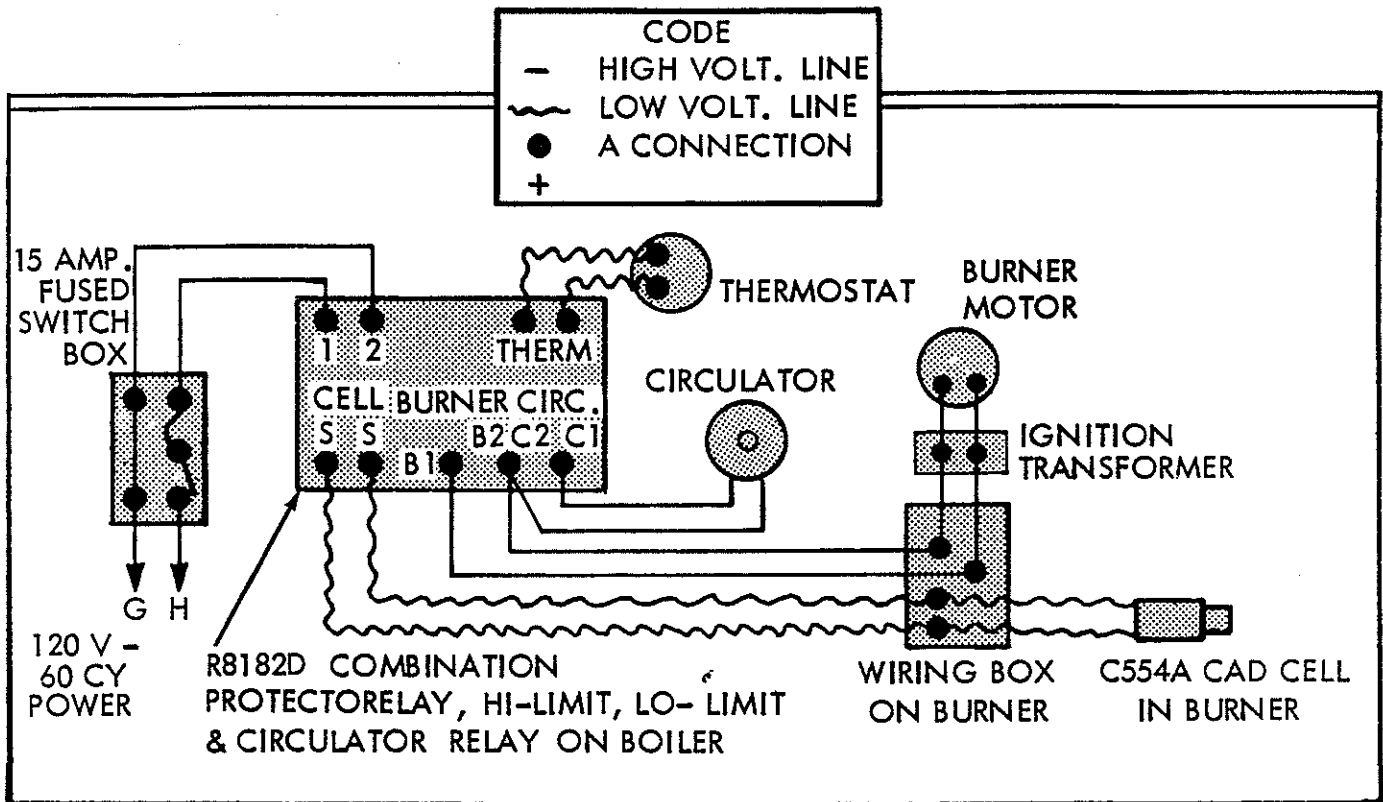
WIRING DIAGRAM WHEN OIL BURNER IS PROTECTED BY A CAD CELL



CONSTANT IGNITION, FORCED HOT WATER SYSTEM WITHOUT TANKLESS HEATER COIL

FIG. 8

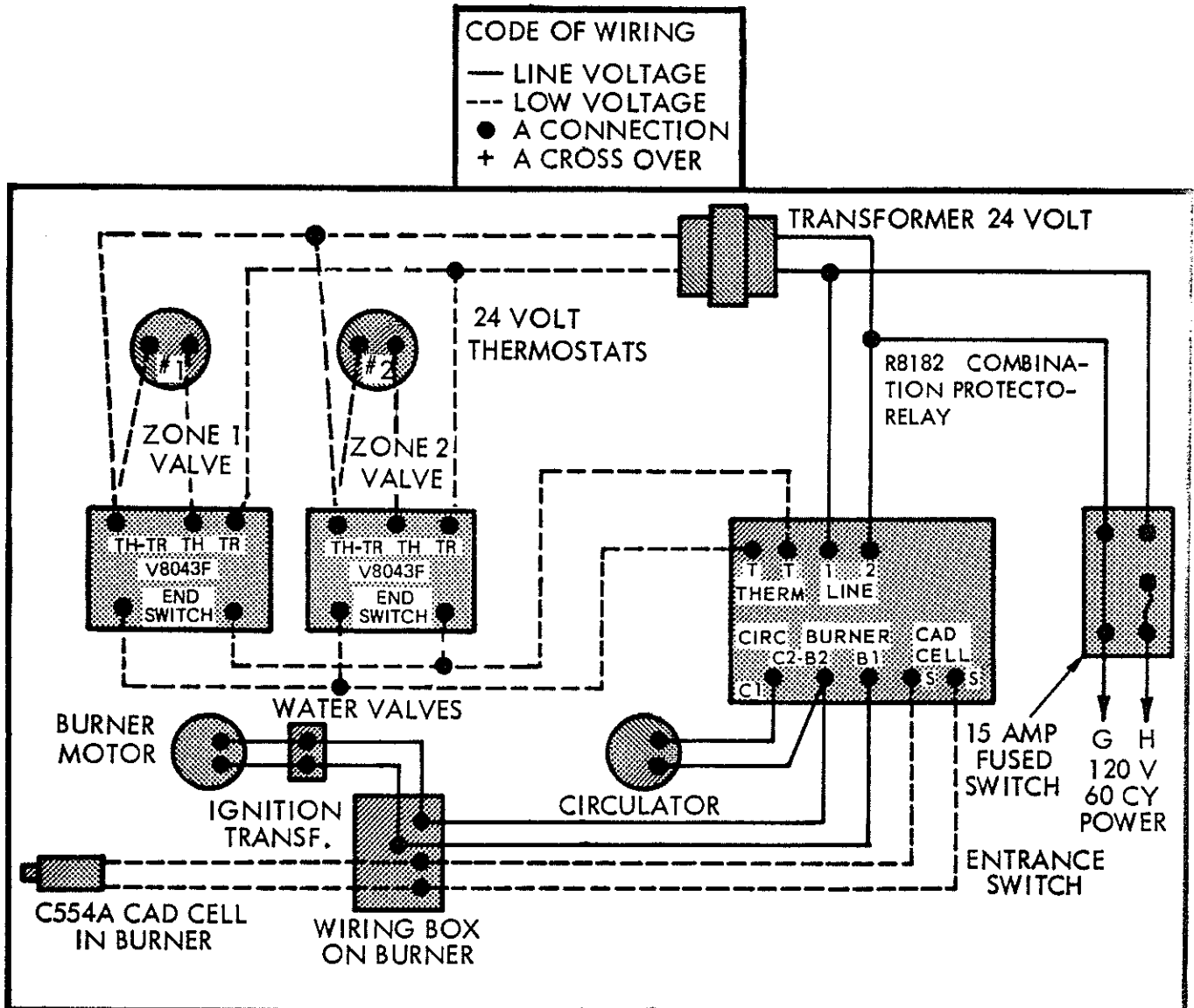
WIRING DIAGRAM WHEN OIL BURNER IS PROTECTED BY
A CAD CELL



CONSTANT - IGNITION, FORCED HOT WATER SYSTEM
WITH TANKLESS HEATER COIL

