USER MANUAL

HALF PINT EVAPORATOR

LEADER™
WE HELP YOU GET MAPLE DONE

LEADER EVAPORATOR
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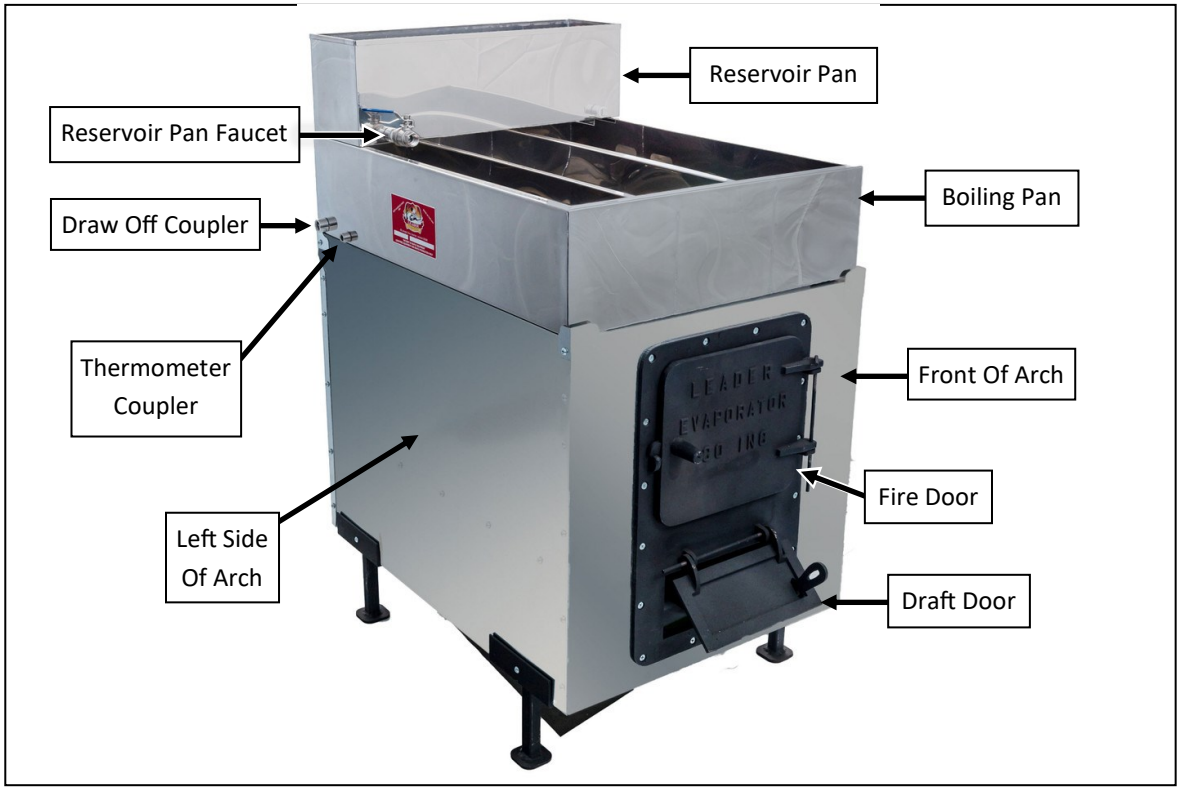
TABLE OF CONTENTS

INTRODUCTION

◊ The Half Pint evaporator is named for its small size. It is specifically designed for the hobbyist maple sugar maker with 15 to 50 taps while keeping the continuous flow, reverse feed operation of the larger evaporators.

◊ The evaporator pan is made of stainless steel and divided into three sections. A reservoir pan allows for manually feeding preheated sap into the evaporator pan while maintaining boil. The redesigned arch is made from 18-gauge galvanized steel, with a cast iron door and steel legs.

◊ As you boil the evaporator will collect residual materials of sugar sand and niter especially in the compartment of the evaporator where the syrup is being finished – where the liquid is hottest. Over time the pan can scorch where there is a buildup of sand. The reverse flow capability of the half pint allows you to change the direction of sap flow allowing the evaporator to "wash" the sand and niter out of the pan.



PARTS LIST

User Manual


Qty: 1 x Brace "J"


Qty: 1 x Brace "I"


Machine Screws
Qty: 22 x *1/4-20 x 3/4"*


Qty: 66 x Hex Nuts 1/4-20


Machine Screws
Qty: 44 x *1/4-20 x 1/2"*


Qty: 1 x Grate Assembly

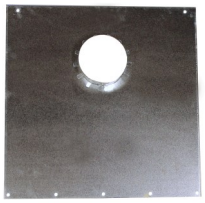

Qty: 4 x Steel Legs


Qty: 1 x Brace "G"


Qty: 1 x Left Side Panel


Qty: 1 x Right Side Panel


Qty: 1 x Bottom Panel


Qty: 1 x Back Panel


Qty: 1 x Front Panel


Qty: 1 x Draft Latch


Qty: 1 x Draft Latch
Bolt & Nut


Qty: 1 x 1/2" SS
Ball Valve


Qty: 1 x 1/2" Close Nipple

STARTUP KIT PARTS AND SUPPLIES

The following section lists the parts for the **Half Pint Startup Kit**. The Half Pint Startup kit contains all the parts needed to complete the setup of the Half Pint Evaporator. *The following parts can be ordered as a kit or individually as listed:*

Qty: 32 x Full Fire Brick
Qty: 63 x Half Fire Brick

Rail Gasket
1/2" x 2" x 25' Roll

Galvanized Elbow 6"

Refractory Cement

1/2" Close SS Nipple

Qty: 2
1/2" SS Ball Valve

Galvanized Smoke Stack 6" Qty: 3

◊ If installing a LEADER Half Pint Extension Kit reduce the number of bricks by 2 to 30.
◊ If *installing a LEADER Half Pint Extension Kit reduce the number of bricks by 18 to 45.*
The quantity of bricks needed for the Half Pint Extension is specified in the document for that equipment.

