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# I N S T A L L A T I O N

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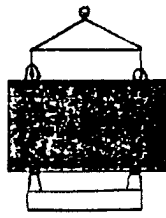
## STEP ONE

### LOCATE THE WATER HEATER IN THE DESIRED POSITION: (See Installation Criteria and SK-298 following)

- A. Locate the heater and complete the installation to comply with building codes and insurance regulations. Provide clearance on all sides as shown on SK-298 following or as required by U. L. Label.
- B. Heater should have access to a good flue connection to a stack or chimney.
- C. Provide access room for maintenance. Minimum would be 18 in. at rear and sufficient room at front to swing the manifold assembly. Preferable clearance would be 3 ft. all around and 4 ft. on top of unit. Provide tube removal space at either the front or the rear.

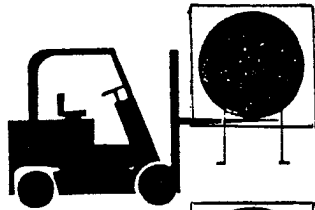
Always provide sufficient room around equipment, heat exchangers, pumps, valves, etc. for maintenance. Do not block doors, openings, etc. with other items. Provide unions and isolating valves where necessary for future convenience and maintenance of pumps, exchangers, valves, etc.

- D. The water heater should be placed on a concrete pad or piers. The pier distributes the weight of the heater, keeps the heater off of wet floors and provides additional cleanout room.
- E. Check distributed weight to be sure floor is not overloaded. Load bearing qualities of soil or concrete should be checked using the shipping weight plus a full tank of water. Make sure the shell or base of heater is level. Place shims under skids, if necessary.
- F. Room must have ample air for combustion. Preferably, there should be cross ventilation with air entering from two directions through louvered grills in doors, windows, or walls. Never install unit in a closed room. Provide a free area of 1/2 sq. ft. of air intake opening per 1,000,000 B.t.u. input.
- G. Provide floor drains near the unit to handle drainage blowdown, cleaning and condensate.
- H. When moving the heater, use proper safety techniques and proper lifting equipment. Water heaters can be heavy. If using a crane and lifting lugs, use a spreader bar and properly tested slings for safety. Fork lifts should be properly rated and have forks long enough to properly support the heater. Keep people away from a unit while it is being moved. See lifting diagram following.



**TOP LIFT  
AT LIFTING EYES ONLY**

**NO**



**DO NOT LIFT ON  
CRATE OR TANK**

**YES**



**LIFT AT FLOOR  
SKID ONLY**

**STEP TWO    CONNECT FLUE OUTLET TO STACK:**  
(See SK-385 following)

- A. Breeching and stack material should be heavy enough for structural rigidity and provide long life. Fabricated steel stacks should be not less than 16 ga. steel or as required by local codes. Manufactured stacks such as "Metalbestos PS" are preferred. Manufactured stacks should at least meet the standard of UL Type B.

Do not rest over 1,000 lbs. of stack directly on the water heater. Heavier stacks should have additional supports.

Run full size flue pipe from flue outlet to stack or chimney. Horizontal runs should pitch upward at least 1 in. per ft., and should be as short as possible. Horizontal runs over 10 ft. or with more than 2 elbows should be avoided. The insulation of flue pipe is recommended, especially horizontal runs. Insulation provides improved draft control.

- B. A safeguard should be provided against excessive updraft on stacks over 50 ft. high. To provide this, a balance type single acting damper should be installed in the flue near the stack. It should have an opening equal to the cross sectional area of the flue opening on the heater. The barometric damper is not required on normal installations.
- C. Normally, a draft of .02 in. to .04 in. water column at the flue outlet will give proper performance. Design stack for not over 30 ft. per second flue gas velocity.
- D. Stack should extend at least 4 ft. above roof or walls of adjacent building or as directed by local building code.
- E. A rain cap on the stack may be necessary to avoid unusual downdraft conditions. This cap should be installed a distance of at least the diameter of the flue pipe from the rain cap to the top of the stack. Bridert or similar atmospheric caps should not be used.

**STEP THREE      MAKE GAS PIPE CONNECTIONS:**  
(See SK-299 following)

- A. Run the gas supply line from gas meter to the main burner inlet connection. The pipe should be at least as large as the main burner connection and preferably one size larger for a normal installation. Check the "sizing gas line" chart following or with your local gas company for complete sizing information for your particular installation. Provide full support for this pipe especially near the heater.
- B. Normally, the pilot line is factory piped into the main burner line. If the gas supply pressure is low, these lines will not be prepped together.

In this case, install a tee with a 3/4 in. or larger side opening for the pilot supply line. This tee should be installed at least 48 in. upstream of the main gas burner regulator. Pipe the side opening to the pilot line and the run of the tee to the main gas line. A cock may be installed upstream of this tee for future convenience.

- C. Vent both regulators. Remove plugs (if installed) from regulator vents. Run tubing of the same size as vent openings to the rear flue pipe or to the outside atmosphere. Vent lines should never be reduced in size. Should they be tied together, the combined single line must be the size of the largest vent line. If lines are run to the outside atmosphere, be sure to provide screen guards to prevent plugging of the line by dirt or insects. Never run vent lines into the combustion chamber.
- D. Make certain the main burner and the pilot burner gas valves are in the vertical position. (Operator or solenoid located on top of the valve.)
- E. After all gas connections are made, the entire line should be purged of dirt and air.

NOTE: Gas regulators are often damaged during installation by careless high pressure testing. Excessive high test pressures can damage regulators, switches and valves. When performing high pressure tests, isolate the factory gas train from the main gas line. Flanged connections should be broken and blanked off. Union connections should be broken and capped.

- F. Before leaving job, check all gas connections for leaks with a soap solution. Correct all leaks immediately.

**STEP FOUR      MAKE WATER PIPE CONNECTIONS:**  
(See Piping Layout SK-299)

- A. Make inlet and service water connections. The following drawings show some typical connection arrangements. Do not install check valve in cold water inlet. Where local codes require a check valve, drill 1/4 in. hole in the flapper to prevent pressure build up in heater.
- B. When the service and hot water piping to the water heater are made of copper pipe, dielectric unions or bushings must be installed between the copper line and the water heater.
- C. Provide a blow down drain. This should be installed at the bottom rear of the unit. A 2 in. line and gate valve should be run to a suitable sewer or other means of disposal.
- D. Provide a condensate drain line. This should be a 3/4 in. line run from the exhaust chamber of the heater to a suitable sewer or other means of disposal. Do not install a valve in this line. If desired, an "S" trap may be installed.
- E. The relief valve should be piped to the same drain. Be sure the drain is not obstructed in any way nor is the pipe size reduced from the outlet size of the relief valve. If the outlets of two relief valves are connected, the cross sectional area of connection shall not be less than the total area of the outlet of the valves. Provide unions in the discharge of every relief valve for future maintenance.
- F. After all water lines are connected, fill the heater with water. Check for and correct all leaks.
- G. Insulate hot water lines as directed by specifications or by owner.

**STEP FIVE      MAKE ELECTRICAL CONNECTIONS:**

- A. Run service lines from fused disconnect switch to designated junction boxes located on side of water heater. Since entire front of burner is hinged, do not make rigid conduit connections to this hinged assembly. Make connections only to junction box located at side of burner near hinge.
- B. The control circuit of all water heaters is 115Volt, 60 Cycles, 1 Phase. The motor voltage should be the same as labeled on junction box.
- C. A 500 VA control transformer is normally installed on 3 Phase systems. On special heaters where this is not factory supplied, it should be installed in the field. The use of a transformer allows disconnecting both motor and control circuits with the single disconnect switch. This insures a safer installation for future maintenance.

STEP FIVE      MAKE ELECTRICAL CONNECTIONS (continued):

- D. A positive electrical connection should be made between the heater shell and ground. Do not depend on cold water lines for this grounding as dielectric unions should isolate the heater. The ground wire should be equal to or larger in size than the motor connection wires but not less than no. 10. Ground connections should be made to the street side of the cold water line or to other good ground sources.
  
- E. When the shell circulating pump is furnished, it is not always factory wired. Small pumps can be factory wired to the control transformer if requested. Pumps require field wiring. Provide 120V power source to the terminal strip in the pump junction box as marked.

## PIPE COLOR CODE

Piping is often color coded to aid in identification. It is suggested coding comply with the ANSI/OSHA Standards No. A13.1.

Positive identification of contents of a piping system should be shown by using a lettered legend giving name of material in full or abbreviated form. Arrows should be used to show direction of flow. A colored background band can also be used to identify the degree of hazard caused by leaking contents.

The Standards suggest the pipe be labeled as follows:

<u>MATERIAL</u>	<u>LETTER COLORING</u>	<u>BACKGROUND COLOR</u>
<u>Dangerous Materials</u>		
Steam	Black	Yellow
Boiler Feed Water	Black	Yellow
Condensate Return	Black	Yellow
Gas, Natural or Propane	Black	Yellow
Hot Water	Black	Yellow
Blow Off Water	Black	Yellow
Flue Gas	Black	Yellow
<u>Low Hazard Material</u>		
City Water	White	Black
Makeup Water	White	Black

# Flow of Water through Schedule 40 Steel Pipe

Pressure Drop per 1000 Feet of Schedule 40 Steel Pipe, in Pounds per Square Inch.

Dis-charge Gals. per Min.	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop	Vel. Ft. per Sec.	Pres- sure Drop
1	1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		3 1/2"			
2	.37	0.49	0.43	0.45	0.41	0.44										
3	.74	1.70	0.84	0.94	0.83	0.74										
4	1.12	3.53	1.07	2.36	0.79	1.12										
5	1.40	5.94	1.28	3.30	0.95	1.53	57	0.46								
6	1.86	9.02	1.72	5.52	1.26	2.63	76	0.75								
8	2.24	12.25	2.14	8.34	1.57	3.86	96	1.14	67	0.48						
10	2.98	21.1	2.36	17.6	1.43	2.33	100	0.99	1.00	0.99						
15	3.72	30.8	3.15	13.5	1.91	3.86	1.34	1.64								
20	5.00	64.6	3.94	20.2	2.39	5.81	1.68	2.48								
25	7.44	110.5	4.72	29.1	2.87	8.04	2.01	3.43								
30			5.51	38.2	3.35	10.95	2.35	4.49								
35			6.30	47.8	3.82	13.7	2.68	5.88								
40			7.08	60.6	4.30	17.4	3.00	7.14								
45			7.87	74.7	4.78	20.6	3.35	8.82								
50					5.74	29.6	4.02	12.2								
60					6.69	38.6	4.69	15.3								
70					7.65	50.3	5.37	21.7								
80					8.60	63.6	6.04	26.1								
90					9.56	75.1	6.71	32.3								
100	1.11	0.39					8.38	48.2								
125	1.39	0.56					10.06	60.4								
150	1.67	0.78					11.73	90.0								
175	1.94	1.06														
200	2.22	1.32														
225	2.50	1.66														
250	2.78	2.05														
275	3.06	2.36														
300	3.33	2.80														
325	3.61	3.29														
350	3.80	3.62														
375	4.16	4.16														
400	4.44	4.72														
425	4.72	5.34														
450	5.00	5.96														
475	5.27	6.66														
500	5.55	7.39														
550	6.11	8.94														
600	6.66	10.6														
650	7.21	11.8														
700	7.77	13.7														
750	8.32	15.7														
800	8.88	17.8														
850	9.44	20.2														
900	10.00	22.6														
950	10.55	23.7														
1,000	11.10	26.3														
1,100	12.22	31.8														
1,200	13.32	37.8														
1,300	14.43	44.4														
1,400	15.54	51.5														
1,500	16.65	55.5														
1,600	17.76	63.1														
1,800	19.98	79.8														
2,000	22.20	98.5														
2,500																
3,000																
3,500																
4,000																
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7,000																
8,000																
9,000																
10,000																
12,000																
14,000																
16,000																