FIG. 9

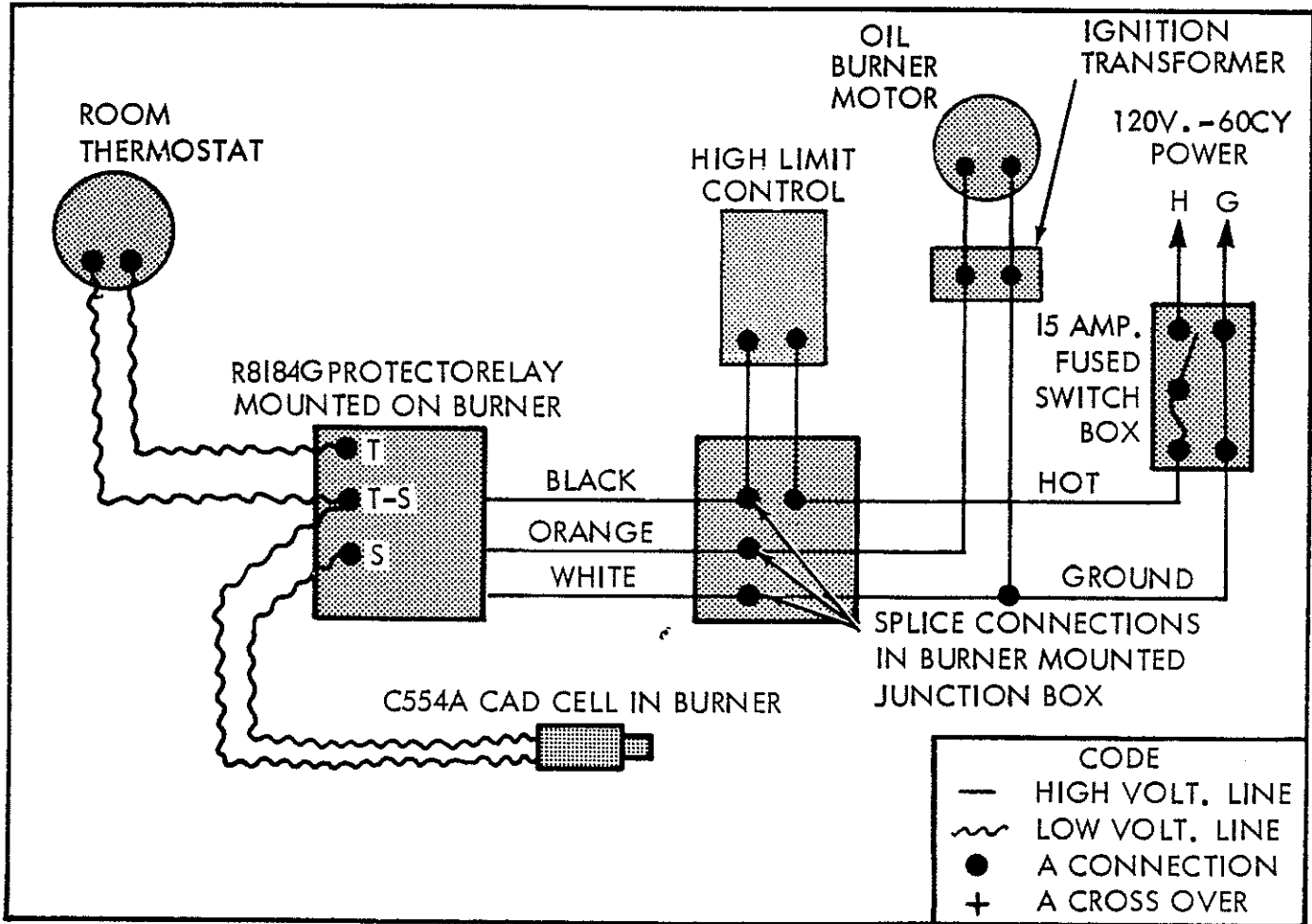
WIRING DIAGRAM WHEN OIL BURNER IS PROTECTED BY A CAD CELL



CONSTANT IGNITION WITH
MOTORIZED ZONE VALVES

EITHER THERMOSTAT WILL START
THE PUMP AND THE BURNERS
SIMULTANEOUSLY AS ITS ZONE
REQUIRES HEAT

WIRING DIAGRAM WHEN OIL BURNER
IS PROTECTED BY A CAD CELL
(CONSTANT IGNITION)



