

# Building and Apple Grinder

Having several years earlier experimented with Pressing fruits without grinding, I knew that grinding the apples before pressing is an important part of extracting the juice.

My parents have been making their own apple cider for the past five years or so, first using equipment borrowed from a neighbor. I gave my press to my parents, and my dad ended up rebuilding it completely, though only reusing the jack. So he had his own press. The grinder was still one borrowed from a neighbor every time. But this cider making occasion (fall of 2003), those neighbors were traveling, and the grinder was not available to borrow.

They experimented with slicing the apples using a cabbage slicing contraption, but this didn't yield very much juice. They ended up running the apples through a kitchen style meat grinder, but that wasn't the best solution either. So my mom instructed me to go find an apple grinder for them.

Having looked into this before, I knew they were not commonly available, and if they were, they were quite expensive and not terribly sophisticated. So I decided to try to build one myself.

## Experimental design, and construction

The core of my grinder design consists of a drum that essentially scrapes the apple to bits. I made this drum by screwing two very thick pieces of oak (cut from firewood) together. To accommodate the drive shaft, I cut a slot in both pieces with the table saw before attaching them together. That way, I didn't have to worry about attempting to drill a straight hole that deep.



I didn't have a good way of mounting the drum and 5/8" shaft on my lathe. But I had the idea of just supporting the shaft on the jointer, and sliding the drum along the shaft, each time rotating it a bit, so eventually cutting a perfect cylinder. I ended up with a cylinder of 107 mm in diameter, and 160 mm long. I chose that size because it was the largest drum I could make from the wood that I used. But exact size is not that important, as long as it's bigger than the biggest apples you have, you should be ok.



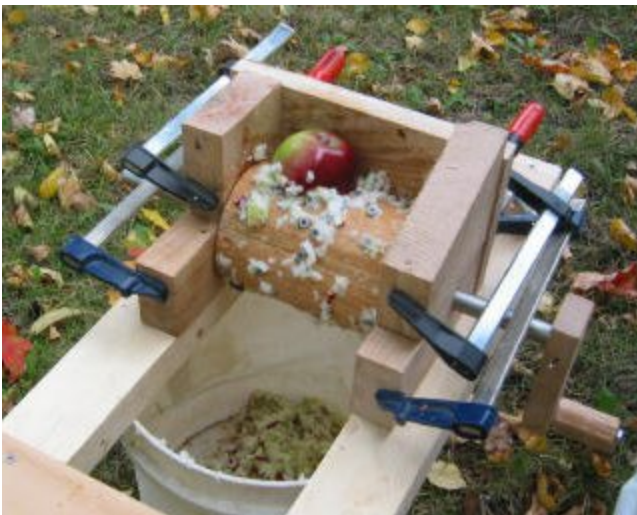
For the shaft in the actual machine, I used a smooth stainless steel shaft I extracted from a monstrous 1970's era electro-mechanical facsimile machine. It was made of stainless steel too! Lucky me.

To couple the drum to the shaft, I put a stainless steel screw through a hole I drilled in the shaft. The screw goes in a slot at the end of the drum.. In the photo at left, you can see part of the slot on the near side of the picture. When drilling a hole in a stainless steel shaft, grind a small flat

spot, then center punch that, and then drill in a drill press. Otherwise, your drill will keep slipping off the curvature of the shaft.

I put a lot of stainless steel countersink wood screws into the drum, each screwed in at an angle so that one edge of the countersink would cut into the apple. Originally I figured I might want to sharpen the edges of the screws, but this turned out to be unnecessary.

For the bearings, I just ran the shaft thru a 5/8" hole in oak. I suppose brass bushings would have been good, but a steel shaft running thru an oiled piece of oak is actually fairly durable as a bearing. The bearing blocks do come apart at the hole for oiling with vegetable oil. Wouldn't want to use machine oil on something that gets too close to food material. I know oak is not too bad in terms of food contact, and it withstands rot fairly well also. Nevertheless, I drenched the drum and blocks in olive oil, just to keep the juice from soaking into the wood.



Having built it this far, it was time to validate the concept of grinding apples this way. I attached a crank to one end of the shaft, and jiggled up a

box with some bar clamps. I then ground up a couple of potatoes (having no apples handy), and it worked quite well. I then went to the grocery store and bought a bag of apples, and ground up some of those too, right on top of the potato grounds. It worked pretty good, and didn't need that much effort to crank it. The apple ground away pretty quick too.

The next step was to build a sturdy housing for the actual grinder. I used some oak wood from discarded palettes. The fact that this wood had some nail holes in it didn't matter too much for a very utilitarian contraption.

