Final Report – SARE grant # FNE01-375 Charcoal making. Ken Gagnon

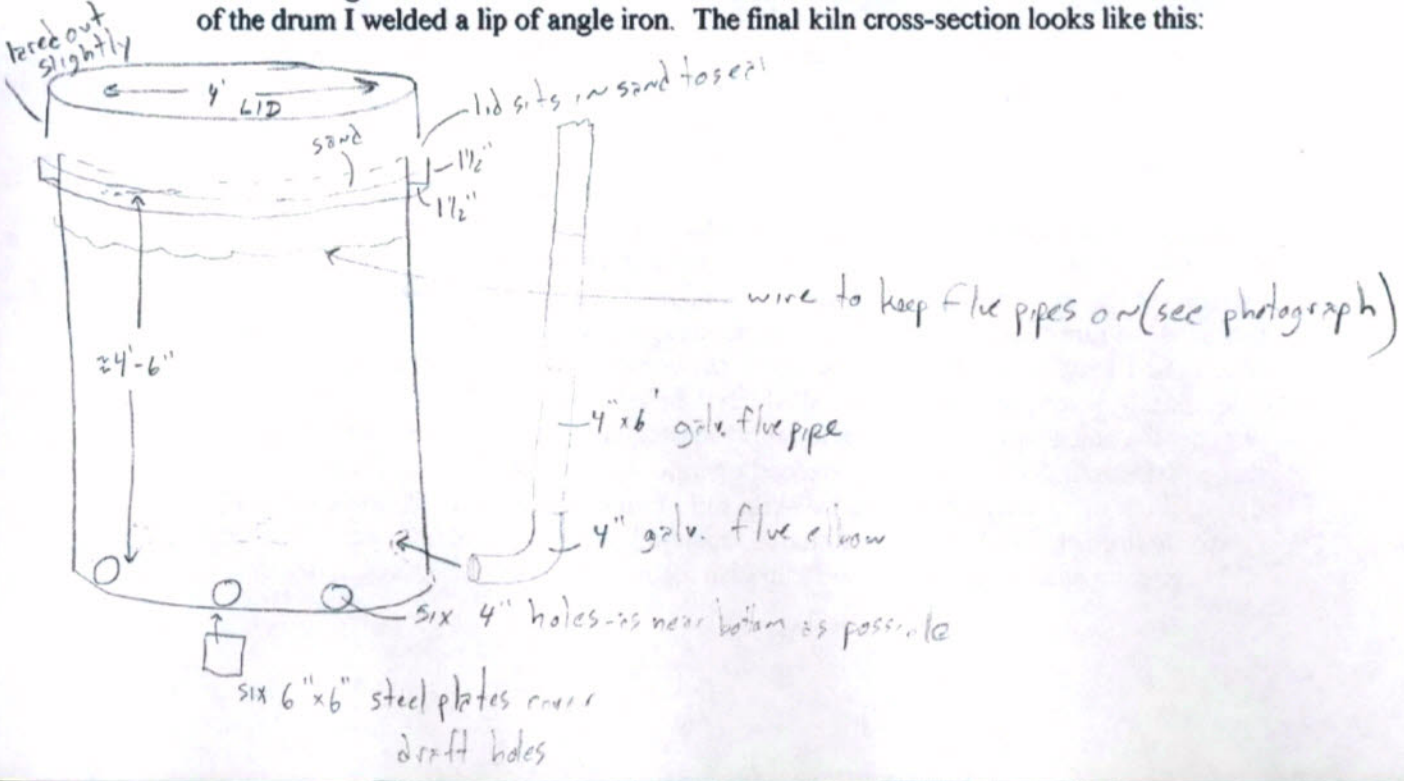
Postulated Benefits vs. Reality

Postulated Benefit 1: Use of a waste product. In the case of slabwood from sawmills which is typically burned in a heap, the material would in fact be wasted, and it is easily charcoaled, being already in a very manageable form. However, in the case of softwood tree tops and curvy logs—these decompose to provide organic material which nourishes the forest plants, not to mention small animal habitat. The material is large, more crooked, and not of uniform size, making it difficult to pack the kiln tightly. So the raw material in this case is neither truly a waste product nor particularly easy to charcoal.

Postulated Benefit 2: Production of a useful fuel. Gourmet or health-conscious barbecuers do in fact like "lump" charcoal, which can now be bought at stores like Agway, though they prefer it make from hardwood. They will pay about the same per pound as for briquettes. Blacksmiths will use it in the forge in place of coal, but with the same reservation. It does burn much cleaner than coal on the forge, leaving no "clinker." Both operations require adjustments to use lump charcoal. People used to cooking on a wood cookstove also need to adjust to charcoal, as it has a different start-p time and heat range. I can sell all I make because of a cooperating blacksmith and an established customer base which seeks locally-made products.

