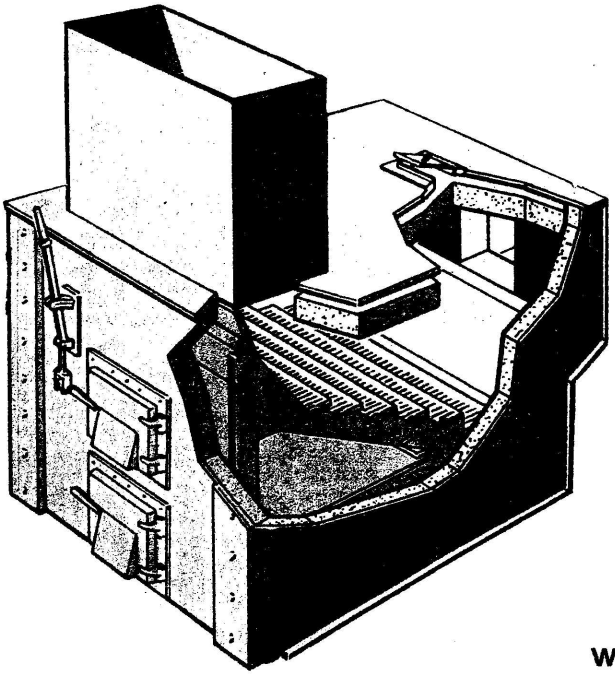
Updated: 11/18/2023

THE CONIFER

WOOD BURNING SYSTEM

In Operation Since 1920



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FEBRUARY 1961

THE "CONIFER" SAWDUST BURNER

The "Conifer" Sawdust Burner is a self-contained unit designed for attachment to the front of any ash pit-equipped heating plant in the same manner as a coal stoker or oil burner. The sawdust burner consists of a heavy metal box with an opening in the top, on which rests a sheet metal hopper containing the fuel supply. Inside the metal box are the grates and the ash pit-door opening. The firebrick lining is then installed so as to form a continuous passageway to conduct the fire from the burner grates to the heating plant firebox.

The "Conifer" Sawdust Burner is simple to operate and maintain, since neither electrical nor mechanical power is required for operation. The fuel is fed by gravity from the hopper onto the grates. Regulation of the draft determines the rate of heat release and fuel consumption. As long as there is fuel merely smolders. The drafts can be regulated manually or automatically, the latter being achieved by electric thermostatic controls which can be added by the user.

"Conifer" Sawdust Burners are designed to use the waste material that is formed when logs are cut into lumber at the sawmill. This waste is in two forms: 1. "Sawdust", which is a product of the head saws, and, 2. "Hogged Fuel", which is small pieces of wood waste such as blocks, slabs, etc., sent through a machine called a "Hog" and sliced into chips about the size of a silver dollar. Sawdust is normally consumed by the household size burner, and the hogged fuel by the larger commercial size burner. Another very popular form of fuel is "chip mix", which is sawdust and hogged fuel combined in the ratio of 75% sawdust and the balance hogged fuel.

Fine resaw sawdust and planer shavings from kiln dried lumber (such as produced by furniture of woodworking plants) will not work satisfactorily in the burner because it is so light in weight by volume that gravity cannot make it feed from the hopper onto the grates. Also, being excessively dry, it burns so fast that it becomes uncontrollable. Any fuel whose natural moisture content is 40% to 60% and is coarse cut, will burn satisfactorily in the "Conifer" Sawdust Burner.

For the most satisfactory results, the fuel should be kept under cover so that it will not absorb moisture from the weather. Fuel that has been piled outdoors so that the elements can beat down on it through more than one winter becomes waterlogged so that it deteriorates. Fuel that has been exposed only through one winter, however, will only become waterlogged to a depth of 6 to 12 inches below the surface (depending upon the porosity of the pile) and the portion below the surface (depending upon the porosity of the pile) and the portion below this level is useable as a rule. The waterlogged portion of the fuel can be salvaged by spreading it out on the basement floor and letting it air dry and then mixing it with the useable fuel. Another method is to mix the wet fuel with any kiln dry sawdust or planer shavings that might be available.