OPTIONAL PARTS AND SUPPLIES

Defoamer

Test Cups

Hydrometer

Firing Gloves

Thermometer

Skimmer

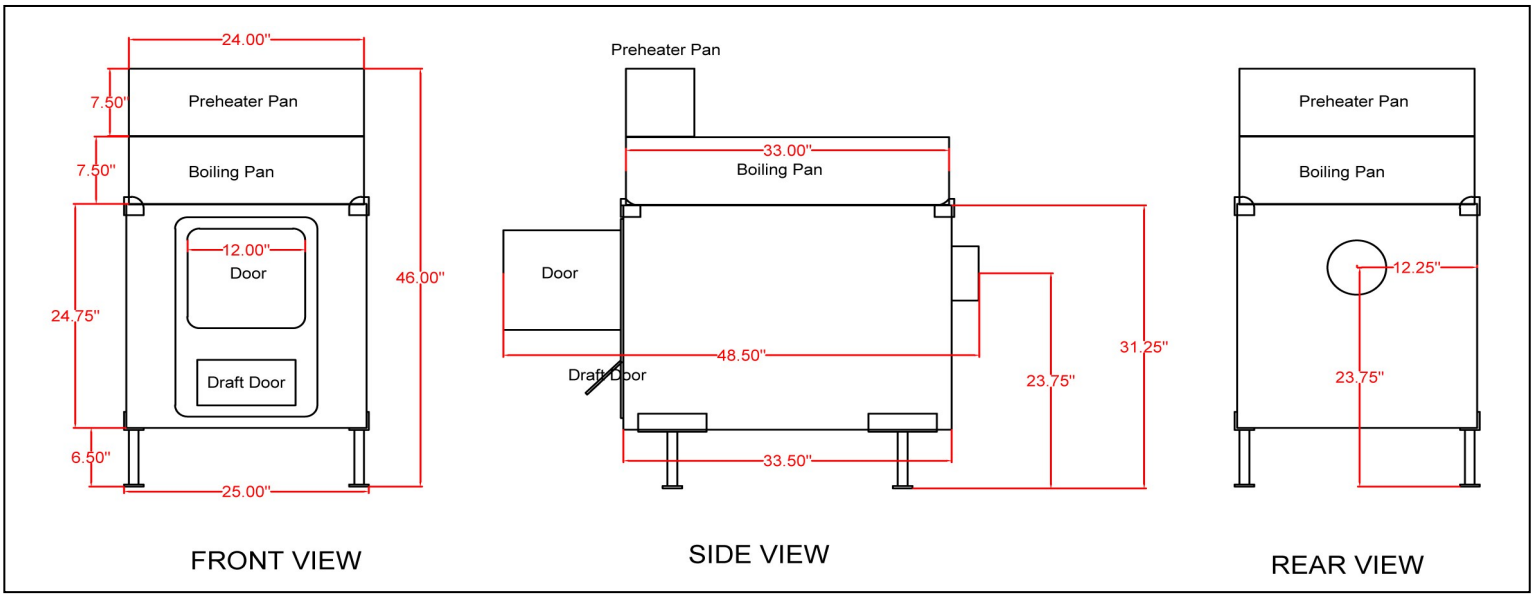
Grading Kit

Pan Cleaner

SETUP

NOTE: This document pertains to the setup of a standard Half Pint Evaporator. However, there are statements included which should be observed if you are also adding a Half Pint Extension Kit.

DIMENSIONS



ASSEMBLY NOTES

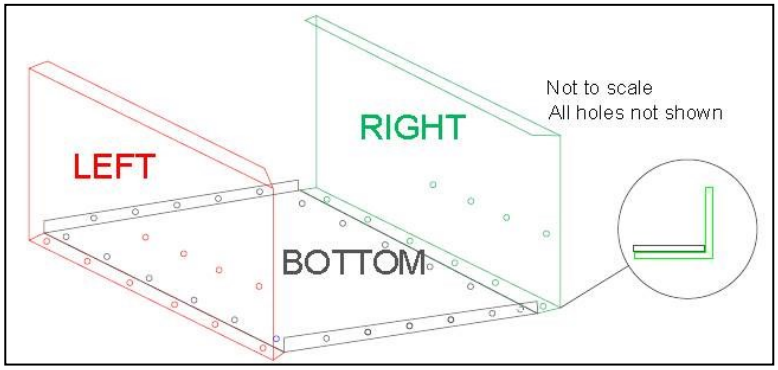
◊ Assemble the arch close to the location where it will be used.
◊ The following pictures were taken of an already fully assembly ½ pint arch and are used for illustration purposes.
◊ Except where indicated use ¼"-20 X ½" bolts for assembly.
◊ Bolts should be inserted into arch so the heads are exposed and the threads are inside the arch unless otherwise indicated.
◊ Finger tighten bolts unless otherwise instructed.

ASSEMBLY STEPS

STEP 1

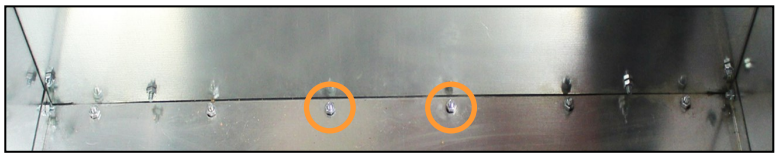
Mount Left and right panel to the bottom panel. Fasten with ¼”-20 X ½” bolts and matching nuts with the bolt heads on the outside of the arch. Finger tighten the bolts.

a. Mountings holes are only in the bottom flange.
b. Flanges on the bottom of the sides are mounted under bottom panel.



STEP 2

Mount bolts in only the two middle holes of each side.



STEP 3

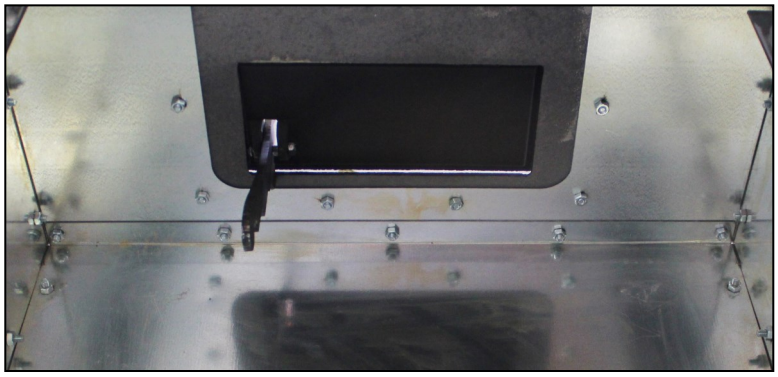
Raise and support the arch up approximately 8” up from the working surface.

a. Use ¼”-20 X ¾” bolts to mount the legs onto the arch. The bolt heads should be outside of the arch. The mounting holes are located one in each side corner and two in each bottom corner. Tighten these bolts with a screwdriver and a 7/16” wrench.
b. Remove the supports and place the arch upright on its legs.

