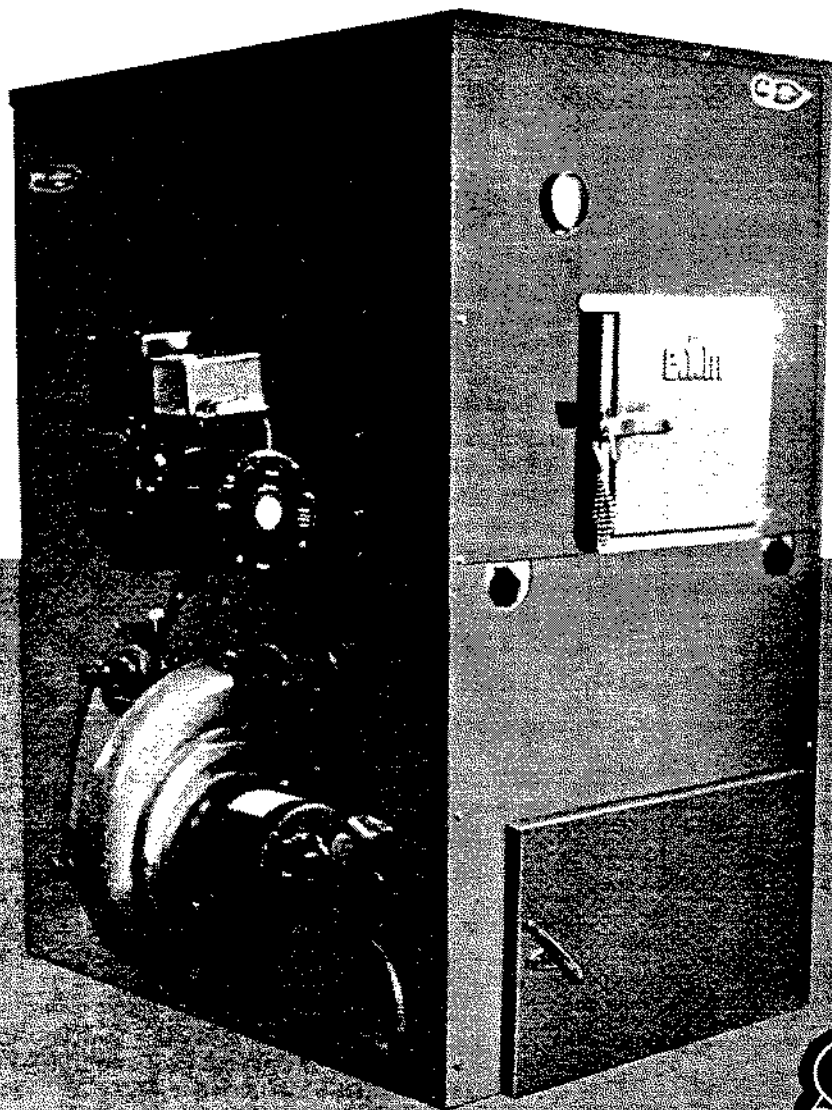


# Installation and Operating Manual for the EFM Stoker Boiler Unit

**Model  
DF520**



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# Installation And Operating Instructions For Model DF520 Stoker Boiler Unit

This manual contains information for the installation, operation, care and service of the EFM DF520 Stoker Fired Boiler. Be sure to follow these instructions carefully when making the installation. Before proceeding with the installation, be sure to check local ordinance requirements. Installation must be made in accordance with local ordinances which may differ from this installation manual.

These instructions are to be saved and given to the equipment owner for operation and maintenance information.

The unit is subject to shipping damage during transit or can be shipped with missing parts. Upon receipt, examine all cartons and boiler for possible missing parts or damage. If unit is damaged, notify carrier immediately. If parts are missing, notify factory as soon as possible.

The EFM Model S20 Stoker as furnished with the DF520 Boiler is designed for coal firing only. Use only Pennsylvania Anthracite Coal in the size known as "Rice Coal". Do not burn garbage, gasoline or naphtha.

An optional oil burner package is available which provides the oil burner with damper and mounting accessories to oil fire the DF520 Boiler with No. 2 Fuel Oil. This can be done with the stoker remaining in place. The oil burner and stoker **must not** be fired at the same time. See supplementary instructions for the oil burner installation and operation. The DF520 Boiler is designed for coal firing. When oil is used it should be used as a back-up fuel and not the primary fuel.

The DF520 Boiler is designed for use with hot water heating systems (30 PSI Max.) and steam heating systems (15 PSI Max.).

Do not use or store flammable liquids, especially gasoline in the vicinity of the boiler.

## Coal

1. The coal should contain not more than 10% oversize and not more than 15% undersize. Oversize or undersize in excess of these amounts will result in poor combustion.
2. Excessively wet coal should not be used, as it will retard combustion. Dust Treatment of coal is accomplished either through the application of certain chemicals or oil. The use of excess quantities of oil on the coal will result in

unsatisfactory operation. It creates a sludge with the fines which fills the burner air inlet holes and causes poor combustion. The use of some chemicals for Dust Treatment creates a corrosive action on the stoker feed worms that shorten their life appreciably.

3. When securing a supplier for your coal, be sure he is aware of the above conditions and make sure you get clean coal with no foreign materials and a minimal amount of fines. If you are in doubt as to the quality of the coal from your supplier, it is advisable to purchase a small quantity and try it in your unit before filling the bin.

## Coal Storage

1. An adequate storage bin will have to be provided for coal storage. This should preferably be located indoors with easy access for a coal truck to deliver the coal with a chute through a cellar window. The storage volume required for one ton of Rice Anthracite Coal is 40 cubic feet. The angle of repose of the coal is approximately 45°. Coal will slide down a smooth surface at 20° off horizontal. It is advisable to provide a drain in the bin. Be sure the bin is well supported to withstand the side thrust load of the coal. The use of a Bin Feed Trap (see Fig. 5) is recommended. This will aid in removal of the bin feed pipe and worm for service and will make the end of the worm accessible for removal of obstructions.
2. If it is impractical to provide a coal bin close enough to the boiler to reach with the standard bin feed, a single section of bin feed worm 4 feet long to extend the bin feed is available on special order. In this case the boiler unit will have to be raised 7" (or the bin floor lower 7") to keep the end of the bin feed the standard height above the floor line. Not more than one 4 foot section of worm may be added, otherwise an overload will be imposed on the motor and drive mechanism.
3. The bin feed can be shortened and a storage drum used to store coal over the pick up end. When doing this, be sure to maintain the original exposure of worm beyond the end of the bin feed pipe. When cutting off the worm, it is advisable to cut at a point directly below a weld holding the worm to the shaft. This is to provide support for the end of the worm. As the bin feed is shortened, the risk of coal gas feed back out of the end of the bin

feed pipe increases. For this reason, the bin feed should be shortened only as a last resort. In no case should the first section of worm from the burner be shortened.

## Disposal of Ashes

1. Ashes should be placed in a metal container with a tight fitting lid. The closed container or ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

## Chimney

1. The chimney must be a type suitable for solid fuel and must provide a minimum draft of .05 IN/WG (as measured with a Draft Gage) at the boiler flue exit to provide for the proper operation of the DF520 Stoker-Boiler Unit. The chimney should be masonry with tile lining (8" x 8" x 15 ft. high) or metal insulated, with a stainless steel internal surface such as the tradename "Metalbestos". (9" dia. inside x 15 ft. high.) See figures 10, 11, and 12 for situations which can cause poor draft conditions in a chimney.

## Ventilation

1. The area in which the heating unit is located must have an adequate supply of air for combustion. Open basements without storm windows or tight doors will generally permit adequate air infiltration. If the heating unit is located in a separate room with a tight door, ventilation must be provided to an open area within the building or to the outside. If the building is of tight construction with exhaust fans, an outside air supply that is ducted into the boiler room may be required.

## To Set Up Boiler and Base

**Refer to Fig. 1** THIS UNIT IS NOT TO BE INSTALLED ON COMBUSTIBLE FLOORING.

1. Make sure that foundation for boiler base is level and adequate to support unit weight (approximately 1300 pounds).
2. Locate base so that: Ash pit door has ample clearance; is in a convenient location for can removal; that bin feed pipe will be in proper position in bin. Maintain a minimum of 30 inches clearance on the front, rear and stoker side of the boiler to any obstructions or combustible material. 65 inches minimum clearance to end of bin feed trap for worm removal and 30 inches clearance on the bin feed side of the boiler to any obstructions

or combustible material. Cabinet and base panels are constructed so that stoker may be installed on either side of base.

3. Hang two steel baffles in front of flue tubes by placing 4 slots in each baffle over hooks welded to flue tubes. Hooks support and retain baffles in position. The baffles are furnished as a right hand and left hand baffle. They will not fit properly if reversed.
4. Hang cast iron baffle in boiler by engaging notches on each side of baffle with brackets welded on each side of boiler interior.
5. If the optional oil burner is to be mounted on this boiler, do the following before the boiler is placed on the base:

Place the insulation on the inside walls of the boiler base, above the ash guide plate. Refer to the installation instructions shipped with the oil burner kit.

