

650A/6500A MILLS BOILER INSTALLATION INSTRUCTIONS



STEAM OR WATER HEATING
FOR AUTOMATIC FIRING
WITH OIL OR GAS



DESIGNED AND TESTED ACCORDING TO A.S.M.E.
BOILER AND PRESSURE VESSEL CODE, SECTION IV
FOR MAXIMUM ALLOWABLE WORKING PRESSURE.

STEAM - 15 PSIG, WATER - 40 PSIG
80 PSIG SPECIAL ORDER

FOR BURNER INSTRUCTIONS
SEE SEPARATE INFORMATION FURNISHED
WITH THE BOILER

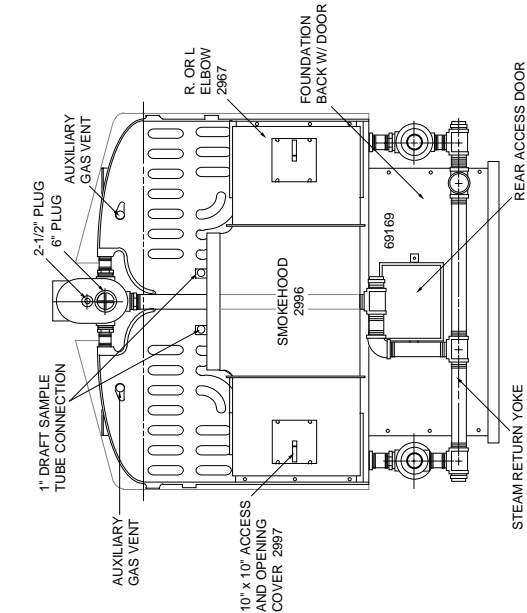
TO STEAMFITTER

NOTE: READ THESE INSTRUCTIONS CAREFULLY.
THEY WILL SAVE YOU TIME IN ASSEMBLING
BOILER PROPERLY.

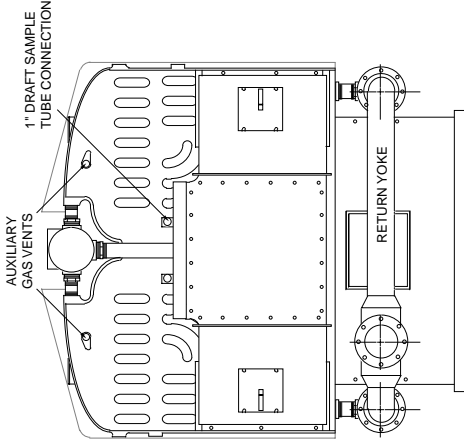
THE SECTIONS IN THIS BOILER **MUST** BE
ASSEMBLED IN THE PROPER ORDER. READ
INSTRUCTIONS.

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

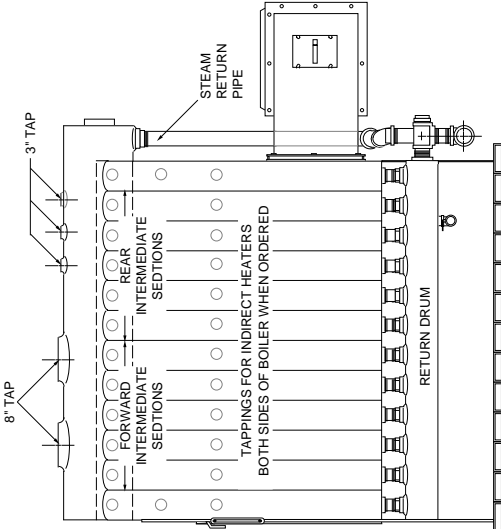
650A/6500A BOILER
INSTALLATION INSTRUCTIONS



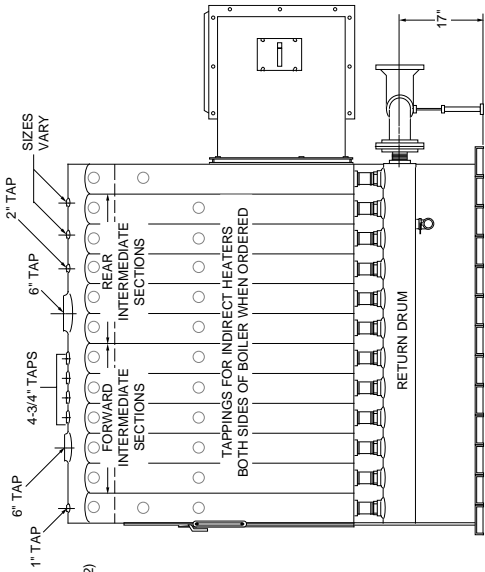
REAR VIEW - STEAM



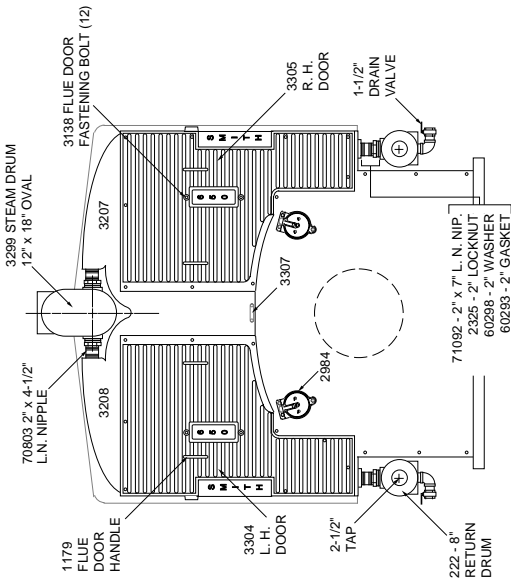
REAR VIEW - WATER



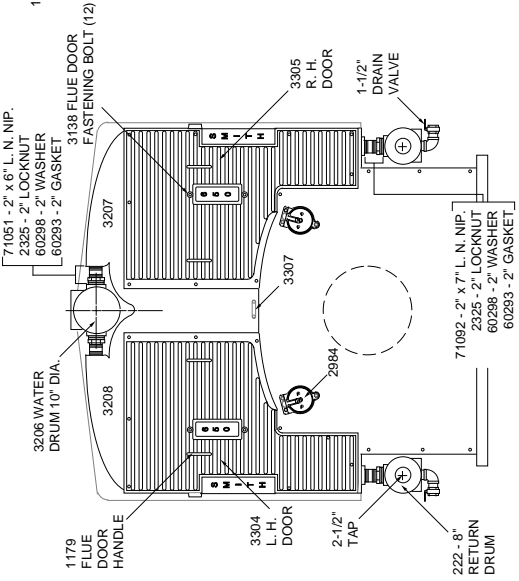
SIDE VIEW - STEAM



SIDE VIEW - WATER



FRONT VIEW - STEAM



FRONT VIEW - WATER

650A/6500A BOILER INSTALLATION INSTRUCTIONS

COMPUTER NO.	DESCRIPTION	COMPUTER NO.	DESCRIPTION
FOUNDATION		BACK	
2851	C.I. Sidewall - 3 Section (18" Long)	3533	Back section, 2 required
2852	C.I. Sidewall - 4 Section (24" Long)	3294	Back connecting strap
2984	Observation Cover	69169	Foundation back with door
3164	Observation Cover Frame	SMOKEHOOD	
	Observation Cover Insulation	2967	Smokehood elbow, R.H. & L.H.
3249	Lug for Windbox Assembly	2996	Smokehood center section
	$\frac{7}{16}$ " x $1\frac{1}{2}$ " Stud for W.B. Assembly	2997	Cleanout cover plate
	$\frac{7}{16}$ " Hex Nut for W.B. Assembly	LOCKNUTS & NIPPLES	
61514	Steel Front Plate with Burner Hole	70803	Supply drum nipple
69196	Foundation Back with Access Door		2" x $4\frac{1}{2}$ " (Steam only)
NOTE: R.H. (Right Hand) or L.H. (Left Hand) as seen from the front of the boiler.		71092	Return drum nipple 2" x 7"
FRONT		71051	Supply drum nipple
1179	Flue Door Handle		2" x 6" (Water only)
2867	Front Top Connecting Strap	2325	C.I. Locknut 2"
3307	Front Bottom Connecting Strap	60293	Hy-Temp hydronic gasket 2"
2877*	Flue Door Hinge, R. and L.H.	60859	6" Dip tube
2878*	Flue Door Boiler Hinge, R. and L.H.		(1 w/ 15 through 23 sect.)
2879*	Flue Door Hinge Arm, R. and L.H.		(2 w/ 24 and 25 sect.)
2880*	Flue Door Hinge Support, R. and L.H.	STANDARD WATER TRIM	
2881*	Flue Door Hinge Eccentric, R. and L.H.	71683	Locknut 1"
74067	Upper Outside Flue Door Lining, R.H.	60291	Hy-Temp hydronic gasket 1"
74068	Upper Inside Flue Door Lining, R.H.	60296	Gasket washer 1"
74069	Lower Flue Door Lining, R.H.	71089	Hydronic seal cross
74070	Upper Outside Flue Door Lining, L.H.	50757	M/M #63 LWCO
74071	Upper Inside Flue Door Lining, L.H.	50767	M/M #150 LWCO (HT boiler)
74072	Lower Flue Door Lining, L.H.	62012	1" Ball valve
3207	Front Section, R.H.	STANDARD STEAM TRIM	
3208	Fron Section, L.H.	61866	Gauge glass set
3304*	Flue Door, L.H.	71633	Locknut 1"
3305*	Flue Door, R.H.	60271	Steam gauge
3307	Lower Front Strap	60291	Hy-Temp Hydronic gasket 1"
*Shipped assembled on front sections.		60296	Gasket washer 1"
INTERMEDIATE		50759	M/M #157RLS Water column & LWCO
3655	Forward Intermediate Section	71089	Hydronic seal cross 1" x 1" x 1"
3656	Rear Intermediate Section	50754	M/M #51-2 Feeder LWCO (opt.)
		62012	1" Ball valve
ACCESSORIES			

Lining for flue doors • Rope wicking • Insulating cement • Furnace cement • Adhesive cement (Tite-Seal)

NOTES

For pipe and fittings, see illustrations of water trim, Fig. No. 30, and steam trim, Fig. Nos. 31 and 32.

Domestic Hot Water

If manifolds and domestic hot water heaters are to be installed, read separate instructions before erecting boiler.

Extract from A.S.M.E. Boiler Construction Code

"When feed or make-up water is introduced from a pressure line, it shall be connected to the piping system and not directly to the boiler."

The draw-off cock should be connected to the opposite side of the boiler from the feed water connection to assist in removing sediment from the boiler.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

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650A/6500A BOILER INSTALLATION INSTRUCTIONS

GENERAL INFORMATION

The 650A/6500A series boiler is of the Mills design and can be either a steam or water boiler. Each section is constructed and hydrostatically tested for a maximum of 40 PSI water or 15 PSI steam in accordance with A.S.M.E. Boiler and Pressure Vessel Code, Section IV.

This manual has been written to assist you in the assembly of the boiler. Please take the time to read this manual through at least once prior to assembly. This will save you a lot of time later.

CONFORMANCE TO CODES & REGULATIONS

All completed boilers shall satisfactorily pass the hydrostatic tests as prescribed by A.S.M.E., Code Section IV.

1. Steam Boilers – The assembled boiler shall be subjected to a hydrostatic test of not less than 45 PSIG.
2. Water Boilers – The assembled boiler shall be subjected to a hydrostatic test pressure not less than $1\frac{1}{2}$ times the maximum allowable working pressure.
3. The required test shall not exceed the test pressure by more than 10 PSI.

IMPORTANT

The installation and operation of this boiler must meet all local, state and federal codes and requirements.

The boiler should be installed on a level concrete floor or pad of sufficient height to support the weight of the boiler and accessory support.

IMPORTANT

If the boiler is to be installed on a combustible floor, local, state, federal and insurance authorities must be consulted for requirements.

Locate boiler close to the chimney to minimize breeching length but allow adequate clearance for piping, service and maintenance. A clearance of 36" on each side of the boiler is recommended.

NOTE: If tankless coil heaters or manifolds are to be used on boilers, sufficient clearance must be provided for coil replacement.

CHIMNEY AND BREECHING

The breeching connection between the boiler and chimney should be as straight and short as possible. It should be pitched slightly upwards ($\frac{1}{4}$ " per foot) towards chimney and the same diameter as the boiler outlet.

If extreme length, excessive number of turns or a reduction in diameter is necessary, consult your Smith representative for recommendations.

COMBUSTION AND VENTILATION AIR.

IMPORTANT

For good combustion and dependable operation, there must be a sufficient supply of fresh air to the boiler room.

Air supply for the boiler room must include both combustion air and ventilation air. Permanent air openings shall have a minimum free area of 10 square inches per gallon of oil burned **plus** the required area for ventilation air.

The National Fuel Gas Code, A.N.S.I. Z223.1, or local codes must be adhered to for proper combustion and ventilation air requirements for gas burning. Requirements differ for various types of installations.

Forced air supplied to the boiler room must have the approval of local authorities and should provide a minimum of 30 CFM/GAL of oil and 0.25 CFM/MBH of gas burned.

IMPORTANT

The installation of the boiler, burner, fuel storage tank, controls, wiring, chimney connection, provision for combustion and ventilation air supply and other associated equipment must conform to the requirements of local authorities having jurisdiction or, in the absence of such requirements, with the "Standards for Oil Burning Equipment," NFPA No. 31 and/or latest edition of National Fuel Gas Code A.N.S.I. Z223.1.