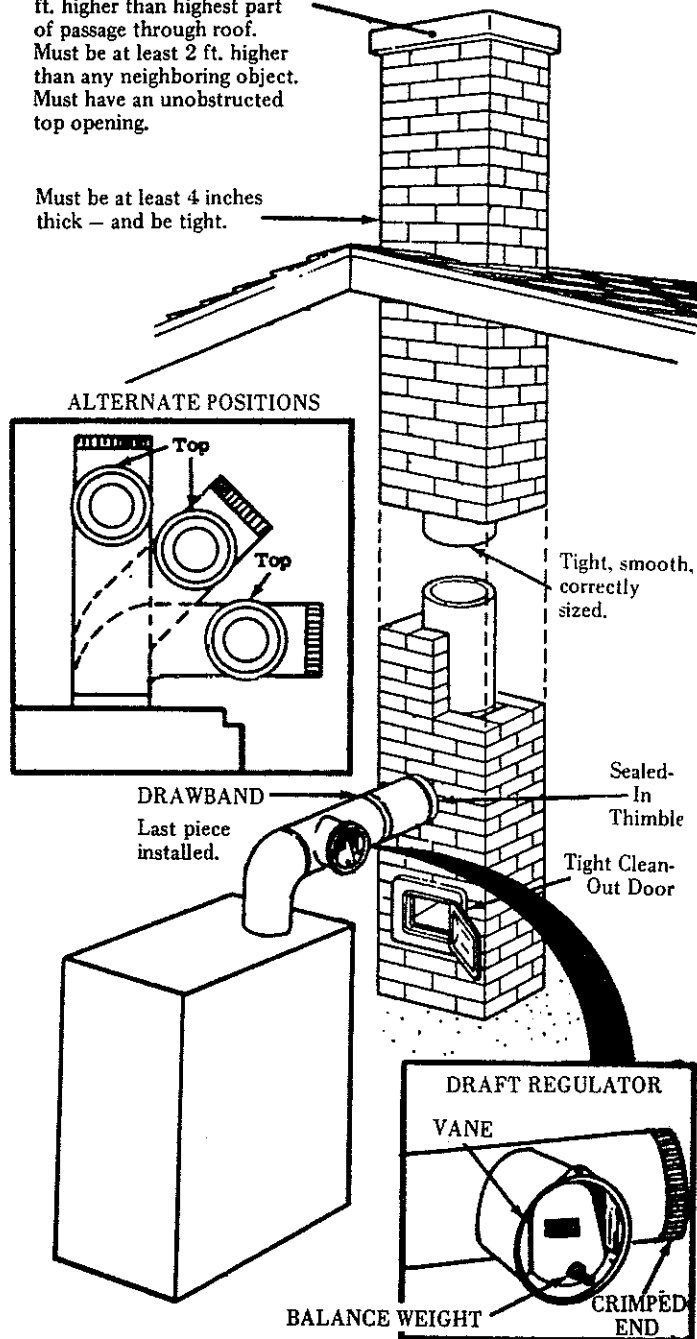
FOR GRAVITY HOT WATER SYSTEM

FIG. 11

INSTALLATION (cont.)

Must be required minimum height. Must be at least 3 ft. higher than highest part of passage through roof. Must be at least 2 ft. higher than any neighboring object. Must have an unobstructed top opening.

Must be at least 4 inches thick – and be tight.



MINIMUM FLUE PIPE CLEARANCE

Wood and other combustible materials must not be closer than 18" from any surface of the flue pipe.

SMOKE PIPE AND DRAFT REGULATOR

Your boiler requires 7" dia. Flue Pipe on 4, 5, and 6 section, 8" dia. pipe on 7 & 8 section and 10" pipe on 9 section sizes. You must also use a draft Regulator of the same size *Never* use a damper. Properly installed, the regulator will control the required draft automatically. Preferably install it in a horizontal section of the pipe; but it may be in an angled or vertical section. Just make certain that the "top" is at top – and that the short pipe section which holds the Vane is horizontal. Install it as close as practicable to the boiler.

To install the smoke pipe run, start at the boiler and preferably take off from the flue collector collar with an elbow – then install the draft regulator next, making it horizontal. When the regulator is in place, start at the chimney end and work back to the regulator. Join the two sections with a Drawband. The entire run must slope up toward the chimney at least 1/4 in. per foot. It must be smoke tight and firmly supported. Join sections with at least two sheet-metal screws – and support every second section with a stovepipe wire hanger.

YOUR CHIMNEY

Your chimney is a very important part of your heating plant. No boiler, however efficient its design, can perform satisfactorily if the chimney that serves it is inadequate. Check your chimney to make certain that it is the right size, properly constructed and in sound condition

MINIMUM CHIMNEY SIZE

NOZZLE SIZE (Gals. per Hr.)	FLUE HT. (In Feet)	FLUE AREA (In In.)
1.00 to 1.35	12	8 x 8
1.35 to 1.75	13	8 x 8
1.75 to 2.50	13	8 x 12
2.50 to 3.50	15	12 x 12

NOTE

The heights and areas shown are the minimum allowable. If possible, use a 15-ft. high chimney. A larger area flue can be used if not more than twice the size listed above.

If your home is located more than 2,000 ft. above sea level, add 3-ft. to chimney heights for an oil-fired boiler. If above 5,000 ft., consult us for advice.

It is cheaper to rebuild a poor chimney than to pay excessive fuel bills. If yours is an old masonry chimney, however, a new steel liner or a new pre-fabricated chimney may be the best solution.

Checking and Adjusting

GENERAL OIL BURNER INFORMATION

FOR ECONOMY AND EFFICIENCY - SEE TO IT THAT YOUR FURNACE IS PROPERLY CHECKED, WITH COMBUSTION INSTRUMENTS

Your modern oil burner has been designed to provide you with a maximum of heat at a minimum of fuel consumption - provided that you burn the specified fuel, that you have obtained a good installation, including your chimney (as described under *Installation*), and that you have your burner and heating system checked and adjusted in a thorough and correct manner. We cannot over-stress the importance of proper checking and adjusting. To do this job properly requires combustion instruments - and the experience to use them correctly. Often, it also takes time and patience, to obtain the exact right balance of adjustments that is required. Therefore, we strongly urge that you employ a competent serviceman who has *all* the needed instruments - and see to it that he does the job thoroughly.

Maximum efficiency is obtained from an oil burner when as much as possible of each drop of oil is consumed in the combustion chamber - and used to heat the house (*not* the chimney). This condition depends upon:

1. *Proper firing rate.* Determined by fuel pump pressure adjustment and nozzle size. Checked by:

1) Measuring the Pump Pressure and 2) Comparing size stamped on nozzle with size specified on boiler data plate.

2. *Proper air-oil mixture.* Determined by the air intake adjustments (primary air and/or secondary air) of the burner. Checked by taking a CO₂ (carbon dioxide) Sample of the burned gases.

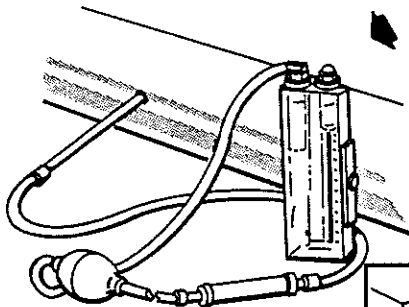
3. *Proper Smoke density.* Determined also by the burner air adjustments. Checked by taking a Smoke Sample of the burned gases. Should be 0 to -1.

4. *Proper draft - over fire and in the smoke pipe.* Determined by the chimney condition (size, tightness and cleanliness), the heating unit condition (tightness and cleanliness), and the adjustment of the draft regulator. Checked by taking draft readings over fire and in the stack.

Summing up, six different "checks" are needed - pump pressure, nozzle size, stack temperature, CO₂ reading, smoke density reading and over-fire draft reading. These cannot be made without proper instruments - you cannot (for instance) "see" the percentage of CO₂, nor "feel" the stack temperature by touching the smoke pipe.