6. You may prefer to mount the stoker on the base before setting the boiler on the base. If so, refer to section "To Install Stoker."
7. Apply boiler putty on top edges of base and set boiler in place. Carefully seal between boiler and base, including space between boiler and divider plate in base.
8. Plug all boiler openings not used. Insulation must now be installed and is shipped with the cabinet and consists of three pieces. The two smaller pieces cover the front and rear of boiler and are placed in position with the excess folded over the top of boiler with the large piece then placed over the top and sides of the boiler with the steel straps as furnished holding all insulation in place. Cut insulation around openings in boiler that are to be used.
9. Install heating supply and return piping. Refer to Fig. 6 and Fig. 7.
10. **Steam Boiler:** Install pressure gage and limit switch (use siphon loop as shown on piping diagram Fig. 6.) safety valve, low limit aquastat. Water gage and low water cut off shall be installed as shown in Fig. 1, after cabinet left side panel is in place. A templet is furnished to locate water gage holes in cabinet left side panel. Note: 3½" long nipples are furnished to connect gage glass to boiler. Gage glass mounted low water cut-off must be used.
11. **Hot Water Boiler:** Install combination altitude gage and thermometer; combination high, low and reverse acting aquastat. If local ordinances require a low water cut-off, use an external mounted cut-off. Refer to Fig. 13.

# To Install Stoker

## Refer to Fig. 2

1. Remove stoker mounting side plate from boiler base, bolt stoker fan housing to this plate with the spacer ring between fan housing and plate. Be sure the spacer ring is assembled with the cabinet retainer tab on top and on side next to fan housing.
2. Assemble air pipe and burner assembly to the stoker fan housing, be sure that slots in ends of air pipe engage with pins and **that air pipe is all the way in air chamber and fan housing hubs** before tightening set screws.
3. Install cleanout lever and rod. Fasten cast iron eye on end of rod to underside of burner with shoulder screw. Lever is fastened to side of fan housing with shoulder screw. Locate spring on outside of base.
4. When mounting stoker to boiler base, the ash guide plate (with large round hole and located inside base) must be removed by pulling it straight out thru the ash door pouch. Mount stoker assembly in position on boiler base. Be sure the angle on inside face of stoker mounting plate hooks over lower edge of base opening. Clamp stoker and plate in position using two spade type screws and nuts.
5. Insert short length of coal pipe thru hole in bin side base plate and into gooseneck. **Be absolutely sure the end of pipe is against shoulder inside gooseneck.** The beveled inside edge of coal pipe must be toward coal bin, the vent holes in pipe must be on top, slot engages pin in gooseneck. Tighten set screws. Screw coal pipe collar to side of base using packing provided.
6. Both base side plates and rear plate must be sealed with boiler putty. Work the putty under the bevel on all four sides of each plate.
7. Insert coal worm (with long shaft extension) into pipe and connect with coupling to clutch shaft. Place bin side cabinet side panel (edge with  $\frac{1}{4}$ " holes is the front edge) in position by tilting it backward and sliding it over the coal pipe (pipe protrudes thru the  $\frac{1}{4}$ " dia. hole). Allow panel to rest against side of boiler while remainder of stoker bin feed is assembled. If it is so desired, the cabinet can be completely assembled before the remainder of stoker bin feed is assembled.
8. Slide cast iron coal pipe coupling over coal pipe that is in place. Assemble second section of coal worm with bin pipe in position over it. Coal worm coupling has left hand thread. Slide pipe coupling down over coal worm coupling. With the coal pipe ends butted together, center coupling over the joint and tighten four set screws to hold coal pipes in

position. See Fig. 4. Apply boiler putty to the ends of the coal pipe coupling to prevent leakage of coal dust and fines.

# To Assemble Cabinet

## Refer to Fig. 3.

**Note:** If the oil burner is to be installed, be sure to remove the panel on the left side panel to clear the burner mounting flange. The left hand panel can be installed after the burner mounting flange is in place but has to be installed before the burner is mounted.

1. Place cabinet support angles on top of boiler and approximately five inches from each end of boiler. On the end of each angle is a tab with hole. Thread a sheet metal screw into each hole. Turn screw in as far as possible. Point of screw touches side of boiler which holds support angles in position.
2. Set front panels in place and screw two sections together.
3. **Take cabinet side panel for the side on which the stoker is installed. (Edge with  $\frac{1}{4}$ " holes is the front edge).** Using the appropriate template, remove the panel to provide the large slot to clear the stoker. Place in position and hang from support angles by placing flange along top edge over ends of support angles. Be sure panel is behind retainer tab on the stoker spacer ring. In the same manner mount the other side panel.
4. Screw the front edge of the side panels to the front panels.
5. Place rear panels in position. Fasten to rear edge of each side panel and along the edge where they overlap, with sheet metal screws as required.
6. The cabinet top panel is furnished in two halves. Place in position with flanges located to the outside of both side panels, upper front and rear panels. The two halves of the top panel lap over each other along the center and are fastened together with sheet metal screws.
7. A reinforcing angle is to be screwed to inside lower edge of cabinet side panel (stoker side) across the stoker opening to reinforce the panel. Be sure angle is against flange on side panel. Use two sheet metal screws.
8. Bolt ash pit door in place.
9. Screw hood support hook strip to side panel where stoker drive is mounted, using sheet metal screws. Hang stoker hood in position over this hook strip.
10. Install flue pipe from boiler base flue outlet to

chimney. The flue pipe must be 8" nominal dia. galvanized steel. The flue pipe should be short as possible (while maintaining the 30 inches to the rear of the unit), with a minimum of elbows and must pitch upward to the chimney connection. Maintain 18" clearance (minimum) between stack and combustible material. Secure each flue pipe joint and boiler base flue outlet connection with sheet metal screws. Seal opening at chimney connection with boiler putty. Where fluctuating draft conditions are present, it is advisable to install a Barometric Draft Control. Refer to Fig. 1.

## **Electrical Installation**

1. All wiring must be in accordance with local codes or in the absence of a local code must comply with the National Electric Code ANSI CI-1978.
2. Refer to appropriate wiring diagram Fig. 8 or 9 when wiring the installation.
3. Provide a fused disconnect switch in the circuit supplying the stoker. The EFM Model S20 Stoker operates on 120 VAC 60Hz with a power draw of 2.5 AMPS.
4. The S400B or R883B Stoker Timers are to be mounted in close vicinity of the boiler. In mounting the R883B Timer, keep in mind that this timer has an internal relay which will cause an audible thump, when energized, which will carry through the house if mounted on a ceiling joist or similar surface.
5. Locate the thermostat where it will sense the natural air circulation within the building. Do not place it in a location where it will be subject to cold drafts from doors or windows or where it can sense the heat from radiation. It is not recommended that a thermostat be installed on an outside wall, in front of a fire place, above a lamp or at the base of an open stairwell

## **Control Settings**

1. Refer to copy in Figures 8 and 9 for proper control settings and operation of the control system.

## **Operation - Stoker Firing**

### **Before Start Up**

1. The reducing unit has been filled with oil at the factory. It is advisable to verify this fact by removing the oil fill plug (on top of reducing unit housing) and check oil level by inserting a dip stick and withdrawing to check oil level. When filling or adding oil, use a light gear oil. Oil is available from

the factory in quart cans. Normal oil level is to the top of the output shaft.

2. Fill the ratchet oil reservoir with the oil furnished with the unit. Keep oil level slightly below top edge of reservoir.
3. Fill oil cups on stoker motor, oil both ends of connecting rod, oil both pawls and bearing bracket with machine oil.
4. Be sure boiler and heating system are full of water and free of air on a circulating hot water system and boiler is filled with water to middle of gage glass on steam boiler. After putting water in boiler (on a steam system) prior to firing for the first time, remove the safety valve and pour in the EFM Water Conditioning Compound in accordance with instructions on the can. This should be repeated each time a steam boiler is drained.

## **Starting the Fire**

**Note:** If desired, drive pawl can be flipped backward when starting a fire. In this position, the fan will supply combustion air but no coal will be fed to the burner. Do not forget to return drive pawl back to its operating position, once the fire is established.

1. Fit the manual coal worm crank (furnished with the unit) over the end of the worm drive shaft. Turn the shaft counter clockwise until the coal fills the burner to within 2 inches of the top of the burner.
2. When starting the stoker for the first time, set the feed rate at 3 teeth and the air shutter at 3¼. If the stoker is being rekindled, do not change the settings as they are adjusted already for the feed rate and coal being used.
3. Wrap a handful of wood shavings in a half sheet of newspaper and place it on top of coal in burner. Ignite paper and start stoker.
4. After wood is ignited, place a small shovel of coal on the fire. When the coal is glowing red, add an additional layer of coal. Operation of the stoker should then be continued under control of the thermostat.

## **Adjusting Coal Feed Rate**

1. The coal feed rate determines the output of the boiler. This data is shown on Table 1.
2. The coal feed rate is adjusted by changing the number of teeth on the ratchet drum that the drive pawl engages with each stroke. To decrease the feed rate, loosen the thumbscrew on the set collar and rotate the collar to the left. To increase the feed rate, rotate the collar to the right. Be sure the drive



pawl engages the root of the ratchet drum tooth when the pawl falls off the pawl guide plate. Refer to Table 1 for feed rate required to achieve desired output.

