

Aluminum Bottle Alcohol Stove

by [hpstoutharrow](#) on August 23, 2009

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Intro: Aluminum Bottle Alcohol Stove

An Alcohol Stove made from **Aluminum Bottles**

There are plenty of aluminum can stove designs out there. This one is different in that it is not made from aluminum cans but rather from aluminum bottles (aluminum beer bottles to be specific) After building a few stoves myself I wanted to design one to address a few shortcomings of other can stoves:

1. Priming - A number of stoves require an external heat source to bring the alcohol to vaporization temperature. Some require heating the bottom for a few minutes or burning some alcohol in a separate "primer pan" or on the ground around the the can as a means to heat the exterior of the of the stove to achieve a self-sustaining burn.
2. Separate pot stands - A number of stoves have a low profile and are very compact however the smallest of the small require separate pot stands to cook with. Kind of defeats the purpose of a compact stove in my mind.

Sure there are side jetted designs that hold a pot however I wanted a design that would also address a third shortcoming.

3. Cold pan Flame-out - Of the can stove designs that do support a pot, I have seen them suffer from this condition. When a pan of cold water (fresh from the camp pump) is placed directly on a can stove, it acts as a large heat sink. Before the stove can warm the water, the cold pot cools the aluminum stove so much that it cannot maintain alcohol vaporization and the stove goes out.

Admittedly, there are are many great can stove designs out there; many are self priming (nothing new there) and some have integral pot stands. Each has pros and cons depending on your priorities. This is another design for consideration.

and besides, I just wanted an excuse to work with those cool aluminum beer bottles.

Update 9/15/09: Just posted an Instructable that that shows another stove related use for aluminum bottles <http://www.instructables.com/id/Aluminum-Bottle-Tumbler-Cup-Cook-Pot/>







step 1: Aluminum Bottles

If you look hard enough you will find a local retailer that usually stocks at least a small quantity of these specialty aluminum beer bottles.

I prefer the use of these aluminum bottles over the traditional aluminum cans for the following reasons:

1. Stability - The overall diameter of a can is larger than a bottle, however, the bottles have a larger diameter where it counts, at the base where it contacts the ground. The wider base is important because we are making a stove to support a pot and every bit of width helps to prevent tipping.

2. Heavier Gauge - The bottles are a thicker gauge aluminum. The thicker metal is a little more challenging to work with (you can't cut it with a utility knife) however it brings a solid, durable feel that you just don't get from a can.

This also means more thermal mass to help counter the "cold pot flame-out" syndrome.

(Sure more metal is more weight however once you step away from a propane grill; a quarter of an ounce here or there is not my biggest priority. (By the way, don't forget to add the weight of a separate pot stand to those other designs)

The last photo show some of my trials with earlier aluminum bottle designs.



step 2: Construction Section

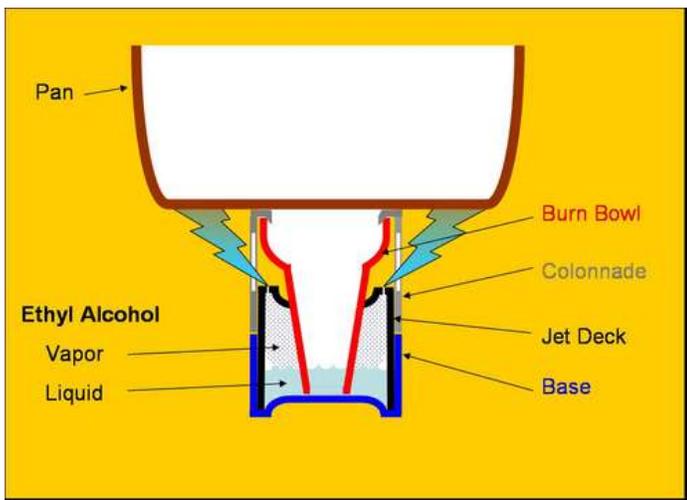
This stove is built from (3) empty aluminum beer bottles (be sure to dispose of contents responsibly...)

No glue or epoxy

No tape

No flux capacitors...

The assembly is all press fit together. The cross section below shows the naming conventions for each of the four parts referenced in the following steps



step 3: Bottom Cuts

1. Cut the bottoms off of the three bottles. Cut two bottoms 1.5" tall and one bottom 1" tall

I found that because to the thicker aluminum, the bottles could not be cut easily with a utility knife. A hack saw works well to make the cuts.

The fixture shown below helped to start the cuts and made sure they were straight around the can. Several turns with the blade pressed against the can started the cut; which was finished by carefully sawing around the outside of the can with a hack saw. (do not try to cut straight through the can as the blade will bend the edges of the can once it breaks through the skin.)