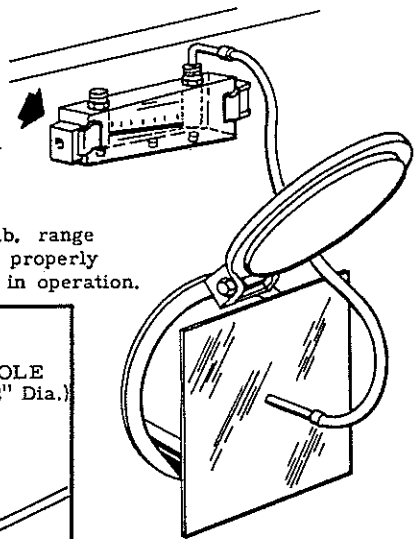
All the "checks" (except pump pressure) are made at one of two places, with instruments like or similar to those shown below.

TYPICAL CO₂ ANALYZER



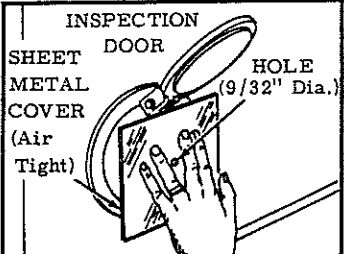
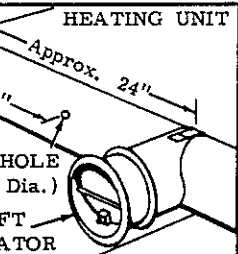
A sampling of flue gas is taken from smoke pipe - and % of CO₂ is read on instrument scale.

TYPICAL DRAFT GAGE



Instrument is leveled at "0" - then "pressure" of gas 1) over the fire and 2) in smoke pipe is transmitted through tube to be read on instrument scale.

NOTE: Pump Pressure is checked with a 200-lb. range Pressure Gage and fittings to connect this gage properly to the Fuel Pump. Pressure is read with pump in operation.

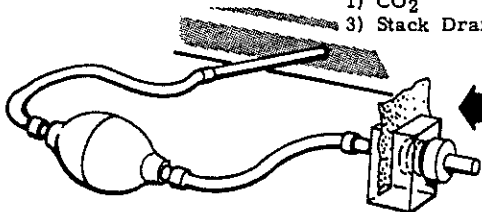


- Drill Stack Hole to check:
- 1) CO₂
 - 2) Smoke Density
 - 3) Stack Draft
 - 4) Stack Temp.

- Provide Cover With Hole to check:
- 5) Over-Fire Draft

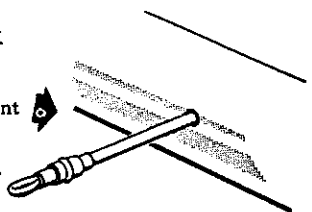
TYPICAL SMOKE ANALYZER WITH SMOKE GAGE

A sampling of flue gas is "sucked" through special filter paper - which is then compared with the gage to visibly determine the smoke density.



TYPICAL STACK THERMOMETER

Bulb of instrument is inserted into smoke pipe - for direct reading of internal temperature.



CHECK-ADJUST (cont.)

SEQUENCE FOR CHECKING AND ADJUSTING

1. Check and adjust Fuel Pump Pressure.
2. Check nozzle size.
3. Open (Primary) air shutter — and start burner

IMPORTANT

Let burner operate at least 15 minutes before continuing. Heating unit must be warm.

4. Decrease burner Primary Air until flame has visible smoky tips; then increase the primary air again, until these smoky tips just disappear.
5. Check both the CO₂ and the Smoke Density. Re-adjust Primary Air until CO₂% is as high as possible, consistent with an acceptable smoke reading. Continue making both checks and readjusting until this is achieved. If CO₂% cannot be raised sufficiently with the Primary Air adjustment, close down Secondary Air (if so equipped), and continue checking and adjusting.
6. Check the Over-Fire Draft and adjust the Draft Regulator until correct. Failure to obtain sufficient draft indicates a faulty chimney, a sooty smoke pipe or chimney, or too much Secondary Air. If correction is impossible, even after cleaning the chimney and smoke pipe and completely sealing all leaks, install a mechanical draft booster. Failure to reduce the draft sufficiently indicates too small a draft regulator. To correct, install next larger size draft regulator.

When over-fire draft is within its correct range, stack draft will automatically be within its range.

7. Check Stack Temperature. If too high, check first for soot accumulation in heating unit and/or stack (if not previously cleaned). If still too high, recheck Fuel Pump Pressure and reduce if too high. If still too high, replace the nozzle with one of assured correct size. If too low, check pump pressure and nozzle size. Pressure should be approximately 100 psi.

SPECIFIC TESTS AND ADJUSTMENTS FOR YOUR BURNER

TEST READINGS

- Pump Pressure* — 100 P.S.I. (or slightly higher)
CO₂ — 8% to 10%
Smoke Density — Preferable No. 1 spot (not over No. 2 spot) on the gage.
Over-fire Draft — .01-.025 inches of water.
Stack Temperature — Min. 400° F.; Max. 600° F.

ADJUSTING PUMP PRESSURE

Bleed air from line(s) — then connect gage in place of Bleeder Plug. Operate burner long enough for flame to become steady. Read gage and adjust pressure as required. To adjust: Remove cap from Pressure Adjusting Screw. Turn screw clockwise

8. If any previous adjustment has been altered, start again at step in this list where the adjustment was first made — and repeat all steps from there to end.

THE "VALUE" OF CORRECT ADJUSTMENTS

Assume that your burner is poorly adjusted — that checks will show a (low) 6.5% CO₂, a (high) 700° Stack Temperature, and a (poor) high Smoke Reading. Then the following table indicates that you have a Stack Loss of 32.3% — meaning that your heating unit efficiency is very poor. Moreover, the "smoky" condition will (by accumulating soot) further increase the stack temperature, will reduce the draft — and will therefore worsen this condition.

Assume now that your serviceman removes accumulated soot and properly adjusts your burner — with the result that he is able to obtain "balanced" adjustments resulting in a (better) 10% CO₂ a (within correct range) 600° Stack Temperature, and a (good) permissible Smoke Reading. The table now indicates a Stack Loss of only 21.2%. This improvement in stack loss has saved you approximately 14% on your fuel bill — has improved the heating capacity of your system — and, because the flame is now burning "clear", will assure you of continued efficient operation for a reasonable length of time.