3. The check pawl of the drive mechanism (mounted on an eccentric stud) must be adjusted to minimize backlash (the tendency for the worm to rotate backwards on the return stroke of the drive pawl). To adjust, loosen the locking nut and rotate the stud until the check pawl falls into the ratchet drum tooth just before the drive pawl finishes its drive stroke. Tighten the locking nut.
4. It is somewhat difficult to check the actual number of teeth feed with the stoker running because of the speed at which the drive pawl engages to ratchet drum. This can be checked by manually turning the motor shaft coupling counterclockwise while counting the number of "clicks" as the ratchet drum teeth pass under the check pawl. Disconnect power to stoker when doing this check.
5. In most cases, two feed settings will be required. One for winter operation and one for summer operation. During the heating season the feed rate will have to be raised to provide sufficient heat for load conditions. This feed rate may cause out fire conditions during the summer when the burning rate required may be considerably less to maintain domestic hot water temperature only. See section on "Outfire". When using two feed rates, be sure to record both air and coal settings for future reference. These can be marked on your instruction card.

## Adjusting Air Supply

1. Whenever the coal feed rate is adjusted, the air setting must be adjusted also. Refer to Table 2 for air setting for each feed rate. These are approximate settings and may have to be varied to suit the particular type of coal being used. The numbers on the air indicator plate are not intended to coincide with the number of teeth being used.
2. To adjust the air setting, loosen the thumbscrew securing the indicator, make the appropriate adjustment, then tighten the thumbscrew. It may be necessary to adjust the air supply several times until the desired setting is attained.
3. With a properly adjusted fire, there will be an ash ring approximately 2" wide around the outside of the burner with a small circle of coal at the center of the fire. With too much air, the fire bed will tend to develop cracks, the ashes will clinker and the dark spot at the center of the fire will disappear. With too little air, the ash ring will be very small, hot coals will drop off the burner ring into the ash pit and the dark spot at the center of the fire will be large.

4. Some unburned coal in the ash is normal and indicates a well adjusted fire for maximum efficiency. This amount must be small. Excess unburnt coal indicates poor air-feed adjustment or a poor grade of coal. In some cases what appears as unburnt coal may be slate or other foreign material.

## Draft

1. All drafts should be measured with the stoker in operation and with stack at normal operating temperature.
2. A good draft is essential for proper operation of the stoker. This draft is created by the chimney when it reaches operating temperature. The draft should be checked with a draft gage at the stack (drill  $\frac{1}{4}$ " dia. hole in stack at a point within 12" of the boiler base outlet and before the barometric draft control) and through the  $\frac{1}{4}$ " dia. hole in the fire inspection door (overfire draft). The over fire draft should be .02 inches water column. The stack draft should be .045 to .05 inches water column. Adjust the barometric draft control to secure these readings. These draft figures are all negative pressure.
3. Too much draft will draw heat up the chimney causing wasted heat. Too little draft can cause positive pressure in the boiler firebox with resultant "coal gas" odors in the boiler room.

## Fines Cleanout

1. To prevent fines accumulation in the burner air chamber and costly repairs, the cleanout lever must be pulled back and held in that position (with stoker operating) for 15 seconds once every day. Be sure to return the lever to its original position by pushing in toward boiler, using force to be sure cleanout is closed.

## Ashes

1. Remove ashes as necessary to prevent overflow of ash into boiler base.

## Outfires

1. A stoker fired boiler is different than an oil, gas or electric unit in that the fire must be maintained by periodic running of the stoker even though there is no call for heat by the thermostat or operating aquastat. This is accomplished by the timer. A normal setting on the timer is 2 minutes of stoker operation per hour. This is a suggested start and may have to be varied to suit installation conditions, coal being used and time of the year.
2. An outfire on the stoker is a more prevalent

condition during the summer months. It can happen even though you find nothing wrong on the stoker mechanism. Following are some conditions which can cause an outfire. These are situations that start to develop where there is no apparent explanation. For other situations refer to service check list.

- A. Feed rate too high for summer operation. In this situation, where the stoker is maintaining boiler water temperature for domestic hot water and there is little domestic water draw, the boiler water temperature can reach high limit setting. The limit control overrides the timer, not allowing the stoker to run and results in an outfire. This occurs on a hot water system and can be corrected by dropping the feed rate, raising the high limit setting, lowering the operating setting on the aquastat (to get more spread between operating and high limit setting on the aquastat) and decreasing the differential on the operating control. The by-pass piping as shown on Fig. 7 is very important in helping to alleviate this condition by reducing stratification in the boiler. Removing insulation from boiler will also help. **Note when adjusting aquastat:** The L8124 A aquastat furnished with this unit has three settings. **High Limit Setting** which shuts stoker off when water temperature reaches the setting and overrides all other controls. **Operating setting** which maintains boiler water temperature and shuts stoker off when water temperature reaches the setting but not if there is a call for heat. **The Differential setting** determines when the stoker will be fired as the boiler water temperature cools. As an example: If the operating control is set at 160° with a 10° differential, the stoker will come on at 150° water temperature and shut off at 160°. The thermostat or timer overrides this control but not the high limit.
- B. Loss of draft. This occurs during hot-humid summer weather with a low fire in the burner. Changing timer operation from one per hour to every half hour and a slightly increased feed rate and more combustion air will help. Thoroughly cleaning boiler, flue pipe and chimney will also help (to remove fly ash build-up). Be sure ash pit door and fire door are closed tightly. Be sure cleanout handle is in closed position (push toward boiler).
- C. Too much draft. This is most apt to occur during cold windy weather where there is no barometric draft control in the stack. In this situation the fire continues to burn even though the stoker is not running. Addition of a barometric control, or proper adjustment (if one is present) will help. Exhaust fans can also cause this problem by drawing air down the chimney, through the burner and out the fan

housing inlet. This can be corrected by providing adequate outside air intake openings for both the stoker and the exhaust fan or discontinue use of the exhaust fan.

## **Before Leaving Installation**

1. Before leaving the installation, instruct the equipment owner on the proper operation and simple maintenance of the unit, such as: Coal feed and air regulations, replacing the shear pin and removal of obstructions on the coal pickup, use of cleanout lever, how to build a fire, where and when to lubricate, use of coal worm crank. A properly informed user will eliminate some service calls.
2. Explain the information on the instruction card to the user and post close to the boiler.

## **Service Check List Stoker Operation**

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### **No Heat**

Stoker will Not Run (See Below)  
Outfire (See Below)  
Pin Sheared (See Below)  
Not Feeding Coal (See Below)  
Circulator Failure (Hot Water System)  
Control Failure

### **Not Enough Heat**

Thermostat Improperly Located  
Thermostat Set Too Low  
Boiler Too Small For Job  
Limit Control Set Too Low  
Too Little Coal Feed  
Insufficient Combustion Air  
Boiler And Flue Passages Dirty  
Air Chamber Filled With Fines  
Burner Plate Holes Clogged  
Poor Air Admission In Boiler Room  
Poor Grade of Coal  
Insufficient Radiation

### **Too Much Heat**

Thermostat Set Too High  
Thermostat Improperly Located  
Control Failure  
Control Circuit Shorted

### **Not Feeding Coal (Stoker Running)**

No Coal Over Bin Worm Pick-Up  
Wet Coal, Packed, Arching Over Worm Pick-Up  
Feed Pawl Disengaged  
Check Pawl Disengaged

Pin Sheared (See Below)  
Coarse Coal Riding On Worm Pick-Up  
Bin Worm Disengaged

### ***Pin Sheared***

Obstruction In Worm Or Worm Worm  
Poor Grade Of Coal  
Packing Of Fines

### ***Outfire (See Outfire Section In Instructions)***

Timer Operates Too Infrequently  
Timer "ON" Operation Too Short  
Excessive Draft  
Too Little Draft  
Too Much Combustion Air  
Not Feeding Coal (See Above)  
Stoker Will Not Run (See Below)  
Exhaust Fan In Building  
Control Failure  
Too Little Coal Feed  
Air Chamber Filled With Fines  
Burner Holes Clogged  
Insufficient Combustion Air

### ***Stoker Will Not Run***

No Power Supply  
Fuse Blown  
Motor Failure  
Switch Off  
Control Failure

### ***Stoker Noisy***

Check And Drive Pawls Not Adjusted Properly  
Loose Or Bent Fan  
Motor Needs Oil  
Reducing Unit Needs Oil  
Oversize Coal

Loose Fan Blade  
Fan Rubbing Housing  
Coupling Slipping Or Out of Alignment  
Crank And Connecting Rod Not Aligned  
Oil Low In Oil Reservoir

### ***Too Much Fly Ash***

Excessive Combustion Air  
Excessive Draft  
Excessive Fines In Coal

### ***Poor Draft***

Chimney Too Low (See Fig. 11 And 12)  
Chimney Too Small  
Chimney Or Flue Pipe Obstructed  
Boiler Passages Or Flue Pipe Full Of Fly Ash  
Excessive Air Leaks Into Boiler  
Base Of Chimney Full Of Fly Ash Where Flue Pipe Enters

### ***Coal Gas Smell***

Poor Draft (See Above)  
Excessive Combustion Air  
Firedoor Not Closed Tightly  
Exhaust Fan Running

### ***Excessive Coal Consumption***

Boiler Needs Cleaning  
Building Temperature Too High  
Thermostat Improperly Located  
Too Low Coal Feed  
Poor Grade Of Coal  
Poor Combustion  
Excessive Draft  
Excessive Air Leaks Into Boiler  
Too Much Combustion Air  
Faulty Distribution System  
High Stack Temperature