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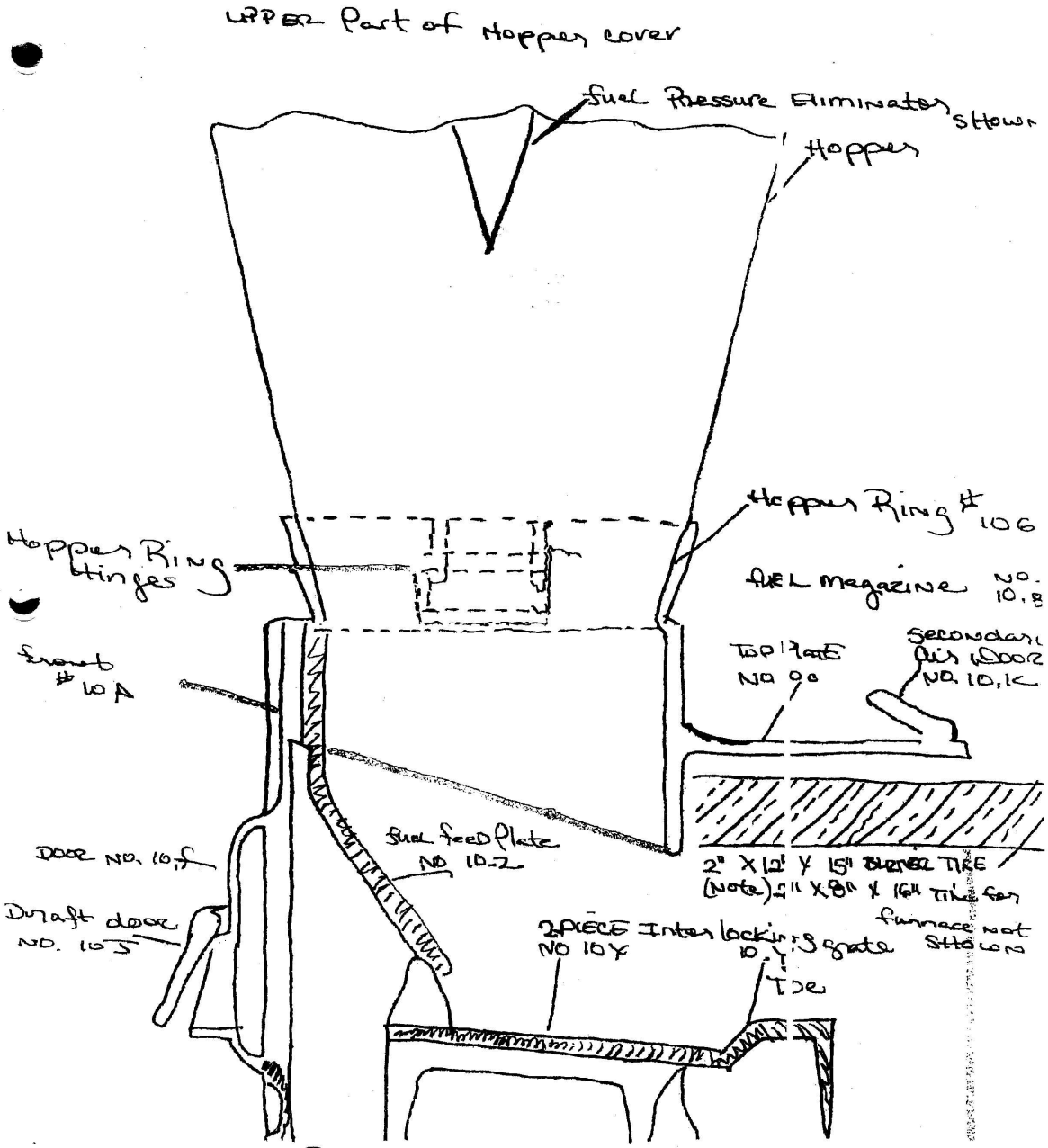

Section Thru No. 10
Conifer Sawdust Burner

3

INSTRUCTIONS FOR INSTALLATION OF "CONIFER" NO. 12 SAWDUST BURNER

1. Remove the grate assembly, including the grate shaking mechanism, from the furnace or boiler to which the burner is to be attached.
   NOTE: On warm air furnaces, remove the ash pit door.
   On boilers, remove the boiler base front.

2. Check the burner and see that the tie-rods at the bottom are tight and that the sides are evenly spaced, using the distance between the sides where they are bolted to the burner front as a gauge. Tighten the bolts holding the sides to the front also, as they may have worked loose during shipment.

3. Place the burner body in position and center it against the ash pit doorway, or as close as the furnace will allow, and set the hopper it to make sure that the furnace pipes or other projections do not interfere with the burner as placed or the tipping of the Hopper after it is installed.

   After the burner has been spotted into place, draw or scratch its outline on the concrete floor if the basement. The burner and hopper may then be set aside so that the furnace brickwork may be installed.

4. Line the metal floor of the furnace completely with one layer of firebrick laid flat. All firebricks in the furnace are to be laid up with high-temperature cement. If the metal floor of the ash pit slopes at the ash pit doorway line it with split firebrick so it is level with the rest of the brick floor.

5. Line the furnace ash pit sides up to the bottom of the furnace firepot with firebrick placed on end on the firebrick floor and flatways to the metal sides of the ash pit.

   Start the brickwork diametrically opposite the ash pit doorway and work along each Side (on round ash pits) toward the doorway. The brick should be laid to break the Joint at the point where the burner joins the furnace or boiler.

   Pack the space on top of the brick at the bottom of the furnace firepot, with high-Temperature cement so flames cannot get in the space between the brick walls and The metal wall of the furnace ash pit. SEE FIGURE 2.

6. Line the ash pit doorway of the furnace firepot with brick to support one of the two Firebrick tile. The tile in the furnace should meet the tile in the burner, and serve to Keep the fire away from the thin metal roof of the ashpot doorway. The thin metal of the ash pit as a whole must be completely protected with firebrick as it is not designed to withstand direct fire like the heavier firepot.

If the ash pit doorway is very low in height, the burner should be dropped into a concrete pot in front of the furnace to allow the two tiles to meet. Seal the space between the furnace tile and the doorway roof with the cement. Use just enough cement at the edges to keep the fire from reaching in between the tile and roof. SEE FIGURE 2.

7. As shown on the blueprint, excavate in front of the furnace for the burner ashpit and construct a wooden form, taking care to have the form exactly centered to the doorway and running lengthwise of the burner. Pour concrete around the form and let it set overnight.

8. After the concrete has set and the form removed, dismount the three top plates, No. 12-L, No.12-A, and No.12-DD, and set the burner shell in position against the furnace.

   Hook the two grate supports No. 12-K over the two tie rods. Space them 12-3/4" apart outside to outside. by doing this, the supports will act a gauge to space the brick walls in the burner 12-3/4" apart. (SEE FIGURE 1) Make sure that the flat sides of the grate supports face each other.