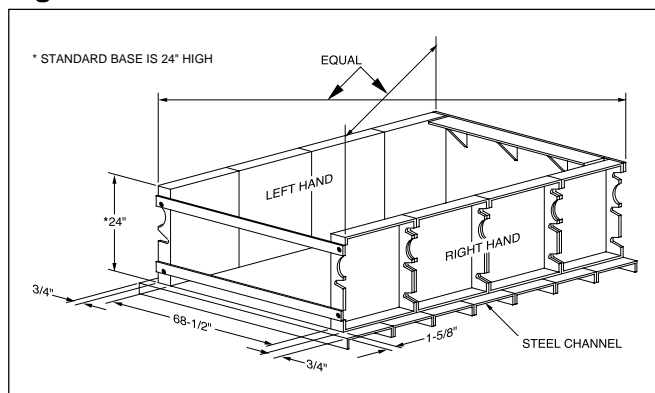
If manifolds and domestic hot water heaters are to be installed, read separate instructions before erecting boiler.

FOUNDATION ASSEMBLY

Note: Some installers prefer to suspend the supply drum prior to assembling the foundation. We recommend you read both Foundation Assembly and Supply Drum Assembly first and decide which will be easier for you installation.

Prepare a smooth, level floor area or setting to receive the boiler foundation. Allow sufficient time for cement in floor or setting to cure before commencing to erect the boiler.

Fig. No. 1



650A/6500A BOILER INSTALLATION INSTRUCTIONS

IMPORTANT

A 6" concrete pad is required for 18-25 sections with I.C. D145 and D175 burners. Concrete pad should extend at least 6" all around channel.

A. Steel Base

- Place steel channels in position on a suitable level floor as shown in Fig. No. 1. See Table 1.
- If necessary, shim the complete steel base to make it level.

Table 1 - Steel Channel Base Schedule

No. of Sections	No. of Channels	No. of Sections	No. of Channels
15	8	21	11
16	9	22	12
17	9	23	12
18	10	24	13
19	10	25	13
20	11		

B. Foundation

1. Bolt the foundation sidewall sections (2851 and 2852) together in the correct combination of 18" and 24" lengths required for the boiler, see Table 2. Use a $\frac{7}{16}$ " x 2" bolt with two washers and a nut at each bolt slot in the sidewall sections. Use shims between the sidewall sections where necessary to insure a straight assembled wall. Be sure that the "top" marking is up and the flat side is on the inside of the foundation.

2. Bolt the foundation back end (69169) and the erecting bars to the sidewalls using a $\frac{7}{16}$ " x $1\frac{3}{4}$ " bolt, two washers and a nut at each bolt hole. Check to be sure that the sidewalls are parallel and at right angles to the back and erecting bars by adjusting to make the diagonal measurements of the foundation exactly equal using a rigid stick or board as a gauge. See Fig. No. 1.

3. Position the assembled foundation in its proper relation to the supply header suspended overhead. Check to be sure it is level.

SUPPLY DRUM ASSEMBLY

IMPORTANT

All threads must be cleaned and nipple compound applied to each nipple prior to assembly. **Tapered threads only.** Do not use nipple compound on running threads.

Note: If the supply and return drums and the boiler sections have been stored on the job so as to have been subjected to weather exposure, care should be exercised to remove any dirt, mud, sand, or other foreign materials from the interior of the castings and to thoroughly clean the threads of all tappings.

A. Water Drums

1. The 2" x 6" top drum nipples (71051) are shipped with exclusive Hy-Temp hydronic gasket (60293) and washer (60298) assembled at the factory. Tapered threads are protected by a plastic cap, which must be removed before installing nipples.

2. Clean the threads of each tapping and install the nipples in the drum so that the ends of the nipples measure 4" out from the boss on the drum. Use wood gauge for measuring. See Fig. No. 2.

B. Steam Drums

1. The 2" x $4\frac{1}{2}$ " top drum nipples (70803) are shipped with exclusive Hy-Temp hydronic gasket (60293). Tapered threads are protected by a plastic cap which must be removed before installing nipples.

2. Clean the threads of each nipple tapping and install nipples in the drums so that the distance from the boss on the drum to the end of the nipple is 3". Use wood gauge (furnished) for measuring. See Fig. No. 2.

3. When supply drum and nipples are prepared, place the drum in position and support it at its proper height with a chain hoist from a pipe frame, the building construction, or by other suitable means.

Fig. No. 2

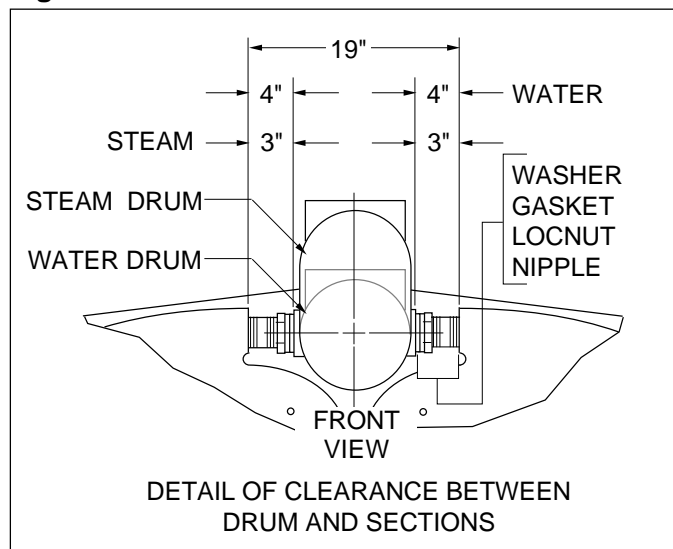


Table 2

Cat. No.	Description	Number of Sections										
		15	16	17	18	19	20	21	22	23	24	25
2851	18" Sidewall, 3 Sec.	2	-	6	4	2	-	6	4	2	-	6
2852	24" Sidewall, 4 Sec.	6	8	4	6	8	10	6	8	10	12	8

650A/6500A BOILER INSTALLATION INSTRUCTIONS

FRONT AND BACK SECTION ASSEMBLY

The assembly of front and back sections can be performed in reverse order if desired.

IMPORTANT

Use pipe joint compound on tapered threads. Do not use compound on running threads.
Do not tighten locknuts until all nipples have been engaged in sections.

A. Front Section

1. Clean the threads on drum tapings on both halves of the front section. Then, one at a time, place each half section in place at front of boiler foundation and make each supply drum nipple into the section using the wood spacing gauge to maintain the exact distance from the boss on the drum to the face of the section when section is plumb and the supply drum is level. The spacing dimension is 4" for the water drum.

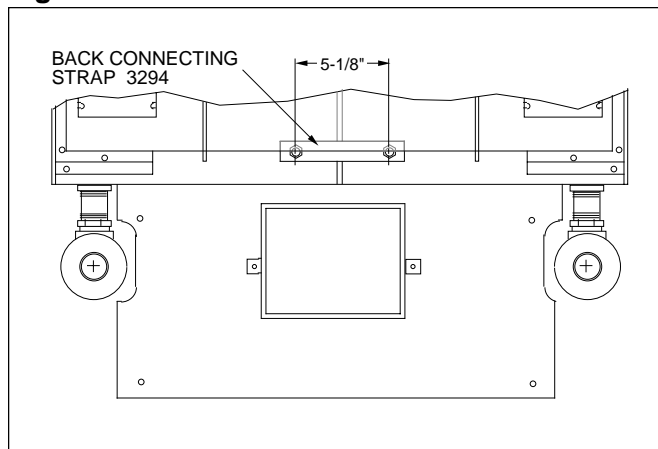
2. Install upper strap (2867) and lower strap (3307). Use $\frac{7}{16}$ " and 2½" steel studs, washers and hex nuts.

3. When the position and arrangement of the front sections and the foundation have been checked and proved, brace the sections in place in a substantial manner. See Fig. No. 6.

B. Back Section

1. Clean the threads of the tapings on both halves of the back section. Then place the foundation and screw the supply drum nipples tightly into sections using pipe joint compound on the thread and employing the wood spacing gauge to maintain the exact distance from the boss on the drum to the face of the section at the paring line when the section is plumb and the supply drum is level. The spacing dimension is 3" for the steam drum. Check to see that sections are centered on the foundation. Install one back connecting strap in lower position as shown in Fig. No. 3.

Fig. No. 3



2. When the front and rear sections are connected to the supply drum and are securely braced into place as shown in Fig. No. 6, check to see that the sections are plumb and centered on the foundation with the center line of the front section three inches from the front of the foundation sidewall. Make the necessary adjustments before proceeding.

3. Place return drums in position on right or left hand side of boiler. Make nipples tight into sections using pipe joint on threads. Maintain the 5½" spacing from the boss on the drum to the face of the section. Check to be sure front and rear sections remain plumb and centered on the foundation.

4. When the front and rear sections are connected into both supply and return drums, remove the temporary backing.

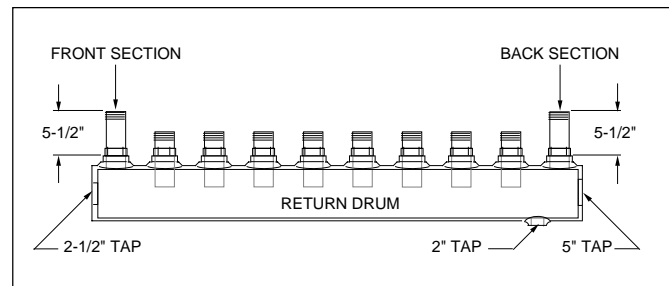
RETURN DRUMS

1. The 2" x 7" bottom drum nipples (71092) are also shipped with the Hy-Temp hydronic gasket (60293) and washer (3033) assembled at the factory. Tapered threads are protected by plastic caps, which must be removed before installing nipples.

2. Clean the threads of each nipple tapping and install nipples in the drums so that the distance from the boss on the drum to the end of the nipple is 5½" for the front and rear sections. Other nipples should be screwed into the drums as far as possible. See Fig. No. 4.

3. Return drums may be used on either the right or left hand side of the boiler. A 2" tapping in the bottom of the drum is provided for the drain valve. The drum must be installed with the 2½" tapping at the front of the boiler. See Fig. No. 4.

Fig. No. 4



Note: Although you may remove the chain hoists supporting the supply drum at this time, we recommend you wait until a couple of intermediate sections are in place before removing the drum support.

Recheck alignment for square level assembly.

IMPORTANT

If, for any reason, the boiler is not centered on the foundation or the drums are not level, something is wrong. Do not continue assembly until alignment is correct.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

DRAFT SAMPLE TUBE

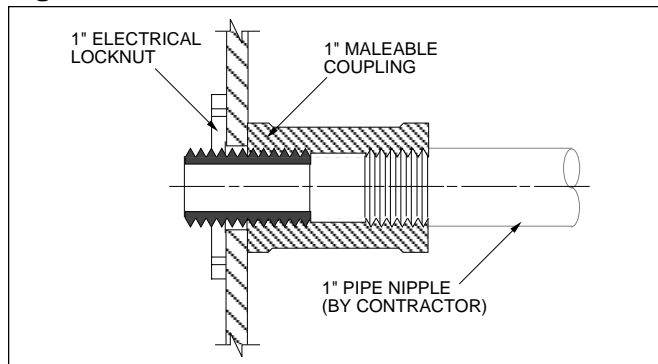
The draft sample tube must be installed in the back section prior to installing the rear intermediate sections.

A knock-out is provided in the webbing of the back section so that the draft sample tube (73002) may be installed in either the right or left hand back section, depending upon control panel location.

Punch out the knock-out with a ball peen hammer and install sample tube as illustrated in **Fig. No. 5**.

Note: The draft sample tube is pre-assembled by Smith in the left hand or right hand back section when specified.

Fig. No. 5



INSULATING CEMENT

1. Insulating cement is to be used to fill the pockets of sections and spaces between adjacent sections and between sections and the foundation. See Fig. No. 7 for location of spaces to be filled.

2. Follow the manufacturer's instructions for the preparation and use of the insulating cement.

INTERMEDIATE SECTION ASSEMBLY

1. Two types of intermediate sections are furnished. Refer to Table 3 for the proper order and location for each type of casting.

2. Fill the pockets, the spaces between the sections, and between sections and foundation with insulating cement. See Fig. No. 7.

3. Take a rear intermediate section (3656), clean the threads of the tappings, and fill the pockets with insulating cement. Place a quantity of insulating cement on the top of the foundation sidewall adjacent to the rear section sufficient to fill the space under the section. Maintain the exact distance from the boss on the drum to the face of the section at the parting line using the wood spacing gauge furnished.

4. Apply pipe joint compound to the tapered threads of return nipple, then engage nipple in section and make up two or three turns to hold section in position.

5. Install and connect the opposite hand rear intermediate section in the same manner taking care to fill the pockets and seal the spaces with insulating cement.

6. As each full section is erected, it is recommended that the joints between sections under the supply drum be sealed while accessible from the inside under the drum. The access to this area is somewhat restricted when all sections are in place.

7. The space between sections should be sealed using the rope wicking furnished with the boiler. Lay the rope over the joint and then pack gently into the space between the beads of the sections taking care not to force the rope past the beads. Apply insulating cement over the rope so as to fill the space up to finish flush with the outside line of the sections. See Fig. No. 7.

8. As the sections are erected, the longitudinal joint directly under the top header should be sealed by placing the narrow millboard strips over the joint, then covered with a layer of insulating cement extending the full width of the millboard and joining with the insulating cement between sections. See Fig. No. 8.