I only made the housing immediately around the drum out of oak. For the funnel, I used 1" thick pieces of white pine - the funnel doesn't do the grinding, so it doesn't need to be super sturdy. I also switched to less expensive deck screws for the parts not immediately surrounding the grinding drum itself.



Note how little



the screws stick out of the drum. This much protrusion actually already does plenty of cutting, I found. The less the screws protrude, the finer they grind the apples. The screws are all slightly angled so that the leading edge of the countersink head sticks out a bit more, so that it acts a bit like a cutter.

Hand cranking a grinder for a hundreds of kilos of apples is a lot of work, even with a more efficient grinder design, so my plan was to

motorize this contraption all along. At this point, it was thanksgiving day, and I couldn't shop for a big pulley to mount on the shaft. I wanted a really big pulley, so the drum

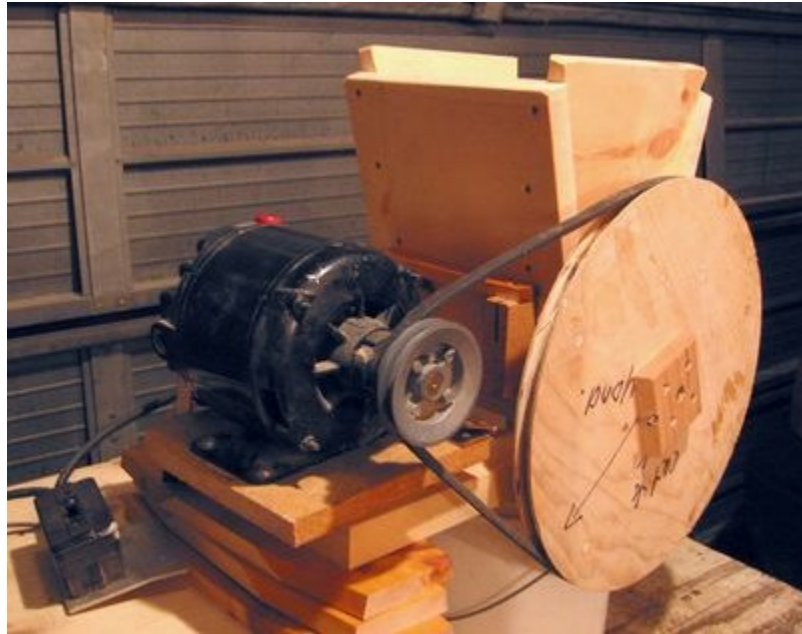
wouldn't run overly fast. I didn't want it to run fast enough to throw bits of ground apples back out the top of the funnel - that would just be messy!

I cut the pulley from a scrap of 1" plywood. I rounded it on the table saw, by drilling a small hole in the middle, a nail thru that into another piece of plywood, and that on the sliding table of the saw, making successive cuts until it was nearly round, then spinning the disk as I moved it slowly past the blade.

The V groove for the belt I also cut on the table saw, by making a series of continuous cuts around the pulley (careful when you do that, it can be accident prone, especially for smaller pulleys). For the motor, I used a utility motor that actually belongs to a lathe.

This had a stepped pulley, which came in handy.

I then proceeded to grind up the remainder of my bag of apples. To make the pulp finer, I had turned the screws further into the grinding drum, but that made it grind slower, so I ended up spinning it just a bit faster by going to the next step on the motor's pulley. On the picture on the right, you can just see



the largest of the four pulleys on the motor, much bigger than the one the belt is actually on. The whole idea is not so much to cut the apples, as to mash the pulp as much as possible, crushing the cells in the apples. It's the grinding that frees up the juice, and pressing is just a matter of wringing the liquid out of the resulting mash.



**Fresh ground apples.**

They turn dark relatively fast after grinding

## Testing the mash for juice extraction

I no longer had the press I had built four years earlier, but I still wanted to see how much juice could be extracted from the apples, ground apples were. I had paid good money for them at the grocery store, and it would have been a pity to just throw them out without getting some further use out of them.

So I took the bucket in the kitchen, and proceeded to squeeze



them with my spätzle press. A spätzle press is a lot like a heavy-duty potato mincer, but with fewer and smaller holes, and cast out of solid aluminium. More solid than a potato mincer, it still couldn't apply nearly the kind of force that a six-ton hydraulic jack could apply. I squeezed everything one small portion at a time into a bowl, and got 1.40 liters. I then took the resulting leftover pulp and squeezed it again, and got another 0.12 liters. I ran the juice thru a fine sieve, but did not filter it in any way, so it wasn't terribly clear. Did very much taste like fresh apple juice. This is important - my grinder and the oiling I gave it did not impact the taste of the resulting juice.