STEP 4

Mount front panel with ¼”-20 X ½” bolts and matching nuts with the bolt heads on the outside of the arch. Finger tighten the bolts.

a. The left and right sides so the flanges of the front panel are outside the left and right sides.
b. The upright flange of the bottom panel should be behind the front panel.

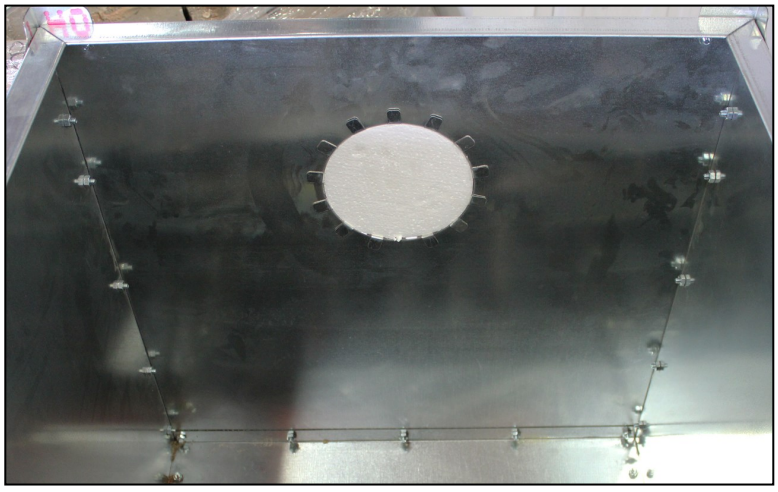


STEP 5

If you are adding a Half Pint Extension Kit skip Step 5 and continue with the Half Pint Extension Kit document for the assembly and attachment of the kit. Return to Step 6 when that is complete.

Mount back panel with ¼”-20 X ½” bolts and matching nuts with the bolt heads on the outside of the arch. Finger tighten the bolts.

a. Back panel flanges go outside the left and right side panels
b. The bottom panel flange goes outside the back panel



ASSEMBLY STEPS CONTINUED

- ◊ All parts assembled so far should be mounted together with bolts that have been finger tightened.
- ◊ Square one corner using a carpenter's square and tighten all the bolts in that corner. All flanges should align. Repeat until all four corners are complete.
- ◊ Tighten all remaining installed bolts.

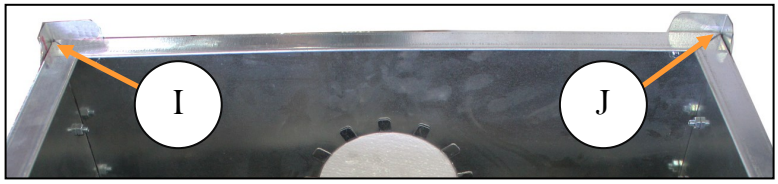
STEP 6

Use ¼"-20 X ¾" bolts and associated nuts with bolt heads outside of the arch to mount a grate rail to the left and right sides. The grate rails should be mounted with the angle iron pointed down. Prior to tightening the bolts, pull the grate rail as high as possible on the side panel then tighten the bolts with a screwdriver and 7/16" wrench.

STEP 7

Install the corner brackets with ¼"-20X ½" bolts and matching nuts with the bolt heads on the outside of the arch.

a. Bracket "I" to the front right and the back left
b. Bracket "J" to the front left and the back right. Brackets must be installed correctly for the fittings of the boiling pan to set on the arch.



If you have assembled the Half Pint Extension Kit, the rear corner brackets will already be installed.

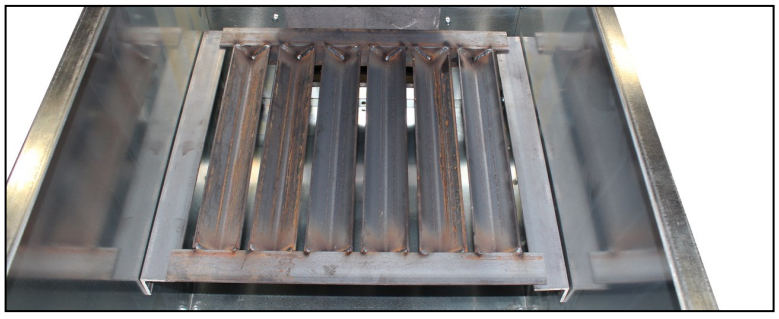
STEP 8

Install the draft door latch using the 10-24 X 1-1/2" bolt and nut.

a. The notches in the latch should be pointed towards the front of the arch.
b. To ease the installation you may remove the door by pulling the hinge pin that connects the door to the arch front.

STEP 9

Install the grates assembly. The edges of the grate assembly are placed on the grate rail. The "V" grooves of the grates will be parallel to the sides of the arch. Grates should be installed so the "V" groove is up. In other words the opening of the "V" will be in a position to catch and fill with ashes.



POSITIONING AND INSULATING

POSITIONING

1. Place the arch on a stable surface. Use a 4 foot level and level the arch front to back and side to side. Shim the legs as necessary using metal shims. Shims are not included. NOTE: If using the LEADER Half Pint Extension Kit ensure all 6 legs are supported on the floor.
2. Place the boiling pan on the arch so it rests between the corner brackets (dividers run front to back) and recheck the level.
3. Install the elbow and stack. The half pint evaporator requires a 6" 90° elbow and 6" smoke stack. Install at least 3 three foot lengths of stack.
4. Remove the boiling pan and grate then brick as described in the following directions.

INSULATING

NOTES:

◊ Fire bricks and cement used should be rated for 3000°F

◊ To apply cement, completely skim coat the metal of the arch where the brick is to be installed. Put about 1/8" on each edge of the brick to be installed and a skim coat on the side facing the metal.

◊ As you install the bricks, smooth the cement that will be forced from between the bricks.

