Ultra-simple, improvised camping stove

by **stinkwheel** on February 14, 2008

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intro: Ultra-simple, improvised camping stove

The simplest ideas are usually the best eh?

I have been experimenting with various designs of improvised camping stove for some time now. They have varied from a simple open cup of burning fuel to highly intricate vapour pressure devices that take hours to build.

This is my latest favourite, it is a combination of two established types of stove. A chimney stove and a low pressure side-burner. It takes about three minutes to make and so can be constructed as and when you want to use it.

This design also has the advantage that it will run on pretty much any flammable liquid you put in it. I have used methylated spirits, rubbing alcohol, xylene, white spirit and petrol.

This brings up an important safety issue though, anything other than an alcohol type fuel is inherantly a lot more dangerous. Pure hydrocarbon fuels like xylene and petrol are toxic, dirty (they make a real mess of your pan!), smelly, potentially explosive and can't be put out using water. An alcohol fire can be extinguished by upending your pot of water over it if things get out of control (don't believe me? Try it.)

For more info on improvised stoves have a look at the site that inspired me to try experimenting: zenstoves

step 1: Build your stove

Ok. To do this you will need:
1) Empty 330ml soft drinks can (*size not that important)*
2) Can opener.
3) Pointy thing *(bradawl, nail, tentpeg, sharpened stick)*

So essentially an empty drinks can and a swiss army knife.

First remove the top of the can using your can opener, be careful not to damage the rim too much.

It would appear that the rim is an important part of this design. Without it, the aluminium of the can might start to melt and crumple from the heat. Some can openers slice the entire top off, these are not suitable *(see picture below for what the completed stove should look like).*

Now punch eight, equally spaced holes through the side of the can about 1" up from the base. The holes should be roughly the diameter as the awl tool on a swiss army knife or a round steel tent-peg. *(again, size isn't all that critical, spacing is more important)*

Punch another ring of eight holes round the angled part of the can just below the top rim.

Punch a third ring of eight holes through the side of the can just below the angled part, arrange them so they fall inbetween the upper row of holes.

Your stove is now complete!

step 2: Setting up and lighting

Right, this stove is also your pot-stand. So, you need it to be steady enough to support the weight of your full pot without falling over. A level surface might suffice or you might want to peg it upright by arranging three pegs round the outside of the can.

If you're outside, try to protect it from wind as much as possible for efficient functioning.

Now, fill with fuel to just below the bottom row of holes. I'd suggest alcohol or methylated spirits. Petrol and xylene will work but are much more dangerous both in terms of health and in terms of fire hazard.

Light the stove by holding a match or lighter to the **bottom** holes.

You'll notice the flame lights inside the can and 'chimneys' up the middle.

Allow the flame to build until it is a few inches above the top of the can then slowly place your cooking pot on top. The flames should transfer to the side holes and start burning like a gas ring. If they don't, remove your pot, allow the flame to get a bit higher and replace it.

You'll note that the flame is actually burning deep in the bottom of the can near the base holes then jetting up through the top holes. Looking down into the uncovered can *(from a height, eyebrows!)* you can appreciate the pattern of flame this arrangement of holes generates.

These stoves are remarkably efficient, almost no heat escapes through the sides, it all goes straight up. Mine will boil two mugs of water in my stainless cookpot on a single fill of methylated spirits. I was using it this weekend to great effect in temperatures below -6C

N.B. I have occasionally seen these stoves 'flashback' through the bottom holes so keep the area around it clear of flammable material!

Oh yeah, they're quite difficult to extinguish once they are going. I try to just fill it with what I'm going to use but an upended cooking pot placed over it for a while seems to do the trick too.

