

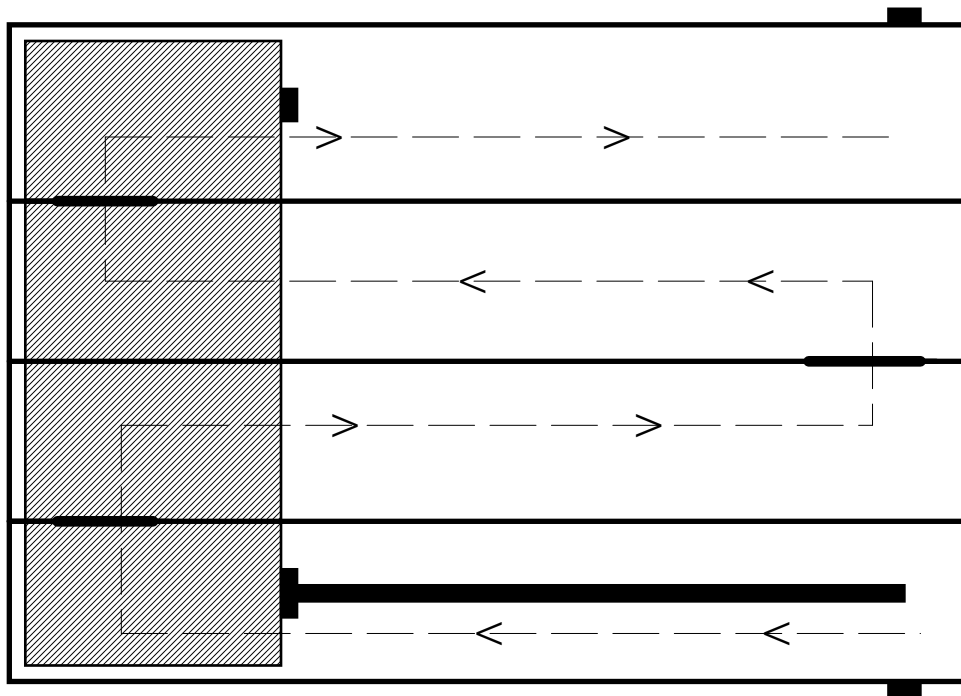
# The LEADER “half-pint” Evaporator

The Leader “half-pint” evaporator is named for its small size. It is specifically designed for the hobbyist maple sugarmaker with 20 to 50 taps. Like its bigger brothers, the half-pint is designed as a continuous-flow, reverse-feed evaporating pan.

## Continuous Flow

Unlike a flat, open pan “batch” system, the half-pint evaporator was built to accept a continuous flow of sap into the pan, with periodic draw-offs of small batches of the finished maple syrup. A traditional open-pan system works by adding large amounts of sap to the boiling pan all at once and boiling it down for several hours until more sap is needed. This step is repeated and sap continues to be added throughout the day until the whole “batch” turns into maple syrup and is drawn off at the end of the day. The first sugars (from sap) added to the pan in the morning are still there at the end of the day. With a batch system, the whole pan is brought to syrup at once. Then the pan (or heat source) must be maneuvered to remove the syrup from the heat as quickly as possible to avoid an overly heavy syrup, or worse yet, a scorched pan. This can be a cumbersome task, not to mention dangerous, when handling hot maple syrup.

With a continuous-flow system, the sap is channeled using dividers in the pan so that the liquids works its way through the pan until finally becoming syrup. As soon as the first syrup is ready, it is drawn off. A short while later, more of the sap will have condensed to



*figure 1--sap flow (top view)*

syrup and another small batch is drawn off, and so on. The sap is cooked only long enough to make syrup--no more. By limiting the hours you are heating and re-heating the sap sugars, you can reduce the caramelizing that takes place. Thus, your maple syrup will generally be lighter colored and have a milder flavor. In addition to improved syrup quality, a major advantage of the continuous flow system is the ease of operation.

### **Half-Pint Preparation**

First, be sure your arch and pan are level and on a stable surface that is not susceptible to frost shifts. Because the sap will flow continuously at a fairly shallow level, it is important that no one area be higher so that the sap will be shallow and at risk of scorching.

