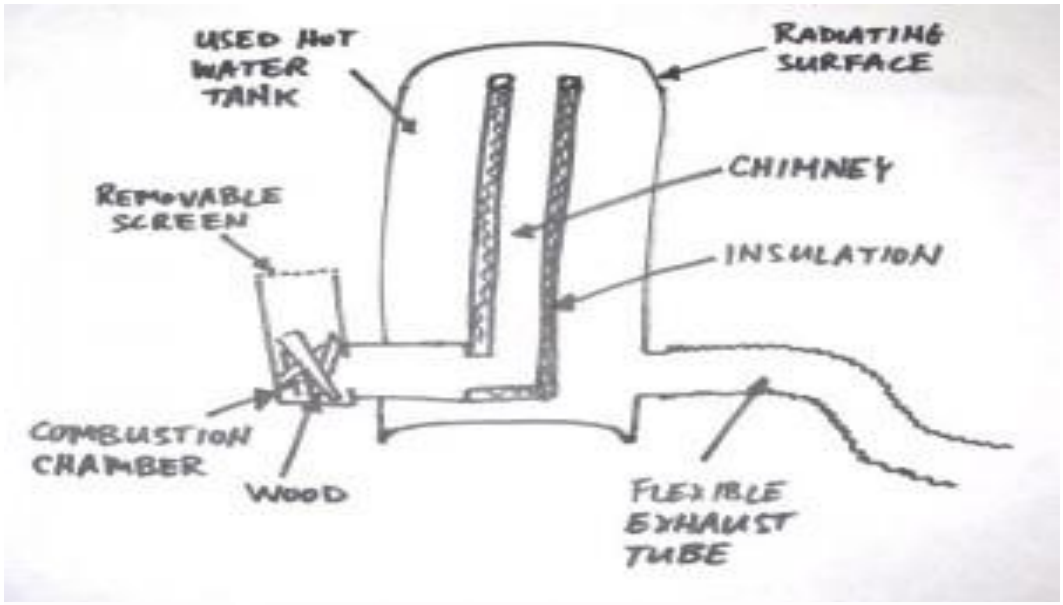
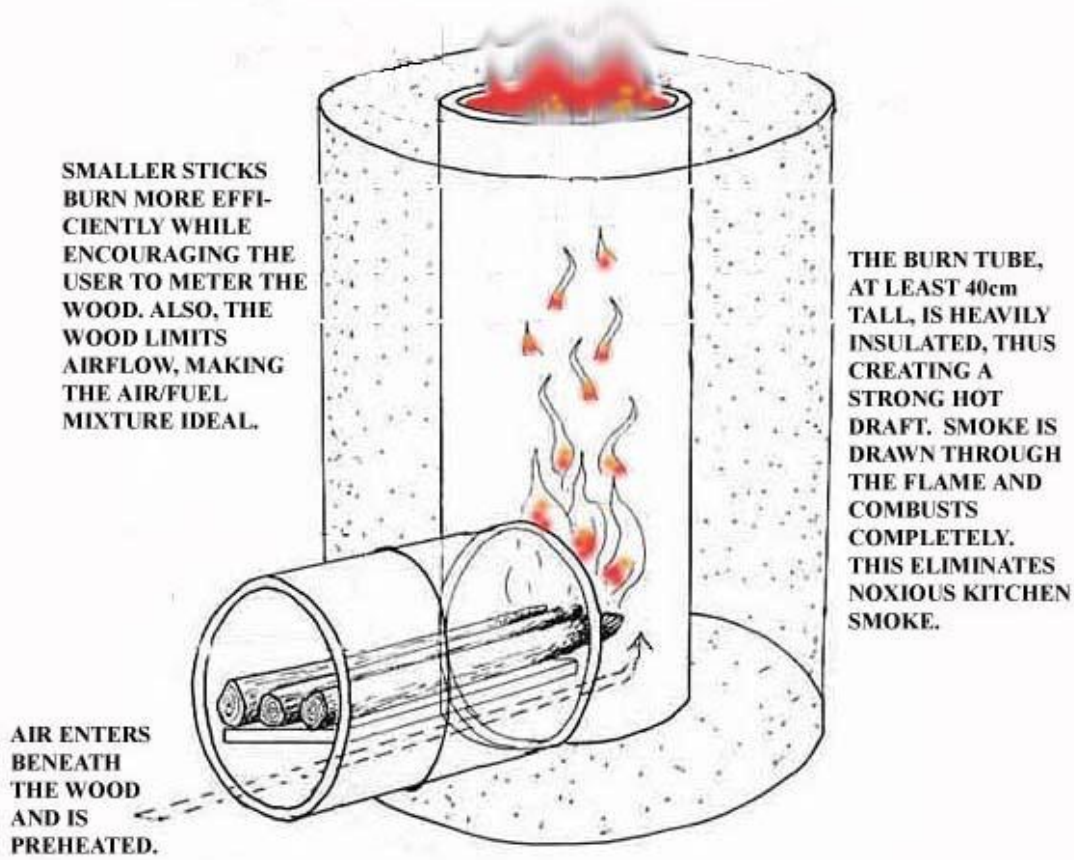