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osmonde says: May 14, 2009. 5:04 PM REPLY

another idea would be to make one out of an aluminum can, it doesnt have the slanted top but it would be way stronger so you could have a heavier load and be more heat resistant so you dont have to worry as much about it getting soft or melting

VanWinn says: May 13, 2009. 1:50 PM REPLY

I made a stove similar to this and was having trouble getting the stove to produce a strong flame. The reason was because not enough heat was staying with the stove to keep the denatured alcohol vaporized. I solved this problem by adding 2 copper "heat Pipes" to the top of the stove. I got some 1/8 copper tubing measured it and bent it into a "U" shape. I then drilled 2 properly spaced holes and inserted the copper tubing (open side down) into the top of the stove. The pipes should be just short of the bottom of the stove. This made a HUGE difference! I could now here the alcohol boiling in the can.

dmdeford says: Apr 16, 2009. 6:19 PM **REPLY**

having trouble...
my stove works fine until I add a pot to it, it works for about 5 seconds and then one by one the burners go out. followed instructions as well as I could.

using:
Arizona Tea Can
91% Isoporyl Alcohol

Any suggestions welcome, thanks.

stinkwheel says: Apr 22, 2009. 1:57 PM **REPLY**

I find making the holes a little bigger sometimes helps. Try this as a first step.

I was cooking on one just this weekend using a heineken lager tin and 95% ethanol (in addition to a "Penny stove" which is more fuel efficient but more fiddly to make). I found that both stoves were struggling to stay lit when I used it on a cold metal surface (on top of an unlit wood burning stove in a mountain bothy). I insulated them underneath using a bit of cardboard and they stayed lit much more readily.

I think it needs to heat the fuel in the bottom a little to keep enough vapour circulating, once the heat is sufficient, the process is self-sustaining. It would make sense that isopropyl alcohol would need more heat initially as it has a higher flash point.

I sometimes find that blowing the stove out then relighting it about 10-20 seconds later does the trick too. Just be careful because the residual vapour can go up with quite a woosh.

In cold conditions and on a cold surface, you could also try 'priming' it slightly by putting a few drops of fuel on a flameproof surface under the stove and lighting those first. Three or four drops is sufficient for most alcohol stoves I've used.

In fact, all the alcohol stove designs I've tried benefit from priming in this way under very cold conditions, even the open burner type.

sirjamesalot77 says: Dec 26, 2008. 9:54 PM **REPLY**

This design works really well. I tried it and put it on youtube, it's the second one:

phoenixjen says: Apr 2, 2009. 2:08 PM **REPLY**

This stove looks good sitting on top of the can but can you put a can or something you are heating up on the stove? Why is is so dented?

stinkwheel says: Apr 3, 2009. 1:03 AM **REPLY**

If you watch the video to the end, you'll see a can of water being boiled on it.

The dents are presumably from where the holes were punched through it. If you want to avoid this, use something good and sharp to punch the holes.

A few dents here and there doesn't seem to upset the functionality but I suspect if there were to many it would make the can more prone to collapsing under a load.

ch0wderdood says: Dec 31, 2008. 4:02 PM **REPLY**

and what was your fuel for both cans?

ch0wderdood says: Dec 31, 2008. 4:02 PM **REPLY**

where or how did u make that pot stand and the stand for the stove?

bylerfamily says: Mar 17, 2009. 8:21 AM **REPLY**

Would 91% rubbing alcohol work in this stove?

davidp says: Apr 10, 2008. 9:39 AM **REPLY**

That's a great idea. I'm going to try it myself. Would an 8-ounce drink can work as well (don't know the metric equivalent)? Seems it would be more stable, not being as tall. Just a thought.

bylerfamily says: Mar 11, 2009. 4:22 PM **REPLY**

Yes it would work.

david_ says: Feb 5, 2009. 1:37 PM **REPLY**

Do you fill the can with anything other than fuel (alcohol) ie an absorbant material? I know many commercial and home-build designs use something like this to both extend burn time and avoid that flash-back you talk about. I believe I have seen kitty litter being used. I guess it doesn't burn. I think i have also seen plaster of paris being used since it can be poured in wet and when dry absorbs the alcohol very well and will not burn.

voltagedude says: Feb 16, 2009. 4:21 PM **REPLY**

You should try fiber glass!! it works great. you can find some in your attic or basement.

stinkwheel says: Feb 10, 2009. 9:31 AM **REPLY**

I think it would probably work but I also suspect it would reduce the fuel capacity to below what I'd consider a useful quantity (ie, enought to boil about a mug of water).

Any absorbent material would have to come to just below the lower ring of holes.

I'll maybe give it a try next time.