2. Finish the edge of the can to remove any sharp edges or nicks. Any nicks at the edge will initiate a split when the can is stretched.

Place emery cloth (sand paper for metal) on a flat surface. Place the entire edge of the bottle flat on the emery cloth and turn the bottle to evenly smooth the edge.



step 4: Cut Burn Bowl

This part is the **BURN BOWL** and serves two purposes. It initially is the internal primer area where alcohol burns to heat the alcohol to vaporization. It also serves as a heat sink, when heated by the jets, to keep the stove at at self-sustaining vaporization temperature.

1. Cut off the neck of one bottle. The cut should be at the tangent where the bottle neck just reaches full diameter.
2. Make a second cut at the top of the bottle opening as shown. This location is approximate. Start out with the cut a little long, it will be adjusted when fitting the burn bowl to the jet deck in step 8.
3. Smooth the edges as before.



step 5: Jet Deck

1. Drill a large hole in the center of the bottom of one of the 1.5" bottle bottoms. This will be the **JET DECK**.
2. With a file enlarge the hole to about 1 5/16" diameter (or a little smaller to leave room to tune)
3. This opening will need be tuned to create a force fit to the neck of the Burn Bowl
4. Drill (8) eight 1/16" diameter holes evenly spaced along the ridge of the bottle bottom. These are the jet holes





step 6: Widen base

1. Widen the opening of the shorter 1" bottle bottom. This is the **BASE** This opening should be widened to allow the jet deck to tightly telescope inside to the bottom.

I used a 1.5" diameter PVC pipe fitting to widen the aluminum "cup". Place the PVC pipe in the cup and by angling the cup while pulling, the cup is "rolled" off the pipe. This is done repeatedly rotating the cup a few degrees each time to gradually increase the diameter of the cup.

Be careful not to "flare" the edge of the cup. You do not want to create a "lip" on the edge. The goal is to increase the whole diameter of the cup to slide tightly over the outside of the Jet Deck.



step 7: Telescope Jet Deck to Base

1. Insert the Jet Deck into the Base.

2. Press evenly to fully set the Jet Deck to bottom of the base. You may need to place a board over the assembly and use a hammer to finish stretching the base to fully seat the Jet Deck.

Be careful to force the two pieces together evenly. They need to be aligned or the side wall of the Base could split or the side wall of the Jet Deck could crease.



step 8: Assembly

Take the Burn Bowl from step 4 and remove material from the small end of the neck as necessary, until the neck is short enough to allow the tapered portion to fit tightly in the hole of the Jet Deck.

It should be a tight force fit without gaps. Also the narrow end of the Burn Bowl neck should be touching the bottom of the Base so do not remove too much material at once.



step 9: Colonnade

This part will be the **COLONNADE**. Openings are cut in the sides to allow for the jet flames to burn while the remaining series of columns support the Burn Bowl.

At this point use emery cloth and steel wool to remove the paint (if you like the bare metal look). It is easier now before all the openings are cut.

1. Widen the opening of the remaining 1.5" tall bottom.

Only widen the first 1/2" of the opening so that it just fits tightly over the Jet Deck.

2. Drill a hole in the center of the bottom and widen it as described in step 5 however this hole is wider. Make it about 1.75" in diameter (widen the hole to remove the "dish" in the bottom - just to the ridge at the edge.)

3. Cutout (8) openings in the side walls to form the Colonnade. These openings are approximately 0.5" wide by 0.75" tall. (Make sure they line up with the jet hole in the Jet Deck)

I could not find an easy way to make these openings. I started with a few drill holes and widened with a file from there.

4. Assemble the Colonnade over the Burn Bowl and press the bottom opening of the Colonnade over the top of the jet deck.

Note: the Colonnade should press tightly down on the top of the Burn Bowl. if bottoms out on the top of the base prematurely, material may need to be removed from the bottom of the Colonnade to allow it to seat down far enough on the Jet Deck. The goal is to clamp the burn bowl into the opening in the Jet Deck.



step 10: Time to Cook

I use Ethyl rubbing alcohol as fuel. An old plastic film canister is a good dosing tool. It is the right amount for about a 10 minute burn (enough to boil a few cups of water.)

Safety note: Never use petroleum based fuels in this type stove. Their explosive nature makes them unsuitable for this type stove.

Pour the alcohol in the burn bowl and light.

After about 30 seconds the stove is hot enough to vaporize the alcohol and ignite the jets.