9. Continue to install the remainder of the intermediate sections in the same manner already described except for the last three full forward intermediate sections. These sections must be placed in position with the beads properly spaced before the nipples are engaged into the sections.

Table 3

Casting No.	Description	Number of Sections											
		15	16	17	18	19	20	21	22	23	24	25	
3207 R.H. 3208 L.H.	Front Section	1	1	1	1	1	1	1	1	1	1	1	
3655	Forward Intermediate Section	6	7	7	8	8	9	9	10	10	11	11	
3656	Rear Intermediate Section	7	7	8	8	9	9	10	10	11	11	12	
3533	Back Section	1	1	1	1	1	1	1	1	1	1	1	

Note: Where one section is indicated in the table, two half sections are required since this is a split section boiler. If no distinction is made between right hand and left hand in the column listing "Casting No.", the sections are suitable for either right or left hand.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 6

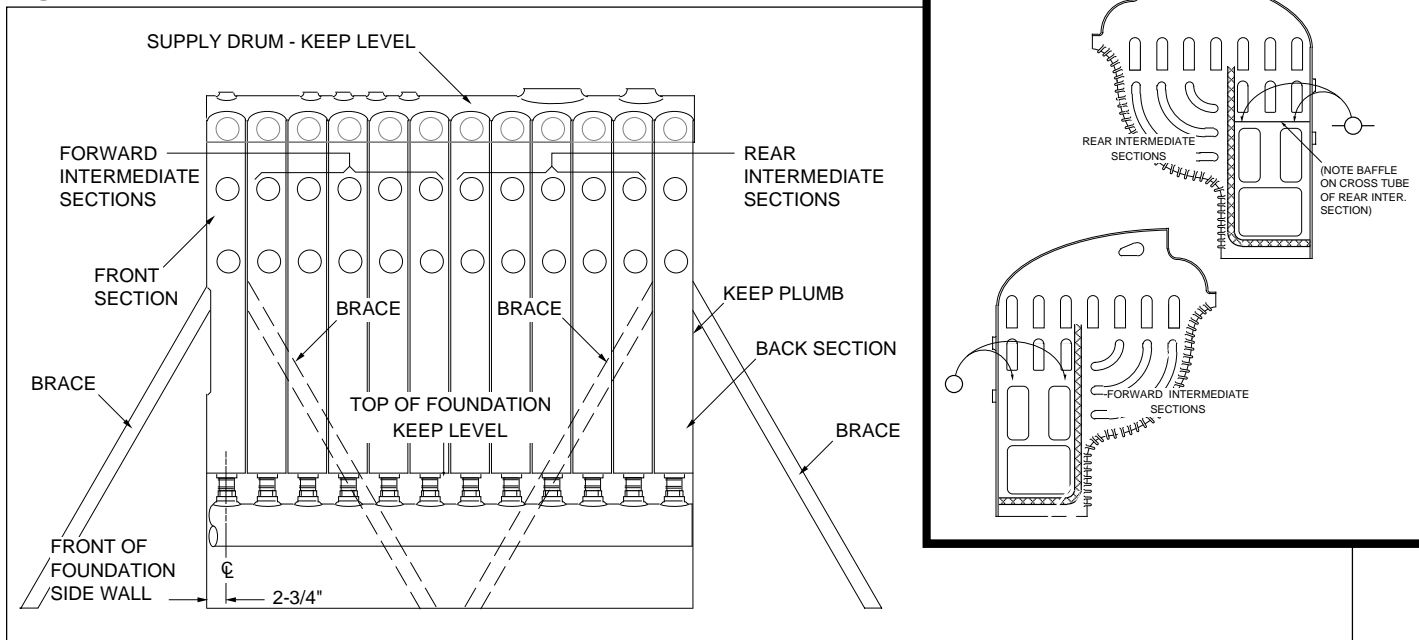
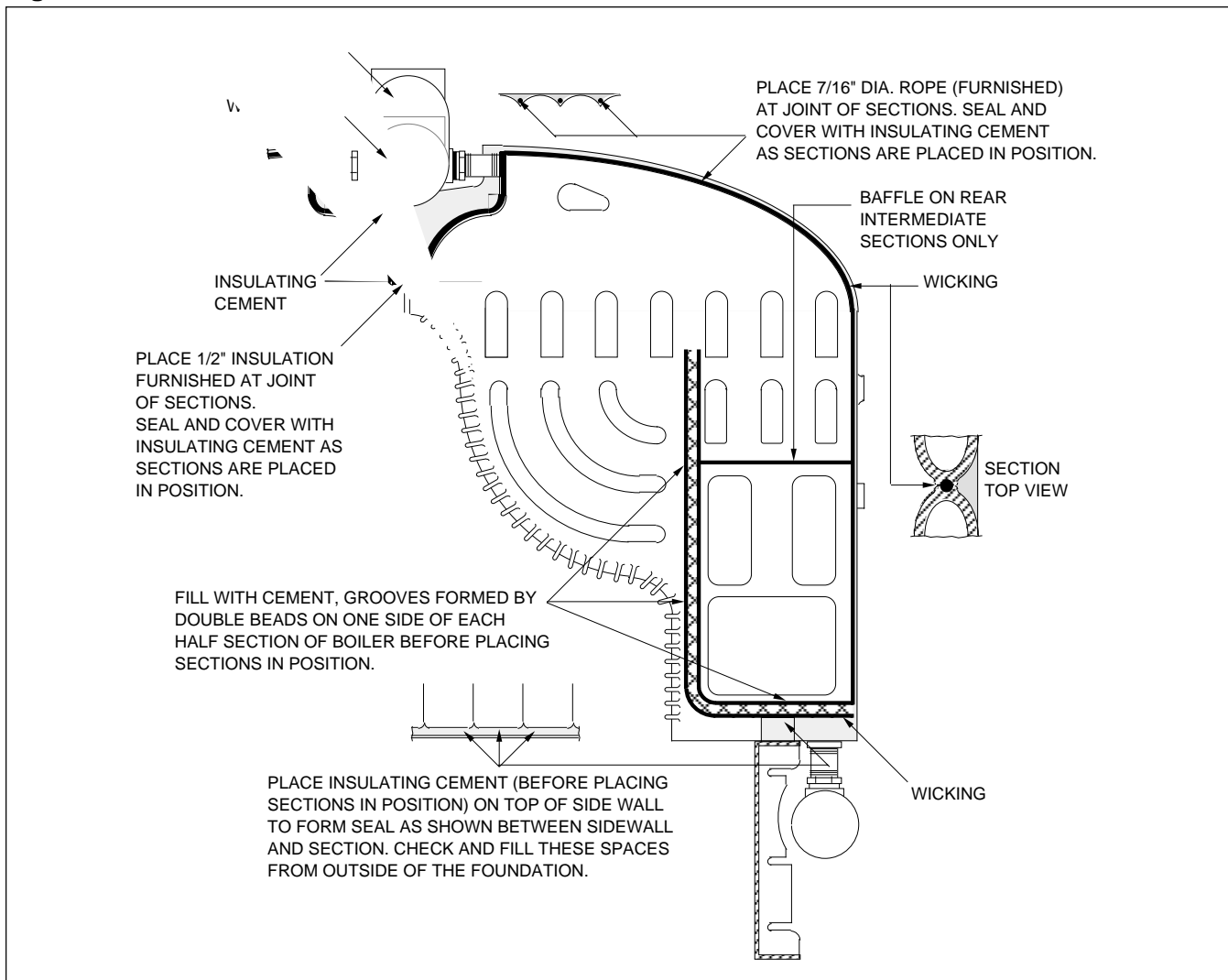


Fig. No. 7



650A/6500A BOILER INSTALLATION INSTRUCTIONS

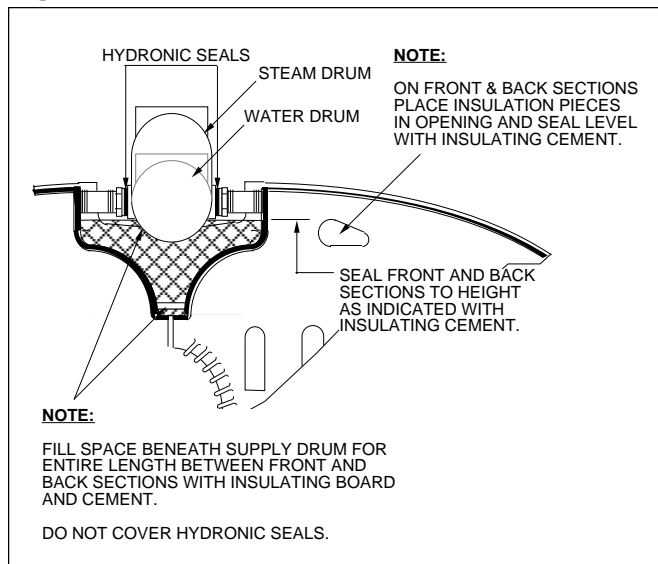
SEALING JOINTS BETWEEN SECTION

IMPORTANT

Do not cover locknuts and gaskets. It is important that you leave all locknuts and gaskets exposed for visual inspection.

1. After all sections are in place and connected to the supply and return drums, go over the entire boiler and complete the sealing of joints using rope wicking and insulating cement, as shown in Fig. No. 7.
2. Take particular care to seal the joints between the bottom of the sections and the top of the foundation at the back and on the sides.
3. The vertical joint between the two halves of the rear section and the vertical joint between the two halves of the front section should be carefully sealed with rope wicking laid in the opening and covered with insulating cement.

Fig. No. 8



4. On the outside of the back section, fill the spaces from webs to match outside of the water tubes with left over insulating cement.
5. From outside of boiler, work two lengths of rope into space between rear sections and top of back plate. Cover with insulating cement. From inside of base, work a single thickness of rope into space between rear section and top of back plate and fill flush with insulating cement.
6. Seal all joints in boiler foundation and between foundation and floor setting with black furnace cement so as to prevent air leakage.

Note: Flue doors are shipped mounted on front sections.

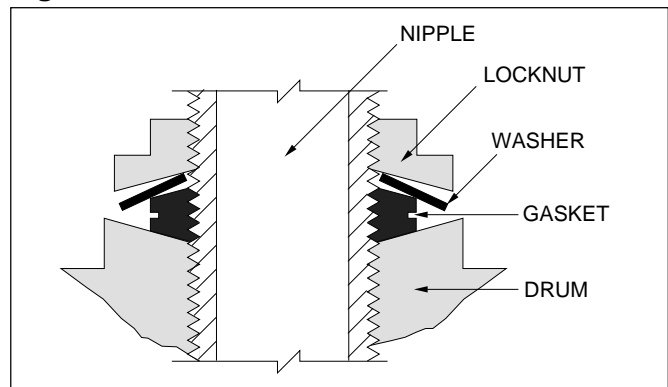
13. LOCKNUT NIPPLES

IMPORTANT

Before commencing to seal hydronic gaskets and tightening locknuts, read this entire section on locknut nipples. Follow the instructions given.

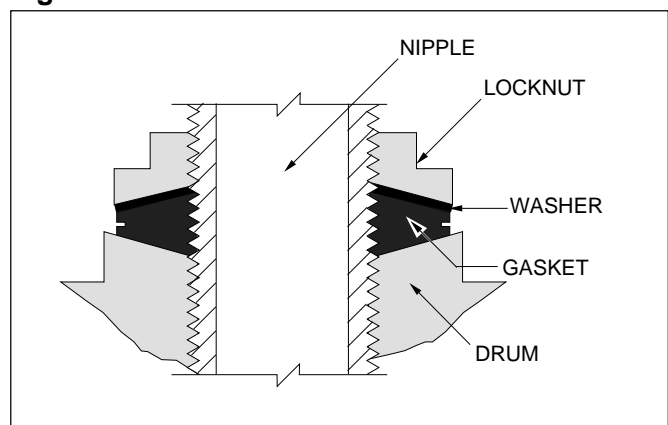
1. With all sections in place, go over the entire boiler retightening all nipples into the sections.
2. Hand tighten all locknuts just enough to cause the hydronic gasket to become tight to the drum boss. See Fig. No. 9.

Fig. No. 9



3. Once locknut is hand tight, use a locknut wrench to tighten each locknut approximately $1\frac{3}{4}$ turns or until the distance from the boss to the washer is approximately $\frac{3}{32}$ ". The outside diameter of the hydronic gasket should be roughly even with the outside diameter of the washer which indicates a proper seal has been made. See Fig. No. 10.

Fig. No. 10



4. Plug all open tappings and hydrostatically test for leaks by applying water pressure of no more than $1\frac{1}{2}$ times the specified maximum working pressure.
5. Leaks around hydronic gasket can be stopped by tightening the locknut approximately $\frac{1}{8}$ of a turn at a time until the leak stops.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

COMBUSTION CHAMBER AND FRONT PLATE

If the optional combustion chamber is being used, see separate catalog and install at this time. Place the front plate in position over the brass studs and assemble plate to sidewalls using the bolts and nuts from the erecting bars. Assemble washers and nuts to brass studs and drape one length of $\frac{3}{8}$ " insulating rope over studs. Tighten all hardware.

FLUE DOOR ADJUSTMENT

IMPORTANT

The flue door and hinge assemblies are factory mounted and adjusted. If field adjustment is necessary, follow these instructions.

1. The boiler hinges should be plumb with the outside edges approximately parallel to the outside edges of the sections. To adjust, loosen cap screws (61689) and rotate the hinge eccentric (2881) to change the angle of hinge. Vertical adjustment is accomplished by the jacking screw in the hinge support (2880). See Fig. No. 11 for parts breakdown.