The arch is designed for a small wood fire. The more efficient your heat source, or fire, the more sap you will be able to boil per hour. (Most half-pint users are boiling away about 5 gallons of water per hour.) Any improvements you can make in heating efficiency will increase your boiling efficiency. We recommend lining your arch with fire brick or other high-temperature insulating-type products to keep the heat from the fire flowing to the bottom of your boiling pan, not out the sides of the arch. You can also “build” a grate system of some sort to get your fire off the bottom of the arch and have more air-flow through it. Some people have even added small blowers to the front draft door to increase air-flow to the fire. With these improvements, some users have been able to boil away up to 7 or 8 gallons of sap an hour.

Keep in mind that your fire is only as good as your wood. Use only good, dry (two years minimum) wood, preferably hard wood. You want the highest BTU for your labor input--cutting, stacking and firing your evaporator. Start with good wood! The wood should be cut in about 2' lengths and split fairly small. The greater the surface area, the greater the BTU's from the fire. Large logs will only smolder with minimal heat output while the same log split into four pieces greatly increases the total surface area and the available BTUs.

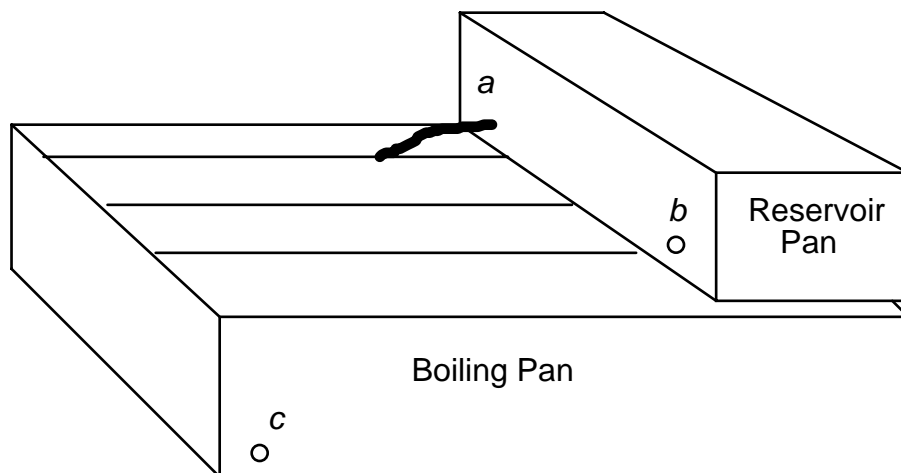
You will also need to add smoke stack to your arch. The collar is designed to attach 6" stove pipe. You will want a 6" elbow coming off the collar with 6' of stack going up from there. Half pint evaporators are designed to be able to contain the fire to increase heat efficiency and avoid smoke and fly-ash in the syrup. This is an important quality control. Take advantage of this feature by getting the smoke up high enough to avoid contact with the syrup.

You will need to add draw-off valves to your boiling pan. You may use a gate or ball valve. Ask your maple equipment dealer about options and costs. The boiling pan sits on the outside rails of the arch, directly over the firebox. The draw-off valves should be at the end closest to the firing door, with the reservoir pan sitting on top and at the back of the boiling pan. The feed pipe of the reservoir pan should feed raw sap into the same area as one of the draw-off valves. You will make syrup at the other draw-off on the opposite side of the pan. The sap flow will follow the path of the arrows in *figure 1*.

### **Half-Pint Operation**

Begin with your pan filled 1<sup>1</sup>/<sub>2</sub>" to 2" deep throughout the pan. **Be sure to fill the pan with sap before starting your fire.** Check to be sure one side of the reservoir pan has the plug securely in place (*figure 2.b*) and the other end has the valve and feed line (*figure 2.a*) securely installed. Fill the reservoir pan with sap. As the sap begins to boil and water is evaporated, you will need to start slowly feeding the pan to try to maintain a standard depth. A slow, drip feed like this helps to keep a good hard boil going all the time. Open the reservoir valve (*figure 2.a*) just enough to let out a small, consistent drip or drizzle.