Suggested Maximum Velocities for Water Flow Service		Velocity (FPS)
Boiler Feed Water		8
Pump Suction		2-4
Water Service		
(In steel pipe)		5-10
(In copper pipe)		5-7

STEEL PIPE FLOW CAPACITIES - CUBIC FEET PER HOUR  
NATURAL GAS - .6 SPECIFIC GRAVITY\*

SIZING GAS LINES (NATURAL GAS)

Nominal Pipe Diameter	Inlet Pressure 4 - 8 Oz. with Pressure Drop of .3" W.C. for Length Shown									
	Equivalent Pipe Length - Feet #									
	10	20	30	40	50	70	100	150	200	500
1"	520	350	285	245	215	180	150	120	100	70
1½"	1,050	730	590	500	440	370	305	250	210	120
1¾"	1,600	1,100	890	760	670	560	460	380	320	190
2"	3,050	2,100	1,650	1,450	1,270	1,050	870	710	610	400
2½"	4,800	3,300	2,700	2,300	2,000	1,700	1,400	1,130	980	700
3"	8,500	5,900	4,700	4,100	3,600	3,000	2,500	2,000	1,700	1,100
4"	17,500	12,000	9,700	8,300	7,400	6,200	5,100	4,100	3,500	2,200
6"					24,000		17,000	13,800	11,900	6,500

Nominal Pipe Diameter	Inlet Pressure 2 PSIG. with Pressure Drop of 5" W.C. for Length Shown									
	Equivalent Pipe Length - Feet #									
	50	100	150	200	300	400	500	1000		
1"	1,080	760	620	540	440	380	340	240		
1½"	2,250	1,590	1,300	1,120	910	790	710	500		
1¾"	3,410	2,410	1,970	1,700	1,390	1,200	1,070	760		
2"	6,640	4,700	3,840	3,310	2,700	2,350	2,090	1,480		
2½"	10,700	7,580	6,190	5,340	4,360	3,790	3,380	2,390		
3"	19,120	13,540	11,060	9,540	7,790	6,770	6,040	4,280		
4"	39,380	27,890	22,780	19,650	16,040	13,940	12,440	8,810		
6"	117,580	83,270	68,010	58,670	47,900	41,630	37,140	26,320		

MULTIPLIERS TO BE USED WITH TABLE WHEN THE SPECIFIC GRAVITY OF THE GAS IS OTHER THAN 0.60												
Specific Gravity Multiplier	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90
	1.31	1.23	1.16	1.10	1.04	1.00	.962	.928	.895	.867	.841	.817
Specific Gravity Multiplier	1.00	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10
	.775	.740	.707	.680	.655	.631	.612	.594	.577	.563	.547	.535

NOTES: \* All figures based on natural gas, 1000 Btu per cubic foot in Schedule 40 pipe using Polyflo formula as calculated in the Gas Engineer's Handbook.  
# Equivalent length of pipe is calculated by adding equivalent length of fittings to actual length of pipe used. Equivalent lengths in feet can be estimated as follows:

Nominal Pipe Diameter	Fittings											
	45° El.	90° El.	Tee	Gate	Globe	Swing Check	Valves					
1"	1'	3'	5'	1'	29'	7'						
1½"	2	4	8	1	44	11						
2"	3	5	10	1	57	14						
4"	5	10	20	2	112	28						
6"	7	15	30	4	168	42						

**STEP SIX CHECK INSTALLATION:**

1.  Is the base of the heater level?
2.  Has room been allowed at either the front or back of the heater for re-tubing?
3.  Is there room to open the burner manifold? Is there room for maintenance on all sides and top of unit?
4.  Is there adequate air for combustion? Be sure there is a free area of 1/2 sq. ft. of air intake for each 1,000,000 Btu's of gas input to this heater.
5.  Is the boiler room free of any negative air conditions that might be caused by exhausting equipment?
6.  Is the main gas piping as large or larger than the main gas burner controls? (A high pressure supply line may violate this rule.)
7.  Is there a master shutoff gas valve in the main gas line?
8.  Are unions located in both the pilot and main gas lines so the burner manifold may be opened?
9.  Does the runner pilot line come off of the main gas line 4 to 5 ft. ahead of the main gas regulator?
10.  Are the appliance regulators vented to the outside or to the flue pipe with tubing no less than the I.P.S. of the vent on the regulator?
11.  Will there be adequate gas available? Check energy supply pressure on nameplate with actual pressure at regulator inlet.
12.  Will the flue pipe adequately remove the products of combustion The area of the flue pipe should be at least as large as the area of the flue outlet on the heater.
13.  Is there a 2" blow down valve installed on the heater?
14.  Were dielectric fittings installed on all the service lines to the water heater? This is especially important with a copper pipe water system.
15.  Has the heater been properly filled with water and all leaks stopped?
16.  Were the controls of the heater checked for damage during shipping or installation?

17.  Are voltages to the heater correct?
18.  Is the impeller turning in the right direction? Counter clockwise when facing shaft end of motor is standard. Check the arrow.

If you can answer "yes" to all of the above questions, then you can be sure the heater is off to a good start and that it will continue to run properly for many years of trouble-free service.

If you must answer "no" to any question, be sure to correct the trouble before placing the unit in service. If you need additional advice, contact your Sellers Representative.

**CAUTION** A Sellers water heater will provide many years of safe and dependable service if properly used. Keep the following safety procedures in mind as well as other normal safety cautions:

. Do not remove or bypass or operate a heater without the factory installed safety devices. If they cause a shutdown, correct the fault. Keep limit controls, relief valves, combustion safeguards, gas switches, etc., in good safe operating condition.

. Operate your water heater at the lowest usable temperature to increase efficiency and safety. Minimum temperature at the heater should be about 125° to provide 120° water at the point of use. Lower temperatures often lead to condensation in Sellers high efficiency fire tubes. Normal temperatures are:

- 120° - general use
- 140° - kitchens, car washes
- 160° - laundry
- 180° - kitchen sanitizing, laundry, meat packers, concrete mixers, food plants.

. Avoid operating heaters at high temperatures where scalding people may be a problem. Note how quickly water can blister the skin. Be careful!

- 120° burns and blisters in 10 minutes
- 125° burns and blisters in 2 minutes
- 131° burns and blisters in 30 seconds
- 140° burns and blisters in 5 seconds
- 158° burns and blisters in 1 second.

. Relief valves must be piped to a drain. If they open under pressure, the scalding water released can be hazardous.

## STACK BREECHING INSTALLATION AND DESIGN CRITERIA

The Sellers heater is provided with a power burner to permit operation under adverse situations. These burners can overcome many of the inadequacies of a poor installation but they are not a cure-all. To help insure that you have a good installation, comply with the following suggestions:

### DO:

1. Keep breeching short, straight and round, if possible (Provide at least 5% more area in rectangular ducts than in round ducts.)
2. Change shapes of breechings slowly and smoothly. Slope on sides of transition pieces should be 10° (20° maximum). Separate stacks for each unit of a multiple installation are preferred to collector breechings and a central common stack.
3. Use Metalbestos - Model PS, Van Packer or equal or 16 gauge minimum fabricated and insulated steel breeching and stack or material as required by local code. Use at least UL Type B stack system.
4. Keep breeching and stack area equal to, or larger than flue openings.
5. Use barometric draft controls or dampers to reduce high natural drafts (.015" W.C. or more), especially if stack is over 50 ft. high. High stacks are not required. In horizontal breeching, the barometric should be located near the heater. The barometric should be mounted in a collar equal in length to the diameter of the breeching to keep the gate from swinging into the flowing flue gases.
6. Design breeching and stack to provide .02" to .04" W.C. Negative static draft at flue outlet test point. For multiple unit installations on combined breeching, design breeching using equal pressure drop techniques. (Calculations should be based on flue gas velocities of 1,300 to 2,000 fpm. Each 1,000,000 Btu./Hr. input creates approximately 465 cfm of flue gas volume.)
7. Slope breeching upward 1" per foot to eliminate gas pockets.
8. Use a rain cap such as the "coolie". Locate "coolie" cap a full pipe diameter above top of stack.
9. Use power flue gas exhauster if long breeching runs, unavoidable downdrafts or erratic winds due to architectural design are encountered. Available exhausters include Wing, Breidert, Tjernlund, etc.
10. Increase breeching size for multiple unit installations: See SK285-3. Area "B" of breeching to be 200% of Area "A" (150% minimum).
11. Consult local codes to insure full compliance with special local regulations.

### DON'T:

1. Don't use more than 2 - 90° elbows on breeching.
2. Don't use more than 10 ft. of horizontal breeching without checking to be sure of proper draft at flue outlet.
3. Don't use bullhead tees or mitered elbows.
4. Don't use vertical or horizontal draft diverters.

(See Service Section of Owner's Manual for more details on stack operation or stack servicing.)



DRAWING NO.  
A-SK-687-1

Hot Water to Fixtures

Flue Gas Outlet to Stack

To Drain

Gate Valve

Gate Valve  
Pump  
Recirculating  
Water for  
Fixtures

Check Valve  
Cold Water Inlet  
Gate Valve

Ball Valve for  
Blowdown

To Drain

Concrete Piers

Floor Line

PLUMBING INSTALLATION FOR  
TWO PASS WATER HEATER

SELLERS ENGINEERING COMPANY  
DANVILLE, KY.

SCALE

DATE 8-4-86

DRAWN BY LG

DRAWING NO.

A-SK-687-1

Rev. No. 1 Redrawn 8-4-86 LG

## EXPLANATORY SUPPLEMENT TO INSTALLATION INSTRUCTIONS

### IMPORTANT - All Types of Water Heaters

Instructions for proper installation of water heaters lists precautions to be observed when certain frequently encountered conditions must be met. One is the widespread use of copper water piping in buildings as headers in battery washer installations. Another is the well known problem of heating artificially softened water or water which is naturally corrosive - due usually to a high content of dissolved oxygen or carbon dioxide.

### WARNING - Copper Service Piping to the Heater

When copper building piping is connected to a water heater, there is a strong possibility of electrolytic corrosion of the heater shell resulting from the galvanic currents produced when two dissimilar metals are joined. This is usually evidenced by discolored or "rusty" water. The condition may be aggravated by improper grounding of electric motors.

In all such cases, install dielectric or "insulating" unions or bushings in all water, gas, and electrical connections to the heater. In doing so, make certain that the normal grounding of electric power is not interrupted. Grounding of the cold water line to the heater should be on the street side of the dielectric fitting to keep stray currents from entering the heater.

### When Water is Artificially Softened or Naturally "Aggressive"

The corrosive nature of pure zeolite softened water is universally recognized. In some localities the water supply is naturally so soft or contains so much dissolved oxygen and carbon dioxide that treatment to prevent corrosion is necessary. Most water softener manufacturers provide or recommend a proper treatment of their own for this purpose. As a general rule, water in the 4 to 12 grain hardness range heats well in Sellers water heaters. Softening systems are rarely required for heaters in this range.