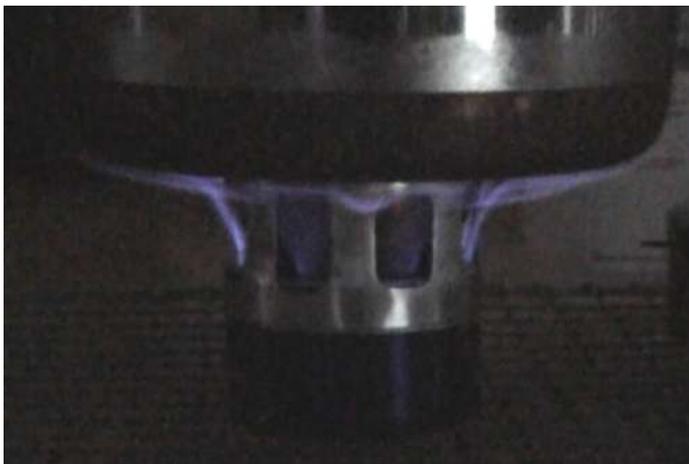
At this point the pot can be placed on top of the stove.

The jets will heat both the pot and the stove.

This continuous heating of the outside of the burn bowl is what keeps this stove lit when a cold pot is placed on it.

Make an option cap from another can bottom and then you can store a canister of fuel in the stove for transport.





Related Instructables



Aluminum Bottle Tumbler Cup & Cook Pot for an Alcohol Stove by hpstoutharrow



Build a low tech CFV stove by watermelon



Camp Table for Backpacking by hpstoutharrow



Pocket Sized Camp Stove (The Improved "Penny Stove") by Javin007



Altoids Tin Alcohol Stove by lo-tec



Hobo Stove - Ultralight Backpacking - Make It Yourself In 3 Minutes - 1oz (video) by Levlie



How to Make a Pocket Sized Alcohol Stove (video) by Pyro the maniac



Cool Little Miniature Stove! by NK5

Comments

50 comments

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Project_Nightmare says:

Mine keeps burning out (even with a wind screen), I have to revert to the old method of priming to get it burning :(

Oct 18, 2009. 7:29 PM [REPLY](#)



sukinmaru says:

What type of alcohol works the best? What is it meant by isopropyl burns dirtier? will it work with that type?

Oct 10, 2009. 2:21 PM [REPLY](#)



Project_Nightmare says:

There are two good types of fuel to use:

The safest one is neutral grain alcohol 150 to 195 proof (75-95% alcohol), a popular one is Everclear.

The cheaper one that is toxic if accidentally consumed is denatured alcohol which is available at any hardware store (you can get it at ACE Hardware or Home Depot).

Oct 18, 2009. 7:25 PM [REPLY](#)



junits15 says:

isopropyl has water in it so it leaves soot on your pan

Oct 12, 2009. 9:22 AM [REPLY](#)



dakkenly says:

Venom has crazy thick cans too, and they're real cheap and good so grab one of them for the under 21 crowd

Sep 7, 2009. 6:54 PM [REPLY](#)



Vulcanator says:

thats exactly what i was thinking!!

but the neck doesnt taper as much as a beer bottle, resulting in a shorter, fatter looking stove

Sep 28, 2009. 5:56 PM [REPLY](#)



junits15 says:
cool where can I find myself some venom energy?

Sep 20, 2009. 4:55 PM [REPLY](#)



dakkenly says:
Gas station, local convenience store, Wal-mart, Target... Get fruit punch flavor

Oct 1, 2009. 4:23 PM [REPLY](#)



junits15 says:
cool i go by walmart on the way home from school i maybe ill pick some up today.

Oct 2, 2009. 3:31 AM [REPLY](#)



k_man93 says:
word

Sep 20, 2009. 9:59 AM [REPLY](#)



Calorie says:
Exceptional job. Well thought out and purposefully executed.
Bit dodgy on thermal mass part, but it works for other reasons.

Sep 24, 2009. 9:10 PM [REPLY](#)



Carpenoctem90hrs says:
One of the most comprehensive and rewarding instructables on the site. Keep up the good work.

Sep 24, 2009. 6:37 AM [REPLY](#)



red9er says:
How does the "optional" cap on the last line not allow fuel to leak out but still stay on?
Also very well written. I could easily see how someone could make this confusing.

Sep 8, 2009. 9:16 AM [REPLY](#)



hpstoutharrow says:
The Alcohol is stored in a separate container. The cap is used to retain a small fuel container/bottle inside the stove. In this case I referenced using a plastic film cannister but any small plastic bottle with a secure lid that fits in the stove could be used. Any Ideas for small fuel containers?
You could also store other small related items inside the stove like matches, folded aluminum foil for a wind brake, or a pocket knife, etc.