STACK LOSS IN PERCENT

Carbon Dioxide (CO ₂)	STACK TEMPERATURE IN F.°							
	300	400	500	600	700	800	900	1000
Percent								
12.5	11.5	15.8	16.2	18.4	20.7	25.1	25.5	27.8
12.0	11.6	14.0	16.5	18.8	21.4	25.7	26.2	28.6
11.5	11.8	14.4	16.8	19.3	22.0	24.3	26.9	29.5
11.0	12.1	14.7	17.3	19.8	22.6	25.1	27.8	30.3
10.5	12.4	15.0	17.8	20.5	23.3	25.8	28.8	31.5
10.0	12.6	15.4	18.3	21.2	24.0	26.8	29.7	32.6
9.5	12.9	15.7	18.8	21.8	24.8	27.8	30.8	33.8
9.0	13.3	16.3	19.4	22.6	25.8	28.8	32.0	35.2
8.5	13.6	16.8	20.1	23.5	26.8	30.0	33.5	36.8
8.0	14.0	17.3	20.9	24.3	28.0	31.5	35.0	38.5
7.5	14.5	18.3	21.8	25.3	29.3	33.0	36.5	40.5
7.0	15.1	18.9	22.9	26.8	30.8	34.8	38.8	42.5
6.5	15.7	19.8	24.0	28.2	32.3	36.7	41.0	45.0
6.0	16.5	20.8	25.5	29.8	34.3	39.0	43.4	47.9
5.5	17.3	22.2	27.0	32.0	36.7	41.5	46.5	51.3
5.0	18.3	23.6	29.0	34.3	38.6	45.0	50.2	55.4
4.5	19.5	25.5	31.4	37.3	43.2	49.0	54.8	60.3
4.0	21.1	27.6	34.2	40.7	47.4	53.7	60.3	67.0

Remember, every oil burner accumulates some soot which affects the adjustments — and it should be cleaned and readjusted during each summer season, to be ready for efficient operation when that "first cold snap" arrives.

to increase pressure; counterclockwise to decrease pressure. Replace cap tightly. Remove gage. Rebleed line(s). Replace plug tightly.

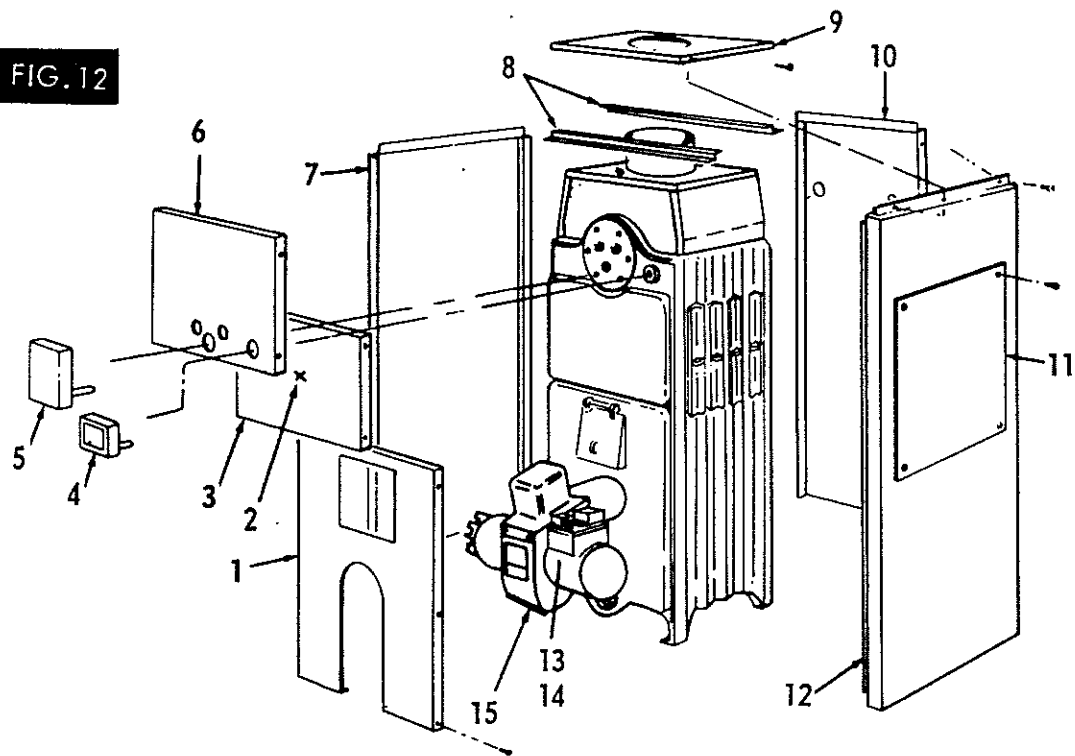
ADJUSTING BURNER AIR

Primary air is adjusted by loosening the screw that holds the Air Adjustment Band, and moving the band to expose more or less of the opening it covers.

ADJUSTING DRAFT REGULATOR

Instructions for your regulator are packaged with it.