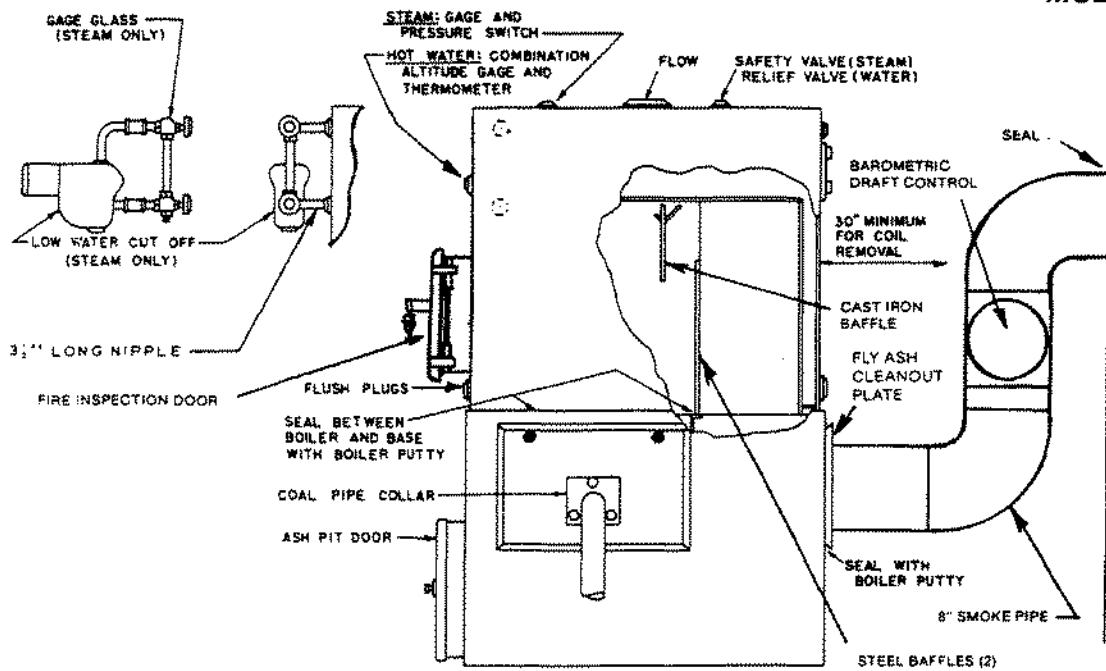
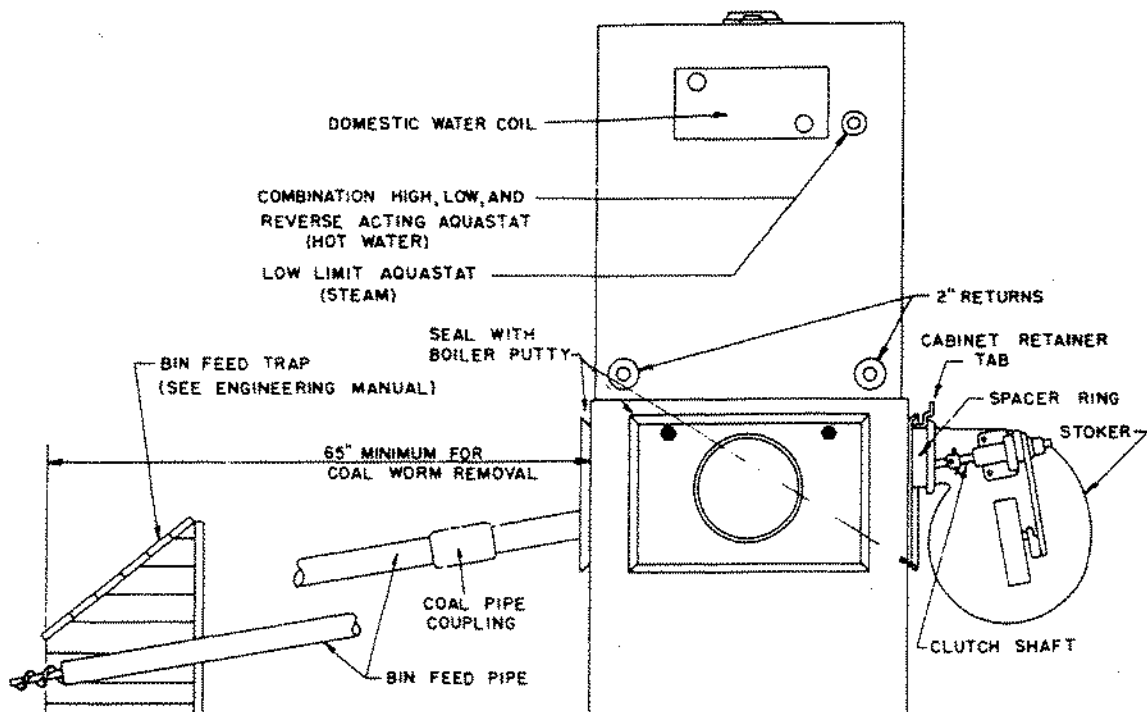


FIG. 1



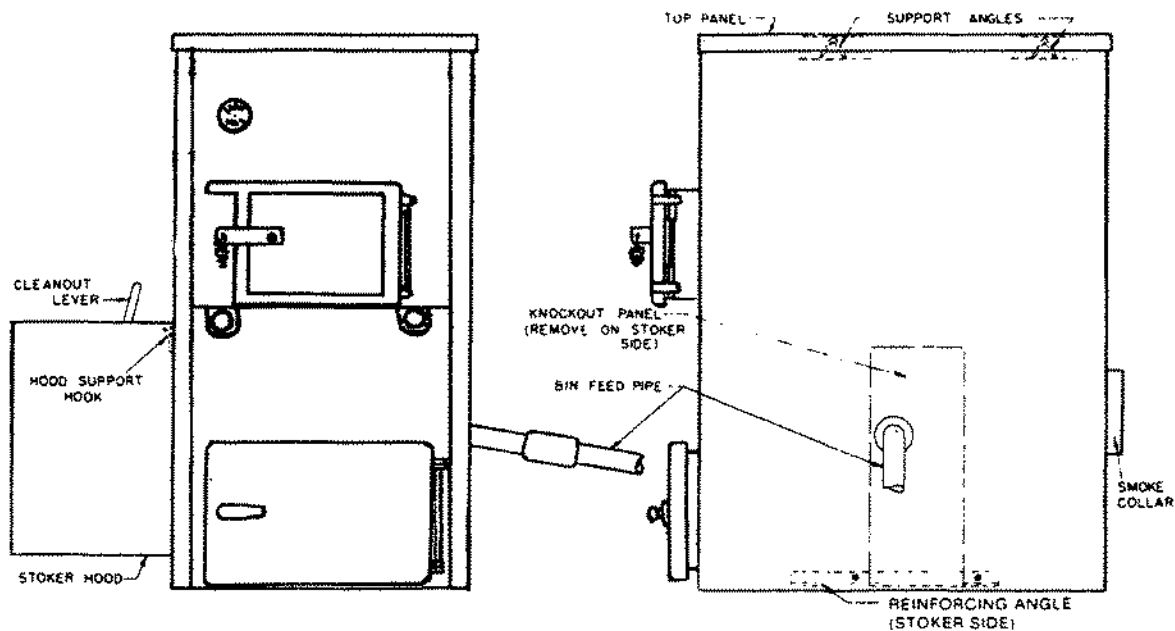
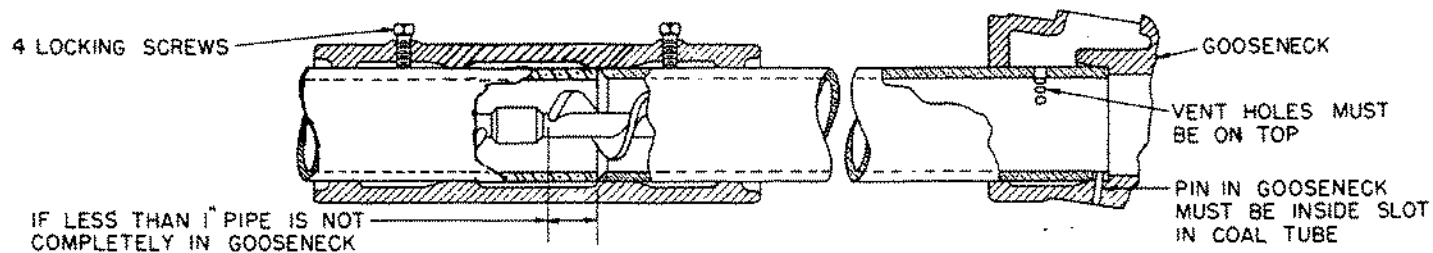