2. With the flue doors closed, the gaskets on the doors should seat squarely on the compression beads on the front section.

3. When the adjustment of the flue doors is satisfactory, tighten all nuts, bolts and screws. Then fasten flue doors in position.

Fig. No. 11

Flue Door Hinge Parts (right hand shown)

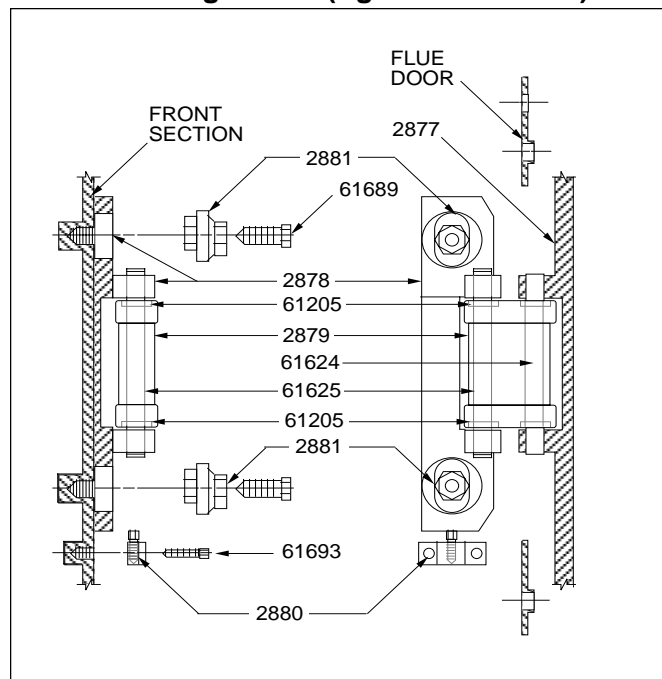
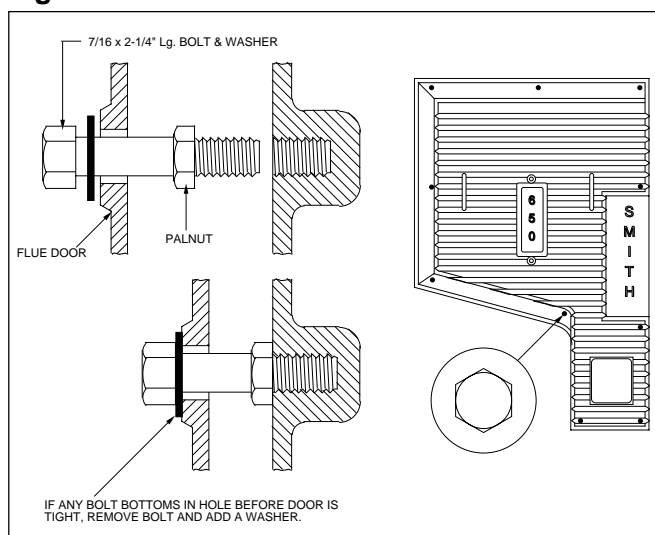


Fig. No. 12



Note: The cover should pivot on the $\frac{7}{16}$ " O.D. brass bushing and the $\frac{5}{16}$ " x $\frac{3}{4}$ " hex head bolt. Repeat the same procedure for the right hand observation cover, but with the latch on the opposite side.

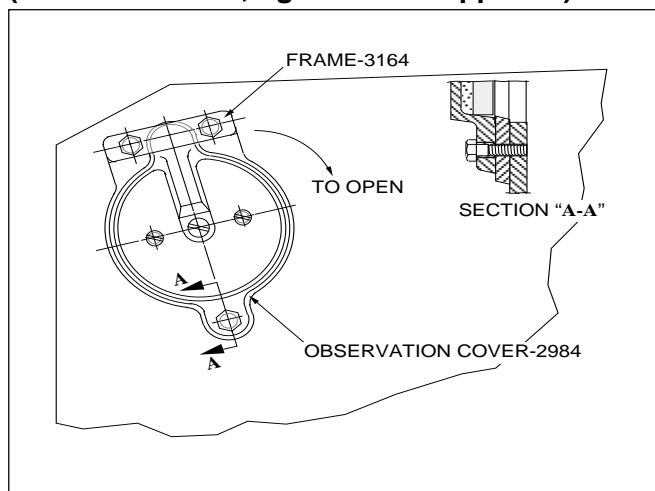
OBSERVATION DOOR AND FRAMES

After the front plate is in position, take one observation cover frame and install it over the left hand opening as shown in Fig. No. 13.

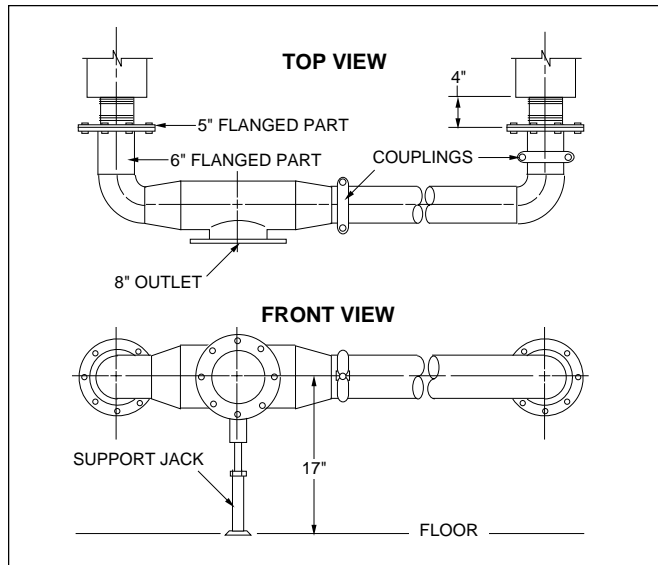
Assemble the cover and catch to the plate in such a manner as to insure the cover swings open toward the center of the boiler.

Fig. No. 13

Observation Cover and Frame Assembly (left hand shown, right hand is opposite)



650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 14

WATER RETURN YOKE

Standard Water Return Yoke Instructions

1. Install the flanged nipple in the return drums as shown in Fig. No. 14 and tighten. Install the flange for "victaulic" coupling on the L.H. drum.
2. Place in position the flanged outlet fitting as shown in Fig. No. 14 on the R.H. side of the boiler (viewed from front of boiler). Assemble bolts and nuts to 5" flanges loosely, then place support jack (furnished by Smith) in position under the yoke.
3. Adjust support jack pipe with running thread to position the outlet 17" from ground level to center of outlet. This dimension is for use with standard foundation.
4. Tighten 5" flange bolts and, after final height adjustment is made, tighten locknut on support jack pipe.
5. Place the pipe in position with "victaulic" joints. Line up fitting with the hardware provided.

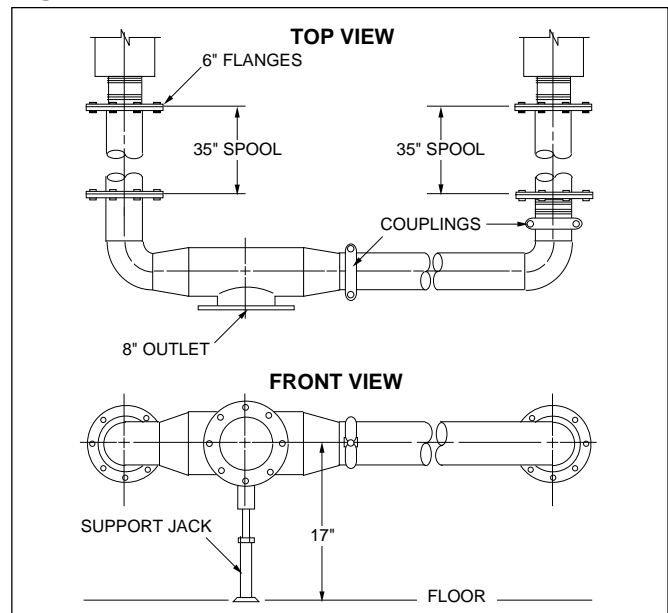
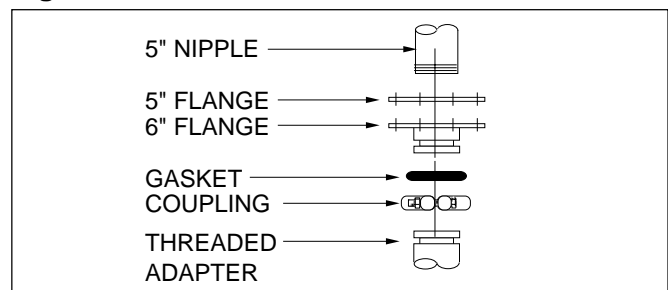
EXTENDED WATER RETURN YOKE

1. Install the flanged adapter nipples in the return drums. Make joint tight. See Fig. No. 15.
2. Place 35" length flanged spool in position on R.H. and L.H. sides with support until gasket, bolts and nuts are assembled and tightened.
3. Assemble the threaded adapter and flange using gasket, bolts and nuts to the L.H. spool flange.
4. Place the flanged outlet fitting in position as shown in Fig. No. 15 on R.H. side of boiler (viewed from front of boiler). Assemble gasket, bolts and nut loosely to flanges. Then place support jack (furnished by Smith) in position under the yoke.

5. Adjust support jack pipe with running thread to position the outlet 17" from ground level to center of outlet. Dimension is for standard foundation.

6. Tighten 5" flange bolts and, after final height adjustment is made, tighten locknut support on support jack pipe.

7. Place the pipe in position with "victaulic" joints. Line up fittings carefully and then tighten the fitting with the hardware provided. See instructions for "victaulic" couplings.

Fig. No. 15**Fig. No. 16**

WATER RETURN 'VICTAULIC' COUPLING

1. Gasket, housing clamp and bolt are now ready for assembly. Make sure grooves and sealing surfaces of the pipes are clean and burr free.
2. Smear ordinary cup grease on pipe ends and on inside of gasket. This facilitates installation.
3. Slip gasket over one pipe end. Bring pipe ends together.
4. Slide gasket into central position over pipe ends.
5. Put on self-centering housing clamps and nuts and tighten to moderate torque.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

STEAM RETURN YOKE (See Fig. No. 17)

IMPORTANT

Be sure to apply pipe dope to the tapered threads of locknut nipples only. All standard nipples require nipple compound. Follow instructions already given for the correct procedure for sealing hydronic gaskets.

1. Assemble the 5" x 4" hex bushing, the 4" x 3" pipe nipple and the 4" standard tee. Screw the second 4" x 3" pipe nipple and 4" tee with 4" close nipple and pipe cap into the branch of the first 4" tee. With all joints tight, screw entire sub-assembly (A) into 5" tapping of the right hand return drum until tight. Make sure that the branches of both tees are straight up and down, while the run of the bottom tee is parallel with the back of the boiler. The pipe cap must be on the left side of the boiler.

2. Repeat the same procedure for sub-assembly (E), into the 5" tapping of the left hand return drum, except the pipe cap must be on the right side of the boiler.

3. Makeup sub-assembly (B) using 4" locknut tee and the 4" x 27" pipe nipple. Screw this assembly into the 4" tee in the right hand return drum, and tighten. Insure that the branch of the locknut tee faces up.

4. Screw the running threads of the 4" x 4 1/2" locknut nipple (C) all the way into the tee just assembled, but not far enough to compress the gasket.

5. After assembling the 4" tee securely to the 4" x 6" pipe nipple, thread this sub-assembly (D) into the tee of the left hand return drum. Tighten while insuring the face of the 4" branch is both plumb and facing away from the boiler.

6. Back the 4" x 4 1/2" locknut nipple out of the locknut tee and into the 4" tee. Check alignment to insure assembly is parallel with back of boiler as possible.

7. Sub-assembly (F) should consist of 4" x 12" pipe nipple with a 4" 90 elbow on one end. Screw the other end into the branch of the 4" locknut tee already assembled.

8. Screw the running threads of the 4" x 55" locknut nipple (H) all the way into the bottom tapping of the supply drum, but do not compress the hydronic gasket.

9. Assemble the running threads of the 4" x 7" locknut nipple in the 4" locknut tee not yet used. Add the 4" close nipple and pipe cap to opposite side of tee. Thread this sub-assembly (G) into the 90 elbow securely.