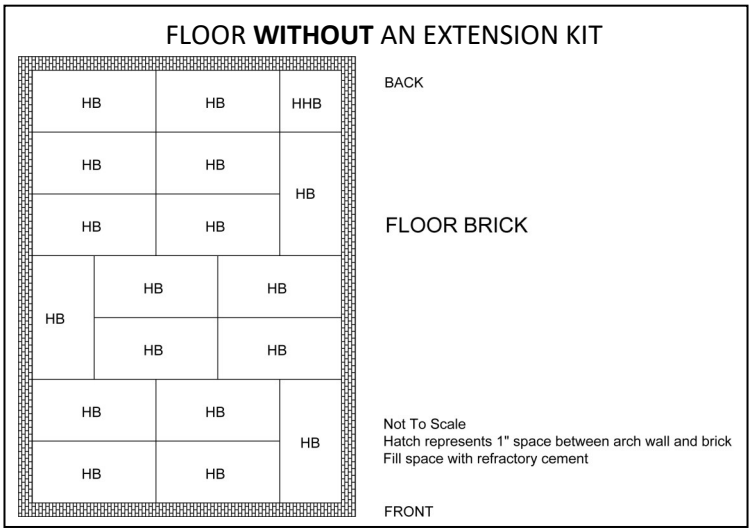
◊ After completing the bricking, allow the cement to dry at room temperature (approximately 65°F) for 36 hours.

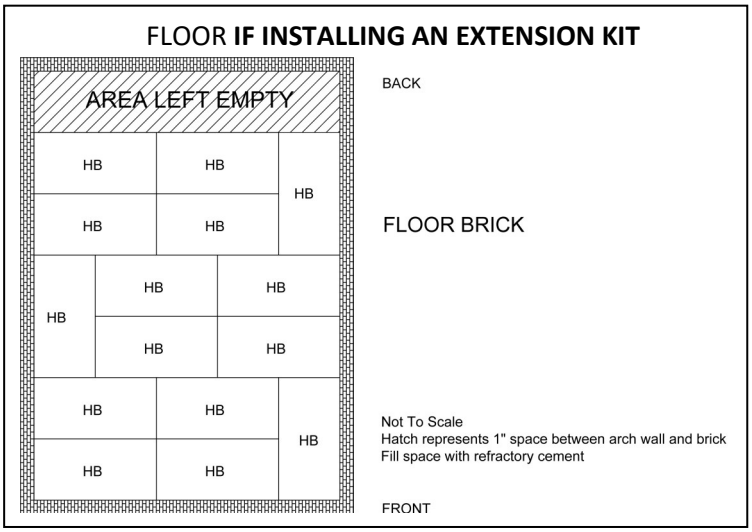
◊ Measurements in these drawings will vary depending on the technique used in bricking. Always "dry fit" the bricks first to ensure a good fit.

FLOOR (BOTTOM) BRICK INSTALLATION

1. You will need 18 half bricks
2. Cut a ½ brick in half (result is 2 pcs 4 ½" x 4 ½") (HHB).
3. Coat the floor with refractory cement.
4. Place the bricks into the arch as illustrated. The spacing between the outside panels of the arch and the brick is approximately 1". Remember to coat the edges of the bricks with approximately 1/8" of refractory cement.

Note: If installing the LEADER Half Point Extension Kit the back row of bricks is not added see picture below on left side.

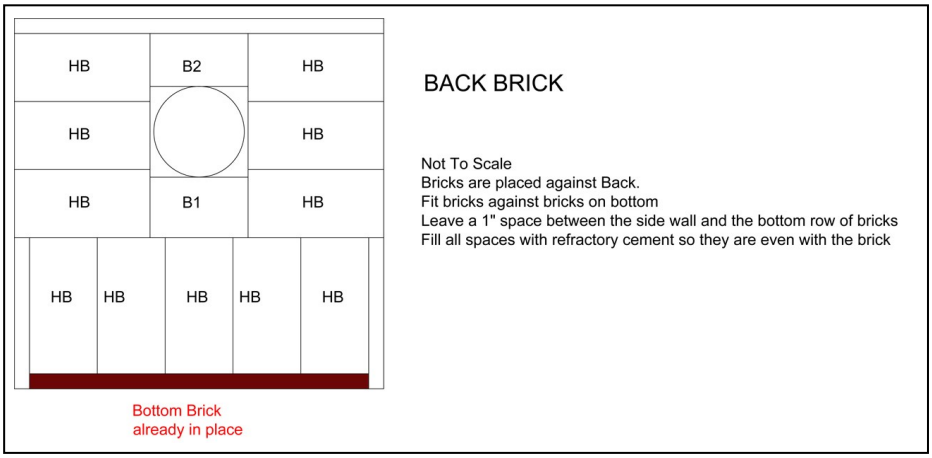




BACK BRICK INSTALLATION

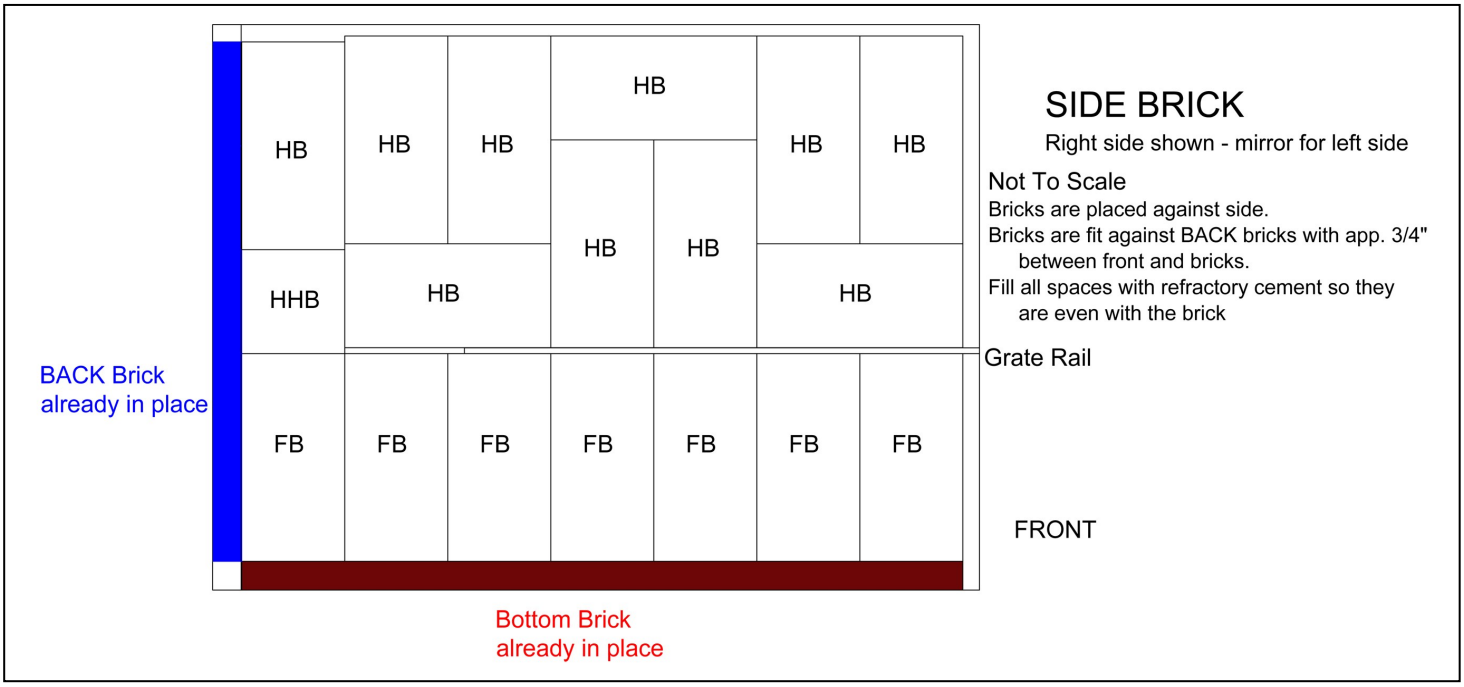
Note: Skip this section if you are installing a Half Pint Extension Kit.

