

The Simple Alcohol Stove

by Bob Van Puten

Traveling light with an alcohol stove

As the nineteenth century drew to a close, small portable stoves became popular with soldiers, mountaineers, people that cruised in small boats and other travelers. At first, these small stoves ran on alcohol, and were known as “spirit stoves”. But portable kerosene and gasoline stoves were evolving. They were complicated, expensive, heavy and smelly compared to spirit stoves, but they were also much hotter. For an arctic expedition, one took petroleum stoves and reserved the spirit stoves for friendlier climates. Both types co-existed for a time, but in America at least, the spirit stove soon became extinct.

The alcohol stove did not die out entirely. For long decades they simmered on quietly in the hands of Swedish troops and a few European hikers. Then, one fateful day in the late 1980s, an American company began importing the Trangia alcohol stove. Made in Sweden since 1951, this was a shiny brass three-ounce stove with no moving parts. At first, it didn’t catch on. Most Americans still burned gasoline, and those that didn’t used the new-fangled butane cartridge stoves. But the Trangia was beautiful, and inexpensive to buy and run. It didn’t make much of a dent in the market, but a seed was planted.

A decade or two later the stove market had changed. The old gasoline tribe with brass tanks and enameled steel boxes were extinct, the sole surviving examples

of the species were flimsy take-apart stoves like the MSR. The butane cartridge stove now ruled. These stoves are not very expensive to buy, but they don’t last and are by far the most expensive of all stoves ever invented to actually use. This suited the folks that sell things just fine, and resulted in big profits, but unnoticed, something strange was happening in the background....

A literal Cambrian explosion of alcohol stoves was erupting! Dozens of designs were born, flourished and died, seemingly overnight. Most were home-made, and the new born internet helped spread these odd creatures. The evolution of the thru-hiker and ultra-light backpacker had created an ecological niche for a simple, cheap and ultra-light stove, and the alcohol stove rose up to fill that niche.

The alcohol stove has many unique attributes, which start with it being very light-weight. With no moving parts, reliability is perfect. They are clean and run silent, and they don’t flair up when priming. Also, they don’t explode like overheated butane or gas stoves are known to do. They burn an ecologically friendly fuel which is not explosive. When spilled it doesn’t stink and stain. An alcohol fire is easily smothered or put out with water, unlike gas. Alcohol can be carried safely in any plastic bottle, instead of pressurized canisters or steel containers like butane or gasoline. Best of all,



Tea time on a blustery day, courtesy of an alcohol stove.

the stoves can be made at home out of trash. If you are self-reliant and prefer to make your own things rather than rely upon the folk that sell stuff, these stoves are for you. Over the years, I've made and tested dozens of stoves of many different types (a man needs a hobby) and will show you how to make and use three very different stoves, which are among the best.

The lightest and simplest stove in the world is the Super Cat, invented by John Woods in 2004. It's nothing more than a 3 oz. aluminum cat food can with holes punched in it. Fancy Feast and similar cans work well, as long as they are aluminum. Use a pliers-type paper hole punch and make a row of 15 holes right below the rim and a second row of 15 holes just below that. Done! To use this unlikely stove, place it on a LEVEL and FIRE PROOF surface, fill it and light. Let it heat up for 30 seconds or so, then balance a pot right on top. The flames spout out the side holes.

This isn't a hot stove, use a wind screen around the pot. One liquid ounce of alcohol (two tablespoons) will burn about seven minutes and might boil two cups of water under ideal conditions. The stove will hold a little more fuel, but be careful, this stove has a well-deserved reputation for starting fires. It's easy to spill fuel out the side holes and ignite the landscape. It's popular because it weighs 0.2 ounce and needs no separate pot support. It works for coffee, oatmeal, ramen, and heating water for dehydrated foods, but that's about it. Again, it's easy to knock over, spilling burning fuel and dinner. I mostly use the Super Cat for tea when out on a hike. It's about the best stove ever made for a light weight, compact brew-up kit. They work well enough for simple solo cooking on

trips in good conditions, and I have used them on short backpacking trips when I wanted to travel as light as possible.