Sep 8, 2009. 2:55 PM [REPLY](#)



90mp11 says:
would a paracetamol/aspirin container be small enough

Sep 24, 2009. 5:34 AM [REPLY](#)



Nivuahc says:
I'm not sure if it would fit in this particular stove but I've had a friend save several of those small energy drink bottles (you know, the ones that are supposed to last for 5 hours) specifically for storing camp stove alcohol. They should hold enough for a 15-20 minute burn and they have a screw-on cap, which is less prone to leakage.
I've taken a crack at several camp stoves and this one is, by far, the best looking/working one that I've seen. I suppose I'll have to make a few myself. Thanks for putting this up, it's very well done.

Sep 11, 2009. 4:20 AM [REPLY](#)



brainiac27 says:
Nice design, certainly a step up from the more basic can stoves. I never liked ethyl alcohol though, I prefer ethanol as it seems to burn cleaner.

Sep 1, 2009. 7:44 PM [REPLY](#)



wutzu says:
ethanol = ethyl alcohol

Sep 2, 2009. 1:53 PM [REPLY](#)



555mst555 says:
what's the diff between denatured, rubbing, Isopropyl and ethanol?

Sep 3, 2009. 6:46 AM [REPLY](#)



discontinuuity says:
Denatured means ethanol mixed with methanol and some chemicals to make it taste bad, so people won't drink it.
Rubbing alcohol is simply any kind of alcohol used for disinfecting cuts. It is usually isopropyl alcohol.
Isopropyl doesn't burn as cleanly as other alcohol and can cover your stove with soot.
Ethanol is the type of alcohol that you drink, like vodka (about 40%) or Everclear (about 90%). It is also called grain alcohol.

Sep 3, 2009. 10:28 PM [REPLY](#)

Methanol is similar to ethanol except that it is poisonous and will not make you drunk. It is also called wood alcohol and is used as race car fuel and in fuel-line antifreeze (those yellow "Heet" bottles at the gas station). It burns with a very light blue flame that can't be seen in daylight.



555mst555 says:
which is the best?...excluding heet....coz they dont sell it in my country

Sep 6, 2009. 7:15 AM [REPLY](#)



90mp11 says:
'Heet' would be similar to liquid meths in the UK i think, which comes as a purple liquid from the chemist. You can get high from it by breathing the fumes, but a large concentration results in death, which is why they add the bad tasting chemicals. Don't do drugs kids...lol

Sep 24, 2009. 5:32 AM [REPLY](#)



gernboken says:
i bet everclear would work. and it has other uses.

Sep 11, 2009. 5:33 AM [REPLY](#)



discontinuuity says:
If you can find pure ethanol or denatured alcohol I would go with that. It's probably cheaper than methanol anyway.

Sep 6, 2009. 2:33 PM [REPLY](#)



Calorie says:
????
Ethanol for consumption is heavily taxed on both continents. That's why you wouldn't use everclear or some other rot gut ethanol drink.

Sep 24, 2009. 9:08 PM [REPLY](#)

Methanol isn't taxed for consumption, but is toxic to drink.

Isopropyl would burn fine, except there is too much water in store bought type. All of the alcohols burn poorly when there's too much water in them.

And isopropyl is very toxic when orally ingested. It is not a pretty death.



brainiac27 says:
Whoops, you are right. When I saw rubbing alcohol, I thought of Isopropyl.

Sep 2, 2009. 2:51 PM [REPLY](#)



kd1uc says:
Cool! I've seen a few of these but I love this heavy aluminum version.
Question: How much fuel is too much?? Say if you wanted to cook, not just heat water.

Sep 23, 2009. 6:53 PM [REPLY](#)

Not to nit pick but most rubbing alcohol is not ethyl and leaving a plastic bottle full of volatile flammable liquid next to a heat source is just asking for a disaster.



wayne11 says:
Nothing but 10 out of 10 for this one bud :) anyone know of Alum bottles in England that would do the job???

Sep 23, 2009. 7:43 AM [REPLY](#)

Spot on



junits15 says:
what concentration of alcohol do you use?

Sep 20, 2009. 4:54 PM [REPLY](#)



cowscankill says:
One of the coolest, best working can stoves I have seen. Great job!

Sep 18, 2009. 7:11 PM [REPLY](#)



Project_Nightmare says:
How do you cut the neck of the bottle off and why did you cut the lip off the neck?

Sep 15, 2009. 6:22 PM [REPLY](#)



hpstoutharrow says:
Because the neck would not fit in the cut-off fixture, I scribed a line around the neck and carefully cut it with a hack saw.