1. You will need 13 half bricks
2. Cut bricks for the locations as labeled
   a. B1 – 4" X 6.5"
   b. B2 – 3.5" X 6.5"
3. Apply a coat of cement to the back panel.
4. Place the bricks into the arch as illustrated. Remember to coat the edges of the bricks with approximately 1/8" of refractory cement.
5. The end bricks of the bottom row of the back bricks will be behind the bottom row of the full bricks on the sides when the sides are bricked (side bricks not shown in this diagram and will be installed in the next step).
6. Fill the gaps between the smoke stack elbow and the brick with refractory cement.



SIDE BRICK INSTALLATION

1. Both sides are laid out the same. Mirror the above diagram for the right side of the arch.
2. You will need for each side; 7 full bricks, 11 – ½ half bricks
3. Cut one half brick in half (result is 2 pcs 4 ½" x 4 ½") (HHB). Use the extra ½ brick on the opposite side.
4. Apply a coat of cement to the side to be bricked.
5. Place the bricks into the arch as illustrated. Remember to coat the edges of the bricks with approximately 1/8" of refractory cement.
6. If the bricks do not fit under the rail, loosen the grate rail bolts and slide the rail up the side as much as possible then retighten the bolts. If the bricks still do not fit, trim the length of the brick.
7. The first row of bricks toward the arch front should be up against the bolts in the side of the arch.



SIDE BRICK

Right side shown - mirror for left side

Not To Scale

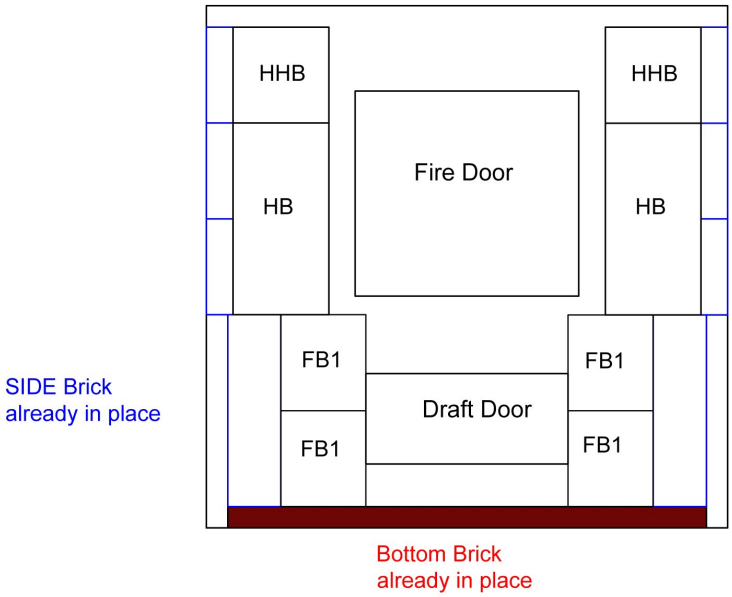
Bricks are placed against side.

Bricks are fit against BACK bricks with app. 3/4" between front and bricks.

Fill all spaces with refractory cement so they are even with the brick

FRONT BRICK INSTALLATION

1. You will need 2 full bricks and 3 half bricks
2. Cut one of the half bricks in half (result is 2 pcs 4 ½" x 4 ½") (HHB)
3. Apply a coat of cement to the front panel from the outside edge to the line of bolts holding the door section to the front panel.
4. Place bricks in the arch as illustrated. Remember to coat the edges of the bricks with approximately 1/8" of refractory cement.
5. Fill in all edges and gaps with cement.



FRONT BRICK

Not To Scale

Bricks are placed against Front panel.

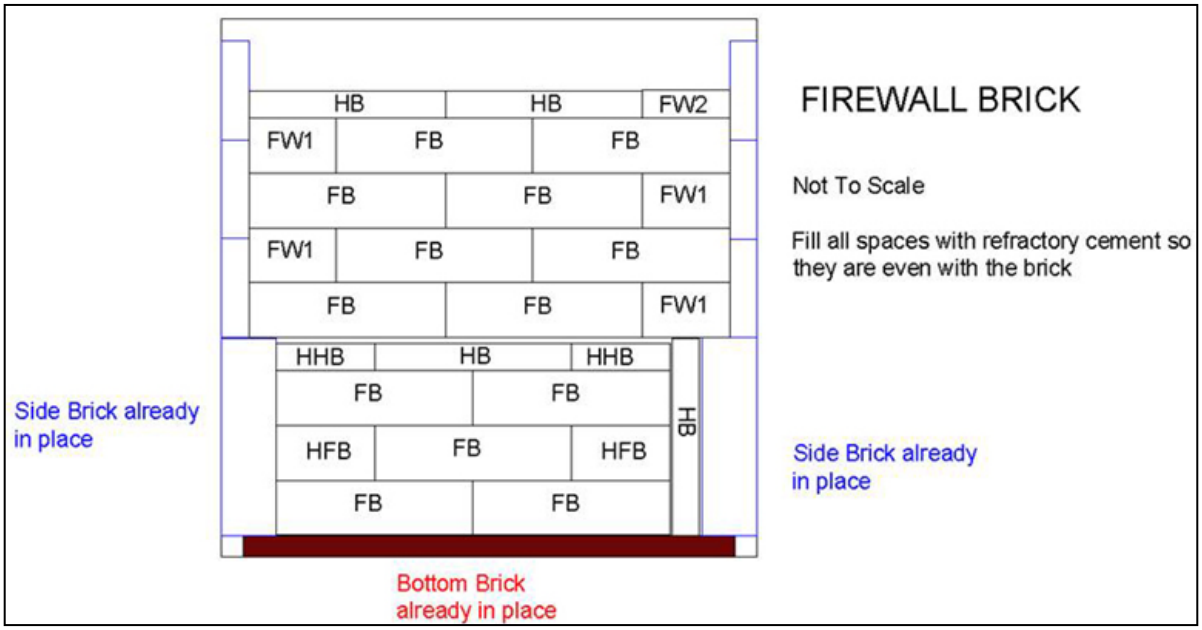
Fit bricks against bricks on side and bottom