The Real Dave says: Feb 5, 2009. 2:43 PM **REPLY**

This is a great project and looks reli cool, but can I ask, whats wrong with a good old fashioned campfire :D

stinkwheel says: Feb 10, 2009. 9:25 AM **REPLY**

Nothing at all wrong with a campfire.

However, they take time to light, are often not allowed during brushfire season, on official campsites or are for some other reason inpractical.

I used one this weekend when firewood was in short supply. I landed up walking in to a bothy (a building in a remote place maintained by a charity for use by anyone) when my motorbike got stuck in snow. There was very little by way of dry wood to be found so I carried a bottle of meths in with me. I then used the stove to make myself and my two companions hot drinks and a hot meal leaving the firewood to heat the building. That way the wood lasted all night.

For reference this one used a 500ml steel beer can (John Smiths Bitter). Indoors on a concrete floor I fried sixteen rashers of bacon on 50ml of meths.

Hawk20 says: Feb 5, 2009. 5:32 AM **REPLY**

I have followed alcohol stove designs for years and never found one worth the time to try. Finally an elegantly simple design that works. Thanks!

woody558 says: Jan 18, 2009. 12:42 PM **REPLY**

one idea is to use a hole puncher to make the holes

woody558 says: Jan 15, 2009. 11:12 AM **REPLY**

This stove doesn't work very well. Te pot ALWAYS smuthers the fire.
My favorite stove is this one:
http://www.instructables.com/id/Cool-Little-Miniature-Stove!/

stinkwheel says: Jan 16, 2009. 4:10 AM **REPLY**

I like those open pressure burners too. They are very efficient.

They do however require more tools and a couple of hours to make.

The idea with this one was to have something that could be made "on the spot" with tools you would normally carry with you (at a mnimum, a can opener

and a pointy stick) and would be more eficient than a simple open can of fuel.

You may need to alter the size of the holes depending on which fuel you are using.

hamtons says: Nov 27, 2008. 2:46 AM **REPLY**

I made something similar before. I fed mine with hexamine tablet fuel and the thing flared so strongly the paint on the side of the can melted into a stinking mess. Is that a consideration when burning liquid fuel? Thanks

stinkwheel says: Nov 27, 2008. 12:56 PM **REPLY**

The reason for using the can in this case is to give a controlled burn of the liquid fuel. Just use an open pot of burning fuel and it starts to vapourise too quickly in its own heat which is wasteful. The can restricts the air supply and allows the fuel to burn a little at a time as well as keeping the flame front a reasonable distance away from the liquid fuel.

This isn't an issue with solid fuel. The rate of burning of the fuel is nice and steady in the open air. All you need for solid fuel is something to rest it on, a pot stand and a wind shield.

Any cans I have used have the design printed directly onto the steel/aluminium. It scorches but isn't really thick enough to melt off. Maybe you had a can with a plastic coating?

hamtons says: Nov 27, 2008. 9:21 PM **REPLY**

I'm not sure but I dont think that my can's had any special coating, it turned brown and it stinks. Perhaps I made the ventilation holes too big. The flames spiraled out of the can 2 inches high. I was using a 1 inch x 1 inch square of hexamine. Or perhaps it was just the stench of the burning hexamine tablet. It kinds of stinks alot on its own.
Thanks anyway (:

lancecozad says: Nov 1, 2008. 8:28 PM **REPLY**

one last thought: everybody seen the video of a Foster's beer can stove melting into a puddle? Makes a great 25 ounce cookpot to boil water in, but to use it AS THE STOVE is a surefire meltdown. Grolsch? Interesting. I'll try one. (hic)

lancecozad says: Nov 1, 2008. 8:14 PM **REPLY**

mine seemed to draw better when the top two rows of holes were just slightly smaller than the air feed holes on the bottom. Awesome, simple design. I am annoyed with myself for not thinking of it on my own. Thanks for putting it out here for those of us who tend to overcomplicate.

lancecozad says: Nov 1, 2008. 8:11 PM **REPLY**

I can't resist the urge to fiddle and experiment. I found that the "wired" energy drink can seemed to boil water a tad faster than a 12 ounce can did. dunno why. I am not an engineer. I do love to tinker with ideas, though. I also tried shorter cans, thinking it would help. it ruins the chimney effect and slows the boil time down. stick with taller cans.