FIG. 12



OIL-FIRED BOILER JACKETS

READ INSTRUCTIONS AT BOTTOM OF PAGE 18, BEFORE ORDERING

These are Repair Parts Lists, NOT Packing Lists

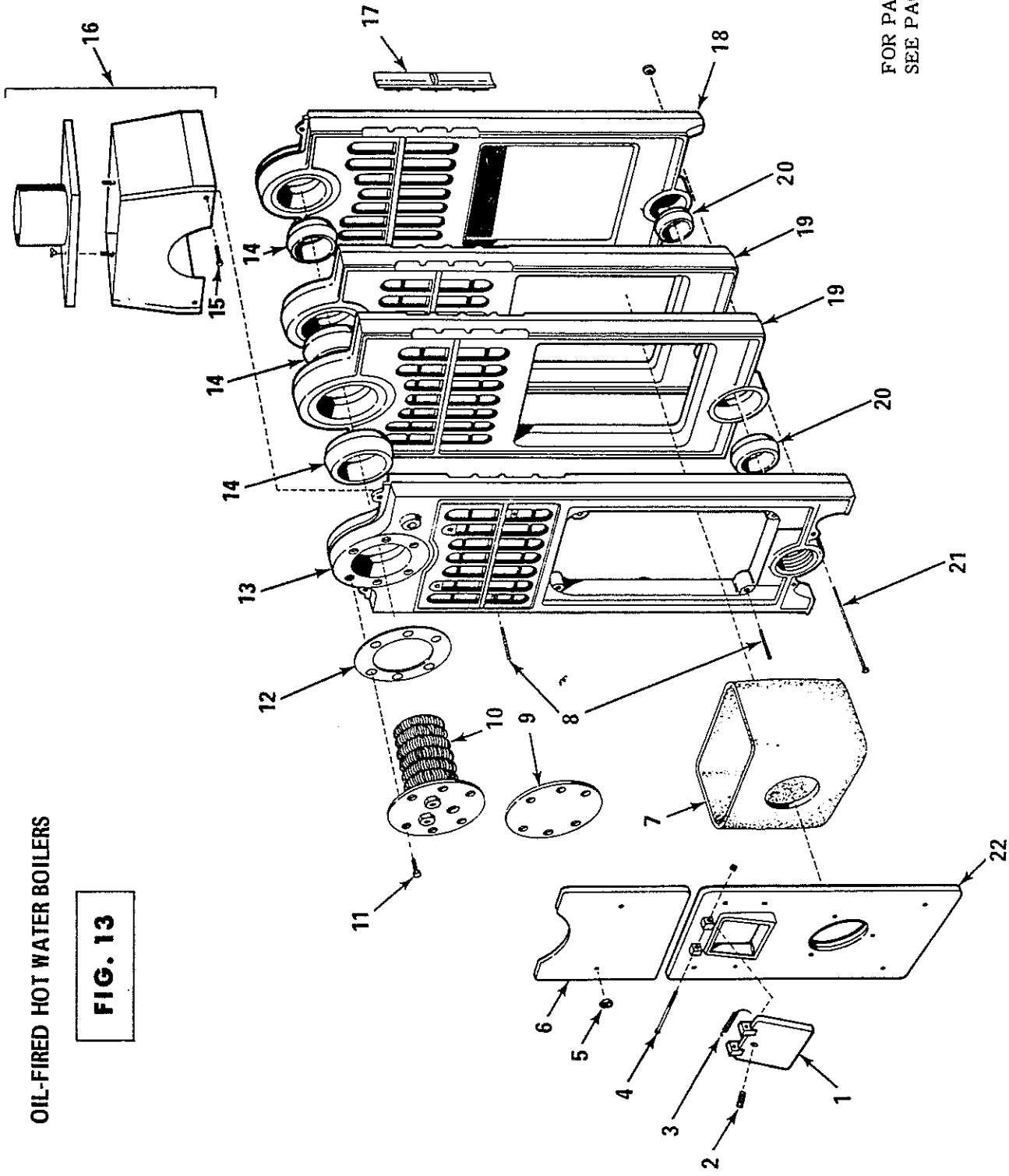
FIG. 12 FLUSH JACKET PARTS AND CONTROLS

KEY NO	DESCRIPTION	PART NUMBERS FOR					
		4 Section	5 Section	6 Section	7 Section	8 Section	9 Section
1	Lower Front Panel	1365-10	1365-10	1365-10	1365-10	1365-10	1365-10
2	Trade Name Plate	13-85	13-85	13-85	13-85	13-85	13-85
3	Clean Out Door Panel	13-43	13-43	13-43	13-43	13-43	13-43
4	Temperature - Pressure Gauge	13-11	13-11	13-11	13-11	13-11	13-11
5A.	High Limit & Relay (With Cad Cell)	R8182B	R8182B	R8182B	R8182B	R8182B	R8182B
5B	Comb.Limit & Relay (With Cad Cell)	R8182A	R8182A	R8182A	R8182A	R8182A	R8182A
6	Upper Front Panel	1365-11	1365-11	1365-11	1365-11	1365-11	1365-11
7	Left Side Panel	13-144-4	13-144-5	13-144-6	13-144-7	13-144-8	13-144-9
8	"Z" Bar Jacket Supports	13-151	13-151	13-151	13-151	13-151	13-151
9	Top Panel	13-145-4	13-145-5	13-145-6	13-145-7	13-145-8	13-145-9
10	Back Panel	1365-12	1365-12	1365-12	1365-12	1365-12	1365-12
11	Cleanout Plate Cover	13-41-4	13-41-5	13-41-6	13-41-7	13-41-8	13-41-9
12	Right Side Panel	13-147-4	13-147-5	13-147-6	13-147-7	13-147-8	13-147-9
13	# Cad Cell in Burner (Optional)	C554A	C554A	C554A	C554A	C554A	C554A
14	# Protectorelay (With Cad Cell)	R8184B	R8184B	R8184B	R8184B	R8184B	R8184B
15	Oil Burner Assembly	1365-6	1365-6	1365-6	1365-7	1365-7	1365-8

Not illustrated

OIL-FIRED HOT WATER BOILERS

FIG. 13



FOR PARTS LIST
SEE PAGE 21

OIL- FIRED HOT WATER BOILERS

FOR ALL MODEL NUMBERS SEE TABLE, TOP PAGE 2.