Fill all spaces with refractory cement so they are even with the brick

FIREWALL

NOTE: IF YOU ARE GOING TO USE A SUPREME PAN YOU WILL NEED TO DETERMINE IF ANY ADJUSTMENTS NEED TO BE MADE TO THE HEIGTH OF THE BRICK OF THE FIREWALL. IF NECESSARY REMOVE THE TOP CENTER BRICKS AND REFIT.

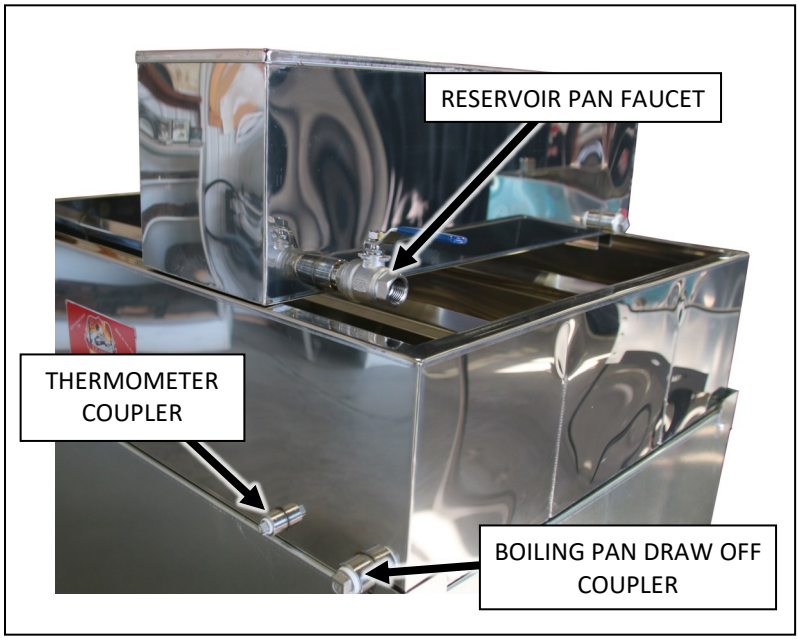
1. You will need 16 full bricks and 6 half bricks.
2. Cut bricks for the locations as labeled:
    a. FW1 – full brick cut to 4" x 4 ½" (4 needed)
    b. FW2 – half brick cut to 4" X 4 ½"
    c. Cut one half brick in half (results in 2 pcs 4 ½" X 4 ½") (HHB)
    d. Cut one full brick in half (results in 2 pcs 4 ½" X 4 ½ ") (HFB)
3. Place a pencil mark 8 ½" in front of the face of the back wall brick. This is the front of the firewall.
4. Place bricks in the arch as illustrated. The bricks are laid with the 4 ½" side down. Only the surfaces of the brick where they face another brick need to be coated with cement.
5. Fill all edges and gaps with cement.



SETTING THE PANS

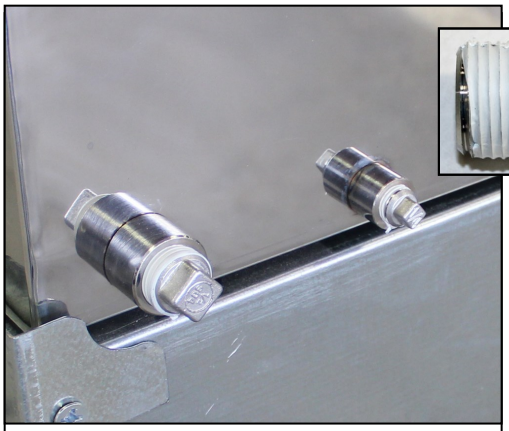
If you have added a Half Pint Extension Kit refer to the Half Pint Kit Instructions for setting up of the pan set.

1. Place the boiling pan on the arch so the pan rests between the corner brackets of the arch.
2. Place the reservoir pan to the front of the arch with the connectors towards the front of the arch.
3. Wrap both ends of the ½" stainless steel nipple (supplied) with Teflon tape.
4. Screw the supplied ½" stainless steel ball valve onto one end of the stainless steel nipple. The assembly is referred to as the reservoir pan faucet.
5. Locate the front draw off of the boiling pan.
6. Connect the reservoir pan faucet to the connector on the reservoir pan that is on the same side as the front draw off of the boiling pan. Ex. if the boiling pan draw off is on the right side, screw the reservoir pan faucet into the right side connector of the reservoir pan.
7. Turn the reservoir pan 180° and place it 6" from the rear of the boiling pan.
8. You will need to add a draw off valve to the boiling pan draw off connectors (2 needed). Contact customer service or your local dealer for options and costs.



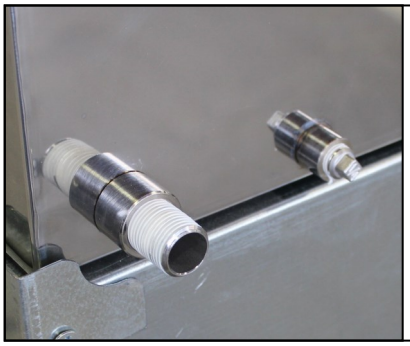
INSTALLING THE DRAW OFF VALVES

It is recommended two ½" stainless steel ball valves and 2 ½" stainless steel close nipples be installed. Other options are available. Contact LEADER Customer Service or your local dealer.