cd41 says: Nov 1, 2008. 7:13 AM **REPLY**

amazing

louie_gee_gee says: Jul 28, 2008. 8:09 PM **REPLY**

Fantastic instructable! Quick, cheap and simple - everything a good tin-can stove should be! Much kudos, kind sir! :)

Just one question, is it Ok to use it more than once or does the metal begin to degrade from the extreme heat?

stinkwheel says: Jul 29, 2008. 7:50 AM **REPLY**

I think a lot depends on how thick the can is and if it is steel or aluminium. Some are better than others. I did have a couple of particularly flimsy aluminium cans collapse on me.

Best one I've used to-date was a grolsh beer can

louie_gee_gee says: Jul 29, 2008. 3:42 PM **REPLY**

Right, thanks. I guess it's just a case of using your own judgment then. Are there any particular brands of can that seem totally unsuitable?

stinkwheel says: Apr 10, 2008. 2:45 PM **REPLY**

Just a quick note to say I had a the top of a can collapse on me at the weekend. Just slowly sagged round the top section.

I was using about double the quantity of water I usually use. It would appear however that the metal of this can was considerably thinner than those I had previously used. It would seem not all cans are alike.

The one that collapsed was an Irn-Bru can (Irn-Bru is an impossibly sugary, fizzy, caffeine loaded beverage from Scotland). A pepsi max can worked fine.

stinkwheel says: Mar 17, 2008. 5:30 AM **REPLY**

I thought I'd add a picture my friend took of me using this design on a recent camping expedition to Wales (UK). In this case, I used a "stubby" grolsch can (being the nearest thing to hand).

Just to show I put my money where my mouth is.

I'm using methylated spirits. The air temperature must be around -6 Celcius (About 20F) because the flysheet of my tent is frozen solid and there was ice in my water bottle when I woke up.

metal_flowboard says: Apr 10, 2008. 12:11 PM **REPLY**

THATS A FORCE TEN TENT!!

top man

Phoghat says: Apr 10, 2008. 10:29 AM **REPLY**

Great idea. I've been looking for something simple but functional like this for a while. The other can stoves are good, but this one can be made with something at hand and no tools but the ubiquitous SAK.

shorn says: Mar 13, 2008. 4:13 PM **REPLY**

My can kind of turns white and shrivels up..
Its just a coke can o.o

mondaymonkey says: Mar 27, 2008. 10:42 PM **REPLY**

I made a Can Stove (diff version than this) and I accidentally spilled a MASSIVE amount of parafin oil on it. Went up in flamse for about 25 mins. At the end, the can was black as night, but a good wash showed that it was still a can. Currently my can is looking like that and its been through about 5 burns. If your coke can just died that quick, then youve been gimped

stinkwheel says: Mar 13, 2008. 5:58 PM **REPLY**

Wow!

Aluminium melts at 660 degrees celcius (1220 degrees farenheit). That must be banging out a truly awesome level of heat. Either that or the can you've used is made of some odd material.

I've burned aluminium drinks cans using a blowlamp but it still took something of an effort, deliberately concentrating the flame on one point at a time.

What fuel are you using?!

shorn says: Mar 16, 2008. 8:13 PM **REPLY**

I'm using regular old isopropyl alcohol. I believe it was 70% too.

I'm not sure if its melting... but it sure turned white. It was a regular coke can.
It smelled a little weird, and your instructable did not mention anything about the can breaking down so I thought I was probably doing something wrong, so I put it out.
I researched a little on it, and I was wondering if it had anything to do with 'galvanized' metal or something of that sort? I really have no idea what that is.

Other than the can burning up, this design actually works really great. I could have boiled the water in the pot pretty quick if the can wasn't crumpling and turning white.

mondaymonkey says: Mar 27, 2008. 10:43 PM **REPLY**

Buy yourself a good quality beer. Your stomach will thank you,(Instructable part) your lungs will thank you and your mind will thank you for not driving it crazy

Tracy says: Mar 27, 2008. 8:05 PM **REPLY**

That's just the finish burning off the can. I think you'll find that if you wash the white stuff off, you'll have no further prob.

stinkwheel says: Mar 17, 2008. 5:20 AM **REPLY**

Interesting. I did encounter a similar problem during experimentation with a chimney stove. Same idea but using only the bottom holes. Instead of the top burner holes I was 'standing off' the pot from the top of the can using three tent pegs inside the can. Without the restricted ventilation, the flame got more and more intense and the rim of the can eventually buckled.