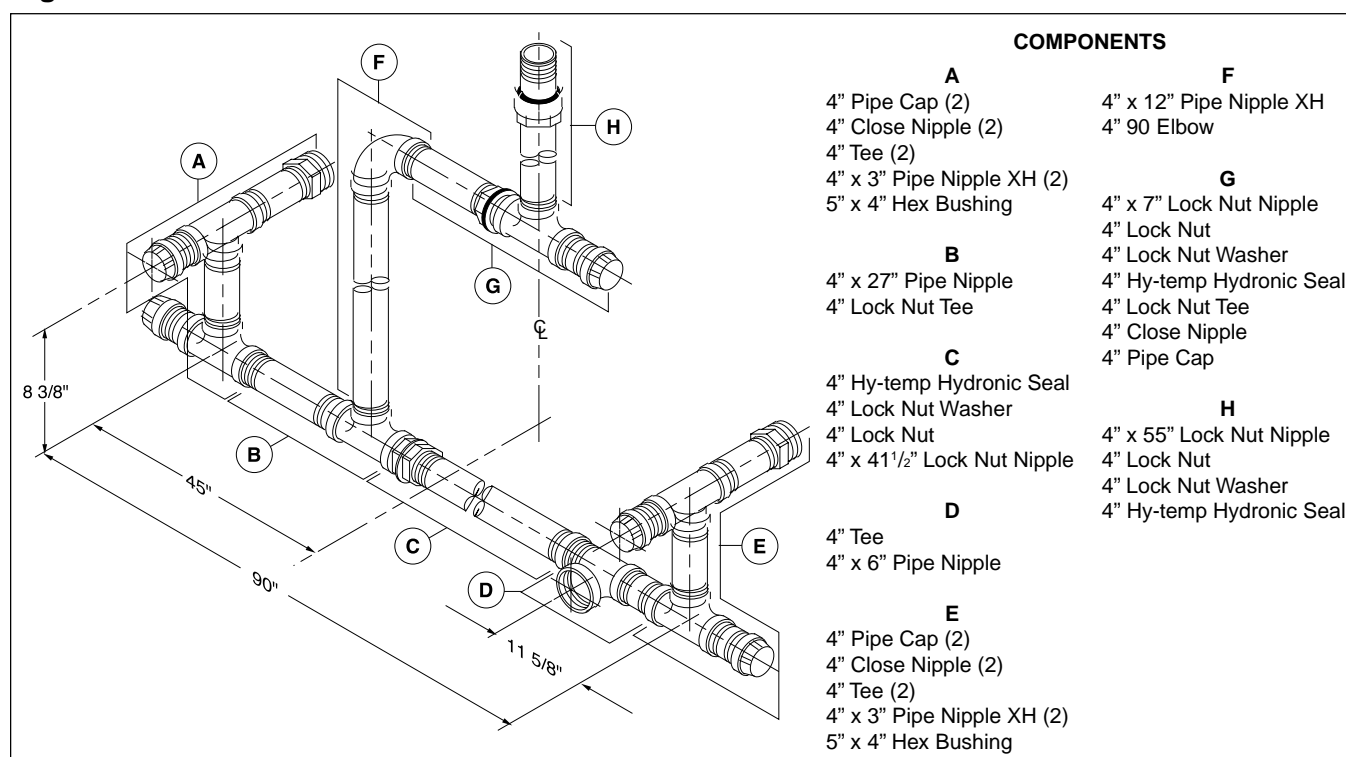
10. Back the locknut nipple out of the supply drum and into the branch of the locknut tee. (By rotating the 4" locknut tee on the running threads and slightly turning the 90 elbow, this assembly should end up completely plumb.)

IMPORTANT

With all joints tight, except gasketed joints, the vertical pipes should be plumb and horizontal pipes level. If this is not true, correct at this time.

11. Tighten all locknut joints as per instructions under "Locknut Nipples".

Fig. No. 17



650A/6500A BOILER INSTALLATION INSTRUCTIONS

BOTTOM BLOW-OFF PIPING

1. A.S.M.E. requires each boiler to have a bottom blow-off connection fitted with a valve or cock connected to the lowest space practical.
2. It must be sized according to Table 3A and the discharge pipe must be full size to point of discharge.
3. Illustrated in Fig. No. 18 is a suggested blow-off piping arrangement for this type boiler. Should you have any questions in regard to this, please consult your Smith representative.

Table 3A

Size of Bottom Blowoff Piping, Valves and Cocks

Minimum required Safety or Safety Relief Valve Capacity, lb. of steam/hr*	Blowoff Piping, Valves & Cocks Size, in. (min.)
Up to 500	$\frac{3}{4}$
501 to 1250	1
1251 to 2500	$1\frac{1}{4}$
2501 to 6000	$1\frac{1}{2}$
6001 and larger	2

* To determine the discharge capacity of safety relief valves in terms of Btu, the relieving capacity in lb. of steam/hr. is multiplied by 1000.

SMOKEHOOD FOR NATURAL DRAFT

1. One at a time, install the elbows using $\frac{7}{16}$ " x $\frac{3}{4}$ " bolts and washers, fastening elbow to back sections (4 bolts and washers per elbow). Allow elbows to be free enough for center section assembly. See Fig. No. 19.

For smokehood elbows with shutter elbows, see Fig. No. 21 and Fig. No. 22 showing right and left hand elbows with linkage on elbows. Cranks are pre-positioned, detach the spindle support only after the elbow is on boiler and re-assemble after the center section is in position.

2. Place the center section between elbows and assemble with $\frac{1}{4}$ " x $\frac{3}{4}$ " bolts, nuts and washers.

3. When elbows with shutter dampers are used, re-assemble the spindle support and assemble the main damper spindle as shown in Fig. No. 20.

4. When the smokehood assembly is drawn up, level up and tighten all bolts and nuts.

5. Seal all openings between the rear section and the flanges with black furnace cement.

Fig. No. 19
Elbows and Natural Drafthood Center Section

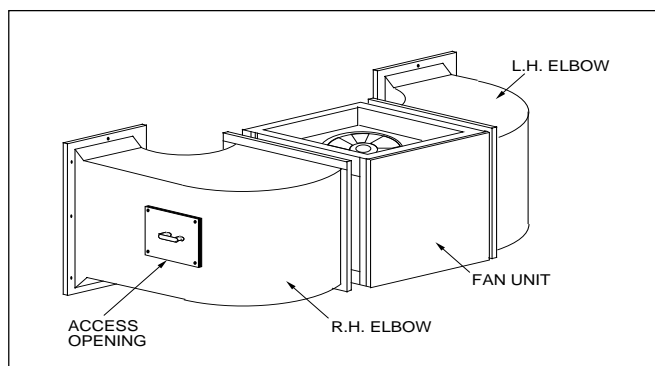
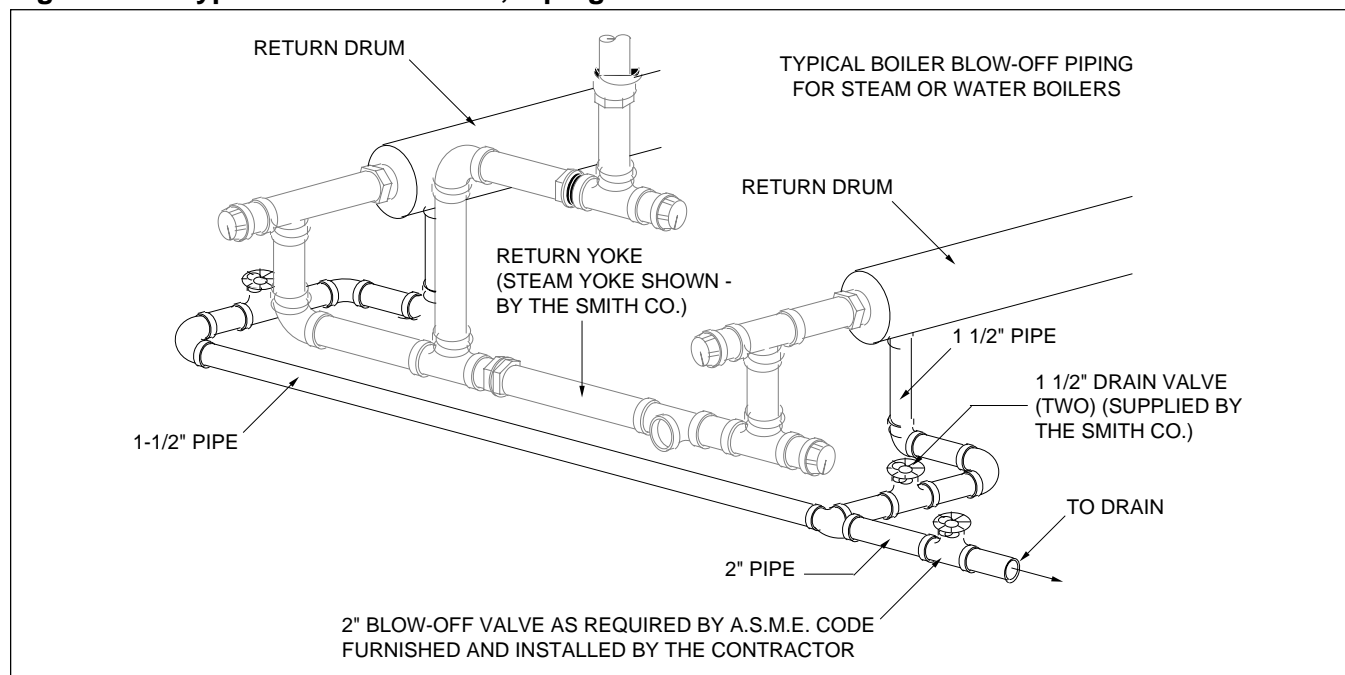


Fig. No. 18 - Typical Boiler Blow-Off, Piping for Steam or Water Boilers



650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 20 - Shutter Damper Linkage

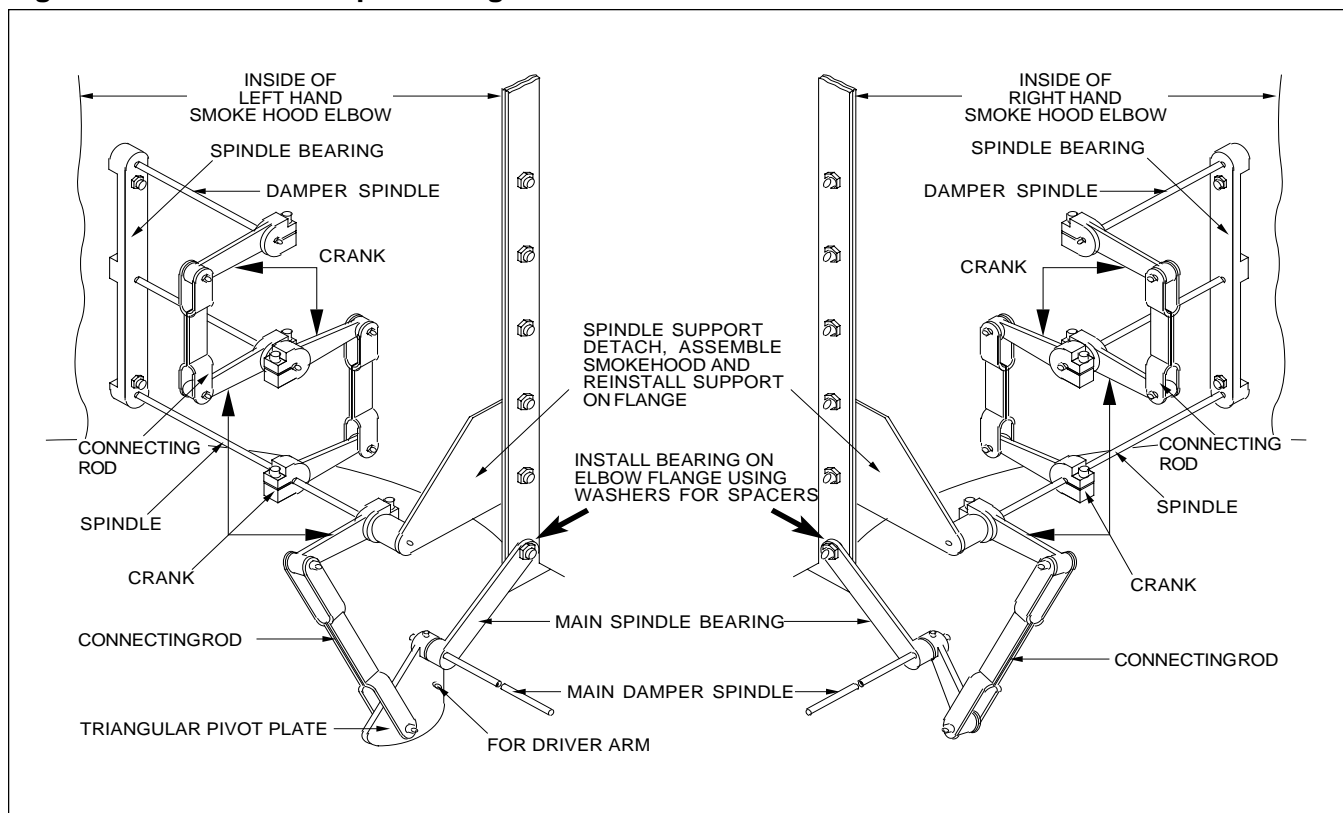
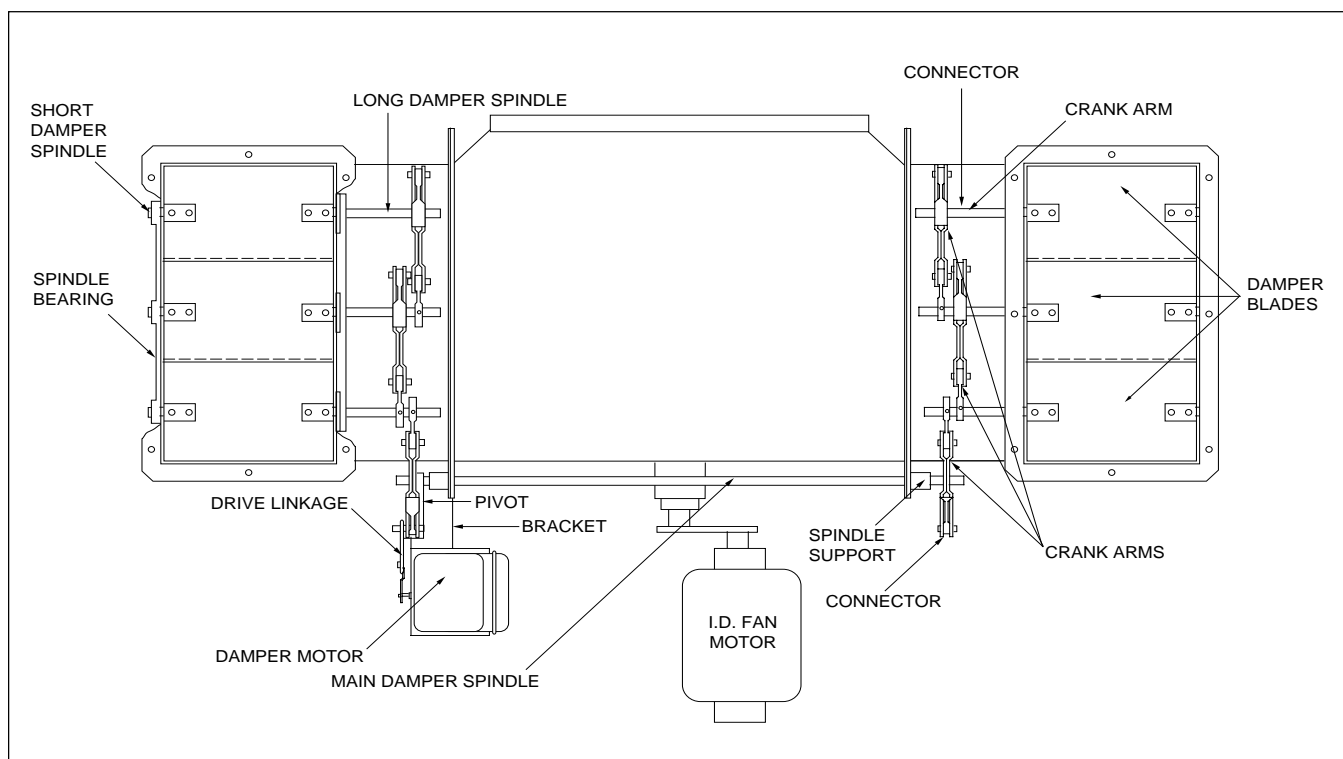