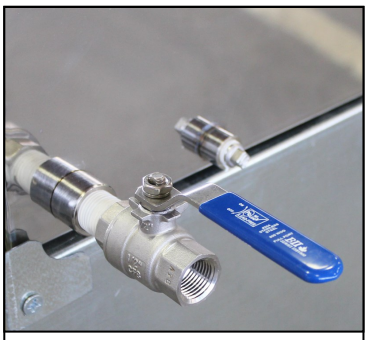


Remove the threaded plug(s) from the couplers located on each side of the boiling pan.

Wrap Teflon tape around each end of the stainless steel close nipples.



Thread a stainless steel nipple into each of the couplers on the boiling pan.



Thread a stainless steel ball valve onto each of the installed nipples. Tighten so the handles of the ball valves are on top.

Install a thermometer (not supplied) on each side of the boiling pan. The thermometers are mounted in the ¼" threaded fittings near the draw off valve couplers. Remove the plugs from the fittings in the pan. Teflon tape the threads on the thermometer and thread into the fittings. Tighten and rotate the "7" so it is straight down for easier viewing standing next to the evaporator.

FIRST BOIL

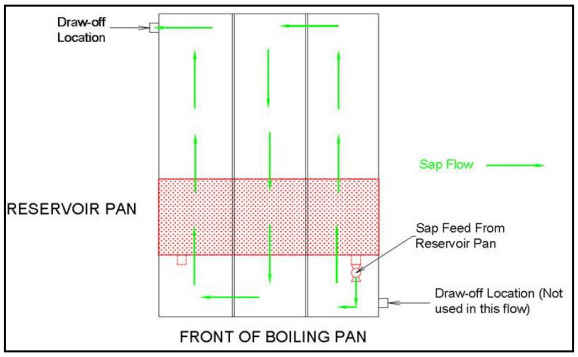
The first boil is done to remove any residual materials from the pans and to "season" the bricking and insulation.

1. Prepare 15 gallons of a baking soda and water mix in proportion as follows:
    a. 1-1/4 ounce of baking soda
    b. 15 gallons of water
2. Fill the boiling pan with the baking soda : water mix to a level of approximately 3 inches.
3. To season the bricking, start by building a small fire in the fire box and very gradually build to a normal fire.
4. Boil the solution for approximately 30 minutes. Watch the boil carefully and replenish the solution as needed to ensure the solution in The pan remains at approximately the 3 inch level.
5. Check all equipment:
    a. No leaks at fittings
    b. Pan is boiling evenly
    c. Valves work properly
    d. Draft is correct (pan boils evenly)
6. Drain the baking soda solution from the pan. Rinse the boiling and reservoir pans thoroughly with clean unsoftened, non-chlorinated well or spring water. Drain the water and dry the pans.

OPERATION OF THE HALF PINT EVAPORATOR

NOTE: NEVER FIRE THE EVAPORATOR WITHOUT LIQUID IN THE PAN AND ENOUGH LIQUID SO THE PAN DOES NOT GO DRY AS IT COOLS AFTER YOU STOP FIRING.

You will feed sap into one side of the boiling pan from the reservoir pan and will draw off syrup from the opposite side of the boiling pan.



THEORY OF OPERATION

GRADIENT

A maple syrup evaporator works under the principal of gradient. As the sap boils, it concentrates. As it concentrates, the sugar concentration increases and the volume decreases. As the concentration increases (and the volume decreases), the liquid works to maintain the levels across the evaporator so the less concentrated liquid (sap) will "push" its way toward the more concentrated liquid. In an evaporator you will be concentrating the percent of sugar from the incoming sap (approximately 2%) to the syrup product (approximately 66%).

FORMING THE GRADIENT

Single Pan (No Extension Kit)

When the half pint is first filled, the boiling pan and reservoir pan will have the same concentration of sugar in the sap. As you boil the sap, the sugar concentration will increase (volume of water will decrease). To maintain the liquid level in the boiling pan you will add less concentrated liquid from the reservoir pan to the first compartment of the boiling pan. The second compartment of the boiling pan now has a more concentrated liquid than the first compartment so the less concentrated liquid will move toward ("push" into) the second compartment to try to bring the concentrations equal. The same activity occurs between the second and final (third) compartment in the boiling pan.

Two Pans (With Extension Kit)

When the evaporator is first filled the two boiling pans and the reservoir pan will have the same concentration. As you boil the sap, the sugar concentration will increase (volume of water will decrease). To maintain the liquid level in the evaporator you will add less concentrated liquid from the reservoir pan to the first compartment of the rear boiling pan. The second compartment of the rear boiling pan now has more concentrated liquid than the first compartment so the less concentrated liquid will move toward ("push" into) the second compartment to try to bring the concentrations equal. The same activity occurs through each of the compartments of the evaporator.

MAINTAINING THE GRADIENT

The important factors to remember in maintaining the gradient area as follows:

◊ Firing
◊ Defoamer
◊ Minimize the effects of flow reversal

FIRING

You are seeking to maintain a constant boil. A constant boil will keep the liquid "push" in the boiling pan. If the boil is not consistent the liquid will flow in reverse and the gradient will be reduced or lost. The arch is designed for a small wood fire.

The wood to use:

◊ Dry for at least two years
◊ Cut to approximately 18" in length
◊ Split into small chunks to allow larger surface area (approximately 2" to 3" in diameter)
◊ A mix of hardwood (longer lasting, more BTUs) and softwood (quicker, intense heat)
◊ NOT slab wood

Loading the arch:

◊ Wood should stay on the grates and be 2" to 4" inside the arch so the fire does not overheat the arch face
◊ Crisscross the wood to allow the air to reach as much of the wood as possible
◊ Do not hit the pan when loading the wood

When:

◊ Fire consistently with small amounts of wood to maintain the level of heat
◊ Use a timer to stay on schedule for the firings, 6 to 10 minutes depending on wood quality, size and desired intensity of boil. TIP: Fire more often with less wood each time (use 2 to 4 sticks per firing).

DEFOAMER

The purpose of defoamer is to prevent foam build up in the boiling pan. Foam build up will prevent proper evaporation of water from the sap. Foam does not handle heat as does liquid. Too much foam could lead to burning the pan.

◊ Use defoamer on a regular basis. One method is to add defoamer each time you add wood to the fire.
◊ Add 1 drop of defoamer where the sap is entering in the boiling pan (rear if there are two pans) from the reservoir pan.