So, that implies a reasonably good seal between the pot and the top of the can is important. If the base of the pot is buckled/dented, the resultant air leak could result in things getting out of control. (the chimney design eventually had the flame 'roaring' about 18" out of the top of the can).

Also, it occurred to me that if the rim was missing off the can, the edge could easily overheat. Make sure it's not the sort of can opener that removes the top of the can, you want one that removes the middle of the can top but leaves the rim intact.

shorn says: Mar 17, 2008. 12:27 PM **REPLY**

Ah that was the problem then. The can opener I used does take off the metal rim as well, leaving it with a razor sharp and thin top.
I'll need to find one that doesn't then...
Perhaps you should make it a little clearer in the instructable? If it was already there, I didn't really notice it so make it more visible :)

pyroelectro says: Feb 15, 2008. 9:24 AM **REPLY**

great idea
great instructable
great drink :)

fishhead455 says: Feb 15, 2008. 8:17 AM **REPLY**

For a level surface how about a small square tile...maybe 4" square. Not much weight or space in the pack. I guess that with a small bottle of fuel, a hole-punch and a tile you can cook anywhere you find a can. (I made one of the other stoves from the two 1" bottoms of the aluminum cans and it worked perfectly). I like this one also....but have not yet tried it. Luck All.

applejack says: Feb 15, 2008. 5:52 AM **REPLY**

A wider and shorter steel can, like a beef stew can, might carry more weight and be a little sturdier. To solve the weight and sturdiness problem I like to use this stove.

callmeshane says: Feb 14, 2008. 6:33 PM **REPLY**

This actually looks really good.

The combustion is clean, the strichometric ratio (air fuel ratio).

The flames are about the right lean-ness to make them HOT and ROBUST; but not sooty.

The spacing of the burner jets, gives good mixing with the air.

I actually like these stoves, if only the simplicity of them and the ease of "availability" when caught out in the middle of nowhere... providing one has the fuel in the first place; or one wants to cook outdoors, without spending megabux for a sort of one off event.

I still feel a bit wary of the width to height ratio - or the ease of tipping over, of a narrow and tall thing - with a proportionally larger object on top.

I once had one of them kerosine pressure burners, with the alcohol preheated gassifier...

Came back into my tent one night, as pissed as (blind drunk), decided I was hungry, wanted a hot feed... had to prime the stove with alcohol... only it was pitch dark and I couldn't find my torch.

And the little bit of estimated alcohol for priming the stove, filled the priming cup and ran in a nice little stream down the side of the stove and along the tents plastic floor....

I was inside the tent... the stove was between me and the door....

And then I lit it.

Needless to say, rather than face the prospect of my tent going up, and some of my stuff with it... I had to act quickly, and douse the flaming plastic with my bare hands...

I saved tent, had a neat big hole in the floor of it, and had some blisters and burns on my hands... nothing too awful tho...

And all was well.

Hence my desire to design in, factors of safety and good design - stability being one of them.

stinkwheel says: Feb 15, 2008. 1:34 AM **REPLY**

Certainly I was concerned about the stability too. The addition of three tent pegs pushed into the ground at euqally spaced points round the can prevents it falling over quite effectively. Just avoid blocking any of the holes with a peg.

I suspect (but haven't tried it) that you could even just use three sticks as there is very little heat radiated from the sides of the can, certainly the lower half.

I suppose drinking alcohol then trying to burn alcohol is what one might call a recipe for disaster. For the record, I wouldn't recomment using this stove actually on the groundsheet. I've sometimes used it on the ground inside the pegged-out awning of my canvas tent to help keep the wind off it.

LinuxH4x0r says: Feb 14, 2008. 6:07 PM **REPLY**

I will try this. All of my other stoves sucked.
Great instructable

SpinWard says: Feb 14, 2008. 3:41 PM **REPLY**

I love the simple stoves!

This looks great. Thanks for the instructable!

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