FIG. 3



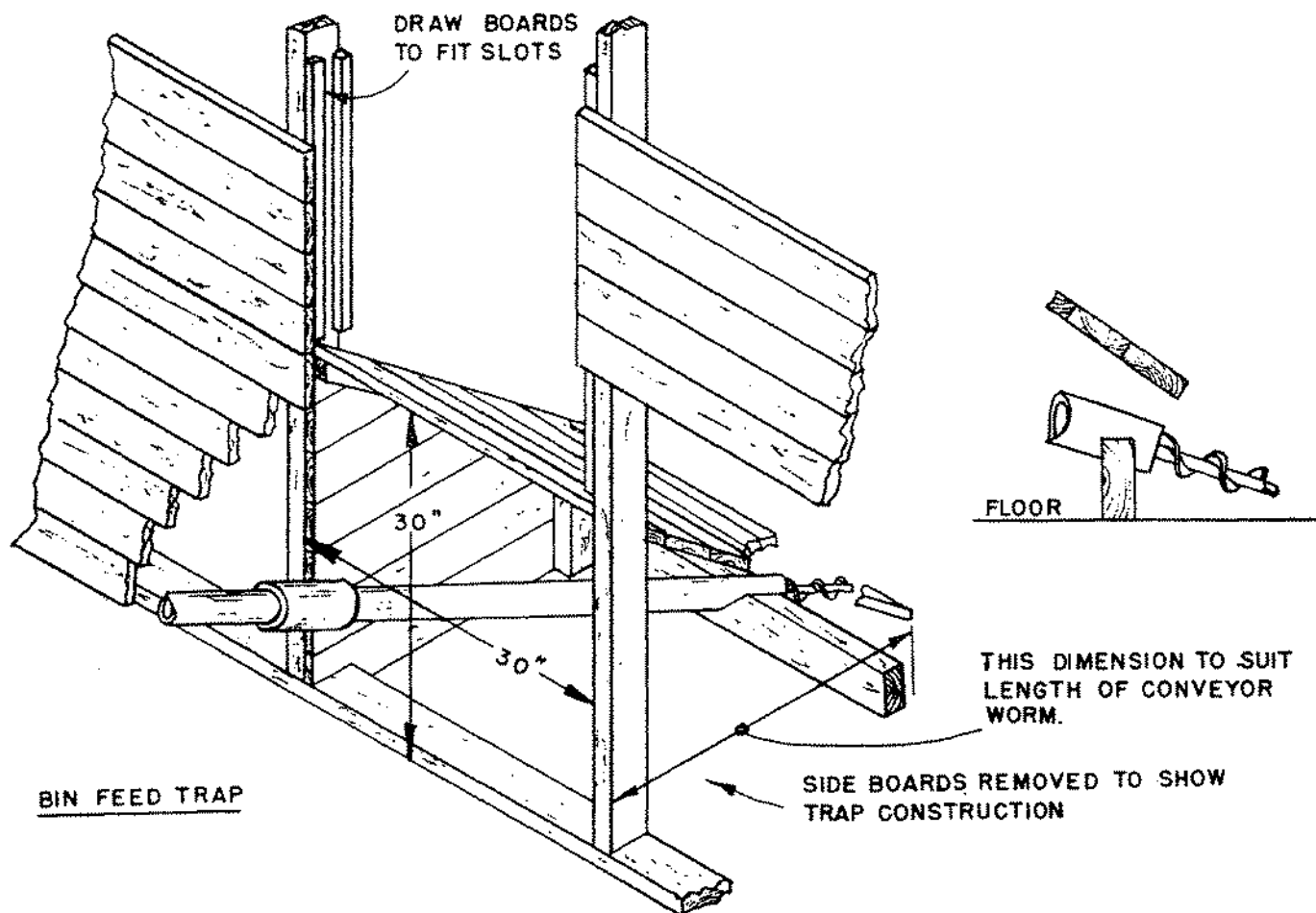
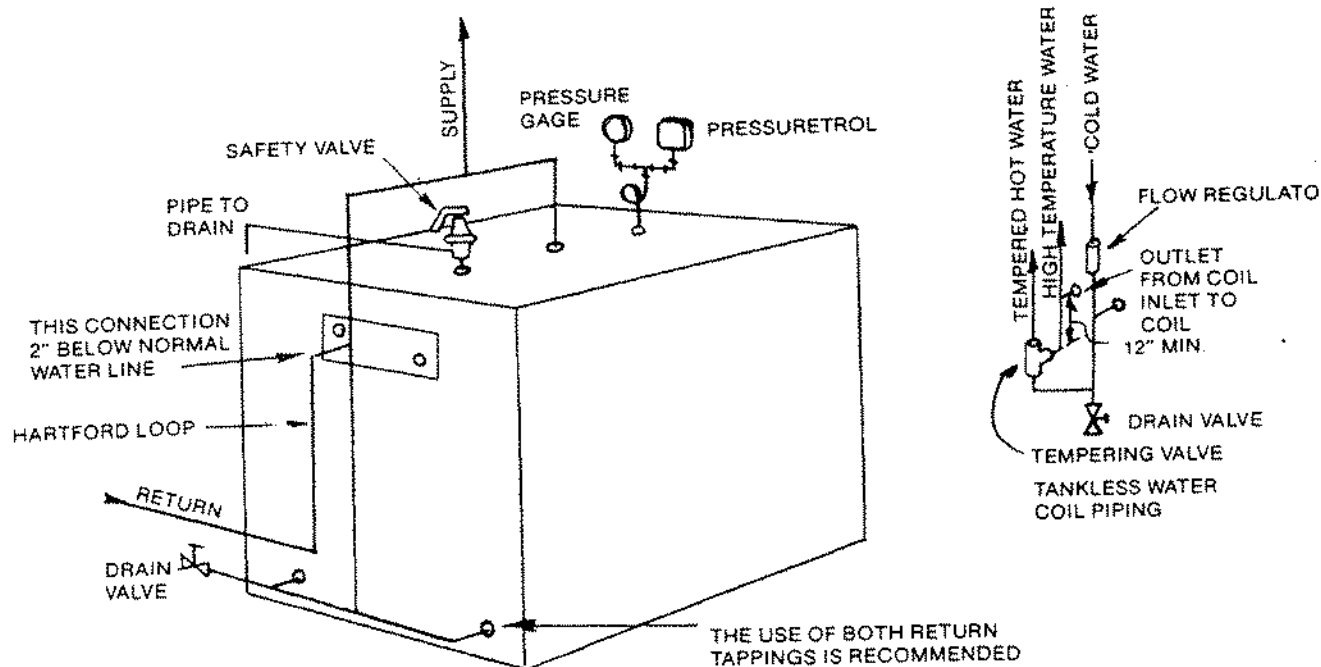
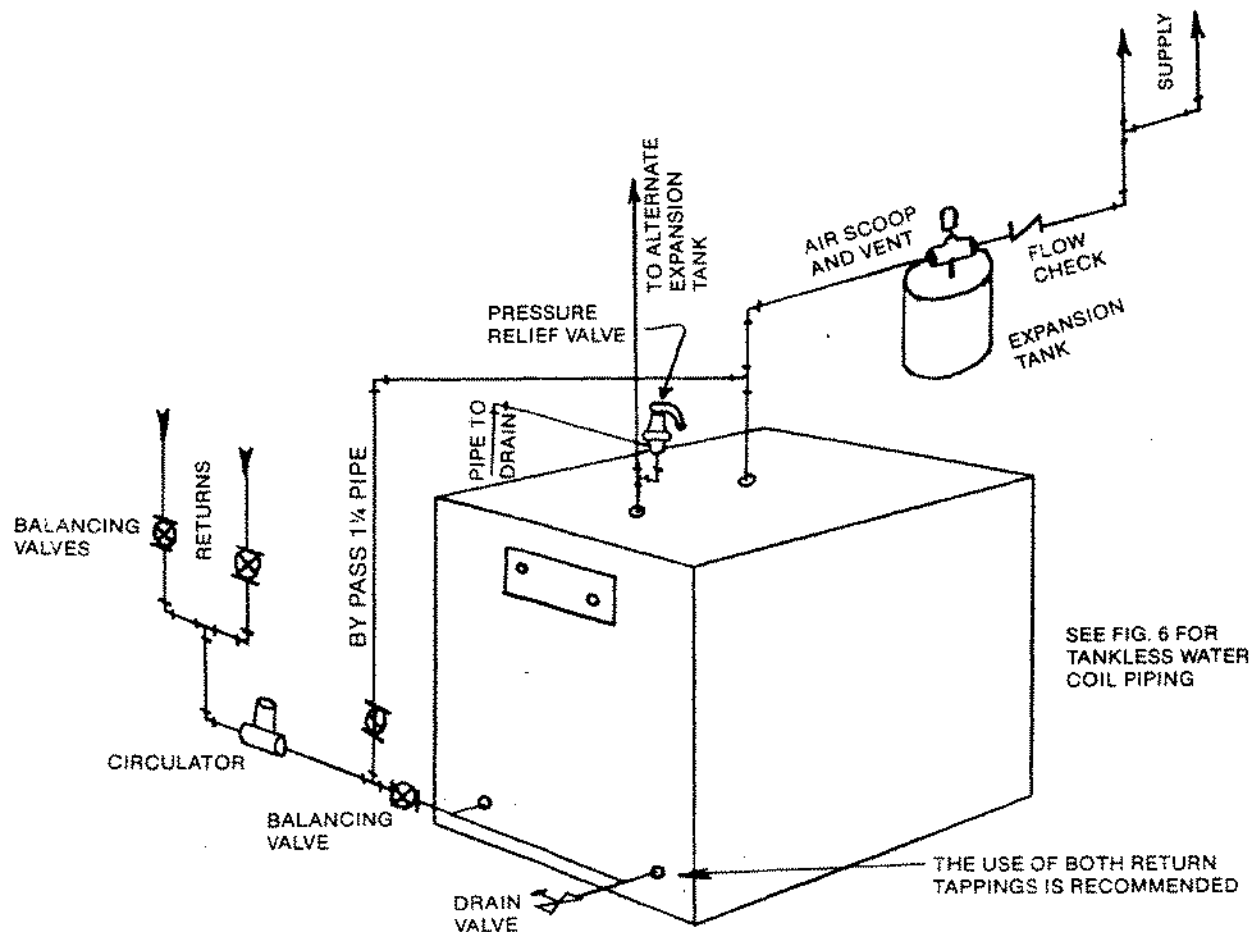