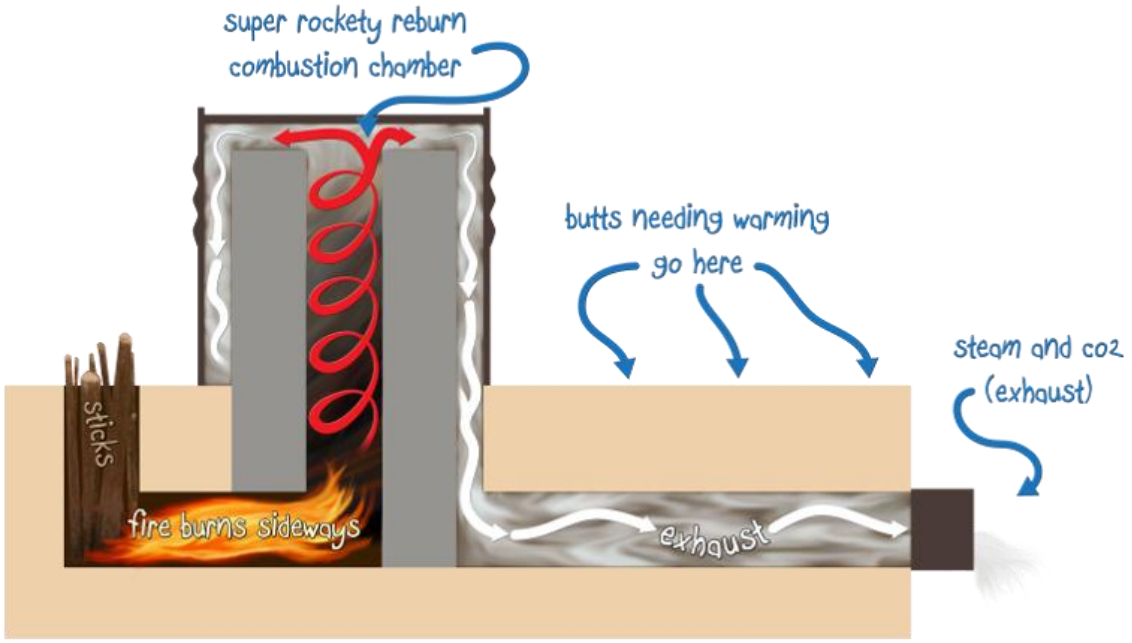
ROCKET STOVE & ROCKET STOVE HEATER