Sep 15, 2009. 6:45 PM [REPLY](#)

I suppose the lip could be left on. The stove would be a little taller. The length of the base and colonnade would have to be adjusted accordingly. (I had already set the length of these with the cut-off fixture for other stove projects so it was easier to adjust the neck length to accommodate.)



ozioz says:

Sep 11, 2009. 10:09 AM [REPLY](#)

ok you should sell these, if you do let me now. best I seen by far.
also the "red cap" that holds the fuel container in the stove, (while in storage)could possible be made by another bottle, expanded/cut long enough to incase 80% or more of the colonnade snugly,while in transport/storage mode.Then used as a cup/cooking /boiling container.
again very nice.



hpstoutharrow says:

Sep 11, 2009. 2:51 PM [REPLY](#)

Instructable in process.... Stay tuned.



hpstoutharrow says:

Sep 15, 2009. 3:13 PM [REPLY](#)

Update: Just published the Instructable for the Metal Tumbler Cup / Cook Pot shown above:

<http://www.instructables.com/id/Aluminum-Bottle-Tumbler-Cup-Cook-Pot/>



ozioz says:

Sep 15, 2009. 5:15 PM [REPLY](#)

very nice work..



ozioz says:

Sep 12, 2009. 9:57 AM [REPLY](#)

exactly what i had in mind, does it fit all the way down to cover the colonnade completely,(to keep foreign material out.) when in travel mode.
looks great



Tetrafish says:

Sep 11, 2009. 7:19 AM [REPLY](#)

I tried this with some cans of Suave Mouse and a can of (aerosol) Febreze. They were different sizes and I don't think I was able to make it right (had to make a funnel from another can). And I think I needed a better type of alcohol to make it work.

...Good news for anyone that won't touch alcohol/liquor (i.e. for religious reasons). Pepsi makes an energy + coffee drink in an aluminum bottle. :-D After I get 2 more of those I will (re)try this.



geowulf says:

Sep 14, 2009. 3:44 PM [REPLY](#)

Mountain dew has an "Independence day" edition that sold at Walmart for \$1.50 a bottle.



ratazc says:

Sep 11, 2009. 5:57 PM [REPLY](#)

Nice project. I'm going to try it this weekend...but will I do with the contents of those blue bottles? hehe.



mikej_w says:

Sep 11, 2009. 10:25 AM [REPLY](#)

I was wondering about the size of the jet holes; it seems to me that a smaller hole might be more efficient because it would increase the pressure and throw the flame ("jet" action) farther. Do you have any insight on the "best" size hole to drill? Maybe put 2 smaller holes side by side within one colonnade opening?

Mike



Tommyhzy says:

Sep 11, 2009. 1:27 PM [REPLY](#)

Smaller flames result in less fuel used (Or same fuel used if the pressure is constant) and won't necessarily mean efficiency, as the flame will be thrown past the pot and into the air, losing heat.

And this one heats things faster, therefore operating time is reduced, reducing fuel consumption. (And it looks "Pro")



mikej_w says:

Sep 11, 2009. 3:54 PM [REPLY](#)

Thanks. I will likely be building mine soon. Right now I'm shopping for some brew!



rogue13_13 says:

Sep 11, 2009. 10:37 AM [REPLY](#)

I am very impressed with this instructable. I think that such a stove would be a great addition to my camping pack.

I have one question though, how does the alcohol get from the burn bowl to the chamber where it vaporizes? I was under the impression that the burn bowl would have a tight fit against the base of the stove, and thus not allow alcohol through.



hpstoutharrow says:

Sep 11, 2009. 3:01 PM [REPLY](#)

The wording "touching the bottom of the base" in step might have been too strong a term. Its being taken to mean "seal". I may have to reword the instructable. Check the comment and reply from Sept. 7th. Thanks for the interest.



alivia says:

Sep 11, 2009. 11:15 AM [REPLY](#)

Excellent Instructable!



ccdiver says:

Sep 11, 2009. 9:36 AM [REPLY](#)

This is a great project and well presented. These are something everybody should have a few of for emergencies, as well as a great backpacking stove that you don't need custom fuel dispensers or expensive fuel for. Thanks for sharing this.



UOS says:

Sep 11, 2009. 6:56 AM [REPLY](#)

That is a useful one! Thanks =)



michaelp says:

Sep 11, 2009. 6:32 AM [REPLY](#)

I will try this over the weekend but I am thinking the cutting blade in a dremel tool would be useful here.



Metalcaster14 says:

Sep 11, 2009. 6:07 AM [REPLY](#)

Great Instructable. good descriptions, very precise. If I could drink/consume wheat (I'm under age and have a gluten allergy lol) I would definitely build one.

[view all 75 comments](#)