   Remove the shaker handle from the right-hand side of the burner shell by unbolting the cover plate No. 12-Z situated between the burner side and the handle, and set the four grate bars No. 12-C, No. 12-B-1, No. 12-C in the grate supports as shown in figure 3 of the blueprint.

   After the grates are installed, bolt the shaker handle back onto to the burner shell, making sure that it fits into the socket on the end of the shaker grate No. 12-B-1.

   Connect the shaker grate No. 12-B-1 and the rocker grate No. 12-B together with the link No. 12-M.

   Note the shaker handle can be mounted on the left-hand side of the burner shell and the two center grates No.12-B and 12-B-1 reversed for left hand operation, if desired.

9 The burner firebrick walls are 2-1/2" thick and are made by bricks laid on edge. It will be necessary to cut out the bottom course of brick to fit over the tie rods and shaker handle shaft. The bricks should be laid up in high-temperature cement.

   Space the walls 12 ¾" apart. SEE FIGURE 1. Fill the space between the stationary grate nearest the furnace and the furnace base with firebrick lay flat, taking care to completely cover the concrete floor and the metal parts of the furnace bottom. SEE FIGURE 3.

10 After the brick walls are built up to the height of 11- ½", place the burner tile on them. This tile must butt against the furnace tile and be flush with the inside surface of the vertical top plate, No. 12-A. The two tile must be cemented together so that there will be no air leakage between them. SEE. FIGURE2.

Fill the empty space between the cast iron sides of the brickwork with the insulating material until it is level with the top of the burner tile.

Block off the air space over the burner tile at the furnace-end, and sides of the burner, with high temperature cement. SEE FIGURE 2.

Smear the edge of the back top plate, No. 12-DD, with the high temperature cement and bolt into place, making sure that the secondary air port is nearest to the furnace.

Smear the edges of the vertical top plate No. 12- A with the same cement, bolt it into place with the top, and bottom flange pointing to the furnace. Continue the brick walls on up level to where the top plate No. 12-L bolts on.

Notch out the top layer of the brick to allow clearance for the two pads, and the flanges on the under side of the top plate, and use the insulating material to fill the space behind this brickwork. Do not let the insulation material run onto the top of the burner tile, NOR fill the secondary-air space above the burner tile.

Smear the edges of the top plate No. 12-L with high temperature cement and bolt it into place. Make sure that the hopper hinges on top of this plate are toward the front of the burner.

11 Place the right-hand and left-hand feed plate supports No. 12-EE and No. 12-FF he No. 12-K grate support ends nearest the burner draft door. This feed plate supports are to be flat against the brickwork, and with the two flanges on each plate facing towards each other. Hook the lower slotted feed plate No. 12-GG on the lower sloping flanges of the feed-plate supports No. 12-EE and No. 12FF. Rest the upper feed-plate No. 12-HH in the top notches of the feed plate supports. Make sure that the thick edge and the smooth side of this plate are in the position shown. SEE FIGURE 3.

12 Install the adjustable baffle No. 12-E by threading the two studs furnished tight into the holes in the thin edge of the baffle. Place these baffle studs through the two holes in located in the top plate No. 12-L and near the edge that bolts to the vertical top plate No. 12-A. Be sure that the No. 12-E faces toward the vertical top plate.

Care should be taken to protect all the metal parts of the burner and furnace from direct contact with the fire. When completely and correctly installed, the burner and furnace should be so sealed that the only air admitted for combustion is through the draft door and the secondary-air port on the burner top.

If care is not taken to see that the top of the tile is blocked off where the burner joins the furnace, and also at the edge of the furnace firepot the secondary air will short circuit directly into the furnace and kill any fire. The secondary air must be forced to flow

across the burner tile towards the adjustable baffle No. 12-E and then down into the fire. The joint where the burner sides touch the furnace must also be airtight; otherwise, air leakage will kill the fire or draft. ANY AIR LEAKS BETWEEN THE FIRE ON THE GRATES AND THE TOP OF THE CHIMNEY WILL EITHER WEAKEN OR KILLL THE FIRE OR DRAFT. The foregoing rule applies with equal force to poorly fitted furnace doors or parts, rusted-through smoke pipes , or any cracks in then chimney or unused openings in the same.

14 The average installation of the No. 12 burner uses approximately:

50 firebricks
6 firebrick soaps
12 firebrick splits
50lbs. high-temperature cement

The firebrick and cement above-mentioned may be purchased from building material firms or boiler repair contractors.