FIG. 5



STEAM PIPING LAYOUT

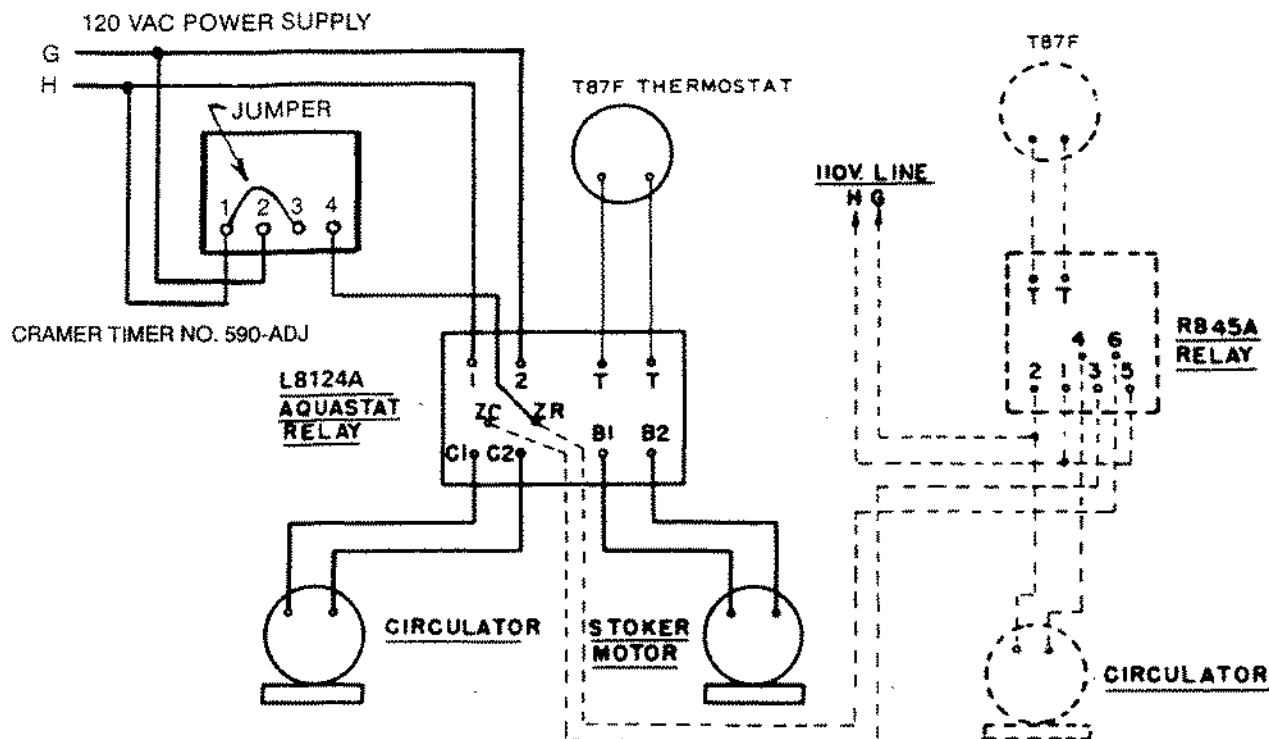
FIG. 6



**FORCED CIRCULATING HOT WATER PIPING LAYOUT**

**FIG. 7**

# FORCED HOT WATER SYSTEM



## STOKER CONTROLS FORCED CIRCULATING HOT WATER WITH DOMESTIC HOT WATER PACKAGE NO. 2

### NOTE:

#### DOTTED PORTION IS FOR ADDITIONAL ZONE IF DESIRED

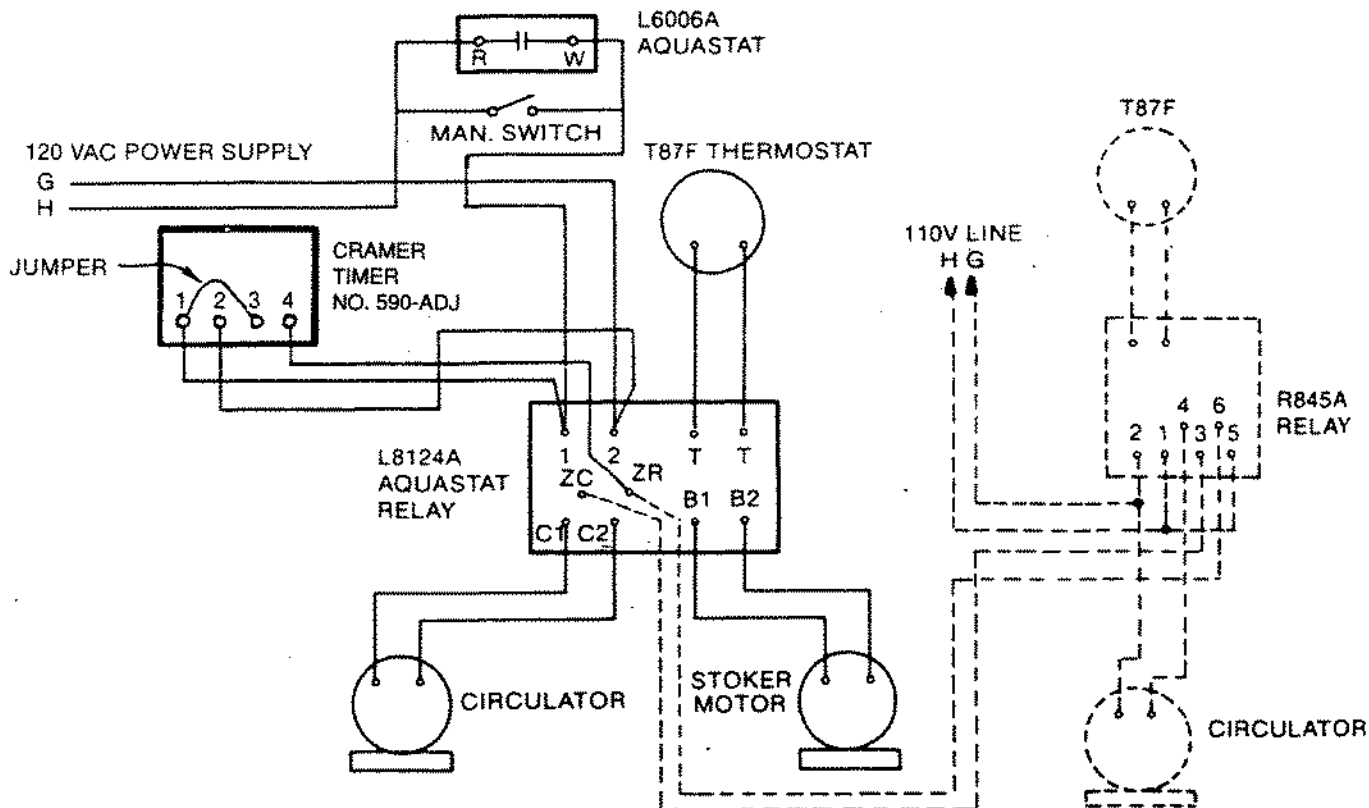
ALL WIRING SHOWN IS FIELD WIRING  
THERMOSTAT TO TT ON AQUASTAT IS 24 VAC  
ALL OTHER WIRING IS 120 VAC

Wiring Diagram of Stoker Control Package No. 2: Controls for Forced Circulating Hot Water System with Domestic Hot Water: includes controls which permit both the stoker and circulator to start simultaneously when the thermostat calls for heat. This method of operation is sometimes preferred, as it eliminates a possible lag in boiler water temperature pickup if stoker operates only on a low water temperature setting. The L8124A is a combination control consisting of a relay for circulator and stoker operation and a triple function aquastat serving as high limit controller to shut down the stoker if the boiler water temperature exceeds the setting of the high limit control; a low limit controller for maintaining a minimum boiler water temperature for domestic hot water service and a circulator controller to prevent circulator operation when boiler water temperature is too low to provide both domestic hot water and house heating.

thermostat calls for heat, provided the boiler water temperature is above the low limit setting. The high limit is usually set at 200° or higher, if boiler operating temperature must be 190°. The low limit is set at 160°. If varied from these settings, there must never be less than 20° between the high limit and low limit for proper operation. The reverse acting aquastat setting is made at the differential which is set for the number of degrees desired below low limit setting. The timer is set for two (2) minutes operation every hour. This may vary to suit the coal feed setting for "hold fire" purposes.

The dotted portion of this wiring diagram shows the use of an additional thermostat and an R845A relay to operate a separate circulator when zoning a system. One or more of these additional zone sets may be used and still retain the functions of the L8124A.