### Inspection

Water heaters using EPOXY-GLASS liner and magnesium alloy anodes should be inspected every 6 months. If the magnesium anode rods have deteriorated by 50%, these rods should be removed and replaced with new anode rods.

### WARNING

Heater shells lined with special EPOXY-GLASS lining and equipped with anode rods should not be welded or repaired in the field as this work will destroy tank lining. Consult factory if repairs are required for proper method of repairing lining.

## S T A R T - U P

Initial Start and Burner Adjustment

Adjustments

Air Adjustment Plate

Safety Checks

Correcting Difficulties

Troubleshooting --

    Pilot Burners

    Blower

    Gas

## INITIAL START AND BURNER ADJUSTMENT:

- A. Refer to Installation Instructions, Step Six, to be sure your heater has been correctly installed. Use piping diagrams and pictures to be sure you have a correctly installed water heater.
- B. CAUTION: Check two (2) important items before firing unit.
  - 1. The unit must not be fired without a full tank of water. Pull up on lever on relief valve to be sure the heater is filled.
  - 2. The impeller on blower must turn in the proper direction. Impeller turns counter clockwise when looking at end of motor shaft.
- C. The master gas supply valve should be in the CLOSED position.
- D. The main burner gas cock should be in the CLOSED position.
- E. The runner pilot gas cock should be in the CLOSED position.
- F. The operating temperature control should be set at desired temperature setting. Normal setting - 120°. The high limit control on top of the heater should be set at 200°. If an extra storage tank or circulating pump is used in the system (as shown on our SK-291), the pump control thermostat located on the storage tank or return line should be set to cut out at the desired temperature - approximately 120°. The cut-in setting on this control also should be set 10° lower than the cut-out settings. (NOTE: High limit is located on top of tank. Operating control is at the center. Pump control is on the bottom.)
- G. The electric safe-start switch on control panel on the unit should be in the OFF position. (Manually controlled.)
- H. The fused line switch (on wall) should be in the OFF position.
- I. Pull up on lever arm of relief valve to be sure the heater is filled with water.
- J. Be sure the room, heater and exhaust stack are free of unburned gases before putting heater into operation.

## TO BEGIN HEATER OPERATING CYCLE:

- K. Place the fused line switch on the wall in the ON position.
- L. Place the master gas shutoff cock (upstream cock) in the full OPEN position.
- M. Place the pilot gas cock in the full OPEN position.

- N. Remove the small hexagon headed plug at the side of the pilot gas cock, and bleed out any air which maybe trapped in the gas line. Replace the small pipe plug.
- O. Place the manually operated safe-start switch in the ON position. The motor starting switch will be energized and the blower motor will start. The 30 second prepurge will begin. When complete, the pilot valve opens and is spark ignited. A ten second trial for ignition starts. The pilot flame must contact the flame rod in this ten second trial.
- P. When the runner pilot flame contacts the flame rod of the combustion control system the main burner gas valve will be energized and will open to allow the gas to flow through the air-gas mixer to the main burners.

NOTE: Under normal operating conditions the lighting cycle is automatic from this point on to the normal running condition.

As gas flows through the air-gas mixer to the main burners it will be ignited by the runner pilot flame bringing the water heater into the ON or operating condition.

However, for this initial start and check test, the manually operated main burner cock has been purposely left in the CLOSED position and thus no gas will flow to the main burners. This makes it possible to check the operation of the runner pilot burners and all operating controls before the main burners are lit.

- Q. Turn the main gas cock to the full OPEN position.

NOTE: If the main burners do not ignite and burn steadily within two or three seconds, CLOSE the main burner gas cock immediately. The manually operated start switch should be placed in the OFF position. Then see Step No. R.

When the operating temperature control is satisfied, the electric circuit is broken, the various gas valves close, the blower provides a postpurge and leaves the heater in a normal OFF or standby position.

- R. Failure of the main burners to ignite or failure to burn steadily after initial ignition is usually due to insufficient gas supply to the main burners. Check carefully to determine if sufficient gas is available. This is determined by measuring the gas pressure at the main burner gas valve with a manometer. The gas pressure at this point should be approximately 4" to 5" water column (or as marked on the valve) when the main burners are in operation or attempting to light. As previously mentioned, the main gas pressure regulator may not be functioning properly, thus not allow-

ing the gas to flow to the main gas valve. If the gas supply is ample then it must be assumed that the gas input adjustment of the water heater has been disturbed from the factory setting, or that the operation is being affected by conditions peculiar to the particular installation. If this is so, it will then be necessary to make a complete readjustment of the gas input to the water heater to obtain proper operation. To make such readjustment, proceed as follows:

## GAS MIXTURE AND SECONDARY AIR ADJUSTMENTS:

Readjustment of air and gas input to the unit may require the repositioning of two separate adjustment valves:

These are:

- I. The secondary air adjustment.
- II. The gas input adjustment valve.

On a new installation, regulation of the gas input is the adjustment most commonly required. This, accordingly, should be the first move. To make this adjustment, proceed as follows:

1. Remove the hexagonal cap on the gas input adjustment valve stem and loosen the small lock nut on the stem.
2. Turn adjustment valve stem in a clockwise direction as far as it will go to place the valve finger tight in the CLOSED position. (Count the turns as you turn it so you can go back to the factory setting if necessary.)
3. Place the manually operated safe-start switch in the ON position to start the blower motor, and the runner pilot burners.
4. Now place the main burner gas cock in the full OPEN position. No gas will flow to the burners because the adjustment valve is closed.
5. Open the gas adjustment valve by turning the valve stem in a counterclockwise direction. As the valve opens, gas will flow to the main burners and will be ignited. Do this fairly rapidly.
6. Continue opening the gas adjustment valve 1/4 to one full turn more to bring the main burner flames to approximately full size where they will burn steadily. Lock the gas input adjustment valve in position at this setting.
7. After the main burners have ignited and are burning steadily, the next step is to adjust the gas input to the specified rating shown on the nameplate of the unit. To increase the gas flow, turn the valve stem in a counterclockwise direction. When the correct setting is reached, the main burners should be burning smooth and steadily. Do not use the color of the flame to determine setting as dust in the air usually will color the flame yellow.

8. If suitable equipment is available for checking the flue products it should be used in making the final adjustment of the air-gas mixture to the main burners. While the CO<sub>2</sub> reading will vary somewhat with the different gas mixtures, it should be readily possible to obtain a satisfactory CO<sub>2</sub> reading on the flue gas samples. There should be no indication of CO in the sample. A CO<sub>2</sub> reading of approximately 9-1/2 to 10% is correct for natural gas at sea level.
9. If it is necessary to make a change in the amount of secondary air supplied to obtain the most satisfactory burner performance, reposition the secondary air control valve in exactly the same manner as the gas adjustment valve. (NOTE: Care must be taken that secondary air is not increased to the point of causing excessive turbulence on the runner pilots, or decreased to the point where there is less than 3/8 inches W.C. pressure in the combustion chamber pilots with the unit firing.) The least turbulent runner pilot condition with main burners off is a good visual check on the secondary air setting.
10. After the correct setting has been made, tighten the lock nut on the valve stem and replace the hexagonal cap.

## CORRECTING MINOR STARTING DIFFICULTIES

The unit has been factory tested and adjusted for operation on natural gas of 1,000 BTU heat content. All controls have been carefully checked. The main burner gas pressure regulator should be adjusted to give an outlet pressure equal to that shown on gas valve tag while in operation. The pilot adjustment has been set to give a rich flame which may show some yellow coloring when burning. This coloration is not harmful and this adjustment definitely gives best pilot performance providing soot does not form. Normally, no adjustments are required for proper operation. Occasionally, however, conditions peculiar to a particular installation - exposure to weather - long periods of storage or careless handling of controls - will cause minor difficulty in starting. The following suggestions will assist in correction of such troubles.

- A. It should be realized that repeated starting of the unit with very brief off intervals will tend to overheat thermally operated cutoff devices such as the safety switch in the combustion control and the heater elements in the magnetic motor control switches. When such a cutoff occurs always allow at least five minutes for cooling of the control before resetting the cutoff mechanism.
- B. Remember that conditions external to the unit itself frequently affect the proper operation of the burner and control system. Be on the lookout for disturbing effects resulting from excessive draft, weak draft or down-draft conditions which may result from natural causes or be due to exhaust or pressure fans within the building or boiler room. When such objectionable conditions are encountered they must be eliminated or counteracted if proper operation is to be obtained.
- C. It cannot be overemphasized the necessity of proper gas supply and regulation. If unusual pressure variations occur between burner on and burner off periods, they must be eliminated before proper operation conditions can be established. Make certain that the service regulators installed are suitable for the initial supply pressure which exists at the installation. Check each regulator to make certain that protective shipping devices have been removed and that required vent lines are installed and open. Consult your local gas company if excessive pressure variations persist.

### TWO IMPORTANT SAFETY PRECAUTIONS:

1. When testing the unit or when making any change on an individual control or working part, always keep the Main Burner Gas Cock in the CLOSED POSITION until you are ready to check the main burner.
2. When making a change in electric wiring always keep the Master Electric Switch in the OFF position and the Master Gas Valve in the CLOSED position.

## SAFETY CHECKS ON CONTROLS:

### 1. OPERATING TEMPERATURE CONTROL

Decrease the setting on this control with the burners firing, until all burners shut off. Burners should shut off at approximately the temperature of the stored water. After testing, reset to original setting.

### 2. HIGH TEMPERATURE CUT OFF SWITCH

Decrease the setting on this control with the burners firing until all burners shut off. Burners should shut off at approximately the temperature of the stored water. After testing, reset to original setting.

### 3. COMBUSTION CONTROL CHECK

Turn off gas cock on pilot gas line with unit running. Main burners should stop in 3 seconds and blower should continue to run. Combustion control should go into reset after 30 seconds. After testing, open pilot gas cock and reset combustion control.

### 4. LOW WATER CUTOFF CHECK

Shut off hot and cold water supply valves to heater. Shut off main gas cock (not pilot) to burner. Start burner in operation. For this test pilot only should burn but not the main burner. Open drain valve and relief valve to allow water level to drop. Low water cutoff should cut off pilot and shut the main gas valve. After testing, shut relief valve and drain. Open hot and cold water and gas cock. Let heater refill with water before restarting.

### IMPROPER OPERATION OF RUNNER PILOT BURNERS:

The pilot burners should ignite promptly, travel readily and burn continuously. The runner pilot gas pressure regulator should be adjusted to give an outlet pressure as shown on the tag on the pilot gas valve. If the runner pilot burners will not light when the manually operated safe start switch is in the ON position, the blower is running, the pilot gas cock is OPEN and the electric ignition is functioning properly, there is definitely something wrong. Check the runner pilot burner to make sure the masking tape used to cover the drilled ports during painting operations has been removed. Make certain that the runner pilot solenoid valve is being powered. It is usually possible to feel or hear the clicking sound of the valve as it opens and closes. Check the gas pressure regulator both with the main burner off and the main burner in operation. When the overall gas supply to the main burner is inadequate, it is possible to have proper gas pressure (about 5 or 6 inch water column) at the pilot gas pressure regulator with the main burners off but yet have insufficient gas pressure with the main burners on.