IMPORTANT; STUDY THE BLUEPRINT MEASUREMENTS IN ORDER TO MAKE A CORRECT INSTALLATION

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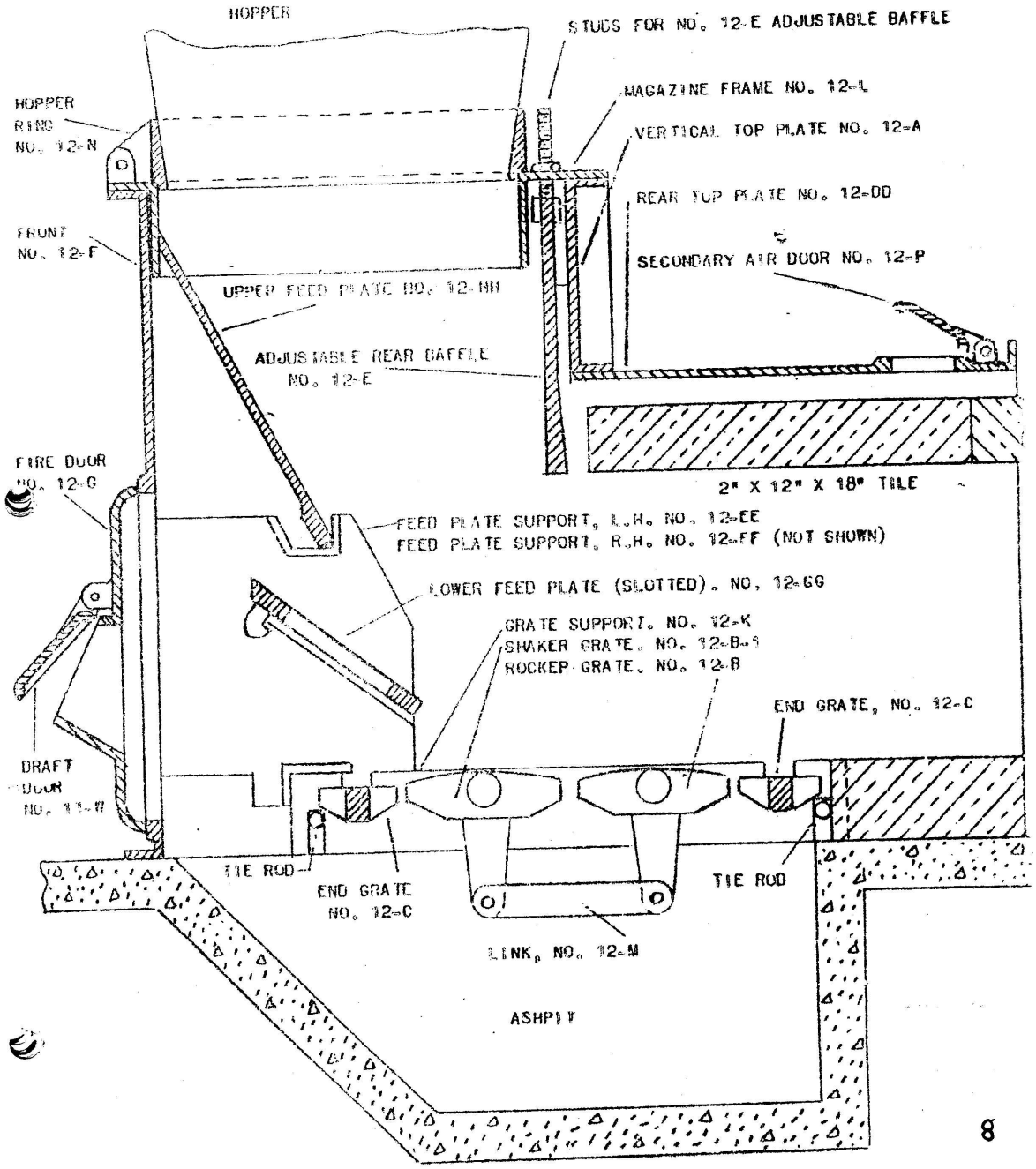

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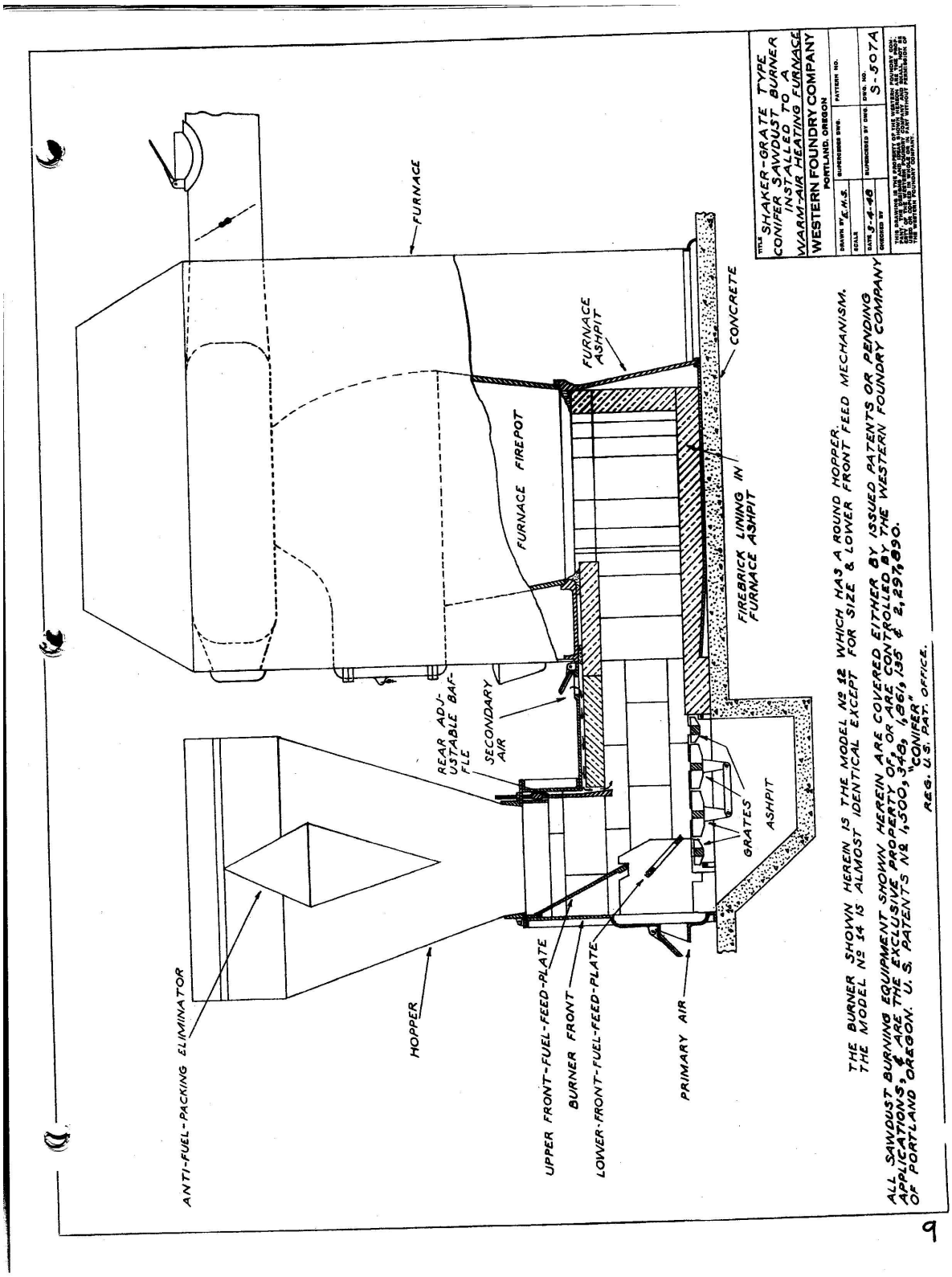