The relay starts the circulator and the stoker when the



STOKER CONTROLS  
FORCED CIRCULATING HOT WATER  
WITH DOMESTIC HOT WATER

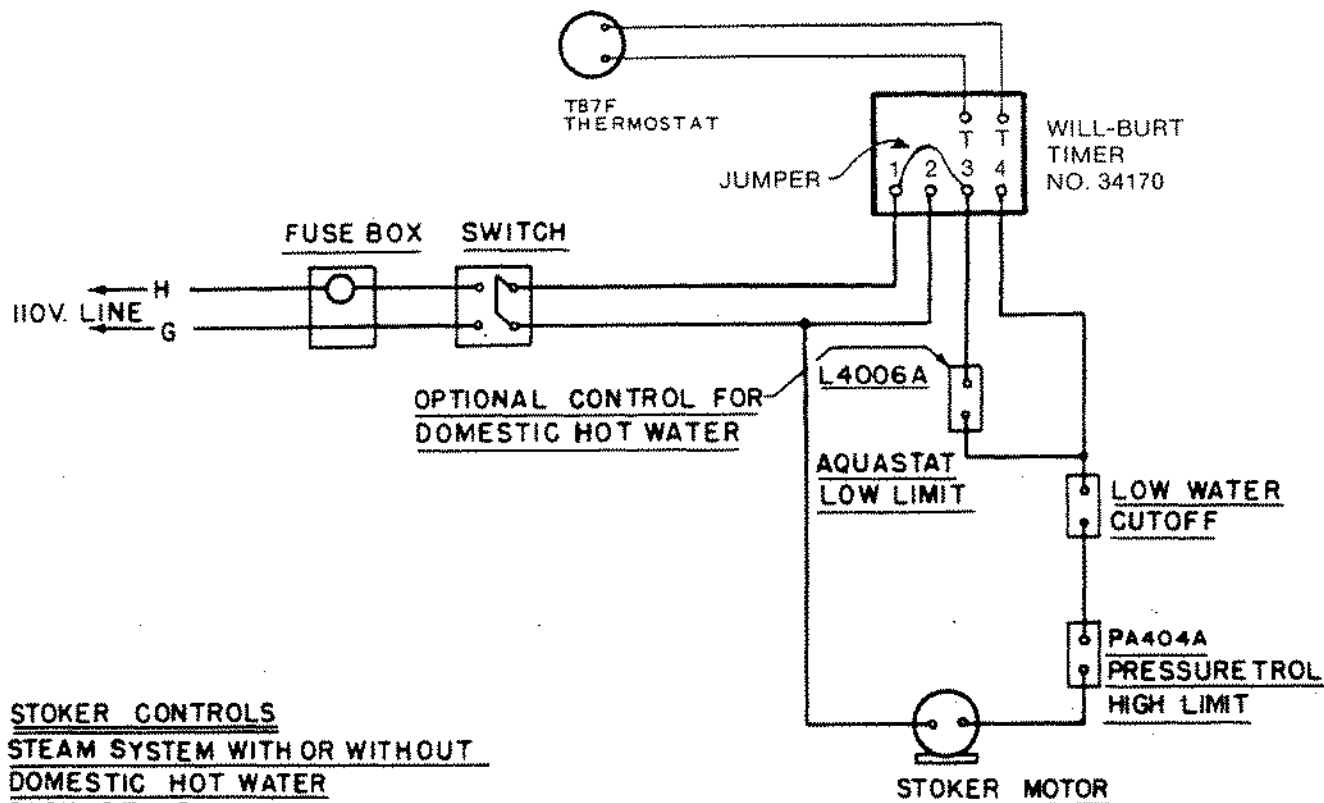
NOTE:  
DOTTED PORTION IS FOR ADDITIONAL  
ZONE IF DESIRED

ALL WIRING SHOWN IS FIELD WIRING  
THERMOSTAT TO TT ON AQUASTAT IS 24 VAC  
ALL OTHER WIRING IS 120 VAC

Alternate wiring to use Honeywell L6006A Aquastat to sense water temperature drop and shut off stoker on an outfire condition. Set temperature setting 20° below the L8124A Aquastat operating control setting minus the differential setting. Differential setting on the L6006A should be 5°. The manual switch is for start up and is to be thrown in "open" position after boiler is up to temperature.



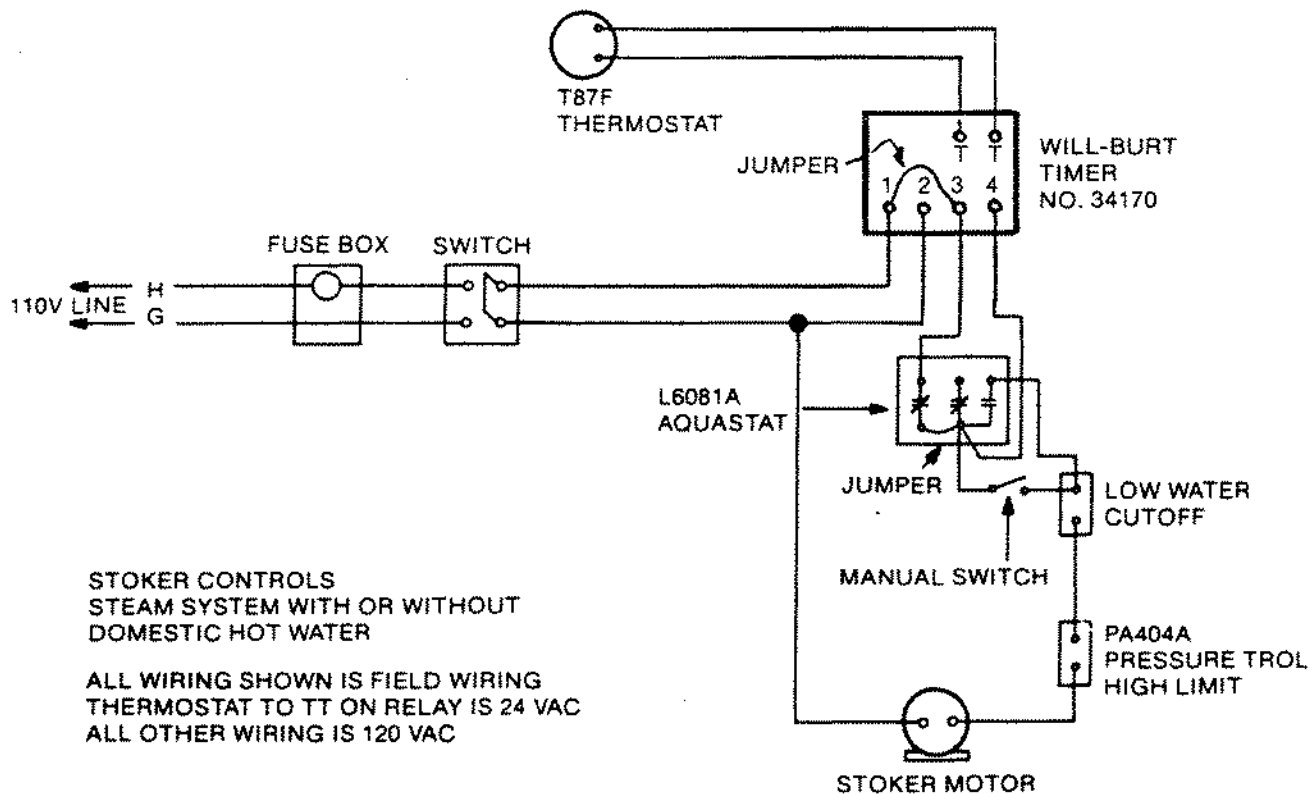
# STEAM SYSTEM



## STOKER CONTROLS STEAM SYSTEM WITH OR WITHOUT DOMESTIC HOT WATER PACKAGE NO. 1

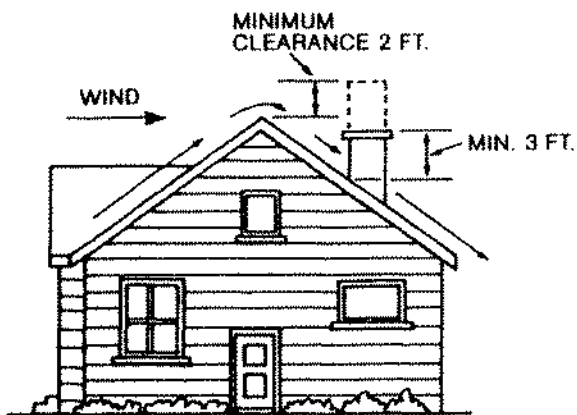
ALL WIRING SHOWN IS FIELD WIRING  
THERMOSTAT TO TT ON RELAY IS 24 VAC  
ALL OTHER WIRING IS 120 VAC

Wiring Diagram of Stoker Controls for Steam System Control Package No. 1 consists of thermostat, stokerelay, and low limit aquastat. The timer is set for two (2) minutes operation each hour. This may vary to suit the coal feed setting for 'hold fire' operation. The low limit aquastat is set for 150° to 160° to maintain a minimum boiler water temperature for domestic water supply. The high limit pressuretrol PA404A is set for 1 lb. to 3 lb. maximum on average domestic heating systems. Set differential of this control to suit job, as per M-H instructions. The low water cutoff should be installed in accordance with manufacturer's instructions.

