

## **Q & A: Will the alcohol fuel evaporate from the stove when it is not in use?**

If the stove's regulator, which serves as the "on" and "off" mechanism, is closed, fuel will not evaporate from the stove (under normal conditions).

If the stove is in a hot place such as in the direct sun and heats up, this will promote evaporation. The canister is protected from heat inside the stove, but the warmer the canister becomes, the more likely it is that the alcohol will evaporate. Though, when alcohol evaporates, because of its high latent heat of evaporation, the canister will cool.

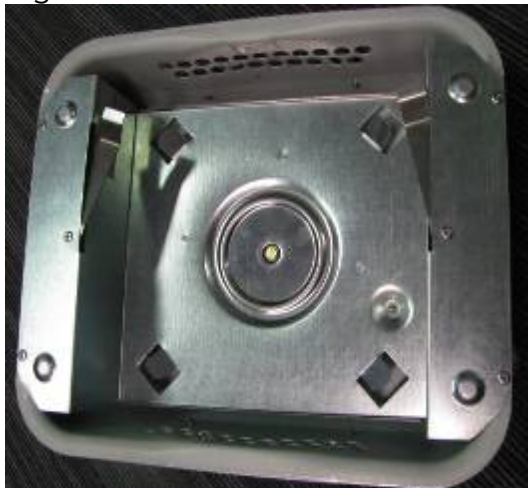
When the stove is used for daily cooking, losing fuel from the canister between uses or overnight is not a concern. As long as the stove's regulator is closed and the stove is kept out of the sun or hot locations, any loss of fuel will be negligible. For storing fuel over long periods of time, a gasket (separate from the stove) is placed over the mouth of the canister. The gasket, plus the closed regulator, assures that fuel will not evaporate from the canister (Figure 5).



The regulator is seen in Figure 1; it is mounted on an arm of spring steel. When the regulator slides over the fuel canister, the contour in the regulator plate locks into a reciprocal contour at the canister mouth. This assures a good seal. The regulator arm presses the regulator plate against the mouth of the canister, securely closing it.

Figure 2 shows the regulator in the closed position, viewed from underneath the stove. The mouth of the fuel canister is raised and protrudes through the heat shield. The regulator plate locks over the canister mouth above the heat shield.

Figures 1 and 2



A small void is created between the regulator plate and the fiber in the canister mouth. This void becomes saturated with ethanol vapor, resulting in the equalization of vapor pressure in and above the canister. As a result, evaporation of fuel from the canister ceases.



Figure 3: Fuel Canister



Figure 4: On/Off Control



Figure 5: Cap for Fuel Storage



Figure 6: Operating Temperatures

Figure 3 shows the fuel canister. Note the contour around the canister mouth, and that it is raised. The regulator plate slides securely over the canister mouth to extinguish the flame and close the canister so that the fuel cannot evaporate.

This unique fuel containment system is achieved without pressure. The fuel canister never becomes pressurized and thus cannot explode. If for some reason the canister heats and excess fuel escapes, it will press out against the regulator plate and dissipate harmlessly.

The boiling point of ethanol is 78° C, while the boiling point of methanol is 64.7° C. As long as the interior of the canister does not heat to these temperatures, the fuel will not forcefully escape. If this occurs, a lit stove may not turn off readily. Though, opening and closing the regulator several times will extinguish the stove. It should then be allowed to cool.

Beneath the surface of the stove is a heat shield. This shields the canister, which lies beneath it, from heat. When the stove is used for extended periods, the top of the stove will get hot from heat reflected from the pot, but the heat will not radiate to the canister because of the heat shield. As noted above, the canister also has its own special cooling mechanism. As fuel evaporates from the canister, heat is transferred from the canister into the gas, cooling the canister (See the Tech Brief: 'Why the Canister Stays Cool').

If the canister should heat to the boiling point of the fuel, the stove will continue to perform normally; but extra care must be taken to turn the stove off. Note the temperatures reached on the stove body when the stove is in use in Figure 6. Aprovecho Stove Research Laboratory rates the stove "Very Safe" (a score of 39 out of 40), with stove body temperature during operation a key factor.

Once alcohol fuel is charged into the canister, it can either be stored for future use, removed through burning, or allowed to evaporate. If water accumulates in the canister, it can simply be boiled (evaporated) off by heating the canister.

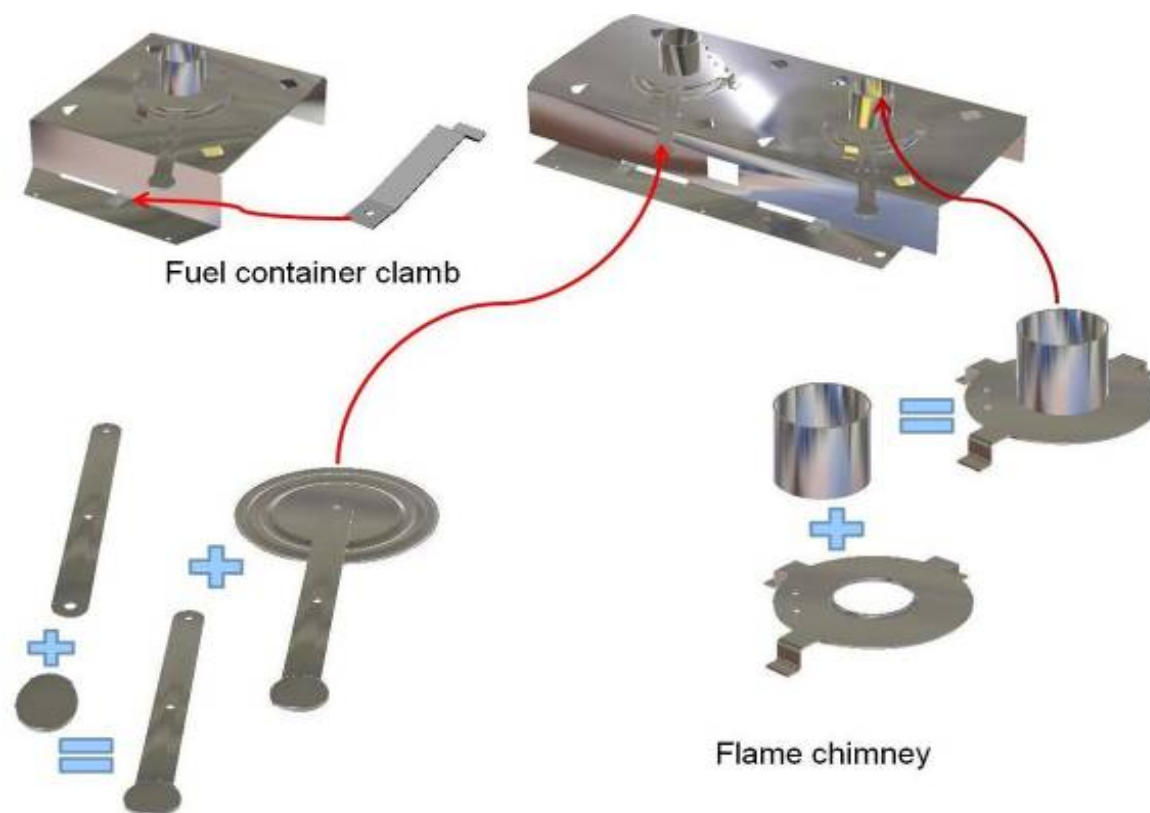


Figure 7: The interior parts of the CLEANCOOK stove



Figure 8: Double burner stove ready for assembly