MINIMIZE REVERSAL EFFECTS

Reversal occurs when the boil in the pan is reduced. This can happen when firing is inconsistent or when there is a change in the pan flow direction (such as when the pan flow is reversed to reduce the sugar sand buildup). To minimize these effects:

◊ Maintain a consistent boil

◊ Before you stop for the day, draw-off about a gallon of almost finished syrup into a container and cover. You will add this liquid back into the boiling pan the next time you boil.

NOTE: Adding "sweet" to the draw off compartment of the syrup pan will raise the concentration in that compartment shortening the time it will take to reestablish the gradient.

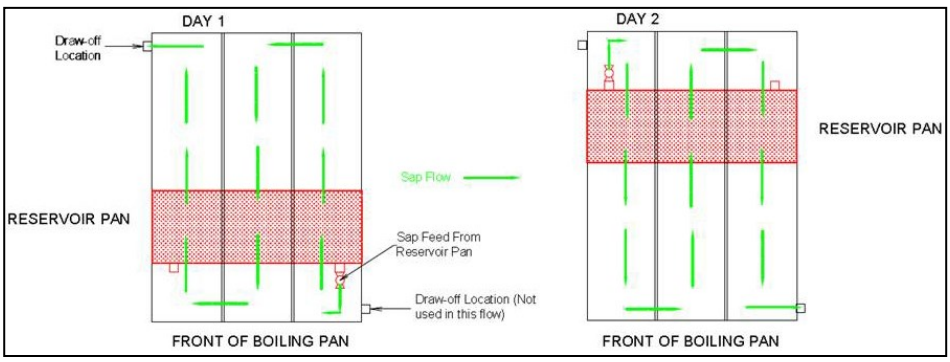
MAKING SYRUP

NOTE: NEVER leave the evaporator unattended. There is a risk of fire and you could ruin your pan if the level of sap goes too low.

1. Fill the boiling pan(s) with sap to a level of 1 ½" to 2".
2. Fill the reservoir pan to ⅔ to ¾ full.
3. Check to ensure all fittings are secure and do not leak.
4. Build a small wood fire in the arch. Keep the firing consistent with good wood (see The Wood To Use in the Firing Section) in order to keep a consistent boil. With a properly fed fire and insulated arch - half pint users are able to boil from 5 to 8 gallons of sap an hour.
5. As the sap boils in the boiling pan(s) it will lose moisture. You will need to keep the level of sap as close to 1 ½" as possible. To maintain the level of sap, feed from the reservoir pan through the valve. Adjust the valve so it is replacing the sap usually this will be drops or drizzle. Do not feed the sap too quickly as it will reduce the boil.
6. As the first time you boil the sap is not concentrated in any area of the pan, the time to the first draw off will take several hours. The next small draw off batches will be regular and small. Timing will depend on how consistent you are in firing the evaporator and how much sugar content is in the sap.
7. The sap in the syrup section of the syrup pan must be boiled until it reaches 7.0° to 7.5°F above the boiling point of water (the draw off temperature). The boiling point of water is not a consistent point. Therefore the following is the recommended method for determining the draw-off temperature.
    a. The sap will turn an amber or darker amber color.
    b. The temperature of the sap will reach 7.0° to 7.5°F above the boiling point of water.
    c. Use a hydrometer and test cup in conjunction with the thermometer.
        i. As the sap begins boiling in the syrup pan, monitor the thermometer. The thermometer needle will need to go around completely once and come back to the "7" mark on the thermometer.
        ii. When the "7" mark is reached, hydrometer the syrup.
        iii. Adjust the thermometer to "7" when the hydrometer indicates the sap in the pan has turned to syrup. To adjust the thermometer, place the Allen wrench, provided with the thermometer, into the screw and turn until the "7" aligns with the needle.
8. Due to the small sizes of the draw off batches, as an option users will collect the batches of sap boiled to "almost syrup" from the evaporator into a bucket or pail. This larger collected batch will then be boiled on another heat source. It is recommended you use a hydrometer to test the final syrup.
9. At the end of the day draw off a container (approximately 1 gallon) of the sap closest to being syrup. Cover and set aside for the next day (See the Maintenance section – Daily).
10. After you have stopped firing for the day, continue to watch the evaporator until there is no more boiling and embers are no longer present in the firebox. Make sure the liquid level is maintained in the boiling pan.

FLOW REVERSAL

In order to minimize the buildup of sugar sand and niter, the flow in the pan should be reversed each day. The following is the illustration of the change (single pan—no extension kit (Day 1 to Day 2):



To do the reversal:

1. Leave the liquid in the boiling pan.
2. Empty the reservoir pan into a container.
3. Turn the reservoir pan 180° and move to 6” from the rear of the boiling pan.
4. Refill the reservoir pan level to 2/3 to ¾.
5. Fill the boiling pan to the operating level (1 ½”).
6. Start the fire in the arch.
7. Slowly feed the liquid saved at the end of the previous day to the new draw off compartment.

MAINTENANCE

DAILY

Allow the evaporator to cool until there is no more boiling and embers are no longer present in the firebox then clean out the ashes.

END OF SEASON

Clean the pans with a pan cleaner such as LEADER Order #63006 (1 quart size). The directions are as follows:

- ◊ Add water to the boiling pan until the coating to be removed is covered with water.
- ◊ Heat the water to simmering and keep at that level for a minimum of one hour and until the scale is noted to dissolve. Maintain the level of water in the pan.
- ◊ Replenish the water level so the coating to be removed is covered. Measure the depth of the water added to the pan.
- ◊ Add 0.8 ounces of concentrated pan cleaner for each inch of water in the boiling pan.
- ◊ Wearing protective gloves, brush the loose scale.
- ◊ If scale is removed flush the pan with unsoftened, non-chlorinated well or spring water. If the scale is thick you may need to continue soaking the solution in the pan.
- ◊ When the scale has been removed, drain off the solution, fill the boiling pan to the level of the dividers with clean unsoftened, non-chlorinated well or spring water. Add 2 ounces of baking soda mix. Brush the pans. Empty the water from the pans.
- ◊ Rinse the boiling and reservoir pans thoroughly with clean unsoftened, non-chlorinated well or spring water. Drain the water and dry the pans.
- ◊ Clean the ashes from the arch.
- ◊ Drain and wipe the reservoir pan clean.
- ◊ If rail gasket was used, discard.
- ◊ Place the reservoir pan on the boiling pan and cover with plastic or a tarp.