You will need to adjust this flow until you are feeding just the right amount to maintain a consistent level. If your sap level is rising, reduce the sap flow in. Conversely, if you are losing depth in your boiling pan, open the valve further. Be sure you are keeping *at least 1<sup>1</sup>/<sub>2</sub>" of sap* at all times. If your valve is incorrectly adjusted and you are losing depth, a few minutes away could be disastrous. Never leave your pan unattended for even short periods unless you are sure the reservoir pan is full and is feeding properly to maintain depth. Obviously, a consistent drizzle in will maintain a constant level only if you have consistent boiling. The firing of your half-pint evaporator is critical in this regard. Consistent firing with a consistent fuel source (the same type and size wood) is required to maintain your sap level.



*figure 2--pan set-up*

### **Finishing Your Maple Syrup**

The first batch of syrup will take several hours. Once you make your first batch, however, small batches will continue to come off on a regular basis. The rate at which you take off batches will vary with your wood, firing efforts and with the sweetness of your sap. You can generally plan on every 20-30 minutes.

The maple syrup will be forming at the draw-off valve on the opposite side of the boiling pan from where you are feeding raw sap (*figure 2.c*). As new, fresh sap is fed into the pan, the sap/syrup already there will move forward to keep the pan level equalized. The effect of this is to continually push ahead the thicker sap that has been there the longest. You will actually see color differences in each section of the pan--as you move from sap to syrup, the liquid will take on a darker and darker amber color because the sap has cooked longer and the sugars have caramelized more as it gets closer and closer to syrup.

Although you can make finished syrup right in your half-pint evaporator, from a practical standpoint, most people find it easier to draw off small batches of almost finished syrup into a pail or pan and “finish” the syrup later inside on a stove. This keeps you from having to get just the right density on many small batches and reduces your risk of burning the syrup and scorching the pan. You can determine an approximate draw-off point using temperature. This is not nearly as accurate as testing density with a hydrometer and hydrometer cup, but will give you an idea of when to draw-off for finishing at a later time. Maple syrup boils at 219°. You might want to take off your “syrup” at 217° or 218°, for instance. You can also use your hydrometer to get a more accurate measure of when the solution is close to syrup. We highly recommend the use of a hydrometer for final testing.

### **Finishing Up /Starting Again**

The half-pint pan is never emptied, as you would using a batch method. When you are finished boiling for the day, draw-off a batch of that which is closest to syrup in a pail or bucket. This is to be sure it doesn’t get heavier than syrup and burn while the pan is cooling down. Be sure there is still enough sap in the reservoir pan to feed the boiling pan throughout this cooling down time. Then let it set. The small amount of heat that continues from your fire will do a little bit of evaporation while you are away, without risk of burning. The sap/syrup stays right in the pan. You needn’t worry about freezing temperatures damaging your pan because the high sugar content in the sap mixture will keep the water from freezing hard.

An advantage of the half-pint system is the capability of reversing the flow of the sap. As sap thickens to syrup, the boiling temperature increases. At the boiling point of maple syrup, or 219 °, the minerals naturally present in the sap solidify and make a niter we call *sugar sand*. Because the niter forms at the higher temperatures, it forms only in those areas of the pan where syrup is being finished. With an open-pan batch system, where the whole pan turns to syrup at once, sugar sand is formed throughout the pan. In a continuous-flow pan, sugar sand builds up in just one spot--the section where syrup forms and is drawn-off. Over time, the sand can build so much that the pan will scorch in that one area. To reduce this problem, all commercial evaporators are designed to reverse the direction of sap flow. Each day, the flow direction is reversed so that the feed and finishing areas of the pan get routinely changed. This “washes” the sand away from the finishing area and decreases the danger of scorching due to sugar sand build-up.

When you are ready with another batch of sap to boil, start your fire, again being sure the pan has sap. Before you fill your reservoir pan, remove the plug and valve and switch ends. You will now feed the section you last made syrup in and you’ll make syrup in the section you were previously feeding with raw sap. This is the reversing process discussed above. Fill your reservoir pan with sap and adjust the valve opening as needed. The pail of “near-syrup” you pulled off the previous day can be slowly fed into the syrup section to be finished along with the new, or you can put it with the other small batches you’ve been saving to finish later.

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