If the flame does not traverse the runner pilots, because of excessive turbulence, it is possible that the secondary air adjustment has been moved from the factory setting. Remove the hexagonal cap that covers the stem of the secondary air adjustment and slowly turn the stem in a clockwise direction until the turbulence has ceased. CAUTION: Do not screw this stem in all the way and leave it in that position. This will cut off all the secondary air that is necessary for proper burner and pilot operation. Ordinarily, this adjustment should not be changed from the factory setting.

### BLOWER WILL NOT START FOR THE PRE-PURGE CYCLE:

Press the reset buttons on the magnetic motor starter switch to make certain that the automatic cutout is not in the OFF position.

Check the fuses on the blower motor power supply. On three phase circuits it is possible to have one fuse blown and yet satisfactorily power the single phase control circuit.

Make certain that all wire connections to the magnetic switch are snug to insure proper contact. Check the electrical circuits between the magnetic switch and motor for a possible faulty connection.

### BLOWER RUNS NORMALLY BUT NO GAS TO MAIN BURNERS:

If all manual cocks are open, check to see if the air pressure switch is level. Also check the pressure adjusting screw inside the switch. The plate on the top of the switch covers this screw. Turn the screw clockwise to raise the pressure adjustment.

If none of the above quick checks provide the solution to the starting difficulties, then it is recommended that an orderly checking procedure be used to determine the trouble. Please turn to the chapter on servicing procedures.

OPERATION  
&  
MAINTENANCE

General Instructions

Operating Instructions

Maintenance Schedule --

Weekly

Semi-annually

Annually

Impeller Replacement

Servicing Procedure

Combustion

Blowing Down

Water Treatment

Leaks

Flues

Main Burner Nozzles

Runner Pilots

Control Functions

Color Code for Wiring

Sequence of Operation -- R4140M

Primary Air Adjustment

Flame & Spark Electrode Details

Magnesium Anode Details

Relief Valves

Gas Pressure Regulation

The Stack

## GENERAL INSTRUCTIONS ON HEATER OPERATION AND MAINTENANCE

The Sellers Water Heater installed correctly is a durable piece of equipment. Give it the care it deserves and it will give ample hot water year after year. Before starting it in operation, be sure it has been installed according to the directions furnished. Take time to learn how the controls function to give fully automatic and safe operation.

### SPECIAL CAUTION

Never operate the water heater without making sure it is full of water. This can be checked by drawing water from the top of the heater. Operating the heater without water is dangerous and will quickly loosen or burn out the tubes.

### OPERATING INSTRUCTIONS

To start heater: (See Startup Instructions for a New Installation)

- (1) Open cold water inlet valve. Allow heater to fill. Be sure it is full.
- (2) Open master, pilot and main burner gas cocks.
- (3) Close main fused disconnect switch.
- (4) Place the On-Off Switch at control cabinet in the ON position.

To stop heater:

- (1) Place the On-Off Switch at control cabinet in the OFF position.
- (2) Open main fused disconnect switch.
- (3) Close master gas cock.

### RECOMMENDED MAINTENANCE SCHEDULE

Every Week

- (1) Blowdown

Open blowdown valve full open and let heater drain until water runs clear. (Blowdown on less frequent schedule if little or no scale is flushed out.)

- (2) Correct Gasket and Connection Leaks.

This applies especially to hand hole gaskets. Leaking gaskets cause corrosion of the metal around the openings.

## Every Six Months

- (1) Clean the Water Heater Thoroughly.

Remove the handhole plates and flush out the interior with a stream of water to remove any accumulated sludge and loose scale. The scale removing action of immersion firing should normally keep the tubes free of scale. If, however, a scale buildup of over 1/16" is found, it should be removed. After cleaning the shell, replace the handhole plates using new gaskets. (If interior of heater is clean, the maintenance may be performed less frequently.)

- (2) Check All Controls.

Raise or lower, as required, settings on temperature controls, high limit switches, safety gas valves, air switches, etc., to be sure they work. Return each control, after check, to its original setting.

- (3) Inspect Magnesium Anodes, if Installed.

Replace deteriorated anodes when 1/2 the original 1-5/16" diameter.

- (4) Check and Clean Blower.

Blades should be clean of all dirt or lint.

- (5) Check and Clean Low Water Probe or Float Chamber.

## Once a Year

- (1) Check Condensate Drain at Rear of Heater for Stoppage.

Remove debris if necessary. Wirebrush and repaint rear chamber with high temperature aluminum paint.

- (2) Examine Flue and Chimney to Determine that there is no Stoppage or Leakage.

- (3) Open Burner Manifold to Check and/or Clean Pilot Holes for Stoppage. Clean Insulators with Soft Rag. Clean Flame and Spark Rod with Crocus Cloth.

- (4) Lubricate Motor if Oil Cups or Grease Fittings are Present.

## IMPELLER REPLACEMENT

Replacement impellers may fail to give full service if proper precautions are not taken. The following steps must be taken to ensure satisfactory service from both the motor and impeller.

Rapid failure of the new impeller often occurs because of worn motor bearings. Be sure motor bearings are checked during the replacement procedure.

1. Remove old impeller. Check housing and burner manifold to be sure loose debris is removed.
2. Check motor shaft for straightness and bearing wear. There should be no discernable shaft movement in any direction. If any movement is felt, replace bearing or motor.
3. New impeller must slide on shaft easily without pounding or using force. Use file to remove set screw marks. Use crocus cloth to remove rust. Apply lubriplate or thin grease for easy assembly and disassembly at a later date.

**ATTENTION: DO NOT HAMMER ON IMPELLER OR MOTOR SHAFT**

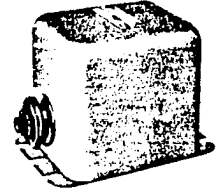
4. Check keyway on new impeller to be sure key is proper size for smooth fit.
5. Install impeller assembly in reverse order of removal. See typical assembly drawing on reverse side.

Adjust impeller on shaft to give minimum clearance between air inlet ring and impeller. 1/16" to 1/8" clearance would be good if attainable.

6. Keep impeller clean. Prevent dust and dirt buildup. They are a major cause of failure.

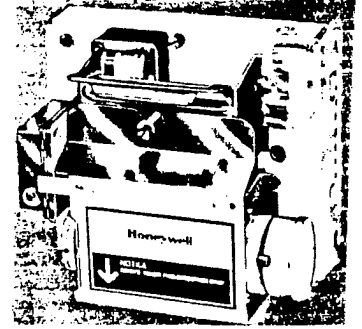
7. IGNITION TRANSFORMER

- A. Located on manifold.
- B. Changes control circuit voltage from 115 V. to 6,000 V. to provide positive spark ignition of pilots.
- C. Non-adjustable transformer.



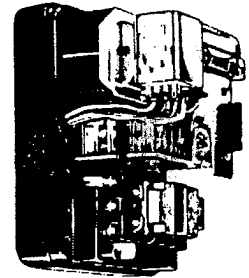
8. COMBUSTION CONTROL (R4140)

- A. Located in control panel.
- B. On a call for heat, it provides proper programming for automatic operation of all controls.
- C. On a call for heat, it times prepurge period, powers pilot valve and ignition transformer, detects pilot flame, powers main gas valve, provides postpurge and will shut down system if abnormal conditions exist.
- D. Non-adjustable



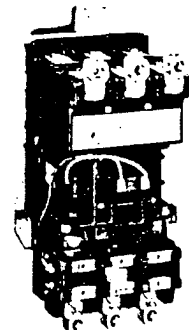
9. COMBUSTION CONTROL (R4795)

- A. Located in control cabinet.
- B. On a call for heat, it provides minimum programming for automatic operation of controls on burners up to 2,500,000 Btu input.
- C. Provides same operation as R4140 except does not provide postpurge.
- D. Non-adjustable.



10. MOTOR STARTER

- A. Located in control panel.
- B. Electrically operated motor switch with thermal motor protection.
- C. Starts, stops and protects motor during heating cycle.
- D. Non-adjustable.



11. FLAME ROD ELECTRODE

- A. Stainless steel rod in ceramic insulator located at end of bottom row of pilots.
- B. Detects presence of pilot flame using flame rectification principle. (Not a thermocouple.)
- C. Causes flame relay (RH) on R4140 or R4795 to pull in when flame touches rod.
- D. Position in pilot flame 1/4" to 3/8" above runner pilot.



**C A U T I O N:** Do not touch flame rod without disconnecting power supply to the unit.

## THE FUNCTIONS OF THE CONTROLS ON YOUR WATER HEATER

### 1. OPERATING TEMPERATURE CONTROL

- A. Located on side of shell.
- B. It is a temperature sensing electrical switch.
- C. Makes and breaks control circuit to maintain correct water temperature.
- D. Normal setting is 120° to 140°, 190° maximum, with 5° fixed differential. (Be careful of scalding.)

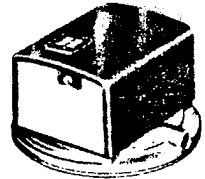


### 2. HIGH LIMIT CONTROL

- A. Located on top of shell.
- B. It is a temperature sensing electrical switch.
- C. Breaks the control circuit in case of failure of the operating temperature control.
- D. Normal setting is 200° with 5° fixed differential.

### 3. AIR PRESSURE SWITCH

- A. Located on side or front near top of burner manifold.
- B. It is an air pressure sensing electrical switch.
- C. It closes the control circuit when proper air pressure is obtained in the manifold.
- D. Screw adjustment clockwise to increase pressure setting. (Adjustment screw located under cover.)



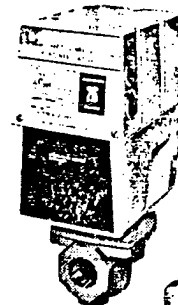
### 4. GAS PRESSURE REGULATORS. (Appliance or ounce to ounce.)

- A. Located on pilot and main burner gas lines.
- B. Gas pressure sensing device.
- C. Reduces and regulates gas pressure to approximately 6".
- D. Turn adjustment screw clockwise to increase gas pressure.



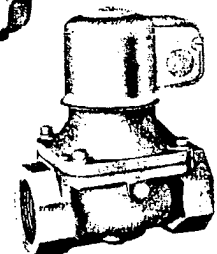
### 5. MAIN GAS VALVE

- A. Located in front of manifold in main burner gas line.
- B. Electric solenoid or motor operated.
- C. Opens main gas line on a call for heat after pilot is established



### 6. PILOT SOLENOID GAS VALVE. (Combination Valve)

- A. Located at front of manifold in pilot gas line.
- B. Electrically operated gas valve.
- C. Opens pilot gas line on a call for heat from operating temperature control.



## RUNNER PILOTS

The runner pilots are designed to be self cleaning. If the pilots have difficulty in traveling from the spark rod to the flame rod, then note whether foreign matter has lodged in any of the gas holes. Matter in these holes can be removed with a no. 53 drill or a fine wire.

If insufficient gas is getting to the pilot, a blockage could occur in the orifice located in the mixer in the pilot header. This can be cleaned by removing the runner pilot or the pilot header manifold.

## BLOWING DOWN

Blowing down is designed to remove some of the mud, sludge and precipitate that accumulates in the bottom of the unit. It does not take the place of opening the shell and washing it out, but it is essential for proper care.

Frequency of the blowdown depends on the kind of water heated and the amount of water used. Hard water generally precipitates more solids and will have to be blown down more often. The more water heated, the more sludge is formed, requiring blowdown more often.

The proper procedures for a blowdown requires a 2" gate valve be installed in the blowdown line. This valve should be fully opened until the water runs clear.