INSTRUCTIONS FOR OPERATING "S" TYPE CONIFER SAWDUST BURNER

TO START THE FIRE

1. Have the draft door closed.

2. Set the step grates so that they are tilted downward from the level postiton, leaving about ½" between grates. If the step grates are set too wide open or to flat, it will allow too much fire between the grates, causing them to burn out sooner than necessary.

3. Have the stack damper open.

4. Set the adjustable baffle in the clear up position. The adjustable baffle is used to control the depth of the fuel bed on the grates, the same as on a chain grate coal stoker.

5. Tip the hopper, crumple paper and place on the grate (together with kindling if sawdust is wet.) Add a small quantity of sawdust and light the paper. At the same time, put lighted paper in the boiler firebox to help start the draft and warm up the stack. After the paper in the burner is burning freely, add more sawdust slowly, being careful not to smother the fire. When the sawdust is burning freely, gradually add more sawdust until the fuel magazine is full, then open the draft door. The reason for keeping the draft door closed until the fire is lighted is that the air for starting the fire should enter through the fuel magazine and keep the smoke from billowing up through the magazine opening. This condition exists when the boiler is cold or the draft is sluggish.

TO ADJUST FOR PROPER FIRE

If the fire is smoky, the fuel bed is too thick, indicating that a deficiency f air exists. Lower the adjustable baffle gradually to thin the fuel bed, until the flame in the boiler becomes clear, meanwhile opening or closing the secondary air ports gradually by thumbscrew to help achieve the clear flame. If the fire is Sparky, raise the adjustable baffle gradually to thicken the fuel bed, as sparks indicate excess air.

Sawdust is a long-flaming, smoky fuel, the same as bituminous coal, thus overfire air through the secondary air ports is necessary for proper combustion.

After the burner has been adjusted, tip the hopper back into place on the fuel magazine and fill.