Fig. No. 21 - Motor Actuator and Shutter Dampers



650A/6500A BOILER INSTALLATION INSTRUCTIONS

Table 4 - Shutter Damper Parts List

Comp. #	Description	# Req.
-	Dampers (9½" x 15")	6
-	Shutter Damper Spacer (3 spindle)	2
2963	Spindle Support Bracket	2
2958	Triangular Pivot Plate	1
69289	Main Damper Spindle (41¾" long)	1
61448	Short Damper Spindle	6
2964	Damper Crank	11
61429	Damper Connecting Rod (9½" long)	4
61428	Damper Connecting Rod (8¾" long)	2
2965	Flat Spindle Bearing (3 Spindle)	2
2966	Beveled Spindle Bearing (3 Spindle)	2
61436	Connector Pin (⅜" x 1")	12
61450	Long Damper Spindle (16" long)	2
61449	Long Damper Spindle (8¾" long)	4
2981B	Driver Arm (8¾" long)	1
Assorted nuts, bolts, washers & fasteners		

SMOKEHOODS (INDUCED DRAFT, WING)

1. One at a time, attach the smokehood elbows loosely to the rear sections using ⅞" x ¾" hex head bolts with one washer each into the screw seats on the boiler. Detach spindle supports from flanges.

2. Place the draft inducer in position between the elbow flanges. Assemble the ¼" x ¾" square head bolts with one square head nut and washer each through holes in the flanges. Be sure to include the main damper spindle bearings with spacer washers on the outside bottom flanges of the two elbows and the damper actuator mounting bracket on the inside of the bottom flanges of L.H. elbow. Replace spindle supports.

3. When all accessories have been properly positioned, align the inside surfaces of the elbows with the fan inlet openings and tighten the nuts to draw the flanges together.

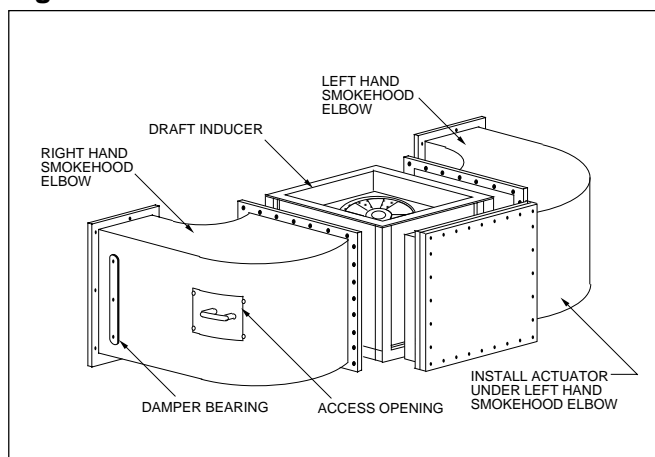
4. When the smokehood assembly is drawn up, level up and draw tightly to the back section.

5. Seal all openings between flanges and between smokehood and the boiler with black furnace cement.

6. The steel smokehood will support itself when insulated with block insulation without additional bracing, provided the weight of the breeching is not applied to the fan discharge. A flexible insulating collar or a slip type joint packed with rope wicking with positive support of the breeching from the building construction is necessary to prevent transmission of weight onto the smokehood and draft inducer.

7. The shutter dampers and complete operating linkage are installed and adjusted at the factory. Run the actuator to the fully retracted position. Install the main damper spindle through the two spindle bearings. Assemble the triangular pivot plate on the left hand end of the main damper spindle so that the set screw bears on the flat, and lock with set screws. Place the dampers in both elbows in the closed position and assemble the end crank to the right hand end of the main damper spindle. Lock tightly with clamping nut.

8. Check damper operation through the full travel for free movement. Binding, if encountered, is most likely to be caused by misalignment of the linkage or friction in the main spindle bearings. Minor adjustments will eliminate friction.

Fig. No. 22

AUBURN FAN INSTALLATION

1. See Fig. No. 27 showing parts.

2. Place the smokehood in position against back sections and assemble it using four ⅞" x ¾" bolts and washers on each back section. Tighten bolts. Seal joints between back section and smokehood using black furnace cement. Replace cleanout covers.

3. Support the fan housing and motor unit in position against the smokehood, matching the holes in the thimble with the ½" studs. Assemble the ½" hex nuts and tighten.

4. The four stand legs (not furnished) illustrated in Fig. No. 27 must be used to support the fan housing. Line up structure and be sure all hardware is drawn up tight.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 23
Auxiliary Flue Gas Vent for Gas Fired Boiler

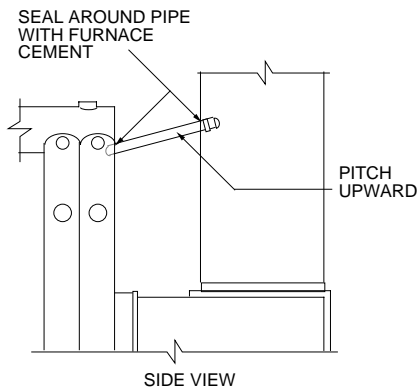
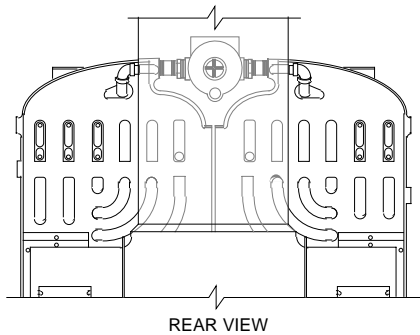
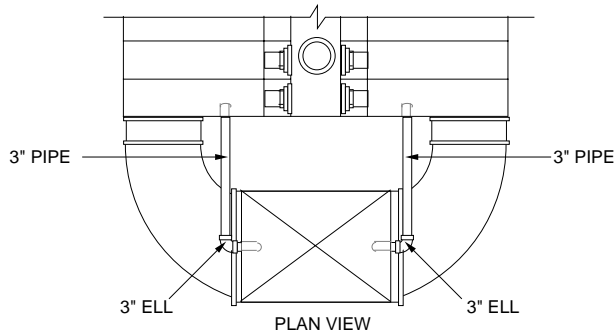
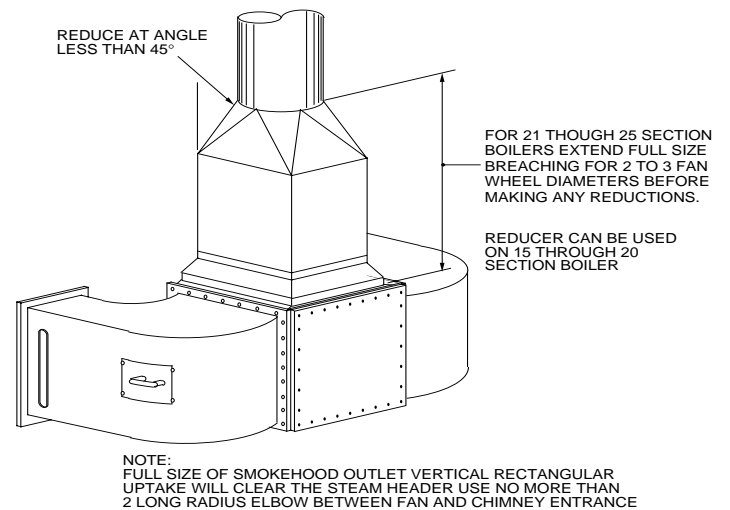
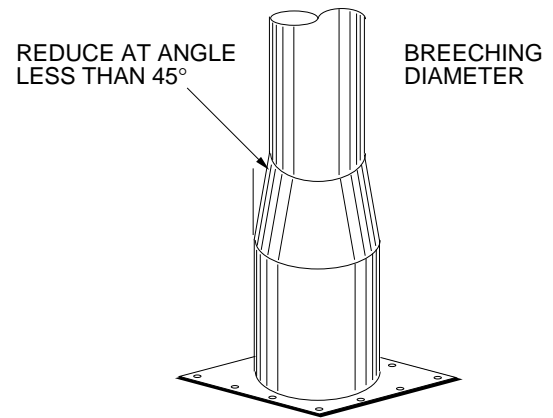


Fig. No. 24
Smokehood Discharge Arrangements



NOTE: Full size of smokehood outlet vertical rectangular uptake will clear the steam header, use no more than two long radius elbows between fan outlet and chimney entrance.

650A/6500A BOILER
INSTALLATION INSTRUCTIONS

Fig. No. 25

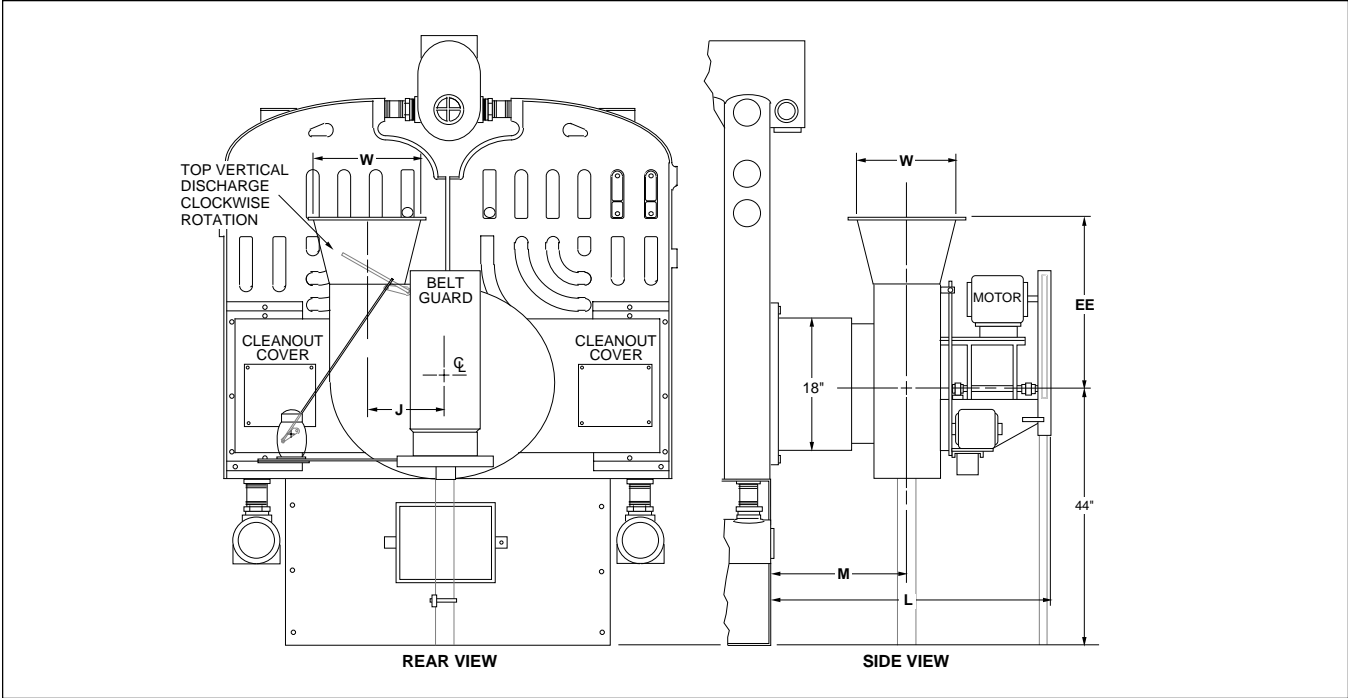


Table 5 650A/6500A
Auburn Fan Dimensions (inches)