READ INSTRUCTIONS AT BOTTOM OF PAGE 18, BEFORE ORDERING

This is a Repair Parts List, NOT a Packing List

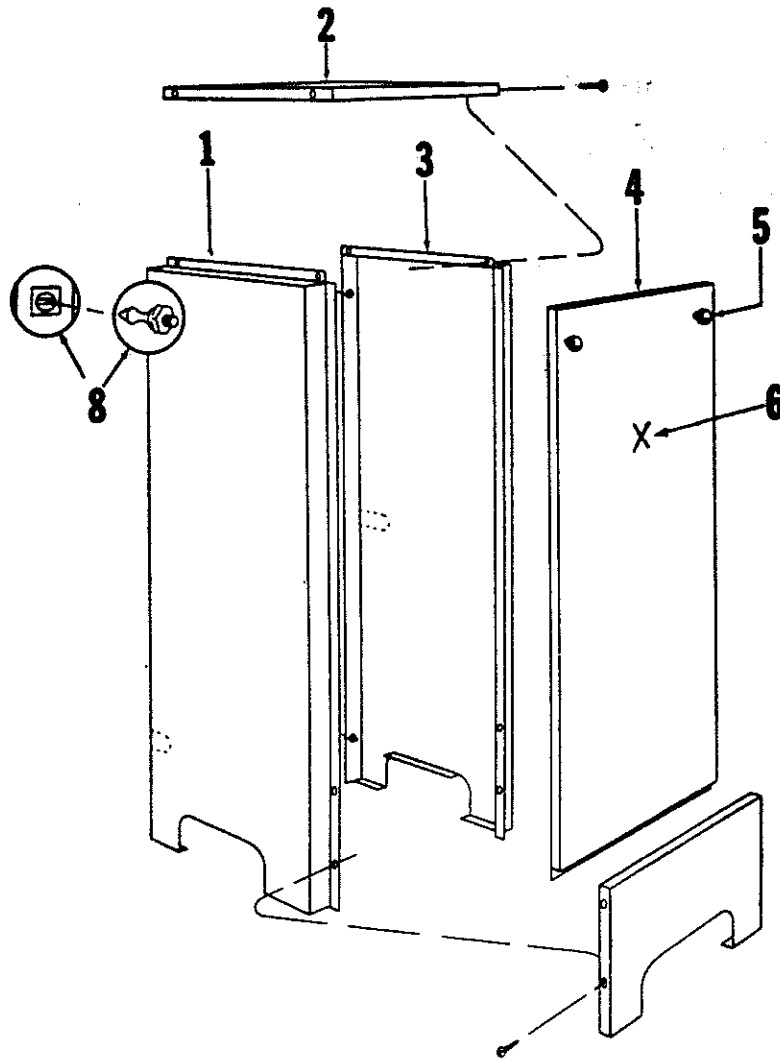
FIG. 13 – BOILER PARTS FOR ALL BOILERS

KEY NO.	DESCRIPTION	PART NUMBERS FOR					
		4 Section	5 Section	6 Section	7 Section	8 Section	9 Section
1	Observation Door	13-7	13-7	13-7	13-7	13-7	13-7
2	1/8 Sq. Hd. Pipe Plug	*	*	*	*	*	*
3	Observation Door Spring	13-7A	13-7A	13-7A	13-7A	13-7A	13-7A
4	10-24 x 5'' Rd. Hd. Stove Bolt & Nut	*	*	*	*	*	*
5	*5/16 Cad Plt. Hex Nut – 6 Req'd.	*	*	*	*	*	*
6	Flue Cleanout Door	13501	13501	13501	13501	13501	13501
7	Combustion Chamber	144	368	369	369	499	499
8	5/16 x 2-1/2 Studs Cad Plt. (6 Req'd.)	13-251	13-251	13-251	13-251	13-251	13-251
9	Tankless Cover Plate	1365-5	1365-5	1365-5	1365-5	1365-5	1365-5
10	Tankless Coil 3.0 GPM	1365-30	1365-30	---	---	---	---
10	Tankless Coil 5.0 GPM	---	---	1365-50	1365-50	1365-50	1365-50
11	3/8 x 3/4 Cad Plated Cap Screws (9 Req'd.)	*	*	*	*	*	*
12	Coil & Cover Plate Gasket	1365-4	1365-4	1365-4	1365-4	1365-4	1365-4
13	Boiler Front Section	1365-1	1365-1	1365-1	1365-1	1365-1	1365-1
14	Top Nipple	13-9	13-9	13-9	13-9	13-9	13-9
15	1/4 x 20 x 1 Rd. Hd. Mach. Screw (4 Req'd.)	*	*	*	*	*	*
16	Flue Collector Assembly (For Cad Cell)	1365-14	1365-15	1365-16	1365-17	1365-18	1365-19
17	Side Cleanout Plate	13-6A	13-6A	13-6A	13-6A	13-6A	13-6A
18	Boiler Back Section	1365-2	1365-2	1365-2	1365-2	1365-2	1365-2
19	Boiler Intermediate Section	13-112	13-112	13-112	13-112	13-112	13-112
20	Bottom Nipple	13-8	13-8	13-8	13-8	13-8	13-8
21	1/2 – 13 Tie Rod & Nut (4 Req'd.)	13-120-4	13-120-5	13-120-6	13-120-7	13-120-8	13-120-9
22	Fire Door	13-5	13-5	13-5	13-5	13-5	13-5
	‡ Flue Cleaning Brush	13-27	13-27	13-27	13-27	13-27	13-27
	‡ Instruction Manual	13-469	13-469	13-469	13-469	13-469	13-469

* Standard Hardware Items – Procure Locally

‡ Not Illustrated

FOR PARTS
ILLUSTRATION
SEE PAGE 20



OIL-FIRED BOILER JACKET EXTENSION

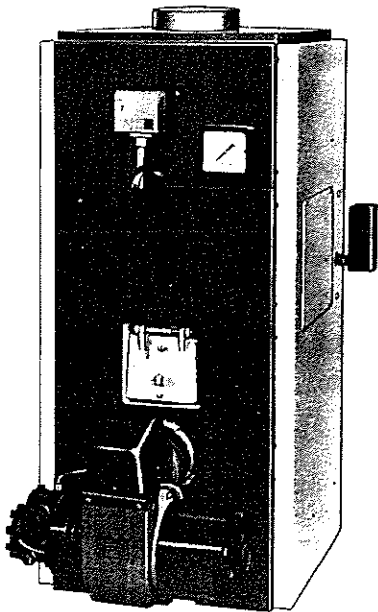
READ INSTRUCTIONS AT BOTTOM OF PAGE 18, BEFORE ORDERING

These are Repair Parts Lists, NOT Packing Lists

FIG. 14 - JACKET EXTENSION PARTS

Key No.	Name of Part	Part Number	Approx. Ship Weight - Lbs.
1	Left Side Panel	13-80	15
2	Louvered Top Panel	1365-21	4
3	Right Side Panel	13-82	15
4	Door	13-83	10
5	Door Handle (set of 2)	13-84	P.P.
6	Name Plate	13-85	P.P.
7	Bottom Front Panel	13-86	2
8	Spring Catch (set of 4)	13-87	P.P.

FOR ALL MODEL NUMBERS SEE TABLE TOP PAGE 2



INSTRUCTIONS for OIL FIRED STEAM BOILERS

FOR INSTALLING, OPERATING AND ORDERING PARTS

FOR MORE COMPLETE INSTRUCTIONS REFER TO INSTALLATION AND OPERATING
INSTRUCTION MANUAL NO. OHB-13W

Unit Model	No Sect's.	Net Sq. Ft. Steam	I=B=R Net BTU Output	I=B=R Gross BTU Output	Rec. Firing Rate GPH
SOB-S-4	4	315	75,000	100,000	1.00
SOB-S-5	5	405	97,500	130,000	1.30
SOB-S-6	6	500	120,000	160,000	1.65
SOB-S-7	7	595	142,500	190,000	1.95
SOB-S-8	8	690	165,000	220,000	2.25
SOB-S-9	9	815	195,000	260,000	2.55

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

These boilers are shipped without the burner, and partially disassembled. The boiler shipment includes: 1) An uncrated assembly of Boiler Sections.

2) A carton containing several Boiler Jacket panels with sheet-metal screws to assemble these parts.
3) A carton containing the flue collector assembly, side clean-out plates (1 for each side opening in the boiler sections), a can of boiler cement, a flue brush, seventeen 3/8" x 1" cap screws, four 1/4" x 1" stove bolts and a rating plate with screws to attach it.

If you have ordered a tankless coil, this will be in a separate carton; if not, the blank coil plate and gasket will be mounted on boiler. If you have ordered your Oil Burner from us, refer to the instruction book packaged with it for parts included.

If you have ordered a Jacket Extension, this will be in a separate carton.