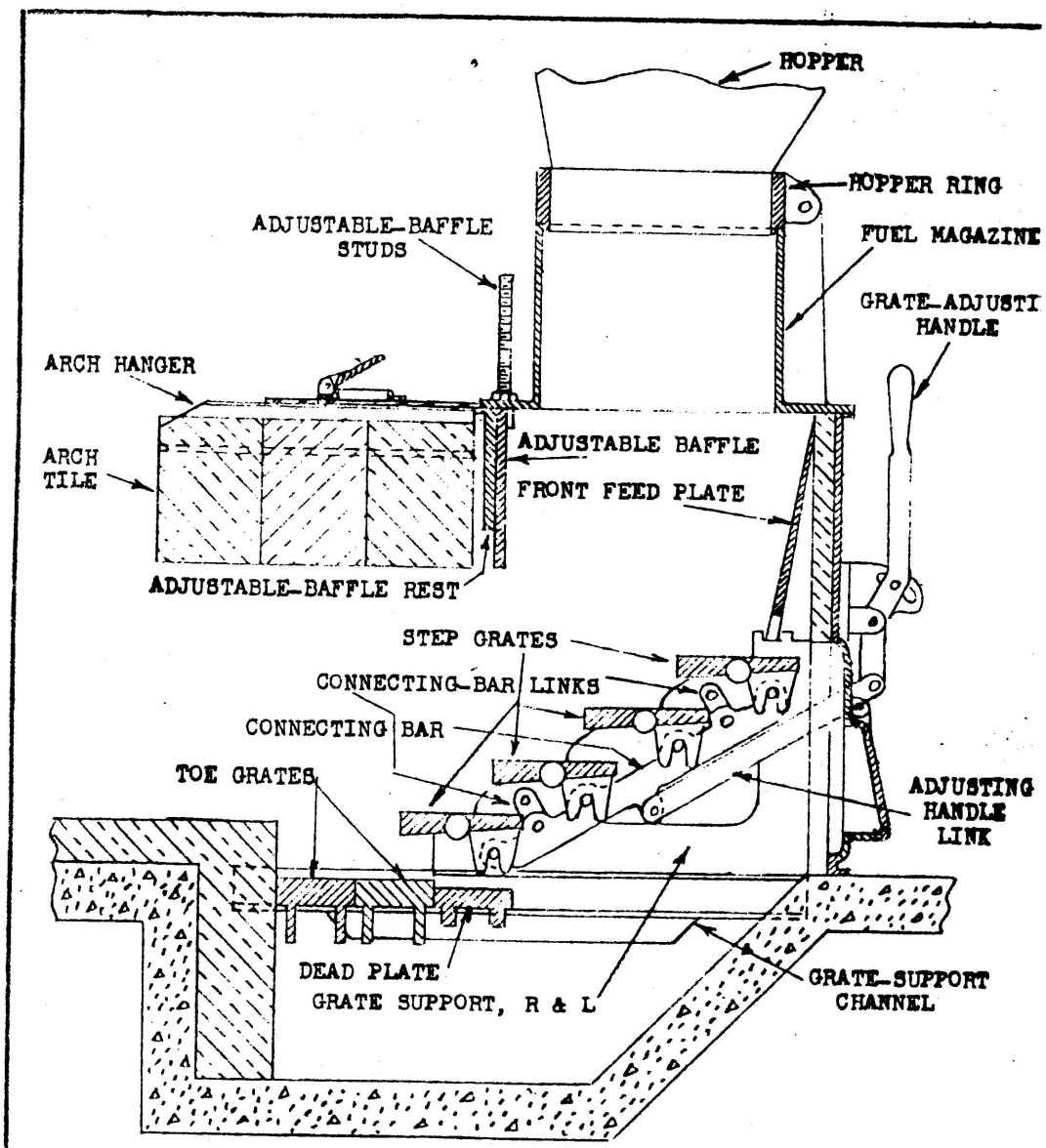
CARE OF BURNER

Do not allow ashes to accumulate or fill up in the ash pit under grates for this will cause them to warp and burn out. To clean out bvurner, lert the fire go out. Scrape the ashes from the grates into the ash pit. How often the burner needs cleaning will depend on the amount dirt, ashes and clinkers in the fuel, but it should be cleaned out at least once a week.

CAUTION: *Keep the top of the hopper covered at all times.*

11

Updated: 11/18/2023



CONIFER SAWDUST & HOGGED FUEL BURNERS ARE COVERED BY U.S. PATENTS NUMBER 1,500,348., 1,861,135 & 2,297,890.

WHEN ORDERING NEW PARTS, BE SURE TO GIVE THE QUANTITY DESIRED, THE CORREC NAME AS SHOWN ABOVE AND THE PROPER PART NUMBER AS GIVEN ON THE OLD PART. ALSO SPECIFY THE MODEL NUMBER OF THE BURNER.

DRAWN BY E.H.S.	TITLE: GENERAL PARTS DESCRIPTION FOR MODEL 21-S & 24-S CONIFER SAWDUST & HOGGED FUEL BURNERS	PATTERN NO.
SCALE		
DATE Rev. 1-14-55		DWG NO. S-559 12
CHECKED BY		

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INSTRUCTIONS FOR OPERATING "S" TYPE CONIFER SAWDUST BURNER

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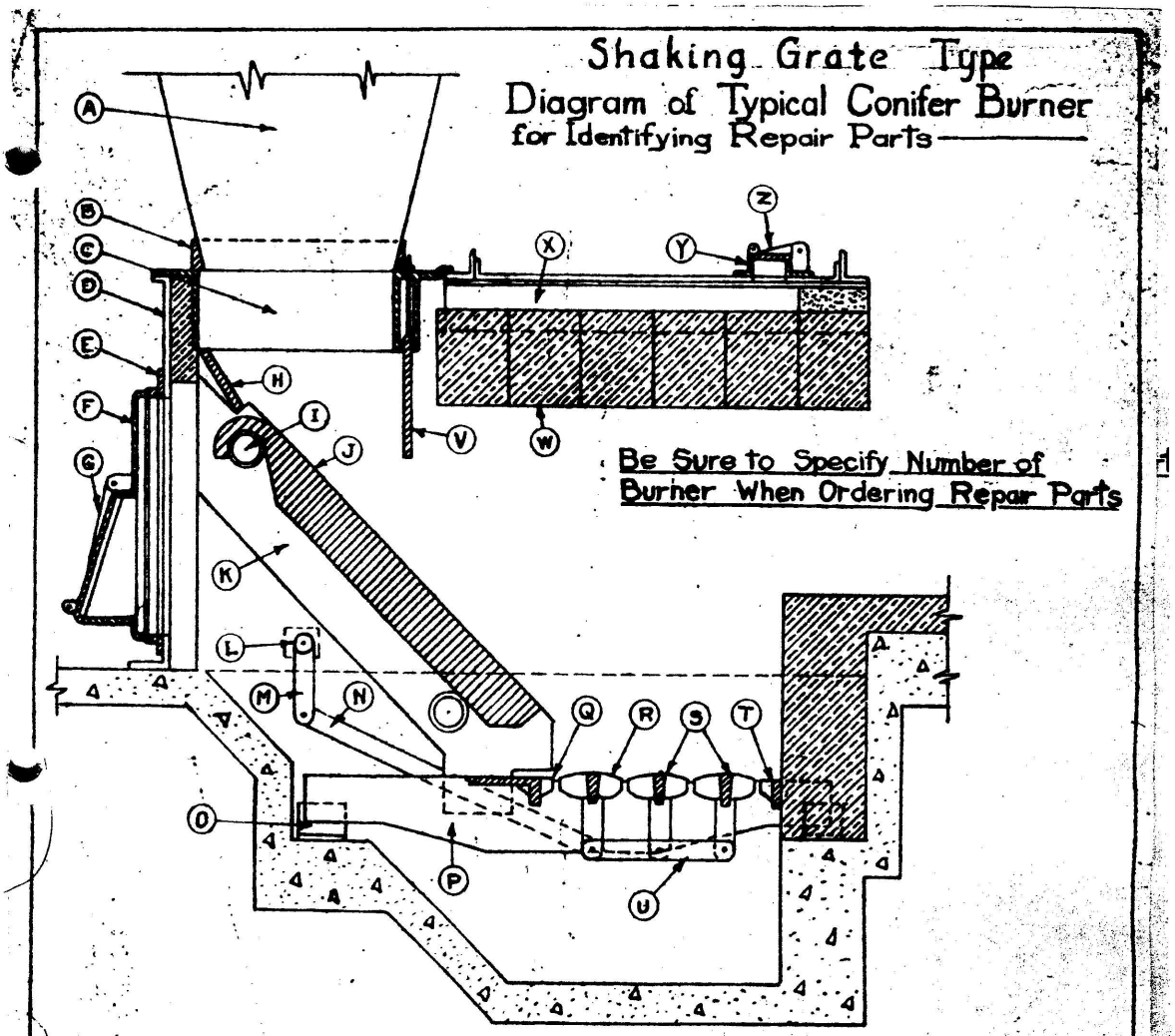