J	L	M	S	T	W	EE
15.0	61.71	29.34	30.5	9.5	20	28.0

Fig. No. 26

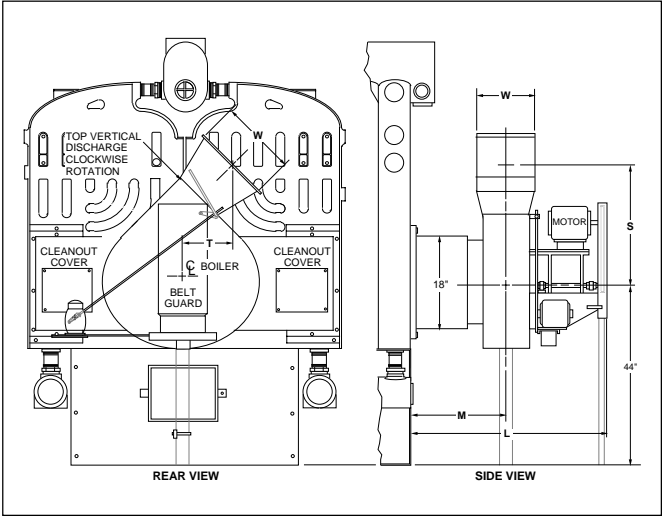
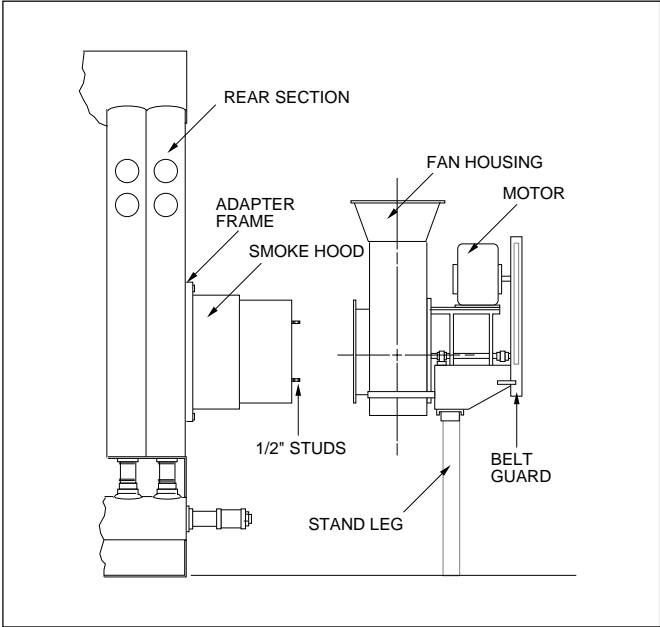


Fig. No. 27



650A/6500A BOILER INSTALLATION INSTRUCTIONS

ACTUATOR INSTALLATION

1. Place the actuator in position on the mounting angle bracket with the red position indicator away from the boiler. Use $\frac{1}{4}$ " x $\frac{5}{8}$ " square head bolts (3). See Fig. No. 28.
2. See Preferred Instruments bulletin SD1 DM-1 dated 11/65 for adjustment and maintenance of motor actuators - Page 4, "Damper Linkage" covers detail of linkage assembly.
3. See Fig. No. 29 for linkage position on different crank arm positions. Optional vertical and 45° discharge fan installations are illustrated. Note damper linkage positions.
4. Assemble D5-602 $\frac{1}{4}$ "-28 thread ball joint connector stud to the D3-600 crank arm.
5. Assemble D5-600 $\frac{1}{4}$ "-28 thread ball joint connector stud to the damper crank of the damper crank shaft. Adjust crank arm of position as necessary for fan housing position shown in Fig. No. 29.
6. Connect push rod between actuator crank arm and damper crank arm. Tighten set screws to lock push rod in position as illustrated. Check to be sure all threaded parts are drawn up tight.

Table 6 - Actuator Parts

Cat. #	Description
DM-1	P.I. Motor Actuator 24V
3276	Damper crank for Auburn fan damper assembly
D3-600	Crank arm for motor actuator Adj. radius from $1\frac{3}{16}$ " to $2\frac{7}{8}$ "
D5-600	$\frac{5}{16}$ "-24 Dia. stud-use with D3- 600 crank arm
D5-602	$\frac{1}{4}$ "-24 Dia. stud-use with D3-601 crank arm
D5-100	Push rod, 5/16" Dia. x 48" long plated steel shaft

STEAM OR WATER TRIM

The water column is furnished with a complete complement of precut pipe and fittings. The crosses are provided to permit the easy installation of piping for low water cut-off, automatic water feeder or other float actuated device. See Fig. No. 30-32.

IMPORTANT

The safety valve or relief valves should not be installed until the interior of the boiler has been cleaned and flushed out.

CLEANING BOILER WATERWAYS

A. Steam Boilers

Assembly of boiler must be complete before cleaning. The burner must be installed and made operational with operating. Limit and safety controls should be functional. Combustion should be adjusted to prevent sooting of boiler flues. Final burner adjustment should be made after cleaning. System piping should not be connected prior to cleaning and all unused boiler tapings must be plugged.

Boilout Solution should be mixed as follows:

1 lb. Caustic Soda and 1 lb. Trisodium Phosphate
per 50 gal. of water

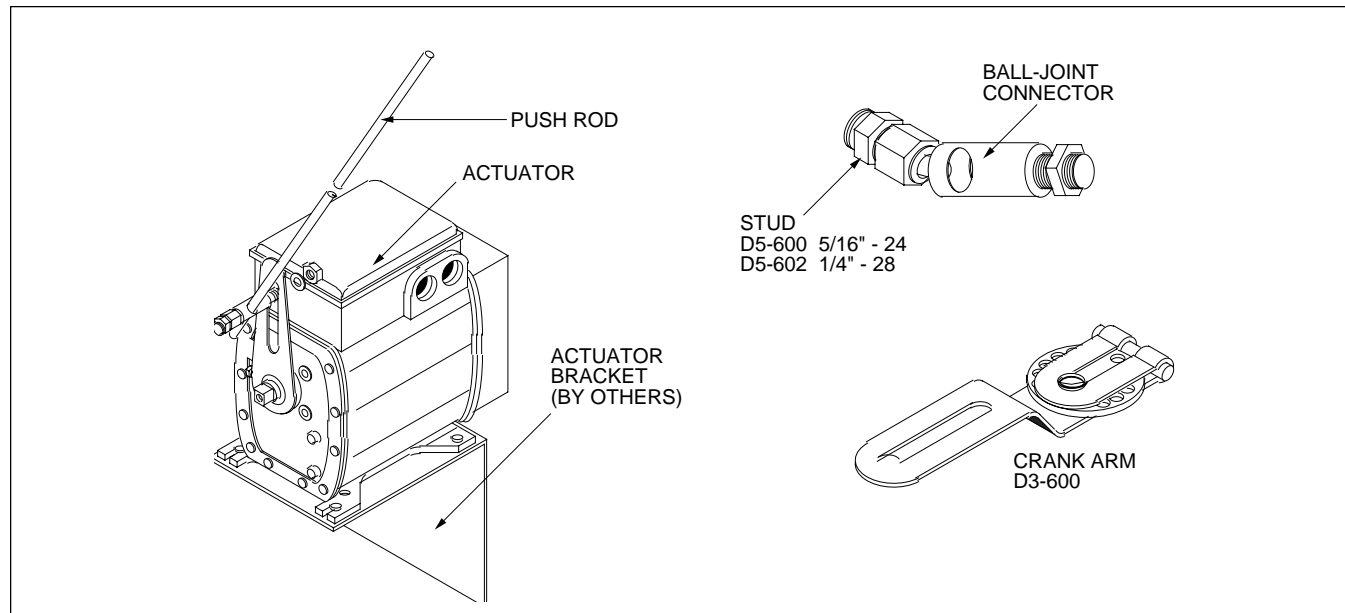
Refer to Table 7 for boiler water content.

Mix chemicals to form a concentrated solution and pour into boiler through safety valve tapping.

CAUTION

Avoid clothing, skin or eye contact with boilout chemicals. If contact occurs, flush with large quantities of water.

Fig. No. 28



650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 29

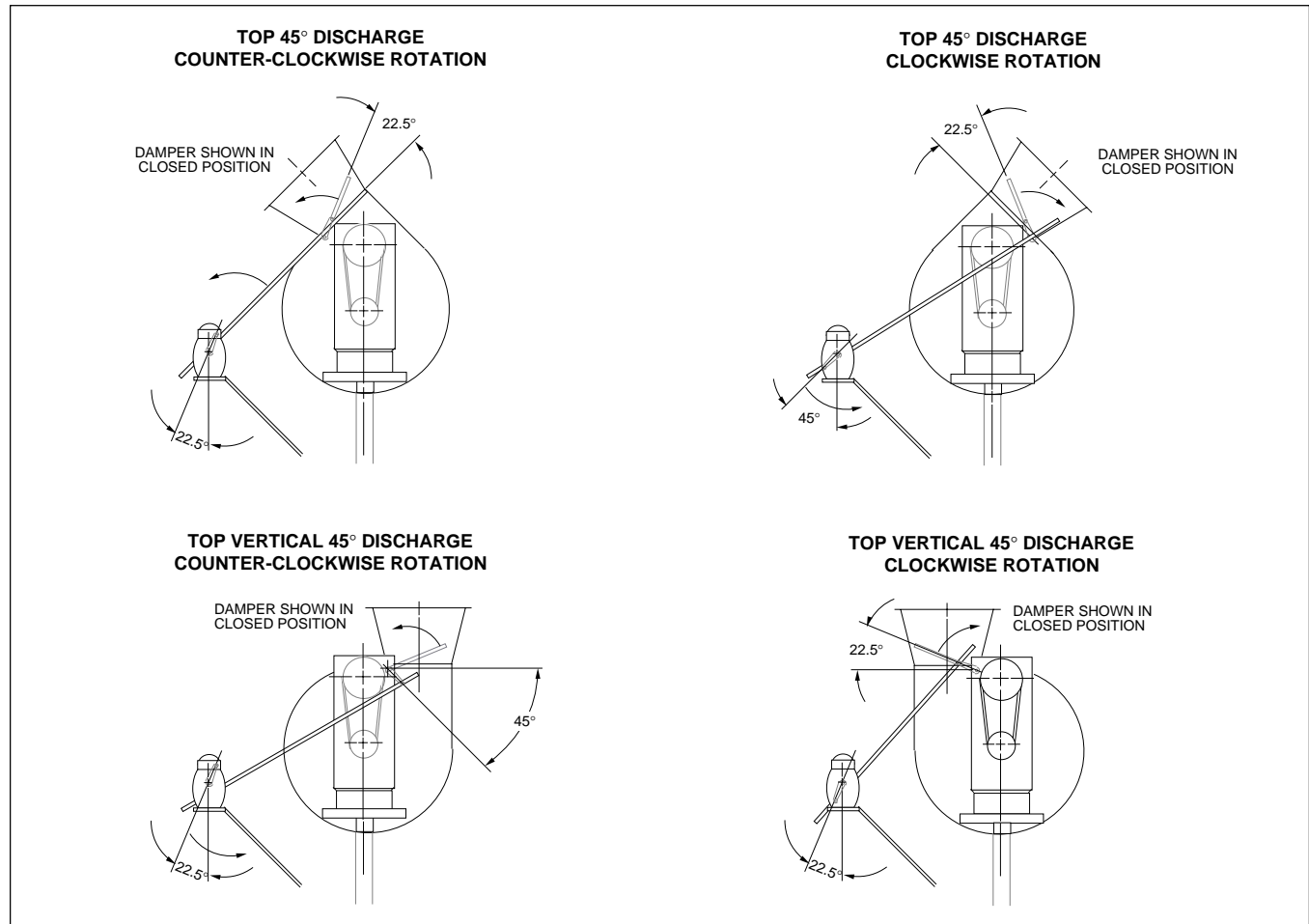
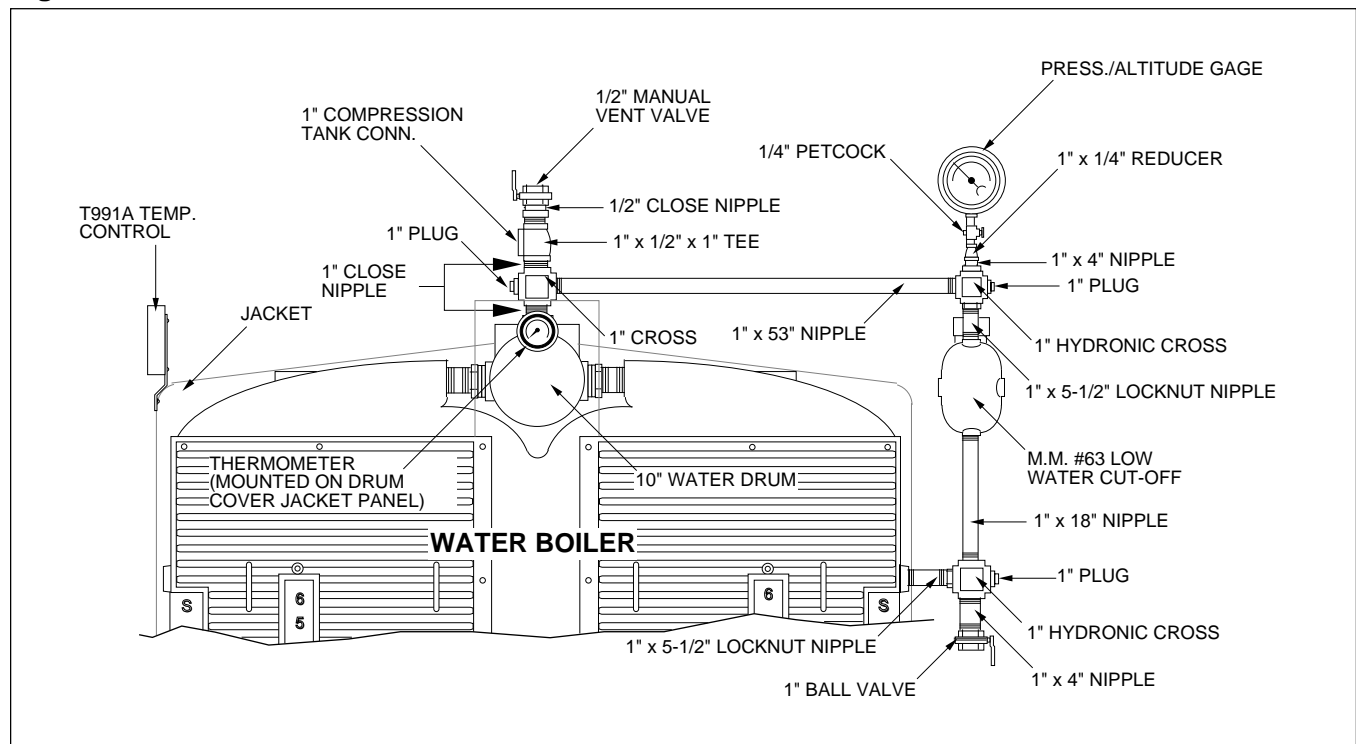