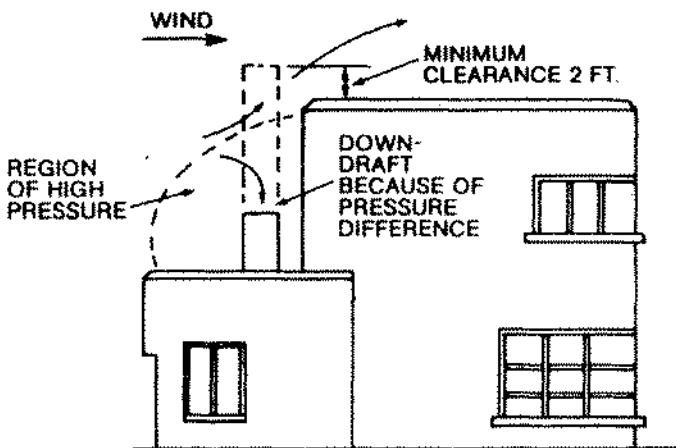


Alternate wiring to use Honeywell L6081A Aquastat to sense water temperature drop and shut off stoker on an outfire condition. Set temperature setting on Lo side of Aquastat at 30° below setting on Hi side. Set Lo side differential at 10°. The Hi side of the Aquastat is used to maintain boiler water temperature for domestic hot water. This outfire control will not apply where boiler water temperature is not maintained. The manual switch is for start up and is to be thrown in "open" position after boiler is up to temperature.

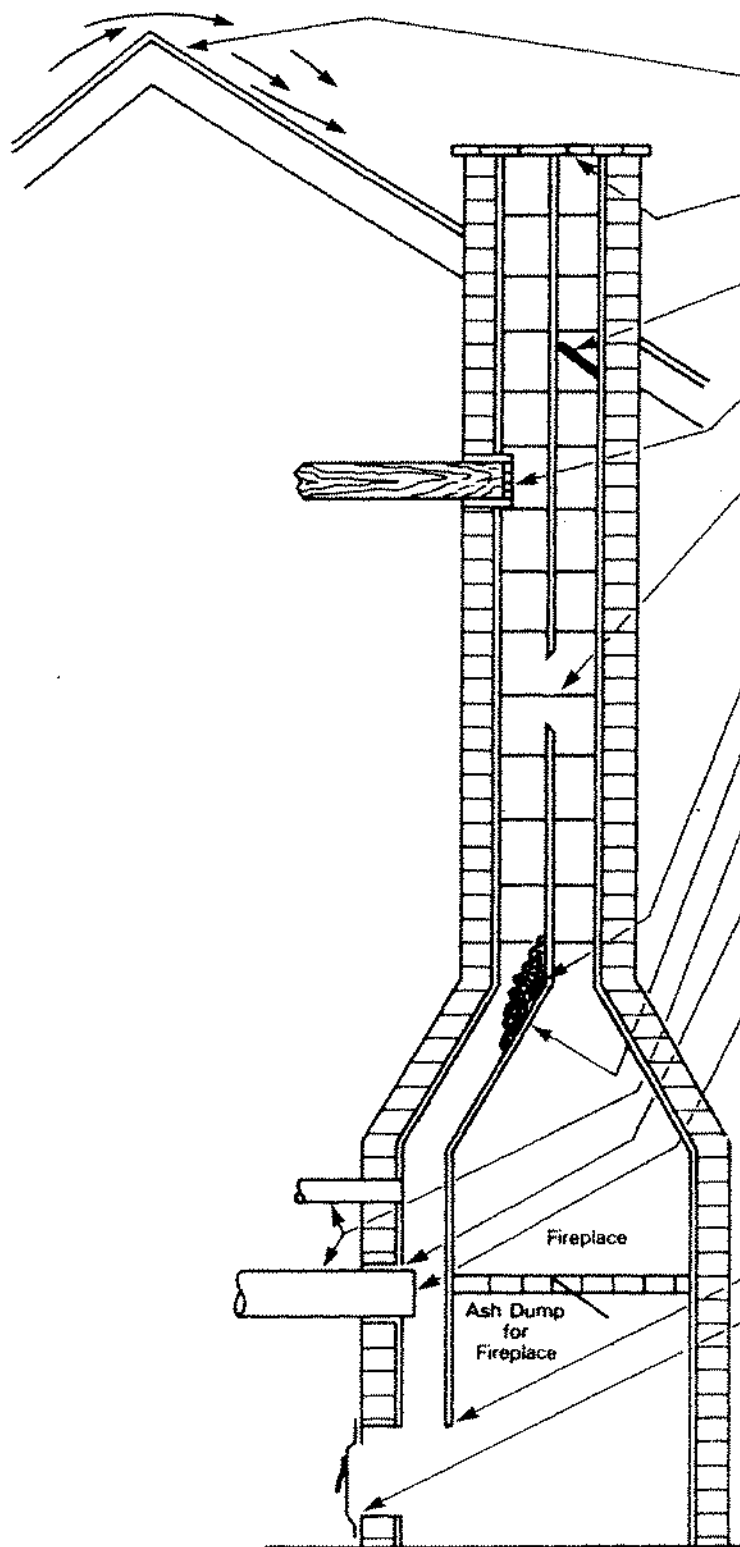
**TYPICAL CHIMNEY CONDITIONS APT TO  
RESULT IN BACK-DRAFTS**



**FIG. 10**



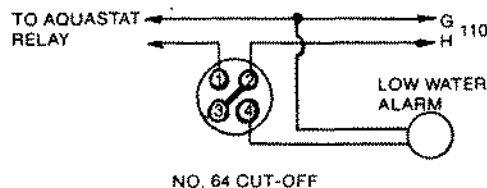
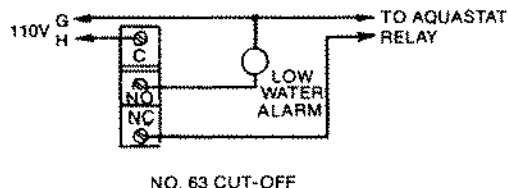
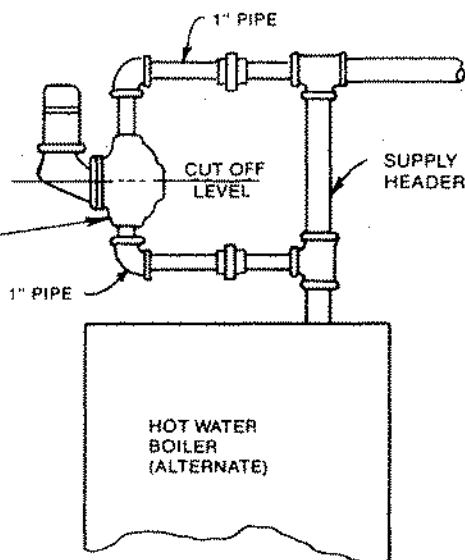
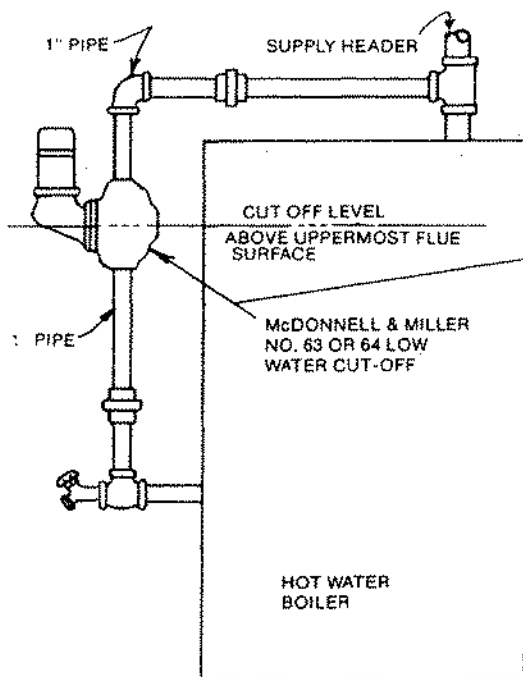
# COMMON CHIMNEY TROUBLES AND THEIR CORRECTIONS



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

FIG. 12

# INSTALLATION OF LOW WATER CUT-OFF ON HOT WATER HEATING BOILERS



## WIRING DIAGRAMS

Low Water Cut-Off Must Be Ahead Of All Controls In Control Circuit

## DF520 SPECIFICATIONS

OUTPUT PER HOUR						HT. SUR. SQ. FT.	OUTLET SIZE	RETURN SIZE	RECOM. CHIMNEY SIZE	COIL GPM	APPOX. SHIPPING WEIGHT
STOKER TEETH FEED	POUNDS COAL PER HR.	GROSS OUTPUT BTUH	NET OUTPUT BTUH	FT. STEAM NET	FT. WATER NET						
1	2½	21470	18670	78	124	28.3	3"	2"	8" x 8" x 30'	5	1250
2	5	42940	37340	156	249						
3	7½	64400	56000	233	373						
4	10	85870	74670	311	498						
5	12½	107340	93340	389	622						
6	15	128810	112010	467	747						
7	17½	150280	130680	545	871						
8	20	171750	149350	622	996						
9	22½	193220	168020	700	1120						
10	25	214690	186690	778	1245						
OIL	1.5 GPH	157000	137000	571	913						

**TABLE 1**

APPROXIMATE AIR SETTINGS FOR STOKER										
Coal Feed Teeth	1	2	3	4	5	6	7	8	9	10
Points on Air Indicator	1¼	2½	3¼	4	4½	5¼	6	6½	7¼	8

**TABLE 2**



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