## WATER TREATMENT

Ordinarily, water used in Sellers water heaters requires no special treatment. In some special industrial processes or water treatments, the water can take on an excess of oxygen or other chemicals, or may become excessively acidic or basic. In these cases, the water should be treated. Any water treatment program should be handled locally through a reputable water treatment service. If you can not locate such a service, consult your Sellers Representative. He will be happy to help you obtain this service. Where softeners are used, it is recommended that water be softened or blended down to between 4 and 12 grains of hardness.

## LEAKS

Water, gas or steam leaks should be stopped as soon as they are discovered. This is especially true of steam leaks. A leak through a steam fitting can quickly cut or score the steel parts requiring a shutdown and major repair. Gas and water leaks should be repaired to prevent hazardous conditions and to prevent further deterioration of equipment.

## FLUES

**Sellers equipment** burns free of soot or carbon deposits. However, at times dirt, lint and other particles can be drawn into the flues from the air. It is recommended that the flues be cleaned with a flue brush if deposits build up.

## MAIN BURNER NOZZLES

Normally, these nozzles require no maintenance. However, if subjected to extreme moisture or dirt, it is possible for some accumulation to occur. This is easily detected by checking the flame retention slots in the end of the nozzle. Dirt can be removed from these slots with a fine wire or compressed air.

- . Is air flow proved? It must prove within 8 seconds of prepurge.
- . Does burner flame safeguard operate correctly prepurge, trial for ignition, proof of pilot and main burner ignition?

### COMBUSTION:

Pilot and ignition spark can be visually checked. A good runner pilot can be recognized as leaning slightly forward, approximately 30°, and showing some yellow when the main burners are in operation. When the main burners are properly operating, they ignite readily and burn steadily. The flame looks solid and forceful. Close inspection reveals a ring of small retaining flames around the burner nozzle. Blowing off of these retaining flames, resonance, "missing" or erratic firing of the main burners may indicate overfiring. Turn the main gas adjustment valve slightly clockwise to correct this condition. Dirt or dust in the burner nozzle also can cause "missing". Remove this by shutting the gas off, opening the manifold, turning blower on and tapping the burner nozzles slightly. Additional cleaning with a small wire may also be required. Underfiring of burners can be recognized by transparent tapering main burner flames. Correct this by turning the main burner gas adjustment counterclockwise. Proper combustion is usually obtained when the pressures at the test locations match those marked on the heater.

The above service approach and hints will handle the most common troubles. These instructions are very general. They are designed to quickly locate troubles with a minimum of effort and equipment. The descriptions and instructions which are included in the Servicing Section of the Owner's Manual are more detailed.

For more details consult the proper section of the Owner's Manual. Your local Sellers representative is also prepared to provide additional assistance.

## SERVICING PROCEDURE

If difficulty in operating the heater is encountered, try to locate the trouble in an orderly logical procedure. Experienced servicemen indicate the majority of all troubles are simple and easily located.

### GAS AND WATER :

First, determine the type of trouble encountered. Gas and water leaks are easily located. A soapy water solution is useful in locating gas leaks. Most common gas troubles can be located with the aid of a water column manometer. Lack of adequate gas pressure is easily checked by measuring the pressure at the pilot gas valve when the main burner valve opens. Pressure at the pilot valve should be at least 4 to 4-1/2" W. C. A momentary drop of over approximately 1" W.C. when the main burner valve opens indicates gas supply problem. It can be corrected by increasing gas pressures, increasing pipe sizes, etc. The gas company should be called to help correct the problem.

### CONTROLS:

Other common troubles include improperly set controls. The operating temperature control should be set at 120° to 140°. Since the actual temperature of the water at the outlet of the heater can be somewhat different, be careful about raising this control setting over approximately 170°. Relief valve leakage is often caused by setting the operating temperature control too high. Erratic temperature troubles are often caused by setting the high limit too low. Set this at 200° F. If the controls are correctly set, then leakage or erratic temperature control is probably due to excessive water pressure, poor circulation, or a defective operating control.

### ELECTRICAL:

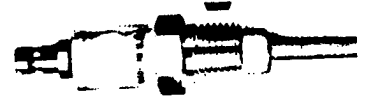
Electrical problems require a logical procedural approach. Think about what is happening. Keep in mind electricity can be compared to water running through pipes. It starts at one end and runs to the other . . . and can be detected anywhere inbetween if it is present. Use a test light to check.

- . Is there power to the unit, wall switches on, and fuses or breakers okay?
- . Is there water to the unit, low water cutoff made, high limits made?
- . Is the unit calling for heat? Maybe it is off because the operating control is satisfied.
- . Are light bulbs defective for any of the above devices.
- . Are high or low gas pressure switches off on manual reset?
- . Is terminal 16 powered on R4140? On most units, when terminal number 16 is powered, the blower should run.

## 12. SPARK ROD ELECTRODE

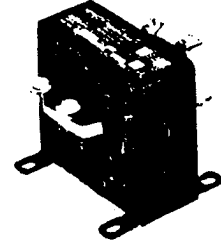
- A. Stainless steel rod in ceramic insulator located at end of top row of runner pilots.
- B. Causes pilot ignition during pilot running cycle.
- C. Provides continuous spark during running cycle.
- D. Position in pilot flame 1/8" to 3/16" above runner pilot port. (Do not set over 3/16 gap.)

**C A U T I O N:** Do not touch spark without disconnecting power supply to the unit. Spark rod has 6000V on it.



## 13. CONTROL TRANSFORMER (500 VA)

- A. Located in control cabinet.
- B. Changes voltage supplied to heater to 120 volts.
- C. Fused for 5 amps.



## 14. ENERGY X-TRACTORS

- A. Located in each firing tube.
- B. They are stainless strips in spiral design.
- C. They deflect and turbulate hot gas in tube to increase heat transfer to water.
- D. If extractors move from original position (flush with rear of tube) then bend slightly to reset tension in initial heating and replace in tube.



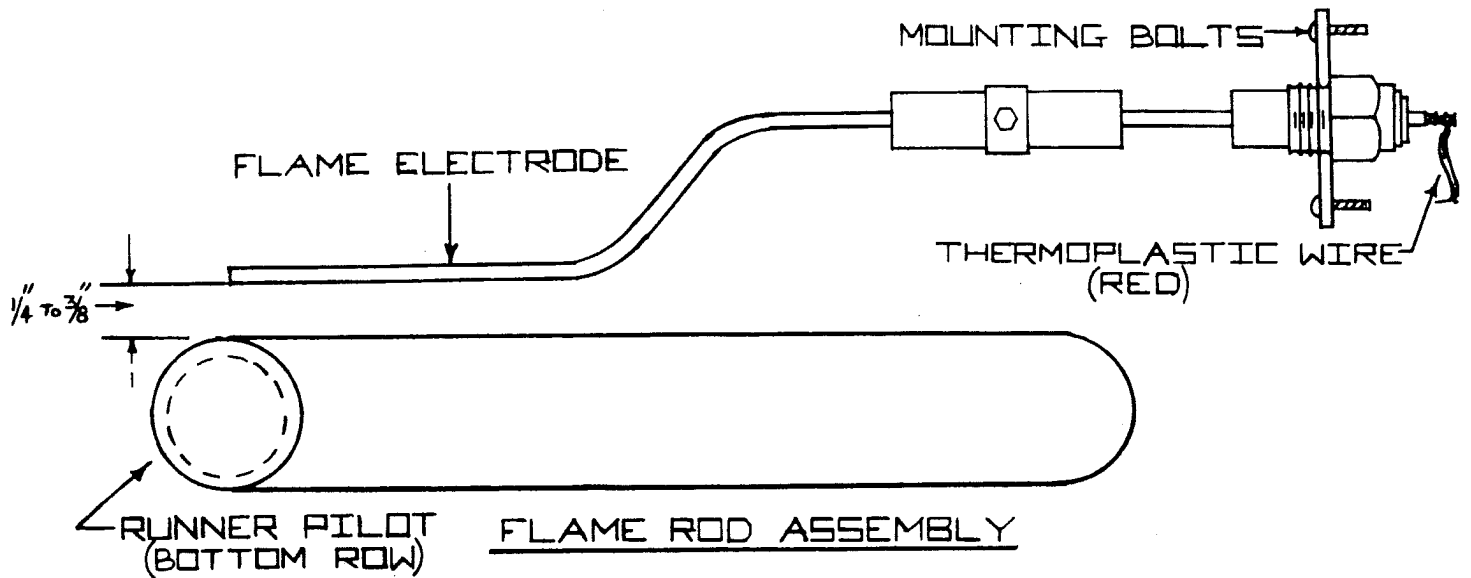
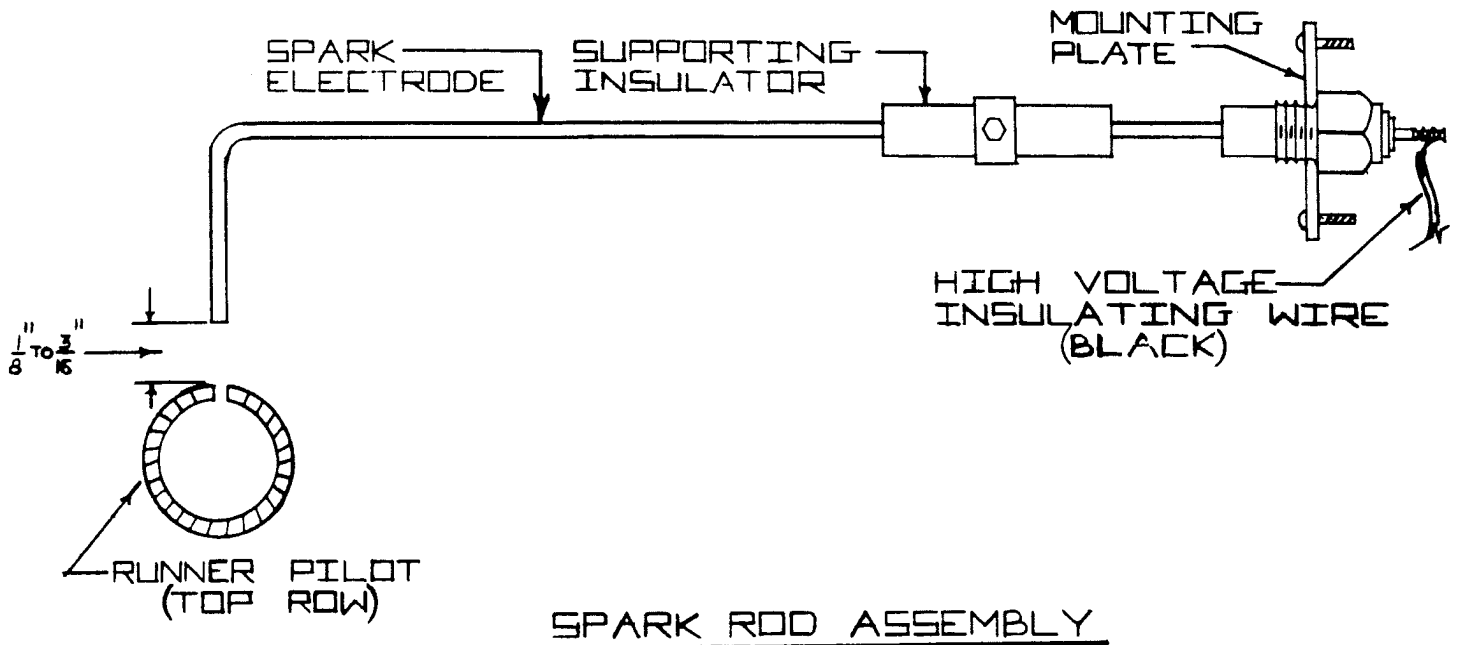
## COLOR CODE FOR WIRING WATER HEATERS

Where possible, the control cabinet is wired according to the following wire color code:

- Black - Power feed to control circuit and motor circuit.
- White - Ground.
- Red - Operating Temperature Controls, Motor Starter Coil and On-Off Switch.
- Yellow - Limit Controls including Air Switch, High Limit Temperature Control, Motor Starter Interlock.
- Blue - Pilot Gas Valve, Ignition Transformer, Low Water Alarm.
- Orange - Main Gas Valve.
- Brown - Low Water Cutoff Probe.
- Green - Neutral Ground.