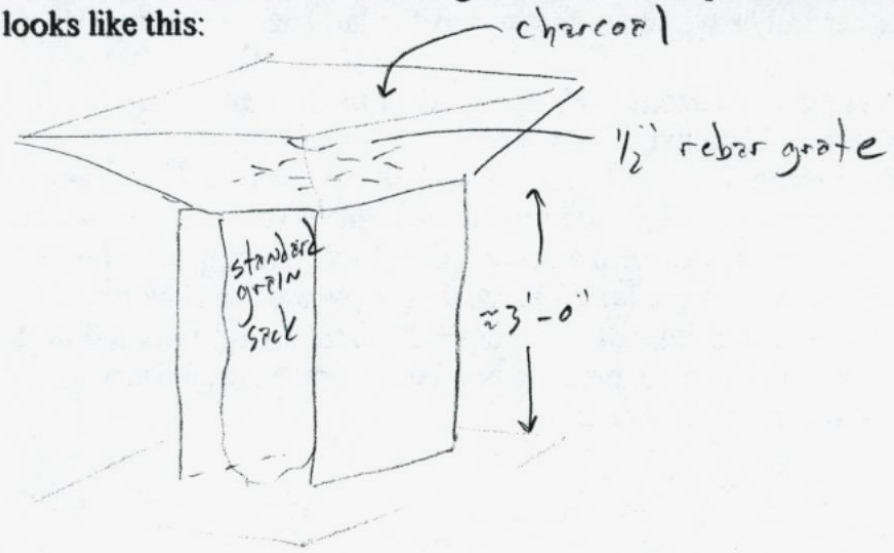
Design

The kiln I designed was supposed to be as good as a "New Hampshire" kiln or "Black Rock" kiln, but easy to build from available materials, requiring no expensive fabrication. It is converted from a 500-gal oil drum I got for $40 from a scrap yard. It is 5-feet height and 4-feet in diameter. I cut six 4-inch draft holes around one end and cut off the other end. The edge on the cut-off disk was then flared. Around the cut end of the remainder of the drum I welded a lip of angle iron. The final kiln cross-section looks like this:



Process:

Newspaper and kindling are placed in the bottom and then the drum is filled with 4-foot wood under 6-inch diameter stacked vertically. The lid is placed on and supported off the drum a couple inches with pieces of wood. The newspaper is lit through a draft hole. In half an hour or so, three flue pipes are inserted and the lid is dropped down in the sand seal. During coaling, which can take from 6 to 24 hours, draft holes are open or shut with steel plates, and flue pipes are moved around as needed. When coaling is complete, all flue pipes are removed, draft holes covered and sealed with sand, and the kiln allowed to coal for 24 hours before removing charcoal. A simple charcoal bagger was built which looks like this:



A more elaborate bagger could certainly be made. I have been unable to locate a pattern for one.

Two Unsolved Problems

1. Design of a lightweight, easy to build and operate kiln. The lid of the kiln weighs about 150 pounds and has to be raised to head-height for every firing. Some people have done this with hoists. I welded handles on the lid but that did not make it any lighter. Solutions to this problem escape me.

2. How to regulate the coaling process. The charge of wood carbonizes into charcoal in a hot, smoky, dark environment. I have not figured out a way to be able to observe the progress of the batch and so know when to regulate the drafts. As a result I rarely achieved the rate of charcoal production predicted. More often I completed the firing only to find a full barrel of blackened wood, or-worse-a shovelful of gray ash. Theoretically, wood becomes charcoal which then becomes ash. The kiln operator watches the smoke quantity and color, feels the heat, and observes the glowing coals through the draft ports. To an experienced operator these are sufficient. I did my darndest but often ended up with a half-kiln full of un-charcoaled wood, some ash, and relatively little charcoal. This necessitates separating charred wood from actual charcoal, and beginning again. The art of small kiln charcoaling was historically taught from

master to apprentice, and few is any masters live today in New England, and old books and internet sites just do not compare to a real person standing by. Measuring instruments, such as a thermocouple, would surely be helpful, if expensive.

All together I've made some two dozen batches—totaling perhaps 100 bushels of charcoal. I've never done much barbecuing, and would just as soon use wood and charcoal in my kitchen cookstove. Anyone wishing to offer his expertise or to pick up where I've left off would be welcome.

Some Statistics:

--1 cord softwood air-dried weighs about 3000 lbs.
--one 500-gal oil tank holds about 1/3 cord, which yields about 13 bushels charcoal (I never got more than 5 or 6), which if made from softwood weigh about 9 lbs each.
--1 cord dry softwood produces about 13 million BTU
--1 lb charcoal produces about 13,000 BTU
--1 cord wood yields about 40 bushels charcoal in a typical steel kiln (under a skilled operator)
--wood converted to charcoal loses about 80% of its weight while retaining about 80-90% of its fuel value