FRONT
Labels: 1/2" PRESSURE GAUGE, 3/4" LIMIT CONTROL, 4-3/4", 20"

RIGHT SIDE ONLY
Labels: JACKET EXTENSION, 44"-18-1/4"

FLUSH JACKET SIDE
Labels: CLEAN OUT PANEL, 3/4" LOW LIMIT CONTROL

REAR
Labels: 1/2" NPT TANKLESS HEATER (OPTIONAL), 3/4" ASME POP SAFETY VALVE, 3" SUPPLY, 2-1/2" LOW WATER CUTOFF, 2-1/2" RETURN, DRAIN, WATER LINE 33-1/2"

DIMENSIONS MIN. CLEARANCES
Labels: 12" MIN., 24" MIN., 5", 12" MIN., OIL LINES, CONCRETE BASE 3" LARGER

No. of Sections	4	5	6	7	8	9
A	18 1/2"	21 1/2"	24 1/2"	27 1/2"	30 1/2"	33 1/2"
B	10 3/4"	12 3/4"	13 3/4"	15 1/4"	16 3/4"	18 1/4"
C	7 1/4"	7 1/4"	7 1/4"	8 1/4"	8 1/4"	10 1/4"

CENTER LINE OF CHIMNEY OPENING MUST BE MINIMUM OF 52" HIGH.

THIS UNIT MUST BE SET UPON A CONCRETE OR OTHER NONCOMBUSTIBLE MATERIAL BASE OR FLOOR. FOR MINIMUM SAFE CLEARANCES BETWEEN THE UNIT AND COMBUSTIBLE MATERIALS, REFER TO SECTION: "INSTALLING YOUR UNIT"

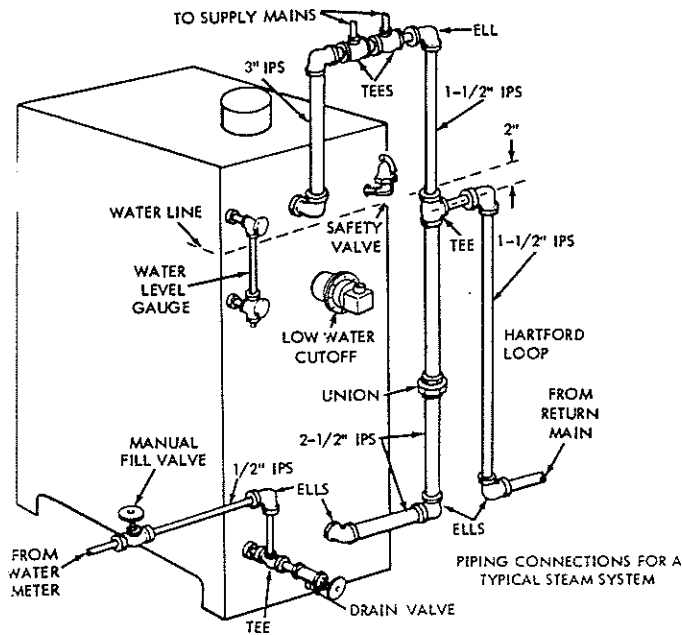


FIG. 1

SAFETY VALVE

An ASME Pop Safety Valve must be used to protect the system against excessive steam pressure. The safety valve will automatically open at 15 pounds pressure to relieve the strain on the boiler and system. The valve is also equipped with a lever for manual operation and should be tested once a month.

WATER LEVEL GAUGE

The level of the water in the boiler can be observed through the glass tube in the water level gauge located at rear of boiler. Correct water level is stamped on rear jacket panel so that the boiler can be filled to the proper level for efficient operation. The water level should be checked at regular intervals so that the proper level is maintained at all times.

Gauge assembly is equipped with valves at top and bottom of glass tube and also a drain cock below the bottom valve. First, open the drain cock and allow water to run into boiler until it comes out of this drain cock. Then close it and watch if water starts to rise in the gauge glass. If it does not, see that both top and bottom valves on the gauge are open, allow water to run in until it reaches the recommended water line of boiler, always keep water at this level. Always leave both valves open.

LOW WATER CUT-OFF

An automatic low water cut-off safeguards the boiler and system in case the water level should become dangerously low. The cut-off shuts off the burner, thus, preventing damage to the system.

WARNING - In case of low water level, never run cold water into a hot boiler, because excessive pressures will be built up and also the sudden change in temperatures would damage the boiler sections.

STEAM VENTS

Before a steam system will operate properly, suitable steam vents must be installed in each radiator and or heating unit as well as the return main. Some systems require steam traps in the return line at the radiation unit.

The "Hartford loop" is a piping arrangement which must be included - as shown in Fig. 1 - for proper operation of the steam system.

The sizes of pipe used in a steam system are also very important. Proper sizing is shown in Fig. 1.

It is also essential that the ends of all pipes be reamed to insure full pipe area and minimize disturbance of the steam and condensate.

The correct amount of water to properly fill the boiler must be maintained at all times - for safe, efficient operation of the system. Adding new water whenever required can be accomplished manually (by use of a hand valve in the water supply line), but this requires regular attention to the system's needs.

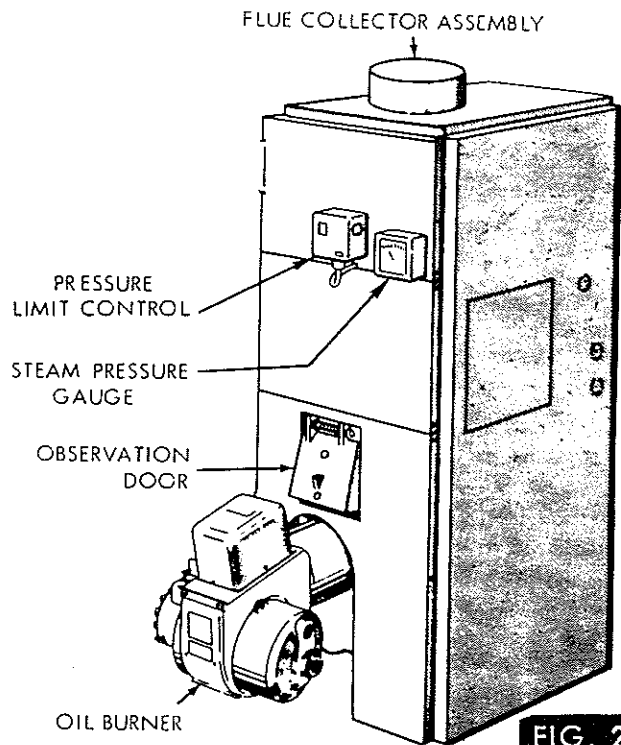


FIG. 2

INSTALL THE FLUE COLLECTOR ASSEMBLY

Rest the collector on top of the boiler sections (Fig. 10) - then secure it in place with the three 1/4" x 1" Rd. Hd. Stove Bolts (furnished). Afterwards, seal its edges tightly to the boiler sections, using the Boiler Cement (furnished). Be sure to plug all cracks so that no fumes will escape.