# FLAME AND SPARK ELECTRODE DETAILS



NOTES: ELECTRODES MAY BE CUT AND BENT AS REQUIRED.  
REPLACEMENT ELECTRODES MAY BE USED FOR  
EITHER FLAME OR SPARK POSITIONS.

## PRIMARY AIR ADJUSTMENT PLATE

The drawing to the right shows a typical air adjustment plate assembly. Specific details vary with burner models. Some burners support the air adjustment screw in a different manner.

This adjustment is factory set during factory tests. It should not be moved except under unusual conditions. Fine tuning of the burner at the job-site should be done with the gas adjustment valve and the secondary air screw.

If access to the blower impeller is required for cleaning, etc., use the following procedure:

1. On units with double manifold (BT, 77, 105E where adjusting plate is on outside and screw is covered by hex cap cover) do not touch center adjustment screw.

FIRST: Remove access plate screws around edge of access plate.

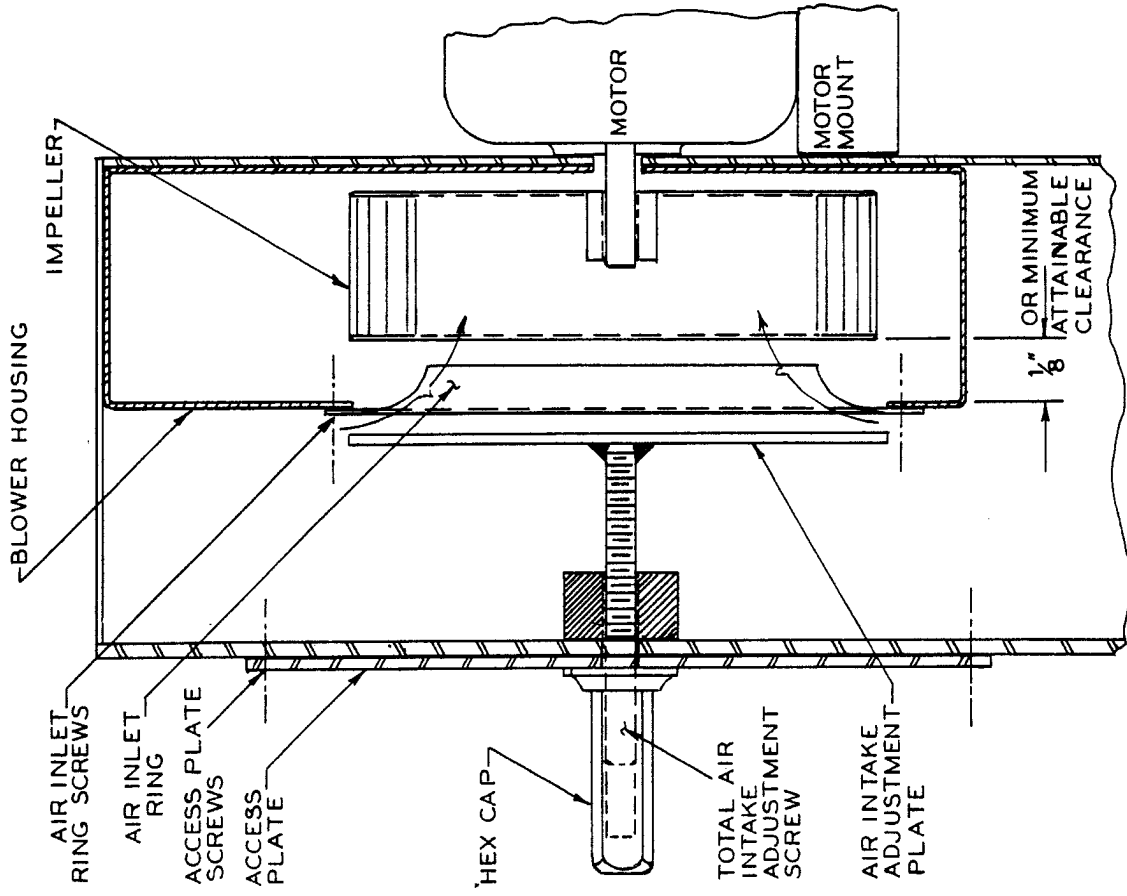
SECOND: Remove access plate to expose air inlet ring. Remove screws around air inlet ring to allow access to impeller.

(For Models TP, CD, TBT)

2. On units with exposed air adjustment screw, remove screws around rim of air inlet ring. If adjustment plate covers screws, back off the plate until screws are exposed. Count turns so adjustment can be returned to original setting.

3. Impeller can now be accessed for cleaning or removal. Cleaning can be done with screwdriver blade or putty knife. Be sure to clean all blades evenly. Do not remove balancing weights from impeller blades if weights are present. If necessary, use solvents to loosen or remove encrusted material.

When removing impellers, see instructions following for proper remounting techniques. Instructions apply to remounting original impeller or a replacement.



## RELIEF VALVES

At times you may notice slight leakage of water from the temperature and pressure relief valve. The following information may be helpful to determine the cause and remedy of this leakage.

A pressure relief valve opens when the pressure in the tank equals or exceeds the pressure stamped on the valve.

A temperature relief valve opens when the temperature at the valve exceeds 210° F.

Most Sellers water heaters have a combination temperature and pressure relief valve installed. This valve will open when either temperature or pressure is in excess of the stamped setting.

If the valve does leak, the following procedure should be used:

1. Check the pressure of the cold water supply line. The relief valve pressure setting should be at least 25 psi above available water line pressure but not above working pressure stamped on top of tank.
2. If the supply line pressure is within 25 psi of the relief valve setting, then a pressure reducing valve should be installed in the cold water supply line.
3. Check to see if the pressure buildup occurs during the heating cycle due to THERMAL EXPANSION of the water. Thermal expansion leakage can be corrected as follows:

A. This condition occurs when there is a check valve in the cold water supply to the water heater. Solution: Drill a small hole (1/8" to 1/4") in the check valve flapper. When this is done, there is the possibility of a small amount of hot water backing up a short way into the cold water system, but this ordinarily causes no harm.

SOLUTION I: When the supply pressure is less than the pressure setting of the tank relief valve, use a Watts Type No. 135B or U5B pressure reducing valve. These by-pass valves prevent pressure from increasing over the street main pressure and will eliminate a "thermal expansion" dripping condition when the T & P relief setting can be higher than the supply setting. (See 2 above.)

SOLUTION II: If the supply pressure is greater than the highest possible relief valve setting, install a secondary pressure only relief valve in the down-stream cold water line at a point convenient to a drain between the reducer and the heater. Set this valve at a lower setting than that stamped on the tank T & P valve.

**SOLUTION II:** This secondary valve may leak on heating cycles of the water heater but it will avoid the frequent dripping of the primary T & P valve on the tank. A Watts No. 174-A - 3/4" valve would be adequate for this secondary valve.

(continued)

4. Temperature relief of the tank T & P valve can be recognized by the flow of a considerable volume of water from the valve. This could be caused by three conditions.

A. Stacking or Stratification:

A build-up of high temperature hot water at the top of the heater as a result of a series of light draws on the hot water line. Remember, there is generally a 5° to 15° temperature difference between the water at the operating control location and at the top of the tank.

SOLUTION: Turn the operating temperature control down approximately 5° to 10° F. If your operating control has an adjustable differential setting, then increase this differential by 5° F.

B. Improper Circulation:

The small storage, high recovery water heaters are designed to provide large volumes of hot water quickly. When the operating temperature control is set in the upper range, the natural internal circulation may not be sufficient to provide proper internal mixing. This then causes the unit to be shut off by the high limit safety or to open the temperature relief valve.

SOLUTION: Install a larger circulating pump in the system. The pump should be capable of moving 75% to 100% of the recovery capacity of the heater.

C. Defective Operating Control:

If the main burners are still operating, the operating and/or high limit controls may be defective.

SOLUTION: Check the control circuits for electrical shorts or for defective operating controls.

## GAS PRESSURE REGULATION

To many people, the subject of gas regulators is somewhat confusing. A brief simplified explanation of this important piece of equipment will follow:

There are generally two types of regulators encountered on Sellers units.

### 1. Maxitrol "RV"

Appliance regulators also called low pressure or ounces to ounces regulator. Generally, they should not be subjected to gas pressure over 1 psi. They work best on the standard gas pressure of 7" to 25" W.C. This is the normal gas pressure delivered by the natural gas companies to the equipment. This regulator works well with Sellers equipment. Most units are shipped with this regulator installed.

### 2. Fisher 66, S100, S201

Service regulators, also called field regulators or pounds to ounces regulator. Generally, these regulators receive gas at two to fifty psi and reduce it to ounces. This regulator is designed to receive gas directly from the high pressure street main and reduce it to 4 to 8 ounces pressure. These regulators are used on Sellers burners if the supply pressure exceeds 1 psi cut is less than 10 psi. If pressure exceeds 10 psi, a second upstream regulator of the same type should be installed to provide another regulation.

Occasionally, it is necessary to install a second appliance regulator downstream of the service regulator to smooth out the action of the service regulator. The following information may be of help in handling high pressure gas service problems:

### WHAT TO DO -

Normally, the correct gas pressure regulator has been factory installed on the heater. If the pressure of the gas service to the heater is changed, then the following information will be of help:

1. When gas is metered at high pressure above 10 psi and a "pounds to ounces" regulator is installed at the meter outlet to service a single unit of equipment, install a second regulator near the unit. The high pressure regulator should be set to deliver gas to the burner at the pressure recommended in the specification sheet. The burner regulator will then reduce it to the operating pressure required by the burner. Be sure the high pressure regulator outlet pressure does not exceed the burner regulators maximum inlet pressure.
2. If under the stated conditions, the "pounds to ounces" regulator service at the meter takes care of two or more units, install at each unit a regulator more sensitive and with a much wider range of inlet pressures than the ordinary appliance regulator. Such a regulator is the Fisher Type 66, or the Maxitrol RV Series. The former is made in 2", 3" and 4" IPS with an inlet pressure limit of 5 pounds and the latter in sizes from 3/4" through 4" IPS and with an inlet pressure limit of 1 to 5 pounds.

If the gas pressure in the line coming into the building is below the pressure limits of the regulators named and if local regulations permit running high pressure gas lines inside a building, the "pounds to ounces" regulator at the meter may be omitted. Simply install a Fisher Type 66 or a Rockwell "120" at each unit. If the regulator at the meter is necessary, performance will be best if it is set for an outlet pressure of 2 to 3 pounds and gas at that pressure is delivered to the recommended regulators at the units. Normally, the correct regulator for the heater has been factory installed.