Fig. No. 30



650A/6500A BOILER INSTALLATION INSTRUCTIONS

Fig. No. 31

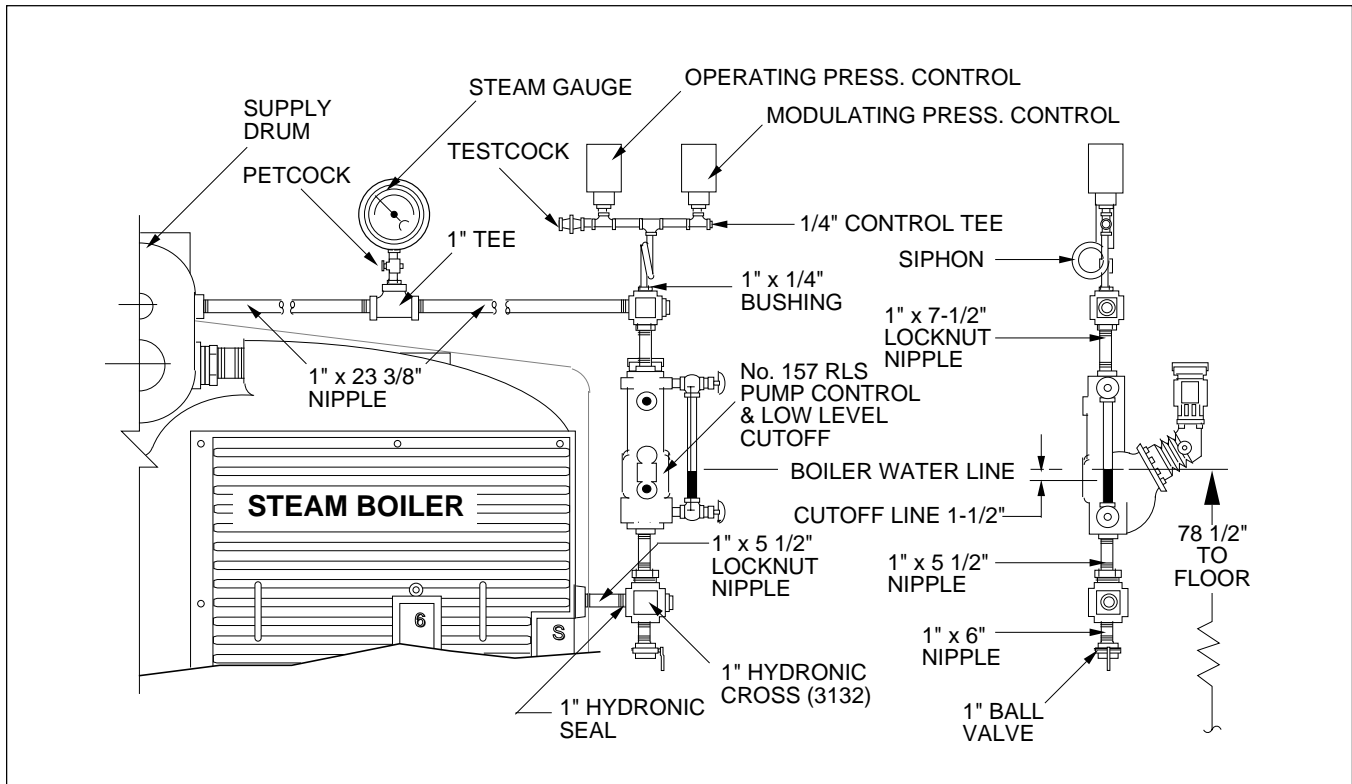
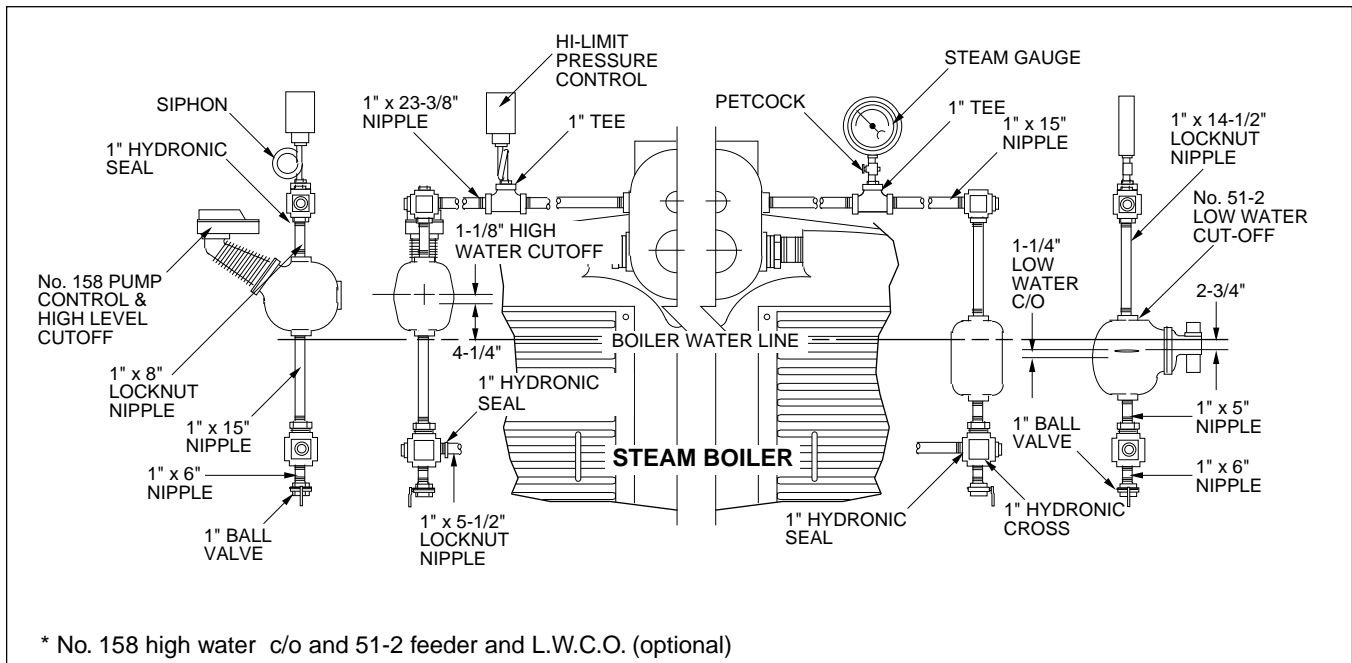


Fig. No. 32



NOTE: This installation is not complete without the red instruction tag for putting cold boilers into service or for changing water level under steam pressure.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

Re-plug safety valve tapping and fire boiler intermittently for at least 5 hours. Maintain 0-2 PSIG steam pressure during boilout. Blow down boiler intermittently through lower drain valves to remove sediment. Maintain water level at normal water line - 78½" from floor.

Stop firing burner and allow boiler to cool below 120° F and drain. Flush the boiler interior with clean water introduced by a hose into the top header. When the flushing is complete, close the drain valves and fill boiler with clean water.

If boiler is not clean, repeat cleaning procedure or clean boiler using a skimmer tapping as follows: Connect temporary piping to the 2" rear tapping on the left hand side of the supply drum.

CAUTION

Be sure water is discharged to an open drain or other location that insures no danger to personnel. Do not install a valve in this piping.

Fill boiler until water reaches the top of gage glass. Add chemicals at the same rate as previously described.

Start the burner and operate sufficiently to boil the water without producing steam pressure for about 5 hours. Add water to boiler at a rate which allows a steady trickle of water to flow from the skimmer piping. Continue this slow boiling and trickle of overflow for several hours or until discharge water is clear.

Stop firing the burner and drain boiler. Wash the water side of boiler thoroughly using a high-pressure water stream.

Remove temporary piping and fill boiler with clean water to normal water level. Replace safety valve and connect permanent piping.

**Table 7
Boiler Water Content**

# of Sections	Steam (gal.)	Water (gal.)
10	286	422
11	312	462
12	338	501
13	355	541
14	391	581
15	418	620
16	445	659
17	471	699
18	497	739
19	524	778
20	551	817
21	577	857
22	604	897
23	631	936
24	657	976
25	684	1015

B. Water Boilers

Normally, cleaning of water boilers is unnecessary unless boiler or system contamination is known to be unusually heavy. If cleaning is necessary, it should be performed as outlined under **Steam Boilers** with the following changes:

1. Include system water when determining amount of boilout solution.
2. Operate circulator during boilout.
3. Maintain system temperature between 160° F and 200° F.
4. If portions of heating system are non-drainable, refill system with water and operate circulator to flush those sections. Drain and refill system with clean water.

CAUTION

Monitor boiler pressure constantly during boilout. Do not allow pressure to exceed 40 PSIG for water boilers (80 PSIG for high test boilers). Direct safety valve discharge away from all personnel during boilout.

JACKET INSTALLATION

The complete flush jacket should be installed now that the boiler assembly and piping are completed. This is covered in a separate booklet, "Jacket Installation."

MAINTENANCE SCHEDULE

The following instructions are offered for best performance of the boiler and burner:

A. Keep boiler fireside surfaces clean. Cleaning should be done at least once annually. Flue temperatures above 530° F indicate cleaning may be necessary.

B. An unstable waterline or system steam hammer indicates contaminated boiler water. Blow down boiler to remove contamination. Excessive blow down should be avoided since this can reintroduce contamination to the boiler. Contaminated boiler water eventually leads to scaling, pluggage and possible section damage.

C. Periodically check all operating and limit controls for proper cut-off.

D. Check flame safeguard controls regularly to insure safe burner shutdown.

CAUTION

Steam Boilers

Do not place cold boilers in service on a hot steam line or severe damage may occur to boiler and piping.

Deep cold boiler valved off line, fire until boiler reaches line pressure before bringing on line. Steam entering a cold boiler causes steam hammer. For boilers not valved off, the system should have an overflow installed to prevent idle boiler from flooding. If this is not done, cold boiler must be heated to near steaming conditions (212° F) and then drop water level to normal.

650A/6500A BOILER INSTALLATION INSTRUCTIONS

WARNING

Any appliance that burns natural gas, propane gas, fuel oil, wood or coal is capable of producing carbon monoxide (CO).

Carbon monoxide (CO) is a gas which is odorless, colorless and tasteless but is very toxic.

If your Smith boiler is not working properly, or is not vented properly, dangerous levels of CO may accumulate. CO is lighter than air and thus may travel throughout the building. **Brief exposure to high concentrations of CO, or prolonged exposure to lesser amounts of CO, may result in carbon monoxide poisoning.**

Exposure can be fatal and exposure to high concentrations may result in the sudden onset of symptoms including unconsciousness.

Symptoms of CO poisoning include:

dizziness	vision problems	shortness of breath
headaches	loss of muscle control	unclear thinking
nausea	weakness	unconsciousness

The symptoms of CO poisoning are often confused with those of influenza, and the highest incidence of poisoning occurs at the onset of cold weather or during flu season. A victim may not experience any symptoms, only one symptom or a few symptoms. Suspect the presence of carbon monoxide if symptoms tend to disappear when you leave your home.

The following signs may indicate the presence of carbon monoxide:

- Hot gases from appliance, venting system, pipes, or chimney escaping into the living space.
- Flames coming out around the appliance.
- Yellow colored flames in the appliance.
- Stale or smelly air.
- The presence of soot or carbon in or around the appliance.
- Very high unexplained humidity inside the building.

If any of the symptoms CO poisoning occur, or if any of the signs of carbon monoxide are present, **vacate the premises immediately and contact a qualified heating service company, the gas company or the fire department.**

To reduce the risk of CO poisoning, have your heating system "tuned up" by a licensed heating contractor or the gas company - preferably before each heating season. Also have the service company check your chimney or vent pipes for blockage. Your home should also be adequately ventilated, particularly if you have insulated your home.

Only qualified, licensed service contractors should perform work on your Smith Boiler.

WARNING

Install, operate and maintain unit in accordance with manufacturer's instructions to avoid exposure to fuel substances or substances from incomplete combustion which can cause death or serious illness. The State of California has determined that these substances may cause cancer, birth defects, or other reproductive harm. Also, install and service this product to avoid exposure to airborne particles of glasswool fibers and/or ceramic fibers known to the State of California to cause cancer through inhalation.