A	Hopper	N	Long Connecting Link
B	Hopper Ring	O	Support Bar Socket
C	Fuel Magazine	P	Shaker Grate Support Bar
D	Burner Front	Q	Front Stationary Grate
E	Fire Door Frame	R	Shaker Grate (Front)
F	Fire Door	S	Shaker Grate (Rear)
G	Draft Door	T	Back Stationary Grate
H	Front Feed Plate	U	Short Connecting Link
I	Finger Grate Cross Bar	V	Rear Adjustable Baffle
J	Finger Grate	W	Arch Tile
K	Finger Grate Side Support	X	Tile Hangers
L	Shaker Bearing	Y	Sec Air Door Frame
M	Shaker Toggle	Z	Sec Air Door

- MANUFACTURED BY -

[redacted]

DWG S-520

NOTE - CONIFER BURNERS - ARE COVERED BY U.S. PATENTS
No. 1,500,348
No. 1,861,135
Other Patents Pending

14

Updated: 11/18/2023

HERN IRON WORKS

GREY IRON FOUNDRY PATTERN SHOP MACHINE SHOP

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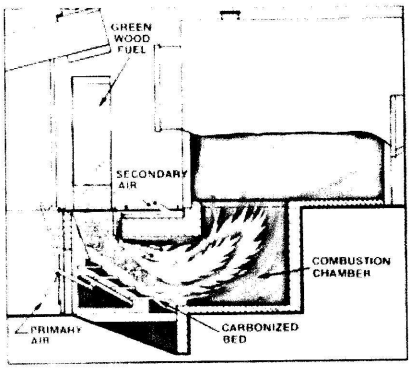
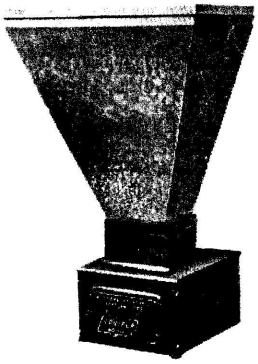
Contact: sales@hernironworks.com

This page was last updated on April 21, 2003

CONIFER SAWDUST BURNER



Commercial Burner



No. 111 Home Furnace Unit

2-3 weeks
2-3 day
most often US freight
150 lbs
~~$1,485~~
$1,485
400
$2,625

ESTIMATING & DATA SHEET FOR SELECTION

BURNER MODEL NO. (1)	GRATE WIDTH INCHES (2)	GRATE AREA SQ. FT. (3)	OUTPUT TO HEATING UNIT BTU'S PER HR (4)	BURNER HORSE POWER (5)	RADIATION IN SQ. FT		STACK OR CHIMNEY SIZE			HOPPER CAPACITY CU.FT (11)	NET SHIP WT. (12)	AVG. NO. FIREBRICK TO LINE BURNER & ASHPIT			AVG. NO. FIREBRICK TO LINE HEATING UNIT (16)
					STEAM (6)	HOT WATER (7)	DIA. IN. (8)	HGT. IN. (9)	AREA SQ. IN. (10)			SPLIT (13)	SOAP (14)	STD. (15)	
10	10.75	1.50	225,000	6.7	700	1125	8	30	50	7.0	250	4	3	15	20
11	11.00	1.80	270,000	8.2	840	1350	8	30	50	7.0	250	4	4	10	20
12	12.75	2.06	312,000	10.2	975	1560	8	30	50	8.5	400	-	6	21	25
14	16.50	3.44	510,000	15.4	1615	2580	12	35	113	12.3	575	-	4	28	35
21-S	18.00	5.00	750,000	23.4	2340	3750	16	35	201	15.3	800	12	-	50	130
24-S	22.00	8.00	1,400,000	41.8	4375	7000	18	40	254	18.9	1200	15	-	100	150
31-S	28.00	12.50	2,187,500	65.4	6850	10935	20	50	314	20.7	2400	24	-	175	240
41-S	32.00	15.00	2,625,000	78.4	8200	13125	24	60	452	22.9	3600	-	-	350	390
49-S	39.00	17.50	3,500,000	105.0	11000	17500	28	60	616	30.8	4200	-	-	360	425
51-S	45.50	30.00	6,000,000	179.00	18750	30000	30	60	706	53.6	6400	-	-	875	950
61-S	57.00	42.00	8,400,000	250.00	26250	56000	38	70	1134	64.0	8700	-	-	-	-

$30,750

Joel Brown

Have A $300

HAS

USE OF THE TABLE

Conifer 10, 11, 12, and 14 burners are mainly home furnace units, and Conifer S type sawdust burners are primarily designed for commercial and industrial use. The capacities indicated are based on use of western fir or pine sawdust or hogged-fuel averaging 40% moisture content. Fuel moisture content must be within 25% to 65%. Dry fuel must be wetted. Planer shavings are not recommended for hopper-fed burners unless mixed with at least 50% green sawdust or hogged-fuel.