3. Occasionally, on a high pressure service, a "pounds to ounces" service regulator is installed ahead of the gas meter and the gas is then metered at low pressure. With this condition, treat the installation as a low pressure installation and follow the recommendations under CASE II. The dampening effect of the diaphragm type low pressure meter and the volume of gas in the piping will usually iron out all effects of "lock up" and other pressure variations. On start up, be sure to check to insure a sufficient volume of gas is delivered to the unit. Check gas pressure drop whenever burners operate.

#### PRESSURE CONVERSION TABLE

Ounces per Square Inch	Pounds per Square Inch	Inches of Water	Inches of Mercury
1	0.062	1.732	0.1275
2	0.125	3.464	0.2551
3	0.187	5.196	0.3826
4	0.250	6.928	0.5102
5	0.312	8.660	0.6377
6	0.375	10.932	0.7653
7	0.437	12.124	0.8928
8	0.500	13.856	1.020
9	0.562	15.588	1.148
10	0.625	17.320	1.275
16	1.000	27.712	2.041

## THE STACK

Your Sellers heater is provided with a power burner. This means air is forced into the heater with an electric blower. Power burners can overcome many of the inadequacies of a poor installation but they are not a cure all.

With Sellers equipment, the stack is used only to vent the products of combustion to the outside atmosphere. The heater will perform well without any stack at all. It is, therefore, important that the stack be sized and constructed so as to not interfere with the operation of the heater.

A properly constructed stack, properly piped to the flue will show a natural draft at the flue outlet of from .02" to .04" water column negative pressure with the unit running.

If pressures run more than approximately .08" W.C. positive, it is an indication of problems with your stack. Either it is too small to handle all the products of combustion, improperly designed, or there is a natural downdraft opposing the action of the burner. It is also possible something is obstructing the stack. This may be the rain cap, a loose flue, cement or any other foreign item. First check to see nothing is obstructing the stack. A mirror is often helpful with this job. Check to be sure the flue piping and the stack are at least as large as the outlet on your heater. If your heater is installed with a long horizontal breeching, problems can also occur. Horizontal runs over 10 ft. should be avoided. All horizontal runs should slope upward at least 1 in. per ft. and should be insulated. A large number of elbows will also cause a restriction in the flue pipe. Restrictions due to excessive elbows or to horizontal runs can be helped by increasing the flue pipe one or two sizes. Elbows should be radiused and not metered or teed.

Often the rain cap is set too close to the top of the flue. The distance from the bottom of the rain cap to the top of the flue should be equivalent at least to the diameter of the flue. If the draft in a chimney changes from negative to positive shortly after ignition of the main burner, be sure to check to see that the rain cap is not the cause.

If the up draft measured at the flue outlet is greater than approximately (.015"), then a draft breaker is recommended. A simple single acting barometric damper similar to the Fields MGI is adequate. It should be sized according to the updraft encountered. Figure full flue pipe size and most high draft conditions will be corrected. Install the damper near the units flue outlet but not closer than 18 in. The Stack Detail Drawing #SK-285 (at front of manual) shows recommended installation for the barometric damper and complete stack assembly.

Care should be used when erecting a stack for an atmospheric burner in the same room with a power burner. The power burner may draw flue products out of the stack of the atmospheric burners if there is any lack of fresh air inlets in the boiler room. Be sure the room is adequately vented, preferably with air inlets on both sides of room to give cross ventilation. One inlet should be near floor level and the second should be at ceiling level. If troubles still are present with flue products or combustion of the atmospheric heater, a duct can be connected directly from the Sellers heater air inlet to the outside.

C O M P O N E N T P A R T S

Parts Identifying Drawing

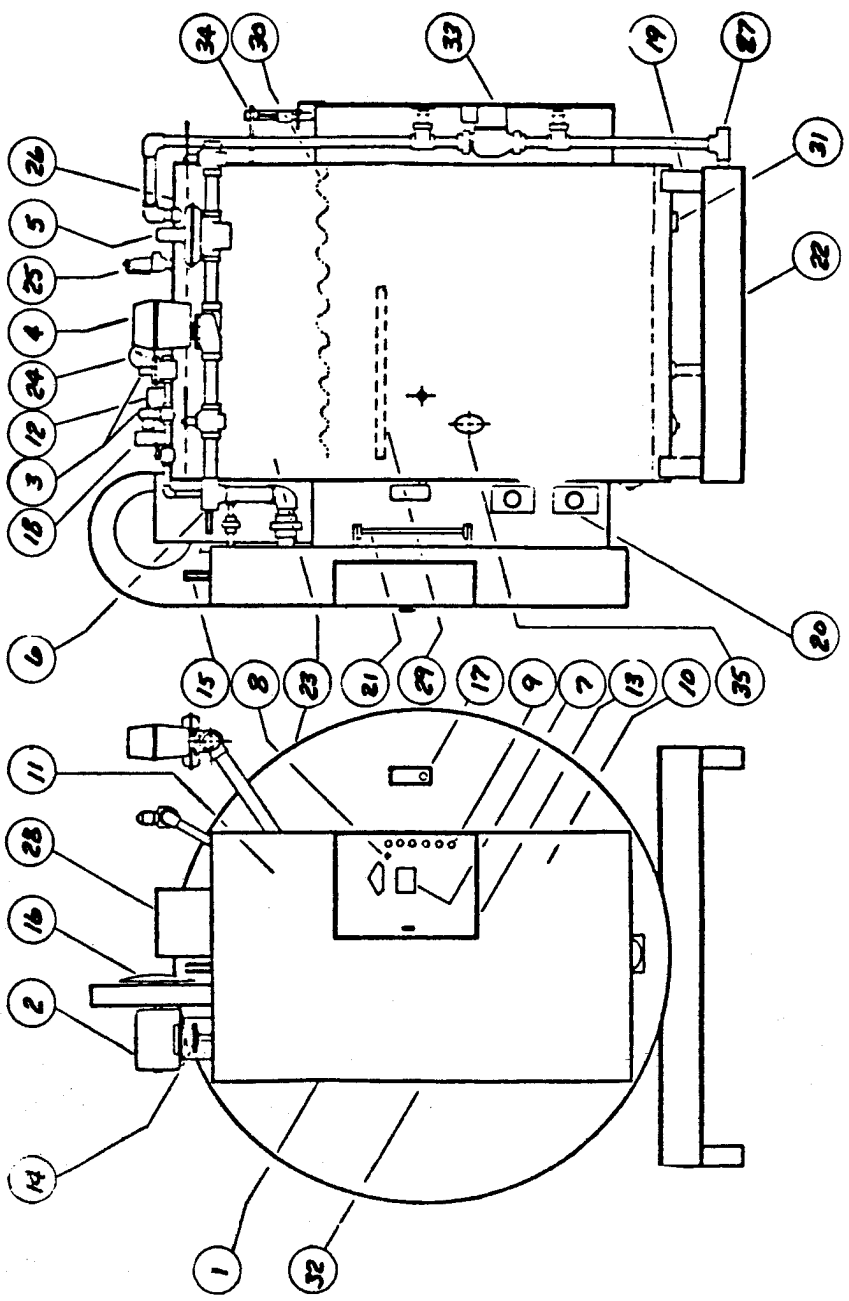
Burner Assembly

Gaskets

Spare Parts

DRAWING NO.  
A-SK-688

- 1 - Burner Assembly
- 2 - Blower Motor
- 3 - Pilot Gas Valve and Regulator
- 4 - Main Gas Valve
- 5 - Main Gas Regulator
- 6 - Gas Adjustment Valve
- 7 - Sellers Nameplate
- 8 - On-Off Switch
- 9 - Indicator Lights
- 10 - Ignition Transformer
- 11 - Low Water Relay
- 12 - Low Water Probe
- 13 - Control Panel
- 14 - Air Switch
- 15 - Secondary Air Adjustment
- 16 - Primary Air Adjustment
- 17 - Operating Temperature Control
- 18 - High Limit Temperature Control
- 19 - Pump Temperature Control
- 20 - Observation Port
- 21 - Burner Hinge
- 22 - Skid Base
- 23 - ASME Stamping
- 24 - Temperature Gauge
- 25 - Relief Valve
- 26 - Hot Water Outlet
- 27 - Cold Water Inlet
- 28 - Flue Gas Outlet
- 29 - Magnesium Anode
- 30 - Energy Extractors
- 31 - Drain Connection
- 32 - Condensate Drain
- 33 - Circulating Pump
- 34 - Davit
- 35 - Handhole