Efficiency: While a wood cooking fire sends heat in all directions, the Rocket Stove concentrates heat into one direction for cooking. This allows the user to boil water or cook with less than half of the wood used by other methods.




super rockety reburn
combustion chamber
butts needing warming
go here
steam and co2
(exhaust)
sticks
fire burns sideways
exhaust

How is a rocket stove different from a regular wood stove?

The goal of a rocket stove is to burn a relatively small amount of wood at as high a temperature as possible, resulting in more complete combustion, and to extract as much heat as possible from the exhaust gases. To generate high combustion temperatures, rocket stoves separate the combustion, heat extraction and exhaust functions.

Construction

Rocket stove mass heaters are often built from steel drums. These are convenient since they have a flat top that can also be used for cooking. I did not have one handy though. What I did have was my parents' old electric hot water tank that they had just replaced since it was corroded and leaking. In addition to this I used some 3″ diameter steel pipe, some 4″x4″ square tubing, and some flat steel plate, all about 1/8″ wall thickness (though that is probably thicker than necessary). I also used some flexible aluminum tubing (dryer ducting) to feed the exhaust from the rocket stove into my existing fireplace.

Above is a picture of the internal parts of the stove (combustion chamber and chimney) set up for initial testing to make sure it would generate enough draft for vigorous combustion. The aluminum flex tubing is connected to the top of the chimney for testing only. In the finished product it will be connected to the side of the stove. The chimney is insulated with about 1″ of Roxul (a rock wool insulation that will tolerate higher temperatures than fiberglass insulation) and wrapped with adhesive aluminum furnace tape to hold the insulation in place.

The above image shows the hot water tank cut to accept the combustion chamber and chimney.

The above image shows the combustion chamber and chimney being welded into the side of the hot water tank. Note the block of wood between the end of the chimney and the inside surface of the tank to ensure an appropriate gap for the exhaust gases. This piece of wood will be removed after the chimney is welded in place.

Mad scientist at work…

… and after a bunch more welding and a paint job that I neglected to take any pictures of … viola! … the finished product. The silver band around the bottom isn't a racing stripe. It covers the seam where I tack welded the bottom of the tank back on. I did not want to weld it on permanently since I may want to disassemble the stove later for inspection.

Notice that I removed a glass pane from the left door of my fire place and replaced it with cardboard. The aluminum flex tube passes snugly through a hole cut in the cardboard to expel the exhaust gases into the fireplace where, still warm, they rise and exit through the existing chimney. I know you're probably thinking I must be crazy to use a combustible material like cardboard for this purpose, but the fact is that the exhaust volume from this stove is so low and the stove is so efficient at removing heat from the exhaust that this aluminum tube reaches a maximum temperature of only about 60 degrees C during operation. That's cooler than a typical cup of coffee. The top of the stove gets much hotter, of course.

I also made a simple metal screen that can be placed over the combustion chamber to prevent sparks from popping out into the room where they could ignite something (or more likely just leave burn marks as they smolder on the carpet). I have another cover, not shown, that is a solid steel plate. It's useful to quickly extinguish the fire and to prevent air infiltration when the stove is not in use.

Above is a photo of the cleanout. The plate which makes up the bottom of the combustion chamber is removable. I just slide it out as shown in the photo and the ash drops into any suitable receptacle (I'm using a plastic tray above). I've found it best to clean the ash out every week or so as once there is more than about a cup full it will fill the bottom of the combustion chamber and start to build up in the tube between the combustion chamber and the internal chimney. Then it's a little harder to get to and it will eventually start to reduce the draft. In hindsight, access through the side of the combustion chamber instead of the bottom would have been more useful.

Savings

On average the heat energy available from burning wood is around 4.5 kWh per kg (assuming a 20% moisture content). Assuming roughly 80% efficiency of the stove (just a rough guess) the heat extracted will be about 3.5 kWh per kg. I heat my home with electricity that costs about $0.07 per kWh. Therefore,

the heating value of my scrap wood is about $0.25 per kg and by burning about 20kg per week I save about $5 per week on heating costs or about 50% of my heating bill for this time of year. Savings will be much greater in winter when the stove can be operated more frequently without the room becoming uncomfortably hot.

Why not just buy a fireplace insert?

I considered buying a fireplace insert but after learning about rocket stoves I quickly dismissed the idea because:

1. an insert would almost certainly be less efficient
2. it would require significantly more cost and effort to install
3. it wouldn't provide nearly the same conversation value
4. I would not be able to re-purpose existing waste material such as my parents hot water heater
5. it would not be portable (I look forward to operating my rocket stove on our patio on cool summer evenings).