Column No. 4: The capacities in this column are based on the following factors:

- Models 10 to 21-S : 150,000 BTU's per square foot of grate surface per hour
- Models 24-S to 31-S : 175,000 BTU's per square foot of grate surface per hour
- Models 41-S to 61-S : 200,000 BTU's per square foot of grate surface per hour

The above output ratings are based upon tests using fir sawdust having an average heating value of 4700 BTU's per pound of fuel as fired, a stack draft range of 0.09 to 0.11 inches of water and a stack temperature range of 500 to 700 degrees F.

Column No. 5: These figures are based on the factor that 33,472 BTU's equal one horsepower, and represent the rating each burner delivers to the heating unit.

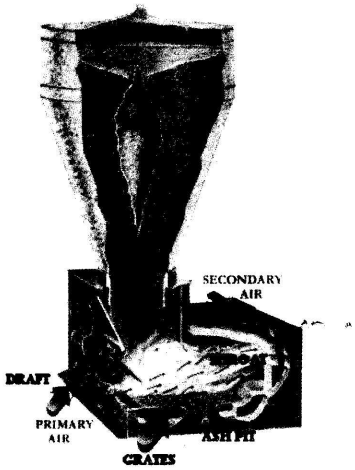
Columns No. 6 & 7: These figures represent the radiation each burner will safely handle under the fuel and draft conditions listed above. In many cases, old boilers installed prior to 1930 are either overloaded or underloaded. The latter condition usually prevails as all manufacturers had not adopted a uniform method of rating their equipment. If you are in doubt as to the rating of the boiler, it is suggested that you have a heating expert check the building, radiator, pipe lines and the domestic hot water supply to determine the total radiation on the boiler thereby enabling you to select the proper size burner needed.

Column No. 12: These figures represent the average net weight of the burner, arch tile and insulating material.

Columns No. 13, 14 & 15: These figures are average only.

Column No. 16: These figures are average only. The amount of fireback required will vary according to the type of heating unit to which the burner is to be attached. Other types of insulation equivalent to firebrick may be substituted.

NO.12 HOME UNIT BURNER : FEATURES



- **THE HOPPER**: The hopper is not supplied with the conifer burner because of shipping costs and individual installation requirements. The hopper which holds the sawdust or hogged fuel msut be securely fastened to the feeding ring with NO LEAKY JOINTS. Capacity should be approximately 9 feet of fuel. The hopper mustbe fitted with tight cover and is hinged to allow easy access to furnace or burner.

  The adjustable feeding baffle feeds a varying depth of fuel to suit conditions of fuel and draft. Fine hogged fuel or sawdust burns equally well with free feeding from the hopper.

  The pressure eliminator, suspended in the fuel magazine, eliminates packing of the fuel and positively assures a constant even flow of the sawdust or hogged fuel to the fire area.

- **THE THROAT**: The throat leading to the furnace directs the hot burning gases to the bottom of the furnace. This secures a longer heat travel with greater heat radiation.

- **THE DRAFT**: The draft regulation of the CONIFER is controlled by a gravity-operated door set on the ash door pit.

- **THE ASH PIT**: Very little ash residue is left from the fuel as consumed by the CONIFER. The ash pit is ample in size, and is easily cleaned through the ash pit door.

- **THE GRATES**: The grates are extra large and heavy, giving a very large grate area, available for extreme firing requirements. The grates are quickly accessible for inspection when necessary. Lever shaker is provided for quick

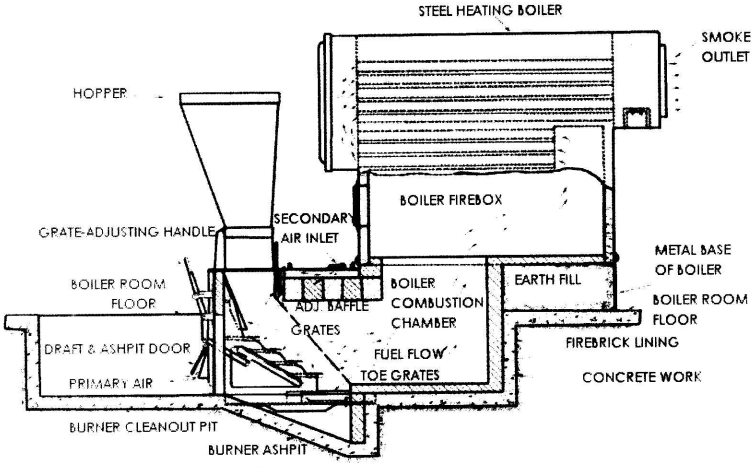
removal of the slight ash residue.

- **PRIMARY AIR**: Even draft is secured by the primary air which is deflected to all grate area.

- **SECONDARY AIR**: The secondary air is introduced at the entrance of the throat to the furnace. This secondary air is pre-heated and is mixed with the burning gases from the CONIFER in just the proper proportion to secure complete combustion.

The commercial sizes of conifer burners operate on the same principles as the home furnace units.

TYPICAL INSTALLATION OF AN "S" TYPE CONIFER SAWDUST & HOGGED-FUEL BURNER ON A STEEL HEATING BOILER



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Please contact us for details: 1-800-228-7794 208-765-3115 Fax: 1-208-664-8540
Or contact Sales : Jack Weigman *(We will get back with you within 24 hours.*
If you do not hear back from us, it could be that we did not receive your email.
Please give us a call. Thank you.)

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