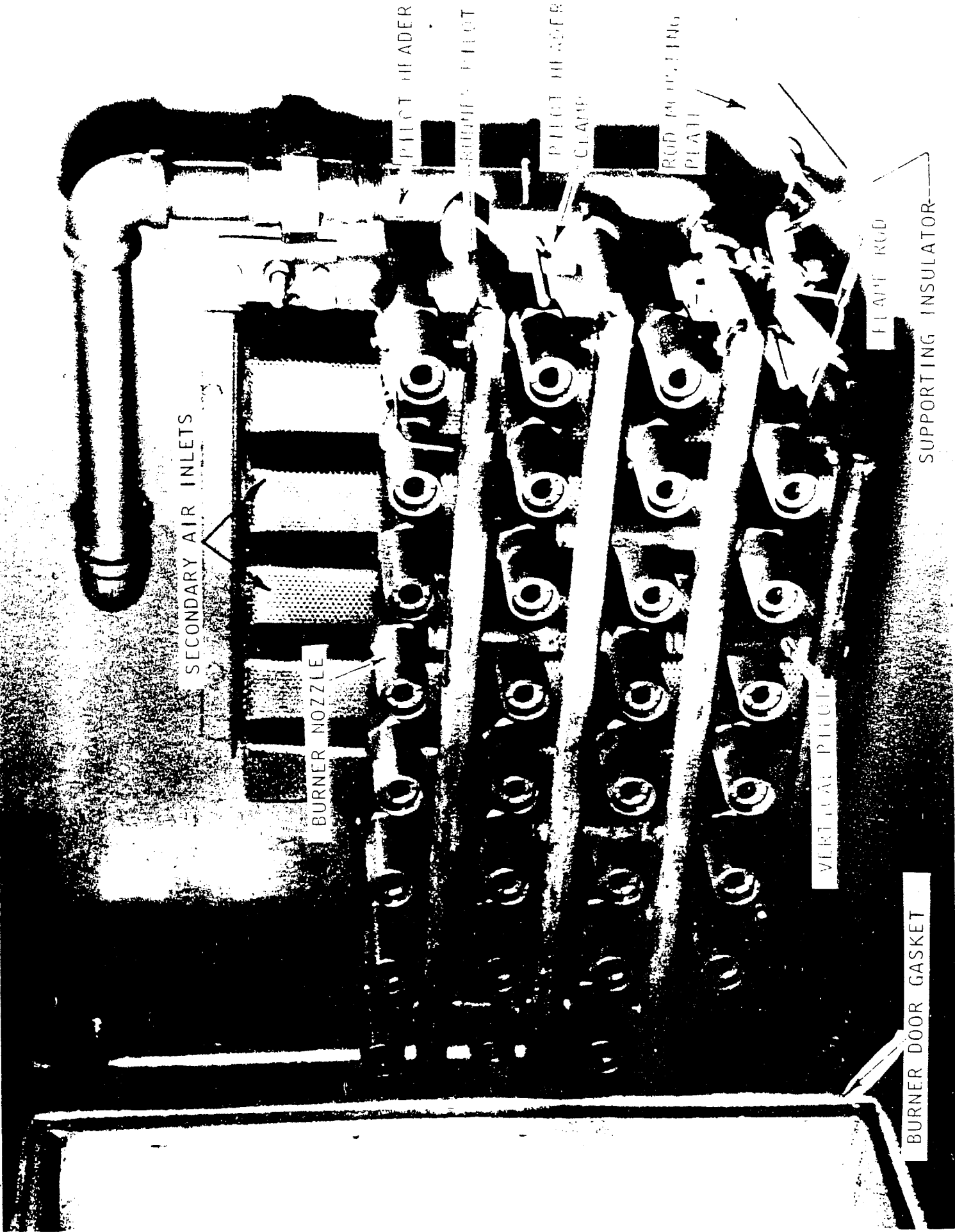


*PARTS IDENTIFYING DRAWING*  
*TWO PASS WATER HEATER*

**SELLERS ENGINEERING COMPANY**  
DANVILLE, KY.

SCALE  
DATE 11-21-84  
DRAWN BY LG

CHECKED  
DRAWING NO.  
A-SK-688



SECONDARY AIR INLETS

BURNER NOZZLE

PILOT HEADER

BURNER PILOT

PILOT HEADER CLAMP

ROD MOUNTING PLATE

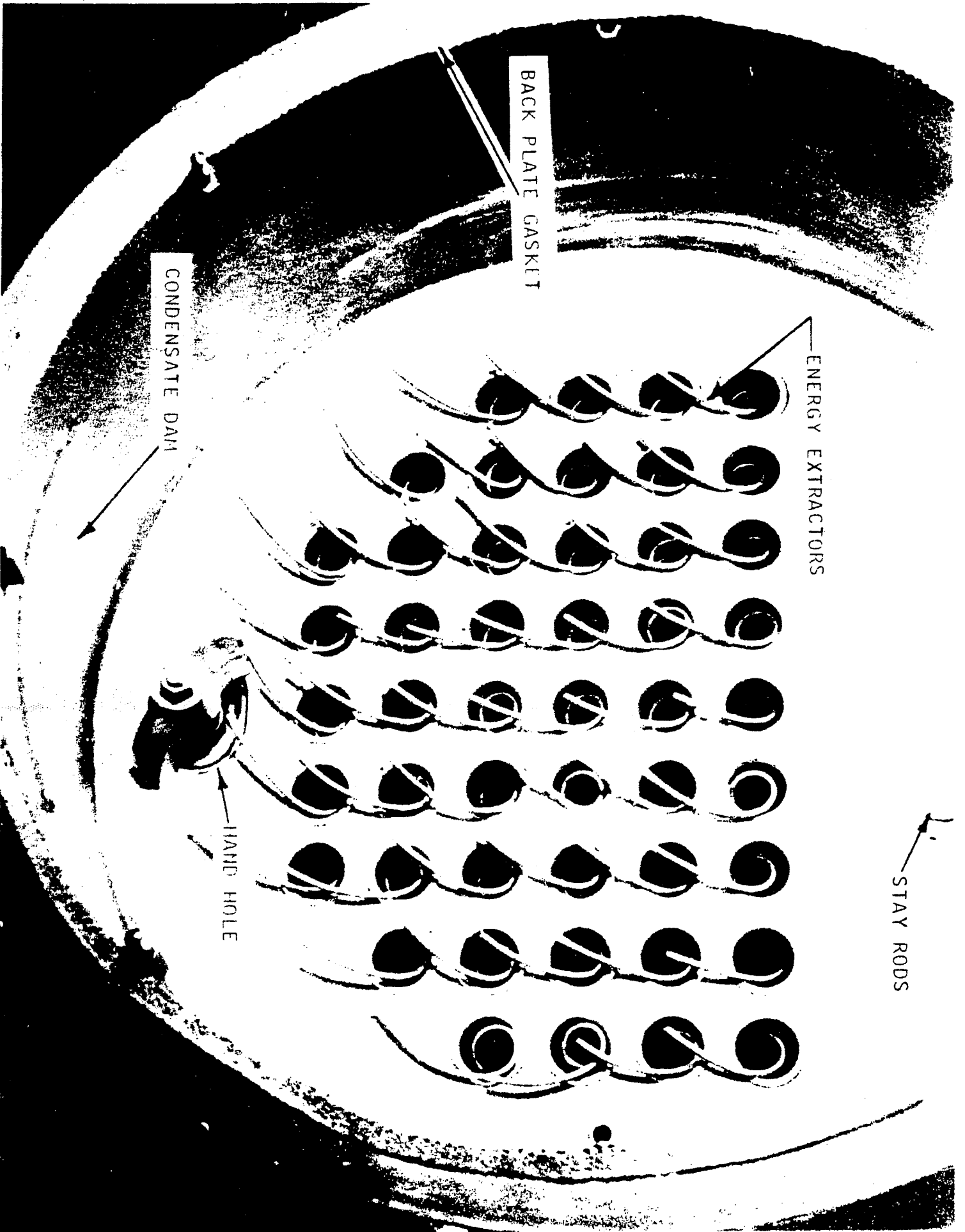
VERTICAL PIPING

BURNER DOOR GASKET

FLAAT ROD

SUPPORTING INSULATOR

TYPICAL BURNER ASSEMBLY



BACK PLATE GASKET

CONDENSATE DAM

ENERGY EXTRACTORS

STAY RODS

HAND HOLE

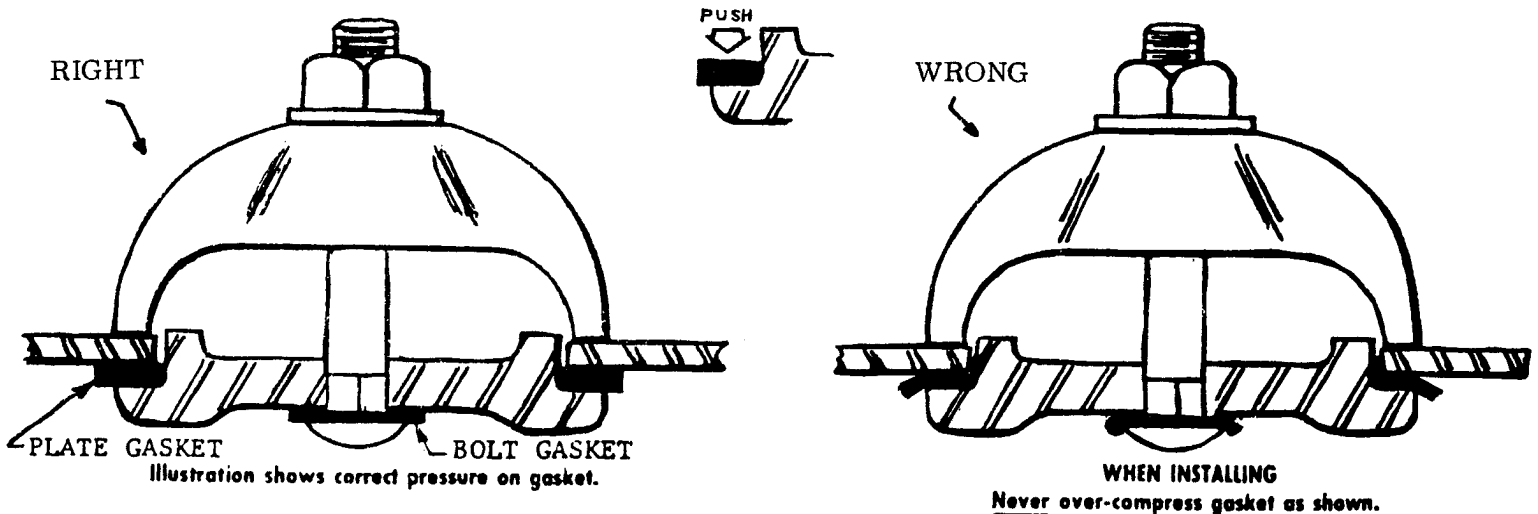
EXHAUST END ASSEMBLY

# GASKETS

WATER HEATERS AND STEAM BOILERS SHOULD BE THOROUGHLY CLEANED INTERNALLY EACH YEAR. HANDHOLE AND MANHOLE (WHERE USED) PLATES SHOULD BE RESEALED WITH NEW GASKETS. KEEP A SUPPLY OF GASKETS ON HAND FOR THIS MAINTENANCE.

EACH HANDHOLE PLATE REQUIRES TWO (2) GASKETS - A PLATE GASKET AND A HARD BOLT GASKET. REPLACE BOTH GASKETS ACCORDING TO THE FOLLOWING INSTRUCTIONS:

- 1.** Remove old gasket and thoroughly clean the surface on boiler and on plate.
- 2.** Place gasket on handhole plate. Be sure the gasket is pushed down tight on the plate. Permatex or other non-hardening gasket compound may help to prevent leaks.
- 3.** After plate is in boiler and gasket is in, set crab and tighten nut only enough to provide a snug fit. Make it hand tight then snug with wrench about 1/4 turn. Do not compress excessively as gaskets should never be compressed as much as the old asbestos type.
- 4.** If gasket leaks while pressure is being built up, tighten only enough to stop leakage. Never tighten more than necessary to prevent leakage. Excessive tightening may shorten life of gasket.
- 5.** Replacement gaskets may be obtained from any Sellers representative.



ENGINEERING COMPANY

P.O. BOX 48 • DANVILLE, KENTUCKY 40422

**RECOMMENDED SPARE PARTS LIST  
FOR  
SELLERS WATER HEATERS**

Parts required annually for maintenance:

<u>Part No.</u>	<u>Quantity</u>	<u>Description</u>
G-1202	12	Handhole Gaskets, 3½" x 4½"
G-1205	12	Handhole Bolt Gaskets, 3/4"

The following parts normally give service for several years. However, each part is needed for operation of the heater. Parts are listed in order of probable need. Number of parts stocked should depend on urgency of repairs and cost of stocking.

- G-4103 or 4 . . . . . 2 . . . Magnesium Anodes (state length)
- B-10103 or B-7201 . . . . 2 . . . Flame and Spark Rod
- C-1100 . . . . . 1 . . . \*Impeller (state diameter, width and bore diameter)
- B-1100 . . . . . 1 . . . \*Electronic Combustion Control (state make & model no.)
- B-6201 . . . . . 1 . . . Fuse, FNM5 for control transformer
- B-8102 . . . . . 12 . . . Indicator lamp bulbs (state size or describe lamp)
- B-7101 . . . . . 1 . . . Ignition Transformer, 6000V
- B-3100 . . . . . 1 . . . Electric Motor (state horsepower, frame size & voltage)
- A-2100 . . . . . 1 . . . Main Gas Valve (state make, model and size)
- A-1100 . . . . . 1 . . . Pilot Valve and Regulator Combination (state make and size)
- F-1100 . . . . . .Varies. . Temperature and Pressure Relief Valve (state Btu input and working pressure)
- B-2101 . . . . . 1 . . . Magnetic Motor Starter Switch (state make and size)

\*These items should be carried as spare parts for heaters where operation is critical.

NOTES: On parts orders give heater model and serial number plus complete description of the part required.

If special non-standard items were ordered with original heater, additional spare parts for these items may be required.

Parts may be ordered through your local representative or Sellers Engineering Company.