The next type of spirit stove are the Open Jet stoves. These are the most popular, and with good reason. Patented in 1904 by New York coppersmith J. Heinrich, these have double wall burners with lots of little jets much like a propane stove. When the stove heats up the alcohol it becomes vaporized and the side jets ignite. The Trangia is an open jet stove, as is the famous Pepsi-Can stove invented by Scott Henderson in 2000.

The classic Pepsi-Can stove is a great invention. It burns hot, and the thin aluminum construction means it's light and heats up fast too. These stoves can be finicky to make but are sturdy, work well, and burn hot enough to be used in cool weather. I made an extra-large size stove from 24-ounce beer cans that gets very hot and can boil a quart of cold water in nine minutes with two ounces of alcohol. It holds plenty of fuel and I've used it to boil two quarts of cold water and serve hot drinks for five people on winter hikes, but it's a fuel hog for ordinary cooking.

Pepsi-Can stoves made from 12-ounce cans hold enough fuel to cook for two, but you may need to let it cool and refill it for coffee. To keep from burning food, drop a "simmer cap" cut from the bottom of a can over the top to block part of the burner. The only complication to using one is guessing at the amount of fuel to use. Generally, people try to put in only as much fuel as they need for whatever they are cooking, and let the stove burn out. The stove can be snuffed out, let cool, and the remaining fuel poured out of the stove, but this doesn't work out well in practice.

I do love these little things and use them as my standard solo backpacking and cycle touring stove. You will need a pot support about 2-1/2" high. The pot support must not restrict airflow to the stove, so something like "hardware cloth" mesh makes a good stand. Use a wind screen.



Super Cat in operation and packed for travel.



Open Jet stoves. Swedish military, Trangia, Pepsi-Can, and 24-ounce beer can stove.

To make a Pepsi-can stove refer to the link listed at the end of this article, but briefly;

1. Cut 1" off the bottom of a 12-ounce soda can. This is the bottom of the stove.
2. Cut open the indented part in the bottom of another can. Drill 16 pin holes in the ridge around the bottom, then cut it off 3/4" high. This is the top of the stove.
3. Cut a strip of the can body 1-3/8 wide and 7-3/4" long, and cut two slots halfway across the strip, 5-1/2" apart, one on each side. Make three small nicks on one long edge. This is the inner wall of the stove. Adjust dimensions to fit your cans.
4. Assemble the strip into a ring, locking the slots together, glue the overlap, and tape with aluminum tape. This must fit neatly in the top of the stove.
5. To assemble, glue the inner wall in place in the top of the stove (don't block the jets). The three nicks in the inner wall go in the bottom of the stove. Don't glue the bottom of the inner wall. Smear glue inside the bottom piece and slip the top of the stove down into the bottom piece. It helps to stretch out the bottom part first by pressing it over the bottom of an unopened can, and to cut short slits in the bottom edge of the top part. For glue, use automotive high-temp RTV sealant.
6. Wrap the finished stove with a strip of aluminum tape.

I've made a dozen at a time and they all burned a little differently, so if you make one and are not happy with the way it works, make a few more before giving up hope.

Lastly, a Chimney stove, a type invented by L. "Traildad" Robinson in 2001. Most stoves use turbulent air flow produced by lots of jets to mix

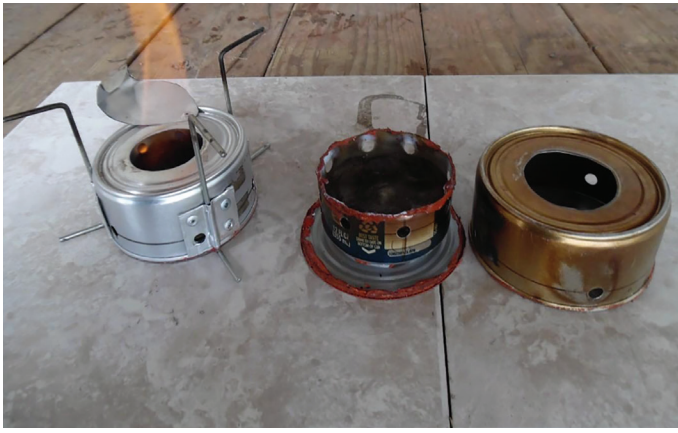
fuel and air. Chimney stoves use laminar airflow for transferring vaporized fuel. They use a different theory of operation and are more fuel efficient. In the first decade of the new millennium, Chimneys battled Open Jets for dominance. There is still one chimney stove made commercially, the Brasslite. This version, the Turbo Cat II, was perfected by John Bednar. Directions to make this stove can be found only here, we're resurrecting an extinct specimen. Try one, you might like it. To make one you'll need a 5.5-ounce aluminum cat food can and a soda can:

1. Cut the top off the cat food can with a side-cutter can opener.
2. Cut a 1-1/2" hole in the bottom of the can.
3. Make five 1/4" holes centered 3/8" down from the rim, evenly spaced around the can.
4. Cut the bottom off a soda can about 1-3/8th high. Adjust height as needed for a snug fit inside the cat food can.
5. Make eight 1/4" holes centered 3/8" below the rim of the soda can, evenly spaced.
6. Glue the soda can to the inside of the cat food can with high-temp RTV or JB weld.
7. Put about 1/4" of fiberglass insulation in the bottom of the soda can. Be sure not to cover the air holes.
8. Put a bead of glue along the rim of the soda can, to seal against the inside top of the stove, and along the rim of the cat food can, to glue its top back on, and put the two parts together.

To use, squirt fuel onto the fiberglass pad and drop a match in. You'll need a pot stand 3" tall and a windscreen. One ounce of fuel burns about ten minutes and can boil a pint of water in seven. Use a flat tab of metal to cover part of the burner opening to simmer. This stove is easy to make, holds plenty of fuel and can simmer for half an hour.



Two old Pepsi-can stoves torn apart to show how they go together, finished stove with pot stand, simmer cap, pot and windscreen.



Turbo Cat II, and an old one opened up to show the simple construction.

All alcohol stoves need windscreens. I cut mine from disposable aluminum roasting pans. Put two rows of holes along the bottom and use a paper clip to hold it in a circle around the pot. Fit them snug to the pot you're using. Denatured Alcohol is a mix of ethanol (booze) and methanol (wood alcohol). It's the preferred fuel and is available at some sporting goods stores or any hardware or big box store in the paint department.HEET gas additive is another fuel, found in gas stations, which is handy when cycle-touring. There are two types. The stuff in the yellow bottle is 99% methanol and works fine. The second type comes in a red bottle and is 99% isopropanol (made from propylene gas) and doesn't work. It burns very dirty and so hot it can melt your stove. Remember, Yellow Bottle Good, Red Bottle Bad! Rubbing alcohol doesn't work because it's an isopropanol and has water in it. Booze isn't worth considering because it usually has too much water and is expensive.

Gasoline has a much higher vapor pressure than alcohol. It will burn with a dirty, sooty, smoky flame, side jets will not ignite, and your stove might melt. Don't try it!

For decades, I used only blowtorch-hot gasoline stoves (I still do in winter) and I had to adjust to use admittedly low-powered alcohol stoves. Once mastered they work on conventional stoves. For example, I used to "cook" a dehydrated meal by blasting water to a boil on a gasoline stove, then pouring it into the foil package, fold it closed and wait ten minutes as per directions. The trouble was I never could wait ten minutes, and often wound up with crunchy food. If I did wait that long, the food was cold. With an alcohol stove, dump the contents of the package into a pot, add the water, give it a stir and set it on the stove to heat. The food re-hydrates better as it heats. In ten minutes, I'm eating hot, fully-hydrated food. Coffee and tea work much the same way. Instead of blasting water to a boil and pouring it over a tea bag, then waiting for it to steep and cool, I toss the bag into the cold water and heat it to a piping-hot-but-drinkable temperature. It actually takes less time this way. These little stoves are fun to make, a delight to carry and can work very well. With a little practice you will gain confidence with them for use in the wilderness. Here are some resources to check out:

Jim Woods Super Cat site.

<http://jwbasescamp.com/Articles/SuperCat/>

Best way to make a Pepsi-can stove.

<http://www.thesodacanstove.com/stove/>

The amazing Zen Stove site. <http://zenstoves.net/>
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